

# 777

## *Quick Reference Handbook*

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**Normal Checklists****Chapter NC**

---

**PREFLIGHT**

Oxygen..... Tested, 100%  
Flight instruments ..... Heading\_\_\_\_, Altimeter\_\_\_\_  
Parking brake .....Set  
Fuel control switches..... CUTOFF

---

**BEFORE START**

[Passenger Airplane]

Flight deck door ..... Closed and locked

[Passenger Airplane]

Passenger signs ..... \_\_\_\_

[Freighter Airplane]

Supernumerary signs..... \_\_\_\_

MCP ..... V2\_\_\_\_, HDG/TRK\_\_\_\_, ALTITUDE\_\_\_\_

Takeoff speeds ..... V1\_\_\_\_, VR\_\_\_\_, V2\_\_\_\_

CDU preflight..... Completed

Trim ..... \_\_\_\_ Units, 0, 0

Taxi and takeoff briefing ..... Completed

Beacon.....ON

---

**BEFORE TAXI**

Anti-ice..... \_\_\_\_

Recall.....Checked

Autobrake .....RTO

Flight controls.....Checked

Ground equipment.....Clear

**BEFORE TAKEOFF**

Flaps ..... \_\_\_\_

**AFTER TAKEOFF**

Landing gear ..... UP

Flaps ..... UP

**DESCENT**

Recall ..... Checked

Notes ..... Checked

Autobrake ..... \_\_\_\_

Landing data ..... VREF\_\_\_\_, Minimums\_\_\_\_

Approach briefing ..... Completed

**APPROACH**

Altimeters ..... \_\_\_\_

**LANDING**

Speedbrake ..... ARMED

Landing gear ..... DOWN

Flaps ..... \_\_\_\_

**SHUTDOWN**

Hydraulic panel ..... Set



777 Flight Crew Operations Manual

---

**[Auxiliary Fuel Tank]**

Auxiliary fuel switch ..... Off

Fuel pumps ..... Off

Flaps ..... UP

Parking brake ..... \_\_\_\_

Fuel control switches ..... CUTOFF

Weather radar ..... Off

---

**SECURE**

ADIRU ..... OFF

Emergency lights ..... OFF

Packs ..... OFF

**DO NOT USE FOR FLIGHT**

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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). . . . . Push to  
CLOSE and hold  
until the outflow valve  
displays show fully closed

[Passenger Airplane]

PASS SIGNS selectors (both) . . . . . ON

[Freighter Airplane]

SEAT BELTS selector . . . . . ON

Do **not** accomplish the following checklists:

PACK L

PACK R

CABIN ALTITUDE AUTO

▼ Continued on next page ▼

▼ Ditching continued ▼

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

Landing gear lever . . . . . UP

Flaps . . . . . 30

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 Refer to the Landing Climb Limit Weight table in the Performance Inflight chapter.

2 Choose one:

◆ Landing gross weight is **greater than** the Landing Climb Limit Weight, **or one engine is inoperative**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

►► **Go to step 7**

◆ Landing gross weight is **less than or equal to** the Landing Climb Limit Weight, **and both engines are running** normally:

[777-200 or 777-200ER]

►► **Go to step 3**

[777F, 777-200LR, 777-300, 777-300ER]

►► **Go to step 5**

[777-200 or 777-200ER]

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

▼ Continued on next page ▼



## ▼ Overweight Landing continued ▼

4 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 provides greater margin to the flap placard speed.

►► **Go to step 7**

[777F, 777-200LR, 777-300, 777-300ER]

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

▼ Continued on next page ▼

## ▼ Overweight Landing continued ▼

6 Choose one:

- ◆ VREF 30 + additives (wind and gusts, 5 knots minimum) is **at or below** 170 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** 170 knots:

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

►► **Go to step 7**

7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 20 or VREF 25,**  
**Minimums \_\_\_\_**  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . **20 or 25**



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**Automatic Unlock**

[Flight Deck Security Door]

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**

[Small Aft Cargo Door]

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

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.



**[ ] DOOR AFT CARGO****[Large Aft Cargo Door]**

Condition: The aft 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  
and set to 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 AFT 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

6 OUTFLOW VALVE MANUAL

switches (both) . . . . . Push to OPEN and  
hold until the outflow  
valve displays 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



**[ ] DOOR BULK CARGO**

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

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.

**[ ] DOOR E/E ACCESS**

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

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.

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

[777F]

Condition: An entry door is not closed and secure.

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.



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

[777-200, 777-200ER, 777-200LR]

Condition: An entry door is not closed and secure.

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.

**[ ] DOOR ENTRY 1-5L, R**

[777-300, 777-300ER]

Condition: An entry door is not closed and secure.

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.

**[ ] DOOR FWD ACCESS**

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

**Note:** The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door remains in place.



**[ ] 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  
and set to 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

6 OUTFLOW VALVE MANUAL  
switches (both) . . . . . Push to OPEN and  
hold until the outflow  
valve displays 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



**[ ] DOOR MAIN DECK CARGO****[Freighter Airplane]**

Condition: The main deck 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  
and set to 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 MAIN DECK 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

6 OUTFLOW VALVE MANUAL

switches (both) . . . . . Push to OPEN and  
hold until the outflow  
valve displays 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



**DOOR WING SLIDE L, R**

[777-300, 777-300ER]

Condition: The door for the unpressurized wing slide  
compartment is not closed and secure.



**DOORS**

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

**ELT ON**

[Option]

Condition: The emergency locator transmitter is on.

**EMER LIGHTS**

Condition: One of these occurs:

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






**Lock Fail**[\[Flight Deck Security Door\]](#)

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 LOW**[\[Passenger Airplane - Gaseous Oxygen\]](#)

Condition: The passenger oxygen pressure is low.

**PASS OXYGEN ON**[\[Passenger Airplane - Chemical \(and Gas all but KLM pro tempore\)\]](#)

Condition: The passenger oxygen system is on.



**SUPRNMRY OXYGEN LOW**

[Freighter Airplane]

Condition: The supernumerary oxygen pressure is low.



**SUPRNMRY OXYGEN ON**

[Freighter Airplane]

Condition: The supernumerary oxygen system is on.



**Window Damage L, R**

Condition: A 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** a forward window is arcing, shattered, or cracked:

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

Do **not** accomplish the following checklist:

WINDOW HEAT FWD

▼ Continued on next page ▼

## ▼ Window Damage L, R continued ▼

- 2 **If** a damaged window is deformed, or an air leak is observed:

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 required 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**:

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.

- 1 Maintain the maneuvering speed for the existing flap setting until the windows are closed.

▼ Continued on next page ▼

▼ **WINDOWS continued** ▼

- 2 The force required 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:

◆ Window **locks and** 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.



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PACK MODE L, R .....2.25

TRIM AIR L, R.....2.26



**[ ] CABIN ALTITUDE**

[Passenger Airplane - AIMS v14 or later]

Condition: A cabin altitude exceedance occurs.

- 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.



**[ ] CABIN ALTITUDE**[\[Freighter Airplane\]](#)

Condition: A cabin altitude exceedance occurs.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 Check the cabin altitude and rate.
- 4 **If** the cabin altitude is uncontrollable:

[\[Gaseous Oxygen \(Standard\)\]](#)

SUPRNMRY 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.



**ALTN VENT SYS**

[Freighter Airplane]

Condition: Alternate ventilation system is inoperative.

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

PACK

HYD PRESS DEM





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

8 Choose one:

◆ **BLEED LEAK STRUT message blanks:**

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

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

Transponder mode selector . . . . TA ONLY

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

▶▶ **Go to step 9**

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 (performance permitting):**

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

▼ **Continued on next page** ▼

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

**10 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

- Recall . . . . . Checked
- Notes . . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

**Landing Checklist**

- Speedbrake . . . . . ARMED
  - Landing gear . . . . . DOWN
  - Flaps. . . . . **20**
- ■ ■ ■

**[ ] 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

**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

- 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
- 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
- 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



Intentionally  
Blank


**[ ] 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

Valves may take up to 6 seconds  
to begin moving.

2    OUTFLOW VALVE MANUAL  
switches (both) . . . . . Push to OPEN  
or CLOSE and hold  
as needed to control  
desired 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
260	2000
300	4000
350	6000
400 and above	8000

3   **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ CABIN ALTITUDE AUTO continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**At pattern altitude**

OUTFLOW VALVE MANUAL  
switches (both). . . . . Push to OPEN and  
hold until the outflow  
valve displays show fully open

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_



**[ ] CABIN TEMPERATURE****[Freighter Airplane]**

Condition: Conditioned air is too hot or too cold.

Objective: To descend and shut down the packs before the flight deck or cabin temperature causes pilot incapacitation.

- 1 TRIM AIR switches (both) . . . . . Off
- 2 Start a descent to the lowest safe altitude or 10,000 feet, whichever is higher.
- 3 Do **not** accomplish the following checklists:  
TRIM AIR L  
TRIM AIR R
- 4 Choose one:
  - ◆ Flight deck or cabin temperature is **too warm**:  
▶▶ **Go to step 5**
  - ◆ Flight deck or cabin temperature is **too cold**:  
▶▶ **Go to step 20**
- 5 CABIN/UTILITY power switch . . . . . Off
- 6 SHOULDER and FOOT HEATERS (all) . . . . . OFF
- 7 Minimize the flight deck lighting intensity.
- 8 **During** daylight, install the flight deck sunvisors.
- 9 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ **CABIN TEMPERATURE continued** ▼

10 **When** at level off:

Choose one:

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

▶▶ **Go to step 11**

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

▶▶ **Go to step 14**

11 Don the oxygen masks.

12 Establish crew communications.

[Gaseous Oxygen (Standard)]

Supernumerary oxygen may not  
be needed below 15,000 feet.

13  SUPRNMRY OXYGEN

switch . . . . . Push to ON and  
hold for 1 second

14 PACK switches (both) . . . . . Off

15 ALTN VENT switch. . . . . ON

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

17 FWD OUTFLOW VALVE

MANUAL switch . . . . . Push to OPEN and  
hold until the outflow valve  
display shows the 9 o'clock position

18 AFT OUTFLOW VALVE

MANUAL switch . . . . . Push to OPEN and  
hold until the outflow  
valve display shows fully open

▼ **Continued on next page** ▼

▼ **CABIN TEMPERATURE continued** ▼

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

- CABIN ALTITUDE
- CABIN ALTITUDE AUTO
- PACK L
- PACK R
- PACK L+R



20 Plan to land at the nearest suitable airport.

21 **When** at level off:

Choose one:

- ◆ Airplane altitude is **above 10,000 feet**:  
▶▶ **Go to step 22**
- ◆ Airplane altitude is **below 10,000 feet**:  
▶▶ **Go to step 25**

22 Don the oxygen masks.

23 Establish crew communications.

[Gaseous Oxygen (Standard)]

Supernumerary oxygen may not be needed below 15,000 feet.

24  SUPRNMRY OXYGEN switch . . . . . Push to ON and hold for 1 second

25 PACK switches (both) . . . . . Off

▼ **Continued on next page** ▼



▼ **CABIN TEMPERATURE continued** ▼

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

CABIN ALTITUDE

PACK L

PACK R

PACK L+R

**CARGO A/C FWD**

[Option on Passenger Airplane]

Condition: Forward lower cargo air conditioning is inoperative.

**CARGO A/C LWR AFT**

[Option on Freighter Airplane]

Condition: Aft lower cargo air conditioning is inoperative.

**CARGO A/C LWR FWD**

[Freighter Airplane]

Condition: Forward lower cargo air conditioning is inoperative.



**CARGO HEAT AFT**

- Condition: One of these occurs:
- Aft cargo heat is inoperative
  - The aft cargo temperature selector is off



**CARGO HEAT BULK**

[Passenger Airplane]

- 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.

▼ Continued on next page ▼

▼ **EQUIP COOLING OVRD continued** ▼

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 occur:

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

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



**MAIN DECK A/C**

[Freighter Airplane]

Condition: Main deck cargo air conditioning is inoperative.



**[ ] OUTFLOW VALVE AFT, FWD**

Condition: One of these occurs:

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

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

- 1 OUTFLOW VALVE switch (affected side) . . . . .MAN
  - 2 OUTFLOW VALVE MANUAL switch (affected side) . . . . .Push to CLOSE and hold until the outflow valve display shows fully closed
- ■ ■ ■

**[ ] PACK L**

[AIMS 2003 or later]

- Condition: The left pack is shut down.
- 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.

▼ Continued on next page ▼

▼ PACK L continued ▼

4 Choose one:

◆ PACK L message **stays blank**:

■ ■ ■ ■

◆ PACK L message **shows again**:

L PACK switch . . . . . Off

[Freighter Airplane]

RECIRC FANS switch . . . . . Off

■ ■ ■ ■

**[ ] PACK R**

[AIMS 2003 or later]

Condition: The right pack is shut down.

- 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

■ ■ ■ ■

**[ ] PACK L+R**[\[AIMS 2003 or later\]](#)

Condition: Both packs are shut down.

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.
- 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:  

[\[Passenger Airplane\]](#)  
 ▶▶ **Go to step 7**

▼ Continued on next page ▼

▼ **PACK L+R continued** ▼

[Freighter Airplane]

►► **Go to step 18**

[Passenger Airplane]

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) . . . . . Push to OPEN and  
hold for 30 seconds

10 IFE/PASS SEATS power switch . . . . . OFF

11 CABIN/UTILITY power switch . . . . . OFF

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

13 Minimize the flight deck lighting intensity.

14 Open the flight deck door.

▼ **Continued on next page** ▼

▼ **PACK L+R continued** ▼

15 **During** daylight:

- Install the flight deck sunvisors.
- Advise the cabin to close the cabin window shades.

16 Plan to land at the nearest suitable airport.

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

CABIN ALTITUDE AUTO  
■ ■ ■ ■

[Freighter Airplane]

18 Choose one:

- ◆ Airplane altitude is **at or below** 10,000 feet:
  - ▶▶ **Go to step 19**
- ◆ Airplane altitude is **above** 10,000 feet:
  - Don the oxygen masks.
  - Establish crew communications.
  - ▶▶ **Go to step 19**

19 ALTN VENT switch. . . . . ON

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

21 OUTFLOW VALVE MANUAL  
switches (both) . . . . . Push to OPEN and  
hold for 30 seconds

22 CABIN/UTILITY power switch . . . . . OFF

▼ **Continued on next page** ▼



▼ **PACK L+R continued** ▼

- 23 SHOULDER and FOOT HEATERS (all). . . . . OFF
- 24 Minimize the flight deck lighting intensity.
- 25 **During** daylight, install the flight deck sunvisors.
- 26 Plan to land at the nearest suitable airport.
- 27 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 and/or higher outside air temperatures, the pack may shut down.



**[ ] TRIM AIR L, R**

Condition: The trim air valve is closed.

- 1 **Wait** 2 minutes. This allows time for any 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  

■ ■ ■ ■

**Non-Normal Checklists**

**Chapter NNC**

**Anti-Ice, Rain**

**Section 3**

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Intentionally  
Blank

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

Condition: An engine anti-ice valve remains 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:** Operate 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**

[GE Engines, PW Engines]

Condition: A bleed air leak occurs in an engine anti-ice or starter 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. Anti-ice is not available to the affected engine.

- 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). . . . . OFF
- 5 Thrust lever (affected side) . . . . . 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**:◆ ANTI-ICE LEAK ENG message **stays shown**:▶▶ **Go to step 8**

8 Transponder mode selector . . . . . TA ONLY

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

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 (performance permitting)**:

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

**10 Checklist Complete Except Deferred Items**


---

**Deferred Items**


---

**Descent Checklist**

Recall . . . . . Checked

▼ Continued on next page ▼



▼ ANTI-ICE LEAK ENG L, R continued ▼

Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 20, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps. . . . . **20**



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

Condition: A bleed air leak occurs in an engine anti-ice or starter duct.

Objective: To isolate the heat source, or reduce the flow of bleed air through the leak.

- 1 The engine anti-ice system automatically isolates the heat source within approximately 1 minute if the leak is in the engine anti-ice duct by closing the engine anti-ice valve.

**Note:** Avoid icing conditions. Anti-ice is not available to the affected engine.

- 2 **Wait** 1 minute.

- 3 Choose one:

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



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

►► **Go to step 4**

- 4 BLEED AIR ISLN switch (affected side) . . . . . Off
- 5 ENG BLEED AIR switch (affected side). . . . . Off
- 6 WING ANTI-ICE selector . . . . . OFF

This prevents possible asymmetrical ice buildup on the wings.

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

BLEED LOSS WING

▼ **Continued on next page** ▼

▼ ANTI-ICE LEAK ENG L, R continued ▼

PACK

8 **Wait** 1 minute.

9 Choose one:

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



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

►► **Go to step 10**

10 A/T ARM switch (affected side). . . . . OFF

11 Thrust lever (affected side) . . . . . Idle

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

12 Transponder mode selector . . . . . TA ONLY

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

AUTOTHROTTLE

▼ Continued on next page ▼

## ▼ ANTI-ICE LEAK ENG L, R continued ▼

14 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 15**◆ Landing using flaps **30 (performance permitting)**:**Note:** Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.**15 Checklist Complete Except Deferred Items**


---

**Deferred Items**


---

**Descent Checklist**

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . \_\_\_\_

Landing data . . . . . **VREF 20, Minimums** \_\_\_\_

Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

▼ Continued on next page ▼

▼ **ANTI-ICE LEAK ENG L, R continued** ▼

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps. . . . . **20**



**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

Objective: To correctly configure the ANTI-ICE selectors.

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



**[ ] 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**:

Operate 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:** Standby air data is unreliable in icing conditions.

**[ ] HEAT PITOT L**

Condition: The left pitot probe heat is failed.

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



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

Condition: Left, center and right pitot probe heat is failed.

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

**[ ] HEAT PITOT R**

Condition: The right pitot probe heat is failed.

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

**[ ] ICE DETECTORS**

Condition: The ice detectors are failed.

**Note:** Operate 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

**TAT Probe Icing**


Condition: Icing of the airplane TAT probe or engine TAT probe is suspected. (Items which may indicate TAT probe icing are listed in the Additional Information section.)

Objective: To use the alternate EEC mode calculated temperature instead of an incorrect TAT.

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

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

Push one switch at a time.

- 3  ENGINE EEC MODE switches (both) . . . . . Off
- 4 Thrust levers (both) . . . . . Set to maintain the  
desired airspeed and  
rate of climb or descent

**Note:** Maximum thrust limiting is not available in the alternate mode. Alternate thrust setting information shows on the N1 display.

▼ Continued on next page ▼



## ▼ TAT Probe Icing continued ▼

5 Choose one:

◆ TAT remains **constant and near** 0 degrees C:

▶▶ **Go to step 6**

◆ TAT is **not** near 0 degrees C:

Engine TAT probe icing is suspected:

Airplane TAT display is reliable.

Reference/target N1 and reference N1 displays are reliable if shown.

Maximum N1 display is reliable if shown.

▶▶ **Go to step 8**

6 Airplane TAT probe icing is suspected:

Reference/target N1 and reference N1 displays may be temporarily unreliable.

Observe EGT caution limits.

Maximum N1 display may be temporarily unreliable.

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

ENG LIMIT PROT L

ENG LIMIT PROT R

▼ Continued on next page ▼

**▼ TAT Probe Icing continued ▼**

- 8 The autothrottle may be re-engaged when both of the following occur:

The reference/target N1 and reference N1 displays show.

TAT is **not** near 0 degrees C.

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

ENG EEC MODE L

ENG EEC MODE R



[PW Engines, RR Engines]

**Additional Information**

One or more of the following may be evidence of TAT probe icing:

- The autothrottle disconnects and the reference/target EPR and reference EPR displays blank
- The thrust levers are not aligned with the engine EPR displays
- The engine EPR displays are not aligned with the thrust levers aligned
- A decrease or increase in the reference/target EPR displays at a constant altitude and speed
- The engines are unable to achieve the maximum continuous or the maximum climb rating with thrust levers fully forward
- The TAT display remains constant and near 0 degrees C during climb, cruise, or descent

**▼ Continued on next page ▼**

## ▼ TAT Probe Icing continued ▼

[\[GE Engines\]](#)**Additional Information**

One or more of the following may be evidence of TAT probe icing:

- The autothrottle disconnects and the reference/target N1 and reference N1 displays blank
- The thrust levers are not aligned with the engine N1 displays
- The engine N1 displays are not aligned with the thrust levers aligned
- A decrease or increase in the reference/target N1 displays at a constant altitude and speed
- The engines are unable to achieve the maximum continuous or the maximum climb rating with thrust levers fully forward
- The TAT display remains constant and near 0 degrees C during climb, cruise, or descent

**WINDOW HEAT**

Condition: Two or more window heats are off.



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

Condition: A primary window heat is off.

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

1 FWD WINDOW HEAT  
switch (affected side) . . . . . Push to Off for  
10 seconds and then ON

2 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: A window heat is off.

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

- 1 SIDE WINDOW HEAT  
switch (affected side) . . . . . Push to Off for  
10 seconds and then ON
- 2 Choose one:
  - ◆ WINDOW HEAT SIDE message **blanks**:  

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

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

■ ■ ■ ■

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**Non-Normal Checklists**

**Chapter NNC**

**Automatic Flight**

**Section 4**

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---

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**AUTOPILOT**

Condition: One or more of these occur:

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

**AUTOPILOT DISC**

Condition: All autopilots are disconnected.

**AUTOTHROTTLE DISC**

Condition: Both autothrottles are disconnected.

**[ ] AUTOTHROTTLE L, R**

Condition: One autothrottle is failed.

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



**NO AUTOLAND**

Condition: The autoland system is not available.

**NO LAND 3**

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



**Non-Normal Checklists  
Communications**

**Chapter NNC  
Section 5**

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**DATALINK LOST**

Condition: The ACARS datalink is temporarily lost.

**DATALINK SYS**

Condition: The datalink system is failed.

**HF DATALINK**

[[HF Datalink and AIMS 2003 or later](#)]

Condition: The HF datalink is failed.



**[ ] RADIO TRANSMIT**

Condition: A VHF or HF radio transmits for 30 seconds or more.

Objective: To identify and isolate the stuck microphone switch.

- 1 Transmitter select switches  
(all audio control panels) . . . . . FLT interphone  
This deselects the radios and stops radio transmissions.
- 2 The microphone/interphone with the stuck switch continuously transmits on flight interphone.
- 3 The associated audio select panel should remain on flight 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**

---

[Option]

Condition: SATCOM voice communication is temporarily lost.



---

**VHF DATALINK**

---

Condition: The VHF datalink is failed.



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**Non-Normal Checklists**

**Chapter NNC**

**Electrical**

**Section 6**

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---

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

Condition: The AC bus is not energized.

Objective: To attempt to restore power or attempt to use the APU to provide an additional source of power.

Attempt only one reset.

1  GEN CTRL switch. . . . . 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.

4  BUS TIE switch . . . . . 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.

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



**[ ] ELEC BACKUP SYS**

Condition: The backup power system is failed.

Attempt only one reset.

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

Attempt only one reset.

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 malfunction occurs.

Objective: To prevent generator drive damage and use the APU to provide an additional source of power.

Action is irreversible.

- 1  DRIVE DISC  
switch . . . . . 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.

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



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

Condition: The generator control breaker is open.

Objective: To attempt to reset the generator or attempt to use the APU to provide an additional source of power.

Attempt only one reset.

1  GEN CTRL switch. . . . . 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**

[Passenger Airplane]

Condition: The IFE/PASS SEATS power switch is OFF.



**ELEC STANDBY SYS**

Condition: A standby power system failure occurs.

**MAIN BATTERY DISCH**

Condition: One of these occurs:

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





**Non-Normal Checklists**

**Chapter NNC**

**Engines, APU**

**Section 7**

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**Aborted Engine Start L, R**

[GE Engines with CON position, PW Engines]

Condition: During a ground start, an abort engine start condition occurs.

- 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  
■ ■ ■ ■

**Aborted Engine Start L, R**

[GE Engines without CON position, RR Engines]

Condition: During a ground start, an abort engine start condition occurs.

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

## Dual Eng Fail/Stall

[GE Engines]

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 Do not manually abort the start if EGT turns red.  
EGT turns red when EGT exceeds the start limit line  
(lower red line). Autostart will discontinue the  
current start attempt before EGT becomes too high  
for continued engine operation.
- 4 Set airspeed **above 270 knots**.
- 5 APU selector  
(if APU available) . . . . . START, then ON
- 6 Engines may accelerate to idle very slowly,  
especially at high altitudes. The time from fuel  
control switch to RUN to stabilized idle may be as  
long as two and a half minutes.
- 7 Slow acceleration may be incorrectly interpreted as  
a hung start or engine malfunction. If N2 is steadily  
increasing and EGT remains within limits, the start  
is progressing normally.
- 8 **When** the HEAT PITOT L+C+R message blanks:  
PRIMARY FLIGHT COMPUTERS  
disconnect switch . . . . . DISC,  
then AUTO

▼ Continued on next page ▼

**▼ Dual Eng Fail/Stall continued ▼**

This restores the flight control normal mode.

The autopilot can be re-engaged when flight control normal mode is restored.



Dual Eng Fail/Stall

[PW Engines]

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 Engines may accelerate to idle very slowly,  
especially at high altitudes.
- 6 Slow acceleration may be incorrectly interpreted as  
a hung start or engine malfunction. If N2 is steadily  
increasing and EGT remains within limits, the start  
is progressing normally.
- 7 **When** the HEAT PITOT L+C+R message blanks:

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

This restores the flight control normal  
mode.

The autopilot can be re-engaged when flight  
control normal mode is restored.





## Dual Eng Fail/Stall

[RR Engines]

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 250 knots**.
- 4 APU SELECTOR  
(if APU available) . . . . . START, then ON
- 5 Engines may accelerate to idle very slowly,  
especially at high altitudes.
- 6 Slow acceleration may be incorrectly interpreted as  
a hung start or engine malfunction. If N3 is steadily  
increasing and EGT remains within limits, the start  
is progressing normally. Any further cycling of the  
fuel control switches will result in longer start  
times.
- 7 **When** the HEAT PITOT L+C+R message blanks:

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

This restores the flight control normal  
mode.

Autopilot can be re-engaged when flight control  
normal mode is restored.



**[ ] ENG AUTOSTART L, R**

[GE Engines with CON position, PW Engines]

Condition: During a ground start, 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) . . . . . CUTOFF
- 
- 2 START/IGNITION selector  
(affected side) . . . . . START
- 3 Motor the engine for 30 seconds.
- 4 START/IGNITION selector  
(affected side) . . . . .NORM
- ■ ■ ■

**[ ] ENG AUTOSTART L, R**

[GE Engines without CON position, RR Engines]

Condition: During a ground start, any of the following conditions 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) . . . . . CUTOFF  
- - - - -
- 2 START selector (affected side) . . . . . START
- 3 Motor the engine for 30 seconds.
- 4 START 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
- 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  
remain within appropriate  
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 **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**

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

▶▶ **Go to step 4**

Check that RPM and EGT follow thrust lever movement.

- 4  Thrust lever  
(affected side) . . . . . Advance slowly
- 5 Run engine normally or at a reduced thrust setting that is surge and stall free.
- 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.

►►Go to step 8

◆ Landing using flaps **30 (performance permitting)**:

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



8 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_\_

▼ Continued on next page ▼

## Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps. . . . . **20**



**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 checklist:

AUTOTHROTTLE

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 (performance permitting)**:

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



**11 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Eng Svr Damage/Sep L, R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



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## Engine Response

**Condition:** One or both engines do not reach commanded thrust or roll back, and fuel system icing is suspected (indicated EPR is below commanded EPR and fuel temperature is below -10 degrees C).

**Objective:** To clear ice from the fuel system by reducing engine fuel flow while descending, then checking for proper engine response.

- 1 Select a lower altitude on the MCP.
- 2 FLCH switch . . . . . Push
- 3 Thrust levers (both) . . . . . Idle
- 4 WING ANTI-ICE selector . . . . . OFF
- 5 ENGINE ANTI-ICE selectors (both) . . . . . OFF
- 6 Maintain idle thrust for 30 seconds.
- 7 If thrust asymmetry compensation is inoperative, manual control inputs are required to compensate for asymmetric thrust conditions.
- 8 Left thrust lever . . . . . Advance to maximum
- 9 Check for normal engine indications. Engine may accelerate very slowly especially at high altitudes. The time from idle to maximum thrust may be as long as 30 seconds.
- 10 Left thrust lever . . . . . Retard to idle
- 11 Right thrust lever . . . . . Advance to maximum

▼ Continued on next page ▼

▼ Engine Response continued ▼

- 12 Check for normal engine indications. Engine may accelerate very slowly especially at high altitudes. The time from idle to maximum thrust may be as long as 30 seconds.
- 13 Right thrust lever . . . . . Retard to idle
- 14 WING ANTI-ICE selector . . . . . AUTO or ON
- 15 ENGINE ANTI-ICE selectors (both) . . . . . AUTO or ON
- 16 Resume normal operation.



**[ ] APU LIMIT**

Condition: An APU limit exceedance occurs.

- 1 APU selector . . . . . OFF



**[ ] APU SHUTDOWN**

Condition: An APU automatic shutdown occurs.

Objective: To attempt to reset the APU controller.

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



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

[GE 90-9x Engines]

Condition: Engine anti-ice capability is degraded.

1 Avoid icing conditions.

**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 operates in the alternate control mode.

Objective: To ensure both engines operate in the alternate mode.

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

This 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 Engage the autothrottle.

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

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

ENG EEC MODE (for other engine)



**[ ] ENG FAIL L, R**

[GE Engines with CON position]

Condition: Engine speed is below idle.

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

- 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 A restart may be attempted if there is no abnormal  
airframe vibration.
- 5 Choose one:
  - ◆ Restart **is** needed:
    - ▶▶ **Go to step 6**
  - ◆ Restart is **not** needed:
    - ▶▶ **Go to step 13**
- 6 Monitor EGT during start to prevent an EGT  
exceedance. Autostart allows EGT to exceed the  
in-flight start limit.
- 7 Engine may accelerate to idle very slowly,  
especially at high altitudes. The time from fuel  
control switch to RUN to stabilized idle may be as  
long as two and a half minutes.

▼ Continued on next page ▼



▼ ENG FAIL L, R continued ▼

- 8 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT remains within limits, the start is progressing normally.

[Not 777-200LR or 777F]

- 9 Choose one:

◆ X-BLD **shows:**

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

►► **Go to step 11**

◆ X-BLD is **blank:**

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

**If** an abort start condition as listed in normal procedures occurs:

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

►► **Go to step 13**

▼ Continued on next page ▼

## ▼ ENG FAIL L, R continued ▼

[777-200LR or 777F]

10 Choose one:

◆ Airspeed is **below** 270 knots:

START/IGNITION selector

(affected side) . . . . . START

▶▶ **Go to step 11**◆ Airspeed is **at or above** 270 knots:

FUEL CONTROL switch

(affected side) . . . . . RUN

**If** an abort start condition as listed in  
normal procedures occurs:

FUEL CONTROL switch

(affected side) . Confirm . . CUTOFF

▶▶ **Go to step 13**

▼ Continued on next page ▼

## ▼ ENG FAIL L, R continued ▼

11 Choose one:

◆ Autostart is **on**:

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

►► **Go to step 12** |

◆ Autostart is **off**:

**When** at maximum motoring: |

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

►► **Go to step 12** |

12 **If** an abort start condition as listed in normal procedures occurs:

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

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

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

AUTOTHROTTLE

▼ Continued on next page ▼

## ▼ ENG FAIL L, R continued ▼

14 Choose one:

◆ **Both** engines run **normally**:◆ Engine stays **failed or is damaged**:| ►► **Go to step 15**

15 FUEL CONTROL switch

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

16 START/IGNITION selector

(affected side) . . . . . NORM

17 APU selector

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

18 Transponder mode selector . . . . . TA ONLY

19 Plan to land at the nearest suitable airport.

20 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 21**◆ Landing using flaps **30 (performance permitting)**:

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



## ▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

**21 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 20, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps. . . . . **20**



**[ ] ENG FAIL L, R****[PW Engines]**

Condition: Engine speed is below idle.

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

- 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 A restart may be attempted if there is no abnormal  
airframe vibration.
- 5 Choose one:
  - ◆ Restart **is** needed:
    - ▶▶ **Go to step 6**
  - ◆ Restart is **not** needed:
    - ▶▶ **Go to step 11**
- 6 Engine may accelerate to idle very slowly,  
especially at high altitudes.
- 7 Slow acceleration may be incorrectly interpreted as  
a hung start or engine malfunction. If N2 is steadily  
increasing and EGT remains within limits, the start  
is progressing normally.

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

8 Choose one:

◆ X-BLD **shows:**

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

►► **Go to step 9**

◆ X-BLD is **blank:**

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

**If** EGT does not increase in 30 seconds, or  
another abort start condition as listed in  
normal procedures occurs:

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

►► **Go to step 11**

▼ Continued on next page ▼

## ▼ ENG FAIL L, R continued ▼

9 Choose one:

◆ Autostart is **on**:

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

►► **Go to step 10**

◆ Autostart is **off**:

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

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

►► **Go to step 10**

10 **If** EGT does not increase in 30 seconds, or another abort start condition as listed in normal procedures occurs:

FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF  
START/IGNITION selector  
(affected side) . . . . . NORM

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

▼ Continued on next page ▼



▼ ENG FAIL L, R continued ▼

12 Choose one:

◆ **Both** engines run **normally**:



◆ Engine stays **failed** or is **damaged**:

►► **Go to step 13**

13 FUEL CONTROL switch

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

14 START/IGNITION selector

(affected side) . . . . . NORM

15 APU selector

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

16 Transponder mode selector . . . . . TA ONLY

17 Plan to land at the nearest suitable airport.

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.

►► **Go to step 19**

◆ Landing using flaps **30 (performance permitting)**:

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



▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

19 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
  - Landing gear . . . . . DOWN
  - Flaps. . . . . **20**
-

Intentionally  
Blank

**[ ] ENG FAIL L, R****[RR Engines]**

Condition: Engine speed is below idle.

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

- 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 A restart may be attempted if there is no abnormal  
airframe vibration.
- 5 Choose one:
  - ◆ Restart **is** needed:
    - ▶ ▶ **Go to step 6**
  - ◆ Restart is **not** needed:
    - ▶ ▶ **Go to step 12**
- 6 Monitor EGT during start to prevent an EGT  
exceedance. Autostart allows EGT to exceed the  
in-flight start limit.
- 7 Engine may accelerate to idle very slowly,  
especially at high altitudes.

▼ Continued on next page ▼

## ▼ ENG FAIL L, R continued ▼

8 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N3 is steadily increasing and EGT remains within limits, the start is progressing normally. Any further cycling of the fuel control switches will result in longer start times.

9 Choose one:

◆ X-BLD **shows:**

START selector (affected side). . . . START

▶▶ **Go to step 10**

◆ X-BLD is **blank:**

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

▶▶ **Go to step 11**

▼ Continued on next page ▼

## ▼ ENG FAIL L, R continued ▼

10 Choose one:

◆ Autostart is **on**:

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

**If** an abort start condition as listed in  
normal procedures occurs:

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

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

▶▶ **Go to step 12**◆ Autostart is **off**:

**When** at maximum motoring:

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

**If** EGT does not increase in 40 seconds, or  
another abort start condition as listed in  
normal procedures occurs:

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

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

▶▶ **Go to step 12**

▼ Continued on next page ▼

▼ **ENG FAIL L, R continued** ▼

11 Choose one:

◆ Autostart is **on**:

**If** an abort start condition as listed in normal procedures occurs:

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

▶▶ **Go to step 12**

◆ Autostart is **off**:

**If** EGT does not increase in 40 seconds, or another abort start condition as listed in normal procedures occurs:

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

▶▶ **Go to step 12**

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

AUTOTHROTTLE

13 Choose one:

◆ **Both** engines run **normally**:



◆ Engine stays **failed or is damaged**:

▶▶ **Go to step 14**

14 FUEL CONTROL switch

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

▼ **Continued on next page** ▼

▼ **ENG FAIL L, R continued** ▼

- 15 START selector  
(affected side) . . . . . NORM
- 16 APU selector  
(if APU available) . . . . . START, then ON
- 17 Transponder mode selector . . . . . TA ONLY
- 18 Plan to land at the nearest suitable airport.
- 19 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 20**

◆ Landing using flaps **30 (performance permitting)**:

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



**20 Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼



▼ ENG FAIL L, R continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
 Notes . . . . . Checked  
 Autobrake . . . . . \_\_\_\_  
 Landing data . . . . . **VREF 20, Minimums** \_\_\_\_  
 Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
 Landing gear . . . . . DOWN  
 Flaps. . . . . **20**



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

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

**Note:** Erratic engine operation and flameout may occur 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

[GE Engines]

- 1 **If** the ENG FUEL VALVE message shows when the fuel control switch is positioned to CUTOFF, the engine may continue to run for approximately 10 seconds.

[PW Engines, RR Engines]

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

- 3 **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.



Intentionally  
Blank

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

[GE Engines with CON position]

Condition: An engine start is needed after a shutdown and there is:

- No fire
- No abnormal airframe vibration

- 1 Monitor EGT during start to prevent an EGT exceedance. Autostart allows EGT to exceed the in-flight start limit.
- 2 The engine may accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stabilized idle may be as long as two and a half minutes.
- 3 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT remains within limits, the start is progressing normally.

▼ Continued on next page ▼

▼ Eng In-Flight Start L, R continued ▼

[Not 777-200LR or 777F]

4 Choose one:

◆ X-BLD **shows:**

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

►► **Go to step 6**

◆ X-BLD is **blank:**

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

**If** an abort start condition as listed in  
normal procedures occurs:

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

►► **Go to step 8**

▼ Continued on next page ▼

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

[777-200LR or 777F]

5 Choose one:

◆ Airspeed is **below** 270 knots:START/IGNITION selector  
(affected side) . . . . . START▶▶ **Go to step 6**◆ Airspeed is **at or above** 270 knots:FUEL CONTROL switch  
(affected side) . . . . . RUN**If** an abort start condition as listed in  
normal procedures occurs:FUEL CONTROL switch  
(affected side) . Confirm . . CUTOFF▶▶ **Go to step 8**

▼ Continued on next page ▼

▼ Eng In-Flight Start L, R continued ▼

6 Choose one:

◆ Autostart is **on**:

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

▶▶ **Go to step 7**

◆ Autostart is **off**:

**When** at maximum motoring:

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

▶▶ **Go to step 7**

7 **If** an abort start condition as listed in normal procedures occurs:

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

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

8 Choose one:

◆ Engine **starts** and runs normally:

GND PROX FLAP OVRD switch . . . . . Off

Transponder mode selector . . . . . TA/RA



◆ Engine **fails** to start:

Plan to land at the nearest suitable airport.



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

[PW Engines]

Condition: An engine start is needed after a shutdown and there is:

- No fire
- No abnormal airframe vibration

- 1 Engine may accelerate to idle very slowly, especially at high altitudes.
- 2 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT remains within limits, the start is progressing normally.

- 3 Choose one:

◆ X-BLD **shows:**

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

►► **Go to step 4**

◆ X-BLD is **blank:**

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

**If** EGT does not increase in 30 seconds, or another abort start condition as listed in normal procedures occurs:

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

►► **Go to step 6**

▼ Continued on next page ▼



▼ Eng In-Flight Start L, R continued ▼

4 Choose one:

◆ Autostart is **on**:

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

►► **Go to step 5**

◆ Autostart is **off**:

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

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

►► **Go to step 5**

5 **If** EGT does not increase in 30 seconds, or another abort start condition as listed in normal procedures occurs:

FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF  
START/IGNITION selector  
(affected side) . . . . . NORM

▼ Continued on next page ▼

▼ Eng In-Flight Start L, R continued ▼

6 Choose one:

- ◆ Engine **starts** and runs normally:
  - GND PROX FLAP OVRD switch . . . . . Off
  - Transponder mode selector . . . . . TA/RA
  - ■ ■ ■
- ◆ Engine **fails** to start:
  - Plan to land at the nearest suitable airport.
  - ■ ■ ■

## Eng In-Flight Start L, R

[RR Engines]

Condition: An engine start is needed after a shutdown and there is:

- No fire
- No abnormal airframe vibration

- 1 Monitor EGT during start to prevent an EGT exceedance. Autostart allows EGT to exceed the in-flight start limit.
- 2 Engine may accelerate to idle very slowly, especially at high altitudes.
- 3 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N3 is steadily increasing and EGT remains within limits, the start is progressing normally. Any further cycling of the fuel control switches will result in longer start times.
- 4 Choose one:

◆ X-BLD **shows:**

START selector (affected side). . . . START

▶▶ **Go to step 5**

◆ X-BLD is **blank:**

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

▶▶ **Go to step 6**

▼ Continued on next page ▼

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

5 Choose one:

◆ Autostart is **on**:

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

**If** an abort start condition as listed in  
normal procedures occurs:

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

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

▶▶ **Go to step 7**◆ Autostart is **off**:

**When** at maximum motoring:

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

**If** EGT does not increase in 40 seconds, or  
another abort start condition as listed in  
normal procedures occurs:

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

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

▶▶ **Go to step 7**

▼ Continued on next page ▼

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

6 Choose one:

◆ Autostart is **on**:

**If** an abort start condition as listed in normal procedures occurs:

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

►► **Go to step 7**

◆ Autostart is **off**:

**If** EGT does not increase in 40 seconds, or another abort start condition as listed in normal procedures occurs:

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

►► **Go to step 7**

7 Choose one:

◆ Engine **starts** and runs normally:

GND PROX FLAP OVRD switch . . . . . Off

Transponder mode selector . . . . . TA/RA



◆ Engine **fails** to start:

Plan to land at the nearest suitable airport.



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

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

- 1 Thrust lever  
(affected side) . . . . . Retard until N1 remains  
within appropriate limits

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

[GE 90-115B Engines before LN500]

Condition: Engine low pressure compressor anti-ice valve is failed closed.



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

[GE Engines]

Condition: Affected engine oil filter contamination has caused filter bypass.

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

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

■ ■ ■ ■
  - ◆ ENG OIL FILTER message **stays shown**:  

► ► **Go to step 5**
- 5 FUEL CONTROL switch  
(affected side) . . . . . Confirm. . . . . CUTOFF
- 6 APU selector  
(if APU available) . . . . . START, then ON
- 7 Transponder mode selector . . . . . TA ONLY

▼ Continued on next page ▼

▼ **ENG OIL FILTER L, R continued** ▼

8 Plan to land at the nearest suitable airport.

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 (performance permitting)**:

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



**10 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

▼ **Continued on next page** ▼



▼ **ENG OIL FILTER L, R continued** ▼

**Landing Checklist**

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps. . . . . **20**



**ENG OIL FILTER L, R**

[PW Engines - Option]

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



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

[GE Engines, PW Engines]

Condition: 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.

► ► **Go to step 9**

◆ Landing using flaps **30 (performance permitting)**:

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



9 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ ENG OIL PRESS L, R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



**[ ] ENG OIL PRESS L, R**[\[RR Engines\]](#)

Condition: Engine oil pressure is low.

- 1 A/T ARM switch  
(affected side) . . . . . Confirm. . . . . OFF
- 2 Thrust lever  
(affected side) . . . . . Confirm. . . . . Idle
- 3 Do **not** accomplish the following checklist:  
AUTOTHROTTLE
- 4 Choose one:
  - ◆ ENG OIL PRESS message **blanks**:  
  ■ ■ ■ ■
  - ◆ ENG OIL PRESS message **stays shown**:  
                    ▶▶ **Go to step 5**
- 5 FUEL CONTROL switch  
(affected side) . . . . . Confirm. . . . . CUTOFF
- 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 OIL PRESS L, R continued ▼

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 (performance permitting)**:

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



10 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_\_

▼ Continued on next page ▼

## Landing Checklist

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps. . . . . **20**



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

[GE Engines]

Condition: Engine oil temperature is high.

- 1 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF
- 2 Thrust lever  
(affected side) . . . . . Confirm . . . . . Move  
to mid position

This allows the oil to cool.

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

AUTOTHROTTLE

- 4 Choose one:

◆ Oil temperature is **below** the **red** line limit, or is in the **amber** band for **less than 15 minutes**:

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



◆ Oil temperature is **at or above** the **red** line limit, or is in the **amber** band for **15 minutes or more**:

►► **Go to step 5**

- 5 Thrust lever  
(affected side) . . . . . Confirm . . . . . Idle
- 6 FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF

▼ Continued on next page ▼



▼ **ENG OIL TEMP L, R continued** ▼

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

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



**11 Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ ENG OIL TEMP L, R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



## [ ] ENG OIL TEMP L, R

[PW Engines]

Condition: 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 **below** the **red** line limit, or is in the **amber** band for **less than 20 minutes**:

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



◆ Oil temperature is **at or above** the **red** line limit, or is in the **amber** band for **20 minutes or more**:

▶▶ **Go to step 5**

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

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

- 6 FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF
- 7 APU selector  
(if APU available) . . . . . START, then ON
- 8 Transponder mode selector . . . . . TA ONLY
- 9 Plan to land at the nearest suitable airport.
- 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 (performance permitting)**:  
**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 . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_

▼ Continued on next page ▼

▼ **ENG OIL TEMP L, R continued** ▼

Approach briefing . . . . . Completed

---

**Approach Checklist**

Altimeters . . . . . \_\_\_\_\_

---

**Landing Checklist**

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps. . . . . **20**



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

Condition: Engine oil temperature is high.

- 1 A/T ARM switch  
(affected side) . . . . . Confirm . . . . . OFF
- 2 Thrust lever  
(affected side) . . . . . Confirm . . . . . Move  
to mid position

This allows the oil to cool.

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

- 4 Choose one:

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

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

◆ Oil temperature is **at or above** the **red** line limit:▶▶ **Go to step 5**

- 5 Thrust lever  
(affected side) . . . . . Confirm . . . . . Idle
- 6 FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF
- 7 APU selector  
(if APU available) . . . . . START, then ON

▼ **Continued on next page** ▼

▼ ENG OIL TEMP L, R continued ▼

8 Transponder mode selector . . . . . TA ONLY

9 Plan to land at the nearest suitable airport.

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 (performance permitting)**:

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



**11 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



ENG REV LIMITED L, R

Condition: One of these will occur after landing:

- The thrust reverser will not deploy
- Only idle reverse thrust will be available





**ENG REVERSER L, R**

Condition: A fault occurs in the thrust reverser system.

**ENG RPM LIMITED L, R**

[GE Engines, PW Engines]

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

**ENG RPM LIMITED L, R**

[RR Engines]

Condition: Engine control is limiting affected engine thrust to prevent N1, N2, or N3 from exceeding the RPM operating 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**

[GE Engines with CON position, PW Engines]

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 the **air**:

►► **Go to step 3**

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

[Not 777-200LR or 777F]

4 Increase airspeed until X-BLD blanks.

[777-200LR or 777F]

5 Increase airspeed above 270 knots.



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

[GE Engines without CON position, RR Engines]

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 selector (affected side). . . . . NORM

■ ■ ■ ■
  - ◆ In the **air**:
 

▶▶ **Go to step 3**
- 3 START selector (affected side) . . . . . NORM  

[Not 777-200LR or 777F]
- 4 Increase airspeed until X-BLD blanks.
 

■ ■ ■ ■

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

[GE Engines with CON position, PW Engines]

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  
 PACK



## [ ] ENG STARTER CUTOUT L, R

[GE Engines without CON position, RR Engines]

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 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

PACK



**ENG THRUST L, R**

Condition: The engine does not reach commanded thrust.



## Volcanic Ash

[GE Engines]

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

Objective: Exit the ash cloud and restart engines if needed.

- 1 Exit volcanic ash as quickly as possible. Consider a 180 degree turn.
- 2 Don oxygen masks and smoke goggles, if needed.
- 3 Establish crew communications, if needed.
- 4 Autothrottle disconnect switch . . . . . Push

**If conditions allow, run the engines at idle.**

- 5  Thrust levers (both). . . . . Idle

This reduces possible engine damage or flameout, or both, by decreasing EGT.

- 6 ENGINE ANTI-ICE selectors (both) . . . . . ON
- 7 WING ANTI-ICE selector . . . . . ON

[Passenger Airplane]

- 8 RECIRC FANS switches (both) . . . . . Off

[Freighter Airplane]

- 9 RECIRC FANS switch . . . . . Off

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

▼ Continued on next page ▼

## ▼ Volcanic Ash continued ▼

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

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

11 Choose one:

◆ Engines run **normally**:

Plan to land at the nearest suitable airport



◆ Engines are **flamed out** or **stalled**, or EGT is rapidly **approaching** or **exceeding** the **limit**:

► ► **Go to step 12**

12 FUEL CONTROL switches

(both) . . . . . CUTOFF, then RUN

13 RAM AIR TURBINE switch . . . . . Push and hold for 1 second

14 For a dual engine in-flight start, do not manually abort the start if the EGT display turns red. Autostart allows EGT to exceed the in-flight start limit, however autostart aborts the start before EGT becomes too high for continued engine operation.

15 Set airspeed **above 270 knots**.

▼ Continued on next page ▼



▼ Volcanic Ash continued ▼

- 16 Engines may accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stabilized idle may be as long as two and a half minutes.
- 17 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT remains within limits, the start is progressing normally.
- 18 **When** the HEAT PITOT L+C+R message blanks:

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

This restores flight control normal mode.

The autopilot can be re-engaged when flight control normal mode is restored.

- 19 Plan to land at the nearest suitable airport.



## Volcanic Ash

[PW Engines]

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

Objective: Exit the ash cloud and restart engines if needed.

- 1 Exit volcanic ash as quickly as possible. Consider a 180 degree turn.
- 2 Don oxygen masks and smoke goggles, if needed.
- 3 Establish crew communications, if needed.
- 4 Autothrottle disconnect switch . . . . . Push

**If** conditions allow, run the engines at idle.

- 5  Thrust levers (both) . . . . . Idle

This reduces possible engine damage or flameout, or both, by decreasing EGT.

- 6 ENGINE ANTI-ICE selectors (both) . . . . . ON
- 7 WING ANTI-ICE selector . . . . . ON
- 8 RECIRC FANS switches (both) . . . . . Off
- 9 APU selector  
(if APU available) . . . . . START, then ON

▼ Continued on next page ▼

## ▼ Volcanic Ash continued ▼

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

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

10 Choose one:

◆ Engines run **normally**:

Plan to land at the nearest suitable airport



◆ Engines are **flamed out** or **stalled**, or EGT is rapidly **approaching** or **exceeding** the **limit**:

► ► **Go to step 11**

11 FUEL CONTROL switches

(both) . . . . . CUTOFF, then RUN

12 RAM AIR TURBINE switch . . . . . Push and hold for 1 second

13 Set airspeed **above 240 knots**.

14 Engines may accelerate to idle very slowly, especially at high altitudes.

15 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT remains within limits, the start is progressing normally.

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

16 **When** the HEAT PITOT L+C+R message blanks:  
PRIMARY FLIGHT COMPUTERS  
disconnect switch . . . . . DISC,  
then AUTO

This restores flight control normal mode.

The autopilot can be re-engaged when flight control normal mode is restored.

17 Plan to land at the nearest suitable airport.  
■ ■ ■ ■

## Volcanic Ash

[RR Engines]

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

Objective: Exit the ash cloud and restart engines if needed.

- 1 Exit volcanic ash as quickly as possible. Consider a 180 degree turn.
- 2 Don oxygen masks and smoke goggles, if needed.
- 3 Establish crew communications, if needed.
- 4 Autothrottle disconnect switch . . . . . Push

**If** conditions allow, run the engines at idle.

- 5  Thrust levers (both). . . . . Idle

This reduces possible engine damage or flameout, or both, by decreasing EGT.

- 6 ENGINE ANTI-ICE selectors (both) . . . . . ON
- 7 WING ANTI-ICE selector . . . . . ON
- 8 RECIRC FANS switches (both) . . . . . Off
- 9 APU selector  
(if APU available) . . . . . START, then ON

▼ Continued on next page ▼

## ▼ Volcanic Ash continued ▼

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

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

10 Choose one:

◆ Engines run **normally**:

Plan to land at the nearest suitable airport



◆ Engines are **flamed out** or **stalled**, or EGT is rapidly **approaching** or **exceeding** the **limit**:

►► **Go to step 11**

11 FUEL CONTROL switches

(both) . . . . . CUTOFF, then RUN

12 RAM AIR TURBINE switch . . . . . Push and hold for 1 second

13 Set airspeed **above 250 knots**.

14 Engines may accelerate to idle very slowly, especially at high altitudes.

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

15 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N3 is steadily increasing and EGT remains within limits, the start is progressing normally. Any further cycling of the fuel control switches will result in longer start times.

16 **When** the HEAT PITOT L+C+R message blanks:

PRIMARY FLIGHT COMPUTERS

disconnect switch . . . . . DISC,  
then AUTO

This restores flight control normal mode.

The autopilot can be re-engaged when flight control normal mode is restored.

17 Plan to land at the nearest suitable airport.



Intentionally  
Blank



**Non-Normal Checklists**

**Chapter NNC**

**Fire Protection**

**Section 8**

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**Smoke, Fire or Fumes ..... 8.7**

**[ ] 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 **blanks**:
    - ▶ ▶ **Go to step 3**
  - ◆ FIRE APU message **stays shown**:
    - Plan to land at the nearest suitable airport.
    - ▶ ▶ **Go to step 3**
- 3 Do **not** accomplish the following checklist:  
APU SHUTDOWN  
■ ■ ■ ■

**[ ] FIRE ENG L, R**

Condition: Fire is detected in the engine.

- 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** the FIRE ENG message stays shown:

Engine fire switch . . . . . Rotate to the stop  
and hold for 1 second

**If** after 30 seconds, the FIRE ENG message stays shown:

Engine fire switch. . . . . Rotate to the  
other stop and  
hold for 1 second

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

## AUTOTHROTTLE

▼ Continued on next page ▼

## ▼ FIRE 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.

►► **Go to step 11**

◆ Landing using flaps **30 (performance permitting)**:

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



**11 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE ENG L, R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



**Fire Engine Tailpipe L, R**

[GE Engines with CON Position, PW Engines]

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 the tower.
    - ■ ■ ■
- 4 START/IGNITION selector  
(affected side) . . . . . START
- 5 Advise the tower.
- 6 Continue to motor the engine until the tailpipe fire is extinguished.
- 7 START/IGNITION selector  
(affected side) . . . . . NORM
  - ■ ■ ■

**Fire Engine Tailpipe L, R**

[GE Engines without CON Position, RR Engines]

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 the tower.
    - ■ ■ ■
- 4 START selector  
(affected side) . . . . . START
- 5 Advise the tower.
- 6 Continue to motor the engine until the tailpipe fire is extinguished.
- 7 START 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.
- [\[Passenger Airplane\]](#)
- 4 IFE/PASS SEATS switch . . . . . OFF
- [\[Passenger Airplane\]](#)
- 5 RECIRC FANS switches (both) . . . . . Off
- [\[Freighter Airplane\]](#)
- 6 RECIRC FANS switch . . . . . Off
- [\[Option\]](#)
- 7 GASPER switch. . . . . Off
- 8 APU BLEED AIR switch . . . . . Off
- 9 **Any time** the smoke or fumes becomes the greatest threat:

▶▶ **Go to the Smoke or Fumes Removal checklist on page 8.32**

▼ Continued on next page ▼

## ▼ Smoke, Fire or Fumes continued ▼

10 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 11**

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

▶▶ **Go to step 12**

11 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 8.32, if needed.**



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

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

►► **Go to step 12**

- 12 Advise the cabin that the main cabin lighting will be turned off.
- 13 CABIN/UTILITY switch. . . . . OFF
- 14 Initiate a diversion to the nearest suitable airport while continuing the checklist.
- 15 Consider an immediate landing if the smoke, fire or fumes situation becomes uncontrollable.
- 16 Do not delay landing in an attempt to complete the following steps.
- 17 C BLEED AIR ISLN switch . . . . . Off
- 18 L PACK switch . . . . . Off
- 19 L TRIM AIR switch . . . . . Off
- 20 Do **not** accomplish the following checklists:  
    PACK L  
    TRIM AIR L
- 21 **Wait** 2 minutes unless the smoke or fumes are increasing.

▼ Continued on next page ▼

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

22 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 23**

- ◆ Smoke or fumes are **decreasing**:
  - ▶▶ **Go to the Smoke or Fumes Removal checklist on page 8.32, if needed.**

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

- PACK R
- TRIM AIR R

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

▼ **Continued on next page** ▼

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

25 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 8.32, if needed.**

◆ Smoke or fumes are **decreasing**:

► ► **Go to the Smoke or Fumes Removal checklist on page 8.32, if needed.**



**BOTTLE 1, 2 DISCH ENG**

Condition: The fire bottle pressure is low.



**BOTTLE DISCH APU**

Condition: The fire bottle pressure is low.



**BOTTLE DISCH CARGO**

Condition: Both rapid discharge fire bottle pressures are low.

**[ ] DET FIRE APU**

Condition: APU fire detection is inoperative.

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 required.

**DET FIRE CARGO AFT, FWD**

Condition: Lower cargo compartment smoke detection is inoperative.



**DET FIRE CARGO MAIN**

[Freighter Airplane]

Condition: Main deck cargo compartment smoke detection is inoperative.

**DET FIRE ENG L, R**

Condition: Engine fire and overheat detection is inoperative.



**[ ] FIRE CARGO AFT**[\[Passenger Airplane\]](#)

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 LDG ALT selector . . . . . PULL ON  
and set to 8000

This minimizes extinguisher agent leakage out of the compartment.

[\[Lower Crew Rest Compartment\]](#)

- 4 Establish cabin communications. Advise the cabin to:  
  
Evacuate the lower crew rest compartment.  
Close the hatches.
- 5 Plan to land at the nearest suitable airport.
- 6 Do **not** accomplish the following checklist:  
  
LANDING ALTITUDE
- 7 **When** at top of descent:  
  
LDG ALT selector . . . . . Push off

**8 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼



▼ FIRE CARGO AFT continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**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.**

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_



**[ ] FIRE CARGO AFT****[Freighter Airplane]**

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

- 1 LWR AFT CARGO  
FIRE ARM switch. . . . . Confirm. . . . . ARMED
- 2 CARGO FIRE DEPR/DISCH  
switch . . . . . Push and  
hold for 1 second
- 3 LDG ALT selector . . . . . PULL ON  
and set to 8000

This minimizes extinguisher agent leakage out of the compartment.

- 4 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.

- 5 Do **not** accomplish the following checklist:  
EQUIP COOLING OVRD  
LANDING ALTITUDE
- 6 **When** at top of descent:  
LDG ALT selector . . . . . Push off

## 7 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

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

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_



**[ ] FIRE CARGO FWD**

[Passenger Airplane]

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 LDG ALT selector . . . . . PULL ON  
and set to 8000

This minimizes extinguisher agent leakage out of the compartment.

- 4 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.

- 5 Do **not** accomplish the following checklists:  
EQUIP COOLING OVRD  
LANDING ALTITUDE
- 6 **When** at top of descent:  
LDG ALT selector . . . . . Push off

**7 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**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.**

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_



**[ ] FIRE CARGO FWD****[Freighter Airplane]**

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

- 1 LWR FWD CARGO  
FIRE ARM switch. . . . . Confirm. . . . . ARMED
- 2 CARGO FIRE DEPR/DISCH  
switch . . . . . Push and  
hold for 1 second
- 3 LDG ALT selector . . . . . PULL ON  
and set to 8000

This minimizes extinguisher agent leakage out of the compartment.

- 4 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.

- 5 Do **not** accomplish the following checklists:  
EQUIP COOLING OVRD  
LANDING ALTITUDE
- 6 **When** at top of descent:  
LDG ALT selector . . . . . Push off
- 7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

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

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_



**[ ] FIRE CARGO MAIN DECK****[Freighter Airplane]**

Condition: Smoke is detected in the main deck cargo compartment.

- 1 Don oxygen masks and smoke goggles.
- 2 Establish crew and cabin communications.  
[Gaseous Oxygen (Standard)]
- 3 SUPRNMRY OXYGEN switch . . . . . Push to ON and  
hold for 1 second
- 4 MAIN DK ALERT switch . . . . . Push
- 5 FWD OUTFLOW VALVE switch . . . . . MAN
- 6 FWD OUTFLOW VALVE  
MANUAL switch . . . . . Push to CLOSE  
and hold until the  
FWD outflow valve  
display shows fully closed
- 7 MAIN DECK CARGO  
FIRE ARM switch. . . . . Confirm. . . . . ARMED
- 8 L TRIM AIR switch . . . . . Off
- 9 CARGO FIRE DEPR/DISCH  
switch . . . . . Push and  
hold for 1 second

**Note:** When the trim air system is off, the flight deck and cabin may become very cold.

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

PACK R

TRIM AIR L

▼ Continued on next page ▼



▼ FIRE CARGO MAIN DECK continued ▼

CABIN ALTITUDE

OUTFLOW VALVE FWD

11 **When** conditions and terrain allow, climb or descend to 23,000 feet.

12 **When** at level off:

FWD OUTFLOW VALVE switch . . . . . AUTO

L TRIM AIR switch . . . . . ON

13 Plan to land at the nearest suitable airport.

**Note:** While smoke is detected in the main deck cargo compartment, lower cargo smoke detection is inhibited. Smoke from the main deck may enter lower cargo compartments. After smoke clears from the main deck, a lower cargo fire warning may occur. If the FIRE CARGO AFT or FIRE CARGO FWD warning occurs, do the checklist for that warning.

14 **When** at top of descent:

L TRIM AIR switch . . . . . Off

15 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO MAIN DECK continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

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

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . \_\_\_\_



**[ ] FIRE WHEEL WELL**

Condition: Fire is detected in a main wheel well.

- 1 Do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).
- 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 **does not need to be retracted** for airplane performance:  
     ■ ■ ■ ■
  - ◆ Gear **must be retracted** for airplane performance:  
     ► ► **Go to step 6**
- 6 **When** the FIRE WHEEL WELL message blanks:  
     **Wait** 20 minutes. This ensures the fire is extinguished.  
     Landing gear lever . . . . . UP  
     ■ ■ ■ ■

**[ ] 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
- 5 Choose one:
  - ◆ OVERHEAT ENG message **blanks**:
 

**Note:** Run the engine at a thrust setting that keeps the OVERHEAT ENG message blank.
  - ◆ OVERHEAT ENG message **stays shown**:
    - ▶▶ **Go to step 6**
- 6 FUEL CONTROL switch  
(affected side) . . . . . Confirm . . . . . CUTOFF
- 7 APU selector  
(if APU available) . . . . . START, then ON
- 8 Transponder mode selector . . . . . TA ONLY

▼ Continued on next page ▼

▼ **OVERHEAT ENG L, R continued** ▼

9 Plan to land at the nearest suitable airport.

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 (performance permitting)**:

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



**11 Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ OVERHEAT ENG L, R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



SMOKE BBAND UPR DR 2

[Option]

Condition: Smoke is detected in the Connexion broadband system located in door 2 upper compartment. System power is automatically shutdown.



**[ ] SMOKE COMPT UPR DR 2**[\[Option\]](#)

Condition: Smoke is detected in a compartment.

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 has **cleared**:

**[ ] SMOKE COMPT UPR DR 4**[\[Option\]](#)

Condition: Smoke is detected in a compartment.

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 has **cleared**:



**SMOKE CREW REST F/D**[\[Option\]](#)

Condition: Smoke is detected in the crew rest area.

**[ ] SMOKE CREW REST LWR**[\[Option\]](#)

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 has **cleared**:

**SMOKE CREW REST MAIN**[\[Option\]](#)

Condition: Smoke is detected in the crew rest area.





**[ ] SMOKE EQUIP COOLING**

[Freighter Airplane]

Condition: Smoke is detected in the equipment cooling system.

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

◆ SMOKE EQUIP COOLING message **blanks**:



◆ SMOKE EQUIP COOLING message **stays shown**:

Plan to land at the nearest suitable airport.

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

Do **not** accomplish the following checklist:

EQUIP COOLING OVRD



## 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.  
[\[Passenger Airplane\]](#)
- 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

[\[Passenger Airplane\]](#)

- 6 Choose one:

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

▶▶ **Go to step 8**

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

▶▶ **Go to step 11**

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

[Freighter Airplane]

7 Choose one:

◆ Most smoke or fumes are in the **flight deck or supernumerary area**:

▶▶ **Go to step 8**

◆ Most smoke or fumes are in the **main deck cargo compartment**:

▶▶ **Go to step 11**

8 AFT OUTFLOW VALVE switch . . . . . MAN

9 AFT OUTFLOW VALVE  
MANUAL switch . . . . . Push to CLOSE  
and hold until the  
AFT outflow valve  
display shows fully closed

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

OUTFLOW VALVE AFT

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.7 and do the remaining steps.**



11 FWD OUTFLOW VALVE switch. . . . . MAN

12 FWD OUTFLOW VALVE  
MANUAL switch . . . . . Push to CLOSE  
and hold until the  
FWD outflow valve  
display shows fully closed

▼ Continued on next page ▼

## ▼ Smoke or Fumes Removal continued ▼

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

OUTFLOW VALVE FWD

►► **Go to the Smoke, Fire or Fumes checklist on page 8.7 and do the remaining steps.**

**[ ] SMOKE REST UPR DR 1**

[Option]

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 has **cleared**:



**[ ] SMOKE REST UPR DR 3**

[Option]

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 has **cleared**:

**[ ] SMOKE REST UPR DR 4**

[Option]

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 has **cleared**:



**[ ] SMOKE REST UPR DR 5**[\[Option\]](#)

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 has **cleared**:

**SMOKE LAVATORY**[\[Option on Passenger Airplane\]](#)

Condition: Smoke is detected in one or more lavatories.

**SMOKE LAVATORY**[\[Freighter Airplane\]](#)

Condition: Smoke is detected in the lavatory.



**SMOKE LAV/COMPT**

[Option on Passenger Airplane]

Condition: Smoke is detected in one or more lavatories,  
or other enclosed 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 remains 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 provides sufficient elevator authority for landing.

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

FLIGHT CONTROLS

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ STABILIZER continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . **VREF 30 + 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



**[ ] AUTO SPEEDBRAKE**

Condition: An automatic speedbrake fault occurs.

**Note:** Do not arm the speedbrake lever. This prevents inadvertent inflight extension.  
Manually extend the speedbrakes after landing.

**1 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . **DOWN**  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_



**[ ] 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 fuel predictions with flaps extended.

- 3 Choose one:

◆ Flap position is **5 or less**

**Note:** Position 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



**[ ] FLAPS PRIMARY FAIL**

Condition: The flaps primary mode is failed.

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

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

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

**2 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
 Notes . . . . . Checked  
 Autobrake . . . . . \_\_\_\_  
 Landing data . . . . . **VREF 20, Minimums** \_\_\_\_  
 Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
 Landing gear . . . . . DOWN  
 Flaps . . . . . **20**



**[ ] FLAP/SLAT CONTROL**

Condition: The flap/slat electronics units are failed.

1 **If** flap retraction is required:

FLAP lever . . . . . UP

This allows the maximum speed display on the PFD to increase to VMO/MMO.

ALTN FLAPS ARM switch . . . . . ALTN

Alternate flaps selector . . . . . RET

Monitor airspeed during retraction.

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

**Note:** Plan additional 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.

3 **Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . \_\_\_\_

Landing data . . . . . **VREF 20, Minimums** \_\_\_\_

Approach briefing . . . . . Completed

▼ Continued on next page ▼



▼ **FLAP/SLAT CONTROL continued** ▼

**Approach Checklist**

Altimeters . . . . . \_\_\_\_\_

**Alternate flaps extension**

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

**Landing Checklist**

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps. . . . . **20**



**[ ] FLIGHT CONTROL MODE**

Condition: The flight control system operates 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 required 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 inflight speedbrake extension.

Manually extend the speedbrakes after landing.

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

AUTO SPEEDBRAKE

THRUST ASYM COMP

6 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ **FLIGHT CONTROL MODE continued** ▼

**Deferred Items**

**Descent Checklist**

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

**Landing Checklist**

- Speedbrake . . . . . **DOWN**
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



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**[ ] 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.

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

**5 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ **FLIGHT CONTROLS continued** ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . **VREF 30 + 20, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps. . . . . **20**



**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



**[ ] PITCH DOWN AUTHORITY**

Condition: Pitch down authority is restricted.

- 1 Slower airspeeds assist nose down pitch control. The airplane is approaching its nose down pitch control limit.

**Note:** Avoid speedbrake use and rapid thrust increases. Only limited elevator authority is available to counter nose up pitching.





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**[ ] 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.

- 3 Choose one:

◆ Flap position is **15 or less**

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

►► **Go to step 4**

◆ Flap position is **20 or greater**

**Note:** Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds provide better pitch up control authority.

►► **Go to step 4**

- 4 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ **PITCH UP AUTHORITY** continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 30 + 40 or**  
**VREF 30 + 20, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . **5 or 20**



**[ ] PRI FLIGHT COMPUTERS**

Condition: The flight control system is operating in the direct mode.

- 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.

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 inflight speedbrake extension.

Manually extend the speedbrakes after landing.

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

AUTO SPEEDBRAKE

THRUST ASYM COMP

6 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ PRI FLIGHT COMPUTERS continued ▼

**Deferred Items**

**Descent Checklist**

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

**Landing Checklist**

- Speedbrake . . . . . **DOWN**
- Landing gear . . . . . DOWN
- Flaps . . . . . **.20**



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**[ ] 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 fuel predictions with slats extended.

Do not use autoland.

Use flaps 20 and VREF 30 + 30 for landing. This provides better handling qualities when the slats are not fully extended.

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

SLATS PRIMARY FAIL

#### 4 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼



▼ SLATS DRIVE continued ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . **VREF 30 + 30, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps. . . . . **20**



**[ ] SLATS PRIMARY FAIL**

Condition: The slats primary mode is failed.

**Note:** Plan additional time for slower slat operation.

[777-200]

**Note:** The slats will extend beyond midrange when the airspeed is below 215 knots. For go-around, do not exceed 215 knots until the slats retract to midrange.



[777-200ER]

**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.



[777-300]

**Note:** The slats will extend beyond midrange when the airspeed is below 246 knots. For go-around, do not exceed 246 knots until the slats retract to midrange.



[777F, 777-200LR, 777-300ER]

**Note:** The slats will extend beyond midrange when the airspeed is below 256 knots. For go-around, do not exceed 256 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.

**[ ] STAB GREENBAND**

Condition: The nose gear pressure switch disagrees with the stabilizer green band calculated by the FMC.

- 1 Check FMC weight and CG entries.



**[ ] STABILIZER C**

Condition: The center stabilizer control path is failed.

1 C STAB cutout switch . . . . . CUTOUT

**Note:** The left 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 right 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 required to compensate for asymmetric thrust conditions.



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-----

**Airspeed Unreliable..... 10.1**

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SGL SOURCE DISPLAYS ..... 10.6

SGL SOURCE RAD ALT ..... 10.6

SINGLE SOURCE F/D ..... 10.6

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## Airspeed Unreliable

Condition: The airspeed or Mach displays are suspected to be unreliable. (Items which may indicate unreliable airspeed are listed in the Additional Information section.)

- 1 Check the pitch attitude and thrust for the phase of flight.
- 2 **If** the pitch attitude or thrust are **not** normal for the phase of flight:

Autopilot disconnect switch . . . . . Push

Autothrottle disconnect switch . . . . . Push

F/D switches (both) . . . . . OFF

Adjust the pitch attitude and thrust.

[GE Engines]

**Note:** The normal pitch attitude and thrust settings are available in the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

Altitude, Vertical Speed, Reference N1, and Maximum N1 may be unreliable.

▼ Continued on next page ▼

▼ **Airspeed Unreliable continued** ▼

[PW Engines, RR Engines]

**Note:** The normal pitch attitude and thrust settings are available in the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

Altitude, Vertical Speed, Reference EPR, and Maximum EPR may be unreliable.

- 3 Compare the pitch attitude, thrust setting, and airspeed with the ground speed and the Flight With Unreliable Airspeed table in the Performance Inflight chapter.
- 4 Choose one:
  - ◆ Reliable airspeed data source **can** be determined:

Use the reliable airspeed display.

■ ■ ■ ■
  - ◆ Reliable airspeed data source can **not** be determined:

►► **Go to step 5**
- 5 Adjust the pitch attitude and thrust for the phase of flight.
- 6 Maintain a normal pitch attitude and thrust setting for the phase of flight. Refer to the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

▼ **Continued on next page** ▼

▼ **Airspeed Unreliable continued** ▼

**Note:** Maintain visual conditions if possible.

Establish landing configuration early.

Use electronic and visual glideslope indicators, where available, for approach and landing.

Refer to ground speed on the ND and reported wind for approach.

**Additional Information**

The flight path vector is based on inertial sources and may be used as a reference in maintaining proper path control.

One or more of the following may be evidence of an unreliable airspeed or Mach display:

- Speed/altitude information not consistent with pitch attitude and thrust setting
- Airspeed failure flags
- PFD current airspeed box amber
- Blank or fluctuating airspeed displays
- Amber line through one or more PFD flight mode annunciations
- Overspeed indications
- Radome damage or loss
- Simultaneous overspeed and stall warnings

One or more of the following EICAS messages may show:

▼ **Continued on next page** ▼

▼ **Airspeed Unreliable continued** ▼

AIRSPD LOW  
GND PROX SYS  
HEAT PITOT C  
HEAT PITOT L  
HEAT PITOT R  
HEAT PITOT L+C+R  
NAV AIR DATA SYS  
OVERSPEED  
SGL SOURCE AIR DATA  
SGL SOURCE DISPLAYS  
WINDSHEAR SYS

**[ ] ALTN ATTITUDE**

Condition: Both pilots' AIR DATA/ATT source switches are in ALTN.

[\[Integrated Standby Flight Display\]](#)

**Note:** Both PFDs show the SAARU attitude information.

[\[Standby Flight Instruments\]](#)

**Note:** Both PFDs and the standby attitude indicator show the SAARU attitude information.



**BARO SET DISAGREE**

Condition: The captain's and first officer's barometric settings disagree.

**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:** CDU control of the EFIS control panel is accessed from the CDU menu page.

**PVD SYS CAPT, F/O**

[Option]

Condition: The affected PVD is failed.

**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.



## SINGLE SOURCE F/D

Condition: Both PFDs use the same flight director source.



**Non-Normal Checklists**  
**Flight Management, Navigation**

**Chapter NNC**  
**Section 11**

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**[ ] 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 Select autopilot roll and pitch modes appropriate for the desired flight path. LNAV and VNAV modes are failed.

**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 and set manually
- 3 Do **not** accomplish the following checklist:

LANDING ALTITUDE



**FMC L, R**

[Option]

Condition: An FMC is failed.

**FMC MESSAGE**

Condition: An alerting message is in the FMC scratchpad.

**FMC RUNWAY DISAGREE**

[Option]

Condition: Airplane is not on FMC origin runway when either engine's thrust is in the takeoff range.

**[ ] GPS**

Condition: Both GPS receivers are failed.

[AIMS BP v14 and later]

**Note:** The FMC uses inertial inputs only.

Look-ahead terrain alerting and display are unavailable due to position uncertainty.

If radio updating is allowed:

- Select the FMC REF NAV DATA page
- Select OFF for RAD NAV INHIBIT



**[ ] 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.



**[ ] 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 provide position and track information.  
[\[ND Map Heading Up\]](#)
- 3 ND map display orientation changes from heading up to track up.  
[\[Gables ATC Control Panel\]](#)
- 4 Transponder ALT SOURCE selector . . . . . ALTN  
[\[Bendix ATC Control Panel\]](#)
- 5 XPDR 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:

▼ Continued on next page ▼

## ▼ NAV ADIRU INERTIAL 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

**Note: Inoperative AFDS Modes**

- LNAV
- VNAV
- TO/GA
- LOC
- GS
- FPA
- TRK HOLD/SEL

- 6 **When** the heading blanks and the SET HDG line shows on POS INIT page 1:

Enter the heading.

Re-engage the autopilot.

▼ Continued on next page ▼

## ▼ NAV ADIRU INERTIAL continued ▼

**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.

**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



**[ ] NAV 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 ▼

▼ NAV 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

**Note:** Yaw damper is degraded.

Manual control inputs are required to compensate for asymmetric thrust conditions.

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

Do not arm speedbrake lever. This prevents inadvertent inflight extension.

Manually extend speedbrakes after landing.

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

- AUTO SPEEDBRAKE
- FLIGHT CONTROL MODE
- THRUST ASYM COMP

5 **Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked

▼ Continued on next page ▼



▼ NAV AIR DATA SYS continued ▼

Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 20, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

---

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

---

**Landing Checklist**

Speedbrake . . . . . **DOWN**  
Landing gear . . . . . DOWN  
Flaps . . . . . **20**



**[ ] 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 procedure or airway **with RNP alerting requirement**:

Select alternate procedure or airway.  
During an approach, initiate a go-around unless suitable visual references can be established and maintained.



◆ On procedure or airway **without RNP**:

Verify position.

**SINGLE SOURCE ILS**

Condition: Both pilots' displays use the same ILS source.



**TRANSPONDER L, R**

Condition: A transponder fault occurs.



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**[ ] FUEL AUTO JETTISON**

Condition: One of these occurs:

- The total fuel quantity is less than 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.

[\[Metric Units\]](#)

1 Choose one:

- ◆ One or more tank quantity displays are **blank**:

Determine jettison time using the following rates:

Fuel in center tank: 2500 kgs/minute

Center tank empty: 1400 kgs/minute

▶▶ **Go to step 3**

- ◆ All tank quantity displays **stay shown**:

▶▶ **Go to step 3**

▼ Continued on next page ▼

▼ **FUEL AUTO JETTISON continued** ▼

[English Units]

2 Choose one:

◆ One or more tank quantity displays are **blank**:

Determine 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 Do **not** accomplish the following checklist:  
FUEL JETTISON

5 **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 ▼

6 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 provides gross weight data for FMC performance calculations and allows VNAV to be re-engaged.



◆ FUEL line on PERF INIT page **shows**:



**[ ] FUEL AUX XFR****[Auxiliary Fuel Tank - One]**

Condition: Auxiliary fuel fails to transfer or is transferring slower than normal.

Attempt only one reset.

- 1  AUX fuel switch . . . . . Off, then ON

This resets the auxiliary transfer system.  
This allows transfer of fuel if it is transferring slower than normal.

- 2 **Wait** 10 minutes.

- 3 Choose one:

◆ FUEL AUX XFR message **blanks**:



◆ FUEL AUX XFR message **stays shown** or **shows again**:

**[Metric Units]**

►► **Go to step 4**

**[English Units]**

►► **Go to step 5**

▼ Continued on next page ▼

## ▼ FUEL AUX XFR continued ▼

[\[Metric Units\]](#)

4 Choose one:

◆ FMC TAKEOFF REF CG is **less than 31%**:

All center tank fuel is usable.

◆ FMC TAKEOFF REF CG is **31%**:**When** center tank quantity decreases to 4,600 kgs:▶▶ **Go to step 6**◆ FMC TAKEOFF REF CG is **32%** or **33%**:**When** center tank quantity decreases to 5,900 kgs:▶▶ **Go to step 6**

▼ Continued on next page ▼

## ▼ FUEL AUX XFR continued ▼

[\[English Units\]](#)

5 Choose one:

◆ FMC TAKEOFF REF CG is **less than 31%**:

All center tank fuel is usable.

◆ FMC TAKEOFF REF CG is **31%**:**When** center tank quantity decreases to 10,000 lbs:▶▶ **Go to step 6**◆ FMC TAKEOFF REF CG is **32%** or **33%**:**When** center tank quantity decreases to 13,000 lbs:▶▶ **Go to step 6**

6 Fuel CENTER PUMPS switches (both). . . . . Off

**Note:** Remaining center tank fuel is unusable.  
Normal scavenge system operation  
decreases center tank quantity.

7 Select the PERF INIT page

8 FUEL . . . . . Enter usable fuel quantity manually

Usable fuel quantity is total fuel minus unusable fuel. Unusable fuel is auxiliary tank quantity plus remaining center tank quantity.

9 ZFW . . . . . Enter adjusted ZFW manually

Adjusted ZFW is dispatch ZFW plus unusable fuel.



**[ ] FUEL CROSSFEED AFT**

Condition: The 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 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**:



**[ ] FUEL DISAGREE**

[AIMS Blockpoint 2005 or later]

Condition: The totalizer fuel quantity and the FMC calculated fuel quantity disagree.

Objective: To check for indications of a fuel leak and select the most accurate fuel value.

- 1 The FUEL DISAGREE message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to the planned fuel remaining.

The fuel flow displays, for an engine with an excessive fuel flow.

The individual tank quantities.

The totalizer compared to calculated quantities (PROGRESS page 2). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time).

▼ Continued on next page ▼

▼ FUEL DISAGREE continued ▼

2 Choose one:

◆ There **is** an indication of an engine fuel leak:

▶▶ **Go to the Fuel Leak checklist on page 12.17**



◆ There is **no indication** of an engine fuel leak **and** the **FUEL DISAGREE message shows:**

▶▶ **Go to step 3**

3 Select PROGRESS page 2.

4 TOTALIZER or  
CALCULATED . . . . . Select USE for the  
most accurate value



**[ ] FUEL IMBALANCE**

Condition: There is a fuel imbalance between the main tanks.

Objective: To check for indications of an engine fuel leak and balance fuel.

- 1 The FUEL IMBALANCE message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to the planned fuel remaining.

The fuel flow displays, for an engine with an excessive fuel flow.

The individual tank quantities.

The totalizer compared to calculated quantities (PROGRESS page 2). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time).

▼ Continued on next page ▼



▼ **FUEL IMBALANCE continued** ▼

2 Choose one:

◆ There **is** an indication of an engine fuel leak:

▶▶ **Go to the Fuel Leak checklist on page 12.17**



◆ There is **no indication** of an engine fuel leak **and** the **FUEL IMBALANCE message shows:**

▶▶ **Go to step 3**

3 FUEL CROSSFEED switch (either) . . . . . On

4 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 7**

◆ **Right** main tank quantity is low:

▶▶ **Go to step 5**

▼ **Continued on next page** ▼

▼ **FUEL IMBALANCE** continued ▼

- 5 R fuel PUMPS FWD and AFT  
switches (both) . . . . . Off

This allows fuel from the higher quantity tank to feed both engines.

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

FUEL PUMP R AFT

FUEL PUMP R FWD

- 7 **When** fuel balancing is complete:

Fuel PUMPS FWD and AFT  
switches (all) . . . . . ON

FUEL CROSSFEED switches (both) . . . . . Off



**FUEL IN AUX**

[Auxiliary Fuel Tank]

Condition: The aux fuel switch is off with fuel in the auxiliary tank.



**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 5**
  - ◆ FUEL TO REMAIN must be **changed**:
    - [Auxiliary Fuel Tank]
    - ▶▶ **Go to step 3**
    - ▶▶ **Go to step 4**
- 3 **If** the FUEL AUX XFR message shows, auxiliary fuel will not be usable. Add the unusable auxiliary fuel quantity to the desired fuel to remain value.
- 4 FUEL TO REMAIN selector . . . . . PULL ON and set manually
- 5 FUEL JETTISON NOZZLE valve switches (both) . . . . . ON
- 6 Do **not** accomplish the following checklists:
  - FUEL AUX XFR
  - FUEL PUMP CENTER L
  - FUEL PUMP CENTER R

▼ Continued on next page ▼

## ▼ Fuel Jettison continued ▼

- 7 **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.

Objective: To close the fuel jettison nozzle valves and disarm the system.

- 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: An in-flight fuel leak is suspected or confirmed. (Items which may indicate a fuel leak are listed in the Additional Information section.)

Objective: To verify that there is a fuel leak and shut down the affected engine, if needed.

- 1 Fuel CENTER PUMPS switches (both) . . . . . Off  
[Auxiliary Fuel Tank]
- 2 AUX fuel switch . . . . . Off  
[Auxiliary Fuel Tank]
- 3 Do **not** accomplish the following checklist:  
FUEL AUX XFR
- 4 FUEL CROSSFEED switches (both) . . . . . Off
- 5 Identify an engine fuel leak by verifying that a left or right main fuel tank quantity is decreasing faster than the other.  
[Metric Units]
- 6 An increase in a fuel imbalance of approximately 500 kgs or more in 30 minutes should be considered a fuel leak.  
[English Units]
- 7 An increase in a fuel imbalance of approximately 1000 lbs or more in 30 minutes should be considered a fuel leak.
- 8 **If** conditions allow, visually check for an engine fuel leak.

▼ Continued on next page ▼

## ▼ Fuel Leak continued ▼

9 Choose one:

◆ Left and right main tank quantities decrease at **different** rates:

▶▶ **Go to step 19**

◆ Left and right main tank quantities decrease at the **same** rate:

[777-200]

▶▶ **Go to step 10**

[777-200ER, 777F, 777-200LR, 777-300, 777-300ER]

▶▶ **Go to step 15**

[777-200]

10 The fuel leak may be from the center tank to the center wing area. Do not use center tank fuel.

11 Choose one:

◆ FUEL DISAGREE message is **blank**:

▶▶ **Go to step 14**

◆ FUEL DISAGREE message **shows**:

▶▶ **Go to step 12**

12 Select PROGRESS page 2.

13 CALCULATED . . . . . Select USE  
Use CALCULATED to determine gross weight.

▼ Continued on next page ▼



## ▼ Fuel Leak continued ▼

14 Check the destination fuel estimate. Verify that adequate fuel is available in the left and right main tanks to complete the flight.

▶▶ **Go to step 19**

[777-200ER, 777F, 777-200LR, 777-300, 777-300ER]

15 Resume normal fuel management procedures.

16 Choose one:

◆ FUEL DISAGREE message is **blank**:

▶▶ **Go to step 19**

◆ FUEL DISAGREE message **shows**:

▶▶ **Go to step 17**

17 Select PROGRESS page 2.

18 TOTALIZER OR CALCULATED . . . . . Select USE  
Select the most accurate value.

19 Choose one:

◆ An engine fuel leak is **not** confirmed:

▶▶ **Go to step 30**

◆ An engine fuel leak is **confirmed**:

▶▶ **Go to step 20**

20 A/T ARM switch

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

▼ Continued on next page ▼

## ▼ Fuel Leak continued ▼

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

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

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

24 Transponder mode selector . . . . . TA ONLY

25 Choose one:

◆ FUEL DISAGREE message is **blank**:

▶▶ **Go to step 28**

◆ FUEL DISAGREE message **shows**:

▶▶ **Go to step 26**

26 Select PROGRESS page 2.

27 TOTALIZER . . . . . Select USE  
Use TOTALIZER to determine fuel remaining.

28 Plan to land at the nearest suitable airport.

**Note:** After engine shutdown, all remaining fuel can be used for the operating engine. Resume normal fuel management procedures. Plan to balance fuel when the FUEL IMBALANCE message shows.

## ▼ Continued on next page ▼

▼ Fuel Leak continued ▼

29 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 30**

◆ Landing using flaps **30 (performance permitting)**:

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

▶▶ **Go to step 30**

30 Choose one:

◆ FUEL QTY LOW message is **blank**:

▶▶ **Go to step 37**

◆ FUEL QTY LOW message **shows**:

▶▶ **Go to step 31**

31 FUEL CROSSFEED switch (either) . . . . . On

This ensures that fuel is available to both engines if the low tank empties.

[Auxiliary Fuel Tank]

32 AUX fuel switch . . . . . ON

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

33 Fuel PUMPS switches (all) . . . . .ON  
This ensures that all fuel is available for use.

34 Plan to land at the nearest suitable airport.

35 GND PROX FLAP OVRD switch . . . . .OVRD

**Note:** Use flaps 20 and VREF 20 for landing.  
Increased speed at flaps 20 provides improved elevator control for landing flare in the event of dual engine flameout.  
  
Avoid high nose up attitude and excessive acceleration or deceleration. This prevents forward pumps from uncovering.

36 Do **not** accomplish the following checklist:  
FUEL QTY LOW

**37 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes. . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 20 or VREF 30,**  
**Minimums**\_\_\_\_  
Approach briefing . . . . . Completed

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

## Approach Checklist

Altimeters . . . . . \_\_\_\_\_

## Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . **20 or 30**



## Additional Information

One or more of the following may be evidence of a fuel leak:

- A visual observation of fuel spray from a strut or an engine
- An excessive engine fuel flow
- The total fuel quantity decreasing at an abnormal rate
- 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 a CDU scratchpad

## FUEL LOW AUX

[Auxiliary Fuel Tank]

Condition: The aux fuel switch in on and the auxiliary tank quantity is low.



**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 engine is on suction feed.

- 1 Fuel PUMPS FWD and AFT switches  
(affected side) . . . . . Off

**Note:** At high altitude, thrust deterioration or an engine flameout may occur

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

FUEL IMBALANCE

FUEL PUMP AFT

FUEL PUMP FWD

- 3 Choose one:

◆ **Able** to maintain the required thrust on the affected engine:



◆ **Unable** to maintain the required thrust on the affected engine:

►► **Go to step 4**

▼ Continued on next page ▼

**▼ FUEL PRESS ENG L, R continued ▼**

- 4 FUEL CROSSFEED switch (either) . . . . . On

This allows fuel from an operative pump side to feed both engines.

**Note:** Continued operation with a crossfeed valve open will result in a progressive fuel imbalance due to both engines feeding from the same main tank.

- 5 Do not balance fuel.

- 6 **When** the FUEL IMBALANCE message shows:

FUEL CROSSFEED switches (both) . . . . . Off

Continue suction feed operation. Sufficient roll control is available to compensate for any main tank fuel imbalance.

**If** unable to maintain required thrust on the affected engine, descend to a lower altitude.

**FUEL PRESS ENG L+R**

Condition: Both engines are on suction feed.



**[ ] FUEL PUMP CENTER L, R**

Condition: The 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 pump pressure is low.

- 1 Fuel PUMP switch (affected pump) . . . . . Off



**[ ] FUEL PUMP R AFT, FWD**

Condition: The 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 check for indications of a fuel leak and ensure that all fuel is available for use.

- 1 The FUEL QTY LOW message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to the planned fuel remaining.

The fuel flow displays, for an engine with an excessive fuel flow.

The individual tank quantities.

The totalizer compared to calculated quantities (PROGRESS page 2). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time).

- 2 Choose one:

◆ There **is** an indication of an engine fuel leak:

▶ ▶ **Go to the Fuel Leak checklist on page 12.17**



◆ There is **no indication** of an engine fuel leak **and** the **FUEL QTY LOW message shows:**

▶ ▶ **Go to step 3**

▼ Continued on next page ▼

▼ **FUEL QTY LOW continued** ▼

- 3 FUEL CROSSFEED switch (either) . . . . . On  
This ensures that fuel is available to both engines if the low tank empties.

[Auxiliary Fuel Tank]

- 4 AUX fuel switch . . . . . ON  
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 provides improved elevator control for landing flare in the event of a dual engine flameout.  
  
Avoid high nose up attitude and excessive acceleration or deceleration. This prevents forward pumps from uncovering.

**8 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

- Recall . . . . . Checked  
Notes. . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 20, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

▼ **Continued on next page** ▼

▼ FUEL QTY LOW continued ▼

**Approach Checklist**

Altimeters . . . . . \_\_\_\_\_

**Landing Checklist**

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps. . . . . **20**



**[ ] FUEL SCAVENGE SYS**[\[AIMS v14 and later\]](#)

Condition: The fuel scavenge system is failed.

**1 Choose one:****◆ Center tank fuel quantity is **available**:**

Select the PERF INIT page.

Add the center tank fuel quantity to the required RESERVES

►► **Go to step 9**

**◆ Center tank fuel quantity is **unavailable**:**

►► **Go to step 2**

**2 Select the PERF INIT page.**[\[Metric Units\]](#)[\[777-200\]](#)**3 Add 400 kgs to the required RESERVES.**[\[777-200ER, 777-300\]](#)**4 Add 1,100 kgs to the required RESERVES.**[\[777F, 777-200LR, 777-300ER\]](#)**5 Add 1,300 kgs to the required RESERVES.**[\[English Units\]](#)[\[777-200\]](#)**6 Add 800 lbs to the required RESERVES.**[\[777-200ER, 777-300\]](#)**7 Add 2,400 lbs to the required RESERVES.**[\[777F, 777-200LR, 777-300ER\]](#)

▼ **Continued on next page** ▼

## ▼ FUEL SCAVENGE SYS continued ▼

- 8 Add 2,700 lbs to the required RESERVES.
- 9 Select the PROGRESS page.
- 10 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 FL250.



**[ ] 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



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Intentionally  
Blank



**[ ] 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 . . . . . 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. . . . . Off
- 2 Do **not** accomplish the following checklist:

HYD PRESS PRI



**[ ] HYD OVERHEAT PRI L, R**

Condition: The pump temperature is high.

- 1 ENG PRIMARY pump switch . . . . . Off

**Note:** Thrust reverser on the affected side may be inoperative.

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

HYD PRESS PRI



**[ ] HYD PRESS DEM C1, C2, L, R**

Condition: Demand pump output pressure is low when commanded on.

1 DEMAND pump selector . . . . . ON

2 Choose one:

◆ HYD PRESS DEM message **blanks**:



◆ HYD PRESS DEM message **stays shown**:

DEMAND pump selector . . . . . OFF



**[ ] HYD PRESS PRI C1, C2**

Condition: The pump pressure is low.

1 ELEC PRIMARY pump switch . . . . . Off



**[ ] HYD PRESS PRI L, R**

Condition: The pump pressure is low.

1 ENG PRIMARY pump switch . . . . . Off

**Note:** Thrust reverser on the affected side may be inoperative.



**[ ] HYD PRESS SYS C**

Condition: The hydraulic system pressure is low.

Objective: To attempt 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 additional 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** ▼[\[777-200\]](#)

**Note:** Slats will extend beyond midrange when airspeed is below 215 knots. For go-around, do not exceed 215 knots until slats retract to midrange.

[\[777-200ER\]](#)

**Note:** Slats will extend beyond midrange when airspeed is below 239 knots. For go-around, do not exceed 239 knots until slats retract to midrange.

[\[777-300\]](#)

**Note:** Slats will extend beyond midrange when airspeed is below 246 knots. For go-around, do not exceed 246 knots until slats retract to midrange.

[\[777-200FT, 777-200LR, 777-300ER\]](#)

**Note:** Slats will extend beyond midrange when airspeed is below 256 knots. For go-around, do not exceed 256 knots until slats retract to midrange.

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS C continued** ▼

**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 inflight extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

**7 Checklist Complete Except Deferred Items**

**Deferred Items**

**Descent Checklist**

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . . **VREF 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

▼ **Continued on next page** ▼

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## Flap extension

Initiate flap extension as required.

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

---

## Alternate gear extension

Landing gear lever . . . . . DN

ALTN GEAR

extend switch . . . . . Push to DOWN and hold  
until all gear indicate in-transit

A 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

---

## Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps . . . . . **20**



**[ ] HYD PRESS SYS L**

Condition: The 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.

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

SPOILERS





**[ ] HYD PRESS SYS L+C**

Condition: Two hydraulic system pressures are low.

Objective: To attempt 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 additional 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.

[\[777-200\]](#)

**Note:** Slats will extend beyond midrange when airspeed is below 215 knots. For go-around, do not exceed 215 knots until slats retract to midrange.

[\[777-200ER\]](#)

**Note:** Slats will extend beyond midrange when airspeed is below 239 knots. For go-around, do not exceed 239 knots until slats retract to midrange.

[\[777-300\]](#)

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS L+C continued** ▼

**Note:** Slats will extend beyond midrange when airspeed is below 246 knots. For go-around, do not exceed 246 knots until slats retract to midrange.

[777-200FT, 777-200LR, 777-300ER]

**Note:** Slats will extend beyond midrange when airspeed is below 256 knots. For go-around, do not exceed 256 knots until slats retract to midrange.

**Note:** Use flaps 20 and VREF 30 + 20 for landing. This allows higher approach speeds to 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 inflight extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

## 12 Checklist Complete Except Deferred Items

### Deferred Items

#### Descent Checklist

Recall . . . . . Checked

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS L+C continued** ▼

- Notes. . . . . Checked
- Autobrake . . . . . \_\_\_\_
- Landing data . . . . **VREF 30 + 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

**Flap extension**

- Initiate flap extension as required.
- Do **not** accomplish the following checklists:
  - FLAPS PRIMARY FAIL
  - SLATS PRIMARY FAIL

**Alternate gear extension**

- Landing gear lever . . . . . DN
- ALTN GEAR
  - extend switch . . . . . Push to DOWN and hold until all gear indicate 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

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS L+C continued** ▼

**Landing Checklist**

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps. . . . . **20**



**HYD PRESS SYS L+C+R**

Condition: All hydraulic system pressures are low.



**[ ] HYD PRESS SYS L+R**

Condition: Two hydraulic system pressures are low.

Objective: To attempt to restore system pressure and configure for landing using alternate systems, if needed.

[777-300, 777-300ER]

- 1 Do not exceed .87 Mach. This ensures sufficient roll control.
- 2 L ELEC DEMAND pump selector . . . . . ON
- 3 R ELEC DEMAND pump selector . . . . . ON
- 4 Choose one:
  - ◆ HYD PRESS SYS L+R message **blanks**:  

■ ■ ■ ■
  - ◆ HYD PRESS SYS L+R message **stays shown**:  

▶ ▶ **Go to step 5**
- 5 L ENG PRIMARY pump switch . . . . . Off
- 6 R ENG PRIMARY pump switch. . . . . Off
- 7 L ELEC DEMAND pump selector . . . . . OFF
- 8 R ELEC DEMAND pump selector . . . . . OFF
- 9 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 10 Plan to land at the nearest suitable airport.
- 11 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. This allows higher approach speeds to 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.

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

FLIGHT CONTROLS

SPOILERS

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

▼ HYD PRESS SYS L+R continued ▼

Deferred Items

Descent Checklist

- Recall . . . . . Checked
- Notes. . . . . Checked
- Autobrake . . . . . **.OFF**
- Landing data . . . . **VREF 30 + 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

Approach Checklist

- Altimeters . . . . . \_\_\_\_

Landing Checklist

- Speedbrake . . . . . ARMED
- Landing gear . . . . . DOWN
- Flaps. . . . . **.20**





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**[ ] HYD PRESS SYS R**

Condition: The 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.

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

SPOILERS

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ **HYD PRESS SYS R continued** ▼

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . **OFF**  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_

**Landing Checklist**

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_



**[ ] HYD PRESS SYS R+C**

Condition: Two hydraulic system pressures are low.

Objective: To attempt to restore system pressure and configure for landing using alternate systems, if needed.

[777-300, 777-300ER]

- 1 Do not exceed .87 Mach. This ensures sufficient roll control.
- 2 C1 or C2 AIR DEMAND pump selector . . . . . ON
- 3 R ELEC DEMAND pump selector . . . . . ON
- 4 Choose one:
  - ◆ HYD PRESS SYS R+C message **blanks**:  

■ ■ ■ ■
  - ◆ HYD PRESS SYS R+C message **stays shown**:  

▶ ▶ **Go to step 5**
- 5 STAB cutout switches (both) . . . . . CUTOUT  
 This keeps the STABILIZER message blank.
- 6 Do not exceed current airspeed. Nose down elevator authority is limited.
- 7 C2 ELEC PRIMARY pump switch . . . . . Off
- 8 R ENG PRIMARY pump switch. . . . . Off
- 9 C1 and C2 AIR DEMAND pump selectors . . . . OFF
- 10 R ELEC DEMAND pump selector . . . . . OFF

▼ Continued on next page ▼

▼ **HYD PRESS SYS R+C continued** ▼

- 11 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 12 Plan to land at the nearest suitable airport.
- 13 GND PROX FLAP OVRD switch . . . . . OVRD
- 14 Do **not** accomplish the following checklists:
  - AUTO SPEEDBRAKE
  - FLIGHT CONTROLS
  - SPOILERS
  - STABILIZER

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS R+C continued** ▼**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 additional 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 and alternate brakes inop**

Reserve brakes are available.

**Main gear steering inop**

Tires may scrub during turns.

[777-200]

**Note:** Slats will extend beyond midrange when airspeed is below 215 knots. For go-around, do not exceed 215 knots until slats retract to midrange.

[777-200ER]

**Note:** Slats will extend beyond midrange when airspeed is below 239 knots. For go-around, do not exceed 239 knots until slats retract to midrange.

[777-300]

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS R+C continued** ▼

**Note:** Slats will extend beyond midrange when airspeed is below 246 knots. For go-around, do not exceed 246 knots until slats retract to midrange.

[777-200FT, 777-200LR, 777-300ER]

**Note:** Slats will extend beyond midrange when airspeed is below 256 knots. For go-around, do not exceed 256 knots until slats retract to midrange.

**Note:** Use flaps 20 and VREF 30 + 20 for landing. This allows higher approach speeds to 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 inflight extension.

Manually extend speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

## 15 Checklist Complete Except Deferred Items

### Deferred Items

#### Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS R+C continued** ▼

- Autobrake .....**OFF**
- Landing data . . . . **VREF 30 + 20, Minimums** \_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_

**Flap extension**

- Initiate flap extension as required.
- Do **not** accomplish the following checklists:
  - FLAPS PRIMARY FAIL
  - SLATS PRIMARY FAIL

**Alternate gear extension**

- Landing gear lever .....DN
- ALTN GEAR
  - extend switch . . . . . Push to DOWN and hold  
until all gear indicate 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

▼ **Continued on next page** ▼



▼ HYD PRESS SYS R+C continued ▼

## Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps. . . . . **20**



### [ ] HYD QTY LOW C

Condition: The 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: Two 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: Two hydraulic quantities are low.

- 1 Plan to land at the nearest suitable airport.



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**[ ] HYD QTY LOW R+C**

Condition: Two 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:  
BRAKE SOURCE  
RESERVE BRAKES/STRG

**4 Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ HYD QTY LOW R+C continued ▼

## Deferred Items

### Descent Checklist

Recall . . . . . Checked  
Notes . . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . VREF \_\_\_\_, Minimums \_\_\_\_  
Approach briefing . . . . . Completed

### Approach Checklist

Altimeters . . . . . \_\_\_\_

### Landing Checklist

Speedbrake . . . . . ARMED  
Landing gear . . . . . DOWN  
Flaps . . . . . \_\_\_\_

### Before landing

C1 ELEC PRIMARY pump switch . . . . . ON  
This restores reserve brakes and may restore steering.



**RAT UNLOCKED**

Condition: The ram air turbine is not stowed and locked.



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**[ ] ANTISKID**

Condition: An antiskid system fault occurs.

**Note:** The autobrake system is inoperative. Use minimum braking consistent with the runway conditions to reduce the possibility of a tire blowout.

**AUTOBRAKE**

Condition: One of these occurs:

- the autobrake system is disarmed
- the autobrake system is failed

**[ ] BRAKE SOURCE**

Condition: Normal, alternate, and reserve brake system pressures are 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:

◆ In **flight**:

Do not exceed the gear EXTEND limit speed  
(270 knots/.82 Mach).

Landing gear lever . . . . . DN

**When** the BRAKE TEMP message blanks:

**Wait** 8 minutes.

Landing gear lever . . . . . UP



◆ On the **ground**:

Refer to the Recommended Brake Cooling  
Schedule table in the Performance Inflight  
chapter for the required cooling time.



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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 (270 knots/.82 Mach).

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 indicate in-transit

3 Reduction of airspeed to below 240 knots may be necessary for the gear to lock down.

▼ **Continued on next page** ▼

▼ **GEAR DISAGREE continued** ▼

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**

**Deferred Items**

**Descent Checklist**

Recall . . . . . Checked

Notes . . . . . Checked

▼ **Continued on next page** ▼

▼ **GEAR DISAGREE continued** ▼

- Autobrake . . . . . \_\_\_\_\_
- Landing data . . . . . **VREF 30, Minimums** \_\_\_\_\_
- Approach briefing . . . . . Completed

**Approach Checklist**

- Altimeters . . . . . \_\_\_\_\_

**At pattern altitude**

- OUTFLOW VALVE switches (both) . . . . . MAN
- OUTFLOW VALVE MANUAL switches (both) . . . . . Push to OPEN and hold until the outflow valve displays show fully open to depressurize the airplane

[\[Auxiliary Fuel Tank\]](#)

- AUX fuel switch. . . . . Off
- Fuel PUMPS switches (all) . . . . . Off

Do **not** accomplish the following checklists:

- CABIN ALTITUDE AUTO
- FUEL AUX XFR
- FUEL PRESS ENG L
- FUEL PRESS ENG R

▼ **Continued on next page** ▼

▼ GEAR DISAGREE continued ▼

**Landing Checklist**

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps . . . . . **30**



**[ ] GEAR DOOR**

Condition: One or more gear doors are not closed.

**Note:** Do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).



**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 . . . . . Checked  
Notes. . . . . Checked  
Autobrake . . . . . \_\_\_\_  
Landing data . . . . . **VREF 30, Minimums** \_\_\_\_  
Approach briefing . . . . . Completed

**Approach Checklist**

Altimeters . . . . . \_\_\_\_

**At pattern altitude**

[\[Auxiliary Fuel Tank\]](#)

AUX fuel switch. . . . . Off  
Fuel PUMPS switches (all) . . . . . Off

▼ Continued on next page ▼



▼ **MAIN GEAR BRACE L, R continued** ▼

Do **not** accomplish the following checklists:

FUEL AUX XFR

FUEL PRESS ENG L

FUEL PRESS ENG R

## Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps. . . . . **30**



## MAIN GEAR STEERING

Condition: Main gear steering does not lock.



## [ ] RESERVE BRAKES/STRG

Condition: One or more of these are possibly not available:

- Reserve brakes
- Normal nose gear extension
- Nose wheel steering

**Note:** Plan for possible alternate gear extension.  
Do not taxi with loss of steering.



**TAIL SKID**

[777-300, 777-300ER]

Condition: The tailskid is not in the commanded position.



**TIRE PRESS**

Condition: One or more tire pressures are not normal.



**Non-Normal Checklists**

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**Warning Systems**

**Section 15**

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**AIRSPEED 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 annunciations during approach are not supplied.

**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:

- A thrust lever is at idle below 800 feet radio altitude
- 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.

**RUNWAY OVRD**

[Option + AIMS v14 and later]

Condition: The ground proximity runway override switch is in OVRD.

**[ ] RUNWAY POS**

[Option + AIMS-1 + v14 and later]

Condition: RAAS position data is lost. The condition may be temporary.

**Note:** Position data for RAAS is lost. Ground proximity alerts that occur are valid.





**[ ] RUNWAY SYS**

[Option + AIMS v14 and later]

Condition: RAAS is inoperative.

**Note:** RAAS voice annunciations and alerts are not available. Ground proximity alerts that occur are valid.



**[ ] TAIL STRIKE**

Condition: The tail hits the runway.

**Caution! Do not pressurize the airplane.  
Pressurizing the airplane may cause  
further structural damage.**

- 1 OUTFLOW VALVE switches (both) . . . . . MAN
- 2 OUTFLOW VALVE MANUAL  
switches (both) . . . . . Push to OPEN and  
hold until the outflow  
valve displays 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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**DO NOT USE FOR FLIGHT**

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**Operational Information**  
**Ops Info**

**Chapter OI**  
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## **Introduction**

**This Section Reserved For Operator-Developed Information**

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**Performance Inflight - QRH**

**Chapter PI-QRH**

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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 KG)			
		160	200	240	280
40000 (.82M)	<b>PITCH ATT</b>	<b>3.5</b>	<b>3.5</b>		
	V/S (FT/MIN)	1300	600		
30000 (280 KIAS)	<b>PITCH ATT</b>	<b>4.5</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>
	V/S (FT/MIN)	2100	1500	1000	600
20000 (270 KIAS)	<b>PITCH ATT</b>	<b>6.5</b>	<b>6.0</b>	<b>6.0</b>	<b>6.0</b>
	V/S (FT/MIN)	3100	2300	1700	1200
10000 (270 KIAS)	<b>PITCH ATT</b>	<b>9.5</b>	<b>8.5</b>	<b>8.0</b>	<b>7.5</b>
	V/S (FT/MIN)	4200	3200	2500	2000
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b>	<b>11.5</b>	<b>10.0</b>	<b>9.0</b>	<b>9.0</b>
	V/S (FT/MIN)	4700	3700	2900	2300

**Cruise****Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	<b>PITCH ATT</b>	<b>1.7</b>	<b>2.3</b>		
	%N1	87.5	91.4		
35000 (280 KIAS)	<b>PITCH ATT</b>	<b>1.4</b>	<b>1.9</b>	<b>2.4</b>	
	%N1	84.1	86.7	89.8	
30000 (280 KIAS)	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.1</b>	<b>2.7</b>	<b>3.4</b>
	%N1	79.4	82.2	85.5	89.4
25000 (280 KIAS)	<b>PITCH ATT</b>	<b>1.6</b>	<b>2.2</b>	<b>2.9</b>	<b>3.5</b>
	%N1	75.3	77.8	80.7	84.4
20000 (270 KIAS)	<b>PITCH ATT</b>	<b>1.8</b>	<b>2.5</b>	<b>3.2</b>	<b>4.0</b>
	%N1	70.2	72.9	75.9	79.3
15000 (270 KIAS)	<b>PITCH ATT</b>	<b>1.7</b>	<b>2.5</b>	<b>3.2</b>	<b>4.0</b>
	%N1	65.9	68.4	71.3	74.6

**Descent****Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	<b>PITCH ATT</b>	<b>-1.7</b>	<b>-0.9</b>		
	V/S (FT/MIN)	-2900	-2700		
30000 (280 KIAS)	<b>PITCH ATT</b>	<b>-1.3</b>	<b>-0.4</b>	<b>0.4</b>	<b>1.0</b>
	V/S (FT/MIN)	-2200	-2000	-1900	-1900
20000 (270 KIAS)	<b>PITCH ATT</b>	<b>-1.1</b>	<b>-0.1</b>	<b>0.8</b>	<b>1.6</b>
	V/S (FT/MIN)	-1800	-1600	-1600	-1600
10000 (270 KIAS)	<b>PITCH ATT</b>	<b>-1.4</b>	<b>-0.3</b>	<b>0.7</b>	<b>1.5</b>
	V/S (FT/MIN)	-1700	-1500	-1400	-1400
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b>	<b>-1.4</b>	<b>-0.3</b>	<b>0.7</b>	<b>1.5</b>
	V/S (FT/MIN)	-1400	-1200	-1200	-1200

## Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

### Holding

### Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		160	200	240	280
10000	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	%N1	55.1	60.4	65.1	69.6
	KIAS	202	216	230	247
5000	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	%N1	52.0	57.0	61.5	65.8
	KIAS	202	216	230	246

### Terminal Area (5000 FT)

### %N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS UP GEAR UP (VREF 30 + 80)	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>
	%N1	52.7	58.3	63.1	67.5
	KIAS	201	216	229	241
FLAPS 1 GEAR UP (VREF 30 + 60)	<b>PITCH ATT</b>	<b>6.0</b>	<b>6.5</b>	<b>7.0</b>	<b>7.5</b>
	%N1	53.1	58.7	64.1	68.6
	KIAS	181	196	209	221
FLAPS 5 GEAR UP (VREF 30 + 40)	<b>PITCH ATT</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>	<b>6.0</b>
	%N1	54.3	60.2	65.4	70.0
	KIAS	161	176	189	201
FLAPS 15 GEAR UP (VREF 30 + 20)	<b>PITCH ATT</b>	<b>6.0</b>	<b>6.0</b>	<b>6.5</b>	<b>6.5</b>
	%N1	55.1	61.6	67.1	72.0
	KIAS	141	156	169	181
FLAPS 20 GEAR DOWN (VREF 30 + 20)	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	%N1	61.6	68.3	73.9	78.9
	KIAS	141	156	169	181

### Final Approach (1500 FT)

### Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 20 (VREF 20 + 10)	<b>PITCH ATT</b>	<b>1.0</b>	<b>1.5</b>	<b>1.5</b>	<b>1.5</b>
	%N1	41.0	45.8	49.8	53.4
	KIAS	142	157	172	185
FLAPS 25 (VREF 25 + 10)	<b>PITCH ATT</b>	<b>0.0</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
	%N1	49.9	55.0	59.6	63.9
	KIAS	138	153	166	179
FLAPS 30 (VREF 30 + 10)	<b>PITCH ATT</b>	<b>-0.5</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
	%N1	55.1	60.7	65.8	70.3
	KIAS	131	146	159	171



**Max Climb %N1****Based on engine bleed for packs on or off and anti-ice off**

TAT		PRESSURE ALTITUDE (FT)/ SPEED (IAS/MACH)									
		0	5000	10000	15000	20000	25000	30000	35000	40000	43000
°C	°F	310(0.47)	310(0.51)	310(0.56)	310(0.61)	310(0.67)	310(0.74)	310(0.81)	(0.84)	(0.84)	(0.84)
60	140	86.5	87.9	89.4	91.3	93.9	96.3	99.7	103.2	103.1	102.5
50	122	88.7	88.8	89.2	89.9	92.5	94.8	98.2	101.6	101.5	100.9
40	104	90.0	90.5	90.7	90.8	91.3	93.3	96.7	100.1	99.9	99.3
30	86	89.1	93.2	92.9	92.8	93.1	93.6	95.2	98.4	98.3	97.7
20	68	87.6	91.6	93.9	94.6	94.8	95.2	96.5	97.2	96.7	96.1
15	59	86.9	90.8	93.1	95.3	95.5	95.9	97.0	97.8	97.0	96.4
10	50	86.1	90.0	92.3	94.5	96.2	96.5	97.6	98.4	97.6	97.1
5	41	85.4	89.2	91.5	93.7	95.8	97.2	98.2	99.0	98.2	97.7
0	32	84.6	88.4	90.7	92.8	94.9	97.0	98.9	99.6	98.9	98.4
-5	23	83.8	87.6	89.8	92.0	94.1	96.1	98.9	100.4	99.6	99.0
-10	14	83.0	86.8	89.0	91.1	93.2	95.2	98.0	101.6	100.5	99.9
-15	5	82.2	86.0	88.1	90.2	92.3	94.3	97.1	101.5	101.4	100.8
-20	-4	81.4	85.1	87.3	89.4	91.4	93.3	96.1	100.5	100.4	99.9
-25	-13	80.6	84.3	86.4	88.5	90.5	92.4	95.2	99.5	99.4	98.9
-30	-22	79.8	83.4	85.5	87.6	89.6	91.5	94.2	98.5	98.4	97.9
-35	-31	79.0	82.6	84.6	86.7	88.6	90.5	93.2	97.5	97.4	96.9
-40	-40	78.2	81.7	83.8	85.8	87.7	89.6	92.3	96.5	96.4	95.8

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.5	-0.6	-0.8	-0.8	-1.2	-1.4
1 PACK ON - 1 BLEED SOURCE	-0.5	-0.6	-0.8	-0.8	-1.2	-1.4
1 PACK ON - 2 BLEED SOURCES	-0.5	-0.6	-0.8	-0.8	-1.2	-1.4
ENGINE ANTI-ICE ON	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON*	-0.5	-0.5	-0.5	-0.9	-1.1	-1.4
ENGINE AND WING ANTI-ICE ON**	-0.6	-0.7	-0.7	-1.4	-1.9	-2.3

\*Wing anti-ice on, packs on, or packs off with 2 bleed sources.

\*\*Wing anti-ice on, packs off, 1 bleed source.

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
250	151	159	164
240	148	156	161
230	145	152	158
220	142	149	154
210	139	145	150
200	135	142	147
190	132	138	143
180	128	134	139
170	124	131	135
160	121	127	131
150	117	123	127
140	113	118	123

# Performance Inflight - QRH

## Advisory Information

# Chapter PI-QRH

## Section 11

### ADVISORY INFORMATION

#### Normal Configuration Landing Distance

##### Flaps 30

	LANDING DISTANCE AND ADJUSTMENT (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	880	+25/-5	20	-35/+125	+10/-10	+20/-20	35	15	40
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1455	+25/-10	40	-70/+245	0/-5	+40/-40	80	0	0
AUTOBRAKE 3	1740	+30/-10	45	-90/+305	+10/-10	+50/-50	95	0	0
AUTOBRAKE 2	1935	+40/-20	55	-100/+350	+20/-35	+55/-55	85	20	20
AUTOBRAKE 1	2060	+45/-25	65	-115/+395	+45/-50	+60/-60	90	120	120

#### Good Reported Braking Action

MAX MANUAL	1390	+25/-10	35	-70/+245	+35/-30	+35/-35	60	80	195
AUTOBRAKE MAX	1485	+30/-10	40	-70/+255	+30/-25	+35/-35	70	85	200
AUTOBRAKE 4	1680	+30/-5	45	-80/+290	+5/-5	+45/-45	90	10	50
AUTOBRAKE 3	2000	+35/-10	50	-105/+350	+10/-10	+60/-60	110	0	0
AUTOBRAKE 2	2225	+45/-25	65	-115/+400	+25/-40	+65/-65	100	25	25
AUTOBRAKE 1	2370	+50/-30	75	-130/+455	+50/-60	+70/-70	105	140	140

#### Medium Reported Braking Action

MAX MANUAL	1865	+40/-25	60	-110/+395	+80/-70	+45/-45	70	235	610
AUTOBRAKE MAX	1880	+40/-15	60	-110/+400	+80/-65	+45/-50	80	230	605
AUTOBRAKE 4	1910	+40/-15	60	-110/+400	+80/-60	+50/-50	85	235	620
AUTOBRAKE 3	2100	+40/-15	60	-115/+430	+60/-40	+60/-60	110	125	465
AUTOBRAKE 2	2275	+45/-25	65	-125/+455	+60/-60	+65/-65	100	100	345
AUTOBRAKE 1	2400	+50/-30	75	-130/+485	+75/-70	+70/-70	105	185	345

#### Poor Reported Braking Action

MAX MANUAL	2380	+50/-35	80	-155/+615	+190/-125	+65/-65	80	530	1620
AUTOBRAKE MAX	2385	+60/-35	80	-155/+620	+195/-130	+65/-65	80	535	1625
AUTOBRAKE 4	2405	+60/-35	80	-160/+620	+190/-130	+65/-70	80	535	1640
AUTOBRAKE 3	2440	+50/-30	80	-160/+625	+185/-110	+65/-70	105	510	1620
AUTOBRAKE 2	2535	+60/-35	80	-165/+640	+175/-120	+70/-70	100	430	1520
AUTOBRAKE 1	2600	+60/-35	85	-165/+650	+180/-120	+70/-75	100	465	1455

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.

For autobrake and manual speedbrakes, increase reference landing distance by 60 m.

Distances for GOOD, MEDIUM, AND POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

## ADVISORY INFORMATION

### Normal Configuration Landing Distance

#### Flaps 25

	LANDING DISTANCE AND ADJUSTMENT (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	925	+25/-10	20	-35/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1260	+20/-15	30	-55/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1570	+30/-20	40	-75/+255	0/-5	+40/-40	85	0	0
AUTOBRAKE 3	1880	+35/-25	50	-95/+320	+10/-15	+55/-55	95	0	0
AUTOBRAKE 2	2070	+45/-35	60	-105/+365	+30/-45	+60/-60	85	50	50
AUTOBRAKE 1	2190	+50/-40	70	-115/+405	+50/-55	+60/-60	90	170	180

#### Good Reported Braking Action

MAX MANUAL	1960	+40/-35	60	-110/+410	+85/-70	+50/-50	70	265	695
AUTOBRAKE MAX	1980	+40/-30	60	-110/+410	+85/-65	+50/-50	80	260	685
AUTOBRAKE 4	2025	+40/-30	60	-115/+415	+75/-50	+50/-60	90	245	690
AUTOBRAKE 3	2260	+45/-35	65	-120/+445	+50/-45	+65/-65	110	125	495
AUTOBRAKE 2	2430	+50/-40	75	-130/+470	+65/-70	+70/-70	100	130	395
AUTOBRAKE 1	2545	+60/-45	80	-140/+495	+85/-80	+70/-75	105	240	425

#### Medium Reported Braking Action

MAX MANUAL	1465	+30/-15	40	-70/+255	+35/-30	+35/-35	60	90	225
AUTOBRAKE MAX	1565	+30/-15	40	-75/+260	+30/-25	+35/-40	70	100	235
AUTOBRAKE 4	1805	+35/-25	45	-85/+300	+5/-5	+45/-45	100	10	50
AUTOBRAKE 3	2160	+40/-30	60	-110/+370	+10/-15	+65/-65	110	0	0
AUTOBRAKE 2	2380	+50/-40	70	-120/+420	+35/-50	+70/-70	100	60	60
AUTOBRAKE 1	2520	+60/-45	80	-130/+465	+60/-65	+70/-70	105	195	205

#### Poor Reported Braking Action

MAX MANUAL	2495	+60/-45	85	-160/+625	+190/-130	+65/-70	80	585	1835
AUTOBRAKE MAX	2505	+60/-45	85	-160/+625	+195/-130	+65/-70	85	585	1840
AUTOBRAKE 4	2525	+60/-45	85	-160/+635	+190/-130	+65/-70	80	590	1850
AUTOBRAKE 3	2595	+60/-45	85	-165/+640	+180/-115	+70/-75	105	535	1800
AUTOBRAKE 2	2685	+65/-45	85	-165/+650	+180/-125	+70/-75	90	475	1700
AUTOBRAKE 1	2750	+65/-50	90	-175/+660	+185/-125	+75/-80	100	535	1645

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.

For autobrake and manual speedbrakes, increase reference landing distance by 65 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 20**

	LANDING DISTANCE AND ADJUSTMENT (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	960	+30/-15	20	-40/+130	+10/-10	+20/-20	35	25	50
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1655	+30/-30	45	-75/+260	0/0	+45/-45	90	0	0
AUTOBRAKE 3	2000	+40/-35	55	-95/+330	+5/-15	+55/-55	100	0	0
AUTOBRAKE 2	2200	+45/-45	65	-110/+380	+25/-45	+60/-60	95	50	50
AUTOBRAKE 1	2335	+55/-50	75	-120/+420	+50/-60	+65/-65	95	180	180

**Good Reported Braking Action**

MAX MANUAL	1540	+30/-25	40	-75/+260	+40/-35	+35/-40	60	110	255
AUTOBRAKE MAX	1635	+30/-30	45	-75/+265	+35/-25	+40/-40	75	110	265
AUTOBRAKE 4	1905	+35/-35	50	-90/+305	+5/-5	+50/-50	105	10	60
AUTOBRAKE 3	2300	+45/-40	65	-110/+380	+5/-15	+65/-65	115	0	0
AUTOBRAKE 2	2530	+50/-50	75	-125/+435	+30/-50	+70/-70	110	60	60
AUTOBRAKE 1	2685	+65/-60	85	-140/+485	+60/-70	+75/-75	110	205	205

**Medium Reported Braking Action**

MAX MANUAL	2075	+45/-40	65	-115/+420	+90/-75	+50/-60	75	300	805
AUTOBRAKE MAX	2085	+45/-40	65	-115/+420	+90/-70	+50/-60	80	295	795
AUTOBRAKE 4	2135	+45/-40	65	-115/+425	+80/-50	+60/-60	100	280	800
AUTOBRAKE 3	2390	+45/-45	70	-125/+455	+50/-45	+65/-70	115	145	585
AUTOBRAKE 2	2590	+50/-50	80	-140/+490	+65/-70	+75/-75	110	130	455
AUTOBRAKE 1	2710	+65/-60	85	-145/+510	+85/-80	+75/-80	110	255	460

**Poor Reported Braking Action**

MAX MANUAL	2650	+65/-60	90	-165/+645	+205/-140	+70/-75	85	665	2140
AUTOBRAKE MAX	2655	+65/-60	90	-165/+645	+205/-145	+70/-75	85	665	2145
AUTOBRAKE 4	2675	+65/-60	90	-165/+650	+200/-140	+70/-75	90	675	2150
AUTOBRAKE 3	2750	+65/-60	90	-175/+655	+185/-120	+75/-80	110	615	2110
AUTOBRAKE 2	2860	+65/-60	90	-175/+665	+185/-130	+75/-80	105	530	1990
AUTOBRAKE 1	2920	+70/-65	100	-180/+685	+195/-130	+80/-80	105	580	1910

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 75 m.

For autobrake and manual speedbrakes, increase reference landing distance by 65 m.

Distances for GOOD, MEDIUM, AND POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### ANTISKID - Flaps 25

#### VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1705	+40/-30	50	-95/+355	+75/-60	+45/-45	60	230	605
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

#### Good Reported Braking Action

MAX MANUAL	1705	+40/-30	50	-95/+355	+75/-60	+45/-45	60	230	605
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

#### Medium Reported Braking Action

MAX MANUAL	2170	+55/-45	75	-140/+545	+165/-115	+55/-60	70	510	1595
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

#### Poor Reported Braking Action

MAX MANUAL	2930	+85/-70	110	-235/+1045	+1350/-260	+75/-85	80	1790	5000
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****ANTISKID - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1620	+35/-20	50	-95/+345	+70/-60	+40/-40	60	205	530
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Good Reported Braking Action**

MAX MANUAL	1620	+35/-20	50	-95/+345	+70/-60	+40/-40	60	205	530
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Medium Reported Braking Action**

MAX MANUAL	2070	+50/-30	70	-135/+535	+165/-110	+55/-55	70	460	1410
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

**Poor Reported Braking Action**

MAX MANUAL	2805	+80/-55	100	-230/+1035	+1310/-255	+70/-85	80	1675	5000
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

ENG SHUTDOWN L, R - Flaps 20

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	970	+35/-15	20	-40/+135	+15/-10	+20/-20	35	0	25
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2240	+50/-45	65	-110/+385	+10/-10	+65/-65	125	0	0

### Good Reported Braking Action

MAX MANUAL	1400	+30/-25	35	-65/+235	+40/-35	+35/-35	55	0	120
AUTOBRAKE MAX	1490	+30/-30	40	-70/+245	+35/-30	+35/-40	65	0	125
AUTOBRAKE 2	2240	+50/-45	65	-110/+385	+10/-10	+65/-65	125	0	0

### Medium Reported Braking Action

MAX MANUAL	1980	+45/-40	60	-110/+400	+105/-80	+55/-55	75	0	385
AUTOBRAKE MAX	1985	+45/-45	60	-110/+400	+105/-75	+55/-55	85	0	380
AUTOBRAKE 3	2135	+50/-45	65	-115/+415	+80/-50	+60/-60	105	0	310

### Poor Reported Braking Action

MAX MANUAL	2665	+70/-65	90	-170/+645	+265/-170	+75/-75	90	0	990
AUTOBRAKE MAX	2675	+70/-65	90	-170/+645	+270/-175	+75/-80	90	0	995
AUTOBRAKE 3	2705	+70/-65	90	-170/+645	+270/-170	+75/-80	95	0	1005

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV      NO REV

**Dry Runway**

MAX MANUAL	890	+25/-5	20	-35/+125	+10/-10	+20/-20	35	0	20
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 2	1945	+40/-15	55	-105/+355	+10/-10	+55/-55	115	0	0

**Good Reported Braking Action**

MAX MANUAL	1250	+25/-10	30	-65/+220	+35/-30	+30/-30	55	0	85
AUTOBRAKE MAX	1340	+25/-10	35	-65/+230	+30/-25	+35/-35	65	0	90
AUTOBRAKE 2	1945	+40/-15	55	-105/+355	+10/-10	+55/-55	115	0	0

**Medium Reported Braking Action**

MAX MANUAL	1750	+40/-20	50	-100/+375	+95/-70	+45/-45	70	0	280
AUTOBRAKE MAX	1755	+40/-20	50	-105/+375	+90/-65	+50/-50	80	0	280
AUTOBRAKE 3	1875	+40/-15	55	-105/+390	+75/-45	+50/-50	95	0	235

**Poor Reported Braking Action**

MAX MANUAL	2335	+60/-35	75	-160/+605	+235/-150	+65/-65	85	0	725
AUTOBRAKE MAX	2340	+60/-35	75	-160/+605	+235/-150	+65/-70	85	0	725
AUTOBRAKE 3	2370	+60/-35	75	-160/+610	+240/-150	+65/-70	85	0	735

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### FLAP / SLAT CONTROL - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	955	+30/-15	20	-40/+130	+10/-10	+20/-20	35	20	50
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2180	+50/-50	65	-110/+375	+30/-45	+60/-60	90	60	60

#### Good Reported Braking Action

MAX MANUAL	1325	+25/-25	35	-65/+220	+30/-30	+30/-30	50	90	215
AUTOBRAKE MAX	1415	+30/-25	35	-65/+230	+25/-20	+35/-35	65	95	220
AUTOBRAKE 2	2180	+50/-50	65	-110/+375	+30/-45	+60/-60	90	60	60

#### Medium Reported Braking Action

MAX MANUAL	1780	+40/-40	55	-100/+360	+75/-60	+45/-45	65	250	670
AUTOBRAKE MAX	1795	+40/-40	55	-100/+360	+75/-55	+45/-50	70	245	660
AUTOBRAKE 3	2070	+45/-40	60	-110/+395	+45/-40	+55/-60	95	115	470

#### Poor Reported Braking Action

MAX MANUAL	2270	+60/-55	75	-145/+555	+175/-115	+60/-65	75	555	1765
AUTOBRAKE MAX	2275	+60/-55	80	-145/+555	+175/-120	+60/-65	75	555	1770
AUTOBRAKE 3	2365	+60/-55	75	-145/+565	+155/-105	+65/-65	95	500	1725

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≤ 5)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	1170	+45/-15	30	-45/+150	+15/-15	+25/-25	40	40	95
AUTOBRAKE MAX	1710	+30/-5	45	-65/+215	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2845	+65/-45	95	-130/+430	+50/-70	+85/-85	95	220	220

**Good Reported Braking Action**

MAX MANUAL	1585	+30/-15	45	-70/+240	+35/-30	+40/-40	50	135	325
AUTOBRAKE MAX	1780	+30/-10	50	-75/+260	+15/-10	+45/-45	75	85	285
AUTOBRAKE 2	2845	+65/-45	95	-130/+430	+50/-70	+85/-85	95	220	220

**Medium Reported Braking Action**

MAX MANUAL	2170	+50/-30	70	-110/+390	+85/-70	+60/-60	65	375	1055
AUTOBRAKE MAX	2200	+50/-25	70	-110/+390	+80/-65	+60/-60	75	370	1040
AUTOBRAKE 3	2725	+55/-35	85	-130/+450	+50/-60	+75/-80	105	175	675

**Poor Reported Braking Action**

MAX MANUAL	2785	+70/-45	100	-155/+600	+195/-135	+75/-80	80	815	2845
AUTOBRAKE MAX	2795	+70/-45	100	-160/+600	+195/-135	+75/-80	80	815	2855
AUTOBRAKE 3	3005	+70/-45	105	-165/+620	+170/-120	+85/-85	100	665	2720

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### FLAPS DRIVE - (5 < Flaps < 20)

#### VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1020	+35/-5	25	-40/+135	+15/-10	+20/-20	35	25	60
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2425	+55/-30	75	-115/+400	+25/-50	+70/-70	100	60	60

#### Good Reported Braking Action

MAX MANUAL	1430	+30/-15	40	-65/+230	+35/-30	+35/-35	55	110	260
AUTOBRAKE MAX	1525	+30/-10	40	-70/+240	+30/-20	+40/-40	65	110	270
AUTOBRAKE 2	2425	+55/-30	75	-115/+400	+25/-50	+70/-70	100	60	60

#### Medium Reported Braking Action

MAX MANUAL	1945	+45/-25	60	-105/+375	+85/-70	+50/-50	70	305	840
AUTOBRAKE MAX	1965	+45/-25	60	-105/+380	+85/-65	+50/-55	70	300	835
AUTOBRAKE 3	2280	+45/-20	65	-115/+415	+40/-40	+65/-65	105	135	610

#### Poor Reported Braking Action

MAX MANUAL	2495	+65/-40	90	-150/+580	+190/-130	+65/-70	80	675	2250
AUTOBRAKE MAX	2515	+65/-40	90	-150/+585	+195/-135	+65/-70	80	680	2265
AUTOBRAKE 3	2610	+65/-35	90	-155/+590	+170/-110	+70/-75	100	625	2220

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≥ 20)****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BWV 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	960	+30/-15	20	-40/+130	+10/-10	+20/-20	35	25	50
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2200	+50/-50	65	-110/+380	+25/-45	+60/-60	95	50	50

**Good Reported Braking Action**

MAX MANUAL	1340	+25/-25	35	-65/+225	+35/-30	+30/-35	50	95	220
AUTOBRAKE MAX	1420	+30/-25	40	-65/+230	+30/-20	+35/-35	65	95	230
AUTOBRAKE 2	2200	+50/-50	65	-110/+380	+25/-45	+60/-60	95	50	50

**Medium Reported Braking Action**

MAX MANUAL	1805	+40/-40	55	-100/+365	+80/-65	+45/-50	65	260	700
AUTOBRAKE MAX	1815	+45/-40	55	-100/+365	+80/-60	+45/-50	70	255	690
AUTOBRAKE 3	2080	+45/-40	60	-110/+395	+45/-40	+55/-60	100	125	510

**Poor Reported Braking Action**

MAX MANUAL	2305	+60/-55	80	-145/+560	+180/-120	+60/-65	75	580	1860
AUTOBRAKE MAX	2310	+60/-55	80	-145/+560	+180/-125	+60/-65	75	580	1865
AUTOBRAKE 3	2390	+60/-55	80	-150/+570	+160/-105	+65/-70	95	535	1835

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### FLAPS PRIMARY FAIL - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1080	+30/-15	25	-40/+145	+15/-15	+25/-25	45	30	60
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

#### Good Reported Braking Action

MAX MANUAL	1475	+30/-25	40	-70/+240	+35/-35	+35/-35	60	110	265
AUTOBRAKE MAX	1485	+30/-30	40	-70/+240	+35/-30	+35/-35	70	110	265
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

#### Medium Reported Braking Action

MAX MANUAL	1965	+45/-40	60	-105/+385	+90/-70	+50/-50	75	305	835
AUTOBRAKE MAX	1955	+45/-40	60	-105/+380	+95/-75	+50/-50	80	305	830
AUTOBRAKE 3	2120	+45/-40	60	-110/+405	+55/-35	+60/-60	110	175	710

#### Poor Reported Braking Action

MAX MANUAL	2480	+65/-60	85	-155/+585	+195/-130	+65/-70	85	660	2200
AUTOBRAKE MAX	2490	+65/-60	85	-155/+585	+200/-140	+65/-70	85	660	2205
AUTOBRAKE 3	2515	+65/-55	85	-155/+590	+190/-120	+65/-70	100	645	2195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****FLIGHT CONTROL MODE - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1105	+30/-15	25	-45/+145	+15/-15	+25/-25	50	30	70
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

**Good Reported Braking Action**

MAX MANUAL	1520	+30/-30	40	-70/+245	+40/-35	+35/-35	65	125	300
AUTOBRAKE MAX	1510	+30/-30	40	-70/+245	+35/-30	+40/-40	70	120	290
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

**Medium Reported Braking Action**

MAX MANUAL	2030	+50/-45	65	-110/+390	+95/-75	+50/-55	80	340	945
AUTOBRAKE MAX	2020	+50/-45	65	-110/+390	+100/-80	+55/-55	85	335	940
AUTOBRAKE 3	2140	+50/-40	65	-115/+405	+70/-35	+60/-60	110	245	855

**Poor Reported Braking Action**

MAX MANUAL	2570	+70/-60	90	-155/+600	+210/-140	+65/-70	95	725	2515
AUTOBRAKE MAX	2580	+70/-60	90	-155/+600	+215/-145	+70/-70	95	730	2525
AUTOBRAKE 3	2585	+70/-60	90	-160/+600	+215/-130	+70/-75	105	725	2520

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### HYD PRESS SYS C - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1080	+30/-15	25	-40/+145	+15/-15	+25/-25	45	30	60
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

#### Good Reported Braking Action

MAX MANUAL	1475	+30/-25	40	-70/+240	+35/-35	+35/-35	60	110	265
AUTOBRAKE MAX	1485	+30/-30	40	-70/+240	+35/-30	+35/-35	70	110	265
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

#### Medium Reported Braking Action

MAX MANUAL	1965	+45/-40	60	-105/+385	+90/-70	+50/-50	75	305	835
AUTOBRAKE MAX	1955	+45/-40	60	-105/+380	+95/-75	+50/-50	80	305	830
AUTOBRAKE 3	2120	+45/-40	60	-110/+405	+55/-35	+60/-60	110	175	710

#### Poor Reported Braking Action

MAX MANUAL	2480	+65/-60	85	-155/+585	+195/-130	+65/-70	85	660	2200
AUTOBRAKE MAX	2490	+65/-60	85	-155/+585	+200/-140	+65/-70	85	660	2205
AUTOBRAKE 3	2515	+65/-55	85	-155/+590	+190/-120	+65/-70	100	645	2195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 25****VREF25**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	990	+30/-10	20	-40/+140	+15/-15	+20/-20	40	0	30
AUTOBRAKE MAX	1260	+25/-15	30	-55/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2135	+45/-30	60	-110/+375	0/-10	+60/-60	125	0	0

**Good Reported Braking Action**

MAX MANUAL	1435	+30/-20	40	-70/+250	+45/-40	+35/-35	65	0	135
AUTOBRAKE MAX	1495	+30/-20	40	-75/+255	+40/-30	+40/-40	70	0	135
AUTOBRAKE 2	2135	+45/-30	60	-110/+375	0/-10	+60/-60	125	0	0

**Medium Reported Braking Action**

MAX MANUAL	2065	+45/-35	65	-120/+435	+125/-95	+55/-60	85	0	455
AUTOBRAKE MAX	2070	+45/-35	65	-120/+435	+130/-100	+55/-60	85	0	455
AUTOBRAKE 3	2145	+45/-35	65	-120/+445	+115/-75	+60/-60	105	0	455

**Poor Reported Braking Action**

MAX MANUAL	2875	+70/-55	100	-195/+765	+380/-215	+80/-85	100	0	1310
AUTOBRAKE MAX	2885	+70/-55	100	-195/+765	+385/-220	+80/-85	100	0	1315
AUTOBRAKE 3	2910	+70/-55	100	-195/+765	+375/-220	+85/-85	100	0	1325

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

HYD PRESS SYS L - Flaps 30

VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	945	+25/-5	20	-40/+135	+15/-15	+20/-20	40	0	25
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 2	1970	+40/-10	55	-105/+355	0/-5	+55/-55	120	0	0

### Good Reported Braking Action

MAX MANUAL	1365	+25/-10	35	-70/+245	+45/-35	+35/-35	65	0	120
AUTOBRAKE MAX	1410	+25/-10	35	-70/+250	+35/-30	+35/-35	70	0	115
AUTOBRAKE 2	1970	+40/-10	55	-105/+355	0/-5	+55/-55	120	0	0

### Medium Reported Braking Action

MAX MANUAL	1965	+45/-20	60	-115/+430	+125/-95	+55/-55	85	0	400
AUTOBRAKE MAX	1965	+45/-20	60	-115/+430	+130/-95	+55/-55	85	0	405
AUTOBRAKE 3	2020	+45/-20	60	-120/+435	+120/-75	+55/-55	95	0	415

### Poor Reported Braking Action

MAX MANUAL	2745	+65/-35	95	-190/+750	+375/-210	+75/-80	100	0	1180
AUTOBRAKE MAX	2755	+65/-35	95	-190/+750	+380/-215	+80/-80	100	0	1185
AUTOBRAKE 3	2775	+65/-35	95	-195/+755	+370/-210	+80/-80	105	0	1190

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS L+C - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1245	+30/-5	30	-50/+165	+20/-20	+30/-30	55	0	50
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2485	+50/-10	70	-120/+405	0/0	+75/-75	140	0	0

**Good Reported Braking Action**

MAX MANUAL	1810	+35/-10	50	-85/+285	+60/-50	+45/-50	80	0	215
AUTOBRAKE MAX	1790	+35/-10	50	-85/+285	+60/-45	+50/-50	90	0	205
AUTOBRAKE 2	2485	+50/-10	70	-120/+405	0/0	+75/-75	140	0	0

**Medium Reported Braking Action**

MAX MANUAL	2595	+55/-25	85	-140/+495	+170/-125	+75/-75	105	0	710
AUTOBRAKE MAX	2585	+55/-25	85	-140/+495	+175/-135	+75/-75	110	0	705
AUTOBRAKE 3	2610	+55/-25	85	-140/+495	+170/-115	+75/-75	115	0	715

**Poor Reported Braking Action**

MAX MANUAL	3580	+85/-50	130	-225/+845	+480/-275	+105/-105	125	0	2015
AUTOBRAKE MAX	3590	+85/-50	135	-225/+850	+490/-285	+105/-110	125	0	2020
AUTOBRAKE 3	3595	+85/-50	135	-225/+850	+490/-275	+105/-110	130	0	2020

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

HYD PRESS SYS L+R - Flaps 20

VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1360	+25/-5	35	-60/+195	+35/-30	+35/-35	65	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

#### Good Reported Braking Action

MAX MANUAL	1925	+35/-10	55	-95/+320	+85/-70	+55/-55	90	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

#### Medium Reported Braking Action

MAX MANUAL	3140	+55/-15	95	-175/+620	+315/-210	+95/-95	130	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

#### Poor Reported Braking Action

MAX MANUAL	5265	+80/-15	180	-355/+1355	+1855/-640	+170/-170	170	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 25****VREF25**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1090	+20/-15	25	-45/+165	+20/-20	+25/-25	50	0	45
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Good Reported Braking Action**

MAX MANUAL	1435	+30/-20	40	-70/+250	+45/-40	+35/-35	65	0	135
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Medium Reported Braking Action**

MAX MANUAL	2055	+45/-35	65	-120/+435	+125/-95	+55/-55	80	0	445
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

**Poor Reported Braking Action**

MAX MANUAL	2835	+65/-50	100	-195/+755	+370/-210	+80/-85	95	0	1265
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

HYD PRESS SYS R - Flaps 30

VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	1035	+20/-5	25	-45/+160	+20/-15	+25/-25	45	0	40
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

### Good Reported Braking Action

MAX MANUAL	1350	+25/-10	35	-70/+240	+40/-35	+35/-35	60	0	115
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

### Medium Reported Braking Action

MAX MANUAL	1915	+40/-20	60	-115/+420	+120/-90	+50/-55	80	0	375
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

### Poor Reported Braking Action

MAX MANUAL	2640	+60/-35	90	-185/+735	+350/-195	+75/-75	95	0	1065
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS R+C - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1550	+25/-5	40	-65/+225	+40/-35	+40/-40	75	0	120
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Good Reported Braking Action**

MAX MANUAL	1855	+35/-10	55	-85/+295	+65/-55	+50/-50	90	0	235
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Medium Reported Braking Action**

MAX MANUAL	2645	+55/-25	85	-140/+500	+175/-130	+75/-75	110	0	755
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

**Poor Reported Braking Action**

MAX MANUAL	3630	+85/-50	135	-225/+855	+490/-280	+105/-110	130	0	2100
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### PITCH UP AUTHORITY - (Flaps ≤ 15)

#### VREF30+40

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1150	+40/-10	25	-45/+150	+15/-15	+25/-25	40	35	75
AUTOBRAKE MAX	1710	+30/-5	45	-65/+215	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2750	+60/-40	90	-125/+420	+60/-65	+80/-80	90	245	265

#### Good Reported Braking Action

MAX MANUAL	1575	+30/-15	45	-70/+240	+35/-30	+40/-40	50	120	285
AUTOBRAKE MAX	1795	+30/-10	50	-75/+260	+20/-15	+45/-50	75	80	245
AUTOBRAKE 2	2750	+60/-40	90	-125/+420	+60/-65	+80/-80	90	245	265

#### Medium Reported Braking Action

MAX MANUAL	2135	+45/-30	70	-105/+390	+85/-70	+55/-60	60	325	865
AUTOBRAKE MAX	2210	+50/-30	70	-110/+395	+80/-65	+60/-60	75	325	870
AUTOBRAKE 3	2655	+55/-35	85	-125/+445	+70/-65	+75/-75	85	190	565

#### Poor Reported Braking Action

MAX MANUAL	2720	+65/-45	95	-155/+595	+190/-130	+75/-75	75	690	2225
AUTOBRAKE MAX	2750	+65/-45	100	-155/+595	+190/-130	+75/-80	80	685	2225
AUTOBRAKE 3	2940	+70/-50	100	-165/+615	+180/-130	+80/-85	85	585	2090

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≥ 20)****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	990	+35/-5	20	-40/+130	+10/-10	+20/-20	35	25	50
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2320	+55/-35	75	-115/+385	+45/-50	+65/-65	85	130	130

**Good Reported Braking Action**

MAX MANUAL	1380	+25/-15	35	-65/+225	+30/-30	+35/-35	45	95	220
AUTOBRAKE MAX	1520	+30/-10	40	-70/+240	+20/-15	+40/-40	70	80	215
AUTOBRAKE 2	2320	+55/-35	75	-115/+385	+45/-50	+65/-65	85	130	130

**Medium Reported Braking Action**

MAX MANUAL	1855	+40/-25	55	-100/+365	+75/-60	+50/-50	60	260	680
AUTOBRAKE MAX	1895	+45/-20	60	-100/+370	+70/-55	+50/-50	70	255	670
AUTOBRAKE 3	2225	+45/-25	65	-115/+410	+55/-50	+60/-65	90	125	440

**Poor Reported Braking Action**

MAX MANUAL	2365	+60/-40	80	-145/+560	+175/-120	+65/-65	70	565	1775
AUTOBRAKE MAX	2375	+60/-40	80	-145/+565	+175/-120	+65/-65	75	565	1775
AUTOBRAKE 3	2505	+60/-40	85	-150/+575	+160/-110	+70/-70	85	470	1690

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### PRIMARY FLIGHT COMPUTERS - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1105	+30/-15	25	-45/+145	+15/-15	+25/-25	50	30	70
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

#### Good Reported Braking Action

MAX MANUAL	1520	+30/-30	40	-70/+245	+40/-35	+35/-35	65	125	300
AUTOBRAKE MAX	1510	+30/-30	40	-70/+245	+35/-30	+40/-40	70	120	290
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

#### Medium Reported Braking Action

MAX MANUAL	2030	+50/-45	65	-110/+390	+95/-75	+50/-55	80	340	945
AUTOBRAKE MAX	2020	+50/-45	65	-110/+390	+100/-80	+55/-55	85	335	940
AUTOBRAKE 3	2140	+50/-40	65	-115/+405	+70/-35	+60/-60	110	245	855

#### Poor Reported Braking Action

MAX MANUAL	2570	+70/-60	90	-155/+600	+210/-140	+65/-70	95	725	2515
AUTOBRAKE MAX	2580	+70/-60	90	-155/+600	+215/-145	+70/-70	95	730	2525
AUTOBRAKE 3	2585	+70/-60	90	-160/+600	+215/-130	+70/-75	105	725	2520

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****SLATS DRIVE - Flaps 20****VREF30+30**

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	1110	+35/-5	25	-40/+145	+15/-15	+25/-25	40	30	70
AUTOBRAKE MAX	1565	+25/-5	40	-60/+205	+5/0	+40/-40	75	0	0
AUTOBRAKE 2	2550	+55/-35	80	-120/+405	+55/-60	+75/-75	90	170	175

**Good Reported Braking Action**

MAX MANUAL	1545	+30/-15	45	-70/+240	+40/-35	+40/-40	55	120	285
AUTOBRAKE MAX	1670	+30/-10	45	-75/+250	+25/-20	+45/-45	75	115	290
AUTOBRAKE 2	2550	+55/-35	80	-120/+405	+55/-60	+75/-75	90	170	175

**Medium Reported Braking Action**

MAX MANUAL	2065	+45/-30	65	-105/+385	+90/-70	+55/-55	65	315	840
AUTOBRAKE MAX	2100	+45/-25	65	-105/+390	+80/-65	+55/-60	75	310	825
AUTOBRAKE 3	2455	+50/-30	75	-120/+430	+65/-60	+70/-70	90	160	565

**Poor Reported Braking Action**

MAX MANUAL	2605	+65/-45	90	-155/+585	+190/-130	+70/-75	75	655	2095
AUTOBRAKE MAX	2615	+65/-45	90	-155/+590	+190/-130	+70/-75	80	655	2095
AUTOBRAKE 3	2755	+65/-45	95	-160/+600	+175/-125	+75/-80	90	555	2000

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### STABILIZER - Flaps 20

#### VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1030	+30/-5	25	-40/+135	+15/-10	+25/-25	35	25	60
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2360	+55/-35	75	-115/+390	+40/-50	+65/-65	90	100	100

#### Good Reported Braking Action

MAX MANUAL	1435	+30/-15	40	-65/+230	+35/-30	+35/-35	50	105	255
AUTOBRAKE MAX	1535	+30/-10	40	-70/+240	+30/-20	+40/-40	70	110	260
AUTOBRAKE 2	2360	+55/-35	75	-115/+390	+40/-50	+65/-65	90	100	100

#### Medium Reported Braking Action

MAX MANUAL	1925	+45/-25	60	-105/+375	+85/-65	+50/-50	65	285	770
AUTOBRAKE MAX	1945	+45/-25	60	-105/+375	+80/-60	+50/-55	75	280	755
AUTOBRAKE 3	2250	+45/-25	65	-115/+410	+55/-45	+65/-65	95	135	535

#### Poor Reported Braking Action

MAX MANUAL	2440	+60/-40	85	-150/+575	+185/-125	+65/-70	75	615	1965
AUTOBRAKE MAX	2450	+65/-40	85	-150/+575	+185/-125	+65/-70	75	615	1970
AUTOBRAKE 3	2555	+60/-35	85	-155/+585	+165/-110	+70/-75	95	540	1905

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Recommended Brake Cooling Schedule****Reference Brake Energy (Millions of Foot Pounds)**

		BRAKES ON SPEED (KIAS)																							
		80				100				120				140				160				180			
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																							
		0	2	4	0	2	4	0	2	4	0	2	4	0	2	4	0	2	4	0	2	4			
300	0	18.3	19.2	20.2	27.3	28.8	30.5	37.8	40.0	42.4	49.5	52.5	55.8	62.2	66.0	70.2	75.2	79.8	84.8						
	10	18.8	19.7	20.7	28.2	29.7	31.4	39.0	41.3	43.8	51.1	54.2	57.6	64.2	68.2	72.4	77.5	82.3	87.4						
	15	19.2	20.1	21.1	28.7	30.3	32.0	39.7	42.1	44.6	52.0	55.2	58.6	65.3	69.4	73.7	78.8	83.7	88.8						
	20	19.5	20.4	21.5	29.2	30.8	32.5	40.4	42.8	45.3	52.9	56.1	59.6	66.4	70.5	74.9	80.1	85.0	90.2						
	30	19.9	20.9	22.0	29.9	31.6	33.3	41.5	43.9	46.6	54.4	57.7	61.3	68.3	72.5	77.0	82.3	87.3	92.6						
	40	20.1	21.1	22.2	30.3	32.0	33.8	42.2	44.7	47.4	55.4	58.9	62.5	69.7	74.0	78.7	84.1	89.2	94.6						
280	0	17.3	18.2	19.1	25.8	27.2	28.8	35.7	37.7	40.0	46.7	49.5	52.5	58.6	62.2	66.1	70.9	75.3	80.0						
	10	17.8	18.7	19.6	26.6	28.1	29.6	36.8	38.9	41.2	48.2	51.1	54.2	60.5	64.2	68.2	73.2	77.7	82.5						
	15	18.1	19.0	20.0	27.1	28.6	30.2	37.5	39.6	42.0	49.1	52.0	55.2	61.6	65.3	69.4	74.4	79.0	83.9						
	20	18.4	19.3	20.3	27.6	29.1	30.7	38.1	40.3	42.7	49.9	52.9	56.1	62.6	66.4	70.6	75.6	80.3	85.2						
	30	18.9	19.8	20.8	28.3	29.8	31.5	39.1	41.4	43.9	51.3	54.4	57.7	64.4	68.3	72.6	77.8	82.5	87.6						
	40	19.0	20.0	21.0	28.6	30.2	31.9	39.8	42.1	44.6	52.2	55.4	58.9	65.7	69.8	74.1	79.5	84.3	89.5						
260	0	16.4	17.2	18.0	24.4	25.7	27.1	33.5	35.5	37.5	43.8	46.4	49.3	54.9	58.3	62.0	66.5	70.7	75.1						
	10	16.8	17.6	18.5	25.1	26.4	27.9	34.6	36.6	38.7	45.2	47.9	50.8	56.7	60.2	63.9	68.7	72.9	77.5						
	15	17.1	18.0	18.9	25.6	26.9	28.4	35.2	37.3	39.4	46.0	48.8	51.7	57.7	61.3	65.1	69.9	74.2	78.8						
	20	17.4	18.3	19.2	26.0	27.4	28.9	35.8	37.9	40.1	46.8	49.6	52.6	58.7	62.3	66.2	71.0	75.4	80.1						
	30	17.8	18.7	19.6	26.6	28.0	29.6	36.8	38.9	41.2	48.1	51.0	54.1	60.3	64.0	68.0	73.0	77.5	82.3						
	40	18.0	18.8	19.8	26.9	28.4	30.0	37.3	39.5	41.9	49.0	51.9	55.2	61.6	65.4	69.5	74.6	79.2	84.1						
240	0	15.5	16.2	17.0	22.9	24.1	25.4	31.4	33.2	35.1	40.9	43.3	45.9	51.2	54.3	57.7	62.0	65.9	70.0						
	10	15.9	16.6	17.4	23.5	24.8	26.1	32.4	34.2	36.2	42.2	44.7	47.4	52.8	56.1	59.6	64.0	68.0	72.3						
	15	16.2	16.9	17.7	24.0	25.3	26.6	33.0	34.8	36.9	43.0	45.5	48.3	53.8	57.1	60.6	65.1	69.2	73.5						
	20	16.4	17.2	18.0	24.4	25.7	27.0	33.5	35.4	37.5	43.7	46.3	49.1	54.7	58.0	61.6	66.2	70.3	74.7						
	30	16.8	17.6	18.4	25.0	26.3	27.7	34.4	36.3	38.5	44.9	47.5	50.4	56.2	59.7	63.4	68.1	72.3	76.8						
	40	16.9	17.7	18.6	25.3	26.6	28.1	34.9	36.9	39.1	45.7	48.4	51.4	57.3	60.9	64.7	69.6	73.9	78.5						
220	0	14.5	15.2	15.9	21.4	22.5	23.7	29.2	30.9	32.6	37.9	40.2	42.6	47.4	50.3	53.4	57.4	60.9	64.8						
	10	14.9	15.6	16.4	22.0	23.2	24.4	30.1	31.8	33.6	39.1	41.4	43.9	48.9	51.9	55.1	59.2	62.9	66.8						
	15	15.2	15.9	16.7	22.4	23.6	24.8	30.7	32.4	34.2	39.8	42.2	44.7	49.8	52.8	56.1	60.3	64.0	68.0						
	20	15.5	16.2	16.9	22.8	24.0	25.2	31.2	32.9	34.8	40.5	42.9	45.5	50.6	53.7	57.0	61.3	65.1	69.1						
	30	15.8	16.5	17.3	23.3	24.6	25.9	32.0	33.8	35.7	41.6	44.1	46.7	52.1	55.2	58.6	63.0	66.9	71.1						
	40	15.9	16.6	17.4	23.6	24.8	26.2	32.5	34.3	36.3	42.3	44.8	47.6	53.0	56.3	59.8	64.3	68.3	72.6						
200	0	13.6	14.3	14.9	19.9	20.9	22.0	27.1	28.5	30.1	35.0	37.0	39.2	43.5	46.1	48.9	52.6	55.8	59.3						
	10	14.0	14.6	15.3	20.5	21.5	22.6	27.9	29.4	31.1	36.0	38.1	40.4	44.9	47.6	50.5	54.3	57.6	61.2						
	15	14.3	14.9	15.6	20.9	21.9	23.0	28.4	29.9	31.7	36.7	38.8	41.1	45.7	48.5	51.4	55.3	58.7	62.3						
	20	14.5	15.1	15.8	21.2	22.3	23.4	28.9	30.4	32.2	37.3	39.5	41.8	46.5	49.3	52.3	56.2	59.7	63.4						
	30	14.8	15.5	16.2	21.7	22.8	24.0	29.6	31.2	33.0	38.3	40.6	43.0	47.8	50.7	53.8	57.8	61.3	65.2						
	40	14.9	15.6	16.3	21.9	23.1	24.3	30.0	31.7	33.5	38.9	41.2	43.7	48.7	51.6	54.8	58.9	62.6	66.5						
180	0	12.8	13.3	13.9	18.4	19.4	20.3	24.9	26.2	27.6	31.9	33.8	35.7	39.6	41.9	44.4	47.7	50.6	53.7						
	10	13.1	13.7	14.3	19.0	19.9	20.9	25.6	27.0	28.5	32.9	34.8	36.8	40.8	43.2	45.9	49.2	52.2	55.4						
	15	13.3	13.9	14.6	19.3	20.3	21.3	26.1	27.5	29.0	33.5	35.4	37.5	41.6	44.0	46.7	50.1	53.2	56.4						
	20	13.5	14.1	14.8	19.6	20.6	21.7	26.5	27.9	29.5	34.1	36.0	38.1	42.3	44.8	47.5	51.0	54.1	57.4						
	30	13.8	14.4	15.1	20.1	21.1	22.2	27.2	28.6	30.2	35.0	37.0	39.2	43.4	46.0	48.8	52.4	55.6	59.0						
	40	13.9	14.5	15.2	20.3	21.3	22.4	27.5	29.0	30.7	35.5	37.6	39.8	44.2	46.8	49.7	53.4	56.7	60.2						

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

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	5.5	14.9	24.1	33.2	42.3	51.4	60.6	69.9	79.3	88.9
	MAX AUTO	5.5	14.0	22.4	31.0	39.6	48.5	57.6	67.0	76.7	86.9
	AUTOBRAKE 4	5.5	13.5	21.4	29.3	37.3	45.5	54.1	63.1	72.6	82.8
	AUTOBRAKE 3	5.5	12.9	20.3	27.6	35.0	42.5	50.5	58.8	67.8	77.4
	AUTOBRAKE 2	5.4	12.4	19.2	25.9	32.7	39.7	46.9	54.6	62.8	71.7
	AUTOBRAKE 1	5.4	11.9	18.2	24.4	30.6	37.0	43.7	50.8	58.5	66.8

### 2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	4.8	13.6	22.1	30.5	38.8	47.0	55.2	63.4	71.7	80.0
	MAX AUTO	3.0	10.1	17.3	24.5	31.9	39.6	47.5	55.9	64.7	74.0
	AUTOBRAKE 4	2.5	7.9	13.5	19.4	25.6	32.1	39.1	46.6	54.7	63.4
	AUTOBRAKE 3	1.6	5.5	9.7	14.2	19.1	24.5	30.3	36.6	43.4	50.7
	AUTOBRAKE 2	0.9	3.6	6.6	10.0	13.7	17.8	22.4	27.4	32.8	38.7
	AUTOBRAKE 1	0.6	2.7	5.0	7.5	10.3	13.4	16.8	20.7	25.1	30.1

### 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	1	2	4	5	6	7		CAUTION	FUSE PLUG MELT ZONE
	REQUIRED	10	13	23	40	53	66	73			
	BTMS	UP TO 2.4	2.4	2.5	2.9	3.4	4.0	4.4	4.9	5.0 TO 6.3	

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

Landing Climb Limit Weight  
Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		CLIMB LIMIT WEIGHT (1000 KG)			
		AIRPORT PRESSURE ALTITUDE (FT)			
		0	1000	2000	3000
54	130	199			
50	122	214	205	196	
45	113	229	220	212	202
40	104	245	235	226	216
35	95	258	252	242	230
30	86	263	260	255	243
25	77	263	261	258	255
20	68	264	261	258	255
15	59	264	261	259	256
10 & BELOW	50 & BELOW	264	262	259	256

Based on engine bleed for 2 packs on and engine anti-ice on or off and wing anti-ice off.  
With packs off, increase allowable weight by 2100 kg.  
With engine and wing anti-ice on, decrease allowable weight by 900 kg.  
Decrease allowable weight by 18000 kg for ice accumulation when operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C.

Intentionally  
Blank



# Performance Inflight - QRH

## Engine Inoperative

# Chapter PI-QRH

## Section 12

### ENGINE INOP

#### Initial Max Continuous %N1

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	98.7	98.2	97.7	97.3	97.2	96.8	96.9	96.5	96.1
15	99.3	98.8	98.3	97.8	97.8	97.1	97.2	96.8	96.4
10	99.9	99.4	98.9	98.4	98.4	97.7	97.8	97.4	97.1
5	100.3	100.1	99.5	99.1	99.0	98.3	98.4	98.1	97.7
0	99.4	100.3	100.2	99.7	99.6	99.0	99.1	98.7	98.4
-5	98.5	99.4	100.4	100.6	100.4	99.6	99.8	99.4	99.0
-10	97.6	98.5	99.5	100.7	101.6	100.6	100.7	100.3	99.9
-15	96.6	97.6	98.5	99.7	101.5	101.5	101.6	101.2	100.8
-20	95.7	96.6	97.6	98.7	100.5	100.6	100.6	100.2	99.9
-25	94.8	95.6	96.6	97.7	99.5	99.6	99.6	99.3	98.9
-30	93.8	94.7	95.6	96.8	98.5	98.6	98.6	98.2	97.9
-35	92.8	93.7	94.6	95.8	97.5	97.5	97.6	97.2	96.9
-40	91.8	92.7	93.6	94.7	96.5	96.5	96.5	96.2	95.8

## ENGINE INOP

### Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT													TAT (°C)	
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	
200	0.63	95.1	96.1	97.2	98.2	99.2	100.2	100.8	100.4	99.6	98.9	98.2	98.0	
240	0.74	95.1	96.1	97.2	98.2	99.3	100.3	101.0	100.9	100.2	99.3	98.6	98.0	
280	0.86	94.0	95.1	96.1	97.1	98.2	99.2	100.2	101.1	100.7	99.7	99.0	98.4	
35000 FT PRESS ALT													TAT (°C)	
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	
200	0.60	94.8	95.9	96.9	98.0	99.0	100.0	101.0	101.2	100.4	99.6	98.8	98.5	
240	0.71	94.9	95.9	97.0	98.0	99.0	100.0	101.0	101.6	100.9	99.9	99.2	98.7	
280	0.82	94.7	95.8	96.8	97.9	98.9	99.9	100.9	101.9	101.3	100.3	99.6	98.9	
33000 FT PRESS ALT													TAT (°C)	
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	
200	0.58	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.3	100.6	99.7	98.9	98.1	
240	0.68	94.7	95.7	96.8	97.8	98.8	99.8	100.8	101.2	100.8	100.0	99.3	98.6	
280	0.79	93.8	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.3	100.4	99.6	98.9	
320	0.89	91.4	92.5	93.5	94.5	95.5	96.4	97.4	98.4	99.3	100.2	99.9	99.2	
31000 FT PRESS ALT													TAT (°C)	
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	
200	0.55	95.8	96.8	97.8	98.9	99.9	100.8	101.4	101.1	100.2	99.3	98.5	97.8	
240	0.66	95.5	96.5	97.6	98.6	99.6	100.6	101.4	101.2	100.4	99.6	99.0	98.3	
280	0.76	94.4	95.4	96.4	97.4	98.4	99.4	100.4	101.3	100.8	99.9	99.3	98.6	
320	0.85	92.3	93.3	94.3	95.2	96.2	97.2	98.1	99.1	100.0	100.3	99.5	98.9	
29000 FT PRESS ALT													TAT (°C)	
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
200	0.53	96.7	97.7	98.7	99.7	100.7	101.5	101.6	100.8	99.8	98.9	98.0	98.1	
240	0.63	96.2	97.2	98.2	99.2	100.2	101.2	101.5	101.0	100.1	99.4	98.7	98.0	
280	0.73	95.1	96.2	97.2	98.2	99.1	100.1	101.1	101.3	100.4	99.7	99.1	98.5	
320	0.82	93.1	94.1	95.1	96.1	97.0	98.0	98.9	99.9	100.8	100.0	99.4	98.7	
360	0.91	91.0	92.0	93.0	93.9	94.9	95.8	96.7	97.6	98.5	99.4	99.7	99.1	
27000 FT PRESS ALT													TAT (°C)	
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
200	0.51	96.5	97.5	98.6	99.6	100.6	101.5	101.9	101.4	100.4	99.4	98.5	97.5	
240	0.60	95.9	96.9	97.9	98.9	99.9	100.9	101.7	101.5	100.7	99.9	99.2	98.4	
280	0.70	94.8	95.8	96.8	97.8	98.7	99.7	100.7	101.6	101.0	100.2	99.5	98.9	
320	0.79	92.9	93.9	94.9	95.9	96.8	97.8	98.7	99.7	100.6	100.5	99.8	99.2	
360	0.88	90.9	91.9	92.9	93.8	94.8	95.7	96.6	97.5	98.4	99.3	100.0	99.4	

### %N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESS ALT (1000 FT)					
	37	35	33	31	29	27
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON (packs on)	-1.0	-1.0	-0.9	-0.9	-0.8	-0.8
ENGINE & WING ANTI-ICE ON (packs off)	-1.7	-1.6	-1.5	-1.4	-1.3	-1.2

**ENGINE INOP****Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.49	97.5	98.5	99.5	100.5	101.5	102.2	101.9	100.9	99.9	98.9	97.9	97.7
240	0.58	96.7	97.7	98.7	99.7	100.6	101.6	101.8	101.1	100.3	99.6	98.8	98.0
280	0.67	95.3	96.3	97.2	98.2	99.2	100.1	101.1	101.3	100.6	100.0	99.3	98.7
320	0.76	93.6	94.6	95.5	96.5	97.4	98.4	99.3	100.2	100.9	100.2	99.6	99.0
360	0.85	91.8	92.7	93.7	94.6	95.5	96.5	97.4	98.3	99.2	100.1	99.8	99.2
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.48	97.4	98.4	99.4	100.4	101.4	102.2	102.2	101.2	100.2	99.2	98.2	97.4
240	0.57	96.4	97.4	98.4	99.4	100.4	101.4	102.0	101.5	100.6	99.9	99.1	98.2
280	0.66	95.1	96.1	97.1	98.0	99.0	100.0	100.9	101.6	100.9	100.2	99.6	98.9
320	0.75	93.5	94.4	95.4	96.4	97.3	98.3	99.2	100.1	101.0	100.5	99.8	99.3
360	0.83	91.7	92.7	93.6	94.6	95.5	96.4	97.3	98.2	99.1	100.0	100.1	99.4
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.46	98.1	99.1	100.1	101.0	102.0	102.4	101.7	100.7	99.7	98.7	97.8	97.7
240	0.55	97.0	98.0	99.0	100.0	101.0	101.9	101.9	101.2	100.4	99.6	98.8	98.0
280	0.63	95.8	96.8	97.7	98.7	99.6	100.6	101.5	101.4	100.7	100.1	99.4	98.7
320	0.72	94.2	95.1	96.1	97.0	98.0	98.9	99.8	100.7	100.9	100.3	99.7	99.1
360	0.80	92.5	93.5	94.4	95.3	96.3	97.2	98.1	99.0	99.9	100.5	99.9	99.3
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.44	97.7	98.7	99.7	100.7	101.7	102.6	102.3	101.3	100.3	99.3	98.4	97.7
240	0.53	96.7	97.7	98.7	99.7	100.6	101.6	102.4	101.8	101.0	100.2	99.3	98.6
280	0.61	95.5	96.5	97.5	98.4	99.4	100.3	101.3	102.0	101.3	100.6	99.9	99.2
320	0.69	93.9	94.8	95.8	96.7	97.7	98.6	99.5	100.4	101.3	100.8	100.0	99.2
360	0.77	92.4	93.4	94.3	95.2	96.1	97.0	98.0	98.8	99.7	100.6	100.3	99.6
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.42	98.3	99.2	100.2	101.2	102.1	102.6	101.6	100.5	99.5	98.6	97.8	97.4
240	0.51	97.2	98.1	99.1	100.0	101.0	101.9	102.0	101.1	100.2	99.4	98.7	98.0
280	0.59	95.6	96.5	97.5	98.4	99.3	100.3	101.2	101.2	100.4	99.8	99.2	98.6
320	0.67	94.1	95.0	95.9	96.9	97.8	98.7	99.6	100.5	100.7	100.1	99.5	98.9
360	0.75	92.7	93.6	94.5	95.4	96.3	97.2	98.1	99.0	99.9	100.3	99.8	99.2

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESS ALT (1000 FT)				
	25	24	22	20	18
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON (packs on)	-0.8	-0.7	-0.7	-0.5	-0.5
ENGINE & WING ANTI-ICE ON (packs off)	-1.1	-1.1	-1.0	-0.7	-0.7

**ENGINE INOP**

**Max Continuous %N1**  
**Based on engine bleed for packs on or off and anti-ice off**  
**16000 FT to 5000 FT Pressure Altitudes**

16000 FT PRESS ALT			TAT (°C)											
CIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.41	97.1	98.1	99.0	100.0	100.9	101.9	101.7	100.6	99.6	98.7	97.9	97.1	
240	0.49	96.2	97.1	98.1	99.0	100.0	100.9	101.8	101.2	100.2	99.4	98.6	97.9	
280	0.57	94.7	95.7	96.6	97.6	98.5	99.4	100.3	101.2	100.5	99.8	99.1	98.3	
320	0.64	93.4	94.3	95.2	96.1	97.0	97.9	98.8	99.7	100.6	100.0	99.5	98.8	
360	0.72	92.1	93.0	93.9	94.8	95.7	96.6	97.5	98.3	99.2	100.1	99.8	99.2	
14000 FT PRESS ALT			TAT (°C)											
CIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35	
200	0.39	96.7	97.7	98.6	99.6	100.5	101.4	100.5	99.5	98.6	97.8	97.1	96.3	
240	0.47	95.9	96.8	97.8	98.7	99.6	100.5	101.1	100.2	99.4	98.5	97.8	97.0	
280	0.54	94.9	95.8	96.7	97.6	98.5	99.4	100.3	100.7	100.0	99.2	98.3	97.5	
320	0.62	93.8	94.7	95.6	96.5	97.4	98.3	99.2	100.1	100.4	99.7	99.0	98.1	
360	0.69	92.5	93.4	94.3	95.2	96.1	96.9	97.8	98.7	99.5	99.9	99.3	98.6	
12000 FT PRESS ALT			TAT (°C)											
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
200	0.38	96.4	97.4	98.3	99.2	100.1	100.6	99.7	98.7	97.9	97.1	96.3	95.5	
240	0.45	95.8	96.7	97.7	98.6	99.5	100.4	100.3	99.4	98.6	97.7	96.8	96.0	
280	0.52	95.0	96.0	96.9	97.8	98.7	99.5	100.4	100.0	99.2	98.5	97.5	96.7	
320	0.60	93.9	94.8	95.7	96.6	97.5	98.4	99.2	100.1	99.7	99.0	98.2	97.3	
360	0.67	92.7	93.6	94.5	95.4	96.3	97.1	98.0	98.8	99.7	99.3	98.6	97.8	
10000 FT PRESS ALT			TAT (°C)											
CIAS	M	-15	10	-5	0	5	10	15	20	25	30	35	40	
200	0.36	95.4	96.3	97.2	98.1	99.0	99.9	99.8	98.9	98.1	97.3	96.5	95.7	
240	0.43	94.8	95.7	96.6	97.5	98.4	99.3	100.1	99.5	98.7	97.9	96.9	96.1	
280	0.51	94.1	95.0	95.9	96.8	97.7	98.6	99.4	100.1	99.3	98.5	97.7	96.8	
320	0.58	93.1	94.0	94.9	95.8	96.7	97.5	98.4	99.3	99.7	99.0	98.2	97.4	
360	0.65	92.0	92.9	93.8	94.6	95.5	96.3	97.2	98.0	98.9	99.2	98.6	97.8	
5000 FT PRESS ALT			TAT (°C)											
CIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45	
200	0.33	92.4	93.3	94.1	95.0	95.8	96.7	97.5	97.3	96.6	95.8	94.9	94.1	
240	0.40	92.0	92.9	93.7	94.6	95.4	96.3	97.1	97.7	97.0	96.2	95.3	94.5	
280	0.46	91.6	92.4	93.3	94.2	95.0	95.8	96.7	97.5	97.5	96.7	95.9	95.0	
320	0.53	91.0	91.8	92.7	93.5	94.4	95.2	96.0	96.8	97.6	97.2	96.4	95.6	
360	0.59	90.2	91.0	91.9	92.7	93.5	94.4	95.2	96.0	96.8	97.6	96.9	96.1	

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESS ALT (1000 FT)				
	16	14	12	10	5
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.3
ENGINE & WING ANTI-ICE ON (packs on)	-0.5	-0.5	-0.5	-0.5	-0.5
ENGINE & WING ANTI-ICE ON (packs off)	-0.7	-0.7	-0.7	-0.7	-0.7

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	252	263	19700	18400	16600
240	232	253	22000	21000	19700
220	213	243	24200	23500	22300
200	194	232	26600	26000	25000
180	174	220	29000	28700	27900
160	155	208	31600	31500	31000

**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
134	125	118	111	105	100	95	91	87	83	80
273	255	238	224	211	200	190	181	172	165	158
412	383	358	337	317	300	285	271	258	246	236
550	511	478	449	423	400	379	361	344	329	314
686	639	597	561	529	500	474	451	430	411	393
822	765	716	673	634	600	569	541	516	493	472
958	892	835	784	740	700	664	632	603	576	552
1093	1018	953	896	845	800	759	723	689	659	631
1227	1144	1071	1007	951	900	854	813	776	742	711
1362	1270	1190	1119	1056	1000	950	904	863	825	790
1496	1395	1308	1230	1161	1100	1045	995	949	908	870
1630	1521	1426	1342	1267	1200	1140	1085	1036	991	949
1765	1647	1544	1453	1372	1300	1235	1176	1123	1074	1029
1900	1773	1662	1565	1478	1400	1330	1267	1209	1157	1108
2035	1900	1781	1676	1583	1500	1425	1357	1296	1239	1188
2171	2027	1900	1788	1689	1600	1520	1448	1382	1322	1267
2308	2154	2019	1900	1795	1700	1615	1538	1468	1404	1346
2445	2282	2139	2012	1900	1800	1710	1628	1554	1486	1424

**Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)						TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)						
	160	180	200	220	240	260	
100	0.9	1.0	1.0	1.1	1.2	1.3	0:15
200	2.1	2.3	2.5	2.7	2.9	3.1	0:32
300	3.4	3.7	4.1	4.4	4.8	5.2	0:49
400	4.7	5.2	5.7	6.2	6.7	7.2	1:05
500	6.0	6.6	7.3	8.0	8.6	9.3	1:21
600	7.2	8.0	8.8	9.6	10.4	11.2	1:37
700	8.4	9.3	10.3	11.3	12.2	13.1	1:53
800	9.6	10.7	11.8	12.9	13.9	15.0	2:09
900	10.8	12.0	13.3	14.5	15.7	16.9	2:24
1000	12.0	13.3	14.7	16.1	17.5	18.8	2:39
1100	13.2	14.7	16.2	17.7	19.2	20.7	2:55
1200	14.4	16.0	17.6	19.3	20.9	22.5	3:10
1300	15.5	17.3	19.1	20.9	22.6	24.4	3:25
1400	16.7	18.6	20.5	22.4	24.3	26.2	3:41
1500	17.8	19.8	21.9	24.0	26.0	28.0	3:57
1600	18.9	21.1	23.3	25.5	27.6	29.8	4:13
1700	20.0	22.3	24.7	27.0	29.3	31.6	4:29
1800	21.1	23.6	26.1	28.5	30.9	33.4	4:45

APU fuel included.

Driftdown at optimum 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 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	15400	13400	10700
240	18500	16300	14400
220	21300	20100	18000
200	23900	22900	21500
180	26600	25800	24600
160	29500	28900	27900
140	32400	32200	31400

With engine anti-ice on, decrease altitude capability by 700 ft.

With engine and wing anti-ice on, decrease altitude capability by 1100 ft.

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	15	17	19	21	23	25	27
260	%N1	91.5	95.9	97.6					
	MACH	.557	.602	.624					
	KIAS	309	305	304					
	FF/ENG	7544	7611	7718					
240	%N1	89.2	93.5	95.2	97.1				
	MACH	.541	.582	.602	.625				
	KIAS	300	294	293	293				
	FF/ENG	6945	6927	6973	7082				
220	%N1	86.6	90.9	92.6	94.4	96.3			
	MACH	.523	.563	.581	.601	.624			
	KIAS	290	285	283	281	281			
	FF/ENG	6360	6291	6302	6339	6448			
200	%N1	83.9	88.3	89.9	91.7	93.5	95.3	98.2	
	MACH	.504	.544	.561	.578	.598	.621	.653	
	KIAS	279	275	272	270	269	268	272	
	FF/ENG	5797	5700	5677	5683	5711	5811	6096	
180	%N1	81.3	85.3	87.0	88.7	90.4	92.2	94.0	96.6
	MACH	.486	.523	.539	.556	.574	.593	.615	.646
	KIAS	269	263	262	259	257	256	255	257
	FF/ENG	5264	5145	5101	5071	5067	5086	5163	5384
160	%N1	78.6	82.1	83.8	85.5	87.2	88.9	90.6	92.4
	MACH	.468	.499	.515	.532	.549	.566	.585	.607
	KIAS	259	251	250	248	246	244	242	241
	FF/ENG	4777	4580	4553	4511	4470	4457	4468	4522
140	%N1	75.8	79.0	80.4	81.9	83.6	85.4	87.0	88.7
	MACH	.449	.477	.490	.505	.522	.539	.557	.575
	KIAS	248	240	237	235	233	232	230	228
	FF/ENG	4333	4071	4015	3973	3925	3879	3863	3881

**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
289	266	245	228	213	200	191	182	174	167	160
581	534	492	457	427	400	381	364	348	333	320
873	802	739	686	641	600	572	545	521	500	480
1166	1071	987	916	855	800	762	726	694	665	639
1460	1340	1235	1145	1069	1000	952	908	867	831	798
1755	1611	1483	1375	1283	1200	1142	1089	1040	996	956
2051	1881	1732	1605	1497	1400	1333	1270	1213	1161	1114
2348	2153	1980	1836	1711	1600	1523	1451	1386	1326	1272
2645	2424	2230	2066	1925	1800	1713	1632	1558	1491	1430
2943	2697	2479	2297	2140	2000	1902	1812	1730	1655	1588

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.3	0:40	2.9	0:39	2.6	0:38	2.4	0:36	2.2	0:34
400	7.0	1:18	6.4	1:15	5.9	1:12	5.5	1:09	5.3	1:05
600	10.6	1:56	9.8	1:51	9.1	1:46	8.6	1:42	8.4	1:35
800	14.1	2:34	13.1	2:27	12.3	2:21	11.6	2:15	11.4	2:06
1000	17.7	3:12	16.5	3:04	15.4	2:56	14.7	2:48	14.4	2:37
1200	21.2	3:51	19.8	3:41	18.5	3:31	17.6	3:21	17.3	3:08
1400	24.7	4:30	23.0	4:18	21.6	4:06	20.6	3:55	20.2	3:40
1600	28.1	5:09	26.3	4:56	24.7	4:42	23.5	4:29	23.0	4:12

**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	140	160	180	200	220	240	260
5	-0.7	-0.5	-0.2	0.0	0.5	1.0	1.5
10	-1.4	-1.0	-0.5	0.0	1.1	2.2	3.4
15	-2.2	-1.5	-0.8	0.0	1.7	3.4	5.2
20	-2.9	-2.0	-1.0	0.0	2.2	4.5	7.0
25	-3.6	-2.5	-1.3	0.0	2.7	5.6	8.8
30	-4.3	-3.0	-1.6	0.0	3.2	6.7	10.5



ENGINE INOP

MAX CONTINUOUS THRUST

Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
260	%N1	79.8	82.7	87.5	92.4		
	KIAS	236	237	238	240		
	FF/ENG	6860	6650	6630	6770		
240	%N1	77.5	80.3	84.8	89.8	94.9	
	KIAS	229	229	229	229	242	
	FF/ENG	6320	6110	6090	6160	6380	
220	%N1	75.0	77.8	82.0	87.0	92.0	
	KIAS	223	223	223	223	224	
	FF/ENG	5800	5600	5560	5570	5660	
200	%N1	72.4	75.1	79.2	84.0	88.9	94.3
	KIAS	216	216	216	216	216	225
	FF/ENG	5260	5120	5060	5040	5050	5310
180	%N1	69.5	72.2	76.2	80.9	85.7	90.7
	KIAS	209	209	209	209	209	209
	FF/ENG	4730	4670	4580	4520	4480	4570

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	240	140				
50	280	200	60			
48	320	240	110			
46	360	290	170			
44	400	330	210	50		
42	440	380	260	100	-60	
40	470	430	300	150	-10	
38	510	470	350	190	40	-130
36	530	510	400	230	80	-80
34	530	540	450	280	120	-30
32	530	560	480	320	160	0
30	540	560	520	370	200	40
20	550	580	560	520	400	240
10	570	600	570	530	450	340
0	590	610	590	550	460	350
-20	610	640	610	570	480	370
-40	640	670	640	590	500	380

Rate of climb capability shown is valid for 180000 kg, gear down at VREF20 + 5.

Decrease rate of climb 45 ft/min per 5000 kg greater than 180000 kg.

Increase rate of climb 55 ft/min per 5000 kg less than 180000 kg.

**Flaps 30**

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-210	-320				
50	-180	-270	-400			
48	-150	-230	-360			
46	-110	-190	-310	-470		
44	-70	-150	-270	-430		
42	-40	-110	-230	-380	-540	
40	-10	-60	-180	-340	-500	
38	20	-20	-140	-300	-450	-620
36	40	10	-100	-260	-420	-570
34	40	40	-60	-220	-380	-530
32	40	50	-30	-180	-340	-500
30	40	60	10	-140	-310	-460
20	50	60	30	-10	-130	-290
10	60	70	40	-10	-100	-210
0	70	80	40	0	-100	-210
-20	70	80	50	0	-100	-210
-40	70	90	50	0	-100	-220

Rate of climb capability shown is valid for 180000 kg, gear down at VREF30 + 5.

Decrease rate of climb 50 ft/min per 5000 kg greater than 180000 kg.

Increase rate of climb 60 ft/min per 5000 kg less than 180000 kg.

Performance Inflight - QRHChapter PI-QRH  
Gear DownSection 13

GEAR DOWN

Long Range Cruise Altitude Capability  
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	17400	15300	12200
240	20900	18400	15600
220	24500	22000	19600
200	27800	26400	23800
180	30900	30500	28900
160	33400	33300	32900
140	36100	36100	36100

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
260	%N1	84.5	89.2	90.9							
	MACH	.453	.492	.508							
	KIAS	251	248	246							
	FF/ENG	5792	5756	5759							
240	%N1	82.1	86.8	88.6	90.4	92.1					
	MACH	.438	.476	.492	.508	.525					
	KIAS	242	240	238	237	235					
	FF/ENG	5337	5288	5273	5275	5290					
220	%N1	79.5	84.1	86.0	87.8	89.6	91.4	93.3			
	MACH	.421	.459	.475	.491	.508	.525	.543			
	KIAS	232	231	230	228	227	225	224			
	FF/ENG	4886	4841	4810	4793	4791	4806	4864			
200	%N1	76.8	81.4	83.1	85.0	86.8	88.6	90.5	92.7		
	MACH	.403	.441	.456	.473	.489	.506	.526	.548		
	KIAS	223	221	220	219	218	217	216	216		
	FF/ENG	4448	4391	4371	4333	4309	4314	4361	4463		
180	%N1	73.8	78.4	80.0	81.8	83.9	85.9	87.9	89.9	92.1	
	MACH	.384	.420	.436	.452	.470	.489	.509	.531	.554	
	KIAS	212	211	210	210	209	209	209	209	209	
	FF/ENG	4011	3934	3926	3975	3941	3878	3931	3984	4071	
160	%N1	70.7	75.6	77.2	79.0	81.1	83.2	85.1	87.1	89.2	91.3
	MACH	.366	.403	.419	.436	.454	.472	.492	.513	.535	.558
	KIAS	202	202	202	202	202	202	202	202	202	202
	FF/ENG	3693	3613	3608	3609	3595	3563	3512	3564	3604	3670
140	%N1	67.8	72.7	74.4	76.1	78.1	80.2	82.2	84.1	86.1	88.2
	MACH	.352	.387	.403	.419	.436	.454	.473	.493	.515	.537
	KIAS	194	194	194	194	194	194	194	194	194	194
	FF/ENG	3358	3267	3255	3251	3245	3228	3206	3208	3194	3226

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
322	287	258	235	216	200	189	178	169	160	153
655	584	522	474	434	400	377	357	338	321	306
992	882	788	714	653	600	566	535	507	482	460
1332	1183	1055	954	872	800	755	713	676	642	612
1675	1485	1323	1195	1091	1000	943	891	844	802	765
2021	1790	1592	1436	1310	1200	1131	1069	1012	962	917
2371	2096	1862	1678	1529	1400	1320	1246	1180	1121	1069
2725	2406	2134	1921	1749	1600	1508	1424	1348	1280	1221
3081	2717	2407	2164	1969	1800	1696	1601	1515	1439	1372
3442	3031	2681	2408	2190	2000	1884	1778	1683	1598	1523
3805	3346	2956	2653	2410	2200	2072	1955	1850	1756	1674
4172	3664	3233	2899	2631	2400	2260	2132	2017	1914	1824
4543	3985	3512	3145	2853	2600	2447	2308	2183	2072	1974
4919	4308	3791	3392	3074	2800	2635	2485	2349	2229	2124
5298	4634	4073	3640	3296	3000	2822	2661	2515	2386	2273
5681	4963	4355	3889	3519	3200	3010	2837	2681	2543	2422
6069	5294	4639	4138	3742	3400	3197	3012	2846	2699	2570
6460	5627	4925	4388	3965	3600	3384	3188	3012	2855	2719
6856	5963	5212	4639	4188	3800	3571	3363	3177	3011	2867
7255	6302	5500	4891	4412	4000	3758	3538	3341	3166	3014

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME
	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)
200	6.6	0:46	6.0	0:45	5.2	0:43	4.9	0:42	4.7	0:40
400	13.2	1:36	12.1	1:32	10.7	1:25	10.1	1:22	9.7	1:17
600	19.7	2:25	18.2	2:18	16.3	2:08	15.3	2:01	14.8	1:54
800	26.2	3:15	24.3	3:05	21.9	2:50	20.5	2:41	19.8	2:32
1000	32.7	4:05	30.3	3:51	27.4	3:33	25.7	3:21	24.9	3:09
1200	38.9	4:57	36.1	4:40	32.7	4:17	30.6	4:02	29.5	3:47
1400	45.1	5:49	41.9	5:29	38.0	5:01	35.5	4:43	34.2	4:26
1600	51.3	6:41	47.6	6:18	43.3	5:45	40.4	5:24	38.9	5:04
1800	57.5	7:33	53.4	7:06	48.6	6:29	45.4	6:05	43.6	5:42
2000	63.7	8:26	59.1	7:55	53.9	7:13	50.3	6:46	48.3	6:21
2200	69.3	9:21	64.4	8:47	58.7	7:59	54.8	7:29	52.7	7:01
2400	75.0	10:17	69.7	9:38	63.6	8:46	59.4	8:12	57.0	7:41
2600	80.7	11:12	75.0	10:30	68.4	9:32	64.0	8:55	61.4	8:21
2800	86.3	12:08	80.3	11:22	73.3	10:18	68.6	9:38	65.7	9:01
3000	92.0	13:03	85.6	12:13	78.2	11:05	73.2	10:21	70.1	9:41
3200	97.2	14:03	90.5	13:08	82.7	11:53	77.4	11:07	74.0	10:23
3400	102.3	15:02	95.3	14:03	87.1	12:42	81.7	11:52	78.0	11:05
3600	107.5	16:01	100.2	14:57	91.6	13:31	85.9	12:37	82.0	11:47
3800	112.7	17:00	105.0	15:52	96.1	14:20	90.2	13:22	86.0	12:29
4000	117.8	17:59	109.9	16:47	100.6	15:08	94.4	14:07	90.0	13:10

GEAR DOWN

Long Range Cruise Enroute Fuel and Time  
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	160	180	200	220	240
10	-0.7	-0.3	0.0	0.9	2.0
20	-1.6	-0.8	0.0	1.7	3.8
30	-2.6	-1.2	0.0	2.5	5.4
40	-3.6	-1.7	0.0	3.2	6.9
50	-4.5	-2.2	0.0	3.9	8.3
60	-5.5	-2.7	0.0	4.5	9.7
70	-6.6	-3.2	0.0	5.1	10.9
80	-7.6	-3.7	0.0	5.7	12.0
90	-8.7	-4.2	0.0	6.2	13.0
100	-9.7	-4.7	0.0	6.7	13.9
110	-10.8	-5.3	0.0	7.1	14.7
120	-11.9	-5.9	0.0	7.5	15.4
130	-13.0	-6.5	0.0	7.9	15.9

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	40	44	48	52	56	60	64	68	72	76
TIME (MINUTES)	11	12	13	13	14	15	16	16	17	18

**GEAR DOWN**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
260	%N1	75.2	78	82.5	87.6	92.7			
	KIAS	236	236	236	236	236			
	FF/ENG	5840	5660	5660	5700	5850			
240	%N1	73.2	76.1	80.3	85.4	90.5			
	KIAS	229	229	229	229	229			
	FF/ENG	5440	5300	5260	5280	5360			
220	%N1	71.2	73.9	78.1	83	88	93.2		
	KIAS	223	223	223	223	223	223		
	FF/ENG	5060	4950	4880	4880	4900	5090		
200	%N1	69	71.7	75.8	80.6	85.5	90.5		
	KIAS	216	216	216	216	216	216		
	FF/ENG	4680	4610	4510	4480	4470	4580		
180	%N1	66.7	69.3	73.3	78.2	82.8	87.9	93.4	
	KIAS	209	209	209	209	209	209	209	
	FF/ENG	4320	4260	4150	4090	4150	4130	4340	
160	%N1	64.2	66.8	70.7	75.6	79.9	85.1	90.2	
	KIAS	202	202	202	202	202	202	202	
	FF/ENG	4030	3990	3880	3790	3790	3690	3810	
140	%N1	61.5	64.1	67.8	72.7	77	82.2	87.1	92.9
	KIAS	194	194	194	194	194	194	194	194
	FF/ENG	3660	3630	3530	3430	3410	3370	3370	3570

**Flaps 1**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
260	%N1	73.8	76.7	81.2	86.4	91.5
	KIAS	216	216	216	216	216
	FF/ENG	5530	5380	5380	5440	5530
240	%N1	71.6	74.5	78.9	84.0	89.1
	KIAS	209	209	209	209	209
	FF/ENG	5130	5020	4980	5020	5060
220	%N1	69.3	72.1	76.5	81.5	86.6
	KIAS	203	203	203	203	203
	FF/ENG	4730	4670	4600	4600	4600
200	%N1	66.8	69.6	73.9	78.9	83.8
	KIAS	196	196	196	196	196
	FF/ENG	4330	4310	4210	4180	4170
180	%N1	64.2	66.9	71.1	76.2	80.8
	KIAS	189	189	189	189	189
	FF/ENG	4030	4010	3910	3860	3870
160	%N1	61.4	64.1	68.1	73.2	77.7
	KIAS	182	182	182	182	182
	FF/ENG	3650	3630	3530	3470	3480
140	%N1	58.4	61.0	64.9	69.9	74.4
	KIAS	174	174	174	174	174
	FF/ENG	3270	3250	3160	3100	3100

These tables include 5% additional fuel for holding in a racetrack pattern.

**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 KG)		VREF + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
220	208	221	4700		
200	190	214	9400	6200	3800
180	172	208	13000	11000	8100
160	154	200	16400	14900	12800

**Long Range Cruise Altitude Capability****100 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
200	6400	4100	
180	11700	8200	5900
160	15200	13600	11200
140	18700	17700	15800

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)					
		5	7	9	11	13	15
200	%N1	92.5	94.5	96.5			
	MACH	.358	.371	.385			
	KIAS	216	216	216			
	FF/ENG	8649	8653	8728			
180	%N1	89.6	91.6	93.6	95.6	97.9	
	MACH	.346	.359	.373	.387	.402	
	KIAS	209	209	209	209	209	
	FF/ENG	7860	7852	7900	7957	8109	
160	%N1	86.5	88.5	90.5	92.5	94.5	96.7
	MACH	.334	.346	.359	.373	.388	.403
	KIAS	202	202	202	202	202	202
	FF/ENG	7101	7080	7111	7147	7207	7327
140	%N1	83.1	85.1	87.1	89.1	91.1	93.0
	MACH	.321	.333	.345	.359	.373	.387
	KIAS	194	194	194	194	194	194
	FF/ENG	6375	6348	6356	6373	6409	6461

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	186	174	163	154	146
529	462	406	363	329	300	279	261	244	230	218
710	620	544	486	440	400	372	347	325	306	289
891	777	681	608	550	500	465	433	405	381	361
1074	936	819	730	660	600	557	519	486	457	432
1258	1095	957	853	771	700	650	606	567	533	504
1443	1255	1096	976	881	800	743	692	647	608	575
1629	1415	1235	1099	992	900	836	778	727	683	646
1815	1576	1374	1222	1102	1000	928	864	808	759	717
2003	1737	1515	1346	1213	1100	1021	950	888	834	788
2191	1900	1655	1470	1324	1200	1114	1036	968	909	859
2381	2062	1795	1593	1435	1300	1206	1122	1048	984	930
2571	2226	1936	1717	1546	1400	1298	1207	1127	1058	1000
2763	2390	2077	1841	1658	1500	1391	1293	1207	1133	1070
2955	2554	2219	1966	1769	1600	1483	1379	1287	1207	1140

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	6.6	0:54	6.3	0:53	6.1	0:51	5.8	0:51	5.7	0:49
300	10.0	1:21	9.6	1:19	9.3	1:16	9.0	1:15	8.8	1:13
400	13.4	1:47	12.9	1:45	12.6	1:42	12.2	1:39	11.9	1:37
500	16.7	2:15	16.2	2:11	15.7	2:07	15.3	2:04	15.0	2:01
600	20.0	2:42	19.4	2:37	18.9	2:33	18.3	2:29	18.0	2:25
700	23.3	3:09	22.6	3:04	22.0	2:58	21.4	2:54	21.0	2:49
800	26.6	3:36	25.8	3:30	25.1	3:24	24.4	3:19	24.0	3:13
900	29.7	4:04	28.9	3:57	28.1	3:50	27.4	3:44	26.9	3:37
1000	32.9	4:32	32.0	4:24	31.1	4:16	30.3	4:09	29.8	4:02
1100	36.1	5:00	35.0	4:51	34.1	4:43	33.2	4:35	32.6	4:27
1200	39.2	5:28	38.0	5:18	37.1	5:09	36.1	5:00	35.4	4:51
1300	42.2	5:57	41.0	5:46	40.0	5:36	38.9	5:26	38.2	5:16
1400	45.3	6:25	44.0	6:14	42.9	6:02	41.8	5:52	41.0	5:42
1500	48.3	6:54	46.9	6:42	45.7	6:29	44.6	6:18	43.7	6:07
1600	51.3	7:23	49.8	7:09	48.5	6:56	47.3	6:44	46.4	6:32



GEAR DOWN  
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time  
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	140	160	180	200	220	240
5	-0.6	-0.3	0.0	0.5	1.1	1.7
10	-1.2	-0.6	0.0	1.0	2.2	3.5
15	-1.8	-0.9	0.0	1.5	3.3	5.2
20	-2.4	-1.2	0.0	1.9	4.3	6.8
25	-2.9	-1.5	0.0	2.3	5.2	8.3
30	-3.5	-1.8	0.0	2.7	6.1	9.7
35	-4.1	-2.1	0.0	3.1	6.8	11.1
40	-4.7	-2.4	0.0	3.4	7.6	12.3
45	-5.3	-2.7	0.0	3.7	8.2	13.4
50	-5.9	-3.0	0.0	4.0	8.8	14.4
55	-6.4	-3.3	0.0	4.3	9.3	15.3

APU fuel included.

Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
200	%N1	89.0	92.5		
	KIAS	216	216		
	FF/ENG	9240	9080		
180	%N1	86.1	89.6	94.6	
	KIAS	209	209	209	
	FF/ENG	8370	8250	8320	
160	%N1	83.2	86.5	91.5	96.7
	KIAS	202	202	202	202
	FF/ENG	7540	7460	7480	7690
140	%N1	80.1	83.1	88.2	93.0
	KIAS	194	194	194	194
	FF/ENG	6740	6690	6680	6780

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**

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**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.

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**General****Flight with Unreliable Airspeed / Turbulent Air Penetration**

Body attitude and average %N1 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.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

**Max Climb %N1**

This table shows Max Climb %N1 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 %N1. %N1 adjustments are shown for anti-ice operation.

**VREF Speeds**

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

---

## Advisory Information

### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. Landing distances for slippery runways are 115% of the actual landing distances.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, 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.

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## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

---

## Engine Inoperative

### Initial Max Continuous %N1

The Initial Max Continuous %N1 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 %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

### Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

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 %N1, 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 autoland 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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**Performance Inflight - QRH**      **Chapter PI-QRH**  
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**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 KG)			
		160	200	240	280
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>4.0</b> 1600	<b>3.5</b> 800		
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>4.5</b> 2300	<b>4.5</b> 1600	<b>4.0</b> 1100	<b>4.5</b> 700
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>7.5</b> 3700	<b>7.0</b> 2700	<b>6.5</b> 2100	<b>6.5</b> 1600
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>10.0</b> 4500	<b>8.5</b> 3400	<b>8.0</b> 2700	<b>8.0</b> 2100
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>12.0</b> 5100	<b>10.5</b> 3900	<b>9.5</b> 3100	<b>9.0</b> 2500

**Cruise**

**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82 M)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.0</b> 1.129 (79.0)	<b>2.5</b> 1.249 (83.4)		
35000 (280 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>1.5</b> 1.065 (76.7)	<b>2.0</b> 1.118 (78.9)	<b>2.5</b> 1.203 (82.3)	<b>3.0</b> 1.356 (87.2)
30000 (280 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>1.5</b> 1.021 (73.1)	<b>2.0</b> 1.059 (75.2)	<b>3.0</b> 1.119 (78.2)	<b>3.5</b> 1.196 (81.7)
25000 (280 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>1.5</b> 0.997 (69.7)	<b>2.0</b> 1.024 (71.7)	<b>3.0</b> 1.067 (74.4)	<b>3.5</b> 1.124 (77.5)
20000 (270 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.0</b> 0.986 (65.2)	<b>2.5</b> 1.008 (67.7)	<b>3.0</b> 1.039 (70.5)	<b>4.0</b> 1.081 (73.6)
15000 (270 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>1.5</b> 0.977 (61.8)	<b>2.5</b> 0.994 (64.0)	<b>3.0</b> 1.018 (66.8)	<b>4.0</b> 1.048 (70.0)

## 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 KG)			
		160	200	240	280
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -2500	<b>-0.5</b> -2400		
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> -1900	<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>0.5</b> -1600	<b>1.5</b> -1600
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1700	<b>-0.5</b> -1500	<b>0.5</b> -1400	<b>1.5</b> -1400
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1500	<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 KG)			
		160	200	240	280
10000	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	EPR	1.004	1.017	1.029	1.040
	(Alt Mode %N1)	(51.3)	(56.8)	(61.7)	(65.9)
	KIAS	202	216	234	253
5000	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	EPR	0.999	1.009	1.019	1.027
	(Alt Mode %N1)	(47.4)	(52.6)	(57.4)	(61.8)
	KIAS	202	216	233	251

### Terminal Area (5000 FT)

#### Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 0 (GEAR UP) (VREF30 + 80)	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>
	EPR	1.000	1.010	1.020	1.040
	(Alt Mode %N1)	(48.3)	(53.9)	(58.8)	(63.2)
	KIAS	201	216	229	241
FLAPS 1 (GEAR UP) (VREF30 + 60)	<b>PITCH ATT</b>	<b>6.0</b>	<b>6.5</b>	<b>7.0</b>	<b>7.0</b>
	EPR	1.020	1.030	1.050	1.060
	(Alt Mode %N1)	(49.5)	(55.4)	(60.9)	(65.4)
	KIAS	181	196	209	221
FLAPS 5 (GEAR UP) (VREF30 + 40)	<b>PITCH ATT</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>	<b>6.0</b>
	EPR	1.030	1.050	1.070	1.090
	(Alt Mode %N1)	(50.1)	(57.2)	(62.4)	(66.7)
	KIAS	161	176	189	201
FLAPS 15 (GEAR UP) (VREF30 + 20)	<b>PITCH ATT</b>	<b>6.0</b>	<b>6.0</b>	<b>6.5</b>	<b>6.5</b>
	EPR	1.040	1.060	1.090	1.110
	(Alt Mode %N1)	(51.5)	(58.9)	(64.4)	(68.9)
	KIAS	141	156	169	181
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	1.070	1.100	1.130	1.170
	(Alt Mode %N1)	(58.6)	(65.7)	(70.6)	(74.9)
	KIAS	141	156	169	181



**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	0.84	0.84	0.84
60	1.132	1.122	1.127	1.146	1.166	1.159	1.152	1.174	1.178	1.170
50	1.168	1.161	1.147	1.146	1.166	1.159	1.152	1.174	1.178	1.170
40	1.209	1.205	1.191	1.184	1.173	1.159	1.152	1.174	1.178	1.170
30	1.217	1.253	1.243	1.237	1.228	1.196	1.157	1.174	1.178	1.170
20	1.217	1.253	1.284	1.298	1.292	1.259	1.228	1.191	1.178	1.170
10	1.217	1.253	1.284	1.329	1.364	1.337	1.307	1.273	1.260	1.257
0	1.217	1.253	1.284	1.329	1.374	1.399	1.402	1.367	1.351	1.348
-10	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.482	1.468	1.465
-15 & BELOW	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.506	1.521	1.518

**EPR Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003	-0.004	-0.005
ENGINE & WING*	-0.010	-0.012	-0.018	-0.020	-0.012	-0.012	-0.011	-0.014	-0.017	-0.019
ENGINE & WING**	-0.012	-0.014	-0.021	-0.025	-0.018	-0.019	-0.020	-0.024	-0.029	-0.033

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, single bleed source and both packs off.

VREF

Flaps 30

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
300	164	164	165	165	165	166
280	159	159	159	160	160	161
260	154	154	154	154	155	155
240	148	148	148	148	148	149
220	142	142	142	142	142	142
200	135	135	135	135	135	135
180	128	128	128	128	128	128
160	123	121	121	121	121	121
140	123	121	118	116	114	113

Flaps 25

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
300	172	172	173	173	173	173
280	167	167	167	167	167	168
260	162	162	162	162	162	162
240	155	155	156	156	156	156
220	149	149	149	149	149	149
200	142	142	142	142	142	142
180	134	134	134	135	135	135
160	127	127	127	127	127	127
140	123	121	118	118	118	118

Flaps 20

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
300	178	178	179	179	180	181
280	173	173	173	173	174	174
260	167	167	168	168	168	168
240	161	161	161	161	161	162
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	139	139	139	139	139	139
160	131	131	131	131	131	131
140	123	122	122	123	123	123

Intentionally  
Blank



# Performance Inflight - QRH

## Advisory Information

# Chapter PI-QRH

## Section 21

### ADVISORY INFORMATION

#### Normal Configuration Landing Distance

##### Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	885	+25/-5	20	-35/+125	+10/-10	+20/-20	35	10	25
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1455	+25/-10	40	-70/+245	0/-5	+40/-40	80	0	0
AUTOBRAKE 3	1735	+30/-10	45	-90/+305	+10/-10	+50/-50	95	0	0
AUTOBRAKE 2	1940	+40/-20	55	-100/+355	+15/-30	+55/-55	95	5	5
AUTOBRAKE 1	2090	+45/-25	65	-115/+395	+40/-55	+60/-60	85	90	90

#### Good Reported Braking Action

MAX MANUAL	1220	+20/-10	30	-60/+215	+30/-25	+30/-30	50	55	125
AUTOBRAKE MAX	1300	+25/-10	35	-65/+225	+25/-20	+30/-30	60	55	130
AUTOBRAKE 4	1460	+25/-10	40	-70/+250	+10/-5	+40/-40	80	5	25
AUTOBRAKE 3	1735	+30/-10	45	-90/+305	+10/-10	+50/-50	95	0	0
AUTOBRAKE 2	1940	+40/-20	55	-100/+355	+15/-30	+55/-55	95	5	5
AUTOBRAKE 1	2090	+45/-25	65	-115/+395	+40/-55	+60/-60	85	90	90

#### Medium Reported Braking Action

MAX MANUAL	1640	+35/-20	50	-95/+350	+75/-60	+40/-40	65	160	390
AUTOBRAKE MAX	1650	+35/-15	50	-95/+355	+70/-50	+40/-40	75	150	385
AUTOBRAKE 4	1670	+35/-15	50	-95/+355	+75/-55	+45/-45	70	165	400
AUTOBRAKE 3	1825	+35/-15	50	-105/+375	+50/-30	+50/-50	95	80	285
AUTOBRAKE 2	1990	+40/-20	55	-110/+400	+45/-45	+55/-55	95	45	180
AUTOBRAKE 1	2115	+45/-25	65	-120/+425	+65/-65	+60/-60	85	110	185

#### Poor Reported Braking Action

MAX MANUAL	2100	+45/-30	70	-140/+550	+175/-115	+55/-55	75	345	945
AUTOBRAKE MAX	2105	+50/-30	70	-140/+550	+175/-115	+55/-55	75	345	945
AUTOBRAKE 4	2120	+50/-30	70	-140/+550	+175/-120	+55/-55	75	350	955
AUTOBRAKE 3	2140	+50/-25	70	-140/+555	+175/-100	+55/-55	85	345	950
AUTOBRAKE 2	2225	+50/-30	70	-145/+565	+150/-100	+60/-60	95	260	860
AUTOBRAKE 1	2300	+50/-30	75	-150/+580	+155/-110	+60/-60	85	285	800

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 60 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 25**

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	925	+25/-10	20	-35/+130	+10/-10	+20/-20	35	15	30
AUTOBRAKE MAX	1260	+20/-15	30	-55/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1565	+30/-20	40	-75/+255	0/-5	+40/-40	85	0	0
AUTOBRAKE 3	1875	+35/-25	50	-95/+315	+10/-10	+55/-55	100	0	0
AUTOBRAKE 2	2080	+45/-35	60	-105/+365	+25/-40	+60/-60	90	30	30
AUTOBRAKE 1	2215	+50/-40	70	-120/+410	+50/-60	+60/-60	85	145	150

**Good Reported Braking Action**

MAX MANUAL	1280	+25/-15	35	-60/+220	+30/-25	+30/-30	50	65	145
AUTOBRAKE MAX	1370	+25/-15	35	-65/+230	+25/-25	+35/-35	60	70	155
AUTOBRAKE 4	1570	+30/-20	40	-75/+260	+10/-5	+40/-40	85	5	25
AUTOBRAKE 3	1875	+35/-25	50	-95/+315	+10/-10	+55/-55	100	0	0
AUTOBRAKE 2	2080	+45/-35	60	-105/+365	+25/-40	+60/-60	90	30	30
AUTOBRAKE 1	2215	+50/-40	70	-120/+410	+50/-60	+60/-60	85	145	150

**Medium Reported Braking Action**

MAX MANUAL	1720	+35/-30	50	-95/+360	+75/-60	+45/-45	65	180	460
AUTOBRAKE MAX	1735	+35/-25	50	-95/+360	+70/-55	+45/-45	75	175	450
AUTOBRAKE 4	1760	+35/-25	50	-100/+360	+75/-50	+45/-45	75	180	465
AUTOBRAKE 3	1960	+40/-25	55	-105/+390	+50/-35	+55/-55	100	80	305
AUTOBRAKE 2	2130	+45/-35	65	-115/+415	+55/-55	+60/-60	90	70	215
AUTOBRAKE 1	2240	+50/-40	70	-125/+435	+75/-70	+65/-65	85	170	250

**Poor Reported Braking Action**

MAX MANUAL	2200	+50/-40	70	-145/+560	+175/-115	+55/-55	75	390	1105
AUTOBRAKE MAX	2205	+50/-40	75	-145/+560	+180/-120	+60/-60	75	390	1105
AUTOBRAKE 4	2220	+50/-40	75	-145/+560	+175/-120	+60/-60	75	395	1115
AUTOBRAKE 3	2255	+50/-35	75	-145/+565	+170/-95	+60/-60	95	370	1095
AUTOBRAKE 2	2360	+50/-40	75	-150/+580	+155/-105	+65/-65	90	290	985
AUTOBRAKE 1	2430	+55/-45	80	-155/+590	+165/-115	+65/-65	85	345	935

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 60 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 20**

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	965	+30/-15	20	-40/+130	+10/-10	+20/-20	35	15	35
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1655	+30/-30	45	-75/+260	0/-5	+45/-45	90	0	0
AUTOBRAKE 3	1990	+40/-35	55	-95/+330	+5/-10	+55/-55	105	0	0
AUTOBRAKE 2	2215	+45/-45	65	-110/+380	+20/-40	+65/-65	100	30	30
AUTOBRAKE 1	2365	+55/-50	75	-125/+425	+50/-65	+65/-65	95	145	150

**Good Reported Braking Action**

MAX MANUAL	1345	+25/-20	35	-65/+225	+35/-30	+30/-35	50	75	170
AUTOBRAKE MAX	1435	+25/-25	40	-65/+235	+30/-25	+35/-35	60	75	180
AUTOBRAKE 4	1660	+30/-30	45	-80/+270	+5/-5	+45/-45	90	5	30
AUTOBRAKE 3	1990	+40/-35	55	-95/+330	+5/-10	+55/-55	105	0	0
AUTOBRAKE 2	2215	+45/-45	65	-110/+380	+20/-40	+65/-65	100	30	30
AUTOBRAKE 1	2365	+55/-50	75	-125/+425	+50/-65	+65/-65	95	145	150

**Medium Reported Braking Action**

MAX MANUAL	1820	+40/-35	55	-100/+370	+80/-65	+45/-45	65	210	540
AUTOBRAKE MAX	1830	+40/-35	55	-100/+370	+80/-60	+50/-50	75	200	530
AUTOBRAKE 4	1865	+40/-35	55	-100/+370	+75/-55	+50/-50	80	205	545
AUTOBRAKE 3	2080	+40/-35	60	-110/+400	+45/-35	+55/-60	105	90	370
AUTOBRAKE 2	2265	+45/-45	70	-120/+425	+55/-55	+65/-65	100	70	250
AUTOBRAKE 1	2390	+55/-50	80	-130/+450	+75/-75	+70/-70	95	170	265

**Poor Reported Braking Action**

MAX MANUAL	2335	+55/-50	80	-150/+575	+185/-125	+60/-60	75	450	1305
AUTOBRAKE MAX	2340	+55/-50	80	-150/+575	+190/-125	+60/-60	75	450	1310
AUTOBRAKE 4	2355	+55/-50	80	-150/+575	+185/-125	+60/-60	80	455	1320
AUTOBRAKE 3	2400	+55/-50	80	-150/+580	+175/-105	+65/-65	95	425	1295
AUTOBRAKE 2	2505	+55/-50	80	-155/+595	+160/-110	+70/-70	100	330	1185
AUTOBRAKE 1	2585	+60/-55	85	-160/+605	+170/-125	+70/-70	95	370	1100

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Dry Runway**

		LANDING DISTANCES AND ADJUSTMENTS (M)								
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
		180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1580	35/-35	50	-90/355	75/-55	20/-20	120	170	435
ANTISKID (FLAPS 30)	VREF30	1505	35/-35	45	-90/345	70/-50	20/-20	120	145	370
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	915	25/-15	20	-35/130	10/-10	10/-10	75	-	20
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	835	25/-15	20	-35/125	10/-10	10/-10	70	-	10
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1060	40/-15	25	-45/150	15/-10	15/-15	75	30	65
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	960	25/-15	20	-35/135	10/-10	10/-10	65	20	45
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	905	25/-15	20	-35/130	10/-10	10/-10	65	15	35
FLAPS PRIMARY FAIL	VREF20	1015	25/-15	20	-40/140	10/-10	10/-10	85	20	45
FLAP/SLAT CONTROL	VREF20	900	25/-15	20	-35/130	10/-10	10/-10	65	15	35
FLIGHT CONTROL MODE	VREF20	1040	25/-15	25	-45/145	10/-10	10/-10	90	20	45
HYD PRESS SYS C	VREF20	1015	25/-15	20	-40/140	10/-10	10/-10	85	20	45
HYD PRESS SYS L+C	VREF30+20	1165	25/-20	25	-45/160	20/-15	15/-15	110	-	35
HYD PRESS SYS L+R	VREF30+20	1255	25/-20	30	-55/190	30/-25	20/-20	130	-	-
HYD PRESS SYS R+C	VREF30+20	1440	25/-25	35	-65/220	35/-30	20/-20	150	-	90
HYD PRESS SYS L (FLAPS 25)	VREF25	920	25/-15	20	-40/135	10/-10	10/-10	80	-	20
HYD PRESS SYS L (FLAPS 30)	VREF30	880	25/-15	20	-35/130	10/-10	10/-10	80	-	15
HYD PRESS SYS R (FLAPS 25)	VREF25	1015	20/-15	25	-45/160	20/-15	10/-10	95	-	30
HYD PRESS SYS R (FLAPS 30)	VREF30	960	15/-15	20	-45/155	20/-15	10/-10	90	-	25
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1055	35/-15	25	-45/145	10/-10	15/-15	65	25	60
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	935	25/-15	20	-35/135	10/-10	10/-10	65	20	40
PRI FLIGHT COMPUTERS	VREF20	1040	25/-15	25	-45/145	10/-10	10/-10	90	20	45
SLATS DRIVE	VREF30+30	1050	25/-15	25	-40/140	10/-10	10/-10	75	25	50
STABILIZER	VREF30+20	975	25/-15	20	-35/135	10/-10	10/-10	70	20	45

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (305 meters air distance).

Assumes maximum manual braking and maximum available reverse thrust.

### Good Reported Braking Action

**Assumes maximum manual braking and maximum available reverse thrust.**

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Medium Reported Braking Action**

EICAS MESSAGE	VREF	LANDING DISTANCES AND ADJUSTMENTS (M)							
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
		180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV NO REV
ANTISKID (FLAPS 25)	VREF25	2000	50/-45	65	-135/560	175/-105	25/-25	135	365 1050
ANTISKID (FLAPS 30)	VREF30	1915	50/-45	65	-130/550	175/-105	25/-25	135	325 900
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1815	45/-45	55	-105/385	100/-75	25/-25	140	- 290
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1610	35/-35	45	-100/370	85/-65	25/-25	130	- 205
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2015	45/-45	65	-105/390	80/-65	30/-30	125	295 825
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1785	40/-40	55	-95/365	75/-60	25/-25	120	240 650
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1665	40/-40	50	-90/360	75/-60	25/-25	120	195 510
FLAPS PRIMARY FAIL	VREF20	1815	45/-45	55	-100/380	80/-65	25/-25	145	230 615
FLAP/SLAT CONTROL	VREF20	1645	35/-35	50	-90/355	70/-55	25/-25	120	185 485
FLIGHT CONTROL MODE	VREF20	1870	45/-45	60	-100/385	90/-65	25/-25	155	255 695
HYD PRESS SYS C	VREF20	1815	45/-45	55	-100/380	80/-65	25/-25	145	230 615
HYD PRESS SYS L+C	VREF30+20	2345	50/-50	80	-130/470	145/-105	35/-35	200	- 525
HYD PRESS SYS L+R	VREF30+20	2730	55/-55	80	-155/560	265/-170	45/-45	245	- -
HYD PRESS SYS R+C	VREF30+20	2395	55/-50	75	-130/480	160/-115	35/-35	215	- 565
HYD PRESS SYS L (FLAPS 25)	VREF25	1860	45/-40	60	-110/420	115/-80	25/-25	155	- 325
HYD PRESS SYS L (FLAPS 30)	VREF30	1770	40/-40	50	-105/410	115/-80	25/-25	160	- 275
HYD PRESS SYS R (FLAPS 25)	VREF25	1850	45/-40	55	-110/420	115/-80	25/-25	155	- 315
HYD PRESS SYS R (FLAPS 30)	VREF30	1730	40/-35	50	-105/405	110/-75	25/-25	150	- 255
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1965	40/-40	60	-100/380	75/-60	25/-25	115	255 685
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1725	35/-35	50	-95/360	70/-55	25/-25	115	195 500
PRI FLIGHT COMPUTERS	VREF20	1870	45/-45	60	-100/385	90/-65	25/-25	155	255 695
SLATS DRIVE	VREF30+30	1920	40/-40	60	-100/380	80/-65	25/-25	125	240 630
STABILIZER	VREF30+20	1790	40/-40	55	-100/370	75/-60	25/-25	120	215 570

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (305 meters air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Poor Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	180000 KG LDG WT	PER 5000 KG ABV/BLW 180000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2715	75/-70	100	-230/1120	700/-255	40/-40	150	1010	5000
ANTISKID (FLAPS 30)	VREF30	2610	75/-65	95	-230/1110	670/-250	35/-35	150	925	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2430	65/-65	80	-160/620	255/-150	35/-35	170	-	730
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2145	55/-55	65	-145/605	225/-135	35/-35	155	-	510
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2565	65/-60	95	-150/605	200/-120	35/-35	150	620	2050
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2265	55/-55	75	-140/580	185/-110	35/-35	145	500	1585
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2120	55/-55	70	-135/560	170/-105	30/-30	140	420	1240
FLAPS PRIMARY FAIL	VREF20	2280	60/-60	75	-145/580	185/-120	35/-35	160	480	1480
FLAP/SLAT CONTROL	VREF20	2090	55/-55	70	-135/555	170/-105	30/-30	135	400	1175
FLIGHT CONTROL MODE	VREF20	2355	65/-65	80	-145/595	200/-125	35/-35	175	530	1700
HYD PRESS SYS C	VREF20	2280	60/-60	75	-145/580	185/-120	35/-35	160	480	1480
HYD PRESS SYS L+C	VREF30+20	3160	75/-75	110	-200/780	395/-225	50/-50	230	-	1340
HYD PRESS SYS L+R	VREF30+20	4240	85/-80	120	-275/1075	1120/-440	75/-75	310	-	-
HYD PRESS SYS R+C	VREF30+20	3200	75/-75	115	-200/790	445/-230	50/-50	245	-	1400
HYD PRESS SYS L (FLAPS 25)	VREF25	2525	65/-60	80	-175/705	340/-175	40/-40	185	-	840
HYD PRESS SYS L (FLAPS 30)	VREF30	2415	60/-55	80	-170/700	340/-175	35/-35	185	-	730
HYD PRESS SYS R (FLAPS 25)	VREF25	2490	65/-60	80	-175/705	330/-175	40/-40	180	-	805
HYD PRESS SYS R (FLAPS 30)	VREF30	2330	55/-55	75	-165/685	315/-160	35/-35	175	-	655
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2475	55/-55	85	-145/595	175/-115	35/-35	130	525	1605
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2185	55/-55	75	-135/575	170/-105	30/-30	130	410	1200
PRI FLIGHT COMPUTERS	VREF20	2355	65/-65	80	-145/595	200/-125	35/-35	175	530	1700
SLATS DRIVE	VREF30+30	2410	55/-55	80	-145/585	185/-120	35/-35	140	490	1445
STABILIZER	VREF30+20	2255	55/-55	75	-140/575	175/-115	35/-35	140	450	1335

**Actual (unfactored) distances are shown.****Includes distances from 50 ft above threshold (305 meters air distance).****Assumes maximum manual braking and maximum available reverse thrust.**

**ADVISORY INFORMATION****Recommended Brake Cooling Schedule****Reference Brake Energy (Millions of Foot Pounds)**

		BRAKES ON SPEED (KIAS)																																			
		80						100						120						140						160						180					
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																																			
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8												
300	0	17.3	19.1	21.2	26.1	29.1	32.6	36.4	40.8	46.0	47.9	53.9	61.0	60.4	68.1	77.1	73.2	82.4	93.0																		
	10	17.9	19.7	21.8	27.0	30.0	33.7	37.6	42.1	47.5	49.5	55.7	63.0	62.4	70.4	79.6	75.6	85.0	95.8																		
	15	18.2	20.0	22.2	27.4	30.5	34.2	38.2	42.9	48.3	50.3	56.7	64.1	63.5	71.5	80.8	76.8	86.3	97.2																		
	20	18.4	20.3	22.5	27.9	31.0	34.8	38.9	43.6	49.1	51.2	57.6	65.1	64.5	72.7	82.1	78.0	87.6	98.5																		
	30	18.8	20.8	23.1	28.6	31.8	35.7	39.9	44.7	50.5	52.6	59.2	66.9	66.3	74.7	84.3	80.2	90.0	101.1																		
	40	19.1	21.0	23.4	29.0	32.4	36.3	40.6	45.6	51.5	53.7	60.5	68.4	67.8	76.4	86.3	82.0	92.0	103.3																		
280	0	16.4	18.0	20.0	24.7	27.4	30.7	34.3	38.4	43.2	45.1	50.7	57.3	56.9	64.1	72.6	69.0	77.8	87.9																		
	10	16.9	18.6	20.6	25.5	28.3	31.7	35.4	39.7	44.7	46.6	52.4	59.3	58.8	66.3	74.9	71.3	80.3	90.6																		
	15	17.2	18.9	20.9	25.9	28.8	32.2	36.0	40.4	45.5	47.4	53.3	60.3	59.8	67.4	76.2	72.5	81.6	92.0																		
	20	17.4	19.2	21.3	26.3	29.3	32.8	36.6	41.0	46.2	48.2	54.2	61.2	60.7	68.5	77.3	73.6	82.8	93.3																		
	30	17.8	19.6	21.8	27.0	30.0	33.6	37.6	42.1	47.5	49.5	55.7	63.0	62.5	70.4	79.5	75.7	85.1	95.8																		
	40	18.0	19.8	22.0	27.4	30.5	34.2	38.3	42.9	48.4	50.5	56.9	64.4	63.8	72.0	81.3	77.4	87.0	97.9																		
260	0	15.5	17.0	18.8	23.2	25.8	28.8	32.2	36.0	40.5	42.3	47.5	53.7	53.3	60.0	67.9	64.7	73.0	82.6																		
	10	15.9	17.5	19.4	24.0	26.6	29.7	33.3	37.2	41.9	43.7	49.1	55.5	55.0	62.0	70.2	66.9	75.4	85.1																		
	15	16.2	17.8	19.7	24.4	27.0	30.2	33.8	37.8	42.6	44.4	49.9	56.4	56.0	63.1	71.3	68.0	76.6	86.5																		
	20	16.5	18.1	20.0	24.8	27.5	30.7	34.4	38.5	43.3	45.2	50.8	57.3	56.9	64.1	72.5	69.1	77.8	87.8																		
	30	16.8	18.5	20.4	25.4	28.2	31.5	35.3	39.5	44.5	46.4	52.2	58.9	58.5	65.9	74.5	71.0	79.9	90.1																		
	40	17.0	18.7	20.7	25.7	28.6	32.0	35.9	40.2	45.3	47.3	53.3	60.2	59.8	67.4	76.2	72.6	81.8	92.2																		
240	0	14.6	15.9	17.6	21.8	24.1	26.9	30.1	33.6	37.8	39.4	44.2	49.9	49.6	55.8	63.2	60.3	68.0	76.9																		
	10	15.0	16.4	18.1	22.5	24.9	27.8	31.1	34.7	39.0	40.7	45.7	51.6	51.2	57.7	65.3	62.3	70.2	79.4																		
	15	15.2	16.7	18.4	22.8	25.3	28.3	31.6	35.3	39.7	41.4	46.5	52.5	52.1	58.7	66.3	63.3	71.4	80.7																		
	20	15.5	16.9	18.7	23.2	25.7	28.7	32.1	35.9	40.3	42.1	47.3	53.3	53.0	59.7	67.4	64.4	72.5	81.9																		
	30	15.8	17.3	19.2	23.7	26.3	29.4	32.9	36.8	41.4	43.2	48.6	54.8	54.4	61.3	69.3	66.2	74.6	84.2																		
	40	15.9	17.5	19.4	24.1	26.7	29.9	33.5	37.5	42.2	44.1	49.6	56.0	55.6	62.7	70.9	67.7	76.3	86.1																		
220	0	13.6	14.9	16.4	20.3	22.4	25.0	28.0	31.2	35.0	36.5	40.9	46.1	45.8	51.6	58.3	55.7	62.8	71.1																		
	10	14.1	15.4	16.9	20.9	23.2	25.8	28.9	32.2	36.1	37.7	42.3	47.7	47.3	53.3	60.2	57.6	64.9	73.4																		
	15	14.3	15.6	17.2	21.3	23.5	26.2	29.4	32.7	36.7	38.4	43.0	48.5	48.2	54.2	61.2	58.5	66.0	74.6																		
	20	14.5	15.9	17.5	21.6	23.9	26.7	29.8	33.3	37.3	39.0	43.7	49.3	49.0	55.1	62.2	59.5	67.0	75.8																		
	30	14.8	16.2	17.9	22.1	24.5	27.3	30.6	34.1	38.3	40.0	44.9	50.6	50.3	56.6	64.0	61.2	68.9	77.9																		
	40	14.9	16.3	18.1	22.4	24.8	27.7	31.1	34.7	39.0	40.8	45.8	51.7	51.3	57.9	65.4	62.5	70.5	79.7																		
200	0	12.7	13.9	15.3	18.8	20.8	23.1	25.8	28.7	32.2	33.6	37.5	42.3	42.0	47.2	53.3	51.0	57.4	65.0																		
	10	13.1	14.3	15.7	19.4	21.4	23.8	26.6	29.6	33.2	34.7	38.8	43.7	43.4	48.8	55.1	52.7	59.4	67.1																		
	15	13.3	14.5	16.0	19.7	21.8	24.2	27.1	30.1	33.8	35.2	39.5	44.4	44.1	49.6	56.0	53.6	60.4	68.2																		
	20	13.5	14.8	16.3	20.0	22.1	24.6	27.5	30.6	34.3	35.8	40.1	45.2	44.9	50.4	56.9	54.5	61.3	69.3																		
	30	13.8	15.1	16.6	20.5	22.6	25.2	28.2	31.4	35.2	36.8	41.2	46.4	46.1	51.8	58.5	56.0	63.1	71.3																		
	40	13.9	15.2	16.8	20.8	22.9	25.6	28.6	31.9	35.8	37.4	42.0	47.3	47.0	52.9	59.8	57.2	64.5	72.9																		
180	0	11.8	12.9	14.1	17.4	19.1	21.2	23.6	26.2	29.3	30.6	34.1	38.4	38.1	42.7	48.2	46.1	51.9	58.6																		
	10	12.2	13.3	14.6	17.9	19.7	21.9	24.4	27.1	30.3	31.6	35.3	39.6	39.3	44.1	49.8	47.6	53.6	60.6																		
	15	12.4	13.5	14.8	18.2	20.0	22.2	24.8	27.5	30.8	32.1	35.9	40.3	40.0	44.9	50.7	48.5	54.5	61.6																		
	20	12.6	13.7	15.0	18.5	20.3	22.6	25.2	28.0	31.3	32.6	36.4	41.0	40.7	45.6	51.5	49.2	55.4	62.6																		
	30	12.8	14.0	15.3	18.9	20.8	23.1	25.8	28.7	32.1	33.5	37.4	42.1	41.8	46.9	52.9	50.6	57.0	64.4																		
	40	12.9	14.1	15.5	19.1	21.1	23.4	26.2	29.1	32.6	34.0	38.1	42.9	42.6	47.8	54.0	51.7	58.2	65.8																		

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**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.3	15.6	24.9	34.0	43.2	52.3	61.6	70.9	80.4
	MAX AUTO	6.1	14.4	22.8	31.3	40.0	49.0	58.2	67.7	77.6
	AUTOBRAKE 4	5.9	13.6	21.2	29.1	37.1	45.5	54.2	63.3	73.0
	AUTOBRAKE 3	5.6	12.7	19.7	26.9	34.2	41.9	49.8	58.3	67.3
	AUTOBRAKE 2	5.3	11.8	18.2	24.8	31.5	38.4	45.6	53.3	61.5
	AUTOBRAKE 1	5.2	11.0	16.8	22.8	28.9	35.2	41.9	48.9	56.4

**2 Engine Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.8	14.7	23.4	32.0	40.4	48.8	57.2	65.6	74.2
	MAX AUTO	4.3	11.6	18.9	26.4	34.1	42.0	50.2	58.9	68.0
	AUTOBRAKE 4	3.6	9.2	15.0	21.1	27.5	34.4	41.7	49.6	58.2
	AUTOBRAKE 3	2.5	6.6	11.1	15.9	21.0	26.7	32.8	39.5	46.8
	AUTOBRAKE 2	1.4	4.4	7.6	11.3	15.3	19.7	24.5	29.8	35.6
	AUTOBRAKE 1	1.0	3.0	5.3	7.8	10.6	13.9	17.5	21.7	26.4

**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
GEAR DOWN	NO SPECIAL	PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
INFLIGHT											
GROUND			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 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 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

## ADVISORY INFORMATION

### Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	258.6	243.7				
52	126	264.6	249.6				
50	122	270.9	255.3	236.3			
48	118	277.2	261.0	242.0			
46	115	283.6	266.6	247.5	227.9		
44	111	289.9	272.9	253.0	232.3		
42	108	294.5	279.4	258.3	236.5	219.7	
40	104	298.9	285.7	263.4	240.9	223.4	
38	100	303.1	290.9	268.8	244.9	226.8	209.6
36	97	307.2	296.1	273.9	249.0	230.3	212.9
34	93	311.2	300.9	278.2	253.1	233.7	216.1
32	90	311.3	305.3	282.4	256.9	237.2	219.3
30	86	311.3	309.7	286.6	260.6	240.8	222.4
28	82	311.4	309.7	290.4	264.4	244.5	225.8
26	79	311.4	309.7	294.1	267.9	248.0	229.2
24	75	311.5	309.8	294.9	271.1	251.4	232.5
22	72	311.6	309.8	294.9	274.2	253.5	234.1
20	68	311.6	309.9	294.9	274.8	254.5	235.5
18	64	311.6	309.9	295.0	274.9	255.6	237.2
16	61	311.6	310.0	295.1	274.9	256.1	239.0
14	57	311.7	310.0	295.1	275.0	256.1	240.5
12	54	311.7	310.1	295.2	275.0	256.2	240.6
10	50	311.8	310.2	295.2	275.1	256.2	240.7
-40	-40	312.9	311.5	296.6	276.3	257.3	241.7

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 900 kg.

With engine and wing anti-ice on, decrease weight by 1450 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature is below 10°C, decrease weight by 20800 kg.

**Performance Inflight - QRH****Chapter PI-QRH****Engine Inoperative****Section 22****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 & ABOVE	1.243	1.234	1.226	1.211	1.192	1.183	1.181	1.175	1.170
15	1.284	1.275	1.263	1.250	1.232	1.222	1.220	1.216	1.212
10	1.327	1.319	1.307	1.288	1.273	1.264	1.262	1.259	1.257
5	1.364	1.366	1.354	1.337	1.314	1.306	1.304	1.302	1.300
0	1.364	1.402	1.406	1.388	1.368	1.355	1.354	1.351	1.349
-5	1.364	1.402	1.439	1.444	1.424	1.412	1.411	1.408	1.406
-10	1.364	1.402	1.439	1.473	1.482	1.471	1.469	1.467	1.465
-15	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518
-20 & BELOW	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518

## ENGINE INOP

### Max Continuous EPR

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT			TAT (°C)										
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	1.531	1.531	1.531	1.531	1.531	1.489	1.436	1.385	1.341	1.302	1.263	1.233
240	0.74	1.534	1.534	1.534	1.534	1.534	1.517	1.455	1.402	1.349	1.308	1.268	
280	0.86	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.469	1.413	1.356	1.304
35000 FT PRESS ALT			TAT (°C)										
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	1.517	1.517	1.517	1.517	1.517	1.486	1.433	1.385	1.341	1.304	1.267	1.234
240	0.71	1.514	1.514	1.514	1.514	1.514	1.514	1.502	1.444	1.394	1.344	1.305	1.266
280	0.82	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.476	1.417	1.362	1.311
33000 FT PRESS ALT			TAT (°C)										
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.58	1.499	1.499	1.499	1.499	1.499	1.499	1.447	1.401	1.358	1.323	1.290	1.257
240	0.68	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.452	1.402	1.355	1.314	1.278
280	0.79	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.472	1.414	1.363	1.314
320	0.89	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.389	1.338
31000 FT PRESS ALT			TAT (°C)										
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	1.480	1.480	1.480	1.480	1.480	1.461	1.414	1.372	1.332	1.303	1.274	1.245
240	0.66	1.471	1.471	1.471	1.471	1.471	1.471	1.461	1.410	1.365	1.322	1.291	1.260
280	0.76	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.415	1.366	1.321	1.281
320	0.85	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.406	1.353	1.306
29000 FT PRESS ALT			TAT (°C)										
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	1.493	1.493	1.493	1.493	1.493	1.454	1.411	1.369	1.334	1.302	1.270	1.252
240	0.63	1.475	1.475	1.475	1.475	1.475	1.475	1.441	1.395	1.352	1.315	1.286	1.255
280	0.73	1.446	1.446	1.446	1.446	1.446	1.446	1.446	1.426	1.378	1.334	1.293	1.259
320	0.82	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.362	1.317	1.273
360	0.91	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.330	1.284

### EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	37	35	33	31	29
ENGINE ONLY	-0.004	-0.003	-0.003	-0.003	-0.003
ENGINE & WING*	-0.015	-0.014	-0.013	-0.012	-0.012
ENGINE & WING**	-0.026	-0.024	-0.022	-0.021	-0.020

\* 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****27000 FT to 20000 Pressure Altitudes**

27000 FT PRESS ALT		TAT (°C)											
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.51	1.507	1.507	1.507	1.507	1.507	1.499	1.452	1.409	1.368	1.336	1.302	1.268
240	0.60	1.488	1.488	1.488	1.488	1.488	1.488	1.483	1.434	1.391	1.349	1.317	1.286
280	0.70	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.398	1.355	1.314	1.279
320	0.79	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.368	1.323	1.282
360	0.88	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.325	1.281
25000 FT PRESS ALT		TAT (°C)											
CIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.49	1.521	1.521	1.521	1.521	1.521	1.496	1.450	1.407	1.369	1.337	1.303	1.278
240	0.58	1.502	1.502	1.502	1.502	1.502	1.502	1.477	1.431	1.389	1.350	1.316	1.282
280	0.67	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.430	1.384	1.344	1.305	1.273
320	0.76	1.386	1.386	1.386	1.386	1.386	1.386	1.386	1.386	1.380	1.335	1.296	1.257
360	0.85	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.288	1.249
24000 FT PRESS ALT		TAT (°C)											
CIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.48	1.523	1.523	1.523	1.523	1.523	1.512	1.465	1.420	1.379	1.346	1.312	1.278
240	0.57	1.502	1.502	1.502	1.502	1.502	1.502	1.490	1.443	1.399	1.357	1.324	1.289
280	0.66	1.455	1.455	1.455	1.455	1.455	1.455	1.455	1.447	1.400	1.358	1.316	1.283
320	0.75	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.350	1.309	1.269
360	0.83	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.300	1.259
22000 FT PRESS ALT		TAT (°C)											
CIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.46	1.523	1.523	1.523	1.523	1.523	1.496	1.449	1.404	1.364	1.330	1.295	1.271
240	0.55	1.505	1.505	1.505	1.505	1.505	1.505	1.473	1.426	1.380	1.341	1.307	1.273
280	0.63	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.433	1.387	1.342	1.302	1.269
320	0.72	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.385	1.340	1.297	1.255
360	0.80	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.329	1.287	1.246
20000 FT PRESS ALT		TAT (°C)											
CIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.44	1.519	1.519	1.519	1.519	1.519	1.519	1.477	1.429	1.383	1.346	1.311	1.275
240	0.53	1.512	1.512	1.512	1.512	1.512	1.512	1.509	1.461	1.413	1.366	1.329	1.294
280	0.61	1.469	1.469	1.469	1.469	1.469	1.469	1.469	1.465	1.417	1.368	1.321	1.287
320	0.69	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.376	1.329	1.283
360	0.77	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.317	1.274

**EPR Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	27	25	24	22	20
ENGINE ONLY	-0.004	-0.005	-0.006	-0.007	-0.006
ENGINE & WING*	-0.012	-0.012	-0.012	-0.013	-0.012
ENGINE & WING**	-0.019	-0.019	-0.019	-0.019	-0.018

\* 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

18000 FT to 5000 FT Pressure Altitudes

18000 FT PRESS ALT			TAT (°C)											
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.42	1.511	1.511	1.511	1.511	1.511	1.500	1.455	1.411	1.369	1.337	1.305	1.275	
240	0.51	1.515	1.515	1.515	1.515	1.515	1.515	1.495	1.449	1.403	1.362	1.328	1.293	
280	0.59	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.447	1.400	1.354	1.313	1.282	
320	0.67	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.402	1.356	1.311	1.269	
360	0.75	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.349	1.305	1.262	
16000 FT PRESS ALT			TAT (°C)											
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.41	1.504	1.504	1.504	1.504	1.504	1.504	1.479	1.438	1.396	1.360	1.332	1.304	
240	0.49	1.511	1.511	1.511	1.511	1.511	1.511	1.511	1.477	1.432	1.389	1.354	1.322	
280	0.57	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.432	1.387	1.344	1.310	
320	0.64	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.384	1.340	1.296	
360	0.72	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.337	1.294	
14000 FT PRESS ALT			TAT (°C)											
KLAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35	
200	0.39	1.488	1.488	1.488	1.488	1.488	1.488	1.452	1.413	1.373	1.343	1.315	1.288	
240	0.47	1.491	1.491	1.491	1.491	1.491	1.491	1.484	1.444	1.402	1.361	1.330	1.298	
280	0.54	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.449	1.407	1.365	1.324	1.293	
320	0.62	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.400	1.357	1.315	1.275	
360	0.69	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.354	1.313	1.272	
12000 FT PRESS ALT			TAT (°C)											
KLAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
200	0.38	1.475	1.475	1.475	1.475	1.475	1.468	1.431	1.393	1.355	1.329	1.302	1.276	
240	0.45	1.473	1.473	1.473	1.473	1.473	1.473	1.453	1.415	1.375	1.339	1.308	1.277	
280	0.52	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.424	1.385	1.344	1.308	1.275	
320	0.60	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.373	1.333	1.292	1.257	
360	0.67	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.327	1.288	1.248	
10000 FT PRESS ALT			TAT (°C)											
KLAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
200	0.36	1.462	1.462	1.462	1.462	1.462	1.462	1.444	1.408	1.371	1.338	1.311	1.284	
240	0.43	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.421	1.383	1.345	1.313	1.283	
280	0.51	1.438	1.438	1.438	1.438	1.438	1.438	1.438	1.433	1.397	1.358	1.318	1.286	
320	0.58	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.382	1.344	1.305	1.265	
360	0.65	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.332	1.295	1.258	
5000 FT PRESS ALT			TAT (°C)											
KLAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45	
200	0.33	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.399	1.367	1.334	1.306	1.282	
240	0.40	1.400	1.400	1.400	1.400	1.400	1.400	1.400	1.394	1.361	1.328	1.295	1.269	
280	0.46	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.365	1.330	1.295	1.263	
320	0.53	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.323	1.288	1.253
360	0.59	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.270	1.237

**EPR Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	18	16	14	12	10	5
ENGINE ONLY	-0.010	-0.013	-0.015	-0.015	-0.015	-0.010
ENGINE & WING*	-0.015	-0.018	-0.019	-0.019	-0.018	-0.012
ENGINE & WING**	-0.021	-0.024	-0.024	-0.023	-0.022	-0.014

\* 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 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	282	17500	16100	14600
280	271	273	19400	18000	16600
260	252	264	21300	20000	18600
240	232	253	23300	22100	20700
220	213	243	25400	24200	22900
200	194	231	27400	26200	25100
180	174	219	29500	28300	27200
160	154	206	32200	30600	29500

**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
136	127	119	112	106	100	95	90	86	82	79
272	254	238	224	211	200	190	181	173	165	158
407	380	356	335	317	300	285	271	259	248	238
541	505	474	447	422	400	380	362	346	331	317
675	631	592	558	527	500	475	453	433	414	397
808	755	709	669	633	600	571	544	520	498	477
940	880	827	780	738	700	666	635	607	581	558
1072	1004	944	890	843	800	761	726	694	665	638
1204	1128	1061	1001	948	900	857	817	782	749	719
1335	1251	1177	1112	1053	1000	952	909	869	833	799
1467	1375	1294	1222	1158	1100	1048	1000	957	917	880
1598	1499	1411	1333	1263	1200	1143	1091	1044	1001	961
1729	1622	1527	1443	1368	1300	1239	1183	1132	1085	1042
1860	1746	1644	1554	1473	1400	1334	1274	1219	1169	1122
1992	1869	1761	1664	1578	1500	1429	1365	1306	1253	1203
2123	1993	1878	1775	1683	1600	1525	1456	1394	1336	1284
2255	2117	1995	1886	1788	1700	1620	1548	1481	1420	1364
2388	2241	2112	1997	1893	1800	1716	1639	1568	1504	1445

**Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)								
	160	180	200	220	240	260	280	300	
100	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	0:16
200	2.5	2.6	2.8	2.9	3.1	3.2	3.3	3.4	0:32
300	3.8	4.1	4.4	4.7	5.0	5.2	5.5	5.7	0:47
400	5.1	5.6	6.0	6.5	6.9	7.4	7.8	8.2	1:03
500	6.4	7.0	7.6	8.2	8.9	9.4	10.0	10.6	1:18
600	7.7	8.4	9.1	9.9	10.7	11.4	12.1	12.9	1:33
700	8.9	9.8	10.6	11.5	12.5	13.3	14.2	15.1	1:47
800	10.1	11.1	12.1	13.1	14.2	15.2	16.3	17.3	2:02
900	11.3	12.5	13.6	14.7	16.0	17.2	18.3	19.5	2:16
1000	12.5	13.8	15.1	16.4	17.7	19.1	20.4	21.6	2:31
1100	13.6	15.1	16.5	18.0	19.5	20.9	22.4	23.8	2:45
1200	14.8	16.4	18.0	19.5	21.2	22.8	24.4	25.9	2:59
1300	16.0	17.7	19.4	21.1	22.9	24.7	26.4	28.1	3:14
1400	17.1	19.0	20.8	22.7	24.6	26.5	28.4	30.2	3:28
1500	18.3	20.3	22.3	24.2	26.3	28.3	30.3	32.3	3:42
1600	19.4	21.6	23.7	25.8	28.0	30.1	32.3	34.4	3:57
1700	20.6	22.8	25.1	27.3	29.7	32.0	34.2	36.5	4:11
1800	21.7	24.1	26.5	28.8	31.3	33.7	36.2	38.5	4:26

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 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	15000	12700	10300
290	15700	13600	11200
280	16300	14400	12000
270	17000	15300	13000
260	18100	16500	14600
250	19200	17600	15800
240	20300	18800	17000
230	21400	20000	18200
220	22500	21100	19400
210	23600	22300	20700
200	24800	23500	22000
190	26000	24800	23400
180	27300	26000	24800
170	28600	27300	26100
160	30000	28600	27400

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	15	17	19	21	23	25	27
300	EPR	1.259	1.366						
	MACH	.585	.641						
	KIAS	325	325						
	FF/ENG	8919	9092						
280	EPR	1.236	1.333	1.383					
	MACH	.585	.641	.665					
	KIAS	325	325	325					
	FF/ENG	8548	8681	8780					
260	EPR	1.213	1.297	1.341	1.398				
	MACH	.577	.627	.651	.680				
	KIAS	321	318	318	320				
	FF/ENG	8069	8080	8152	8331				
240	EPR	1.188	1.260	1.298	1.344	1.402			
	MACH	.558	.606	.627	.652	.681			
	KIAS	310	307	306	306	308			
	FF/ENG	7412	7389	7412	7482	7658			
220	EPR	1.164	1.226	1.258	1.297	1.343	1.402		
	MACH	.538	.585	.605	.626	.651	.681		
	KIAS	298	296	294	294	294	296		
	FF/ENG	6764	6736	6728	6748	6810	6972		
200	EPR	1.141	1.195	1.223	1.254	1.293	1.339	1.398	
	MACH	.516	.562	.581	.601	.623	.648	.677	
	KIAS	286	284	283	282	281	281	282	
	FF/ENG	6126	6094	6085	6077	6089	6140	6273	
180	EPR	1.119	1.166	1.189	1.217	1.247	1.284	1.330	1.386
	MACH	.492	.537	.556	.576	.596	.617	.642	.671
	KIAS	272	271	270	269	268	267	267	268
	FF/ENG	5490	5462	5451	5443	5434	5438	5475	5573
160	EPR	1.098	1.139	1.158	1.181	1.207	1.237	1.272	1.316
	MACH	.466	.510	.529	.548	.568	.588	.609	.633
	KIAS	258	257	256	256	255	254	253	252
	FF/ENG	4862	4838	4827	4817	4809	4800	4796	4817

# 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
287	264	244	227	213	200	191	182	174	167	160
576	530	489	455	426	400	381	364	348	334	321
865	796	735	684	640	600	572	546	522	501	482
1156	1064	982	913	853	800	763	729	698	669	643
1448	1332	1229	1142	1067	1000	953	910	871	835	803
1742	1602	1477	1372	1281	1200	1144	1092	1045	1002	963
2036	1871	1725	1602	1495	1400	1335	1274	1219	1168	1122
2332	2141	1973	1831	1709	1600	1525	1456	1392	1334	1282
2629	2414	2223	2062	1924	1800	1715	1637	1565	1500	1441

### Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.4	0:40	3.0	0:38	2.6	0:37	2.4	0:36	2.1	0:34
400	7.1	1:17	6.5	1:13	6.0	1:10	5.5	1:07	5.2	1:03
600	10.9	1:54	10.0	1:48	9.3	1:43	8.7	1:38	8.2	1:33
800	14.5	2:31	13.5	2:24	12.6	2:17	11.8	2:10	11.2	2:02
1000	18.2	3:09	16.9	2:59	15.8	2:51	14.9	2:42	14.2	2:32
1200	21.8	3:47	20.3	3:35	19.1	3:25	17.9	3:14	17.1	3:02
1400	25.3	4:26	23.7	4:12	22.2	3:59	20.9	3:47	20.0	3:33
1600	28.8	5:05	27.0	4:48	25.4	4:33	23.9	4:19	22.9	4:03
1800	32.3	5:44	30.3	5:25	28.5	5:08	26.9	4:52	25.7	4:34

**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
2	-0.1	-0.1	0.0	0.1	0.3	0.4	0.6	0.7
4	-0.4	-0.2	0.0	0.4	0.7	1.1	1.5	1.9
6	-0.6	-0.3	0.0	0.6	1.2	1.8	2.4	3.1
8	-0.9	-0.4	0.0	0.8	1.6	2.5	3.4	4.3
10	-1.1	-0.5	0.0	1.0	2.1	3.2	4.3	5.4
12	-1.3	-0.7	0.0	1.2	2.5	3.8	5.2	6.6
14	-1.6	-0.8	0.0	1.4	2.9	4.5	6.1	7.7
16	-1.8	-0.9	0.0	1.6	3.3	5.1	6.9	8.8
18	-2.0	-1.0	0.0	1.8	3.7	5.7	7.8	10.0
20	-2.3	-1.1	0.0	2.0	4.1	6.3	8.6	11.1
22	-2.5	-1.2	0.0	2.2	4.5	6.9	9.5	12.1
24	-2.8	-1.4	0.0	2.4	4.9	7.5	10.3	13.2
26	-3.0	-1.5	0.0	2.5	5.2	8.1	11.1	14.3
28	-3.2	-1.6	0.0	2.7	5.6	8.7	11.9	15.4
30	-3.5	-1.7	0.0	2.9	5.9	9.2	12.7	16.4
32	-3.7	-1.8	0.0	3.0	6.2	9.7	13.5	17.4
34	-3.9	-2.0	0.0	3.1	6.6	10.3	14.2	18.5

**ENGINE INOP**  
**MAX CONTINUOUS THRUST**

**Holding**  
**Flaps up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
300	EPR	1.163	1.200	1.271	1.363		
	KIAS	260	260	262	277		
	FF/ENG	8080	8090	8160	8510		
280	EPR	1.147	1.179	1.242	1.327	1.460	
	KIAS	251	251	253	261	286	
	FF/ENG	7480	7480	7530	7730	8420	
260	EPR	1.131	1.159	1.215	1.294	1.401	
	KIAS	242	242	243	246	266	
	FF/ENG	6890	6900	6910	7010	7430	
240	EPR	1.116	1.141	1.189	1.259	1.352	
	KIAS	232	233	234	235	247	
	FF/ENG	6310	6310	6320	6370	6620	
220	EPR	1.102	1.124	1.165	1.225	1.310	1.437
	KIAS	222	223	224	224	230	251
	FF/ENG	5750	5740	5740	5760	5880	6350
200	EPR	1.088	1.106	1.142	1.193	1.269	1.370
	KIAS	215	215	215	215	215	229
	FF/ENG	5230	5190	5190	5180	5230	5480
180	EPR	1.075	1.090	1.119	1.161	1.225	1.316
	KIAS	208	208	208	208	208	209
	FF/ENG	4840	4680	4650	4650	4670	4750
160	EPR	1.061	1.074	1.097	1.133	1.183	1.259
	KIAS	203	203	203	203	203	203
	FF/ENG	4360	4310	4160	4160	4160	4180
140	EPR	1.047	1.058	1.076	1.105	1.146	1.208
	KIAS	203	203	203	203	203	203
	FF/ENG	3960	3910	3760	3740	3780	3750

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	550	460				
50	600	510	380			
48	650	550	420			
46	690	600	470	310		
44	720	650	510	340		
42	760	690	550	370	230	
40	790	730	580	400	260	
38	820	760	610	440	290	150
36	840	800	650	470	320	180
34	840	830	680	500	350	200
32	850	850	710	530	380	230
30	850	850	730	550	410	260
20	870	870	760	620	480	340
10	890	890	770	630	490	360
0	900	900	790	650	500	370
-20	940	940	820	670	520	390
-40	990	990	860	710	550	400

Rate of climb capability shown is valid for 200000 kg, gear down at VREF20 + 5.  
Decrease rate of climb 40 ft/min per 5000 kg greater than 200000 kg.  
Increase rate of climb 60 ft/min per 5000 kg less than 200000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	50	-50				
50	90	-10	-140			
48	130	30	-100			
46	170	80	-60	-220		
44	200	120	-20	-190		
42	230	160	20	-160	-290	
40	260	190	50	-130	-270	
38	290	230	80	-100	-240	-380
36	310	260	110	-70	-220	-360
34	310	290	130	-40	-190	-340
32	320	310	160	-20	-170	-310
30	320	310	180	10	-140	-290
20	320	320	200	60	-80	-220
10	330	330	210	70	-80	-210
0	340	330	210	70	-80	-210
-20	360	350	220	70	-80	-210
-40	380	370	240	80	-80	-220

Rate of climb capability shown is valid for 200000 kg, gear down at VREF30 + 5.  
Decrease rate of climb 40 ft/min per 5000 kg greater than 200000 kg.  
Increase rate of climb 60 ft/min per 5000 kg less than 200000 kg.

Intentionally  
Blank

**Performance Inflight - QRH****Chapter PI-QRH****Gear Down****Section 23****GEAR DOWN****220 KIAS Max Climb EPR**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	1.187	1.185	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
50	1.204	1.199	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
45	1.223	1.219	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
40	1.243	1.239	1.229	1.218	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
35	1.264	1.262	1.253	1.243	1.233	1.223	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
30	1.280	1.286	1.276	1.268	1.259	1.250	1.243	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
25	1.280	1.311	1.303	1.293	1.284	1.276	1.271	1.267	1.259	1.262	1.260	1.251	1.246	1.235	1.225
20	1.280	1.323	1.331	1.321	1.312	1.304	1.299	1.296	1.290	1.280	1.260	1.251	1.246	1.235	1.225
15	1.280	1.323	1.360	1.350	1.342	1.334	1.329	1.326	1.321	1.313	1.293	1.264	1.246	1.235	1.225
10	1.280	1.323	1.366	1.377	1.373	1.366	1.362	1.359	1.352	1.345	1.325	1.295	1.270	1.246	1.225
5	1.280	1.323	1.366	1.377	1.391	1.399	1.396	1.394	1.389	1.380	1.359	1.326	1.298	1.276	1.256
0	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.431	1.426	1.419	1.397	1.359	1.325	1.306	1.292
-5	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.468	1.461	1.439	1.401	1.363	1.337	1.327
-10	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.484	1.444	1.406	1.381	1.369
-15	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.454	1.427	1.417
-20	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.480	1.480	1.469

**Anti-Ice Adjustment**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-0.008	-0.010	-0.015	-0.014	-0.006	-0.005	-0.003	-0.003
ENGINE AND WING*	-0.010	-0.012	-0.018	-0.019	-0.012	-0.012	-0.011	-0.013
ENGINE AND WING**	-0.012	-0.014	-0.021	-0.024	-0.018	-0.019	-0.020	-0.023

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, single bleed source and both packs off.

**Long Range Cruise Altitude Capability****Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13000	10400	7300
280	16200	13700	11000
260	19500	17200	14600
240	22500	20500	18200
220	25300	23600	21700
200	27300	26100	25000
180	29400	28200	27100
160	32100	30500	29300
140	35700	34000	32300

**GEAR DOWN**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
300	EPR	1.240									
	MACH	.488									
	KIAS	270									
	FF/ENG	7412									
280	EPR	1.216	1.292	1.334							
	MACH	.474	.518	.538							
	KIAS	262	261	261							
	FF/ENG	6899	6901	6969							
260	EPR	1.192	1.261	1.295	1.338						
	MACH	.458	.501	.519	.540						
	KIAS	253	252	252	252						
	FF/ENG	6367	6344	6363	6431						
240	EPR	1.169	1.231	1.261	1.296	1.340	1.395				
	MACH	.441	.484	.501	.520	.541	.563				
	KIAS	244	243	243	242	242	242				
	FF/ENG	5839	5818	5811	5829	5893	5962				
220	EPR	1.147	1.202	1.229	1.259	1.295	1.339	1.394			
	MACH	.422	.465	.482	.500	.519	.541	.563			
	KIAS	233	234	233	233	232	232	232			
	FF/ENG	5304	5300	5291	5283	5299	5356	5419			
200	EPR	1.127	1.174	1.197	1.224	1.255	1.290	1.334	1.389		
	MACH	.402	.445	.462	.480	.498	.517	.538	.561		
	KIAS	222	223	223	223	222	222	222	222		
	FF/ENG	4772	4784	4779	4771	4763	4773	4820	4879		
180	EPR	1.110	1.147	1.167	1.190	1.218	1.247	1.281	1.324	1.378	
	MACH	.387	.422	.439	.457	.475	.493	.512	.534	.557	
	KIAS	213	212	212	212	212	211	211	211	211	
	FF/ENG	4327	4262	4268	4264	4257	4249	4252	4286	4341	
160	EPR	1.094	1.125	1.141	1.160	1.185	1.211	1.240	1.275	1.317	1.369
	MACH	.372	.403	.419	.436	.454	.472	.492	.513	.535	.558
	KIAS	205	202	202	202	202	202	202	202	202	202
	FF/ENG	3925	3818	3812	3805	3799	3797	3802	3815	3845	3887
140	EPR	1.079	1.106	1.120	1.136	1.157	1.180	1.205	1.233	1.267	1.308
	MACH	.352	.387	.403	.419	.436	.454	.473	.493	.515	.537
	KIAS	194	194	194	194	194	194	194	194	194	194
	FF/ENG	3474	3496	3491	3486	3475	3468	3407	3409	3419	3444





**GEAR DOWN**

**Long Range Cruise Enroute Fuel and Time  
Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.4	-0.7	0.0	0.8	2.0	3.5	5.4	7.6
20	-2.1	-1.1	0.0	1.6	3.7	6.3	9.4	13.1
30	-2.9	-1.5	0.0	2.3	5.3	8.9	13.2	18.1
40	-3.7	-1.9	0.0	3.0	6.8	11.4	16.6	22.7
50	-4.6	-2.4	0.0	3.7	8.2	13.6	19.8	26.8
60	-5.4	-2.8	0.0	4.3	9.5	15.6	22.6	30.5
70	-6.3	-3.3	0.0	4.9	10.7	17.5	25.1	33.7
80	-7.2	-3.7	0.0	5.5	11.8	19.1	27.4	36.5
90	-8.1	-4.2	0.0	6.0	12.8	20.6	29.3	38.8
100	-9.1	-4.7	0.0	6.4	13.7	21.9	30.9	40.7
110	-10.1	-5.1	0.0	6.9	14.5	22.9	32.1	42.1
120	-11.1	-5.6	0.0	7.3	15.2	23.8	33.1	43.1
130	-12.1	-6.1	0.0	7.6	15.8	24.5	33.8	43.6

**Descent at VREF30+80**

PRESSURE ALT (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	41	45	49	53	57	61	65	69	73	78
TIME (MINUTES)	12	12	13	14	15	16	16	17	18	18

GEAR DOWN

Holding  
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
300	EPR	1.138	1.167	1.227	1.313			
	KIAS	244	244	244	244			
	FF/ENG	7090	7090	7110	7210			
280	EPR	1.123	1.150	1.203	1.278			
	KIAS	239	239	239	239			
	FF/ENG	6610	6620	6620	6670			
260	EPR	1.110	1.134	1.179	1.247	1.345		
	KIAS	234	234	234	234	234		
	FF/ENG	6160	6150	6150	6180	6300		
240	EPR	1.097	1.119	1.158	1.217	1.302		
	KIAS	228	228	228	228	228		
	FF/ENG	5720	5690	5690	5690	5750		
220	EPR	1.086	1.104	1.140	1.190	1.263	1.376	
	KIAS	222	222	222	222	222	222	
	FF/ENG	5290	5260	5240	5230	5250	5390	
200	EPR	1.076	1.092	1.123	1.166	1.230	1.322	
	KIAS	215	215	215	215	215	215	
	FF/ENG	5000	4840	4810	4790	4800	4860	
180	EPR	1.067	1.081	1.106	1.144	1.199	1.277	1.402
	KIAS	208	208	208	208	208	208	208
	FF/ENG	4600	4440	4390	4380	4370	4390	4510
160	EPR	1.059	1.071	1.093	1.126	1.173	1.242	1.345
	KIAS	203	203	203	203	203	203	203
	FF/ENG	4270	4220	4060	4040	4030	4030	4100
140	EPR	1.053	1.064	1.084	1.114	1.157	1.219	1.310
	KIAS	203	203	203	203	203	203	203
	FF/ENG	4110	4060	3900	3870	3910	3830	3870

This table includes 5% additional fuel for holding in a racetrack pattern.

**GEAR DOWN**

**Holding  
Flaps 1**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.140	1.168	1.225	1.307	
	KIAS	224	224	224	224	
	FF/ENG	6760	6760	6760	6820	
280	EPR	1.126	1.153	1.202	1.276	1.384
	KIAS	219	219	219	219	219
	FF/ENG	6320	6310	6300	6330	6470
260	EPR	1.113	1.137	1.181	1.247	1.342
	KIAS	214	214	214	214	214
	FF/ENG	5890	5870	5860	5880	5960
240	EPR	1.101	1.122	1.161	1.218	1.301
	KIAS	208	208	208	208	208
	FF/ENG	5460	5430	5420	5410	5450
220	EPR	1.090	1.107	1.143	1.191	1.264
	KIAS	202	202	202	202	202
	FF/ENG	5030	4990	4970	4960	4980
200	EPR	1.080	1.095	1.125	1.167	1.229
	KIAS	195	195	195	195	195
	FF/ENG	4730	4570	4530	4530	4530
180	EPR	1.069	1.083	1.107	1.144	1.196
	KIAS	188	188	188	188	188
	FF/ENG	4310	4270	4110	4100	4090
160	EPR	1.059	1.072	1.093	1.125	1.169
	KIAS	183	183	183	183	183
	FF/ENG	3960	3920	3770	3800	3790
140	EPR	1.053	1.064	1.083	1.111	1.151
	KIAS	183	183	183	183	183
	FF/ENG	3770	3720	3640	3600	3580

This table includes 5% additional fuel for holding in a racetrack pattern.

**Performance Inflight - QRH**

**Gear Down, Engine INOP**

**Chapter PI-QRH**

**Section 24**

**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 KG)		VREF + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	246	233	2200		
240	228	227	5600	3300	400
220	210	221	8500	6600	4200
200	191	214	11300	9700	7500
180	172	208	14100	12500	10700
160	153	200	16800	15400	13700
140	134	192	19500	18100	16500

**Long Range Cruise Altitude Capability**

**100 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
240	3500		
220	6900	4800	1700
200	10100	8100	5800
180	13000	11300	9300
160	15900	14400	12500
140	18700	17200	15700

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)						
		5	7	9	11	13	15	17
240	EPR	1.394						
	MACH	.379						
	KIAS	229						
	FF/ENG	10859						
230	EPR	1.372	1.420					
	MACH	.374	.388					
	KIAS	226	226					
	FF/ENG	10399	10514					
220	EPR	1.350	1.395					
	MACH	.369	.382					
	KIAS	223	223					
	FF/ENG	9949	10039					
210	EPR	1.330	1.371	1.420				
	MACH	.363	.377	.391				
	KIAS	220	220	220				
	FF/ENG	9514	9582	9688				
200	EPR	1.310	1.348	1.393	1.447			
	MACH	.358	.371	.385	.400			
	KIAS	216	216	216	216			
	FF/ENG	9096	9139	9222	9351			
190	EPR	1.291	1.326	1.367	1.417	1.478		
	MACH	.352	.365	.379	.393	.408		
	KIAS	213	213	213	213	213		
	FF/ENG	8689	8712	8774	8870	9037		
180	EPR	1.273	1.305	1.343	1.388	1.442		
	MACH	.346	.359	.373	.387	.402		
	KIAS	209	209	209	209	209		
	FF/ENG	8291	8303	8340	8414	8529		
170	EPR	1.255	1.285	1.320	1.361	1.409	1.470	
	MACH	.340	.353	.366	.380	.395	.410	
	KIAS	206	206	206	206	206	206	
	FF/ENG	7892	7901	7919	7971	8055	8200	
160	EPR	1.238	1.266	1.298	1.335	1.379	1.432	1.500
	MACH	.334	.346	.359	.373	.388	.403	.419
	KIAS	202	202	202	202	202	202	202
	FF/ENG	7496	7504	7513	7541	7605	7701	7882
150	EPR	1.221	1.247	1.276	1.310	1.350	1.397	1.456
	MACH	.327	.340	.353	.366	.380	.395	.411
	KIAS	198	198	198	198	198	198	198
	FF/ENG	7109	7109	7116	7129	7168	7238	7355
140	EPR	1.205	1.228	1.256	1.287	1.323	1.365	1.416
	MACH	.321	.333	.345	.359	.373	.387	.403
	KIAS	194	194	194	194	194	194	194
	FF/ENG	6729	6721	6725	6732	6750	6799	6877

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
170	150	132	119	109	100	93	88	83	78	75
349	305	269	241	219	200	187	175	164	154	146
529	462	406	363	329	300	279	260	244	230	218
710	620	544	486	440	400	372	347	325	306	290
892	778	681	608	550	500	465	433	406	381	361
1075	936	819	730	660	600	558	520	487	458	433
1259	1096	958	853	771	700	651	606	567	533	504
1444	1256	1097	976	882	800	743	692	647	608	575
1630	1416	1236	1100	992	900	836	778	727	683	646
1817	1577	1375	1223	1103	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		14	
	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME
	(1000 KG)	(HR:MIN)	(1000 KG)	(HR:MIN)	(1000 KG)	(HR:MIN)	(1000 KG)	(HR:MIN)	(1000 KG)	(HR:MIN)
100	3.3	0:28	3.1	0:27	2.9	0:27	2.7	0:26	2.6	0:26
200	6.9	0:54	6.6	0:53	6.4	0:52	6.1	0:50	5.9	0:49
300	10.5	1:21	10.1	1:19	9.8	1:17	9.5	1:15	9.2	1:13
400	14.1	1:48	13.6	1:45	13.2	1:42	12.8	1:39	12.5	1:36
500	17.6	2:15	17.0	2:11	16.5	2:07	16.1	2:04	15.7	2:00
600	21.1	2:42	20.4	2:37	19.8	2:33	19.3	2:29	18.9	2:24
700	24.6	3:09	23.8	3:04	23.1	2:59	22.5	2:54	22.0	2:49
800	28.0	3:37	27.1	3:31	26.3	3:25	25.6	3:19	25.1	3:13
900	31.3	4:05	30.4	3:58	29.5	3:51	28.8	3:44	28.1	3:37
1000	34.7	4:33	33.6	4:25	32.7	4:17	31.8	4:09	31.2	4:02

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Diversion Fuel and Time  
Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	140	160	180	200	220	240
4	-0.4	-0.2	0.0	0.3	0.8	1.3
6	-0.7	-0.3	0.0	0.5	1.2	2.0
8	-0.9	-0.5	0.0	0.7	1.6	2.7
10	-1.2	-0.6	0.0	0.9	2.0	3.3
12	-1.4	-0.7	0.0	1.0	2.4	4.0
14	-1.7	-0.8	0.0	1.2	2.7	4.6
16	-1.9	-1.0	0.0	1.4	3.1	5.2
18	-2.1	-1.1	0.0	1.5	3.5	5.8
20	-2.4	-1.2	0.0	1.7	3.8	6.4
22	-2.6	-1.3	0.0	1.8	4.1	7.0
24	-2.9	-1.4	0.0	2.0	4.5	7.5
26	-3.1	-1.6	0.0	2.1	4.8	8.0
28	-3.3	-1.7	0.0	2.3	5.1	8.5
30	-3.6	-1.8	0.0	2.4	5.4	9.0
32	-3.8	-1.9	0.0	2.6	5.7	9.5
34	-4.1	-2.0	0.0	2.7	6.0	10.0
36	-4.3	-2.2	0.0	2.8	6.2	10.4

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
240	EPR	1.319	1.390		
	KIAS	228	228		
	FF/ENG	11170	11310		
220	EPR	1.285	1.347		
	KIAS	222	222		
	FF/ENG	10300	10360		
200	EPR	1.253	1.307	1.414	
	KIAS	215	215	215	
	FF/ENG	9440	9470	9650	
180	EPR	1.223	1.270	1.360	
	KIAS	208	208	208	
	FF/ENG	8620	8620	8700	
160	EPR	1.199	1.240	1.319	1.437
	KIAS	203	203	203	203
	FF/ENG	7950	7940	7970	8170
140	EPR	1.185	1.222	1.295	1.401
	KIAS	203	203	203	203
	FF/ENG	7590	7570	7590	7720

This table includes 5% additional fuel for holding in a racetrack pattern.



**Performance Inflight - QRH****Chapter PI-QRH****Text****Section 25**

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**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.

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**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.

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.

**VREF Speeds**

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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## Advisory Information

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### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, 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.

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## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, 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 landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

---

## 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 autoland 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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**Performance Inflight - QRH****Chapter PI-QRH****General****Section 30****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 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>5.0</b> 2500	<b>4.5</b> 1500			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>6.5</b> 3700	<b>5.5</b> 2600	<b>5.5</b> 1800	<b>5.0</b> 1300	<b>4.5</b> 900
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>9.5</b> 5000	<b>8.5</b> 3600	<b>8.0</b> 2700	<b>7.5</b> 2000	<b>7.5</b> 1400
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>14.0</b> 6700	<b>11.5</b> 4900	<b>10.0</b> 3700	<b>9.5</b> 2900	<b>9.5</b> 2200
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>17.5</b> 7800	<b>14.5</b> 5700	<b>12.5</b> 4400	<b>11.5</b> 3500	<b>11.0</b> 2800

**Cruise****Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> %N1	<b>2.0</b> 78.6	<b>3.0</b> 83.2			
35000 (.82M)	<b>PITCH ATT</b> %N1	<b>1.5</b> 76.5	<b>2.0</b> 78.9	<b>3.0</b> 82.8	<b>3.5</b> 88.0	
30000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 72.6	<b>2.5</b> 74.7	<b>3.0</b> 78.1	<b>3.5</b> 82.4	<b>3.5</b> 87.3
25000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 68.6	<b>2.5</b> 70.7	<b>3.5</b> 73.8	<b>4.0</b> 77.7	<b>4.0</b> 82.3
20000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 63.4	<b>2.5</b> 65.8	<b>3.5</b> 69.0	<b>4.5</b> 72.8	<b>5.5</b> 77.4
15000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 59.6	<b>2.5</b> 61.8	<b>3.5</b> 65.0	<b>4.5</b> 68.2	<b>5.5</b> 72.5

**Descent****Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2900	<b>0.0</b> -2600			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2500	<b>-0.5</b> -2000	<b>0.5</b> -1900	<b>1.0</b> -1900	<b>0.5</b> -2400
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1900	<b>0.5</b> -1600	<b>1.5</b> -1500	<b>2.5</b> -1400	<b>3.0</b> -1400
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1700	<b>0.0</b> -1400	<b>1.0</b> -1300	<b>2.0</b> -1300	<b>3.0</b> -1300
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-2.0</b> -1500	<b>-0.5</b> -1300	<b>1.0</b> -1200	<b>2.0</b> -1200	<b>3.0</b> -1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

## Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

### Holding

### Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	<b>PITCH ATT</b>	<b>3.0</b>	<b>4.5</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	<b>PITCH ATT</b>	<b>3.0</b>	<b>4.5</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

## Terminal Area (5000 FT)

### %N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP GEAR UP (VREF 30 + 80)	<b>PITCH ATT</b>	<b>3.5</b>	<b>5.0</b>	<b>6.0</b>	<b>6.5</b>	<b>6.5</b>
	%N1	47.7	52.3	57.2	61.9	66.4
	KIAS	217	217	225	243	263
FLAPS 1 GEAR UP (VREF 30 + 60)	<b>PITCH ATT</b>	<b>5.0</b>	<b>6.5</b>	<b>8.0</b>	<b>8.0</b>	<b>8.0</b>
	%N1	48.5	53.4	58.8	63.9	68.2
	KIAS	197	197	205	223	243
FLAPS 5 GEAR UP (VREF 30 + 40)	<b>PITCH ATT</b>	<b>3.5</b>	<b>5.5</b>	<b>7.0</b>	<b>7.0</b>	<b>6.5</b>
	%N1	48.8	54.0	59.7	64.7	69.0
	KIAS	177	177	185	203	223
FLAPS 15 GEAR UP (VREF 30 + 20)	<b>PITCH ATT</b>	<b>3.5</b>	<b>6.5</b>	<b>8.0</b>	<b>7.5</b>	<b>7.0</b>
	%N1	49.0	55.2	61.9	66.8	71.2
	KIAS	157	157	165	183	203
FLAPS 20 GEAR DOWN (VREF 30 + 20)	<b>PITCH ATT</b>	<b>2.0</b>	<b>4.5</b>	<b>6.5</b>	<b>6.0</b>	<b>5.5</b>
	%N1	56.2	61.4	67.3	73.1	78.1
	KIAS	157	157	165	183	203

## Final Approach (1500 FT)

### Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	<b>PITCH ATT</b>	<b>0.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.5</b>	<b>2.5</b>
	%N1	36.8	40.7	45.1	49.3	52.6
	KIAS	147	155	172	187	201
FLAPS 25 (VREF 25 + 10)	<b>PITCH ATT</b>	<b>1.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.5</b>	<b>2.5</b>
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	147	147	163	178	191
FLAPS 30 (VREF 30 + 10)	<b>PITCH ATT</b>	<b>0.0</b>	<b>1.0</b>	<b>2.0</b>	<b>1.5</b>	
	%N1	56.9	55.6	60.2	65.3	
	KIAS	147	147	155	172	

**Max Climb %N1****Based on engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	.84	.84	.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

\*Packs on or packs off with 2 bleed sources.

\*\*Packs off with 1 bleed source.

**VREF**

**Flaps 30**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	184	184	184	184	184	184
340	180	180	180	180	180	180
320	173	173	173	173	173	173
300	164	164	164	164	164	165
280	158	158	158	158	158	158
260	149	149	149	150	150	150
240	143	144	144	144	144	144
220	137	137	138	138	138	138
200	137	134	131	131	131	131
180	137	134	130	126	124	124
160	137	134	130	126	121	117

**Flaps 25**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	183	183	183	183	183	183
340	180	180	180	180	181	181
320	175	175	175	175	175	176
300	169	170	170	170	170	170
280	164	164	164	164	164	164
260	158	158	158	158	158	158
240	152	152	152	152	152	152
220	145	145	146	146	146	146
200	139	139	139	139	139	139
180	137	134	131	131	131	132
160	137	134	130	126	124	124

**Flaps 20**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	193	193	193	193	194	195
340	190	190	190	191	191	192
320	185	185	185	185	185	186
300	179	179	179	179	180	180
280	173	173	173	173	174	174
260	167	167	167	167	167	167
240	160	160	161	161	161	161
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	139	139	139	139	139	139
160	137	134	131	131	131	131

# Performance Inflight - QRH

## Advisory Information

# Chapter PI-QRH

## Section 31

### ADVISORY INFORMATION

#### Normal Configuration Landing Distance

##### Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	910	+25/0	20	-35/+125	+10/-10	+20/-20	35	20	40
AUTOBRAKE MAX	1215	+25/0	25	-50/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1575	+35/0	40	-75/+255	0/0	+40/-40	90	0	0
AUTOBRAKE 3	1855	+45/-10	45	-90/+315	0/-10	+50/-50	100	0	0
AUTOBRAKE 2	2045	+50/-20	60	-105/+365	+25/-45	+55/-55	80	65	65
AUTOBRAKE 1	2205	+55/-25	70	-120/+420	+65/-70	+60/-60	80	250	305

#### Good Reported Braking Action

MAX MANUAL	1270	+25/-5	30	-60/+220	+30/-25	+30/-30	50	80	195
AUTOBRAKE MAX	1320	+25/-5	35	-65/+225	+30/-20	+30/-30	60	85	205
AUTOBRAKE 4	1580	+35/0	40	-75/+260	+10/-5	+40/-40	90	5	35
AUTOBRAKE 3	1855	+45/-10	45	-90/+315	+5/-10	+50/-50	100	0	0
AUTOBRAKE 2	2045	+50/-20	60	-105/+365	+25/-45	+55/-55	80	65	65
AUTOBRAKE 1	2205	+55/-25	70	-120/+420	+65/-70	+60/-60	80	250	305

#### Medium Reported Braking Action

MAX MANUAL	1695	+40/-15	50	-95/+350	+75/-60	+45/-45	60	215	575
AUTOBRAKE MAX	1695	+40/-15	50	-95/+350	+75/-60	+45/-45	65	210	570
AUTOBRAKE 4	1755	+40/-5	50	-100/+360	+60/-35	+50/-50	90	195	565
AUTOBRAKE 3	1955	+45/-10	50	-105/+385	+40/-35	+55/-55	100	85	390
AUTOBRAKE 2	2095	+50/-20	60	-115/+405	+55/-65	+60/-60	80	115	310
AUTOBRAKE 1	2210	+55/-25	70	-125/+435	+90/-70	+60/-65	80	275	415

**ADVISORY INFORMATION**

**Normal Configuration Landing Distance**

**Flaps 30**

**Poor Reported Braking Action**

MAX MANUAL	2145	+50/-25	70	-140/+540	+165/-110	+60/-60	70	445	1380
AUTOBRAKE MAX	2150	+55/-25	70	-140/+540	+170/-115	+60/-60	70	445	1385
AUTOBRAKE 4	2150	+55/-20	70	-140/+540	+170/-110	+60/-60	75	445	1385
AUTOBRAKE 3	2220	+55/-20	70	-140/+545	+140/-90	+65/-65	100	395	1340
AUTOBRAKE 2	2320	+55/-25	75	-145/+560	+145/-115	+65/-65	80	345	1265
AUTOBRAKE 1	2380	+60/-30	80	-150/+570	+170/-120	+70/-70	80	440	1220

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 25**

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	940	+20/-5	20	-35/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1285	+20/-5	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1670	+30/-10	45	-80/+265	0/0	+45/-45	95	0	0
AUTOBRAKE 3	1975	+35/-15	55	-95/+330	0/-15	+55/-55	100	5	5
AUTOBRAKE 2	2165	+40/-25	70	-110/+375	+30/-50	+60/-60	85	90	90
AUTOBRAKE 1	2330	+50/-30	80	-125/+435	+75/-75	+65/-65	80	295	365

**Good Reported Braking Action**

MAX MANUAL	1325	+20/-10	35	-65/+225	+30/-30	+35/-35	50	90	215
AUTOBRAKE MAX	1380	+25/-10	35	-65/+230	+30/-20	+35/-35	65	95	225
AUTOBRAKE 4	1680	+30/-10	45	-80/+270	+10/-5	+45/-45	95	5	35
AUTOBRAKE 3	1975	+35/-15	55	-95/+330	+5/-15	+55/-55	100	5	5
AUTOBRAKE 2	2165	+40/-25	70	-110/+375	+30/-50	+60/-60	85	90	90
AUTOBRAKE 1	2330	+50/-30	80	-125/+435	+75/-75	+65/-65	80	295	365

**Medium Reported Braking Action**

MAX MANUAL	1775	+35/-20	55	-100/+360	+75/-60	+50/-50	60	235	635
AUTOBRAKE MAX	1775	+35/-20	55	-100/+360	+80/-60	+50/-50	65	235	630
AUTOBRAKE 4	1855	+35/-10	55	-100/+370	+55/-35	+50/-50	95	195	610
AUTOBRAKE 3	2075	+35/-20	60	-110/+395	+40/-40	+60/-60	100	90	410
AUTOBRAKE 2	2220	+40/-25	70	-120/+420	+65/-70	+65/-65	85	145	350
AUTOBRAKE 1	2340	+50/-30	80	-125/+445	+95/-80	+65/-65	80	315	480

**Poor Reported Braking Action**

MAX MANUAL	2250	+45/-30	80	-145/+550	+170/-115	+65/-65	70	485	1535
AUTOBRAKE MAX	2255	+50/-30	80	-145/+550	+175/-120	+65/-65	70	490	1535
AUTOBRAKE 4	2255	+50/-30	80	-145/+550	+175/-110	+65/-65	80	490	1535
AUTOBRAKE 3	2350	+45/-25	80	-145/+560	+145/-95	+70/-70	100	415	1470
AUTOBRAKE 2	2445	+50/-35	85	-150/+575	+155/-120	+70/-70	80	390	1395
AUTOBRAKE 1	2510	+55/-35	90	-155/+585	+175/-125	+75/-75	80	490	1360

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.

For autobrake and manual speedbrakes, increase reference landing distance by 55 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 20**

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1005	+25/-10	25	-40/+135	+10/-10	+20/-20	35	25	55
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 4	1820	+30/-20	50	-80/+280	0/0	+50/-50	100	0	0
AUTOBRAKE 3	2160	+40/-30	65	-100/+345	+5/-15	+60/-60	105	5	5
AUTOBRAKE 2	2370	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105
AUTOBRAKE 1	2560	+55/-45	90	-135/+455	+80/-85	+75/-75	90	345	420

**Good Reported Braking Action**

MAX MANUAL	1430	+25/-20	40	-65/+230	+35/-30	+35/-35	50	105	250
AUTOBRAKE MAX	1485	+25/-20	40	-70/+240	+30/-20	+40/-40	65	105	265
AUTOBRAKE 4	1825	+30/-20	50	-85/+285	+10/0	+50/-50	100	10	40
AUTOBRAKE 3	2160	+40/-30	65	-100/+345	+5/-15	+60/-60	105	5	5
AUTOBRAKE 2	2370	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105
AUTOBRAKE 1	2560	+55/-45	90	-135/+455	+80/-85	+75/-75	90	345	420

**Medium Reported Braking Action**

MAX MANUAL	1925	+35/-30	65	-105/+375	+85/-65	+55/-55	65	275	750
AUTOBRAKE MAX	1925	+40/-30	65	-105/+375	+85/-65	+55/-55	70	270	745
AUTOBRAKE 4	2010	+40/-25	65	-105/+385	+60/-40	+55/-60	100	225	710
AUTOBRAKE 3	2260	+40/-35	70	-115/+415	+45/-45	+65/-65	105	100	490
AUTOBRAKE 2	2425	+50/-40	80	-125/+440	+65/-75	+70/-70	90	160	410
AUTOBRAKE 1	2565	+55/-45	95	-135/+470	+100/-90	+75/-75	90	370	550

**Poor Reported Braking Action**

MAX MANUAL	2450	+55/-45	90	-150/+570	+185/-125	+70/-70	75	565	1815
AUTOBRAKE MAX	2455	+55/-45	90	-150/+570	+190/-130	+70/-70	75	565	1815
AUTOBRAKE 4	2455	+55/-40	90	-150/+570	+190/-120	+70/-70	80	565	1815
AUTOBRAKE 3	2550	+55/-40	90	-155/+580	+160/-100	+75/-75	105	480	1740
AUTOBRAKE 2	2665	+55/-45	95	-160/+595	+165/-125	+80/-80	90	445	1650
AUTOBRAKE 1	2745	+60/-50	100	-165/+610	+190/-140	+80/-80	85	565	1600

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.

For autobrake and manual speedbrakes, increase reference landing distance by 55 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Dry Runway**

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1590	35/-15	50	-90/340	65/-50	40/-40	115	215	600
ANTISKID (FLAPS 30)	VREF30	1580	35/-15	35	-90/335	65/-50	40/-40	110	210	575
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	930	25/-10	20	-35/130	10/-10	20/-20	70	-	45
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	885	20/0	10	-35/125	10/-10	20/-20	70	-	40
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1105	40/-5	20	-40/140	10/-10	25/-25	65	35	80
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1010	30/-5	15	-40/130	10/-10	20/-20	70	30	65
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	925	25/-10	20	-35/125	10/-10	20/-20	70	20	50
FLAPS PRIMARY FAIL	VREF20	1050	20/-10	25	-40/140	15/-10	20/-25	90	30	65
FLAP/SLAT CONTROL	VREF20	925	25/-10	20	-35/125	10/-10	20/-20	70	20	50
FLIGHT CONTROL MODE	VREF20	1065	25/-10	25	-40/140	15/-10	25/-25	90	30	70
HYD PRESS SYS C	VREF20	1050	20/-10	25	-40/140	15/-10	20/-25	90	30	65
HYD PRESS SYS L+C	VREF30+20	1280	25/0	20	-50/165	20/-20	30/-30	125	-	60
HYD PRESS SYS L+R	VREF30+20	1385	25/5	20	-55/195	30/-30	35/-35	140	-	-
HYD PRESS SYS R+C	VREF30+20	1565	25/0	25	-65/220	35/-35	40/-40	155	-	140
HYD PRESS SYS L (FLAPS 25)	VREF25	940	20/0	20	-40/130	15/-10	20/-20	80	-	30
HYD PRESS SYS L (FLAPS 30)	VREF30	950	20/0	10	-40/135	15/-10	20/-20	85	-	30
HYD PRESS SYS R (FLAPS 25)	VREF25	1030	15/0	25	-45/155	15/-15	25/-25	90	-	45
HYD PRESS SYS R (FLAPS 30)	VREF30	1035	20/0	15	-45/155	20/-15	25/-25	95	-	45
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1145	35/-5	20	-40/140	15/-10	25/-25	70	35	85
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1020	25/-5	15	-40/135	10/-10	20/-20	70	30	65
PRI FLIGHT COMPUTERS	VREF20	1065	25/-10	25	-40/140	15/-10	25/-25	90	30	70
SLATS DRIVE	VREF30+30	1095	30/-5	20	-40/140	15/-10	25/-25	75	35	75
STABILIZER	VREF30+20	1020	25/-5	15	-40/135	10/-10	20/-20	70	30	65

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (305 meters air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Good Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1590	35/-15	50	-90/340	65/-50	40/-40	115	215	600
ANTISKID (FLAPS 30)	VREF30	1580	35/-15	35	-90/335	65/-50	40/-40	110	210	575
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1345	25/-20	35	-65/230	35/-30	35/-35	105	-	180
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1250	25/-5	20	-60/220	35/-30	30/-30	100	-	155
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1580	30/-10	35	-70/240	35/-30	40/-40	95	140	365
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1425	25/-10	30	-65/230	30/-30	35/-35	100	115	300
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1290	25/-15	35	-60/220	30/-25	30/-30	95	95	235
FLAPS PRIMARY FAIL	VREF20	1435	25/-20	40	-65/235	35/-30	35/-35	120	115	295
FLAP/SLAT CONTROL	VREF20	1290	25/-15	35	-60/220	30/-25	30/-30	95	95	235
FLIGHT CONTROL MODE	VREF20	1460	25/-20	40	-70/240	35/-30	35/-35	125	120	315
HYD PRESS SYS C	VREF20	1435	25/-20	40	-65/235	35/-30	35/-35	120	115	295
HYD PRESS SYS L+C	VREF30+20	1850	35/-5	35	-85/290	60/-50	50/-50	170	-	270
HYD PRESS SYS L+R	VREF30+20	2000	35/0	35	-95/325	90/-70	55/-55	190	-	-
HYD PRESS SYS R+C	VREF30+20	1880	35/-5	35	-85/290	65/-55	50/-50	175	-	285
HYD PRESS SYS L (FLAPS 25)	VREF25	1370	25/-5	35	-70/240	40/-35	35/-35	120	-	145
HYD PRESS SYS L (FLAPS 30)	VREF30	1375	25/-5	25	-70/245	40/-35	35/-35	125	-	150
HYD PRESS SYS R (FLAPS 25)	VREF25	1370	25/-5	35	-70/240	40/-35	35/-35	120	-	150
HYD PRESS SYS R (FLAPS 30)	VREF30	1365	25/-5	25	-70/240	40/-35	35/-35	120	-	145
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1610	30/-10	35	-70/240	35/-30	40/-40	100	140	360
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1420	25/-10	30	-65/230	35/-30	35/-35	100	110	275
PRI FLIGHT COMPUTERS	VREF20	1460	25/-20	40	-70/240	35/-30	35/-35	125	120	315
SLATS DRIVE	VREF30+30	1530	30/-10	30	-70/240	35/-30	40/-40	100	125	315
STABILIZER	VREF30+20	1420	25/-10	30	-65/230	35/-30	35/-35	100	110	275

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (305 meters air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Medium Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1995	45/-25	70	-130/515	145/-100	55/-55	130	445	1475
ANTISKID (FLAPS 30)	VREF30	1970	50/-25	50	-130/510	140/-95	55/-55	125	425	1385
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1870	40/-30	60	-105/385	95/-75	50/-50	140	-	540
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1710	40/-15	35	-100/365	85/-65	45/-45	130	-	445
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2120	45/-25	60	-105/380	80/-65	60/-60	120	370	1115
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1890	40/-20	50	-100/365	75/-60	50/-50	125	305	895
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1710	35/-25	55	-95/350	70/-55	45/-45	120	250	705
FLAPS PRIMARY FAIL	VREF20	1870	40/-30	60	-100/370	80/-65	50/-50	145	295	860
FLAP/SLAT CONTROL	VREF20	1710	35/-25	55	-95/350	70/-55	45/-45	120	250	705
FLIGHT CONTROL MODE	VREF20	1905	40/-30	65	-105/375	85/-65	50/-50	150	310	925
HYD PRESS SYS C	VREF20	1870	40/-30	60	-100/370	80/-65	50/-50	145	295	860
HYD PRESS SYS L+C	VREF30+20	2550	55/-20	60	-135/480	150/-115	75/-75	205	-	790
HYD PRESS SYS L+R	VREF30+20	3190	55/-10	70	-175/615	300/-210	95/-95	260	-	-
HYD PRESS SYS R+C	VREF30+20	2585	55/-20	65	-135/485	155/-120	75/-75	210	-	820
HYD PRESS SYS L (FLAPS 25)	VREF25	1925	40/-15	60	-115/415	110/-85	55/-55	155	-	470
HYD PRESS SYS L (FLAPS 30)	VREF30	1925	40/-15	45	-115/415	110/-85	55/-55	155	-	460
HYD PRESS SYS R (FLAPS 25)	VREF25	1915	40/-15	60	-110/415	110/-85	55/-55	155	-	465
HYD PRESS SYS R (FLAPS 30)	VREF30	1880	40/-15	40	-110/410	105/-80	50/-50	145	-	430
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2115	45/-25	55	-105/380	80/-65	60/-60	120	350	1005
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1870	40/-20	45	-100/360	75/-60	50/-50	120	280	785
PRI FLIGHT COMPUTERS	VREF20	1905	40/-30	65	-105/375	85/-65	50/-50	150	310	925
SLATS DRIVE	VREF30+30	2005	40/-20	50	-105/375	80/-65	55/-55	120	310	875
STABILIZER	VREF30+20	1870	40/-20	45	-100/360	75/-60	50/-50	120	280	785

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (305 meters air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Poor Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2620	70/-45	100	-210/930	665/-215	75/-75	145	1265	5000
ANTISKID (FLAPS 30)	VREF30	2570	70/-40	80	-205/920	645/-210	75/-75	140	1200	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2475	60/-45	90	-160/610	230/-150	75/-75	170	-	1400
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2230	55/-25	55	-150/580	200/-130	65/-65	150	-	1120
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2665	65/-35	85	-150/570	170/-120	75/-75	145	750	2780
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2370	60/-30	70	-145/550	165/-115	65/-65	140	615	2185
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2145	55/-40	80	-135/530	155/-105	60/-60	140	515	1735
FLAPS PRIMARY FAIL	VREF20	2315	55/-40	85	-145/555	170/-115	65/-65	160	590	2085
FLAP/SLAT CONTROL	VREF20	2145	55/-40	80	-135/530	155/-105	60/-60	140	515	1735
FLIGHT CONTROL MODE	VREF20	2365	60/-45	90	-145/560	175/-120	65/-65	165	625	2265
HYD PRESS SYS C	VREF20	2315	55/-40	85	-145/555	170/-115	65/-65	160	590	2085
HYD PRESS SYS L+C	VREF30+20	3365	80/-35	100	-205/785	385/-230	100/-100	225	-	1945
HYD PRESS SYS L+R	VREF30+20	5110	85/-15	130	-330/1255	1395/-575	165/-160	320	-	-
HYD PRESS SYS R+C	VREF30+20	3395	80/-35	100	-210/790	390/-235	100/-100	230	-	2000
HYD PRESS SYS L (FLAPS 25)	VREF25	2605	60/-25	95	-180/700	305/-180	75/-75	185	-	1250
HYD PRESS SYS L (FLAPS 30)	VREF30	2590	60/-25	70	-180/700	300/-180	75/-75	180	-	1205
HYD PRESS SYS R (FLAPS 25)	VREF25	2575	55/-25	90	-175/695	295/-175	75/-75	180	-	1205
HYD PRESS SYS R (FLAPS 30)	VREF30	2500	60/-25	70	-175/685	280/-170	75/-75	165	-	1085
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2625	60/-35	80	-150/570	170/-120	75/-75	135	670	2330
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2325	55/-30	70	-140/545	160/-110	65/-65	135	555	1845
PRI FLIGHT COMPUTERS	VREF20	2365	60/-45	90	-145/560	175/-120	65/-65	165	625	2265
SLATS DRIVE	VREF30+30	2485	60/-35	75	-145/560	165/-115	70/-70	135	600	2010
STABILIZER	VREF30+20	2325	55/-30	70	-140/545	160/-110	65/-65	135	555	1845

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (305 meters air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule  
Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																							
		80				100				120				140				160				180			
WEIGHT 1000 KG	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																							
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8			
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6						
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9						
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8						
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6						
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9						
340	0	25.7	28.4	31.4	37.7	42.0	46.8	51.5	57.8	64.8	67.1	75.5	84.9	83.7	94.2	105.8	100.7	113.0	126.4						
	10	22.2	24.5	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4						
	15	22.9	25.2	27.8	33.2	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6						
	20	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4						
	30	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3						
320	0	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4						
	10	24.6	27.1	30.0	35.9	40.0	44.6	49.0	55.0	61.6	63.8	71.8	80.7	79.7	89.7	100.8	96.0	107.9	120.9						
	15	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0						
	20	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1						
	30	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9						
300	0	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7						
	10	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7						
	20	23.4	25.8	28.5	34.2	38.0	42.3	46.6	52.2	58.4	60.5	68.0	76.5	75.6	85.1	95.7	91.2	102.6	115.1						
	10	20.2	22.2	24.5	29.2	32.4	36.0	39.5	44.1	49.3	51.1	57.3	64.3	63.7	71.6	80.6	76.8	86.6	97.5						
	15	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4						
260	0	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1						
	10	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8						
	15	22.1	24.3	26.8	32.0	35.5	39.4	43.4	48.5	54.2	56.1	63.0	70.7	70.0	78.8	88.5	84.4	95.0	106.7						
	20	22.3	24.6	27.1	32.4	36.0	40.1	44.1	49.3	55.2	57.2	64.3	72.2	71.4	80.4	90.5	86.3	97.1	109.0						
	30	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8						
220	0	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5						
	10	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0						
	15	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6						
	20	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2						
	30	20.1	22.1	24.2	28.9	32.1	35.6	39.1	43.7	48.7	50.5	56.6	63.5	62.9	70.8	79.6	76.0	85.6	96.2						
180	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5						
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8						
	15	17.1	18.7	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2						
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5						
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8						
	0	17.9	19.6	21.5	25.5	28.2	31.1	34.1	38.0	42.3	43.7	48.9	54.7	54.1	60.8	68.2	65.2	73.4	82.5						
	10	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6						
	15	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5						
	20	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6						
	30	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8						
	0	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6						
	40	15.8	17.2	18.8	22.1	24.3	26.8	29.1	32.3	35.8	36.8	41.0	45.7	45.1	50.5	56.5	53.9	60.5	68.0						

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**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

**2 Engine Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

**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
GEAR DOWN	NO SPECIAL	PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
INFLIGHT											
GROUND			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 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 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

**ADVISORY INFORMATION****Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	297.3	279.1				
52	126	306.3	287.0				
50	122	315.2	294.5	269.7			
48	118	323.5	303.4	276.9			
46	115	331.8	312.4	284.1	259.6		
44	111	340.4	321.1	291.5	267.7		
42	108	352.1	329.0	299.1	275.0	251.6	
40	104	359.1	337.3	307.2	281.4	257.0	
38	100	366.2	349.6	316.0	287.8	262.8	233.8
36	97	369.0	356.4	323.2	293.4	269.2	238.4
34	93	369.3	363.2	330.4	299.7	274.4	243.0
32	90	369.5	365.7	338.2	306.4	278.7	247.1
30	86	369.8	365.9	346.1	312.9	282.9	250.9
28	82	370.1	366.0	352.5	318.7	287.3	254.6
26	79	370.3	366.1	352.7	322.6	292.2	258.2
24	75	370.6	366.3	352.8	326.0	297.0	263.1
22	72	370.8	366.4	352.9	327.4	300.3	268.1
20	68	371.1	366.5	352.9	327.5	302.5	272.4
18	64	371.3	366.7	353.0	327.6	304.7	275.2
16	61	371.6	366.8	353.1	327.6	304.7	276.9
14	57	371.8	366.9	353.2	327.7	304.8	278.5
12	54	372.0	367.0	353.3	327.8	304.9	278.6
10	50	372.2	367.2	353.3	327.9	304.9	278.7
8	46	372.3	367.3	353.4	327.9	304.9	278.7
6	43	372.5	367.4	350.4	328.0	304.9	272.8
4	40	372.6	367.4	341.5	313.7	286.7	254.9
2	36	372.7	367.5	341.6	313.8	286.8	254.9
0	32	372.8	367.5	341.6	313.8	286.8	255.0
-40	-40	373.4	367.8	341.6	313.8	286.8	255.0

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 1250 kg.

With engine and wing anti-ice on, decrease weight by 2350 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26950 kg.

## ADVISORY INFORMATION

### Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	302.7	284.5				
52	126	310.0	292.5				
50	122	317.6	300.2	275.6			
48	118	325.1	307.8	282.4			
46	115	332.9	315.3	289.8	267.1		
44	111	340.7	322.9	297.4	273.6		
42	108	351.0	330.3	304.4	280.1	258.9	
40	104	357.8	337.9	311.1	286.7	264.5	
38	100	365.0	348.4	318.5	293.4	269.9	241.1
36	97	367.8	355.1	325.0	299.2	275.1	245.9
34	93	368.0	361.9	331.6	305.0	279.9	250.6
32	90	368.3	364.3	338.6	310.6	284.3	254.9
30	86	368.5	364.5	345.5	315.9	288.7	259.0
28	82	368.8	364.6	351.2	320.8	293.2	262.9
26	79	369.1	364.8	351.4	324.4	298.1	266.5
24	75	369.3	364.9	351.5	327.7	302.6	270.7
22	72	369.6	365.0	351.6	329.0	305.5	274.7
20	68	369.8	365.2	351.6	329.1	307.3	278.2
18	64	370.1	365.3	351.7	329.1	309.0	281.0
16	61	370.3	365.4	351.8	329.2	309.1	282.8
14	57	370.5	365.5	351.9	329.3	309.1	284.4
12	54	370.7	365.7	351.9	329.3	309.2	284.5
10	50	370.9	365.8	352.0	329.4	309.2	284.5
8	46	371.1	365.9	352.1	329.5	309.3	284.6
6	43	371.2	366.0	352.1	329.5	309.3	284.5
4	40	371.3	366.0	352.2	329.6	309.3	278.4
2	36	371.4	366.1	352.2	329.6	309.4	278.4
0	32	371.5	366.1	352.3	329.7	309.4	278.4
-40	-40	372.1	366.4	352.4	329.8	309.5	278.5

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 1400 kg.

With engine and wing anti-ice on, decrease weight by 2300 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24500 kg.



**Performance Inflight - QRH****Chapter PI-QRH****Engine Inoperative****Section 32****ENGINE INOP****Initial Max Continuous %N1****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	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

**ENGINE INOP**

**Max Continuous %N1**  
**Based on engine bleed for packs on or off and anti-ice off**  
**37000 FT to 27000 FT Pressure Altitudes**

37000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT													TAT (°C)
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT													TAT (°C)
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT													TAT (°C)
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

**ENGINE INOP****Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT			TAT (°C)										
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT			TAT (°C)										
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT			TAT (°C)										
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT			TAT (°C)										
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT			TAT (°C)										
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

**ENGINE INOP**

**Max Continuous %N1**

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT			TAT (°C)										
CIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT			TAT (°C)										
CIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	103.6	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT			TAT (°C)										
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT			TAT (°C)										
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT			TAT (°C)										
CIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

**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
134	125	118	111	105	100	95	90	86	82	79
268	251	236	222	210	200	190	181	173	166	159
402	376	354	333	316	300	285	272	260	249	239
535	501	471	445	421	400	380	363	347	332	319
668	626	588	555	526	500	476	454	434	416	399
800	750	706	666	631	600	571	545	521	499	479
932	874	823	777	736	700	666	636	608	583	560
1064	998	940	888	841	800	762	727	696	667	640
1196	1122	1057	998	946	900	857	818	783	751	721
1327	1246	1173	1109	1051	1000	952	910	870	835	801
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446

**Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)											TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)											
	160	180	200	220	240	260	280	300	320	340	360	
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24

Includes APU fuel burn.  
Driftdown at optimum driftdown speed and cruise at LRC speed.



**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716



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
284	263	244	227	213	200	190	181	173	166	159
565	523	485	453	425	400	381	364	348	334	321
847	784	728	680	638	600	572	546	522	501	482
1129	1045	970	906	850	800	763	729	698	669	643
1413	1308	1214	1133	1063	1000	954	911	872	836	804
1697	1570	1457	1361	1276	1200	1145	1094	1047	1004	965
1982	1834	1701	1588	1489	1400	1336	1276	1221	1171	1125
2268	2097	1945	1815	1702	1600	1526	1458	1395	1338	1286
2554	2362	2190	2043	1915	1800	1717	1640	1569	1505	1446
2842	2626	2434	2270	2128	2000	1908	1822	1743	1671	1606

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.8	0:39	3.3	0:38	3.0	0:36	2.7	0:36	2.5	0:35
400	8.0	1:13	7.3	1:10	6.8	1:08	6.4	1:05	6.1	1:03
600	12.1	1:48	11.2	1:44	10.6	1:39	10.0	1:35	9.7	1:32
800	16.2	2:23	15.1	2:17	14.3	2:11	13.6	2:06	13.2	2:01
1000	20.2	2:59	18.9	2:50	18.0	2:43	17.1	2:36	16.7	2:30
1200	24.2	3:34	22.7	3:24	21.7	3:15	20.7	3:06	20.2	2:59
1400	28.2	4:10	26.5	3:58	25.3	3:47	24.1	3:37	23.6	3:29
1600	32.1	4:46	30.2	4:33	28.9	4:19	27.6	4:08	26.9	3:58
1800	36.0	5:22	33.8	5:07	32.4	4:52	31.0	4:39	30.2	4:28
2000	39.8	5:59	37.5	5:42	36.0	5:25	34.4	5:10	33.5	4:58

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
5	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.1	1.7	2.4
10	-2.1	-1.7	-1.3	-0.9	-0.4	0.0	0.7	1.5	2.5	3.7	5.0
15	-3.3	-2.6	-2.0	-1.3	-0.7	0.0	1.0	2.3	3.8	5.6	7.6
20	-4.4	-3.5	-2.7	-1.8	-0.9	0.0	1.4	3.1	5.1	7.4	9.9
25	-5.5	-4.4	-3.4	-2.2	-1.1	0.0	1.8	3.9	6.3	9.1	12.2
30	-6.7	-5.4	-4.0	-2.7	-1.3	0.0	2.1	4.6	7.5	10.7	14.3
35	-7.8	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.3	8.6	12.2	16.2
40	-8.9	-7.2	-5.4	-3.6	-1.8	0.0	2.8	6.0	9.7	13.7	18.1

Includes APU fuel burn.

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	80.5	83.9	88.6	93.4			
	KIAS	264	264	265	269			
	FF/ENG	9070	9130	9370	9670			
340	%N1	78.7	81.9	86.7	91.4	100.4		
	KIAS	260	260	260	260	299		
	FF/ENG	8520	8560	8730	8950	10320		
320	%N1	76.7	79.7	84.6	89.2	96.4		
	KIAS	253	253	253	253	289		
	FF/ENG	7930	7940	8050	8210	9240		
300	%N1	74.7	77.7	82.3	87.1	92.4		
	KIAS	244	244	244	244	259		
	FF/ENG	7380	7360	7430	7550	8120		
280	%N1	72.8	75.7	80.1	85.0	90.1		
	KIAS	238	238	238	238	238		
	FF/ENG	6880	6850	6880	6950	7350		
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1	
	KIAS	229	229	229	229	229	262	
	FF/ENG	6380	6340	6330	6380	6690	7470	
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5	
	KIAS	223	223	223	223	223	228	
	FF/ENG	5910	5870	5820	5850	6110	6420	
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7	96.7
	KIAS	217	217	217	217	217	217	242
	FF/ENG	5440	5400	5330	5350	5530	5760	6550
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0	91.2
	KIAS	217	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200	5550
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5	87.2
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730	4880
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0	84.7
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340	4450

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	720	630				
50	780	680	520			
48	830	740	570			
46	880	790	620	480		
44	930	840	670	520		
42	980	900	730	570	420	
40	1020	950	770	620	460	
38	1030	1000	820	660	490	280
36	1030	1030	860	700	520	310
34	1040	1040	910	740	560	340
32	1040	1040	950	780	590	370
30	1050	1040	960	810	630	400
20	1080	1070	980	860	730	530
10	1100	1090	970	850	510	320
0	1120	1110	920	710	500	250
-20	1170	1150	960	740	520	260
-40	1220	1200	990	770	540	270

Rate of climb capability shown is valid for 190000 kg, gear down at VREF20 + 5.

Decrease rate of climb 50 ft/min per 5000 kg greater than 190000 kg.

Increase rate of climb 60 ft/min per 5000 kg less than 190000 kg.

**Flaps 30**

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	100	10				
50	150	60	-80			
48	200	110	-30			
46	240	160	20	-110		
44	290	210	70	-70		
42	340	260	110	-20	-160	
40	380	310	160	20	-130	
38	380	350	200	50	-100	-300
36	380	390	240	90	-70	-270
34	390	390	280	130	-40	-250
32	390	390	310	160	-10	-220
30	390	390	330	190	20	-200
20	410	400	340	240	110	-80
10	420	410	290	150	10	-150
0	430	420	260	80	-120	-360
-20	450	440	270	80	-120	-370
-40	470	460	280	90	-130	-390

Rate of climb capability shown is valid for 190000 kg, gear down at VREF30 + 5.

Decrease rate of climb 30 ft/min per 5000 kg greater than 190000 kg.

Increase rate of climb 40 ft/min per 5000 kg less than 190000 kg.

Intentionally  
Blank

**Performance Inflight - QRH****Chapter PI-QRH****Gear Down****Section 33****GEAR DOWN****220 KIAS Max Climb %N1**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

**Anti-ice Adjustment**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

\* Packs on or off with 2 bleed sources.

\*\* Packs off with 1 bleed source.

**GEAR DOWN**

**Long Range Cruise Altitude Capability**  
**Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

**GEAR DOWN****Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7524	7653	7775	7993						
340	%N1	83.5	87.8	89.7	91.8						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7296	7405	7486	7646						
320	%N1	82.6	86.7	88.3	90.0	92.1					
	MACH	.488	.534	.550	.568	.588					
	KIAS	270	269	267	265	264					
	FF/ENG	7058	7105	7101	7142	7267					
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1				
	MACH	.481	.520	.537	.554	.572	.594				
	KIAS	266	262	260	258	257	256				
	FF/ENG	6725	6632	6624	6623	6679	6806				
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3			
	MACH	.468	.507	.523	.540	.557	.576	.598			
	KIAS	259	255	253	252	250	248	248			
	FF/ENG	6283	6189	6167	6168	6164	6230	6361			
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7	
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628	
	KIAS	251	248	246	244	243	241	239	239	239	
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239	
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0	
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605	
	KIAS	242	240	238	237	235	233	231	230	230	
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450	
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4	91.5
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582	.606
	KIAS	232	231	230	228	227	225	224	222	221	220
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859	4983
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3	88.5
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571	.596
	KIAS	223	221	220	219	218	217	217	216	217	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481	4565
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1	87.0
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283	4335
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1	85.9
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125	4159

**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
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

**Reference Fuel and Time Required at Check Point**

AIR DIST( NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME
	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)
200	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57



**GEAR DOWN****Long Range Cruise Enroute Fuel and Time****Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

**Descent at VREF30 + 80**

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

**GEAR DOWN**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1						
	KIAS	264						
	FF/ENG	7750						
340	%N1	74.6	77.7					
	KIAS	260	260					
	FF/ENG	7360	7350					
320	%N1	72.8	75.8					
	KIAS	253	253					
	FF/ENG	6890	6870					
300	%N1	70.6	73.7	78.1				
	KIAS	244	244	244				
	FF/ENG	6380	6370	6340				
280	%N1	68.8	72.0	76.3				
	KIAS	238	238	238				
	FF/ENG	5970	5960	5920				
260	%N1	66.7	69.7	74.1	78.6			
	KIAS	229	229	229	229			
	FF/ENG	5520	5510	5470	5490			
240	%N1	64.9	67.7	72.2	76.7			
	KIAS	223	223	223	223			
	FF/ENG	5150	5130	5100	5100			
220	%N1	63.1	65.8	70.1	74.6	79.4		
	KIAS	217	217	217	217	217		
	FF/ENG	4800	4770	4730	4730	4770		
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7	
	KIAS	217	217	217	217	217	217	
	FF/ENG	4610	4570	4520	4520	4550	4610	
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5	86.0
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420	4520
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5	84.9
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260	4350

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding  
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3	94.3
	KIAS	244	244	244	244	244
	FF/ENG	7660	7700	7690	7810	8200
340	%N1	74.3	77.4	82.1	86.8	91.8
	KIAS	240	240	240	240	240
	FF/ENG	7240	7260	7250	7350	7630
320	%N1	72.5	75.5	80.0	84.9	89.7
	KIAS	233	233	233	233	233
	FF/ENG	6770	6780	6770	6830	7040
300	%N1	70.3	73.4	77.8	82.9	87.6
	KIAS	224	224	224	224	224
	FF/ENG	6270	6270	6270	6320	6450
280	%N1	68.3	71.5	75.8	80.6	85.6
	KIAS	218	218	218	218	218
	FF/ENG	5840	5840	5820	5870	5980
260	%N1	66.0	69.1	73.5	78.1	83.3
	KIAS	209	209	209	209	209
	FF/ENG	5380	5370	5340	5400	5460
240	%N1	64.1	66.9	71.4	75.9	81.0
	KIAS	203	203	203	203	203
	FF/ENG	4980	4960	4930	4970	5020
220	%N1	62.0	64.7	69.0	73.6	78.4
	KIAS	197	197	197	197	197
	FF/ENG	4600	4570	4530	4550	4610
200	%N1	60.5	63.2	67.3	71.8	76.5
	KIAS	197	197	197	197	197
	FF/ENG	4350	4310	4260	4270	4310
180	%N1	59.1	61.8	65.8	70.3	74.9
	KIAS	197	197	197	197	197
	FF/ENG	4140	4100	4040	4050	4070
160	%N1	57.9	60.7	64.6	69.0	73.5
	KIAS	197	197	197	197	197
	FF/ENG	3970	3920	3860	3860	3860

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally  
Blank

**Performance Inflight - QRH**  
**Gear Down, Engine INOP**

**Chapter PI-QRH**  
**Section 34**

**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 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	307	254	5600	4400	2200
300	288	246	7700	6800	5300
280	269	238	9800	9100	8100
260	250	230	12100	11400	10300
240	230	223	14000	13500	12400
220	210	217	15900	15400	14400
200	191	216	17300	16700	15700
180	172	216	18500	18100	16900
160	153	216	19700	19400	18200

**Long Range Cruise Altitude Capability**  
**100 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
340	1800		
330	3300	1000	
320	4500	2700	
310	5700	4400	1900
300	6800	5700	3800
290	7800	7000	5300
280	8800	8100	6700
270	9800	9100	8100
260	11100	10400	9300
250	12100	11400	10300
240	13100	12500	11300
230	14000	13600	12400
220	15100	14600	13600
210	15900	15400	14400
200	16700	16100	15100
190	17400	16700	15800
180	18000	17500	16400
170	18700	18200	16900
160	19300	18900	17700

## GEAR DOWN

## ENGINE INOP

### MAX CONTINUOUS THRUST

#### Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		5	7	9	11	13	15	17	19
300	%N1	94.3	96.8						
	MACH	.403	.418						
	KIAS	244	244						
	FF/ENG	12328	12507						
280	%N1	92.3	94.1	96.8					
	MACH	.393	.407	.422					
	KIAS	238	238	238					
	FF/ENG	11514	11566	11807					
260	%N1	90.5	91.6	93.6	96.4				
	MACH	.385	.393	.408	.423				
	KIAS	233	229	229	229				
	FF/ENG	10870	10626	10714	10945				
240	%N1	88.9	89.8	91.3	93.4	96.5			
	MACH	.379	.385	.397	.412	.428			
	KIAS	229	225	223	223	223			
	FF/ENG	10228	9966	9915	10023	10245			
220	%N1	86.6	88.0	89.1	90.9	93.1	96.4		
	MACH	.368	.377	.387	.401	.417	.433		
	KIAS	223	220	217	217	217	217		
	FF/ENG	9452	9309	9167	9222	9323	9542		
200	%N1	84.2	86.0	87.8	89.5	91.4	94.0	98.1	
	MACH	.358	.371	.385	.400	.415	.431	.448	
	KIAS	217	217	217	217	217	217	217	
	FF/ENG	8693	8698	8718	8773	8844	8956	9300	
180	%N1	82.9	84.7	86.7	88.4	90.2	92.3	95.5	100.2
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8330	8328	8342	8399	8458	8533	8740	9239
160	%N1	81.7	83.6	85.4	87.3	89.0	90.9	93.5	97.7
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8019	8011	8010	8058	8115	8168	8310	8670

**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
165	145	129	118	108	100	95	90	84	78	73
332	295	263	238	218	200	187	175	165	155	147
500	444	396	358	327	300	280	262	246	233	221
669	593	528	477	436	400	374	350	329	310	294
837	742	661	597	545	500	467	437	410	387	367
1007	893	795	718	655	600	560	524	492	464	440
1177	1043	928	838	764	700	653	611	574	541	513
1347	1193	1061	958	873	800	746	698	655	618	586
1519	1344	1195	1078	983	900	839	785	737	695	659
1691	1496	1329	1198	1092	1000	933	873	819	772	731

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	4.0	0:27	3.8	0:26	3.5	0:26	3.4	0:25	3.3	0:25
200	8.2	0:51	7.8	0:50	7.5	0:49	7.3	0:48	7.2	0:47
300	12.3	1:15	11.8	1:14	11.4	1:12	11.1	1:10	11.1	1:09
400	16.4	1:40	15.8	1:38	15.3	1:36	14.9	1:33	14.9	1:30
500	20.5	2:04	19.7	2:02	19.1	1:59	18.7	1:56	18.7	1:53
600	24.5	2:29	23.6	2:27	22.9	2:23	22.5	2:19	22.4	2:15
700	28.5	2:53	27.5	2:51	26.7	2:46	26.1	2:42	26.0	2:37
800	32.5	3:18	31.3	3:16	30.4	3:10	29.8	3:05	29.6	2:59
900	36.4	3:43	35.1	3:40	34.1	3:34	33.4	3:28	33.2	3:22
1000	40.3	4:08	38.8	4:05	37.8	3:58	37.0	3:51	36.7	3:44

**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.8	-0.5	0.0	1.6	2.6
10	-1.8	-1.1	0.0	3.0	5.6
15	-2.8	-1.6	0.0	4.4	8.6
20	-3.7	-2.2	0.0	5.6	11.6
25	-4.5	-2.7	0.0	6.8	14.4
30	-5.4	-3.2	0.0	7.8	17.3
35	-6.2	-3.7	0.0	8.7	20.0
40	-7.0	-4.2	0.0	9.5	22.7
45	-7.7	-4.7	0.0	10.2	25.3

Includes APU fuel burn.

**GEAR DOWN**  
**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
340	%N1	95.5			
	KIAS	260			
	FF/ENG	14970			
320	%N1	93.4	97.2		
	KIAS	253	253		
	FF/ENG	13980	14120		
300	%N1	91.1	94.3		
	KIAS	244	244		
	FF/ENG	12970	12940		
280	%N1	89.3	92.3	98.8	
	KIAS	238	238	238	
	FF/ENG	12100	12090	12660	
260	%N1	86.8	90.0	94.8	
	KIAS	229	229	229	
	FF/ENG	11100	11180	11340	
240	%N1	84.6	88.0	92.2	
	KIAS	223	223	223	
	FF/ENG	10310	10380	10460	
220	%N1	82.3	85.7	90.0	96.4
	KIAS	217	217	217	217
	FF/ENG	9540	9590	9650	10020
200	%N1	80.8	84.2	88.6	94.0
	KIAS	217	217	217	217
	FF/ENG	9080	9130	9180	9400
180	%N1	79.6	82.9	87.5	92.3
	KIAS	217	217	217	217
	FF/ENG	8700	8750	8780	8960
160	%N1	78.6	81.7	86.4	90.9
	KIAS	217	217	217	217
	FF/ENG	8380	8420	8430	8580

This table includes 5% additional fuel for holding in a racetrack pattern.



**Performance Inflight - QRH****Chapter PI-QRH****Text****Section 35**

---

**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 %N1 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.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

**Max Climb %N1**

This table shows Max Climb %N1 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 %N1. %N1 adjustments are shown for anti-ice operation.

**VREF Speeds**

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

---

## Advisory Information

### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, 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.

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## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, 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 landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

---

## Engine Inoperative

### Initial Max Continuous %N1

The Initial Max Continuous %N1 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 %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

### Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

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 %N1, 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 autoland 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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**Performance Inflight - QRH****Chapter PI-QRH****General****Section 40****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 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>5.0</b> 2500	<b>4.5</b> 1500			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>6.5</b> 3700	<b>5.5</b> 2600	<b>5.5</b> 1800	<b>5.0</b> 1300	<b>4.5</b> 900
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>9.5</b> 5000	<b>8.5</b> 3600	<b>8.0</b> 2700	<b>7.5</b> 2000	<b>7.5</b> 1400
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>14.0</b> 6700	<b>11.5</b> 4900	<b>10.0</b> 3700	<b>9.5</b> 2900	<b>9.5</b> 2200
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>17.5</b> 7800	<b>14.5</b> 5700	<b>12.5</b> 4400	<b>11.5</b> 3500	<b>11.0</b> 2800

**Cruise****Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> %N1	<b>2.0</b> 78.6	<b>3.0</b> 83.2			
35000 (.82M)	<b>PITCH ATT</b> %N1	<b>1.5</b> 76.5	<b>2.0</b> 78.9	<b>3.0</b> 82.8	<b>3.5</b> 88.0	
30000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 72.6	<b>2.5</b> 74.7	<b>3.0</b> 78.1	<b>3.5</b> 82.4	<b>3.5</b> 87.3
25000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 68.6	<b>2.5</b> 70.7	<b>3.5</b> 73.8	<b>4.0</b> 77.7	<b>4.0</b> 82.3
20000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 63.4	<b>2.5</b> 65.8	<b>3.5</b> 69.0	<b>4.5</b> 72.8	<b>5.5</b> 77.4
15000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 59.6	<b>2.5</b> 61.8	<b>3.5</b> 65.0	<b>4.5</b> 68.2	<b>5.5</b> 72.5

**Descent****Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2900	<b>0.0</b> -2600			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -2500	<b>-0.5</b> -2000	<b>0.5</b> -1900	<b>1.0</b> -1900	<b>0.5</b> -2400
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1900	<b>0.5</b> -1600	<b>1.5</b> -1500	<b>2.5</b> -1400	<b>3.0</b> -1400
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1700	<b>0.0</b> -1400	<b>1.0</b> -1300	<b>2.0</b> -1300	<b>3.0</b> -1300
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-2.0</b> -1500	<b>-0.5</b> -1300	<b>1.0</b> -1200	<b>2.0</b> -1200	<b>3.0</b> -1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

**Flight With Unreliable Airspeed / Turbulent Air Penetration**  
**Altitude and/or vertical speed indications may also be unreliable.**

**Holding**

**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	<b>PITCH ATT</b>	<b>3.0</b>	<b>4.5</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	<b>PITCH ATT</b>	<b>3.0</b>	<b>4.5</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

**Terminal Area (5000 FT)**

**%N1 for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP GEAR UP (VREF 30 + 80)	<b>PITCH ATT</b>	<b>3.5</b>	<b>5.0</b>	<b>6.0</b>	<b>6.5</b>	<b>6.5</b>
	%N1	47.7	52.3	57.2	61.9	66.4
	KIAS	217	217	225	243	263
FLAPS 1 GEAR UP (VREF 30 + 60)	<b>PITCH ATT</b>	<b>5.0</b>	<b>6.5</b>	<b>8.0</b>	<b>8.0</b>	<b>8.0</b>
	%N1	48.5	53.4	58.8	63.9	68.2
	KIAS	197	197	205	223	243
FLAPS 5 GEAR UP (VREF 30 + 40)	<b>PITCH ATT</b>	<b>3.5</b>	<b>5.5</b>	<b>7.0</b>	<b>7.0</b>	<b>6.5</b>
	%N1	48.8	54.0	59.7	64.7	69.0
	KIAS	177	177	185	203	223
FLAPS 15 GEAR UP (VREF 30 + 20)	<b>PITCH ATT</b>	<b>3.5</b>	<b>6.5</b>	<b>8.0</b>	<b>7.5</b>	<b>7.0</b>
	%N1	49.0	55.2	61.9	66.8	71.2
	KIAS	157	157	165	183	203
FLAPS 20 GEAR DOWN (VREF 30 + 20)	<b>PITCH ATT</b>	<b>2.0</b>	<b>4.5</b>	<b>6.5</b>	<b>6.0</b>	<b>5.5</b>
	%N1	56.2	61.4	67.3	73.1	78.1
	KIAS	157	157	165	183	203

**Final Approach (1500 FT)**

**Gear Down, %N1 for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	<b>PITCH ATT</b>	<b>0.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.5</b>	<b>2.5</b>
	%N1	36.8	40.7	45.1	49.3	52.6
	KIAS	147	155	172	187	201
FLAPS 25 (VREF 25 + 10)	<b>PITCH ATT</b>	<b>1.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.5</b>	<b>2.5</b>
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	147	147	163	178	191
FLAPS 30 (VREF 30 + 10)	<b>PITCH ATT</b>	<b>0.0</b>	<b>1.0</b>	<b>2.0</b>	<b>1.5</b>	
	%N1	56.9	55.6	60.2	65.3	
	KIAS	147	147	155	172	

**Max Climb %N1****Based on engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	.84	.84	.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

\*Packs on or packs off with 2 bleed sources.

\*\*Packs off with 1 bleed source.

VREF

Flaps 30

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	186	186	186	186	187	187
340	180	180	180	180	180	180
320	173	173	173	173	173	173
300	164	164	164	164	164	165
280	158	158	158	158	158	158
260	149	149	149	150	150	150
240	143	144	144	144	144	144
220	137	137	138	138	138	138
200	137	134	131	131	131	131
180	137	134	130	126	124	124
160	137	134	130	126	121	117

Flaps 25

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	185	185	185	185	185	185
340	180	180	180	180	181	181
320	175	175	175	175	175	176
300	169	170	170	170	170	170
280	164	164	164	164	164	164
260	158	158	158	158	158	158
240	152	152	152	152	152	152
220	145	145	146	146	146	146
200	139	139	139	139	139	139
180	137	134	131	131	131	132
160	137	134	130	126	124	124

Flaps 20

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	195	195	195	196	196	198
340	190	190	190	191	191	192
320	185	185	185	185	185	186
300	179	179	179	179	180	180
280	173	173	173	173	174	174
260	167	167	167	167	167	167
240	160	160	161	161	161	161
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	139	139	139	139	139	139
160	137	134	131	131	131	131

# Performance Inflight - QRH

## Advisory Information

# Chapter PI-QRH

## Section 41

### ADVISORY INFORMATION

#### Normal Configuration Landing Distance

##### Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	990	+25/-5	20	-40/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 4	1740	+40/-5	45	-80/+270	0/0	+45/-50	95	0	0
AUTOBRAKE 3	2065	+45/-15	60	-100/+335	0/-5	+60/-60	115	0	0
AUTOBRAKE 2	2315	+50/-25	70	-115/+390	+20/-50	+65/-65	90	45	45
AUTOBRAKE 1	2530	+60/-30	85	-130/+455	+75/-80	+75/-75	90	245	285

#### Good Reported Braking Action

MAX MANUAL	1620	+35/-10	45	-75/+265	+40/-35	+40/-40	65	100	230
AUTOBRAKE MAX	1680	+35/-10	45	-80/+270	+35/-30	+40/-40	70	105	245
AUTOBRAKE 4	2010	+45/-5	60	-90/+315	+10/-5	+60/-60	110	5	40
AUTOBRAKE 3	2375	+50/-15	70	-115/+385	0/-5	+70/-70	130	0	0
AUTOBRAKE 2	2660	+60/-30	80	-130/+450	+25/-60	+75/-75	105	50	50
AUTOBRAKE 1	2910	+70/-35	100	-150/+525	+85/-90	+85/-85	105	280	330

#### Medium Reported Braking Action

MAX MANUAL	2195	+45/-25	70	-120/+430	+100/-80	+60/-60	80	265	690
AUTOBRAKE MAX	2200	+45/-25	70	-120/+430	+105/-80	+60/-60	80	265	690
AUTOBRAKE 4	2260	+50/-10	70	-120/+435	+85/-50	+65/-65	110	255	690
AUTOBRAKE 3	2505	+60/-15	75	-130/+470	+50/-40	+75/-75	130	115	475
AUTOBRAKE 2	2730	+60/-30	85	-145/+500	+70/-80	+75/-80	105	115	350
AUTOBRAKE 1	2920	+70/-35	100	-155/+535	+115/-100	+85/-85	105	305	455

#### Poor Reported Braking Action

MAX MANUAL	2825	+65/-35	100	-180/+665	+230/-155	+80/-80	90	550	1650
AUTOBRAKE MAX	2835	+65/-35	105	-180/+665	+230/-155	+80/-80	90	560	1655
AUTOBRAKE 4	2835	+65/-30	105	-180/+665	+230/-150	+80/-80	100	560	1655
AUTOBRAKE 3	2900	+70/-30	100	-180/+680	+200/-120	+85/-85	125	520	1620
AUTOBRAKE 2	3040	+70/-35	105	-185/+690	+195/-150	+85/-85	105	425	1505
AUTOBRAKE 1	3150	+75/-40	110	-190/+715	+225/-160	+90/-90	105	525	1430

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 75 m.

For autobrake and manual speedbrakes, increase reference landing distance by 60 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

## ADVISORY INFORMATION

### Normal Configuration Landing Distance

#### Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE/ BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV  NO REV

#### Dry Runway

MAX MANUAL	1045	+25/-10	25	-40/+135	+15/-10	+25/-25	35	25	50
AUTOBRAKE MAX	1445	+20/-10	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 4	1900	+30/-15	50	-85/+285	0/0	+55/-55	100	0	0
AUTOBRAKE 3	2265	+35/-25	65	-105/+350	0/-15	+65/-65	110	0	0
AUTOBRAKE 2	2510	+40/-35	80	-120/+405	+30/-60	+70/-70	90	80	80
AUTOBRAKE 1	2735	+50/-40	95	-140/+470	+85/-90	+80/-80	90	295	370

#### Good Reported Braking Action

MAX MANUAL	1725	+25/-15	45	-80/+275	+45/-40	+45/-45	65	110	265
AUTOBRAKE MAX	1800	+30/-15	50	-80/+280	+40/-30	+45/-45	75	115	280
AUTOBRAKE 4	2195	+35/-15	65	-100/+335	+10/-5	+65/-65	115	5	45
AUTOBRAKE 3	2605	+40/-30	75	-120/+400	0/-15	+75/-75	125	0	0
AUTOBRAKE 2	2885	+45/-40	90	-140/+465	+35/-70	+80/-80	105	90	90
AUTOBRAKE 1	3145	+60/-45	110	-160/+540	+100/-105	+90/-90	105	340	425

#### Medium Reported Braking Action

MAX MANUAL	2350	+40/-30	75	-120/+450	+105/-85	+65/-65	80	295	775
AUTOBRAKE MAX	2350	+40/-30	75	-125/+450	+110/-80	+65/-65	85	295	775
AUTOBRAKE 4	2450	+40/-25	75	-125/+455	+80/-50	+70/-70	115	260	755
AUTOBRAKE 3	2735	+40/-30	80	-140/+490	+50/-50	+80/-80	125	115	500
AUTOBRAKE 2	2955	+50/-40	90	-150/+520	+80/-90	+85/-85	105	155	410
AUTOBRAKE 1	3155	+60/-45	110	-160/+560	+125/-110	+90/-90	105	360	560

#### Poor Reported Braking Action

MAX MANUAL	3020	+60/-40	110	-185/+685	+235/-160	+85/-85	90	615	1855
AUTOBRAKE MAX	3030	+60/-40	110	-185/+685	+240/-165	+85/-85	90	615	1865
AUTOBRAKE 4	3030	+60/-40	110	-185/+685	+240/-155	+85/-85	105	620	1865
AUTOBRAKE 3	3140	+60/-40	110	-185/+695	+200/-130	+90/-90	125	540	1795
AUTOBRAKE 2	3275	+60/-45	115	-190/+715	+215/-160	+100/-100	105	490	1680
AUTOBRAKE 1	3390	+65/-50	120	-195/+730	+240/-175	+100/-100	105	590	1620

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 80 m.

For autobrake and manual speedbrakes, increase reference landing distance by 65 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).



**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 20**

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 4	2080	+30/-25	60	-90/+295	0/0	+60/-60	105	0	0
AUTOBRAKE 3	2480	+40/-35	70	-110/+370	0/-15	+75/-75	120	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
AUTOBRAKE 1	3010	+55/-50	105	-145/+495	+90/-100	+90/-90	100	350	425

**Good Reported Braking Action**

MAX MANUAL	1870	+30/-25	50	-80/+290	+45/-40	+45/-45	65	130	310
AUTOBRAKE MAX	1945	+30/-25	60	-85/+295	+40/-30	+50/-50	80	140	330
AUTOBRAKE 4	2400	+35/-30	70	-105/+350	+10/0	+70/-70	120	10	50
AUTOBRAKE 3	2850	+45/-40	80	-125/+425	0/-15	+85/-85	140	0	0
AUTOBRAKE 2	3175	+50/-50	105	-145/+490	+40/-70	+90/-90	115	110	110
AUTOBRAKE 1	3460	+65/-60	120	-165/+570	+105/-115	+105/-105	115	400	490

**Medium Reported Braking Action**

MAX MANUAL	2560	+45/-40	85	-130/+465	+115/-90	+70/-70	85	345	920
AUTOBRAKE MAX	2560	+45/-40	85	-130/+465	+120/-90	+75/-75	85	345	915
AUTOBRAKE 4	2660	+45/-35	85	-130/+475	+85/-60	+75/-75	120	300	885
AUTOBRAKE 3	2990	+45/-45	90	-145/+510	+60/-50	+85/-85	140	130	590
AUTOBRAKE 2	3245	+60/-50	105	-155/+545	+85/-100	+100/-100	115	180	475
AUTOBRAKE 1	3475	+65/-60	120	-175/+585	+130/-120	+105/-105	115	430	640

**Poor Reported Braking Action**

MAX MANUAL	3300	+65/-50	120	-190/+715	+260/-180	+100/-100	100	720	2200
AUTOBRAKE MAX	3305	+65/-50	120	-190/+715	+265/-180	+100/-100	100	720	2200
AUTOBRAKE 4	3305	+65/-50	120	-190/+715	+265/-165	+100/-100	105	720	2200
AUTOBRAKE 3	3425	+65/-50	120	-195/+725	+220/-140	+105/-105	130	625	2120
AUTOBRAKE 2	3580	+65/-60	125	-200/+740	+225/-175	+110/-110	115	565	1995
AUTOBRAKE 1	3720	+70/-65	140	-205/+765	+260/-190	+110/-110	110	690	1910

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 85 m.

For autobrake and manual speedbrakes, increase reference landing distance by 70 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### ANTISKID - Flaps 25

#### VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

#### Good Reported Braking Action

MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

#### Medium Reported Braking Action

MAX MANUAL	2625	+50/-35	95	-160/+595	+205/-140	+75/-75	80	535	1615
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

#### Poor Reported Braking Action

MAX MANUAL	3565	+75/-60	140	-265/+1110	+1265/-315	+110/-110	90	1435	5000
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****ANTISKID - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Good Reported Braking Action**

MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Medium Reported Braking Action**

MAX MANUAL	2455	+55/-30	85	-155/+580	+200/-135	+70/-70	80	480	1435
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

**Poor Reported Braking Action**

MAX MANUAL	3345	+80/-45	130	-255/+1090	+1220/-305	+100/-100	90	1320	5000
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

ENG SHUTDOWN L, R - Flaps 20

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	1130	+35/-10	25	-45/+145	+15/-15	+25/-25	40	0	30
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2840	+45/-40	85	-130/+435	+5/-20	+85/-85	140	0	0

### Good Reported Braking Action

MAX MANUAL	1700	+25/-20	50	-75/+265	+50/-45	+45/-45	60	0	150
AUTOBRAKE MAX	1775	+25/-25	50	-80/+270	+45/-40	+50/-50	70	0	160
AUTOBRAKE 2	2840	+45/-40	85	-130/+435	+5/-20	+85/-85	140	0	0

### Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-125/+445	+135/-105	+70/-70	85	0	460
AUTOBRAKE MAX	2450	+40/-35	80	-125/+445	+135/-95	+70/-70	95	0	455
AUTOBRAKE 3	2675	+45/-35	85	-135/+465	+90/-60	+80/-80	125	0	345

### Poor Reported Braking Action

MAX MANUAL	3325	+60/-55	115	-195/+710	+330/-215	+100/-100	105	0	1125
AUTOBRAKE MAX	3330	+60/-55	120	-195/+710	+335/-215	+100/-100	105	0	1130
AUTOBRAKE 3	3365	+65/-55	120	-195/+715	+320/-205	+100/-105	110	0	1140

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	995	+30/-5	20	-40/+135	+15/-10	+20/-20	40	0	25
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 2	2345	+55/-15	70	-115/+390	+10/-15	+70/-70	125	0	0

**Good Reported Braking Action**

MAX MANUAL	1460	+30/-10	40	-70/+245	+40/-35	+40/-40	60	0	110
AUTOBRAKE MAX	1525	+30/-10	40	-70/+250	+40/-35	+40/-40	65	0	120
AUTOBRAKE 2	2345	+55/-15	70	-115/+390	+10/-15	+70/-70	125	0	0

**Medium Reported Braking Action**

MAX MANUAL	2070	+45/-20	65	-115/+410	+110/-85	+60/-60	80	0	340
AUTOBRAKE MAX	2070	+45/-15	65	-115/+410	+115/-80	+60/-60	85	0	340
AUTOBRAKE 3	2235	+50/-15	70	-120/+425	+80/-55	+65/-65	110	0	270

**Poor Reported Braking Action**

MAX MANUAL	2790	+65/-30	95	-175/+655	+280/-180	+85/-85	95	0	825
AUTOBRAKE MAX	2795	+65/-30	95	-175/+655	+285/-180	+85/-85	95	0	830
AUTOBRAKE 3	2830	+65/-30	95	-175/+660	+270/-180	+85/-85	95	0	840

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### FLAP / SLAT CONTROL - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

#### Good Reported Braking Action

MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

#### Medium Reported Braking Action

MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515

#### Poor Reported Braking Action

MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≤ 5)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	1300	+55/-10	45	-45/+205	+20/-15	+40/-35	55	55	130
AUTOBRAKE MAX	1910	+35/-5	50	-70/+230	0/0	+50/-50	80	0	0
AUTOBRAKE 2	3345	+70/-40	115	-140/+470	+60/-75	+100/-100	115	225	225

**Good Reported Braking Action**

MAX MANUAL	1850	+30/-15	55	-75/+265	+45/-40	+50/-50	55	155	375
AUTOBRAKE MAX	1995	+35/-5	55	-80/+275	+20/-15	+55/-55	80	95	330
AUTOBRAKE 2	3345	+70/-40	115	-140/+470	+60/-75	+100/-100	115	225	225

**Medium Reported Braking Action**

MAX MANUAL	2570	+50/-25	90	-120/+425	+110/-90	+75/-75	75	415	1170
AUTOBRAKE MAX	2570	+50/-25	90	-120/+425	+110/-80	+75/-75	80	410	1160
AUTOBRAKE 3	3160	+60/-30	100	-140/+485	+60/-60	+95/-95	120	150	690

**Poor Reported Braking Action**

MAX MANUAL	3335	+70/-40	130	-175/+655	+245/-170	+100/-100	90	870	2925
AUTOBRAKE MAX	3335	+70/-40	130	-175/+655	+245/-170	+100/-100	90	870	2925
AUTOBRAKE 3	3530	+75/-40	130	-185/+670	+215/-140	+105/-110	120	690	2750

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### FLAPS DRIVE - (5 < Flaps < 20)

#### VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1135	+40/-5	25	-40/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+60/-30	90	-130/+435	+35/-50	+85/-85	115	85	85

#### Good Reported Braking Action

MAX MANUAL	1660	+30/-10	50	-75/+250	+40/-35	+45/-45	60	125	305
AUTOBRAKE MAX	1715	+35/-5	50	-75/+255	+35/-25	+45/-45	70	125	315
AUTOBRAKE 2	2845	+60/-30	90	-130/+435	+35/-50	+85/-85	115	85	85

#### Medium Reported Braking Action

MAX MANUAL	2290	+50/-20	75	-115/+410	+105/-85	+65/-65	75	340	930
AUTOBRAKE MAX	2290	+50/-20	75	-115/+410	+105/-85	+65/-65	75	335	925
AUTOBRAKE 3	2665	+55/-20	80	-130/+450	+50/-45	+80/-80	125	120	625

#### Poor Reported Braking Action

MAX MANUAL	2965	+65/-35	110	-170/+630	+230/-160	+85/-85	90	710	2280
AUTOBRAKE MAX	2970	+65/-35	110	-170/+630	+235/-160	+90/-90	90	710	2285
AUTOBRAKE 3	3055	+70/-30	110	-170/+640	+210/-125	+90/-90	120	630	2205

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≥ 20)****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

**Dry Runway**

MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

**Good Reported Braking Action**

MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

**Medium Reported Braking Action**

MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515

**Poor Reported Braking Action**

MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### FLAPS PRIMARY FAIL - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1280	+30/-15	30	-45/+155	+15/-15	+30/-30	50	35	80
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

#### Good Reported Braking Action

MAX MANUAL	1820	+25/-25	50	-80/+270	+50/-45	+45/-45	70	140	340
AUTOBRAKE MAX	1820	+25/-25	55	-80/+270	+50/-40	+50/-50	75	140	335
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

#### Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-120/+430	+115/-90	+70/-70	85	360	985
AUTOBRAKE MAX	2445	+40/-35	80	-120/+425	+120/-95	+70/-70	85	360	975
AUTOBRAKE 3	2640	+40/-35	80	-130/+450	+70/-45	+80/-80	130	180	795

#### Poor Reported Braking Action

MAX MANUAL	3110	+60/-50	115	-175/+650	+250/-170	+90/-90	100	725	2315
AUTOBRAKE MAX	3110	+60/-50	115	-175/+650	+255/-175	+90/-90	100	725	2315
AUTOBRAKE 3	3135	+60/-50	115	-175/+650	+245/-150	+95/-95	115	700	2285

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****FLIGHT CONTROL MODE - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

**Dry Runway**

MAX MANUAL	1295	+30/-15	30	-50/+160	+20/-15	+30/-30	50	35	85
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

**Good Reported Braking Action**

MAX MANUAL	1850	+30/-25	55	-80/+275	+50/-45	+50/-50	75	150	365
AUTOBRAKE MAX	1850	+30/-25	55	-80/+270	+50/-45	+50/-50	75	145	355
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

**Medium Reported Braking Action**

MAX MANUAL	2495	+45/-35	85	-125/+435	+120/-95	+70/-70	90	385	1060
AUTOBRAKE MAX	2495	+45/-35	85	-120/+435	+125/-100	+70/-70	90	380	1050
AUTOBRAKE 3	2650	+40/-35	80	-130/+450	+80/-45	+80/-80	130	225	895

**Poor Reported Braking Action**

MAX MANUAL	3180	+60/-50	120	-180/+655	+260/-175	+95/-95	105	775	2515
AUTOBRAKE MAX	3180	+60/-50	120	-180/+655	+265/-185	+95/-95	105	775	2515
AUTOBRAKE 3	3195	+60/-50	120	-180/+660	+260/-160	+95/-95	115	760	2500

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

HYD PRESS SYS C - Flaps 20

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	1280	+30/-15	30	-45/+155	+15/-15	+30/-30	50	35	80
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

### Good Reported Braking Action

MAX MANUAL	1820	+25/-25	50	-80/+270	+50/-45	+45/-45	70	140	340
AUTOBRAKE MAX	1820	+25/-25	55	-80/+270	+50/-40	+50/-50	75	140	335
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

### Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-120/+430	+115/-90	+70/-70	85	360	985
AUTOBRAKE MAX	2445	+40/-35	80	-120/+425	+120/-95	+70/-70	85	360	975
AUTOBRAKE 3	2640	+40/-35	80	-130/+450	+70/-45	+80/-80	130	180	795

### Poor Reported Braking Action

MAX MANUAL	3110	+60/-50	115	-175/+650	+250/-170	+90/-90	100	725	2315
AUTOBRAKE MAX	3110	+60/-50	115	-175/+650	+255/-175	+90/-90	100	725	2315
AUTOBRAKE 3	3135	+60/-50	115	-175/+650	+245/-150	+95/-95	115	700	2285

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 25****VREF25**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1125	+25/-10	25	-45/+150	+15/-15	+25/-25	45	0	35
AUTOBRAKE MAX	1445	+20/-10	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2595	+40/-25	75	-125/+415	0/0	+75/-75	145	0	0

**Good Reported Braking Action**

MAX MANUAL	1700	+25/-15	50	-80/+270	+55/-45	+45/-45	70	0	160
AUTOBRAKE MAX	1740	+25/-15	50	-80/+275	+50/-40	+45/-45	75	0	165
AUTOBRAKE 2	2595	+40/-25	75	-125/+415	0/0	+75/-75	145	0	0

**Medium Reported Braking Action**

MAX MANUAL	2460	+40/-30	80	-130/+465	+150/-115	+70/-70	90	0	510
AUTOBRAKE MAX	2465	+40/-30	80	-130/+465	+155/-115	+70/-70	95	0	510
AUTOBRAKE 3	2530	+40/-25	80	-135/+470	+130/-70	+75/-75	125	0	500

**Poor Reported Braking Action**

MAX MANUAL	3395	+60/-45	120	-210/+780	+400/-245	+105/-105	110	0	1310
AUTOBRAKE MAX	3405	+60/-45	125	-210/+780	+405/-245	+105/-105	110	0	1310
AUTOBRAKE 3	3405	+60/-45	125	-210/+780	+405/-235	+105/-105	120	0	1310

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### HYD PRESS SYS L - Flaps 30

#### VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1060	+30/-5	25	-40/+145	+15/-15	+25/-25	45	0	30
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 2	2360	+55/-10	70	-115/+395	0/0	+70/-70	140	0	0

#### Good Reported Braking Action

MAX MANUAL	1595	+30/-10	45	-75/+265	+50/-45	+40/-40	70	0	145
AUTOBRAKE MAX	1620	+35/-10	45	-75/+265	+45/-40	+45/-45	75	0	145
AUTOBRAKE 2	2360	+55/-10	70	-115/+395	0/0	+70/-70	140	0	0

#### Medium Reported Braking Action

MAX MANUAL	2305	+50/-20	75	-125/+455	+145/-110	+65/-65	90	0	460
AUTOBRAKE MAX	2305	+50/-20	75	-125/+455	+145/-110	+65/-65	95	0	460
AUTOBRAKE 3	2345	+55/-15	75	-130/+455	+135/-75	+70/-70	110	0	465

#### Poor Reported Braking Action

MAX MANUAL	3185	+70/-35	115	-200/+760	+385/-230	+95/-95	110	0	1190
AUTOBRAKE MAX	3195	+70/-35	115	-200/+760	+390/-235	+95/-95	110	0	1195
AUTOBRAKE 3	3195	+70/-35	115	-200/+760	+390/-230	+95/-95	110	0	1195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS L+C - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1420	+40/-5	35	-50/+175	+25/-20	+35/-35	65	0	55
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2930	+60/-10	85	-130/+440	0/0	+90/-90	155	0	0

**Good Reported Braking Action**

MAX MANUAL	2125	+40/-10	60	-90/+310	+75/-65	+60/-60	90	0	255
AUTOBRAKE MAX	2125	+40/-10	60	-90/+305	+80/-60	+60/-60	95	0	245
AUTOBRAKE 2	2930	+60/-10	85	-130/+440	0/0	+90/-90	155	0	0

**Medium Reported Braking Action**

MAX MANUAL	3040	+65/-25	100	-150/+525	+195/-150	+90/-90	120	0	770
AUTOBRAKE MAX	3040	+65/-25	100	-150/+520	+205/-155	+90/-90	120	0	760
AUTOBRAKE 3	3040	+65/-20	100	-150/+520	+205/-140	+90/-90	125	0	765

**Poor Reported Braking Action**

MAX MANUAL	4140	+90/-45	155	-235/+860	+500/-305	+125/-125	140	0	1920
AUTOBRAKE MAX	4140	+90/-45	155	-235/+860	+515/-315	+130/-130	140	0	1915
AUTOBRAKE 3	4140	+90/-45	155	-235/+860	+515/-315	+130/-130	140	0	1915

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

HYD PRESS SYS L+R - Flaps 20

VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	1530	+40/-5	40	-60/+205	+35/-30	+40/-40	70	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

### Good Reported Braking Action

MAX MANUAL	2545	+50/-10	75	-120/+400	+135/-110	+75/-75	115	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

### Medium Reported Braking Action

MAX MANUAL	4095	+75/-20	125	-215/+745	+470/-305	+130/-130	160	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

### Poor Reported Braking Action

MAX MANUAL	6545	+110/-35	210	-400/+1475	+2250/-810	+210/-210	200	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 25****VREF25**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1245	+20/-10	30	-50/+170	+25/-20	+30/-30	50	0	50
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Good Reported Braking Action**

MAX MANUAL	1870	+30/-20	55	-90/+310	+70/-60	+50/-50	75	0	220
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Medium Reported Braking Action**

MAX MANUAL	2660	+45/-30	90	-145/+525	+185/-135	+80/-80	95	0	640
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

**Poor Reported Braking Action**

MAX MANUAL	3595	+65/-50	130	-230/+875	+515/-280	+110/-110	110	0	1565
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

HYD PRESS SYS R - Flaps 30

VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

### Dry Runway

MAX MANUAL	1165	+20/-5	30	-50/+165	+20/-20	+30/-30	50	0	45
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

### Good Reported Braking Action

MAX MANUAL	1730	+35/-10	50	-85/+300	+65/-55	+45/-45	75	0	190
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

### Medium Reported Braking Action

MAX MANUAL	2440	+55/-20	80	-140/+505	+170/-125	+70/-70	90	0	545
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

### Poor Reported Braking Action

MAX MANUAL	3295	+70/-35	120	-220/+845	+480/-260	+100/-100	105	0	1330
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****HYD PRESS SYS R+C - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1755	+30/-5	50	-70/+235	+45/-40	+45/-45	80	0	130
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Good Reported Braking Action**

MAX MANUAL	2605	+55/-15	80	-120/+410	+130/-105	+75/-75	110	0	480
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

**Medium Reported Braking Action**

MAX MANUAL	3625	+80/-35	130	-190/+680	+325/-225	+110/-110	135	0	1295
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

**Poor Reported Braking Action**

MAX MANUAL	4795	+105/-55	185	-295/+1110	+915/-430	+150/-150	150	0	3035
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### PITCH UP AUTHORITY - (Flaps ≤ 15)

#### VREF30+40

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1290	+50/-5	35	-45/+175	+15/-15	+30/-30	40	40	85
AUTOBRAKE MAX	1910	+35/-5	50	-70/+230	0/0	+50/-50	80	0	0
AUTOBRAKE 2	3265	+65/-40	110	-140/+460	+70/-85	+95/-95	100	280	290

#### Good Reported Braking Action

MAX MANUAL	1880	+35/-15	55	-80/+265	+45/-40	+50/-50	60	150	365
AUTOBRAKE MAX	2010	+35/-10	55	-80/+280	+25/-20	+55/-55	80	110	335
AUTOBRAKE 2	3265	+65/-40	110	-140/+460	+70/-85	+95/-95	100	280	290

#### Medium Reported Braking Action

MAX MANUAL	2570	+50/-25	85	-120/+430	+110/-90	+75/-75	75	385	1050
AUTOBRAKE MAX	2580	+50/-25	90	-120/+430	+105/-85	+75/-75	80	385	1050
AUTOBRAKE 3	3135	+60/-30	100	-140/+485	+75/-75	+95/-95	105	185	640

#### Poor Reported Braking Action

MAX MANUAL	3285	+70/-40	125	-175/+650	+240/-165	+100/-100	85	775	2450
AUTOBRAKE MAX	3290	+70/-40	125	-175/+650	+240/-170	+100/-100	85	775	2450
AUTOBRAKE 3	3505	+75/-40	125	-180/+670	+210/-155	+105/-105	105	620	2295

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≥ 20)****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1145	+40/-5	25	-45/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

**Good Reported Braking Action**

MAX MANUAL	1660	+30/-10	45	-75/+250	+45/-35	+45/-45	55	115	280
AUTOBRAKE MAX	1725	+35/-5	50	-75/+260	+40/-25	+45/-45	75	120	295
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

**Medium Reported Braking Action**

MAX MANUAL	2265	+45/-20	75	-115/+405	+100/-80	+65/-65	75	310	815
AUTOBRAKE MAX	2265	+50/-20	75	-115/+405	+105/-75	+65/-65	80	305	815
AUTOBRAKE 3	2660	+55/-25	80	-130/+450	+55/-55	+80/-80	115	120	520

**Poor Reported Braking Action**

MAX MANUAL	2905	+65/-35	105	-165/+620	+225/-155	+85/-85	85	630	1925
AUTOBRAKE MAX	2910	+65/-35	105	-165/+625	+230/-155	+85/-85	85	630	1930
AUTOBRAKE 3	3035	+65/-35	105	-170/+635	+190/-130	+90/-90	110	540	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### PRIMARY FLIGHT COMPUTERS - Flaps 20

#### VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1295	+30/-15	30	-50/+160	+20/-15	+30/-30	50	35	85
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

#### Good Reported Braking Action

MAX MANUAL	1850	+30/-25	55	-80/+275	+50/-45	+50/-50	75	150	365
AUTOBRAKE MAX	1850	+30/-25	55	-80/+270	+50/-45	+50/-50	75	145	355
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

#### Medium Reported Braking Action

MAX MANUAL	2495	+45/-35	85	-125/+435	+120/-95	+70/-70	90	385	1060
AUTOBRAKE MAX	2495	+45/-35	85	-120/+435	+125/-100	+70/-70	90	380	1050
AUTOBRAKE 3	2650	+40/-35	80	-130/+450	+80/-45	+80/-80	130	225	895

#### Poor Reported Braking Action

MAX MANUAL	3180	+60/-50	120	-180/+655	+260/-175	+95/-95	105	775	2515
AUTOBRAKE MAX	3180	+60/-50	120	-180/+655	+265/-185	+95/-95	105	775	2515
AUTOBRAKE 3	3195	+60/-50	120	-180/+660	+260/-160	+95/-95	115	760	2500

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****SLATS DRIVE - Flaps 20****VREF30+30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV  NO REV

**Dry Runway**

MAX MANUAL	1230	+45/-5	30	-45/+150	+15/-15	+30/-30	40	35	75
AUTOBRAKE MAX	1750	+30/-5	45	-65/+220	0/0	+45/-45	80	0	0
AUTOBRAKE 2	3030	+60/-35	100	-135/+445	+60/-75	+90/-90	95	190	190

**Good Reported Braking Action**

MAX MANUAL	1785	+30/-15	50	-75/+260	+45/-40	+50/-50	60	135	320
AUTOBRAKE MAX	1875	+35/-5	55	-80/+270	+35/-20	+50/-50	80	130	325
AUTOBRAKE 2	3030	+60/-35	100	-135/+445	+60/-75	+90/-90	95	190	190

**Medium Reported Braking Action**

MAX MANUAL	2430	+50/-25	80	-120/+420	+110/-85	+70/-70	75	340	905
AUTOBRAKE MAX	2440	+50/-25	80	-120/+420	+110/-80	+70/-70	80	340	905
AUTOBRAKE 3	2905	+55/-30	90	-135/+470	+65/-70	+85/-85	105	150	565

**Poor Reported Braking Action**

MAX MANUAL	3110	+65/-40	115	-170/+640	+235/-160	+90/-90	85	685	2100
AUTOBRAKE MAX	3115	+65/-40	115	-170/+640	+240/-165	+95/-95	85	690	2100
AUTOBRAKE 3	3280	+70/-40	115	-175/+655	+200/-150	+100/-100	105	565	1990

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### STABILIZER - Flaps 20

#### VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

#### Dry Runway

MAX MANUAL	1145	+40/-5	25	-45/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

#### Good Reported Braking Action

MAX MANUAL	1660	+30/-10	45	-75/+250	+45/-35	+45/-45	55	115	280
AUTOBRAKE MAX	1725	+35/-5	50	-75/+260	+40/-25	+45/-45	75	120	295
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

#### Medium Reported Braking Action

MAX MANUAL	2265	+45/-20	75	-115/+405	+100/-80	+65/-65	75	310	815
AUTOBRAKE MAX	2265	+50/-20	75	-115/+405	+105/-75	+65/-65	80	305	815
AUTOBRAKE 3	2660	+55/-25	80	-130/+450	+55/-55	+80/-80	115	120	520

#### Poor Reported Braking Action

MAX MANUAL	2905	+65/-35	105	-165/+620	+225/-155	+85/-85	85	630	1925
AUTOBRAKE MAX	2910	+65/-35	105	-165/+625	+230/-155	+85/-85	85	630	1930
AUTOBRAKE 3	3035	+65/-35	105	-170/+635	+190/-130	+90/-90	110	540	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION

Recommended Brake Cooling Schedule  
Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																							
		80				100				120				140				160				180			
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																							
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8			
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6						
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9						
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8						
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6						
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9						
340	0	22.2	24.4	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4						
	10	22.9	25.2	27.8	33.2	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6						
	15	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4						
	20	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3						
	30	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4						
320	0	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0						
	10	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1						
	15	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9						
	20	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7						
	30	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7						
300	0	20.2	22.5	24.8	34.2	38.0	42.3	46.6	52.2	58.4	60.5	68.0	76.5	75.6	85.1	95.7	91.2	102.6	115.1						
	10	20.2	22.2	24.5	29.2	32.4	36.0	39.5	44.1	49.3	51.1	57.3	64.3	63.7	71.6	80.6	76.8	86.6	97.5						
	15	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4						
	20	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1						
	30	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8						
260	0	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8						
	10	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5						
	15	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0						
	20	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6						
	30	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2						
220	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5						
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8						
	15	17.1	18.7	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2						
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5						
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8						
180	0	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6						
	10	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5						
	15	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6						
	20	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8						
	30	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6						

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**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

**2 Engine Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

**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
GEAR DOWN	NO SPECIAL	PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
INFLIGHT											
GROUND			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 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 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

**ADVISORY INFORMATION****Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	297.3	279.1				
52	126	306.3	287.0				
50	122	315.2	294.5	269.7			
48	118	323.5	303.4	276.9			
46	115	331.8	312.4	284.1	259.6		
44	111	340.4	321.1	291.5	267.7		
42	108	349.8	329.0	299.1	275.0	251.6	
40	104	356.7	337.3	307.2	281.4	257.0	
38	100	363.8	347.0	316.0	287.8	262.8	233.8
36	97	366.6	354.0	323.2	293.4	269.2	238.4
34	93	366.8	360.8	330.4	299.7	274.4	243.0
32	90	367.1	363.3	337.6	306.4	278.7	247.1
30	86	367.3	363.4	344.5	312.9	282.9	250.9
28	82	367.6	363.6	350.2	318.7	287.3	254.6
26	79	367.9	363.7	350.4	322.6	292.2	258.2
24	75	368.1	363.9	350.5	326.0	297.0	263.1
22	72	368.4	364.0	350.5	327.4	300.3	268.1
20	68	368.6	364.1	350.6	327.5	302.5	272.4
18	64	368.9	364.3	350.7	327.6	304.7	275.2
16	61	369.2	364.4	350.8	327.6	304.7	276.9
14	57	369.4	364.5	350.8	327.7	304.8	278.5
12	54	369.6	364.6	350.9	327.8	304.9	278.6
10	50	369.8	364.7	351.0	327.9	304.9	278.7
8	46	369.9	364.8	351.1	327.9	304.9	278.7
6	43	370.0	364.9	349.7	328.0	304.9	272.8
4	40	370.1	365.0	341.5	313.7	286.7	254.9
2	36	370.2	365.1	341.5	313.8	286.8	254.9
0	32	370.3	365.1	341.5	313.8	286.8	255.0
-40	-40	371.0	365.4	341.6	313.8	286.8	255.0

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 1250 kg.

With engine anti-ice on, decrease weight by 150 kg.

With engine and wing anti-ice on, decrease weight by 2350 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24600 kg.

## ADVISORY INFORMATION

### Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	302.7	284.5				
52	126	310.0	292.5				
50	122	317.6	300.2	275.6			
48	118	325.1	307.8	282.4			
46	115	332.9	315.3	289.8	267.1		
44	111	340.7	322.9	297.4	273.6		
42	108	348.8	330.3	304.4	280.1	258.9	
40	104	355.6	337.9	311.1	286.7	264.5	
38	100	362.7	345.9	318.5	293.4	269.9	241.1
36	97	365.5	352.9	325.0	299.2	275.1	245.9
34	93	365.7	359.6	331.6	305.0	279.9	250.6
32	90	366.0	362.1	338.2	310.6	284.3	254.9
30	86	366.3	362.2	344.3	315.9	288.7	259.0
28	82	366.5	362.4	349.1	320.8	293.2	262.9
26	79	366.8	362.5	349.3	324.4	298.1	266.5
24	75	367.0	362.7	349.4	327.7	302.6	270.7
22	72	367.3	362.8	349.4	329.0	305.5	274.7
20	68	367.5	362.9	349.5	329.1	307.3	278.2
18	64	367.8	363.0	349.6	329.1	309.0	281.0
16	61	368.1	363.2	349.7	329.2	309.1	282.8
14	57	368.3	363.3	349.7	329.3	309.1	284.4
12	54	368.5	363.4	349.8	329.3	309.2	284.5
10	50	368.6	363.5	349.9	329.4	309.2	284.5
8	46	368.8	363.6	350.0	329.5	309.3	284.6
6	43	368.9	363.7	350.0	329.5	309.3	284.5
4	40	369.0	363.8	350.1	329.6	309.3	278.4
2	36	369.1	363.8	350.1	329.6	309.4	278.4
0	32	369.2	363.9	350.1	329.7	309.4	278.4
-40	-40	369.8	364.1	350.3	329.8	309.6	278.5

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 1400 kg.

With engine anti-ice on, decrease weight by 100 kg.

With engine and wing anti-ice on, decrease weight by 2300 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 22400 kg.

# Performance Inflight - QRH

## Engine Inoperative

# Chapter PI-QRH

## Section 42

### ENGINE INOP

#### Initial Max Continuous %N1

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	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

**ENGINE INOP**

**Max Continuous %N1**  
**Based on engine bleed for packs on or off and anti-ice off**  
**37000 FT to 27000 FT Pressure Altitudes**

37000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT													TAT (°C)
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT													TAT (°C)
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT													TAT (°C)
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

**ENGINE INOP****Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT			TAT (°C)										
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT			TAT (°C)										
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT			TAT (°C)										
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT			TAT (°C)										
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT			TAT (°C)										
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

**ENGINE INOP**

**Max Continuous %N1**

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT			TAT (°C)										
CIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT			TAT (°C)										
CIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	103.6	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT			TAT (°C)										
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT			TAT (°C)										
CIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT			TAT (°C)										
CIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1



ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

**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
134	125	118	111	105	100	95	90	86	82	79
268	251	236	222	210	200	190	181	173	166	159
402	376	354	333	316	300	285	272	260	249	239
535	501	471	445	421	400	380	363	347	332	319
668	626	588	555	526	500	476	454	434	416	399
800	750	706	666	631	600	571	545	521	499	479
932	874	823	777	736	700	666	636	608	583	560
1064	998	940	888	841	800	762	727	696	667	640
1196	1122	1057	998	946	900	857	818	783	751	721
1327	1246	1173	1109	1051	1000	952	910	870	835	801
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446

**Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)											TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)											
	160	180	200	220	240	260	280	300	320	340	360	
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24

Includes APU fuel burn.  
Driftdown at optimum driftdown speed and cruise at LRC speed.



**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716



**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	80.5	83.9	88.6	93.4			
	KIAS	264	264	265	269			
	FF/ENG	9070	9130	9370	9670			
340	%N1	78.7	81.9	86.7	91.4	100.4		
	KIAS	260	260	260	260	299		
	FF/ENG	8520	8560	8730	8950	10320		
320	%N1	76.7	79.7	84.6	89.2	96.4		
	KIAS	253	253	253	253	289		
	FF/ENG	7930	7940	8050	8210	9240		
300	%N1	74.7	77.7	82.3	87.1	92.4		
	KIAS	244	244	244	244	259		
	FF/ENG	7380	7360	7430	7550	8120		
280	%N1	72.8	75.7	80.1	85.0	90.1		
	KIAS	238	238	238	238	238		
	FF/ENG	6880	6850	6880	6950	7350		
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1	
	KIAS	229	229	229	229	229	262	
	FF/ENG	6380	6340	6330	6380	6690	7470	
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5	
	KIAS	223	223	223	223	223	228	
	FF/ENG	5910	5870	5820	5850	6110	6420	
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7	96.7
	KIAS	217	217	217	217	217	217	242
	FF/ENG	5440	5400	5330	5350	5530	5760	6550
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0	91.2
	KIAS	217	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200	5550
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5	87.2
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730	4880
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0	84.7
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340	4450

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	720	630				
50	780	680	520			
48	830	740	570			
46	880	790	620	480		
44	930	840	670	520		
42	980	900	730	570	420	
40	1020	950	770	620	460	
38	1030	1000	820	660	490	280
36	1030	1030	860	700	520	310
34	1040	1040	910	740	560	340
32	1040	1040	950	780	590	370
30	1050	1040	960	810	630	400
20	1080	1070	980	860	730	530
10	1100	1090	970	850	510	320
0	1120	1110	920	710	500	250
-20	1170	1150	960	740	520	260
-40	1220	1200	990	770	540	270

Rate of climb capability shown is valid for 190000 kg, gear down at VREF20 + 5.  
Decrease rate of climb 50 ft/min per 5000 kg greater than 190000 kg.  
Increase rate of climb 60 ft/min per 5000 kg less than 190000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	100	10				
50	150	60	-80			
48	200	110	-30			
46	240	160	20	-110		
44	290	210	70	-70		
42	340	260	110	-20	-160	
40	380	310	160	20	-130	
38	380	350	200	50	-100	-300
36	380	390	240	90	-70	-270
34	390	390	280	130	-40	-250
32	390	390	310	160	-10	-220
30	390	390	330	190	20	-200
20	410	400	340	240	110	-80
10	420	410	290	150	10	-150
0	430	420	260	80	-120	-360
-20	450	440	270	80	-120	-370
-40	470	460	280	90	-130	-390

Rate of climb capability shown is valid for 190000 kg, gear down at VREF30 + 5.  
Decrease rate of climb 30 ft/min per 5000 kg greater than 190000 kg.  
Increase rate of climb 40 ft/min per 5000 kg less than 190000 kg.

Intentionally  
Blank



**Performance Inflight - QRH****Chapter PI-QRH****Gear Down****Section 43****GEAR DOWN****220 KIAS Max Climb %N1**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

**Anti-ice Adjustment**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

\* Packs on or off with 2 bleed sources.

\*\* Packs off with 1 bleed source.

**GEAR DOWN**

**Long Range Cruise Altitude Capability**  
**Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

**GEAR DOWN****Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7524	7653	7775	7993						
340	%N1	83.5	87.8	89.7	91.8						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7296	7405	7486	7646						
320	%N1	82.6	86.7	88.3	90.0	92.1					
	MACH	.488	.534	.550	.568	.588					
	KIAS	270	269	267	265	264					
	FF/ENG	7058	7105	7101	7142	7267					
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1				
	MACH	.481	.520	.537	.554	.572	.594				
	KIAS	266	262	260	258	257	256				
	FF/ENG	6725	6632	6624	6623	6679	6806				
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3			
	MACH	.468	.507	.523	.540	.557	.576	.598			
	KIAS	259	255	253	252	250	248	248			
	FF/ENG	6283	6189	6167	6168	6164	6230	6361			
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7	
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628	
	KIAS	251	248	246	244	243	241	239	239	239	
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239	
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0	
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605	
	KIAS	242	240	238	237	235	233	231	230	230	
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450	
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4	91.5
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582	.606
	KIAS	232	231	230	228	227	225	224	222	221	220
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859	4983
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3	88.5
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571	.596
	KIAS	223	221	220	219	218	217	217	216	217	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481	4565
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1	87.0
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283	4335
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1	85.9
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125	4159

**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
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

**Reference Fuel and Time Required at Check Point**

AIR DIST( NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME	FUEL	TIME
	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)	1000 KG	(HR:MIN)
200	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57

GEAR DOWN

Long Range Cruise Enroute Fuel and Time  
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

**GEAR DOWN**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1						
	KIAS	264						
	FF/ENG	7750						
340	%N1	74.6	77.7					
	KIAS	260	260					
	FF/ENG	7360	7350					
320	%N1	72.8	75.8					
	KIAS	253	253					
	FF/ENG	6890	6870					
300	%N1	70.6	73.7	78.1				
	KIAS	244	244	244				
	FF/ENG	6380	6370	6340				
280	%N1	68.8	72.0	76.3				
	KIAS	238	238	238				
	FF/ENG	5970	5960	5920				
260	%N1	66.7	69.7	74.1	78.6			
	KIAS	229	229	229	229			
	FF/ENG	5520	5510	5470	5490			
240	%N1	64.9	67.7	72.2	76.7			
	KIAS	223	223	223	223			
	FF/ENG	5150	5130	5100	5100			
220	%N1	63.1	65.8	70.1	74.6	79.4		
	KIAS	217	217	217	217	217		
	FF/ENG	4800	4770	4730	4730	4770		
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7	
	KIAS	217	217	217	217	217	217	
	FF/ENG	4610	4570	4520	4520	4550	4610	
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5	86.0
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420	4520
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5	84.9
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260	4350

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding  
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3	94.3
	KIAS	244	244	244	244	244
	FF/ENG	7660	7700	7690	7810	8200
340	%N1	74.3	77.4	82.1	86.8	91.8
	KIAS	240	240	240	240	240
	FF/ENG	7240	7260	7250	7350	7630
320	%N1	72.5	75.5	80.0	84.9	89.7
	KIAS	233	233	233	233	233
	FF/ENG	6770	6780	6770	6830	7040
300	%N1	70.3	73.4	77.8	82.9	87.6
	KIAS	224	224	224	224	224
	FF/ENG	6270	6270	6270	6320	6450
280	%N1	68.3	71.5	75.8	80.6	85.6
	KIAS	218	218	218	218	218
	FF/ENG	5840	5840	5820	5870	5980
260	%N1	66.0	69.1	73.5	78.1	83.3
	KIAS	209	209	209	209	209
	FF/ENG	5380	5370	5340	5400	5460
240	%N1	64.1	66.9	71.4	75.9	81.0
	KIAS	203	203	203	203	203
	FF/ENG	4980	4960	4930	4970	5020
220	%N1	62.0	64.7	69.0	73.6	78.4
	KIAS	197	197	197	197	197
	FF/ENG	4600	4570	4530	4550	4610
200	%N1	60.5	63.2	67.3	71.8	76.5
	KIAS	197	197	197	197	197
	FF/ENG	4350	4310	4260	4270	4310
180	%N1	59.1	61.8	65.8	70.3	74.9
	KIAS	197	197	197	197	197
	FF/ENG	4140	4100	4040	4050	4070
160	%N1	57.9	60.7	64.6	69.0	73.5
	KIAS	197	197	197	197	197
	FF/ENG	3970	3920	3860	3860	3860

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally  
Blank



**Performance Inflight - QRH**  
**Gear Down, Engine INOP**

**Chapter PI-QRH**  
**Section 44**

**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 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	307	254	5600	4400	2200
300	288	246	7700	6800	5300
280	269	238	9800	9100	8100
260	250	230	12100	11400	10300
240	230	223	14000	13500	12400
220	210	217	15900	15400	14400
200	191	216	17300	16700	15700
180	172	216	18500	18100	16900
160	153	216	19700	19400	18200

**Long Range Cruise Altitude Capability**  
**100 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
340	1800		
330	3300	1000	
320	4500	2700	
310	5700	4400	1900
300	6800	5700	3800
290	7800	7000	5300
280	8800	8100	6700
270	9800	9100	8100
260	11100	10400	9300
250	12100	11400	10300
240	13100	12500	11300
230	14000	13600	12400
220	15100	14600	13600
210	15900	15400	14400
200	16700	16100	15100
190	17400	16700	15800
180	18000	17500	16400
170	18700	18200	16900
160	19300	18900	17700

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		5	7	9	11	13	15	17	19
300	%N1	94.3	96.8						
	MACH	.403	.418						
	KIAS	244	244						
	FF/ENG	12328	12507						
280	%N1	92.3	94.1	96.8					
	MACH	.393	.407	.422					
	KIAS	238	238	238					
	FF/ENG	11514	11566	11807					
260	%N1	90.5	91.6	93.6	96.4				
	MACH	.385	.393	.408	.423				
	KIAS	233	229	229	229				
	FF/ENG	10870	10626	10714	10945				
240	%N1	88.9	89.8	91.3	93.4	96.5			
	MACH	.379	.385	.397	.412	.428			
	KIAS	229	225	223	223	223			
	FF/ENG	10228	9966	9915	10023	10245			
220	%N1	86.6	88.0	89.1	90.9	93.1	96.4		
	MACH	.368	.377	.387	.401	.417	.433		
	KIAS	223	220	217	217	217	217		
	FF/ENG	9452	9309	9167	9222	9323	9542		
200	%N1	84.2	86.0	87.8	89.5	91.4	94.0	98.1	
	MACH	.358	.371	.385	.400	.415	.431	.448	
	KIAS	217	217	217	217	217	217	217	
	FF/ENG	8693	8698	8718	8773	8844	8956	9300	
180	%N1	82.9	84.7	86.7	88.4	90.2	92.3	95.5	100.2
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8330	8328	8342	8399	8458	8533	8740	9239
160	%N1	81.7	83.6	85.4	87.3	89.0	90.9	93.5	97.7
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8019	8011	8010	8058	8115	8168	8310	8670

**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
165	145	129	118	108	100	95	90	84	78	73
332	295	263	238	218	200	187	175	165	155	147
500	444	396	358	327	300	280	262	246	233	221
669	593	528	477	436	400	374	350	329	310	294
837	742	661	597	545	500	467	437	410	387	367
1007	893	795	718	655	600	560	524	492	464	440
1177	1043	928	838	764	700	653	611	574	541	513
1347	1193	1061	958	873	800	746	698	655	618	586
1519	1344	1195	1078	983	900	839	785	737	695	659
1691	1496	1329	1198	1092	1000	933	873	819	772	731

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	4.0	0:27	3.8	0:26	3.5	0:26	3.4	0:25	3.3	0:25
200	8.2	0:51	7.8	0:50	7.5	0:49	7.3	0:48	7.2	0:47
300	12.3	1:15	11.8	1:14	11.4	1:12	11.1	1:10	11.1	1:09
400	16.4	1:40	15.8	1:38	15.3	1:36	14.9	1:33	14.9	1:30
500	20.5	2:04	19.7	2:02	19.1	1:59	18.7	1:56	18.7	1:53
600	24.5	2:29	23.6	2:27	22.9	2:23	22.5	2:19	22.4	2:15
700	28.5	2:53	27.5	2:51	26.7	2:46	26.1	2:42	26.0	2:37
800	32.5	3:18	31.3	3:16	30.4	3:10	29.8	3:05	29.6	2:59
900	36.4	3:43	35.1	3:40	34.1	3:34	33.4	3:28	33.2	3:22
1000	40.3	4:08	38.8	4:05	37.8	3:58	37.0	3:51	36.7	3:44

**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.8	-0.5	0.0	1.6	2.6
10	-1.8	-1.1	0.0	3.0	5.6
15	-2.8	-1.6	0.0	4.4	8.6
20	-3.7	-2.2	0.0	5.6	11.6
25	-4.5	-2.7	0.0	6.8	14.4
30	-5.4	-3.2	0.0	7.8	17.3
35	-6.2	-3.7	0.0	8.7	20.0
40	-7.0	-4.2	0.0	9.5	22.7
45	-7.7	-4.7	0.0	10.2	25.3

Includes APU fuel burn.

**GEAR DOWN**

**ENGINE INOP**

**MAX CONTINUOUS THRUST**

**Holding  
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
340	%N1	95.5			
	KIAS	260			
	FF/ENG	14970			
320	%N1	93.4	97.2		
	KIAS	253	253		
	FF/ENG	13980	14120		
300	%N1	91.1	94.3		
	KIAS	244	244		
	FF/ENG	12970	12940		
280	%N1	89.3	92.3	98.8	
	KIAS	238	238	238	
	FF/ENG	12100	12090	12660	
260	%N1	86.8	90.0	94.8	
	KIAS	229	229	229	
	FF/ENG	11100	11180	11340	
240	%N1	84.6	88.0	92.2	
	KIAS	223	223	223	
	FF/ENG	10310	10380	10460	
220	%N1	82.3	85.7	90.0	96.4
	KIAS	217	217	217	217
	FF/ENG	9540	9590	9650	10020
200	%N1	80.8	84.2	88.6	94.0
	KIAS	217	217	217	217
	FF/ENG	9080	9130	9180	9400
180	%N1	79.6	82.9	87.5	92.3
	KIAS	217	217	217	217
	FF/ENG	8700	8750	8780	8960
160	%N1	78.6	81.7	86.4	90.9
	KIAS	217	217	217	217
	FF/ENG	8380	8420	8430	8580

This table includes 5% additional fuel for holding in a racetrack pattern.

**Performance Inflight - QRH****Chapter PI-QRH****Text****Section 45**

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**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.

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**General****Flight with Unreliable Airspeed / Turbulent Air Penetration**

Body attitude and average %N1 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.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

**Max Climb %N1**

This table shows Max Climb %N1 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 %N1. %N1 adjustments are shown for anti-ice operation.

**VREF Speeds**

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

---

## Advisory Information

### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. Landing distances for slippery runways are 115% of the actual landing distances.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, 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.

---

## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, 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 landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

---

## Engine Inoperative

### Initial Max Continuous %N1

The Initial Max Continuous %N1 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 %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

### Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

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 %N1, 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 autoland 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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# Performance Inflight - QRH

## General

# Chapter PI-QRH

## Section 50

**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)			
		400	500	600	700
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>3.5</b> 800			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>4.0</b> 1800	<b>4.0</b> 1200	<b>4.0</b> 700	
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>6.5</b> 2900	<b>6.0</b> 2100	<b>6.0</b> 1500	<b>6.5</b> 1000
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>9.0</b> 3900	<b>8.0</b> 2900	<b>8.0</b> 2200	<b>8.0</b> 1700
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>11.5</b> 4700	<b>10.5</b> 3600	<b>9.5</b> 2800	<b>9.5</b> 2300

### Cruise

#### Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)			
		400	500	600	700
40000 (.82M)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.5</b> 1.211 (83.6)			
35000 (280 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>1.5</b> 1.092 (79.8)	<b>2.0</b> 1.18 (83.1)	<b>3.0</b> 1.370 (89.7)	
30000 (280 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.0</b> 1.027 (76.3)	<b>2.5</b> 1.082 (79.0)	<b>3.0</b> 1.168 (82.8)	<b>4.0</b> 1.336 (89.2)
25000 (280 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.0</b> 0.988 (72.5)	<b>2.5</b> 1.024 (75.2)	<b>3.5</b> 1.084 (78.6)	<b>4.0</b> 1.162 (82.4)
20000 (270 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.0</b> 0.973 (68.0)	<b>3.0</b> 1.001 (70.6)	<b>4.0</b> 1.042 (74.5)	<b>5.0</b> 1.101 (78.5)
15000 (270 KIAS)	<b>PITCH ATT</b> EPR (Alt Mode %N1)	<b>2.0</b> 0.969 (64.9)	<b>3.0</b> 0.988 (67.3)	<b>4.0</b> 1.018 (70.2)	<b>5.0</b> 1.057 (74.1)

**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)			
		400	500	600	700
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-0.5</b> -2500			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -2100	<b>0.0</b> -1900	<b>1.0</b> -1900	
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-0.5</b> -1700	<b>0.5</b> -1600	<b>1.5</b> -1600	<b>2.0</b> -1600
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1600	<b>0.0</b> -1500	<b>1.0</b> -1400	<b>2.0</b> -1400
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.5</b> -1600	<b>-0.5</b> -1400	<b>1.0</b> -1400	<b>2.0</b> -1400

**Holding**

**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)			
		400	500	600	700
10000	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>	<b>4.5</b>
	EPR	1.002	1.012	1.019	1.028
	(Alt Mode %N1)	(55.8)	(61.5)	(66.3)	(70.0)
	KIAS	210	227	249	271
5000	<b>PITCH ATT</b>	<b>4.0</b>	<b>4.5</b>	<b>5.0</b>	<b>5.0</b>
	EPR	0.998	1.006	1.010	1.016
	(Alt Mode %N1)	(51.5)	(57.2)	(62.2)	(66.3)
	KIAS	210	226	248	268

**Terminal Area (5000 FT)**

**Set Thrust for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)			
		400	500	600	700
FLAPS 0 (GEAR UP) (VREF30 + 80)	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>
	EPR	1.000	1.010	1.020	1.030
	(Alt Mode %N1)	(52.3)	(58.1)	(63.5)	(67.9)
	KIAS	210	226	240	255
FLAPS 1 (GEAR UP) (VREF30 + 60)	<b>PITCH ATT</b>	<b>6.0</b>	<b>6.5</b>	<b>7.0</b>	<b>7.0</b>
	EPR	1.010	1.020	1.040	1.060
	(Alt Mode %N1)	(52.7)	(59.0)	(64.6)	(69.5)
	KIAS	190	206	220	235
FLAPS 5 (GEAR UP) (VREF30 + 40)	<b>PITCH ATT</b>	<b>5.0</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>
	EPR	1.030	1.040	1.060	1.080
	(Alt Mode %N1)	(54.0)	(60.7)	(66.1)	(70.8)
	KIAS	170	186	200	215
FLAPS 15 (GEAR UP) (VREF30 + 20)	<b>PITCH ATT</b>	<b>5.5</b>	<b>6.0</b>	<b>6.5</b>	<b>6.5</b>
	EPR	1.040	1.060	1.090	1.110
	(Alt Mode %N1)	(55.6)	(62.5)	(68.1)	(72.5)
	KIAS	150	166	180	195
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.5</b>	<b>5.0</b>
	EPR	1.070	1.100	1.140	1.170
	(Alt Mode %N1)	(62.4)	(69.2)	(74.4)	(79.0)
	KIAS	150	166	180	195

**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)			
		400	500	600	700
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	1.000	1.010	1.010	1.020
	(Alt Mode %N1)	(41.3)	(45.7)	(49.9)	(53.5)
	KIAS	153	170	185	198
FLAPS 25 (VREF25 + 10)	<b>PITCH ATT</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.5</b>
	EPR	1.030	1.040	1.060	1.070
	(Alt Mode %N1)	(50.6)	(56.1)	(60.9)	(65.0)
	KIAS	146	162	176	189
FLAPS 30 (VREF30 + 10)	<b>PITCH ATT</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
	EPR	1.050	1.070	1.090	1.110
	(Alt Mode %N1)	(55.6)	(61.1)	(65.9)	(70.7)
	KIAS	140	156	170	184

**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	0.84	0.84	0.84
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, single bleed source and both packs off.



VREF

WEIGHT (1000 LB)	FLAPS		
	30	25	20
660	169	174	183
640	165	172	181
620	163	169	178
600	160	167	175
580	157	164	172
560	155	161	169
540	152	158	166
520	149	155	163
500	146	152	160
480	143	149	157
460	140	146	154
440	137	143	150
420	133	139	147
400	130	136	143
380	126	132	139
360	123	128	135
340	119	124	131

Intentionally  
Blank

# Performance Inflight - QRH

## Advisory Information

# Chapter PI-QRH

## Section 51

### ADVISORY INFORMATION

#### Normal Configuration Landing Distance

##### Flaps 30

##### Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	450000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 450000 LB	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2950	+70/-40	60	-120	430	40	-30	60	-60	230	50	120
MAX AUTO	3980	+60/-40	90	-170	610	0	0	90	-100	410	0	0
AUTOBRAKE 4	4940	+80/-60	130	-240	850	0	-20	130	-130	520	0	0
AUTOBRAKE 3	5970	+100/-80	160	-290	1060	40	-70	160	-160	560	10	20
AUTOBRAKE 2	6640	+120/-110	190	-340	1220	100	-140	180	-180	530	190	190
AUTOBRAKE 1	7010	+140/-120	220	-370	1360	160	-190	200	-190	530	480	580

#### Good Reported Braking Action

MAX MANUAL	4040	+70/-70	100	-200	750	100	-90	100	-100	320	220	500
MAX AUTO	4450	+70/-70	110	-210	770	80	-50	100	-100	410	220	520
AUTOBRAKE 4	4960	+80/-80	130	-240	880	20	-30	130	-130	520	20	80
AUTOBRAKE 3	5970	+100/-110	160	-290	1060	40	-70	160	-160	560	10	20

#### Medium Reported Braking Action

MAX MANUAL	5420	+100/-100	160	-310	1240	260	-190	140	-140	410	580	1460
MAX AUTO	5720	+100/-100	160	-310	1230	240	-160	140	-140	480	550	1410
AUTOBRAKE 4	5720	+100/-100	160	-310	1250	220	-140	150	-150	510	540	1460
AUTOBRAKE 3	6250	+110/-110	170	-340	1330	180	-140	170	-170	560	280	980

#### Poor Reported Braking Action

MAX MANUAL	6930	+150/-140	230	-460	1960	630	-370	190	-180	470	1230	3390
MAX AUTO	7320	+150/-140	230	-450	1940	640	-360	190	-180	490	1240	3430
AUTOBRAKE 4	7320	+150/-140	230	-460	1950	620	-380	190	-180	460	1260	3470
AUTOBRAKE 3	7340	+150/-140	230	-470	1970	590	-330	200	-190	560	1100	3330

\*Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 200 ft.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 25****Dry Runway**

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	450000 LB LANDING WT	PER 10000 LB ABOVE BELOW 450000 LB	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	3050	+80/-40	70	-120	440	40	-30	60	-60	230	60	140
MAX AUTO	4210	+60/-40	100	-180	630	0	0	100	-100	420	0	0
AUTOBRAKE 4	5260	+90/-70	140	-250	880	0	-30	140	-140	530	0	0
AUTOBRAKE 3	6370	+110/-90	180	-310	1090	50	-90	170	-170	550	40	50
AUTOBRAKE 2	7020	+130/-120	210	-350	1250	120	-160	190	-190	520	300	300
AUTOBRAKE 1	7360	+150/-140	240	-380	1390	190	-210	210	-200	530	620	780

**Good Reported Braking Action**

MAX MANUAL	4200	+70/-70	110	-200	760	100	-90	100	-100	320	250	580
MAX AUTO	4660	+70/-70	120	-210	790	70	-50	110	-110	420	230	580
AUTOBRAKE 4	5270	+90/-90	140	-250	910	20	-30	140	-140	530	20	80
AUTOBRAKE 3	6370	+110/-120	180	-310	1090	50	-90	170	-170	550	40	50

**Medium Reported Braking Action**

MAX MANUAL	5630	+110/-110	170	-320	1250	260	-200	150	-150	410	660	1680
MAX AUTO	5960	+110/-110	170	-310	1250	240	-160	150	-150	480	630	1630
AUTOBRAKE 4	5960	+110/-110	170	-320	1270	210	-140	160	-160	530	540	1620
AUTOBRAKE 3	6650	+120/-120	190	-350	1360	180	-160	180	-180	550	300	1080

**Poor Reported Braking Action**

MAX MANUAL	7180	+150/-150	240	-470	1980	640	-380	200	-190	470	1370	3900
MAX AUTO	7620	+150/-140	240	-460	1970	640	-370	200	-190	490	1380	3930
AUTOBRAKE 4	7620	+150/-140	240	-460	1970	620	-370	200	-190	480	1400	3990
AUTOBRAKE 3	7690	+150/-150	240	-470	2010	590	-350	210	-200	550	1180	3770

\*Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 200 ft.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

## ADVISORY INFORMATION

### Normal Configuration Landing Distance

#### Flaps 20

#### Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	450000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 450000 LB	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	3240	+90/-50	70	-130	440	40	-40	70	-70	240	70	170
MAX AUTO	4520	+70/-70	110	-190	630	0	0	110	-110	440	0	0
AUTOBRAKE 4	5680	+100/-100	150	-260	880	0	-30	160	-160	570	0	0
AUTOBRAKE 3	6760	+120/-130	200	-320	1100	60	-100	190	-190	590	50	60
AUTOBRAKE 2	7360	+140/-150	240	-370	1250	140	-170	220	-210	570	330	340
AUTOBRAKE 1	7790	+160/-170	270	-400	1390	210	-230	230	-230	580	720	850

### Good Reported Braking Action

MAX MANUAL	4510	+80/-80	120	-210	750	110	-100	110	-110	340	290	680
MAX AUTO	4790	+80/-80	130	-220	780	70	-50	120	-120	440	270	680
AUTOBRAKE 4	5690	+100/-100	150	-260	910	20	-40	160	-160	570	20	100
AUTOBRAKE 3	6760	+120/-130	200	-320	1100	60	-100	190	-190	590	50	60

### Medium Reported Braking Action

MAX MANUAL	6090	+120/-120	190	-330	1220	270	-210	160	-160	430	770	1990
MAX AUTO	6090	+120/-120	190	-330	1210	240	-180	170	-160	500	730	1930
AUTOBRAKE 4	6270	+140/-120	190	-340	1240	200	-150	170	-170	560	630	1920
AUTOBRAKE 3	7040	+130/-130	210	-370	1340	180	-170	200	-200	590	350	1290

### Poor Reported Braking Action

MAX MANUAL	7790	+170/-160	270	-490	1900	620	-410	220	-210	500	1600	4630
MAX AUTO	7790	+170/-160	270	-480	1880	610	-400	220	-210	510	1610	4670
AUTOBRAKE 4	7790	+170/-160	270	-490	1890	600	-400	220	-210	520	1630	4740
AUTOBRAKE 3	8010	+170/-160	270	-500	1920	560	-370	230	-220	590	1380	4490

\*Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 190 ft.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance  
Dry Runway**

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	5630	110/-110	180	-320/1210	260/-200	80/-80	410	660	1680
ANTISKID (FLAPS 30)	VREF30	5420	100/-100	170	-310/1190	250/-190	80/-80	410	580	1450
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	3300	100/-50	80	-130/480	50/-40	40/-40	270	-	100
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2980	80/-40	70	-120/450	40/-40	40/-40	250	-	70
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	3970	130/-70	120	-150/600	60/-50	50/-50	290	160	390
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	3400	100/-40	80	-130/490	50/-40	40/-40	260	110	250
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	3240	90/-50	80	-130/470	50/-40	40/-40	250	90	190
FLAPS PRIMARY FAIL	VREF20	3630	90/-50	90	-140/500	50/-40	50/-40	290	100	220
FLAP/SLAT CONTROL	VREF20	3220	90/-50	80	-130/470	50/-40	40/-40	240	90	190
FLIGHT CONTROL MODE	VREF20	3730	90/-50	90	-140/500	50/-50	50/-50	310	110	240
HYD PRESS SYS C	VREF20	3630	90/-50	90	-140/500	50/-40	50/-40	290	100	220
HYD PRESS SYS L+C	VREF30+20	4140	100/-60	100	-160/550	70/-60	50/-50	380	-	160
HYD PRESS SYS L+R	VREF30+20	4840	80/-70	130	-210/720	130/-110	70/-70	480	-	-
HYD PRESS SYS R+C	VREF30+20	5140	70/-80	140	-220/750	130/-110	70/-70	500	-	380
HYD PRESS SYS L (FLAPS 25)	VREF25	3270	90/-50	80	-140/480	50/-50	40/-40	280	-	100
HYD PRESS SYS L (FLAPS 30)	VREF30	3150	80/-40	70	-130/470	50/-40	40/-40	280	-	90
HYD PRESS SYS R (FLAPS 25)	VREF25	3810	60/-60	100	-170/590	80/-70	50/-50	340	-	180
HYD PRESS SYS R (FLAPS 30)	VREF30	3640	60/-60	90	-160/580	70/-60	50/-50	340	-	150
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	3870	120/-60	110	-150/570	60/-50	50/-50	270	140	320
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	3340	100/-40	80	-130/480	50/-40	40/-40	250	90	200
PRI FLIGHT COMPUTERS	VREF20	3730	90/-50	90	-140/500	50/-50	50/-50	310	110	240
SLATS DRIVE	VREF30+30	3690	110/-50	100	-140/510	50/-50	50/-50	260	120	260
STABILIZER	VREF30+20	3440	90/-50	80	-140/480	50/-40	40/-40	260	100	220

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance

#### Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	5630	110/-110	180	-320/1210	260/-200	80/-80	410	660	1680
ANTISKID (FLAPS 30)	VREF30	5420	100/-100	170	-310/1190	250/-190	80/-80	410	580	1450
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	4740	80/-80	130	-220/810	140/-110	70/-70	380	-	370
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	4210	70/-70	110	-200/760	120/-100	60/-60	350	-	270
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	5290	80/-80	160	-220/820	120/-100	80/-70	330	420	1020
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	4750	80/-80	140	-210/780	120/-100	70/-60	340	360	850
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	4510	80/-80	130	-210/760	120/-100	60/-60	340	290	680
FLAPS PRIMARY FAIL	VREF20	4970	80/-90	140	-220/820	130/-110	70/-70	410	350	820
FLAP/SLAT CONTROL	VREF20	4460	80/-80	120	-210/760	110/-90	60/-60	330	280	650
FLIGHT CONTROL MODE	VREF20	5120	90/-90	150	-230/840	140/-120	70/-70	440	380	920
HYD PRESS SYS C	VREF20	4970	80/-90	140	-220/820	130/-110	70/-70	410	350	820
HYD PRESS SYS L+C	VREF30+20	5980	100/-90	180	-270/960	210/-160	90/-90	540	-	640
HYD PRESS SYS L+R	VREF30+20	6320	90/-100	190	-300/1030	270/-220	100/-100	610	-	-
HYD PRESS SYS R+C	VREF30+20	6140	100/-100	180	-280/970	220/-180	90/-90	590	-	700
HYD PRESS SYS L (FLAPS 25)	VREF25	4710	80/-80	130	-230/830	150/-120	70/-70	410	-	400
HYD PRESS SYS L (FLAPS 30)	VREF30	4530	80/-80	130	-220/820	140/-120	60/-60	420	-	350
HYD PRESS SYS R (FLAPS 25)	VREF25	4710	80/-80	130	-230/830	150/-120	70/-70	410	-	400
HYD PRESS SYS R (FLAPS 30)	VREF30	4480	80/-70	120	-220/810	140/-120	60/-60	410	-	340
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	5220	80/-80	150	-220/810	120/-100	80/-70	310	390	930
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	4590	70/-70	130	-210/770	110/-90	60/-60	310	280	660
PRI FLIGHT COMPUTERS	VREF20	5120	90/-90	150	-230/840	140/-120	70/-70	440	380	920
SLATS DRIVE	VREF30+30	5150	80/-80	150	-220/820	130/-110	70/-70	350	370	860
STABILIZER	VREF30+20	4790	80/-80	140	-220/790	120/-100	70/-70	350	330	760

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Medium Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	7180	150/-150	250	-460/1900	610/-380	110/-100	470	1370	3890
ANTISKID (FLAPS 30)	VREF30	6930	150/-140	230	-460/1880	610/-380	110/-100	470	1230	3380
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	6720	130/-130	210	-360/1380	380/-280	110/-100	500	-	1130
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	5870	110/-110	180	-340/1290	330/-240	90/-90	460	-	810
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	7240	130/-130	250	-350/1340	310/-240	110/-110	440	1130	3070
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	6400	120/-120	210	-340/1280	290/-220	100/-90	440	940	2510
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	6090	120/-120	200	-330/1260	290/-210	90/-90	430	770	1980
FLAPS PRIMARY FAIL	VREF20	6610	130/-130	220	-350/1320	320/-240	100/-90	500	900	2370
FLAP/SLAT CONTROL	VREF20	6000	120/-110	190	-320/1240	280/-210	90/-90	420	740	1890
FLIGHT CONTROL MODE	VREF20	6840	140/-130	230	-360/1350	350/-260	100/-100	550	1000	2680
HYD PRESS SYS C	VREF20	6610	130/-130	220	-350/1320	320/-240	100/-90	500	900	2370
HYD PRESS SYS L+C	VREF30+20	8480	150/-150	290	-440/1620	570/-400	140/-130	700	-	1940
HYD PRESS SYS L+R	VREF30+20	9960	160/-160	330	-530/1920	920/-620	170/-170	840	-	-
HYD PRESS SYS R+C	VREF30+20	8660	160/-160	300	-450/1640	580/-420	140/-140	730	-	2070
HYD PRESS SYS L (FLAPS 25)	VREF25	6710	130/-130	220	-380/1430	410/-300	100/-100	540	-	1230
HYD PRESS SYS L (FLAPS 30)	VREF30	6450	120/-120	210	-370/1410	410/-300	100/-100	550	-	1070
HYD PRESS SYS R (FLAPS 25)	VREF25	6660	120/-120	220	-380/1430	410/-300	100/-100	530	-	1200
HYD PRESS SYS R (FLAPS 30)	VREF30	6300	120/-120	200	-370/1390	390/-280	100/-100	520	-	1000
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	7020	130/-120	230	-340/1310	290/-220	110/-100	400	990	2610
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	6190	110/-110	200	-330/1250	280/-210	90/-90	400	750	1900
PRI FLIGHT COMPUTERS	VREF20	6840	140/-130	230	-360/1350	350/-260	100/-100	550	1000	2680
SLATS DRIVE	VREF30+30	6890	130/-120	230	-350/1320	310/-240	110/-100	440	920	2360
STABILIZER	VREF30+20	6430	120/-120	210	-340/1280	300/-220	100/-90	440	840	2150

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.



## ADVISORY INFORMATION

### Non-Normal Configuration Landing Distance Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	9800	230/-210	350	-800/3800	2900/-910	150/-140	520	3630	15000
ANTISKID (FLAPS 30)	VREF30	9490	220/-210	340	-790/3770	2800/-900	150/-140	520	3340	15000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	9060	190/-190	310	-560/2240	1020/-580	150/-140	600	-	2730
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	7860	170/-160	260	-520/2100	900/-500	130/-120	550	-	1930
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	9310	190/-180	350	-520/2080	740/-460	150/-140	520	2330	7390
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	8160	170/-160	300	-490/1990	700/-420	130/-120	510	1900	5880
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	7790	170/-160	280	-480/1960	690/-410	120/-110	500	1600	4620
FLAPS PRIMARY FAIL	VREF20	8360	180/-180	300	-510/2040	760/-500	130/-120	570	1830	5480
FLAP/SLAT CONTROL	VREF20	7670	170/-160	270	-480/1950	670/-400	120/-110	480	1530	4380
FLIGHT CONTROL MODE	VREF20	8680	190/-180	320	-520/2080	810/-480	140/-130	620	2030	6270
HYD PRESS SYS C	VREF20	8360	180/-180	300	-510/2040	760/-500	130/-120	570	1830	5480
HYD PRESS SYS L+C	VREF30+20	11510	230/-220	440	-690/2690	1580/-830	190/-180	820	-	4770
HYD PRESS SYS L+R	VREF30+20	15410	250/-240	570	-960/3630	3590/-1580	270/-270	1050	-	-
HYD PRESS SYS R+C	VREF30+20	11670	230/-230	450	-700/2710	1530/-850	200/-190	840	-	4970
HYD PRESS SYS L (FLAPS 25)	VREF25	9150	190/-180	330	-600/2420	1160/-640	150/-140	640	-	3050
HYD PRESS SYS L (FLAPS 30)	VREF30	8830	180/-170	320	-600/2390	1150/-640	140/-140	650	-	2690
HYD PRESS SYS R (FLAPS 25)	VREF25	9040	180/-180	330	-600/2400	1130/-630	150/-140	630	-	2940
HYD PRESS SYS R (FLAPS 30)	VREF30	8510	170/-170	300	-580/2340	1080/-600	140/-130	600	-	2420
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	8890	180/-170	330	-500/2030	690/-420	140/-130	470	1970	5900
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	7910	160/-160	280	-480/1960	670/-400	120/-120	470	1550	4390
PRI FLIGHT COMPUTERS	VREF20	8680	190/-180	320	-520/2080	810/-480	140/-130	620	2030	6270
SLATS DRIVE	VREF30+30	8720	180/-170	320	-510/2040	730/-440	140/-130	500	1820	5240
STABILIZER	VREF30+20	8170	170/-160	290	-500/2000	720/-430	130/-120	500	1690	4870

Actual (unfactored) distances are shown.  
Includes distances from 50 ft above threshold (1000 ft air distance).  
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule  
Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																							
		80				100				120				140				160				180			
WEIGHT (1000 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																							
		0	2	4	0	2	4	0	2	4	0	2	4	0	2	4	0	2	4	0	2	4			
680	0	19.3	20.2	21.0	28.6	30.1	31.5	39.3	41.5	43.7	51.2	54.2	57.3	64.1	67.9	71.8	77.0	81.7	86.3						
	10	19.8	20.7	21.6	29.4	31.0	32.5	40.5	42.8	45.0	52.8	55.9	59.1	66.1	70.1	74.1	79.4	84.1	88.9						
	15	20.2	21.1	22.0	30.0	31.6	33.1	41.2	43.6	45.9	53.8	56.9	60.2	67.3	71.3	75.4	80.7	85.5	90.3						
	20	20.6	21.5	22.4	30.5	32.1	33.6	41.9	44.3	46.7	54.7	57.9	61.2	68.4	72.5	76.6	82.0	86.8	91.7						
	30	21.0	22.0	22.9	31.3	32.9	34.5	43.1	45.5	47.9	56.2	59.5	62.8	70.2	74.4	78.7	84.2	89.2	94.0						
640	0	21.2	22.1	23.1	31.6	33.3	34.9	43.7	46.2	48.7	57.2	60.6	64.0	71.6	75.9	80.2	85.9	91.0	96.0						
	10	18.5	19.3	20.1	27.3	28.7	30.0	37.4	39.5	41.6	48.7	51.6	54.4	60.9	64.6	68.3	73.4	77.8	82.3						
	15	19.0	19.8	20.6	28.1	29.5	30.9	38.6	40.7	42.8	50.2	53.2	56.1	62.8	66.6	70.4	75.6	80.2	84.7						
	20	19.3	20.2	21.0	28.6	30.1	31.5	39.3	41.5	43.6	51.1	54.2	57.1	63.9	67.8	71.6	76.9	81.5	86.1						
	30	19.6	20.5	21.4	29.1	30.6	32.0	39.9	42.2	44.4	52.0	55.1	58.1	65.0	68.9	72.8	78.2	82.8	87.5						
600	0	20.1	21.0	21.8	29.8	31.3	32.8	41.0	43.3	45.6	53.4	56.6	59.7	66.8	70.8	74.8	80.3	85.1	89.8						
	10	20.2	21.1	22.0	30.1	31.7	33.2	41.6	43.9	46.3	54.4	57.6	60.8	68.1	72.2	76.3	81.9	86.8	91.6						
	15	17.6	18.4	19.1	26.0	27.3	28.5	35.5	37.5	39.4	46.2	48.8	51.5	57.7	61.2	64.7	69.6	73.8	78.0						
	20	18.1	18.9	19.6	26.7	28.0	29.4	36.6	38.6	40.6	47.6	50.4	53.1	59.5	63.1	66.7	71.8	76.1	80.4						
	30	18.4	19.2	20.0	27.2	28.5	29.9	37.3	39.3	41.4	48.5	51.3	54.1	60.6	64.2	67.9	73.0	77.4	81.8						
560	0	18.7	19.5	20.3	27.7	29.0	30.4	37.9	40.0	42.1	49.3	52.2	55.0	61.6	65.3	69.0	74.2	78.6	83.1						
	10	19.2	20.0	20.8	28.3	29.8	31.2	38.9	41.0	43.2	50.6	53.6	56.5	63.3	67.1	70.9	76.2	80.8	85.3						
	15	19.2	20.1	20.9	28.6	30.1	31.5	39.4	41.6	43.8	51.5	54.5	57.6	64.5	68.4	72.3	77.8	82.4	87.1						
	20	16.8	17.5	18.2	24.6	25.8	27.0	33.6	35.4	37.2	43.6	46.1	48.6	54.4	57.7	60.9	65.7	69.7	73.7						
	30	17.2	17.9	18.7	25.3	26.6	27.8	34.6	36.5	38.4	44.9	47.5	50.1	56.1	59.5	62.8	67.7	71.8	75.9						
520	0	17.5	18.3	19.0	25.8	27.1	28.3	35.3	37.2	39.1	45.8	48.4	51.0	57.1	60.6	63.9	68.9	73.1	77.2						
	10	17.8	18.6	19.3	26.3	27.5	28.8	35.9	37.8	39.7	46.6	49.2	51.9	58.1	61.6	65.0	70.1	74.3	78.5						
	15	18.2	19.0	19.8	26.9	28.2	29.5	36.8	38.8	40.8	47.8	50.6	53.3	59.7	63.3	66.8	72.0	76.3	80.6						
	20	18.3	19.1	19.9	27.1	28.5	29.8	37.3	39.3	41.4	48.6	51.4	54.2	60.8	64.5	68.1	73.4	77.8	82.3						
	30	15.9	16.6	17.2	23.3	24.4	25.5	31.7	33.4	35.1	41.0	43.3	45.6	51.1	54.1	57.1	61.7	65.4	69.1						
480	0	16.4	17.0	17.7	24.0	25.1	26.3	32.6	34.4	36.1	42.3	44.7	47.1	52.7	55.8	58.9	63.6	67.4	71.3						
	15	16.7	17.3	18.0	24.4	25.6	26.8	33.2	35.0	36.8	43.1	45.5	47.9	53.7	56.8	60.0	64.7	68.6	72.5						
	20	17.0	17.6	18.3	24.8	26.0	27.2	33.8	35.6	37.4	43.8	46.3	48.7	54.6	57.8	61.0	65.8	69.8	73.7						
	30	17.3	18.0	18.7	25.4	26.6	27.9	34.7	36.5	38.4	44.9	47.5	50.1	56.1	59.4	62.7	67.6	71.7	75.7						
	40	17.4	18.1	18.8	25.6	26.9	28.2	35.1	37.0	38.9	45.6	48.3	50.9	57.1	60.5	63.9	68.9	73.1	77.2						
440	0	15.1	15.7	16.3	22.0	23.0	24.0	29.8	31.3	32.9	38.4	40.5	42.6	47.7	50.5	53.3	57.5	61.0	64.4						
	10	15.5	16.1	16.7	22.6	23.7	24.7	30.6	32.2	33.8	39.5	41.7	44.0	49.2	52.1	54.9	59.3	62.9	66.4						
	15	15.8	16.4	17.0	23.0	24.1	25.2	31.2	32.8	34.5	40.3	42.5	44.8	50.1	53.0	55.9	60.4	64.0	67.6						
	20	16.1	16.7	17.3	23.4	24.5	25.6	31.8	33.4	35.1	41.0	43.2	45.5	50.9	53.9	56.9	61.4	65.1	68.7						
	30	16.4	17.1	17.7	24.0	25.1	26.2	32.5	34.2	36.0	42.0	44.4	46.7	52.3	55.4	58.4	63.1	66.9	70.6						
400	0	16.5	17.1	17.8	24.2	25.3	26.5	32.9	34.7	36.4	42.7	45.1	47.5	53.2	56.4	59.5	64.3	68.2	72.0						
	10	14.3	14.9	15.4	20.7	21.6	22.5	27.8	29.2	30.6	35.7	37.7	39.6	44.2	46.8	49.3	53.2	56.4	59.6						
	15	14.7	15.2	15.8	21.2	22.2	23.2	28.6	30.1	31.6	36.8	38.8	40.8	45.6	48.2	50.9	54.9	58.2	61.4						
	20	15.0	15.5	16.1	21.6	22.6	23.6	29.2	30.7	32.2	37.5	39.5	41.6	46.4	49.1	51.8	55.9	59.2	62.5						
	30	15.2	15.8	16.4	22.0	23.0	24.0	29.7	31.2	32.7	38.1	40.2	42.3	47.2	49.9	52.7	56.8	60.2	63.6						
400	0	15.5	16.1	16.7	22.5	23.5	24.6	30.4	32.0	33.5	39.1	41.2	43.4	48.5	51.3	54.1	58.4	61.9	65.3						
	10	15.6	16.2	16.8	22.7	23.7	24.8	30.7	32.3	33.9	39.6	41.9	44.1	49.3	52.2	55.1	59.5	63.0	66.6						

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

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	5.1	14.1	23.1	32.1	41.2	50.3	59.5	68.8	78.3	87.9
	MAX AUTO	5.1	13.1	21.2	29.6	38.1	46.9	56.0	65.5	75.3	85.6
	AUTOBRAKE 4	4.9	12.4	19.9	27.5	35.4	43.5	52.1	61.1	70.6	80.8
	AUTOBRAKE 3	4.6	11.6	18.5	25.5	32.7	40.1	47.9	56.2	65.0	74.5
	AUTOBRAKE 2	4.3	10.8	17.2	23.6	30.1	36.9	43.9	51.4	59.4	68.0
	AUTOBRAKE 1	4.2	10.1	15.9	21.8	27.7	33.8	40.3	47.1	54.5	62.4

### 2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	4.4	13.0	21.4	29.7	37.9	46.1	54.3	62.6	71.1	79.7
	MAX AUTO	2.4	9.4	16.4	23.5	30.9	38.6	46.6	55.0	64.0	73.5
	AUTOBRAKE 4	1.9	7.2	12.7	18.4	24.5	31.0	37.9	45.5	53.6	62.5
	AUTOBRAKE 3	1.1	4.9	9.0	13.4	18.2	23.4	29.0	35.2	42.0	49.3
	AUTOBRAKE 2	0.3	3.1	6.1	9.4	13.0	16.9	21.3	26.1	31.4	37.2
	AUTOBRAKE 1	0.1	2.3	4.6	7.1	9.8	12.7	16.1	19.9	24.2	29.2

### 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
GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1.0	1.6	2.6	4.2	5.5	6.6	7.3	CAUTION	FUSE PLUG MELT ZONE	
INFLIGHT											
GROUND		10	16	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 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

Landing Climb Limit Weight  
Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)			
		AIRPORT PRESSURE ALTITUDE (FT)			
		0	1000	2000	3000
54	129	509.5			
52	126	524.1	504.0		
50	122	539.1	519.0	497.5	
48	118	555.3	533.9	512.5	493.3
46	115	571.0	549.5	526.9	506.8
44	111	586.0	564.3	541.8	520.4
42	108	600.7	578.4	555.9	533.9
40	104	614.6	591.8	569.1	546.8
38	100	628.0	604.4	581.5	559.3
36	97	640.3	616.1	592.9	570.6
34	93	651.1	627.0	603.2	581.0
32	90	660.2	636.1	612.5	588.7
30	86	668.7	644.0	619.6	596.1
28	82	668.8	651.9	625.1	601.9
26	79	668.9	652.0	630.4	606.1
24	75	669.0	652.2	633.1	610.0
22	72	669.2	652.3	633.3	612.9
20	68	669.3	652.4	633.4	615.3
18	64	669.4	652.5	633.5	615.4
16	61	669.5	652.6	633.6	615.5
14	57	669.6	652.8	633.7	615.6
12	54	669.8	652.9	633.8	615.7
10 & BELOW	50 & BELOW	669.9	653.0	634.0	615.9

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 4800 lb.  
With engine anti-ice on, decrease weight by 1100 lb.  
With engine and wing anti-ice on, decrease weight by 4800 lb.  
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 43300 lb.

**Performance Inflight - QRH**  
**Engine Inoperative**

**Chapter PI-QRH**  
**Section 52**

**ENGINE INOP**

**Initial Max Continuous EPR**

**Based on .84M, engine bleed for packs on or off 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	1.488	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  
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	0.48	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	0.63	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	0.77	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	0.91	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	0.46	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	0.60	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	0.74	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	0.87	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	0.44	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	0.58	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	0.71	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	0.84	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	0.91	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	0.42	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	0.55	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	0.68	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	0.81	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.477	1.435	1.386	1.334
333	0.88	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)			
	31	33	35	37
ENGINE ONLY	-0.018	-0.017	-0.016	-0.017
ENGINE & WING *	-0.033	-0.032	-0.032	-0.034
ENGINE & WING **	-0.048	-0.047	-0.048	-0.051

\*Wing anti-ice on, packs on.  
\*\*Wing anti-ice on, packs off.

## ENGINE INOP

### Max Continuous EPR

#### 29000 FT to 24000 FT Pressure Altitudes

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
150	0.40	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	0.53	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	0.65	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	0.78	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	0.85	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 PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
150	0.38	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	0.51	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	0.63	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	0.75	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	0.81	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 PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
150	0.37	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	0.49	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	0.60	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	0.72	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	0.78	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 PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
150	0.36	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	0.48	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	0.59	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	0.70	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.424	1.381	1.310	1.257
333	0.77	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.378	1.336	1.270

### EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	24	25	27	29
ENGINE ONLY	-0.022	-0.023	-0.021	-0.020
ENGINE & WING*	-0.037	-0.038	-0.036	-0.035
ENGINE & WING**	-0.051	-0.053	-0.051	-0.050

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off.

## ENGINE INOP

### Max Continuous EPR

#### 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	0.35	1.529	1.529	1.529	1.529	1.529	1.511	1.474	1.399	1.399	1.367	1.346	1.346
200	0.46	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	0.57	1.466	1.466	1.466	1.466	1.466	1.466	1.455	1.423	1.380	1.339	1.302	1.270
300	0.68	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	0.74	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	0.33	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	0.44	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	0.55	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	0.65	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	0.71	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	0.32	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	0.42	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	0.53	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	0.63	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	0.69	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	0.31	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	0.41	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	0.51	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	0.60	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	0.66	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)			
	16	18	20	22
ENGINE ONLY	-0.011	-0.014	-0.018	-0.020
ENGINE & WING*	-0.022	-0.026	-0.031	-0.034
ENGINE & WING**	-0.033	-0.038	-0.044	-0.047

\*Wing anti-ice on, packs on.

\*\*Wing anti-ice on, packs off.



## ENGINE INOP

### Max Continuous EPR

#### 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	0.29	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	0.39	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	0.49	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	0.58	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	0.64	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	0.28	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	0.38	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	0.47	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	0.56	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	0.62	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	0.27	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	0.36	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	0.45	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	0.54	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.372	1.323	1.282	1.254	
330	0.59	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	0.25	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	0.33	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	0.41	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	0.49	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	0.54	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)			
	5	10	12	14
ENGINE ONLY	-0.015	-0.015	-0.013	-0.010
ENGINE & WING*	-0.023	-0.025	-0.023	-0.020
ENGINE & WING**	-0.031	-0.035	-0.033	-0.030

\*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	638	281	16200	14700	13100
620	600	273	17700	16300	14700
580	562	264	19000	18000	16400
540	522	255	20400	19600	18300
500	483	246	22300	21700	20500
460	444	236	24300	24100	22900
420	406	226	26400	26200	25300
380	367	215	28700	28300	27500
340	329	204	31200	30600	29900

# ENGINE INOP

## MAX CONTINUOUS THRUST

## Driftdown/LRC Cruise Range Capability

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
134	125	118	111	105	100	95	91	87	83	80
274	255	239	224	211	200	190	181	172	165	158
413	384	359	337	317	300	284	270	258	246	236
551	512	479	449	423	400	379	360	343	328	314
688	640	598	561	529	500	474	451	429	410	393
825	768	717	674	635	600	569	541	516	492	471
961	895	836	785	740	700	664	631	602	575	550
1097	1021	955	897	846	800	759	722	688	658	629
1233	1148	1074	1009	951	900	854	812	775	740	709
1368	1274	1192	1121	1057	1000	949	903	861	823	788
1503	1401	1311	1232	1162	1100	1044	993	947	906	867
1639	1527	1430	1344	1268	1200	1139	1084	1034	988	947
1774	1654	1548	1456	1373	1300	1234	1174	1120	1071	1026
1910	1781	1667	1567	1479	1400	1329	1265	1207	1153	1105
2047	1908	1786	1679	1585	1500	1424	1355	1293	1236	1184
2184	2035	1906	1792	1690	1600	1519	1445	1379	1318	1263
2321	2163	2025	1904	1796	1700	1614	1536	1465	1400	1341
2460	2292	2145	2016	1902	1800	1708	1626	1550	1482	1419

### 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	2.8	3.0	3.2	3.2	3.4	3.6	0:15
200	4.9	5.4	5.8	6.3	6.8	7.2	7.5	8.0	8.6	0:32
300	8.0	8.8	9.5	10.3	11.1	11.9	12.5	13.4	14.2	0:49
400	11.2	12.3	13.4	14.5	15.6	16.7	17.7	18.9	20.1	1:06
500	14.2	15.7	17.1	18.5	20.0	21.4	22.6	24.2	25.8	1:22
600	17.2	19.0	20.7	22.4	24.1	25.9	27.4	29.3	31.2	1:38
700	20.2	22.2	24.2	26.2	28.3	30.4	32.2	34.4	36.5	1:54
800	23.1	25.4	27.7	30.0	32.4	34.8	36.9	39.4	41.8	2:10
900	26.0	28.6	31.2	33.8	36.4	39.1	41.6	44.4	47.1	2:26
1000	28.8	31.7	34.6	37.5	40.5	43.4	46.2	49.4	52.3	2:41
1100	31.6	34.8	38.0	41.2	44.4	47.7	50.8	54.2	57.5	2:57
1200	34.4	37.9	41.4	44.8	48.4	51.9	55.3	59.1	62.6	3:13
1300	37.1	40.9	44.7	48.4	52.2	56.1	59.8	63.8	67.7	3:29
1400	39.8	43.9	47.9	52.0	56.1	60.2	64.2	68.6	72.7	3:44
1500	42.5	46.9	51.2	55.5	59.9	64.3	68.6	73.3	77.6	4:00
1600	45.1	49.8	54.4	59.0	63.7	68.4	73.0	77.9	82.5	4:17
1700	47.8	52.7	57.6	62.5	67.4	72.4	77.3	82.5	87.4	4:33
1800	50.3	55.5	60.7	65.9	71.1	76.4	81.5	87.0	92.2	4:50

**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	13200	12000	7600
640	14000	12800	9700
620	14800	13600	12200
600	15700	14400	13000
580	16500	15300	13800
560	17400	16200	14700
540	18300	17100	15600
520	19000	18000	16600
500	19700	18800	17600
480	20600	19600	18600
460	21600	20700	19700
440	22700	22000	20900
420	23700	23300	22200
400	24900	24800	23600
380	26100	25900	24900
360	27400	27100	26200
340	28800	28400	27500

## ENGINE INOP

### MAX CONTINUOUS THRUST

#### Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	13	15	17	19	21	23	25	27	29
660	EPR	1.263	1.355								
	MACH	.577	.615								
	KIAS	321	323								
	FF/ENG	20270	21145								
620	EPR	1.235	1.302	1.379							
	MACH	.567	.591	.622							
	KIAS	315	310	315							
	FF/ENG	19027	19136	20113							
580	EPR	1.209	1.263	1.315	1.404						
	MACH	.555	.575	.595	.628						
	KIAS	308	302	301	306						
	FF/ENG	17754	17668	17936	19053						
540	EPR	1.185	1.233	1.270	1.327	1.426					
	MACH	.541	.564	.577	.599	.633					
	KIAS	300	296	292	292	297					
	FF/ENG	16495	16470	16382	16765	17916					
500	EPR	1.164	1.204	1.236	1.274	1.336					
	MACH	.526	.549	.564	.578	.601					
	KIAS	292	288	285	281	281					
	FF/ENG	15293	15222	15189	15142	15546					
460	EPR	1.145	1.179	1.205	1.235	1.274	1.342				
	MACH	.512	.532	.548	.564	.577	.601				
	KIAS	284	279	277	274	270	270				
	FF/ENG	14164	14013	13947	13934	13868	14271				
420	EPR	1.127	1.157	1.178	1.201	1.233	1.273	1.342	1.448		
	MACH	.497	.516	.530	.546	.563	.576	.599	.634		
	KIAS	275	270	267	265	263	259	258	263		
	FF/ENG	13077	12883	12744	12662	12641	12582	12936	13947		
380	EPR	1.110	1.136	1.154	1.172	1.198	1.231	1.274	1.333	1.440	
	MACH	.482	.499	.513	.527	.543	.559	.574	.594	.630	
	KIAS	267	261	258	255	253	251	247	246	250	
	FF/ENG	12119	11793	11631	11445	11375	11331	11311	11574	12465	
340	EPR	1.092	1.116	1.131	1.146	1.168	1.193	1.227	1.267	1.321	1.419
	MACH	.461	.483	.495	.508	.522	.537	.554	.570	.587	.620
	KIAS	255	253	249	246	243	240	238	235	233	236
	FF/ENG	11113	10789	10555	10335	10202	10115	10047	10033	10187	10906

**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
288	265	245	228	213	200	190	181	173	165	158
573	528	489	455	426	400	380	362	346	331	318
860	793	734	683	639	600	571	544	519	497	477
1147	1057	978	911	852	800	761	725	692	662	635
1435	1323	1224	1139	1066	1000	951	906	865	828	794
1724	1589	1469	1367	1279	1200	1141	1086	1037	992	952
2014	1856	1716	1596	1493	1400	1331	1268	1210	1157	1109
2305	2123	1962	1825	1706	1600	1521	1448	1381	1321	1266
2596	2391	2208	2054	1920	1800	1710	1628	1552	1484	1423

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		18		22	
	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	8.6	0:40	7.5	0:39	6.8	0:38	6.5	0:36
300	13.1	0:58	11.9	0:56	11.0	0:54	10.9	0:51
400	17.7	1:16	16.2	1:13	15.2	1:11	15.2	1:06
500	22.3	1:34	20.6	1:31	19.4	1:28	19.4	1:22
600	26.8	1:52	24.9	1:48	23.5	1:44	23.6	1:37
700	31.3	2:10	29.2	2:05	27.6	2:01	27.8	1:53
800	35.8	2:29	33.4	2:23	31.7	2:18	31.9	2:08
900	40.2	2:47	37.7	2:41	35.7	2:35	35.9	2:24
1000	44.6	3:05	41.9	2:58	39.8	2:52	40.0	2:40
1100	49.0	3:24	46.1	3:16	43.8	3:09	43.9	2:56
1200	53.4	3:42	50.2	3:34	47.8	3:26	47.9	3:12
1300	57.8	4:01	54.4	3:52	51.7	3:43	51.8	3:28
1400	62.1	4:19	58.5	4:09	55.7	4:00	55.7	3:44
1500	66.4	4:38	62.6	4:27	59.6	4:17	59.5	4:01
1600	70.7	4:57	66.7	4:45	63.5	4:34	63.3	4:17
1700	75.0	5:16	70.7	5:03	67.3	4:52	67.0	4:33
1800	79.2	5:35	74.8	5:22	71.2	5:09	70.8	4:50

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time  
Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	300	350	400	450	500	550	600	650
5	-0.7	-0.6	-0.4	-0.2	0.0	0.5	0.8	1.2
10	-1.7	-1.4	-1.0	-0.5	0.0	1.3	2.3	3.1
15	-2.8	-2.2	-1.5	-0.8	0.0	2.1	3.7	5.1
20	-3.8	-3.0	-2.1	-1.1	0.0	2.8	5.2	7.0
25	-4.9	-3.8	-2.6	-1.3	0.0	3.6	6.6	9.0
30	-5.9	-4.6	-3.1	-1.6	0.0	4.3	8.0	10.9
35	-6.9	-5.3	-3.6	-1.9	0.0	5.1	9.3	12.9
40	-7.9	-6.1	-4.2	-2.1	0.0	5.8	10.7	14.8
45	-9.0	-6.9	-4.7	-2.4	0.0	6.5	12.0	16.7
50	-10.0	-7.6	-5.2	-2.7	0.0	7.1	13.4	18.7
55	-11.0	-8.4	-5.7	-2.9	0.0	7.8	14.7	20.6
60	-12.0	-9.1	-6.2	-3.2	0.0	8.5	16.0	22.5
65	-13.0	-9.9	-6.6	-3.4	0.0	9.1	17.2	24.4
70	-14.0	-10.6	-7.1	-3.7	0.0	9.7	18.5	26.4
75	-15.0	-11.3	-7.6	-3.9	0.0	10.3	19.7	28.3
80	-16.0	-12.0	-8.0	-4.2	0.0	10.9	20.9	30.2

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	1.150	1.186	1.256	1.382		
	KIAS	259	260	261	277		
	FF/ENG	17910	17770	18030	19530		
620	EPR	1.136	1.168	1.231	1.333		
	KIAS	251	252	253	262		
	FF/ENG	16750	16610	16750	17560		
580	EPR	1.122	1.152	1.208	1.294		
	KIAS	243	244	245	248		
	FF/ENG	15690	15450	15560	15900		
540	EPR	1.109	1.136	1.186	1.261	1.400	
	KIAS	234	235	236	237	252	
	FF/ENG	14630	14330	14410	14510	16030	
500	EPR	1.097	1.120	1.165	1.229	1.334	
	KIAS	226	226	227	228	235	
	FF/ENG	13600	13270	13270	13280	14050	
460	EPR	1.085	1.105	1.144	1.199	1.283	1.470
	KIAS	220	220	220	220	220	238
	FF/ENG	12610	12350	12200	12140	12400	14260
420	EPR	1.073	1.090	1.124	1.171	1.241	1.371
	KIAS	213	213	213	213	213	220
	FF/ENG	11610	11430	11230	11090	11140	12000
380	EPR	1.061	1.076	1.105	1.145	1.201	1.303
	KIAS	206	206	206	206	206	206
	FF/ENG	10630	10450	10290	10050	10030	10340
340	EPR	1.051	1.063	1.087	1.121	1.164	1.252
	KIAS	199	199	199	199	199	199
	FF/ENG	9660	9480	9370	9050	9000	9150





Intentionally  
Blank

**Performance Inflight - QRH**  
**Gear Down**

**Chapter PI-QRH**  
**Section 53**

**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	-.016	-.015	-.015	-.009	-.017	-.023	-.019	-.016
ENGINE AND WING*	-.022	-.023	-.025	-.020	-.030	-.038	-.034	-.032
ENGINE AND WING**	-.029	-.031	-.035	-.030	-.043	-.053	-.048	-.048

\*Wing anti-ice on, dual bleed source and packs on or off.

\*\*Wing anti-ice on, single bleed source and both packs off.

**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	14400	14300	12000
640	15800	15700	13600
620	17100	17000	15100
600	18400	18300	16500
580	19700	19600	17900
560	20800	20700	19300
540	21900	21800	20500
520	23000	22900	21700
500	24200	24100	22800
480	25300	25200	24000
460	26300	26100	25100
440	27300	27100	26200
420	28300	28000	27200
400	29400	29100	28300
380	30600	30100	29400
360	31500	31200	30600
340	32200	31900	31500

## GEAR DOWN

### Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)										
		10	13	15	17	19	21	23	25	27	29	31
660	EPR	1.204	1.253	1.291								
	MACH	.479	.499	.511								
	KIAS	265	261	258								
	FF/ENG	15529	15395	15416								
620	EPR	1.186	1.228	1.261	1.301							
	MACH	.469	.489	.501	.514							
	KIAS	259	256	252	249							
	FF/ENG	14589	14433	14371	14499							
580	EPR	1.167	1.205	1.234	1.266	1.312						
	MACH	.457	.478	.491	.504	.517						
	KIAS	253	250	247	244	241						
	FF/ENG	13649	13497	13400	13407	13541						
540	EPR	1.150	1.183	1.208	1.236	1.272	1.322					
	MACH	.444	.465	.479	.492	.505	.519					
	KIAS	245	243	241	238	235	232					
	FF/ENG	12713	12572	12457	12394	12420	12552					
500	EPR	1.132	1.162	1.184	1.208	1.239	1.277	1.336				
	MACH	.430	.452	.466	.480	.493	.507	.527				
	KIAS	238	236	234	232	229	226	226				
	FF/ENG	11769	11644	11535	11422	11399	11426	11779				
460	EPR	1.115	1.141	1.160	1.182	1.209	1.241	1.285	1.347			
	MACH	.415	.436	.451	.465	.480	.493	.513	.534			
	KIAS	229	228	226	225	223	220	220	220			
	FF/ENG	10894	10707	10614	10495	10443	10413	10634	10992			
420	EPR	1.099	1.121	1.138	1.157	1.178	1.208	1.246	1.291	1.357		
	MACH	.398	.420	.434	.449	.464	.478	.498	.519	.540		
	KIAS	220	219	218	217	215	213	213	213	213		
	FF/ENG	10010	9791	9683	9581	9527	9501	9605	9792	10171		
380	EPR	1.083	1.103	1.117	1.132	1.149	1.177	1.212	1.247	1.294	1.361	
	MACH	.381	.402	.416	.431	.446	.463	.482	.502	.523	.546	
	KIAS	210	209	209	208	207	206	206	206	206	206	
	FF/ENG	9133	8911	8771	8660	8625	8650	8724	8803	8956	9326	
340	EPR	1.070	1.086	1.098	1.110	1.121	1.147	1.180	1.209	1.245	1.293	1.360
	MACH	.362	.382	.397	.412	.429	.446	.465	.484	.505	.527	.549
	KIAS	199	199	199	199	199	199	199	199	199	199	199
	FF/ENG	8341	8164	8039	7946	7798	7838	7883	7931	7997	8134	8478

**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
315	285	258	236	217	200	190	180	171	162	154
634	570	515	471	433	400	378	359	340	324	309
955	858	774	706	650	600	567	537	509	485	463
1280	1149	1035	943	867	800	756	715	679	646	617
1609	1441	1297	1180	1084	1000	944	894	848	807	771
1940	1736	1560	1419	1302	1200	1133	1072	1017	968	924
2276	2034	1825	1658	1520	1400	1322	1251	1186	1128	1077
2615	2334	2091	1898	1739	1600	1510	1429	1354	1288	1229
2959	2636	2359	2139	1958	1800	1699	1606	1523	1448	1382
3307	2942	2629	2381	2177	2000	1887	1784	1691	1607	1534
3660	3251	2901	2623	2397	2200	2075	1961	1859	1767	1685
4017	3563	3174	2867	2617	2400	2263	2139	2026	1925	1837
4378	3877	3449	3112	2838	2600	2451	2316	2193	2084	1987
4743	4194	3725	3357	3059	2800	2639	2493	2360	2242	2138
5112	4514	4003	3603	3280	3000	2827	2669	2527	2400	2288
5485	4835	4282	3850	3502	3200	3014	2845	2693	2557	2437
5862	5160	4563	4098	3724	3400	3202	3021	2858	2714	2587
6245	5488	4845	4346	3946	3600	3389	3197	3024	2870	2735
6632	5819	5129	4596	4169	3800	3577	3373	3190	3027	2884
7023	6152	5415	4846	4392	4000	3764	3549	3356	3183	3032

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		20		24	
	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	17.0	0:45	15.5	0:44	13.7	0:42	13.4	0:40
400	33.1	1:31	30.5	1:27	27.5	1:23	26.8	1:19
600	49.2	2:18	45.5	2:11	41.2	2:03	40.2	1:57
800	65.3	3:04	60.5	2:55	55.0	2:44	53.6	2:35
1000	81.4	3:50	75.5	3:38	68.7	3:24	67.0	3:13
1200	96.8	4:39	89.7	4:24	81.8	4:06	79.6	3:53
1400	112.2	5:27	104.0	5:09	94.9	4:48	92.2	4:32
1600	127.2	6:16	117.9	5:55	107.7	5:30	104.5	5:12
1800	142.0	7:07	131.6	6:43	120.1	6:13	116.4	5:52
2000	156.7	7:57	145.2	7:30	132.6	6:56	128.4	6:32
2200	170.9	8:50	158.4	8:19	144.5	7:40	139.8	7:13
2400	185.1	9:43	171.6	9:08	156.4	8:24	151.2	7:55
2600	198.9	10:37	184.5	9:58	168.1	9:09	162.3	8:36
2800	212.5	11:32	197.3	10:49	179.6	9:54	173.2	9:19
3000	226.0	12:27	210.0	11:40	191.1	10:40	184.0	10:01
3200	238.9	13:23	222.1	12:32	202.2	11:27	194.4	10:44
3400	251.8	14:20	234.3	13:25	213.3	12:13	204.8	11:28
3600	264.5	15:18	246.2	14:18	224.2	13:01	214.9	12:12
3800	276.8	16:17	257.9	15:12	234.9	13:49	224.8	12:56
4000	289.2	17:16	269.6	16:06	245.5	14:37	234.7	13:41

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	550	600	650	700
20	-3.7	-2.9	-2.0	-1.1	0.0	2.6	5.2	8.0	10.9
40	-7.8	-5.9	-4.0	-2.0	0.0	5.4	11.1	17.1	23.5
60	-11.9	-8.9	-5.9	-3.0	0.0	8.0	16.5	25.6	35.2
80	-16.1	-12.0	-7.9	-4.0	0.0	10.4	21.5	33.4	46.1
100	-20.2	-15.0	-9.9	-5.0	0.0	12.6	26.2	40.7	56.1
120	-24.4	-18.1	-12.0	-6.1	0.0	14.6	30.4	47.2	65.2
140	-28.5	-21.2	-14.0	-7.1	0.0	16.5	34.2	53.2	73.5
160	-32.7	-24.3	-16.1	-8.1	0.0	18.1	37.6	58.6	81.0
180	-36.9	-27.4	-18.1	-9.1	0.0	19.5	40.6	63.3	87.6
200	-41.0	-30.6	-20.2	-10.2	0.0	20.7	43.2	67.4	93.4
220	-45.2	-33.7	-22.3	-11.2	0.0	21.8	45.4	70.9	98.3
240	-49.4	-36.9	-24.5	-12.3	0.0	22.6	47.2	73.8	102.3
260	-53.6	-40.1	-26.6	-13.3	0.0	23.2	48.6	76.0	105.5
280	-57.9	-43.3	-28.8	-14.4	0.0	23.7	49.5	77.6	107.9
300	-62.1	-46.5	-31.0	-15.5	0.0	23.9	50.1	78.6	109.4

Descent at VREF30+80

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	54	58	63	67	71	75	79	84	88	92
TIME (MINUTES)	13	14	15	16	16	17	17	18	19	19

GEAR DOWN

Holding  
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
660	EPR	1.111	1.139	1.194	1.281			
	KIAS	249	249	249	249			
	FF/ENG	15280	15000	15140	15520			
620	EPR	1.100	1.125	1.174	1.250			
	KIAS	242	242	242	242			
	FF/ENG	14400	14090	14160	14360			
580	EPR	1.090	1.113	1.157	1.223	1.339		
	KIAS	237	237	237	237	237		
	FF/ENG	13620	13290	13290	13370	14160		
540	EPR	1.081	1.101	1.140	1.199	1.292		
	KIAS	232	232	232	232	232		
	FF/ENG	12860	12580	12460	12470	12970		
500	EPR	1.072	1.090	1.125	1.175	1.255		
	KIAS	226	226	226	226	226		
	FF/ENG	12060	11860	11680	11600	11850		
460	EPR	1.063	1.079	1.110	1.154	1.222	1.347	
	KIAS	220	220	220	220	220	220	
	FF/ENG	11250	11110	10910	10750	10850	11540	
420	EPR	1.054	1.068	1.095	1.134	1.191	1.291	
	KIAS	213	213	213	213	213	213	
	FF/ENG	10450	10300	10150	9880	9920	10280	
380	EPR	1.047	1.059	1.081	1.115	1.161	1.247	1.408
	KIAS	206	206	206	206	206	206	206
	FF/ENG	9660	9490	9380	9080	9050	9240	10040
340	EPR	1.040	1.050	1.069	1.098	1.133	1.209	1.323
	KIAS	199	199	199	199	199	199	199
	FF/ENG	9020	8860	8720	8440	8210	8330	8700

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	1.115	1.143	1.198	1.284	
	KIAS	229	229	229	229	
	FF/ENG	14670	14390	14570	14830	
620	EPR	1.103	1.129	1.177	1.252	
	KIAS	222	222	222	222	
	FF/ENG	13770	13480	13560	13700	
580	EPR	1.093	1.115	1.159	1.223	1.332
	KIAS	217	217	217	217	217
	FF/ENG	12930	12690	12630	12720	13310
540	EPR	1.083	1.103	1.142	1.197	1.285
	KIAS	212	212	212	212	212
	FF/ENG	12130	11960	11820	11820	12130
500	EPR	1.073	1.091	1.125	1.174	1.247
	KIAS	206	206	206	206	206
	FF/ENG	11300	11160	11010	10920	11050
460	EPR	1.064	1.079	1.109	1.152	1.211
	KIAS	200	200	200	200	200
	FF/ENG	10490	10340	10230	10020	10080
420	EPR	1.054	1.068	1.094	1.131	1.177
	KIAS	193	193	193	193	193
	FF/ENG	9680	9520	9440	9150	9170
380	EPR	1.047	1.058	1.080	1.111	1.146
	KIAS	186	186	186	186	186
	FF/ENG	9010	8870	8750	8490	8310
340	EPR	1.039	1.049	1.067	1.093	1.115
	KIAS	179	179	179	179	179
	FF/ENG	8200	8080	7950	7730	7610

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 54**

**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 ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	476	224	4100	2800	
460	438	218	6700	5900	5000
420	401	211	9300	8700	7900
380	364	204	12400	11900	11100
340	326	197	14900	14000	13200

**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			
480	2100		
460	4000	2400	
440	5800	4800	3200
420	7500	6700	5800
400	9200	8500	7700
380	11200	10300	9500
360	12700	12200	11500
340	13900	13200	12600

**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						
	MACH						
	KIAS						
	FF/ENG						
440	EPR	1.312	1.361				
	MACH	.366	.379				
	KIAS	221	221				
	FF/ENG	20938	21487				
400	EPR	1.263	1.302	1.351	1.409		
	MACH	.349	.362	.375	.389		
	KIAS	211	211	211	210		
	FF/ENG	18577	18792	19254	19826		
360	EPR	1.227	1.257	1.294	1.342	1.403	
	MACH	.335	.347	.360	.374	.389	
	KIAS	202	203	203	203	203	
	FF/ENG	16667	16770	16958	17332	17890	
340	EPR	1.212	1.239	1.271	1.313	1.366	1.439
	MACH	.329	.341	.354	.367	.382	.397
	KIAS	199	199	199	199	199	199
	FF/ENG	15842	15909	16058	16265	16688	17379

## 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
353	309	271	242	220	200	186	174	163	153	145
533	465	408	364	330	300	279	260	244	229	217
714	622	545	486	440	400	372	347	324	305	288
897	781	684	609	550	500	464	433	404	380	360
1080	940	822	732	661	600	557	518	485	456	431
1265	1100	961	855	772	700	650	604	565	531	502
1450	1260	1100	978	882	800	742	690	645	606	573
1637	1420	1239	1101	993	900	835	777	725	681	643
1824	1582	1378	1224	1104	1000	927	863	805	756	714
2013	1744	1518	1348	1214	1100	1020	949	886	831	785
2202	1907	1659	1472	1325	1200	1113	1035	966	906	856

### 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	15.9	0:55	15.5	0:54	15.2	0:53	15.0	0:51
300	23.9	1:22	23.3	1:20	22.9	1:18	22.7	1:16
400	31.8	1:49	31.1	1:46	30.7	1:43	30.4	1:40
500	39.4	2:16	38.5	2:12	38.0	2:09	37.8	2:05
600	47.1	2:43	46.0	2:39	45.4	2:34	45.1	2:30
700	54.7	3:11	53.5	3:05	52.8	3:00	52.5	2:55
800	62.4	3:38	61.0	3:32	60.1	3:26	59.8	3:20
900	69.7	4:06	68.2	3:59	67.2	3:52	66.8	3:46
1000	77.1	4:34	75.5	4:26	74.3	4:18	73.7	4:11
1100	84.3	5:02	82.5	4:54	81.2	4:45	80.5	4:37
1200	91.5	5:31	89.5	5:21	88.1	5:12	87.3	5:03

### Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)					
	300	350	400	450	500	550
10	-1.4	-0.7	0.0	1.3	2.3	3.4
20	-2.8	-1.5	0.0	2.9	5.5	7.8
30	-4.3	-2.2	0.0	4.5	8.6	12.2
40	-5.7	-2.9	0.0	5.9	11.6	16.5
50	-7.1	-3.7	0.0	7.3	14.4	20.8
60	-8.5	-4.4	0.0	8.7	17.2	25.0
70	-9.8	-5.1	0.0	9.9	19.9	29.2
80	-11.2	-5.8	0.0	11.0	22.6	33.3
90	-12.5	-6.5	0.0	12.1	25.1	37.4
100	-13.8	-7.2	0.0	13.1	27.5	41.4

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding  
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
500	EPR	1.286			
	KIAS	226			
	FF/ENG	23810			
460	EPR	1.255	1.320		
	KIAS	220	220		
	FF/ENG	22000	22290		
420	EPR	1.227	1.278		
	KIAS	213	213		
	FF/ENG	20230	20240		
380	EPR	1.200	1.243	1.345	
	KIAS	206	206	206	
	FF/ENG	18490	18390	19110	
340	EPR	1.175	1.212	1.291	1.439
	KIAS	199	199	199	199
	FF/ENG	16750	16630	16950	18250

This table includes 5% additional fuel for holding in a racetrack pattern.

**Performance Inflight - QRH**  
**Text**

**Chapter PI-QRH**  
**Section 55**

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## **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.

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## **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.

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.

### **VREF Speeds**

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

---

## Advisory Information

### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,



wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, 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.

---

## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

---

## 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 autoland 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.

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## 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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**Performance Inflight - QRH****Chapter PI-QRH****General****Section 60****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)				
		400	500	600	700	800
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>4.5</b> 1100	<b>4.0</b> 700			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>5.5</b> 2800	<b>5.0</b> 2100	<b>5.0</b> 1500	<b>4.5</b> 1100	<b>4.0</b> 800
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>8.5</b> 4100	<b>7.5</b> 3100	<b>7.5</b> 2400	<b>7.5</b> 1700	<b>7.0</b> 1300
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>11.5</b> 5400	<b>10.5</b> 4100	<b>9.5</b> 3300	<b>9.5</b> 2600	<b>9.0</b> 2100
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>15.0</b> 6300	<b>13.0</b> 4900	<b>12.0</b> 3900	<b>11.5</b> 3200	<b>11.0</b> 2600

**Cruise****Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		400	500	600	700	800
40000 (.82M)	<b>PITCH ATT</b> %N1	<b>2.5</b> 82.1	<b>3.0</b> 87.2			
35000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>1.5</b> 78.9	<b>2.5</b> 81.6	<b>3.0</b> 85.3	<b>3.5</b> 92.0	
30000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 74.5	<b>2.5</b> 77.2	<b>3.0</b> 80.7	<b>3.0</b> 84.8	<b>3.0</b> 88.8
25000 (280 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 70.6	<b>2.5</b> 73.0	<b>3.5</b> 76.1	<b>3.5</b> 80.0	<b>3.5</b> 83.7
20000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 65.8	<b>3.0</b> 68.3	<b>4.0</b> 71.4	<b>4.0</b> 75.2	<b>4.0</b> 78.9
15000 (270 KIAS)	<b>PITCH ATT</b> %N1	<b>2.0</b> 61.8	<b>3.0</b> 64.4	<b>4.0</b> 67.2	<b>4.5</b> 70.4	<b>4.5</b> 74.3

**Descent****Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		400	500	600	700	800
40000 (.82M)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -2700	<b>0.0</b> -2700			
30000 (280 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -2200	<b>0.0</b> -2000	<b>1.0</b> -1900	<b>0.5</b> -2100	<b>0.5</b> -2500
20000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-0.5</b> -1800	<b>0.5</b> -1600	<b>1.5</b> -1500	<b>2.0</b> -1500	<b>1.5</b> -1600
10000 (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1600	<b>0.0</b> -1400	<b>1.5</b> -1400	<b>2.5</b> -1400	<b>2.5</b> -1400
SEA LEVEL (270 KIAS)	<b>PITCH ATT</b> V/S (FT/MIN)	<b>-1.0</b> -1400	<b>0.0</b> -1300	<b>1.0</b> -1200	<b>2.0</b> -1200	<b>2.5</b> -1300

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

**Flight With Unreliable Airspeed / Turbulent Air Penetration**  
Altitude and/or vertical speed indications may also be unreliable.

**Holding**  
**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		400	500	600	700	800
10000	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>	<b>5.5</b>
	%N1	52.8	57.5	62.0	66.1	69.7
	KIAS	207	222	238	258	276
5000	<b>PITCH ATT</b>	<b>4.5</b>	<b>5.0</b>	<b>5.5</b>	<b>5.5</b>	<b>5.5</b>
	%N1	49.3	53.8	58.0	61.9	65.6
	KIAS	207	222	237	256	274

**Terminal Area (5000 FT)**  
**Set Thrust for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		400	500	600	700	800
FLAPS UP GEAR UP VREF30+80	<b>PITCH ATT</b>	<b>5.0</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>	<b>6.5</b>
	%N1	50.3	55.2	59.5	63.8	67.6
	KIAS	208	223	237	253	266
FLAPS 1 GEAR UP VREF30+60	<b>PITCH ATT</b>	<b>6.5</b>	<b>7.0</b>	<b>7.5</b>	<b>7.5</b>	<b>8.0</b>
	%N1	51.2	56.4	61.1	65.5	69.3
	KIAS	188	203	217	233	246
FLAPS 5 GEAR UP VREF30+40	<b>PITCH ATT</b>	<b>5.5</b>	<b>6.0</b>	<b>6.5</b>	<b>6.5</b>	<b>6.5</b>
	%N1	51.9	57.0	62.2	66.3	70.3
	KIAS	168	183	197	213	226
FLAPS 15 GEAR UP VREF30+20	<b>PITCH ATT</b>	<b>6.5</b>	<b>7.0</b>	<b>7.0</b>	<b>7.0</b>	<b>7.0</b>
	%N1	52.9	58.7	63.7	68.1	72.4
	KIAS	148	163	177	193	206
FLAPS 20 GEAR DOWN VREF30+20	<b>PITCH ATT</b>	<b>5.0</b>	<b>5.0</b>	<b>5.5</b>	<b>5.0</b>	<b>5.5</b>
	%N1	58.8	64.9	70.4	75.3	79.5
	KIAS	148	163	177	193	206

**Final Approach (1500 FT)**  
**Gear Down, Set Thrust for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		400	500	600	700	800
FLAPS 20 VREF20+10	<b>PITCH ATT</b>	<b>1.0</b>	<b>1.0</b>	<b>1.5</b>	<b>1.5</b>	<b>2.0</b>
	%N1	39.2	43.4	47.2	50.5	53.3
	KIAS	154	171	186	200	210
FLAPS 25 VREF25+10	<b>PITCH ATT</b>	<b>1.5</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>
	%N1	49.2	53.8	57.7	61.3	64.0
	KIAS	145	160	174	187	197
FLAPS 30 VREF30+10	<b>PITCH ATT</b>	<b>1.0</b>	<b>1.5</b>	<b>1.5</b>		
	%N1	53.4	58.6	62.8		
	KIAS	138	153	166		



**Max Climb %N1****Based on engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

\*Packs on or off with 2 bleed sources.

\*\*Packs off with 1 bleed source.

VREF

WEIGHT (1000 LB)	FLAPS		
	30	25	20
800	185	187	200
750	180	183	196
700	173	177	189
650	162	171	183
600	156	164	176
550	149	157	168
500	142	150	161
450	135	142	152
400	127	134	144
350	118	125	134

**Performance Inflight - QRH****Chapter PI-QRH****Advisory Information****Section 61****ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 30****Dry Runway**

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
	500000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 500000 LB	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	3040	+70/-40	70	-130	450	40	-30	70	-70	240	70	140
MAX AUTO	4080	+70/-40	100	-170	620	0	0	100	-100	410	0	0
AUTOBRAKE 4	5300	+100/-60	140	-250	890	10	-10	140	-140	570	20	20
AUTOBRAKE 3	6260	+120/-80	170	-310	1100	10	-70	170	-170	590	40	50
AUTOBRAKE 2	7070	+130/-100	210	-350	1250	90	-160	190	-190	510	300	330
AUTOBRAKE 1	7800	+150/-120	250	-400	1460	230	-230	210	-210	510	820	1090

**Good Reported Braking Action**

MAX MANUAL	4250	+70/-60	110	-210	780	100	-90	110	-110	340	280	650
MAX AUTO	4560	+80/-70	110	-200	760	80	-50	110	-110	400	300	710
AUTOBRAKE 4	5310	+100/-80	140	-250	900	20	-10	140	-140	570	40	140
AUTOBRAKE 3	6260	+120/-100	170	-310	1100	10	-70	170	-170	590	40	50

**Medium Reported Braking Action**

MAX MANUAL	5640	+110/-100	170	-310	1240	250	-190	160	-160	420	750	1940
MAX AUTO	5870	+110/-90	170	-300	1200	240	-170	150	-150	450	740	1950
AUTOBRAKE 4	6000	+110/-100	170	-310	1230	190	-110	160	-160	570	670	1920
AUTOBRAKE 3	6520	+120/-110	190	-340	1320	130	-130	190	-180	590	380	1390

**Poor Reported Braking Action**

MAX MANUAL	7100	+150/-130	240	-440	1880	530	-340	210	-210	480	1550	4700
MAX AUTO	7410	+150/-130	240	-430	1840	530	-340	210	-210	470	1580	4790
AUTOBRAKE 4	7410	+150/-130	240	-430	1840	530	-310	210	-210	510	1580	4760
AUTOBRAKE 3	7520	+150/-130	240	-440	1880	440	-290	220	-220	590	1400	4620

\*Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 200 ft.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 25****Dry Runway**

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	500000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 500000 LB	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	3190	+70/-40	70	-130	460	40	-30	70	-70	240	70	160
MAX AUTO	4380	+60/-40	110	-180	640	0	0	110	-110	430	0	0
AUTOBRAKE 4	5720	+80/-60	150	-260	920	10	-10	160	-160	600	20	20
AUTOBRAKE 3	6790	+100/-90	200	-320	1140	20	-90	190	-190	590	70	80
AUTOBRAKE 2	7620	+120/-120	230	-360	1300	120	-180	210	-210	520	410	450
AUTOBRAKE 1	8360	+150/-130	270	-420	1510	250	-250	220	-230	520	970	1340

**Good Reported Braking Action**

MAX MANUAL	4490	+70/-70	120	-210	790	110	-90	120	-120	340	310	720
MAX AUTO	4830	+70/-70	120	-210	790	90	-40	120	-120	430	320	780
AUTOBRAKE 4	5740	+80/-90	150	-260	940	20	-10	160	-160	600	40	150
AUTOBRAKE 3	6790	+100/-120	200	-320	1140	20	-90	190	-190	590	70	80

**Medium Reported Braking Action**

MAX MANUAL	5980	+100/-100	190	-320	1270	260	-200	170	-170	430	820	2160
MAX AUTO	6220	+100/-100	180	-310	1230	250	-170	160	-170	460	830	2170
AUTOBRAKE 4	6400	+100/-110	190	-330	1270	180	-110	180	-180	600	680	2090
AUTOBRAKE 3	7030	+110/-120	210	-360	1360	130	-150	200	-200	590	420	1500

**Poor Reported Braking Action**

MAX MANUAL	7530	+140/-140	260	-460	1920	550	-360	230	-230	490	1710	5230
MAX AUTO	7860	+140/-140	260	-440	1880	550	-350	220	-220	480	1740	5320
AUTOBRAKE 4	7860	+150/-140	260	-450	1890	550	-320	220	-220	540	1740	5300
AUTOBRAKE 3	8050	+140/-150	260	-460	1920	440	-310	240	-240	590	1480	5100

\*Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 200 ft.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

**ADVISORY INFORMATION****Normal Configuration Landing Distance****Flaps 20****Dry Runway**

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	500000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 500000 LB	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	3450	+90/-40	80	-130	450	40	-40	80	-80	240	90	200
MAX AUTO	4840	+70/-70	120	-200	660	0	0	120	-130	460	0	0
AUTOBRAKE 4	6360	+90/-100	180	-280	940	10	-10	180	-180	640	20	20
AUTOBRAKE 3	7480	+120/-130	220	-340	1160	50	-100	210	-210	640	110	120
AUTOBRAKE 2	8090	+140/-150	270	-390	1320	150	-200	230	-230	580	540	570
AUTOBRAKE 1	8710	+170/-170	310	-440	1520	300	-310	260	-260	550	1240	1690

**Good Reported Braking Action**

MAX MANUAL	4920	+70/-80	140	-220	780	120	-100	120	-120	350	380	900
MAX AUTO	5080	+80/-80	140	-230	790	70	-50	130	-130	460	350	910
AUTOBRAKE 4	6370	+100/-100	180	-280	960	20	-20	180	-180	640	40	160
AUTOBRAKE 3	7480	+120/-130	220	-340	1160	50	-100	210	-210	640	110	120

**Medium Reported Braking Action**

MAX MANUAL	6590	+110/-110	210	-340	1240	270	-220	170	-180	440	990	2630
MAX AUTO	6590	+120/-110	210	-340	1220	270	-190	170	-170	480	980	2620
AUTOBRAKE 4	6880	+120/-120	210	-350	1270	180	-120	190	-190	640	760	2450
AUTOBRAKE 3	7720	+130/-140	240	-380	1370	150	-160	220	-220	640	460	1740

**Poor Reported Braking Action**

MAX MANUAL	8310	+160/-160	300	-490	1870	580	-410	230	-230	510	2020	6270
MAX AUTO	8310	+160/-160	290	-480	1860	580	-400	220	-220	510	2030	6320
AUTOBRAKE 4	8310	+160/-150	300	-480	1860	580	-350	230	-230	590	2030	6280
AUTOBRAKE 3	8570	+160/-160	300	-500	1900	480	-350	240	-240	640	1700	6020

\*Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 230 ft.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Dry Runway**

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	500000 LB LDG WT	PER 10000 LB ABV/BLW 500000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	5980	100/-100	190	-320/1210	260/-200	90/-90	410	840	2200
ANTISKID (FLAPS 30)	VREF30	5640	110/-80	180	-310/1180	250/-190	80/-80	410	760	1980
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	3500	100/-50	90	-130/490	50/-40	40/-40	260	-	160
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	3060	80/-30	70	-120/430	40/-40	40/-40	240	-	130
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	3850	150/-40	110	-150/570	60/-50	70/-70	280	160	370
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	3500	110/-30	90	-130/500	40/-40	40/-40	260	100	220
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	3460	90/-50	80	-130/470	40/-40	40/-40	240	90	200
FLAPS PRIMARY FAIL	VREF20	3950	80/-50	90	-150/500	50/-50	50/-50	320	120	260
FLAP/SLAT CONTROL	VREF20	3460	90/-50	80	-130/470	40/-40	40/-40	240	90	200
FLIGHT CONTROL MODE	VREF20	4000	80/-50	100	-150/510	50/-50	50/-50	330	130	280
HYD PRESS SYS C	VREF20	3950	80/-50	90	-150/500	50/-50	50/-50	320	120	260
HYD PRESS SYS L+C	VREF30+20	4380	100/-40	110	-160/560	70/-60	60/-60	410	-	190
HYD PRESS SYS L+R	VREF30+20	4740	90/-40	120	-190/660	110/-100	70/-70	460	-	-
HYD PRESS SYS R+C	VREF30+20	5380	80/-50	150	-220/760	140/-120	80/-80	520	-	440
HYD PRESS SYS L (FLAPS 25)	VREF25	3440	70/-40	80	-140/470	50/-50	40/-40	290	-	110
HYD PRESS SYS L (FLAPS 30)	VREF30	3270	70/-30	70	-130/460	50/-40	40/-40	290	-	100
HYD PRESS SYS R (FLAPS 25)	VREF25	3790	50/-50	90	-160/550	70/-60	50/-50	330	-	170
HYD PRESS SYS R (FLAPS 30)	VREF30	3580	60/-40	90	-150/530	60/-60	50/-50	320	-	150
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	3970	130/-40	110	-150/560	60/-50	60/-60	280	150	340
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	3530	100/-30	80	-130/460	40/-40	40/-40	250	100	210
PRI FLIGHT COMPUTERS	VREF20	4000	80/-50	100	-150/510	50/-50	50/-50	330	130	280
SLATS DRIVE	VREF30+30	3800	110/-40	100	-140/520	50/-40	40/-40	260	110	250
STABILIZER	VREF30+20	3530	100/-30	80	-130/460	40/-40	40/-40	250	100	210

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Good Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	500000 LB LDG WT	PER 10000 LB ABV/BLW 500000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	5980	100/-100	190	-320/1210	260/-200	90/-90	410	840	2200
ANTISKID (FLAPS 30)	VREF30	5640	110/-80	180	-310/1180	250/-190	80/-80	410	760	1980
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	5170	80/-80	150	-240/840	150/-120	80/-80	380	-	640
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	4430	80/-60	120	-210/780	130/-100	60/-60	360	-	500
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	5580	90/-70	160	-230/830	130/-110	90/-90	340	510	1240
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	5020	80/-60	140	-220/800	120/-110	70/-70	350	420	1000
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	4920	70/-80	140	-220/790	120/-100	70/-70	350	380	890
FLAPS PRIMARY FAIL	VREF20	5500	80/-90	160	-240/850	140/-120	80/-80	430	470	1130
FLAP/SLAT CONTROL	VREF20	4920	70/-80	140	-220/790	120/-100	70/-70	350	380	890
FLIGHT CONTROL MODE	VREF20	5590	80/-90	160	-240/860	150/-130	80/-80	450	490	1200
HYD PRESS SYS C	VREF20	5500	80/-90	160	-240/850	140/-120	80/-80	430	470	1130
HYD PRESS SYS L+C	VREF30+20	6460	110/-70	190	-290/1000	230/-190	100/-100	580	-	840
HYD PRESS SYS L+R	VREF30+20	6910	110/-70	200	-320/1110	320/-250	110/-110	650	-	-
HYD PRESS SYS R+C	VREF30+20	6550	110/-70	190	-290/1010	240/-190	100/-100	600	-	880
HYD PRESS SYS L (FLAPS 25)	VREF25	5110	70/-80	140	-240/870	160/-140	70/-70	430	-	530
HYD PRESS SYS L (FLAPS 30)	VREF30	4840	90/-60	130	-230/850	160/-130	70/-70	430	-	480
HYD PRESS SYS R (FLAPS 25)	VREF25	5110	70/-80	140	-240/870	160/-140	70/-70	430	-	530
HYD PRESS SYS R (FLAPS 30)	VREF30	4790	80/-60	130	-230/840	150/-130	70/-70	420	-	460
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	5690	90/-70	170	-240/840	140/-120	80/-80	350	500	1200
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	5020	80/-60	140	-220/800	120/-110	60/-60	350	390	930
PRI FLIGHT COMPUTERS	VREF20	5590	80/-90	160	-240/860	150/-130	80/-80	450	490	1200
SLATS DRIVE	VREF30+30	5400	90/-70	160	-230/830	130/-110	70/-70	360	440	1050
STABILIZER	VREF30+20	5020	80/-60	140	-220/800	120/-110	60/-60	350	390	930

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

**ADVISORY INFORMATION**

**Non-Normal Configuration Landing Distance  
Medium Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	500000 LB LDG WT	PER 10000 LB ABV/BLW 500000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	7490	140/-140	270	-450/1820	550/-360	110/-110	470	1730	5310
ANTISKID (FLAPS 30)	VREF30	7050	150/-110	240	-440/1780	530/-340	100/-100	460	1570	4780
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	7310	130/-130	230	-380/1410	400/-300	110/-110	510	-	1910
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	6160	120/-90	190	-340/1300	340/-250	90/-90	470	-	1460
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	7580	140/-110	260	-360/1320	300/-240	130/-130	440	1350	3810
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	6750	130/-100	220	-340/1270	290/-230	100/-100	450	1110	3040
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	6580	120/-110	220	-340/1260	290/-220	100/-100	430	990	2630
FLAPS PRIMARY FAIL	VREF20	7230	130/-130	240	-360/1330	330/-250	110/-110	520	1180	3230
FLAP/SLAT CONTROL	VREF20	6580	120/-110	220	-340/1260	290/-220	100/-100	430	990	2630
FLIGHT CONTROL MODE	VREF20	7380	130/-130	250	-370/1350	340/-260	110/-110	540	1250	3480
HYD PRESS SYS C	VREF20	7230	130/-130	240	-360/1330	330/-250	110/-110	520	1180	3230
HYD PRESS SYS L+C	VREF30+20	9090	170/-120	300	-460/1670	600/-430	140/-140	720	-	2530
HYD PRESS SYS L+R	VREF30+20	11120	180/-120	350	-590/2100	1160/-730	190/-190	910	-	-
HYD PRESS SYS R+C	VREF30+20	9200	170/-120	310	-460/1680	620/-440	140/-140	740	-	2630
HYD PRESS SYS L (FLAPS 25)	VREF25	7290	120/-120	240	-400/1490	460/-330	110/-110	560	-	1660
HYD PRESS SYS L (FLAPS 30)	VREF30	6880	130/-90	220	-390/1460	440/-310	110/-110	560	-	1510
HYD PRESS SYS R (FLAPS 25)	VREF25	7240	120/-120	230	-400/1490	450/-320	110/-110	550	-	1630
HYD PRESS SYS R (FLAPS 30)	VREF30	6720	130/-90	210	-380/1440	420/-300	100/-100	530	-	1410
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	7590	140/-110	260	-360/1330	310/-240	110/-120	440	1260	3430
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	6690	130/-100	220	-340/1270	290/-220	80/-80	430	1010	2680
PRI FLIGHT COMPUTERS	VREF20	7380	130/-130	250	-370/1350	340/-260	110/-110	540	1250	3480
SLATS DRIVE	VREF30+30	7190	130/-100	240	-350/1310	310/-240	90/-90	440	1110	2970
STABILIZER	VREF30+20	6690	130/-100	220	-340/1270	290/-220	80/-80	430	1010	2680

Actual (unfactored) distances are shown.  
Includes distances from 50 ft above threshold (1000 ft air distance).  
Assumes maximum manual braking and maximum available reverse thrust.



**ADVISORY INFORMATION****Non-Normal Configuration Landing Distance****Poor Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	500000 LB LDG WT	PER 10000 LB ABV/BLW 500000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	9650	210/-190	380	-690/3260	2660/-720	150/-150	530	4340	15000
ANTISKID (FLAPS 30)	VREF30	9090	220/-160	350	-670/3200	2580/-690	140/-140	510	4010	15000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	9740	190/-180	350	-570/2230	990/-590	160/-160	610	-	4850
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	8140	170/-130	280	-520/2070	840/-490	130/-130	550	-	3690
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	9580	200/-150	370	-500/1990	640/-430	170/-170	530	2770	9540
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	8510	180/-140	320	-480/1920	620/-410	130/-130	520	2280	7500
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	8270	160/-150	300	-470/1900	610/-400	130/-130	500	2020	6320
FLAPS PRIMARY FAIL	VREF20	8950	180/-170	330	-500/1980	670/-440	140/-140	580	2330	7610
FLAP/SLAT CONTROL	VREF20	8270	160/-150	300	-470/1900	610/-400	130/-130	500	2020	6320
FLIGHT CONTROL MODE	VREF20	9150	180/-170	340	-510/2000	700/-460	140/-140	610	2480	8260
HYD PRESS SYS C	VREF20	8950	180/-170	330	-500/1980	670/-440	140/-140	580	2330	7610
HYD PRESS SYS L+C	VREF30+20	12140	240/-180	450	-700/2730	1560/-850	200/-200	820	-	6360
HYD PRESS SYS L+R	VREF30+20	17790	270/-160	590	-1100/4220	5750/-1980	320/-320	1140	-	-
HYD PRESS SYS R+C	VREF30+20	12260	250/-190	460	-710/2750	1590/-870	200/-200	840	-	6540
HYD PRESS SYS L (FLAPS 25)	VREF25	9910	180/-170	360	-630/2520	1310/-690	160/-160	660	-	4300
HYD PRESS SYS L (FLAPS 30)	VREF30	9370	190/-140	330	-610/2470	1270/-660	150/-150	660	-	3950
HYD PRESS SYS R (FLAPS 25)	VREF25	9790	170/-170	350	-620/2500	1280/-670	160/-160	640	-	4150
HYD PRESS SYS R (FLAPS 30)	VREF30	9040	180/-130	320	-600/2420	1190/-620	140/-140	610	-	3570
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	9450	190/-150	360	-500/1980	640/-430	150/-150	500	2480	8010
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	8360	180/-130	300	-480/1900	610/-400	110/-110	500	2030	6340
PRI FLIGHT COMPUTERS	VREF20	9150	180/-170	340	-510/2000	700/-460	140/-140	610	2480	8260
SLATS DRIVE	VREF30+30	8960	190/-140	330	-490/1950	630/-420	120/-120	500	2210	6900
STABILIZER	VREF30+20	8360	180/-130	300	-480/1900	610/-400	110/-110	500	2030	6340

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule  
Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																							
		80				100				120				140				160				180			
WEIGHT (1000 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																							
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8			
780	0	21.8	23.8	26.1	32.5	35.8	39.7	45.4	50.5	56.5	59.5	66.5	74.6	74.6	83.6	94.0	90.2	101.1	113.5						
	10	22.4	24.5	26.9	33.4	36.9	40.9	46.8	52.1	58.2	61.4	68.6	77.0	77.0	86.3	96.9	93.1	104.2	116.8						
	15	22.8	24.9	27.4	34.0	37.6	41.7	47.7	53.1	59.3	62.5	69.9	78.4	78.3	87.8	98.6	94.7	106.0	118.7						
	20	23.2	25.4	27.8	34.7	38.2	42.4	48.5	54.0	60.3	63.5	71.1	79.7	79.7	89.3	100.2	96.2	107.7	120.6						
	30	23.8	26.0	28.5	35.5	39.2	43.5	49.8	55.4	62.0	65.3	73.0	81.9	81.9	91.7	102.9	98.9	110.6	123.7						
740	0	23.9	26.1	28.7	35.9	39.7	44.1	50.6	56.3	63.0	66.4	74.4	83.5	83.4	93.5	105.0	100.8	112.8	126.0						
	10	21.0	22.8	25.0	31.1	34.3	38.0	43.5	48.8	53.9	56.6	63.5	71.2	71.3	79.9	89.8	86.3	96.8	108.7						
	15	21.5	23.5	25.7	32.0	35.3	39.1	44.8	49.8	55.6	58.6	65.5	73.5	73.6	82.5	92.6	89.1	99.8	111.9						
	20	21.9	23.9	26.2	32.6	36.0	39.8	45.6	50.7	56.6	59.7	66.7	74.8	74.9	83.9	94.2	90.6	101.5	113.8						
	30	22.3	24.3	26.7	33.2	36.6	40.5	46.4	51.6	57.6	60.7	67.9	76.1	76.2	85.3	95.8	92.1	103.1	115.6						
700	0	23.0	24.9	27.3	34.0	37.5	41.6	47.6	53.0	59.2	62.4	69.7	78.2	78.3	87.7	98.4	94.7	105.9	118.6						
	10	23.0	25.1	27.5	34.4	37.9	42.1	48.3	53.8	60.1	63.4	71.0	79.7	79.7	89.4	100.4	96.5	108.1	120.9						
	15	20.1	21.9	23.9	29.8	32.8	36.2	41.5	46.1	51.4	54.2	60.5	67.8	68.0	76.2	85.6	82.4	92.4	103.8						
	20	20.6	22.5	24.6	30.6	33.7	37.3	42.8	47.5	53.0	55.9	62.4	70.0	70.1	78.6	88.3	85.0	95.2	106.9						
	30	21.0	22.9	25.1	31.2	34.3	38.0	43.6	48.4	53.9	56.9	63.5	71.2	71.4	80.0	89.8	86.4	96.9	108.7						
620	0	21.4	23.3	25.5	31.8	35.0	38.7	44.3	49.2	54.9	57.9	64.6	72.4	72.6	81.3	91.3	87.9	98.5	110.4						
	10	21.9	23.8	26.1	32.5	35.8	39.7	45.5	50.5	56.4	59.5	66.4	74.4	74.6	83.6	93.8	90.3	101.2	113.4						
	20	22.0	24.0	26.3	32.9	36.2	40.2	46.1	51.3	57.3	60.5	67.6	75.8	76.0	85.2	95.7	92.1	103.2	115.6						
	30	18.4	20.0	21.8	27.1	29.7	32.8	37.6	41.6	46.3	48.8	54.4	60.9	61.2	68.4	76.8	74.1	83.1	93.4						
	40	18.9	20.5	22.4	27.9	30.6	33.8	38.7	42.9	47.7	50.4	56.1	62.8	63.1	70.6	79.3	76.5	85.7	96.3						
540	0	19.3	20.9	22.8	28.4	31.2	34.4	39.4	43.6	48.6	51.3	57.1	63.9	64.2	71.9	80.7	77.8	87.2	97.9						
	10	19.6	21.3	23.2	28.9	31.7	35.0	40.1	44.4	49.4	52.2	58.1	65.0	65.4	73.1	82.0	79.2	88.7	99.6						
	15	20.0	21.7	23.8	29.6	32.5	35.9	41.1	45.6	50.7	53.6	59.7	66.8	67.1	75.1	84.3	81.4	91.2	102.3						
	20	20.1	21.9	23.9	29.9	32.8	36.3	41.7	46.2	51.5	54.4	60.7	68.0	68.3	76.5	85.9	82.9	93.0	104.3						
	30	16.8	18.1	19.8	24.4	26.7	29.4	33.6	37.1	41.2	43.4	48.3	53.9	54.2	60.5	67.8	65.5	73.4	82.5						
460	0	17.2	18.6	20.3	25.1	27.5	30.3	34.6	38.2	42.4	44.8	49.8	55.5	55.9	62.4	69.9	67.6	75.7	85.1						
	10	17.5	19.0	20.7	25.6	28.0	30.8	35.2	38.9	43.2	45.6	50.7	56.5	56.9	63.5	71.2	68.8	77.1	86.5						
	15	17.8	19.3	21.0	26.0	28.5	31.4	35.9	39.6	44.0	46.4	51.5	57.5	57.9	64.6	72.4	70.0	78.4	88.0						
	20	18.2	19.7	21.5	26.6	29.2	32.1	36.8	40.6	45.1	47.6	52.9	59.1	59.4	66.4	74.4	71.9	80.6	90.4						
	30	18.3	19.8	21.6	26.9	29.4	32.5	37.2	41.1	45.7	48.3	53.7	60.1	60.4	67.6	75.8	73.3	82.1	92.2						
380	0	15.2	16.4	17.7	21.8	23.8	26.1	29.6	32.6	36.0	37.9	42.0	46.7	47.0	52.3	58.5	56.6	63.3	70.9						
	10	15.6	16.8	18.2	22.4	24.4	26.8	30.5	33.5	37.1	39.1	43.3	48.2	48.4	53.9	60.3	58.4	65.3	73.2						
	15	15.9	17.1	18.6	22.8	24.9	27.3	31.0	34.2	37.8	39.8	44.1	49.1	49.3	54.9	61.4	59.4	66.4	74.5						
	20	16.1	17.4	18.9	23.2	25.3	27.8	31.6	34.8	38.5	40.5	44.9	49.9	50.2	55.9	62.5	60.5	67.6	75.8						
	30	16.5	17.8	19.3	23.7	25.9	28.4	32.4	35.6	39.4	41.5	46.0	51.3	51.5	57.4	64.2	62.1	69.4	77.8						
380	0	16.5	17.8	19.4	23.9	26.1	28.7	32.7	36.0	39.9	42.1	46.7	52.0	52.3	58.3	65.3	63.2	70.7	79.3						
	10	13.6	14.6	15.8	19.2	20.8	22.7	25.6	28.1	30.9	32.4	35.7	39.6	39.6	43.9	48.9	47.3	52.7	58.9						
	15	14.0	15.0	16.2	19.7	21.4	23.4	26.3	28.9	31.8	33.3	36.8	40.8	40.8	45.3	50.4	48.8	54.3	60.7						
	20	14.2	15.3	16.5	20.0	21.8	23.8	26.8	29.4	32.4	33.9	37.4	41.5	41.6	46.1	51.4	49.7	55.3	61.8						
	30	14.5	15.5	16.8	20.4	22.2	24.2	27.3	29.9	33.0	34.5	38.1	42.3	42.3	46.9	52.3	50.5	56.3	62.9						
40	0	14.8	15.9	17.2	20.8	22.7	24.8	28.0	30.6	33.8	35.4	39.1	43.3	43.4	48.1	53.6	51.9	57.8	64.6						
	10	14.8	15.9	17.2	20.9	22.8	25.0	28.2	30.9	34.2	35.8	39.6	43.9	44.0	48.8	54.5	52.7	58.7	65.8						

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

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	4.4	14.1	23.7	33.2	42.6	51.9	61.2	70.5	79.9	89.3	98.9	108.7
	MAX AUTO	4.4	13.1	21.7	30.2	38.7	47.3	56.0	65.0	74.3	83.9	94.0	104.6
	AUTOBRAKE 4	4.3	12.5	20.4	28.1	35.7	43.4	51.2	59.3	67.7	76.6	86.1	96.4
	AUTOBRAKE 3	4.2	11.9	19.2	26.3	33.3	40.3	47.4	54.8	62.6	70.8	79.7	89.3
	AUTOBRAKE 2	4.1	11.2	17.9	24.4	30.8	37.2	43.7	50.5	57.6	65.1	73.2	81.9
	AUTOBRAKE 1	4.0	10.3	16.3	22.1	27.8	33.4	39.1	45.1	51.3	58.0	65.1	72.9

### 2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.3	12.0	21.0	30.0	38.9	47.5	56.1	64.5	72.8	81.0	89.2	97.5
	MAX AUTO	2.0	8.7	15.5	22.3	29.3	36.4	43.8	51.5	59.6	68.3	77.5	87.4
	AUTOBRAKE 4	1.4	5.6	10.4	15.6	20.9	26.4	32.2	38.3	44.8	51.9	59.6	68.0
	AUTOBRAKE 3	0.9	3.2	6.4	10.3	14.3	18.5	23.0	27.9	33.2	39.0	45.4	52.4
	AUTOBRAKE 2	0.3	1.8	4.0	6.5	9.3	12.3	15.6	19.2	23.3	27.9	33.0	38.7
	AUTOBRAKE 1	0.2	1.2	2.6	4.3	6.1	8.1	10.3	12.8	15.6	18.8	22.3	26.4

### 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
GEAR DOWN	NO SPECIAL	PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
INFLIGHT											
GROUND			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 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 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

## ADVISORY INFORMATION

### Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	672.3	628.0				
52	126	690.0	643.1				
50	122	707.8	659.3	605.6			
48	118	725.5	677.8	619.9			
46	115	743.7	696.5	635.4	585.0		
44	111	761.0	714.1	652.5	600.2		
42	108	777.3	732.3	671.6	614.6	563.6	
40	104	793.0	750.7	689.9	629.6	576.5	
38	100	809.0	769.5	707.1	644.2	589.2	523.7
36	97	823.4	785.6	722.9	658.1	600.0	534.2
34	93	834.9	801.0	739.6	671.9	609.6	544.6
32	90	835.0	816.7	753.4	684.7	618.5	554.2
30	86	835.0	830.3	765.2	699.0	627.8	562.5
28	82	835.0	830.6	775.5	709.9	638.0	570.7
26	79	835.0	830.8	787.4	718.4	648.3	578.8
24	75	835.0	831.0	787.5	725.5	659.0	587.6
22	72	835.0	831.2	787.7	732.4	666.4	596.9
20	68	835.0	831.5	787.8	732.6	671.0	604.8
18	64	835.0	831.6	788.0	732.8	675.5	610.3
16	61	835.0	831.8	788.2	732.9	675.6	614.2
14	57	835.0	831.9	788.4	733.1	675.8	617.6
12	54	835.0	832.1	788.5	733.3	675.9	617.8
10	50	835.0	832.1	788.7	733.4	675.9	617.9
8	46	835.0	832.2	788.9	733.6	676.0	617.9
6	43	835.0	832.3	788.9	733.7	676.0	617.8
4	40	835.0	832.4	781.7	706.6	645.9	570.9
2	36	835.0	832.4	781.9	706.7	646.0	570.9
0	32	835.0	832.5	781.9	706.8	646.1	571.0
-40	-40	835.0	832.7	781.9	706.8	646.1	571.1

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.

With engine bleed for packs off, increase weight by 2900 lb.

With engine and wing anti-ice on, decrease weight by 4800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 48400 lb.

ADVISORY INFORMATION

Landing Climb Limit Weight  
Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
		-2000	0	2000	4000	6000	8000
54	129	680.0	637.9				
52	126	695.9	653.6				
50	122	712.4	668.9	615.7			
48	118	729.4	684.9	630.1			
46	115	746.7	701.5	645.6	594.1		
44	111	763.5	718.1	662.4	609.4		
42	108	779.7	735.6	679.3	624.3	572.7	
40	104	795.5	753.2	695.5	639.7	586.1	
38	100	811.6	771.9	711.8	655.4	599.2	533.2
36	97	826.3	788.0	727.2	668.7	611.1	543.8
34	93	835.0	803.5	743.1	681.2	620.9	554.2
32	90	835.0	819.5	756.3	692.2	630.5	564.5
30	86	835.0	833.3	767.7	705.0	639.8	573.1
28	82	835.0	833.5	778.2	715.2	650.4	581.7
26	79	835.0	833.7	790.3	723.4	660.6	589.8
24	75	835.0	834.0	790.5	730.1	670.3	598.7
22	72	835.0	834.2	790.6	736.7	676.8	608.2
20	68	835.0	834.4	790.8	736.9	680.7	616.4
18	64	835.0	834.6	791.0	737.0	684.6	622.2
16	61	835.0	834.7	791.2	737.2	684.7	626.3
14	57	835.0	834.9	791.3	737.4	684.8	629.8
12	54	835.0	835.0	791.5	737.5	684.9	630.0
10	50	835.0	835.0	791.7	737.7	685.0	630.1
8	46	835.0	835.0	791.8	737.9	685.1	630.1
6	43	835.0	835.0	791.9	738.0	685.2	630.0
4	40	835.0	835.0	792.0	738.1	685.2	618.9
2	36	835.0	835.0	792.1	738.2	685.3	619.0
0	32	835.0	835.0	792.1	738.2	685.4	619.0
-40	-40	835.0	835.0	792.4	738.4	685.8	619.3

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.  
With engine bleed for packs off, increase weight by 3200 lb.  
With engine and wing anti-ice on, decrease weight by 4000 lb.  
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 49000 lb.

Intentionally  
Blank

# Performance Inflight - QRH

## Engine Inoperative

# Chapter PI-QRH

## Section 62

### ENGINE INOP

#### Initial Max Continuous %N1

Based on .84M, engine bleed for one pack on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

**ENGINE INOP**

**Max Continuous %N1**

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT													TAT (°C)	
KLAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7	
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1	
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3	
35000 FT PRESS ALT													TAT (°C)	
KLAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1	
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2	
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1	
33000 FT PRESS ALT													TAT (°C)	
KLAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8	
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7	
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5	
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4	
31000 FT PRESS ALT													TAT (°C)	
KLAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4	
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0	
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9	
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1	
29000 FT PRESS ALT													TAT (°C)	
KLAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8	
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1	
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0	
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2	
27000 FT PRESS ALT													TAT (°C)	
KLAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1	
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1	
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1	
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2	
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6	

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4



**ENGINE INOP****Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT									TAT (°C)					
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1	
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6	
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7	
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9	
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9	
24000 FT PRESS ALT									TAT (°C)					
KLAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4	
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8	
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9	
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2	
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6	
22000 FT PRESS ALT									TAT (°C)					
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3	
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5	
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6	
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1	
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8	
20000 FT PRESS ALT									TAT (°C)					
KLAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1	
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1	
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3	
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2	
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3	
18000 FT PRESS ALT									TAT (°C)					
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100.0	100.9	101.8	102.0	100.6	99.4	
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6	
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8	
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2	
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4	

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

**ENGINE INOP**

**Max Continuous %N1**  
**Based on engine bleed for packs on or off and anti-ice off**  
**16000 FT to 5000 FT Pressure Altitudes**

16000 FT PRESS ALT								TAT (°C)						
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2	
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4	
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8	
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9	
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4	
14000 FT PRESS ALT								TAT (°C)						
KLAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35	
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5	
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9	
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4	
240	0.47	97.3	98.2	99.2	100.1	101.1	102.0	102.8	102.5	100.6	99.0	97.8	96.7	
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6	
12000 FT PRESS ALT								TAT (°C)						
KLAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0	
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4	
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1	
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0	
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8	
10000 FT PRESS ALT								TAT (°C)						
KLAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1	
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6	
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4	
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9	
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6	
5000 FT PRESS ALT								TAT (°C)						
KLAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45	
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5	
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2	
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8	
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4	
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3	

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

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
780	758	298	18000	16800	15600
740	720	290	19300	18200	17000
700	682	283	20500	19600	18500
660	642	275	21700	20900	20000
620	601	267	23200	22200	21200
580	562	258	25000	24000	22800
540	524	249	27000	26100	24700
500	485	241	29100	28400	27000
460	448	231	30900	30500	29400
420	409	221	32600	32300	31700
380	369	211	34400	34300	34000

**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
134	126	118	111	105	100	95	90	86	82	79
269	251	236	222	210	200	190	181	173	165	159
403	377	354	334	316	300	285	272	260	248	238
536	502	472	445	421	400	380	362	346	332	318
670	627	589	556	526	500	475	453	433	415	398
803	752	707	667	632	600	571	544	520	498	478
936	877	824	778	737	700	666	635	607	582	558
1068	1001	942	889	842	800	761	726	695	665	639
1201	1126	1059	1000	947	900	856	817	782	749	719
1333	1250	1176	1111	1052	1000	952	908	869	833	799
1466	1374	1293	1222	1157	1100	1047	1000	956	916	880
1598	1499	1411	1332	1262	1200	1142	1091	1043	1000	960
1731	1623	1528	1443	1368	1300	1238	1182	1131	1084	1040
1863	1747	1645	1554	1473	1400	1333	1273	1218	1167	1121
1996	1872	1762	1665	1578	1500	1428	1364	1305	1251	1201
2129	1997	1880	1776	1683	1600	1524	1455	1392	1334	1281
2262	2121	1997	1887	1788	1700	1619	1546	1479	1418	1361
2395	2246	2115	1998	1894	1800	1714	1637	1566	1501	1441

**Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 LB)											TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)											
	380	420	460	500	540	580	620	660	700	740	780	
100	2.4	2.6	2.9	3.1	3.3	3.5	3.7	3.9	4.0	4.2	4.2	0:16
200	5.4	6.0	6.5	7.1	7.4	7.8	8.3	8.7	9.0	9.5	9.8	0:31
300	8.7	9.5	10.4	11.2	11.8	12.5	13.2	13.9	14.5	15.4	15.9	0:46
400	11.9	13.1	14.2	15.4	16.3	17.2	18.2	19.2	20.1	21.2	22.1	1:01
500	14.9	16.4	17.8	19.3	20.5	21.7	23.0	24.2	25.3	26.8	28.0	1:16
600	17.9	19.6	21.3	23.1	24.6	26.1	27.5	29.0	30.4	32.2	33.7	1:31
700	20.8	22.8	24.8	26.9	28.6	30.4	32.1	33.8	35.4	37.5	39.3	1:46
800	23.7	26.0	28.3	30.6	32.5	34.6	36.5	38.5	40.4	42.7	44.9	2:01
900	26.6	29.2	31.7	34.3	36.5	38.8	41.0	43.2	45.4	48.0	50.5	2:15
1000	29.5	32.3	35.1	37.9	40.4	42.9	45.4	47.9	50.3	53.2	56.0	2:30
1100	32.3	35.4	38.4	41.5	44.3	47.1	49.8	52.5	55.2	58.3	61.4	2:44
1200	35.1	38.5	41.8	45.1	48.1	51.2	54.1	57.1	60.1	63.5	66.8	2:59
1300	37.9	41.5	45.1	48.7	51.9	55.2	58.5	61.7	64.9	68.6	72.2	3:14
1400	40.7	44.6	48.4	52.2	55.7	59.3	62.8	66.2	69.7	73.6	77.5	3:28
1500	43.4	47.6	51.6	55.7	59.5	63.3	67.0	70.7	74.5	78.6	82.8	3:43
1600	46.1	50.5	54.9	59.2	63.2	67.3	71.3	75.2	79.2	83.6	88.1	3:58
1700	48.8	53.5	58.1	62.7	66.9	71.2	75.5	79.7	83.9	88.6	93.3	4:13
1800	51.5	56.4	61.2	66.1	70.6	75.2	79.6	84.1	88.6	93.5	98.5	4:27

Includes APU fuel burn.

Driftdown at optimum driftdown speed and cruise at LRC speed.



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
780	%N1	91.3	96.8								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	22536	24156								
740	%N1	90.4	95.1	97.9							
	MACH	.602	.660	.678							
	KIAS	334	335	332							
	FF/ENG	21826	22989	23330							
700	%N1	89.4	93.5	95.6	98.8						
	MACH	.599	.649	.665	.684						
	KIAS	333	329	325	322						
	FF/ENG	21042	21608	21727	22025						
660	%N1	87.7	91.9	93.6	96.1						
	MACH	.583	.637	.653	.670						
	KIAS	324	323	319	315						
	FF/ENG	19683	20284	20323	20423						
620	%N1	85.9	90.2	91.9	93.6	96.5					
	MACH	.567	.621	.641	.657	.675					
	KIAS	315	315	313	309	305					
	FF/ENG	18411	18905	19032	19011	19194					
580	%N1	84.1	88.4	90.1	91.8	93.7	96.8				
	MACH	.551	.602	.625	.644	.661	.680				
	KIAS	306	305	305	302	298	295				
	FF/ENG	17177	17504	17683	17733	17760	18050				
540	%N1	82.1	86.3	88.2	89.9	91.6	93.7	97.0			
	MACH	.534	.582	.605	.627	.646	.663	.683			
	KIAS	296	294	295	294	292	288	285			
	FF/ENG	15983	16124	16312	16429	16476	16562	16922			
500	%N1	80.1	84.1	86.0	87.8	89.5	91.2	93.5	97.0		
	MACH	.516	.563	.583	.606	.629	.648	.665	.686		
	KIAS	286	284	284	284	284	281	277	274		
	FF/ENG	14812	14796	14951	15098	15202	15263	15363	15748		
460	%N1	77.9	81.8	83.6	85.5	87.2	88.9	90.7	93.1	96.7	
	MACH	.498	.543	.563	.583	.607	.630	.649	.666	.688	
	KIAS	276	274	273	273	273	272	270	266	264	
	FF/ENG	13638	13500	13643	13767	13886	13996	14052	14137	14531	
420	%N1	75.5	79.3	81.2	82.9	84.8	86.5	88.2	90.0	92.4	96.1
	MACH	.480	.521	.540	.560	.581	.605	.628	.648	.666	.688
	KIAS	266	263	262	262	261	261	261	258	255	252
	FF/ENG	12483	12254	12367	12495	12575	12676	12787	12829	12899	13288
380	%N1	73.1	76.7	78.5	80.3	82.0	83.8	85.6	87.3	89.1	91.5
	MACH	.462	.500	.517	.536	.556	.578	.601	.625	.646	.664
	KIAS	255	252	251	250	249	249	249	249	247	243
	FF/ENG	11350	11040	11139	11257	11323	11376	11460	11565	11610	11661
340	%N1	70.3	73.9	75.7	77.4	79.1	80.8	82.5	84.3	86.1	88.0
	MACH	.443	.478	.494	.511	.530	.550	.571	.594	.620	.642
	KIAS	245	240	239	238	237	236	236	236	236	234
	FF/ENG	10261	9890	9952	10062	10110	10131	10176	10235	10339	10404

**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
286	264	244	227	213	200	190	181	173	166	159
569	525	487	454	425	400	381	364	348	333	320
853	788	730	681	638	600	572	546	522	501	482
1138	1051	974	908	851	800	763	729	698	669	643
1424	1316	1219	1136	1064	1000	954	911	872	836	803
1711	1580	1464	1364	1278	1200	1144	1093	1046	1003	964
1999	1846	1709	1592	1491	1400	1335	1275	1220	1170	1124
2288	2111	1954	1820	1704	1600	1526	1457	1394	1337	1285
2578	2378	2201	2049	1918	1800	1717	1639	1568	1504	1445
2869	2646	2447	2278	2132	2000	1907	1821	1742	1670	1605

**Reference Fuel and Time Required at Check Point**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	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	9.2	0:38	8.1	0:37	7.3	0:36	6.5	0:35	6.1	0:34
400	19.3	1:12	17.7	1:09	16.5	1:06	15.6	1:04	15.3	1:02
600	29.2	1:46	27.2	1:41	25.7	1:37	24.5	1:34	24.4	1:30
800	39.0	2:21	36.6	2:14	34.7	2:07	33.2	2:03	33.3	1:58
1000	48.7	2:56	45.9	2:47	43.7	2:38	41.9	2:33	42.1	2:26
1200	58.4	3:31	55.1	3:20	52.6	3:09	50.5	3:03	50.7	2:55
1400	67.9	4:06	64.2	3:53	61.4	3:41	59.0	3:33	59.2	3:24
1600	77.4	4:41	73.2	4:27	70.1	4:12	67.4	4:03	67.6	3:53
1800	86.8	5:17	82.1	5:01	78.6	4:44	75.6	4:33	75.8	4:22
2000	96.1	5:53	90.9	5:35	87.2	5:16	83.8	5:03	84.0	4:51

**Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)								
	400	450	500	550	600	650	700	750	800
10	-1.7	-1.3	-0.8	-0.4	0.0	0.8	1.8	2.9	4.2
20	-3.7	-2.7	-1.8	-0.9	0.0	1.8	3.9	6.3	9.0
30	-5.7	-4.2	-2.7	-1.4	0.0	2.8	6.0	9.6	13.7
40	-7.7	-5.7	-3.7	-1.9	0.0	3.8	8.0	12.8	18.1
50	-9.8	-7.2	-4.7	-2.4	0.0	4.7	10.0	15.9	22.4
60	-11.8	-8.7	-5.7	-2.8	0.0	5.6	11.9	18.9	26.6
70	-13.9	-10.2	-6.7	-3.3	0.0	6.5	13.7	21.8	30.6
80	-15.9	-11.7	-7.7	-3.8	0.0	7.3	15.5	24.5	34.5
90	-18.0	-13.2	-8.7	-4.3	0.0	8.1	17.2	27.2	38.1
100	-20.1	-14.8	-9.7	-4.8	0.0	8.9	18.8	29.7	41.7

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding  
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
800	%N1	81.3	84.8	89.5	94.9			
	KIAS	273	275	276	301			
	FF/ENG	20620	20800	21460	23060			
760	%N1	79.7	83.0	87.8	92.7			
	KIAS	266	268	269	285			
	FF/ENG	19500	19610	20160	21200			
720	%N1	78.2	81.2	86.1	90.8	99.6		
	KIAS	259	260	261	271	297		
	FF/ENG	18410	18460	18870	19520	22300		
680	%N1	76.5	79.4	84.3	88.9	96.1		
	KIAS	252	253	254	256	286		
	FF/ENG	17340	17340	17630	18000	20240		
640	%N1	74.7	77.7	82.3	87.1	92.7		
	KIAS	245	245	246	248	267		
	FF/ENG	16280	16250	16430	16710	18210		
600	%N1	72.9	75.8	80.2	85.1	90.3		
	KIAS	236	237	238	239	251		
	FF/ENG	15240	15180	15250	15440	16560		
560	%N1	70.9	73.8	78.1	83.0	88.0	96.0	
	KIAS	231	231	231	231	234	263	
	FF/ENG	14210	14140	14130	14260	15010	16930	
520	%N1	68.8	71.9	76.0	80.8	85.8	91.6	
	KIAS	225	225	225	225	225	243	
	FF/ENG	13210	13140	13070	13140	13740	14810	
480	%N1	66.7	69.6	73.8	78.3	83.5	88.4	98.4
	KIAS	220	220	220	220	220	224	245
	FF/ENG	12240	12170	12060	12090	12540	13170	15210
440	%N1	64.6	67.3	71.6	75.9	80.8	85.7	93.3
	KIAS	213	213	213	213	213	213	232
	FF/ENG	11280	11200	11070	11080	11390	11800	13060
400	%N1	62.4	65.0	69.1	73.4	78.1	83.2	88.3
	KIAS	207	207	207	207	207	207	209
	FF/ENG	10360	10250	10130	10120	10320	10640	11140
360	%N1	60.0	62.6	66.4	70.7	75.3	80.3	85.0
	KIAS	200	200	200	200	200	200	200
	FF/ENG	9480	9350	9220	9210	9310	9520	9830

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	430	320				
50	480	370	210			
48	530	420	270			
46	570	470	320	160		
44	620	530	370	210		
42	670	570	410	250	90	
40	710	620	460	290	120	
38	740	670	510	330	150	
36	740	710	540	370	180	-20
34	740	760	580	400	210	0
32	750	760	610	440	240	30
30	750	770	640	460	280	60
20	770	780	650	510	350	170
10	790	800	600	420	260	130
0	810	810	590	360	130	-110
-20	840	850	610	370	130	-110
-40	880	880	640	390	140	-120

Rate of climb capability shown is valid for 500000 lb, gear down at VREF20 + 5.

Decrease rate of climb 30 ft/min per 10000 lb greater than 500000 lb.

Increase rate of climb 40 ft/min per 10000 lb less than 500000 lb.

**Flaps 30**

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-140	-250				
50	-100	-210	-360			
48	-60	-160	-320			
46	-10	-120	-270	-420		
44	30	-70	-220	-380		
42	70	-30	-180	-340	-500	
40	100	20	-150	-310	-470	
38	140	60	-110	-280	-450	
36	140	100	-70	-250	-420	-620
34	140	130	-40	-210	-400	-600
32	140	150	-10	-180	-370	-580
30	140	150	10	-160	-340	-550
20	150	150	20	-120	-270	-460
10	160	160	0	-150	-300	-660
0	160	160	-50	-270	-500	-730
-20	170	170	-60	-280	-510	-750
-40	180	170	-60	-300	-530	-780

Rate of climb capability shown is valid for 500000 lb, gear down at VREF30 + 5.

Decrease rate of climb 30 ft/min per 10000 lb greater than 500000 lb.

Increase rate of climb 40 ft/min per 10000 lb less than 500000 lb.

Intentionally  
Blank

**Performance Inflight - QRH****Chapter PI-QRH****Gear Down****Section 63****GEAR DOWN****220 KIAS Max Climb %N1**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

**%N1 Adjustments for Engine Bleed**

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

\*Packs on or off with 2 bleed sources.

\*\*Packs off with 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
780	18600	16600	14200
760	19100	17200	14800
740	19700	17900	15500
720	20200	18500	16100
700	21000	19400	17100
680	21900	20400	18200
660	22900	21500	19400
640	23900	22500	20600
620	25000	23500	21900
600	25900	24600	23000
580	27000	25700	24200
560	28000	27000	25400
540	29100	28200	26700
520	30100	29500	28000
500	30900	30500	29300
480	31600	31300	30500
460	32400	32200	31500
440	33300	33100	32600
420	34100	33900	33600
400	34900	34800	34600
380	35800	35700	35600
360	36700	36600	36400

**GEAR DOWN****Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
800	%N1	84.9	89.2	91.3	93.9						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	16879	17230	17550	18041						
760	%N1	84.0	88.3	90.3	92.5						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	16350	16643	16893	17295						
720	%N1	83.2	87.5	89.4	91.4	94.2					
	MACH	.488	.535	.556	.578	.600					
	KIAS	270	270	270	270	270					
	FF/ENG	15899	16146	16324	16639	17073					
680	%N1	81.4	85.8	87.8	89.6	91.8					
	MACH	.475	.521	.542	.564	.587					
	KIAS	263	263	263	263	264					
	FF/ENG	14938	15104	15281	15498	15865					
640	%N1	79.5	83.9	86.0	87.8	89.7	92.1				
	MACH	.461	.506	.526	.548	.570	.594				
	KIAS	255	255	255	255	256	256				
	FF/ENG	13989	14087	14216	14393	14638	14997				
600	%N1	77.6	82.1	84.1	86.0	87.7	89.7	92.5			
	MACH	.447	.491	.511	.531	.553	.576	.600			
	KIAS	247	247	247	247	248	248	248			
	FF/ENG	13042	13113	13185	13337	13490	13756	14123			
560	%N1	75.5	80.0	82.0	84.0	85.8	87.6	89.6	92.7		
	MACH	.433	.475	.494	.514	.535	.557	.581	.606		
	KIAS	239	239	239	239	239	240	240	240		
	FF/ENG	12107	12162	12207	12291	12445	12584	12856	13237		
520	%N1	73.3	77.8	79.8	81.8	83.7	85.4	87.3	89.4	92.8	
	MACH	.418	.459	.477	.496	.516	.538	.560	.584	.610	
	KIAS	231	231	231	231	231	231	231	232	232	
	FF/ENG	11193	11213	11263	11306	11394	11539	11679	11939	12332	
480	%N1	71.1	75.5	77.4	79.4	81.3	83.2	85.0	86.8	89.1	92.8
	MACH	.402	.442	.459	.478	.497	.517	.539	.562	.587	.614
	KIAS	222	222	222	222	222	222	222	222	223	223
	FF/ENG	10294	10279	10324	10368	10407	10495	10627	10769	11006	11406
440	%N1	68.6	73.1	75.0	76.8	78.9	80.7	82.7	84.4	86.2	88.5
	MACH	.387	.425	.442	.460	.478	.498	.519	.540	.563	.588
	KIAS	213	213	213	213	213	213	213	213	213	214
	FF/ENG	9429	9422	9440	9486	9514	9547	9627	9739	9856	10065
400	%N1	66.5	71.0	72.8	74.7	76.7	78.7	80.4	82.3	84.0	85.9
	MACH	.375	.413	.429	.446	.465	.484	.504	.525	.548	.571
	KIAS	207	207	207	207	207	207	207	207	207	207
	FF/ENG	8736	8731	8729	8756	8786	8810	8845	8930	9028	9136
360	%N1	64.3	68.7	70.5	72.3	74.4	76.4	78.2	79.9	81.8	83.6
	MACH	.363	.399	.415	.432	.450	.468	.488	.508	.530	.553
	KIAS	200	200	200	200	200	200	200	200	200	200
	FF/ENG	8041	8029	8026	8031	8049	8072	8095	8137	8220	8303

**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
316	284	257	235	216	200	189	180	171	162	155
634	570	515	470	433	400	379	359	341	326	312
956	859	774	706	650	600	568	539	512	489	468
1282	1149	1035	943	867	800	757	718	683	651	623
1610	1442	1297	1180	1084	1000	947	898	853	813	778
1942	1737	1560	1419	1302	1200	1136	1077	1024	976	933
2276	2034	1825	1658	1520	1400	1325	1256	1193	1137	1087
2614	2333	2091	1898	1739	1600	1514	1434	1362	1298	1241
2954	2634	2358	2138	1958	1800	1702	1613	1531	1459	1394
3297	2936	2626	2379	2176	2000	1891	1791	1701	1619	1547
3642	3240	2894	2620	2396	2200	2080	1969	1869	1780	1700
3991	3546	3164	2862	2615	2400	2268	2147	2037	1939	1852
4342	3853	3435	3104	2835	2600	2456	2324	2205	2098	2004
4697	4164	3707	3347	3055	2800	2644	2502	2373	2258	2156
5054	4476	3981	3591	3275	3000	2832	2679	2541	2416	2307
5414	4789	4255	3836	3495	3200	3020	2856	2708	2575	2458
5778	5105	4531	4081	3716	3400	3208	3033	2875	2734	2609
6146	5424	4808	4326	3937	3600	3396	3210	3041	2891	2759
6516	5744	5086	4572	4159	3800	3584	3386	3208	3049	2909
6889	6066	5365	4819	4380	4000	3772	3564	3375	3207	3059

**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	15.5	0:49	14.1	0:47	12.4	0:44	11.4	0:42	10.6	0:40
400	31.3	1:36	29.1	1:31	26.2	1:24	24.6	1:20	23.3	1:15
600	47.2	2:24	44.0	2:16	40.0	2:04	37.8	1:57	36.1	1:51
800	62.4	3:12	58.4	3:02	53.3	2:46	50.5	2:36	48.3	2:27
1000	77.7	4:01	72.9	3:47	66.7	3:27	63.2	3:15	60.5	3:03
1200	92.4	4:51	86.8	4:34	79.6	4:10	75.4	3:55	72.2	3:40
1400	107.2	5:41	100.8	5:21	92.5	4:52	87.7	4:34	84.0	4:17
1600	121.4	6:32	114.3	6:08	105.0	5:35	99.5	5:14	95.4	4:55
1800	135.6	7:23	127.8	6:56	117.5	6:18	111.4	5:55	106.8	5:32
2000	149.4	8:15	140.8	7:45	129.6	7:02	122.9	6:36	117.8	6:10
2200	163.1	9:07	153.9	8:34	141.7	7:46	134.4	7:17	128.8	6:49
2400	176.4	10:01	166.5	9:23	153.4	8:31	145.6	7:58	139.5	7:28
2600	189.6	10:54	179.1	10:13	165.0	9:16	156.7	8:40	150.1	8:07
2800	202.5	11:49	191.2	11:04	176.4	10:02	167.5	9:23	160.4	8:46
3000	215.3	12:44	203.4	11:55	187.7	10:47	178.3	10:05	170.7	9:26
3200	227.7	13:40	215.1	12:47	198.7	11:34	188.7	10:49	180.7	10:06
3400	240.1	14:36	226.9	13:39	209.6	12:21	199.2	11:32	190.7	10:46
3600	252.1	15:33	238.3	14:32	220.3	13:08	209.3	12:16	200.3	11:27
3800	264.1	16:30	249.6	15:26	230.9	13:56	219.4	13:00	210.0	12:08
4000	275.9	17:28	260.7	16:20	241.3	14:44	229.3	13:45	219.4	12:50

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)							
	350	400	450	500	550	600	650	700
20	-2.9	-2.0	-1.1	0.0	1.7	4.0	6.6	9.5
40	-6.3	-4.3	-2.2	0.0	3.2	7.4	12.3	18.0
60	-9.7	-6.5	-3.3	0.0	4.7	10.7	17.8	25.9
80	-12.9	-8.7	-4.4	0.0	6.2	13.9	22.9	33.3
100	-16.1	-10.8	-5.5	0.0	7.6	16.8	27.7	40.2
120	-19.2	-12.9	-6.5	0.0	8.9	19.7	32.2	46.5
140	-22.2	-15.0	-7.6	0.0	10.2	22.3	36.3	52.3
160	-25.2	-17.0	-8.6	0.0	11.5	24.8	40.2	57.6
180	-28.0	-19.0	-9.6	0.0	12.7	27.2	43.7	62.3
200	-30.8	-20.9	-10.6	0.0	13.8	29.4	46.9	66.5
220	-33.5	-22.8	-11.6	0.0	14.9	31.5	49.8	70.1
240	-36.2	-24.7	-12.6	0.0	16.0	33.4	52.3	73.3
260	-38.7	-26.5	-13.6	0.0	17.0	35.1	54.5	75.8
280	-41.2	-28.2	-14.5	0.0	17.9	36.7	56.4	77.9

Descent at VREF30+80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	39	43	48	52	56	60	64	69	73
TIME (MINUTES)	11	12	12	13	14	15	15	16	17	17

**GEAR DOWN**

**Holding  
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
800	%N1	76.4						
	KIAS	262						
	FF/ENG	17280						
760	%N1	75.4	78.5					
	KIAS	262	262					
	FF/ENG	16690	16710					
720	%N1	73.9	76.9					
	KIAS	256	256					
	FF/ENG	15790	15760					
680	%N1	72.1	75.1	79.6				
	KIAS	248	248	248				
	FF/ENG	14820	14790	14740				
640	%N1	70.2	73.3	77.7				
	KIAS	241	241	241				
	FF/ENG	13860	13840	13780				
600	%N1	68.5	71.7	76.1				
	KIAS	236	236	236				
	FF/ENG	13050	13040	12960				
560	%N1	66.9	69.9	74.3	78.9			
	KIAS	231	231	231	231			
	FF/ENG	12270	12260	12180	12240			
520	%N1	65.3	68.1	72.5	77.1	81.9		
	KIAS	225	225	225	225	225		
	FF/ENG	11520	11490	11400	11430	11550		
480	%N1	63.6	66.3	70.7	75.2	80.0		
	KIAS	220	220	220	220	220		
	FF/ENG	10800	10750	10660	10660	10770		
440	%N1	61.7	64.5	68.6	73.1	77.8	82.7	
	KIAS	213	213	213	213	213	213	
	FF/ENG	10080	10000	9900	9890	9980	10110	
400	%N1	59.8	62.5	66.5	71.0	75.6	80.4	85.0
	KIAS	207	207	207	207	207	207	207
	FF/ENG	9380	9290	9170	9170	9210	9290	9520
360	%N1	57.7	60.4	64.3	68.7	73.3	78.2	82.7
	KIAS	200	200	200	200	200	200	200
	FF/ENG	8670	8580	8440	8430	8440	8500	8680

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
800	%N1	76.0	79.1	84.0	88.5	94.6
	KIAS	242	242	242	242	242
	FF/ENG	16960	17050	17030	17300	18200
760	%N1	74.9	78.0	82.7	87.3	92.6
	KIAS	242	242	242	242	242
	FF/ENG	16320	16370	16340	16570	17270
720	%N1	73.3	76.4	80.9	85.7	90.6
	KIAS	236	236	236	236	236
	FF/ENG	15370	15390	15380	15540	16070
680	%N1	71.5	74.5	78.9	83.9	88.7
	KIAS	228	228	228	228	228
	FF/ENG	14380	14390	14380	14500	14850
640	%N1	69.4	72.6	77.0	81.9	86.7
	KIAS	221	221	221	221	221
	FF/ENG	13410	13410	13390	13510	13770
600	%N1	67.6	70.8	75.2	79.9	84.9
	KIAS	216	216	216	216	216
	FF/ENG	12590	12580	12530	12660	12860
560	%N1	65.9	68.9	73.3	77.9	83.0
	KIAS	211	211	211	211	211
	FF/ENG	11790	11760	11700	11810	11950
520	%N1	64.1	66.9	71.3	75.8	81.0
	KIAS	205	205	205	205	205
	FF/ENG	11000	10950	10880	10950	11070
480	%N1	62.2	64.9	69.3	73.8	78.7
	KIAS	200	200	200	200	200
	FF/ENG	10250	10170	10090	10130	10240
440	%N1	60.1	62.8	66.9	71.4	76.2
	KIAS	193	193	193	193	193
	FF/ENG	9480	9380	9290	9300	9400
400	%N1	57.9	60.7	64.6	69.1	73.7
	KIAS	187	187	187	187	187
	FF/ENG	8740	8640	8520	8500	8570
360	%N1	55.6	58.2	62.2	66.4	71.0
	KIAS	180	180	180	180	180
	FF/ENG	8010	7900	7760	7710	7760

This table includes 5% additional fuel for holding in a racetrack pattern.

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**Performance Inflight - QRH****Chapter PI-QRH****Gear Down, Engine INOP****Section 64****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 ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
700	674	253	5200	4000	1700
660	635	246	7100	6200	4600
620	596	239	9100	8400	7200
580	557	232	10900	10200	9100
540	519	227	12700	12100	10900
500	480	222	14500	14000	12900
460	442	216	16500	15900	15000
420	404	210	18600	18200	17000
380	366	203	20800	20500	19700

**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
740	800		
720	2200		
700	3600	1100	
680	4600	2700	
660	5600	4200	1400
640	6600	5400	3200
620	7600	6700	4800
600	8700	7900	6300
580	9700	9000	7900
560	10700	10100	9000
540	11700	11000	9900
520	12700	12000	10900
500	13600	13000	11800
480	14500	14000	12900
460	15500	15100	14000
440	16600	16000	15100
420	17700	17000	16100
400	18800	18400	17200
380	20000	19800	18700
360	21200	20800	20100

# GEAR DOWN

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)							
		5	7	9	11	13	15	17	19
680	%N1	97.1							
	MACH	.418							
	KIAS	253							
	FF/ENG	29597							
640	%N1	94.7	97.1						
	MACH	.407	.421						
	KIAS	246	246						
	FF/ENG	27548	27915						
600	%N1	92.6	94.4	97.1					
	MACH	.395	.409	.423					
	KIAS	239	239	238					
	FF/ENG	25711	25775	26281					
560	%N1	90.5	92.1	94.1	97.1				
	MACH	.383	.396	.410	.425				
	KIAS	232	231	231	231				
	FF/ENG	23975	23881	24040	24623				
520	%N1	88.5	90.1	91.9	94.1	97.5			
	MACH	.372	.386	.400	.415	.431			
	KIAS	225	225	225	225	225			
	FF/ENG	22233	22269	22345	22621	23249			
480	%N1	86.4	88.2	89.8	91.7	94.1	97.9		
	MACH	.363	.376	.391	.405	.421	.437		
	KIAS	220	220	220	220	220	220		
	FF/ENG	20677	20727	20792	20944	21208	21887		
440	%N1	84.0	85.9	87.7	89.4	91.3	93.8	97.9	
	MACH	.353	.366	.380	.394	.409	.425	.442	
	KIAS	213	213	213	213	213	213	213	
	FF/ENG	19092	19110	19166	19293	19457	19720	20473	
400	%N1	81.5	83.5	85.3	87.2	89.0	90.9	93.5	97.8
	MACH	.342	.355	.368	.382	.397	.413	.429	.446
	KIAS	207	207	207	207	207	207	207	207
	FF/ENG	17577	17577	17585	17695	17852	18003	18297	19100
360	%N1	78.9	80.7	82.7	84.6	86.5	88.3	90.2	92.9
	MACH	.331	.343	.356	.370	.384	.399	.415	.432
	KIAS	200	200	200	200	200	200	200	200
	FF/ENG	16044	16055	16035	16082	16230	16375	16525	16831

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
165	145	129	117	108	100	93	87	81	77	73
332	295	263	238	218	200	187	175	165	156	148
500	444	396	358	327	300	281	263	247	234	222
669	593	528	477	436	400	374	350	329	311	295
839	743	662	597	545	500	467	438	411	388	368
1009	894	795	718	655	600	561	525	494	466	442
1180	1044	928	838	764	700	654	612	575	543	515
1351	1196	1063	958	874	800	747	700	657	620	588
1523	1347	1197	1079	983	900	840	787	739	697	661
1696	1499	1331	1199	1093	1000	933	874	820	773	733

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	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)
100	8.6	0:27	8.1	0:27	7.6	0:26	7.2	0:26	6.9	0:25
200	17.4	0:52	16.7	0:51	16.0	0:50	15.4	0:49	15.0	0:47
300	26.2	1:18	25.2	1:15	24.3	1:13	23.6	1:11	23.1	1:10
400	34.9	1:43	33.7	1:40	32.6	1:37	31.7	1:35	31.1	1:32
500	43.4	2:08	42.0	2:05	40.8	2:01	39.7	1:58	39.0	1:54
600	52.0	2:34	50.3	2:29	48.8	2:25	47.6	2:21	46.8	2:17
700	60.4	3:00	58.5	2:54	56.9	2:49	55.4	2:45	54.5	2:40
800	68.7	3:25	66.6	3:20	64.8	3:14	63.2	3:08	62.1	3:03
900	76.9	3:51	74.7	3:45	72.6	3:38	70.9	3:32	69.6	3:26
1000	85.1	4:18	82.6	4:10	80.4	4:03	78.5	3:56	77.0	3:49

## GEAR DOWN

## ENGINE INOP

### MAX CONTINUOUS THRUST

#### Long Range Cruise Diversion Fuel and Time

#### Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	350	400	450	500	550	600	650	700
15	-2.5	-1.7	-0.8	0.0	1.6	3.3	5.2	7.3
20	-3.4	-2.3	-1.1	0.0	2.1	4.4	7.0	9.9
25	-4.3	-2.8	-1.4	0.0	2.6	5.5	8.8	12.5
30	-5.2	-3.4	-1.7	0.0	3.0	6.5	10.5	14.9
35	-6.0	-4.0	-2.0	0.0	3.5	7.6	12.2	17.4
40	-6.9	-4.6	-2.3	0.0	3.9	8.5	13.8	19.7
45	-7.8	-5.2	-2.6	0.0	4.4	9.5	15.4	22.0
50	-8.7	-5.8	-2.9	0.0	4.8	10.4	16.9	24.3
55	-9.6	-6.4	-3.2	0.0	5.2	11.3	18.4	26.5
60	-10.5	-7.0	-3.5	0.0	5.6	12.2	19.9	28.6
65	-11.4	-7.6	-3.8	0.0	6.0	13.1	21.3	30.7
70	-12.3	-8.2	-4.0	0.0	6.3	13.9	22.7	32.7
75	-13.1	-8.7	-4.3	0.0	6.7	14.7	24.0	34.6
80	-14.0	-9.3	-4.6	0.0	7.0	15.4	25.3	36.5
85	-14.9	-9.9	-4.9	0.0	7.3	16.1	26.5	38.4
90	-15.8	-10.5	-5.2	0.0	7.6	16.8	27.7	40.1

Includes APU fuel burn.

## GEAR DOWN

# ENGINE INOP

## MAX CONTINUOUS THRUST

## Holding Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
760	%N1	96.6			
	KIAS	262			
	FF/ENG	34160			
720	%N1	94.7			
	KIAS	256			
	FF/ENG	32150			
680	%N1	92.8	96.4		
	KIAS	248	248		
	FF/ENG	30210	30360		
640	%N1	90.8	94.0		
	KIAS	241	241		
	FF/ENG	28280	28220		
600	%N1	89.1	92.1	98.5	
	KIAS	236	236	236	
	FF/ENG	26550	26560	27770	
560	%N1	87.2	90.3	95.3	
	KIAS	231	231	231	
	FF/ENG	24850	25010	25470	
520	%N1	85.2	88.5	92.8	
	KIAS	225	225	225	
	FF/ENG	23170	23340	23590	
480	%N1	83.0	86.4	90.7	97.9
	KIAS	220	220	220	220
	FF/ENG	21570	21710	21890	22980
440	%N1	80.7	84.0	88.5	93.8
	KIAS	213	213	213	213
	FF/ENG	19930	20050	20190	20710
400	%N1	78.4	81.5	86.3	90.9
	KIAS	207	207	207	207
	FF/ENG	18360	18460	18510	18900
360	%N1	76.0	78.9	83.6	88.3
	KIAS	200	200	200	200
	FF/ENG	16800	16850	16850	17190

**This table includes 5% additional fuel for holding in a racetrack pattern.**

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**Performance Inflight - QRH****Chapter PI-QRH****Text****Section 65**

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**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.

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**General****Flight with Unreliable Airspeed / Turbulent Air Penetration**

Body attitude and average %N1 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.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

**Max Climb %N1**

This table shows Max Climb %N1 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 %N1. %N1 adjustments are shown for anti-ice operation.

**VREF Speeds**

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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## Advisory Information

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### Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, 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.

---

## Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, 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 landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

---

## Engine Inoperative

### Initial Max Continuous %N1

The Initial Max Continuous %N1 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 %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

### Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

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 %N1, 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 autoland 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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**Maneuvers****Chapter MAN****Introduction****Section 05****General**

Non-Normal Maneuvers and Flight Patterns are included for training and review purposes.

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**Non-Normal Maneuvers**

Flight crews are expected to do non-normal maneuvers from memory.

---

**Flight Patterns**

Flight patterns show procedures for some all-engine and engine-inoperative situations.

Flight patterns do not include all procedural items but show required/recommended:

- configuration changes
- thrust changes
- Mode Control Panel (MCP) changes
- pitch mode and roll mode changes
- checklist calls

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**Maneuvers****Chapter MAN****Non-Normal Maneuvers****Section 1****Approach to Stall Recovery**

The following is immediately accomplished at the first indication of stall buffet or stick shaker.

Pilot Flying	Pilot Monitoring
<ul style="list-style-type: none"><li>• Advance the thrust levers to maximum thrust*</li><li>• Smoothly adjust the pitch attitude** to avoid ground contact or obstacles</li><li>• Level the wings (do not change flaps or landing gear configuration)</li><li>• Retract the speedbrakes</li></ul>	<ul style="list-style-type: none"><li>• Verify maximum thrust</li><li>• Monitor altitude and airspeed</li><li>• Call out any trend toward terrain contact</li><li>• Verify all required actions have been completed and call out any omissions</li></ul>
When ground contact is no longer a factor: <ul style="list-style-type: none"><li>• Adjust the pitch attitude to accelerate while minimizing altitude loss</li><li>• Return to a speed appropriate for the configuration</li></ul>	

**Note:** \*If an approach to stall is encountered with the autopilot engaged, apply maximum thrust and allow the airplane to return to the normal airspeed.

**Note:** \*\*At high altitudes it may be necessary to descend to accelerate.

**Note:** If autopilot response is not acceptable, it should be disengaged.

**Rejected Takeoff**

The Captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the rejected takeoff maneuver by V1. If the decision is to reject the takeoff, the Captain must clearly announce “REJECT,” immediately start the rejected takeoff maneuver, and assume control of the airplane. If the First Officer is making the takeoff, the First Officer must maintain control of the airplane until the Captain makes a positive input to the controls.

Prior to 80 knots, the takeoff should be rejected for any of the following:

- activation of the master caution system
- system failure(s)
- unusual noise or vibration
- tire failure

- abnormally slow acceleration
- takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- if a side window opens
- if the airplane is unsafe or unable to fly

Above 80 knots and prior to V1, the takeoff should be rejected for any of the following:

- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly

During the takeoff, the crew member observing the non-normal situation will immediately call it out as clearly as possible.

Captain	First Officer
<p>Without delay:</p> <p>Simultaneously close the thrust levers, disengage the autothrottles, and apply maximum manual wheel brakes or verify operation of RTO autobrakes.</p> <p>If RTO autobrakes is selected, monitor system performance and apply manual wheel brakes if the AUTOBRAKE message is displayed or deceleration is not adequate.</p> <p>Raise speedbrake lever.</p> <p>Apply the maximum amount of reverse thrust consistent with conditions.</p> <p>Continue maximum braking until certain the airplane will stop on the runway.</p>	<p>Verify actions as follows:</p> <p>Thrust levers closed.</p> <p>Autothrottles disengaged.</p> <p>Maximum brakes applied.</p> <p>Verify speedbrake lever UP and call “SPEEDBRAKES UP.” If speedbrake lever not UP call “SPEEDBRAKES NOT UP.”</p> <p>Reverse thrust applied.</p> <p>Call out any omitted action items.</p>

**777 Flight Crew Operations Manual**

<b>Captain</b>	<b>First Officer</b>
Field length permitting: Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.	Call out 60 knots. <b>[777 Passenger]</b> Communicate the reject decision to the control tower and cabin as soon as practical. <b>[777 Freighter]</b> Communicate the reject decision to the control tower as soon as practical.
When the airplane is stopped, perform procedures as required. Review Brake Cooling Schedule for brake cooling time and precautions (refer to the Performance Inflight chapter). Consider the following: <ul style="list-style-type: none"><li>• the possibility of wheel fuse plugs melting</li><li>• the need to clear the runway</li><li>• the requirement for remote parking</li><li>• wind direction in case of fire</li><li>• alerting fire equipment</li><li>• not setting the parking brake unless passenger evacuation is necessary</li><li>• advising the ground crew of the hot brake hazard</li></ul> <b>[777 Passenger]</b> <ul style="list-style-type: none"><li>• advising passengers of the need to remain seated or evacuate</li></ul> <b>[777 Freighter]</b> <ul style="list-style-type: none"><li>• advising supernumeraries of the need to remain seated or evacuate</li><li>• completion of Non-Normal checklist (if appropriate) for conditions which caused the RTO</li></ul>	

**Runway Awareness and Advisory System (RAAS)****[Option - Runway Awareness and Advisory System (RAAS) installed]**

Accomplish the following if a RAAS voice annunciation or alert differs from the flight crew's expectation:

<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
Verify position. Contact ATC for assistance, if needed.	

## Terrain Avoidance

### Ground Proximity Caution

Accomplish the following maneuver for any of these aural alerts\*:

- CAUTION OBSTACLE
- CAUTION TERRAIN

**Note:** For JAA certificated airplanes, CAUTION OBSTACLE is replaced with OBSTACLE AHEAD, and CAUTION TERRAIN is replaced with TERRAIN AHEAD.

- SINK RATE
- TERRAIN
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- GLIDESLOPE
- BANK ANGLE

Pilot Flying	Pilot Monitoring
Correct the flight path or the airplane configuration.	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer or backcourse approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope
- unreliable glideslope signal

**Note:** If a terrain caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.

**Note:** \*As installed, some repeat.

### Ground Proximity Warning

Accomplish the following maneuver for any of these conditions:

- activation of the “PULL UP”, “OBSTACLE OBSTACLE PULL UP”, or “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain

<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
<ul style="list-style-type: none"><li>• Disconnect autopilot</li><li>• Disconnect autothrottle(s)</li><li>• Aggressively apply maximum* thrust</li><li>• Simultaneously roll wings level and rotate to an initial pitch attitude of 20°</li><li>• Retract speedbrakes</li><li>• If terrain remains a threat, continue rotation up to the pitch limit indicator or stick shaker or initial buffet</li></ul>	<ul style="list-style-type: none"><li>• Assure maximum* thrust</li><li>• Verify all required actions have been completed and call out any omissions</li></ul>
<ul style="list-style-type: none"><li>• Do not change gear or flap configuration until terrain separation is assured</li><li>• Monitor radio altimeter for sustained or increasing terrain separation</li><li>• When clear of the terrain, slowly decrease pitch attitude and accelerate</li></ul>	<ul style="list-style-type: none"><li>• Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude)</li><li>• Call out any trend toward terrain contact</li></ul>

**Note:** Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

**Note:** Do not use flight director commands.

**Note:** \* Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

**Note:** If positive visual verification is made that no obstacle or terrain hazard exists when flying under daylight VMC conditions prior to a terrain or obstacle (as installed) warning, the alert may be regarded as cautionary and the approach may be continued.

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## **Traffic Avoidance**

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

**WARNING: Comply with RA if there is conflict between RA and air traffic control.**

**WARNING:** Once an RA has been issued, safe separation could be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA

**Note:** If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

**Note:** If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

**Note:** Do not use flight director commands (integrated cue)/flight director pitch commands (split cue) until clear of conflict.

**For TA:**

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic	
If traffic is sighted, maneuver if needed.	

**Note:** Maneuvers based solely on a TA may result in reduced separation and are not recommended.

**For RA, except a climb in landing configuration:**

**WARNING:** A DESCEND (fly down) RA issued below 1000 feet AGL should not be followed.



<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
If maneuvering is required, disengage the autopilot and autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

**For a climb RA in landing configuration:**

<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
Disengage the autopilot and autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 20. Smoothly adjust pitch to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	Verify maximum thrust set. Position flap lever to 20 detent.
Verify a positive rate of climb on the altimeter and call "GEAR UP."	Verify a positive rate of climb on the altimeter and call "POSITIVE RATE." Set landing gear lever to UP.
Attempt to establish visual contact. Call out any conflicting traffic.	

**Upset Recovery**

An upset can generally be defined as unintentionally exceeding the following conditions:

- pitch attitude greater than 25 degrees nose up, or
- pitch attitude greater than 10 degrees nose down, or
- bank angle greater than 45 degrees, or
- within above parameters but flying at airspeeds inappropriate for the conditions

The following techniques represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all the actions may be necessary once recovery is underway. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume that the airplane is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stick shaker activation accompanied by one or more of the following:

- buffeting, which could be heavy at times
- lack of pitch authority and/or roll control
- inability to arrest descent rate

If the airplane is stalled, recovery from the stall must be accomplished first by applying and maintaining nose down elevator until stall recovery is complete and stick shaker activation ceases.

## Nose High Recovery

Pilot Flying	Pilot Monitoring
<ul style="list-style-type: none"> <li>• Recognize and confirm the situation.</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<ul style="list-style-type: none"> <li>• Disconnect autopilot and autothrottle</li> <li>• Apply as much as full nose down elevator</li> <li>• *Apply appropriate nose down stabilizer trim</li> <li>• Reduce thrust</li> <li>• *Roll (adjust bank angle) to obtain a nose down pitch rate</li> <li>• Complete the recovery:                             <ul style="list-style-type: none"> <li>• - when approaching the horizon, roll to wings level</li> <li>• - check airspeed and adjust thrust</li> <li>• - establish pitch attitude</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Call out attitude, airspeed and altitude throughout the recovery</li> <li>• Verify all required actions have been completed and call out any omissions</li> </ul>

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**Nose Low Recovery**

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation.	
<ul style="list-style-type: none"><li>• Disconnect autopilot and autothrottle</li><li>• Recover from stall, if required</li><li>• *Roll in the shortest direction to wings level (unload and roll if bank angle is more than 90 degrees)</li><li>• Recover to level flight:<ul style="list-style-type: none"><li>• - apply nose up elevator</li><li>• - *apply nose up trim, if required</li><li>• - adjust thrust and drag as required</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Call out attitude, airspeed and altitude throughout the recovery</li><li>• Verify all required actions have been completed and call out any omissions</li></ul>

**WARNING: \* EXCESSIVE USE OF PITCH TRIM OR RUDDER MAY AGGRAVATE AN UPSET SITUATION OR MAY RESULT IN LOSS OF CONTROL AND/OR HIGH STRUCTURAL LOADS.**

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**Windshear****Windshear Caution**

For predictive windshear caution alert: (“MONITOR RADAR DISPLAY” aural)

Pilot Flying	Pilot Monitoring
• Maneuver as required to avoid the windshear	

**Windshear Warning**

Predictive windshear warning during takeoff roll: (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural)

- Prior to V<sub>1</sub>, reject takeoff
- After V<sub>1</sub>, perform the Windshear Escape Maneuver

Windshear encountered during takeoff roll:

- If windshear is encountered prior to V<sub>1</sub>, there may not be sufficient runway remaining to stop if an RTO is initiated at V<sub>1</sub>. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach: (“GO-AROUND, WINDSHEAR AHEAD” aural)

- perform Windshear Escape Maneuver or, at pilot’s discretion, perform a normal go-around

Windshear encountered in flight:

- perform the Windshear Escape Maneuver

**Note:** The following are indications the airplane is in windshear:

- windshear warning (two-tone siren followed by “WINDSHEAR, WINDSHEAR, WINDSHEAR”) or
- unacceptable flight path deviations

**Note:** Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 FPM vertical speed
- 5 degrees pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time

**Windshear Escape Maneuver**

<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
<b>MANUAL FLIGHT</b> <ul style="list-style-type: none"> <li>• Disconnect autopilot</li> <li>• Push either TO/GA switch</li> <li>• Aggressively apply maximum* thrust</li> <li>• Disconnect autothrottle(s)</li> <li>• Simultaneously roll wings level and rotate toward an initial pitch attitude of 15°</li> <li>• Retract speedbrakes</li> <li>• Follow flight director TO/GA guidance (if available)</li> </ul>	<ul style="list-style-type: none"> <li>• Assure maximum* thrust</li> <li>• Verify all required actions have been completed and call out any omissions</li> </ul>

<b>Pilot Flying</b>	<b>Pilot Monitoring</b>
<b>AUTOMATIC FLIGHT</b> <ul style="list-style-type: none"> <li>• Press either TO/GA switch**</li> <li>• Verify TO/GA mode annunciation</li> <li>• Verify thrust advances to GA power</li> <li>• Retract speedbrakes</li> <li>• Monitor system performance***</li> </ul>	<ul style="list-style-type: none"> <li>• Assure maximum* thrust</li> <li>• Verify all required actions have been completed and call out any omissions</li> </ul>
<ul style="list-style-type: none"> <li>• Do not change gear or flap configuration until windshear is no longer a factor</li> <li>• Monitor vertical speed and altitude</li> <li>• Do not attempt to regain lost airspeed until windshear is no longer a factor</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor vertical speed and altitude</li> <li>• Call out any trend toward terrain contact, descending flight path, or significant airspeed changes</li> </ul>

**Note:** Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

**Note:** \* Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

**Note:** \*\* If TO/GA is not available, disconnect autopilot and autothrottle(s) and fly manually.

**WARNING:** \*\*\* Severe windshear may exceed the performance capability of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle(s) and fly manually.

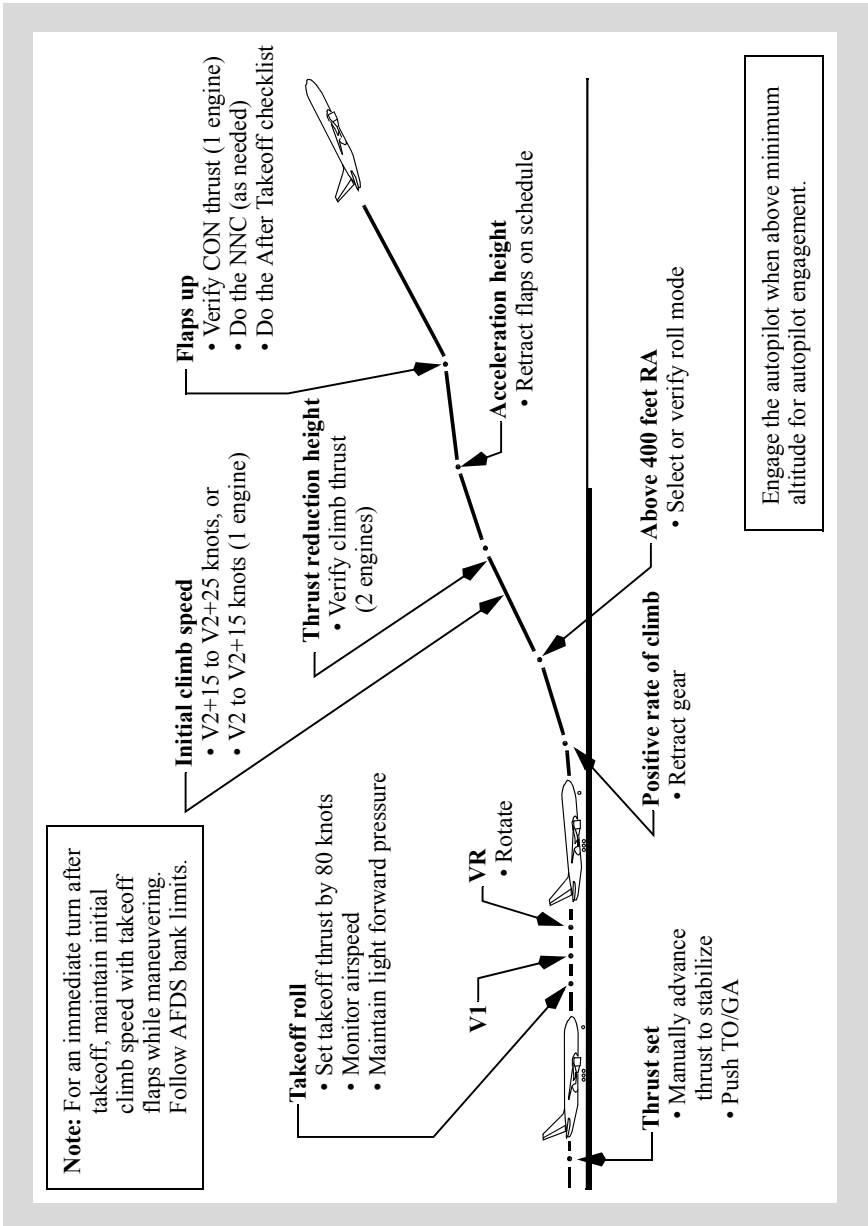
### Maneuvers

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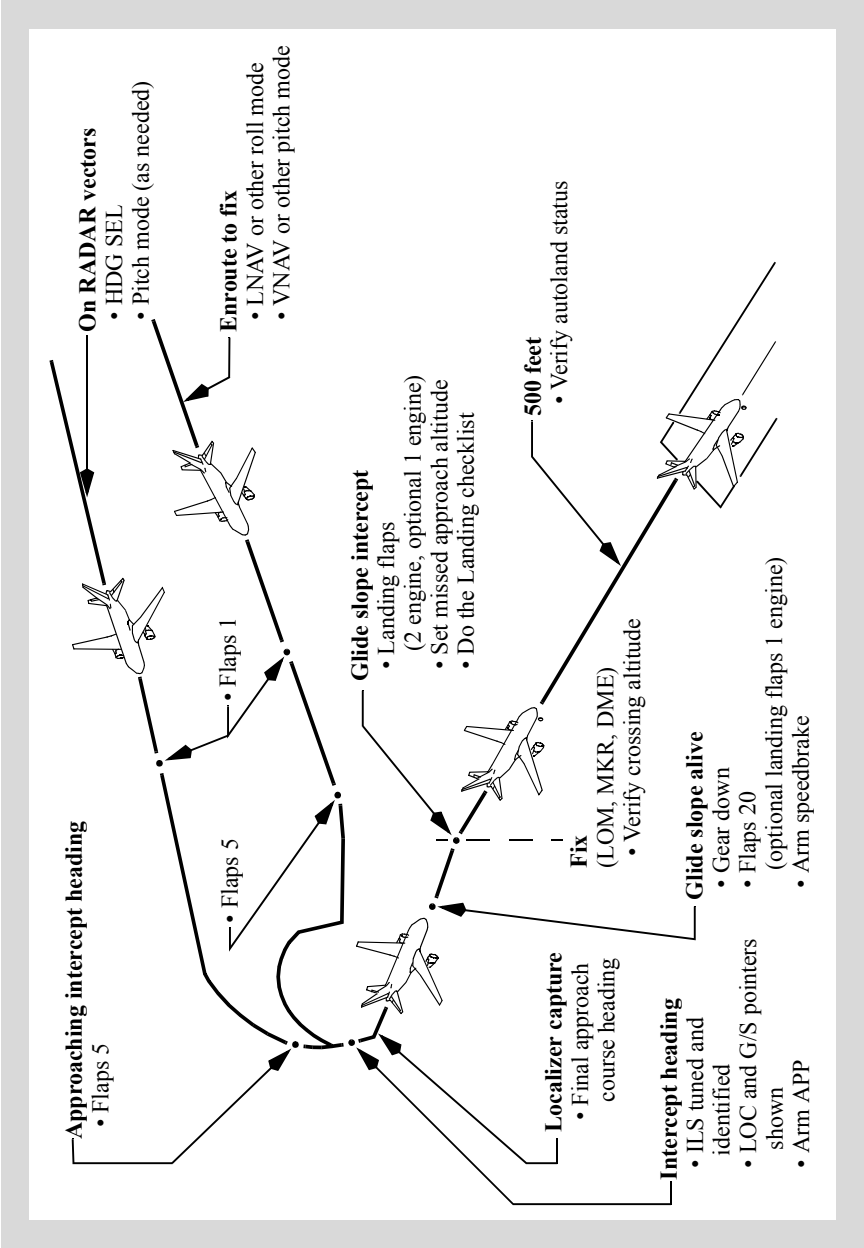
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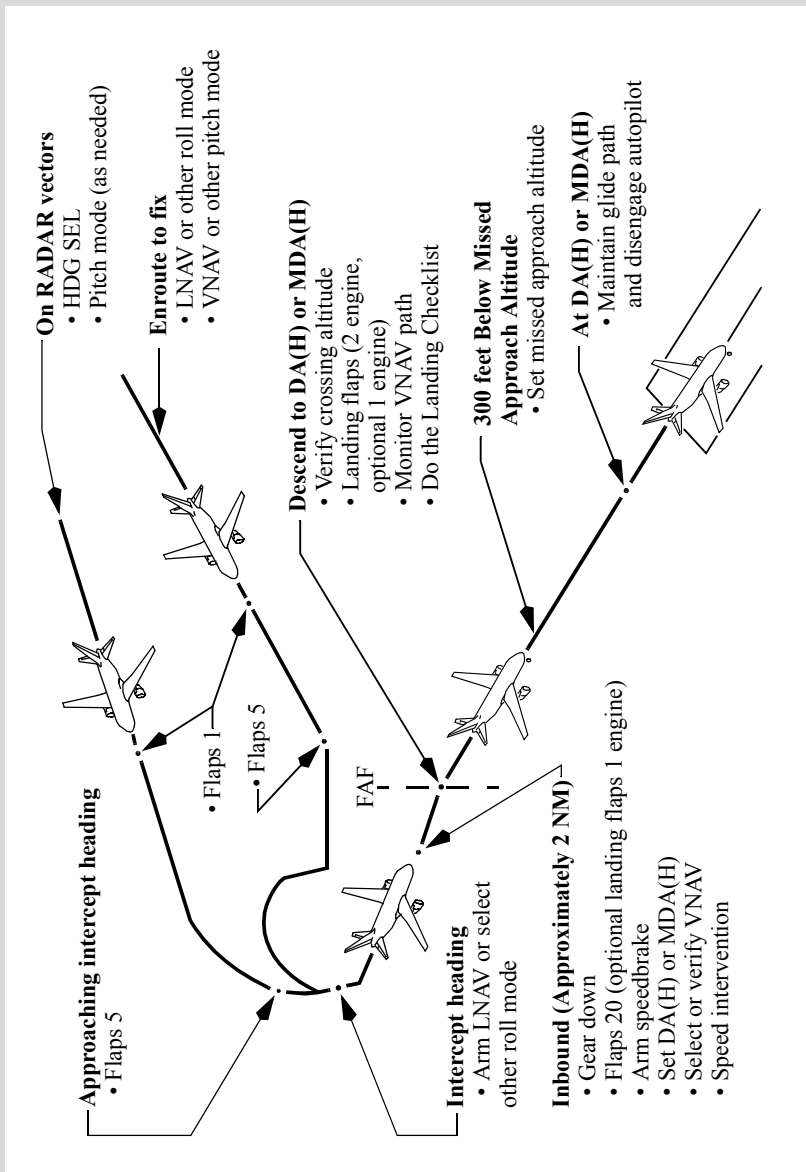
### Takeoff



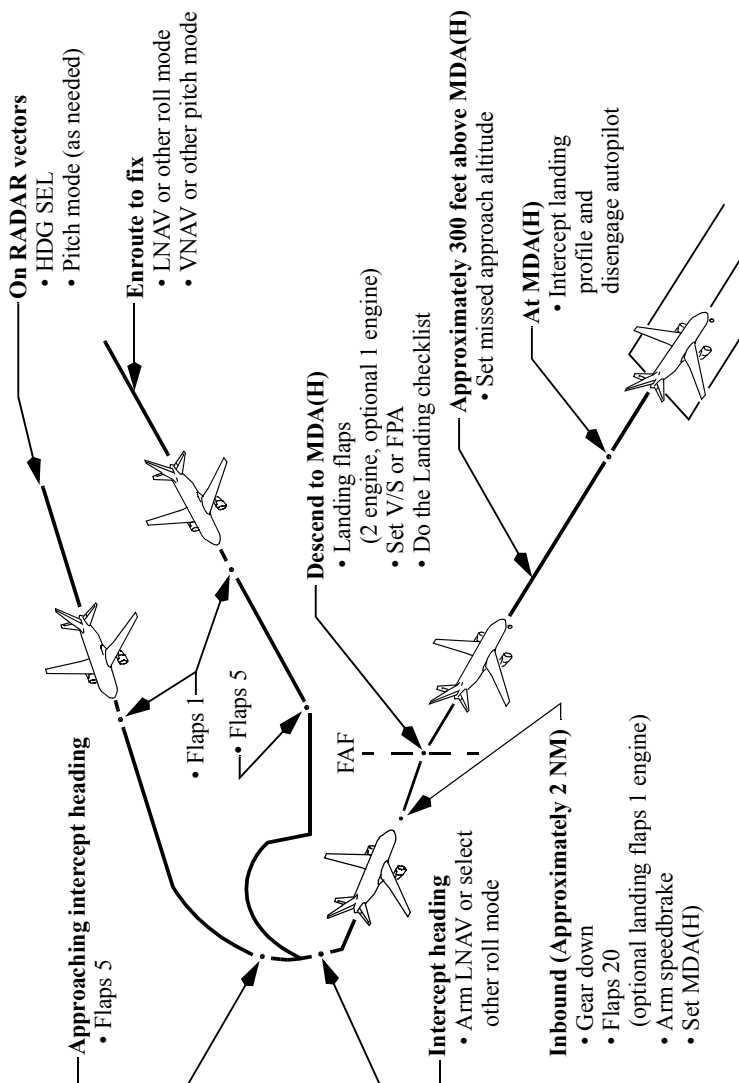
ILS Approach





**Instrument Approach Using VNAV**

## Instrument Approach Using V/S or FPA



## Circling Approach

If a missed approach is needed at any time while circling, make an initial climbing turn toward the landing runway and intercept the missed approach course.

### Configuration at MDA(H)

- Gear down
- Flaps 20 (landing flaps optional)
- Arm speedbrake

**Before turning base or initiating the turn to base**

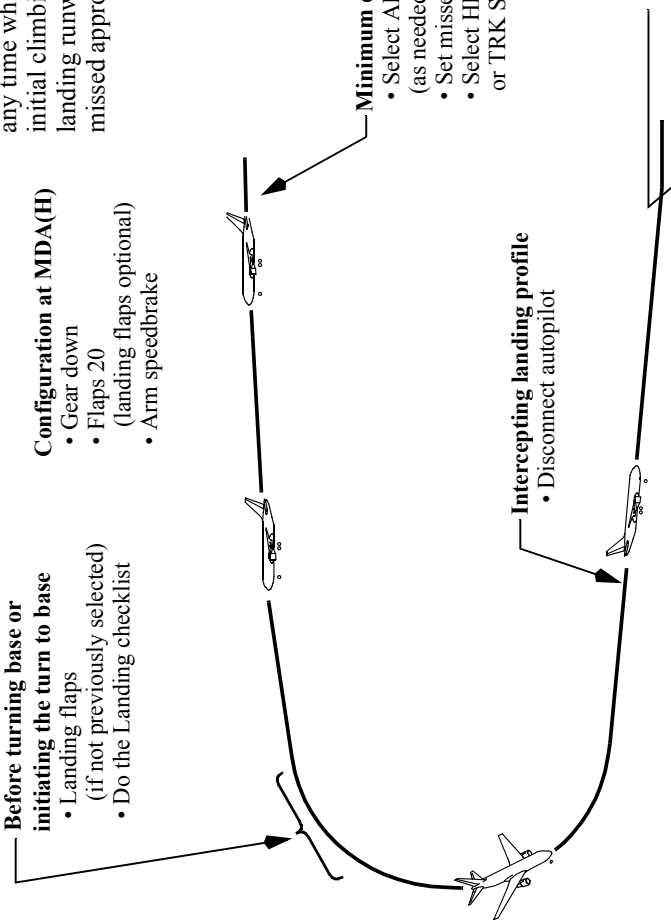
- Landing flaps (if not previously selected)
- Do the Landing checklist

### Minimum descent altitude

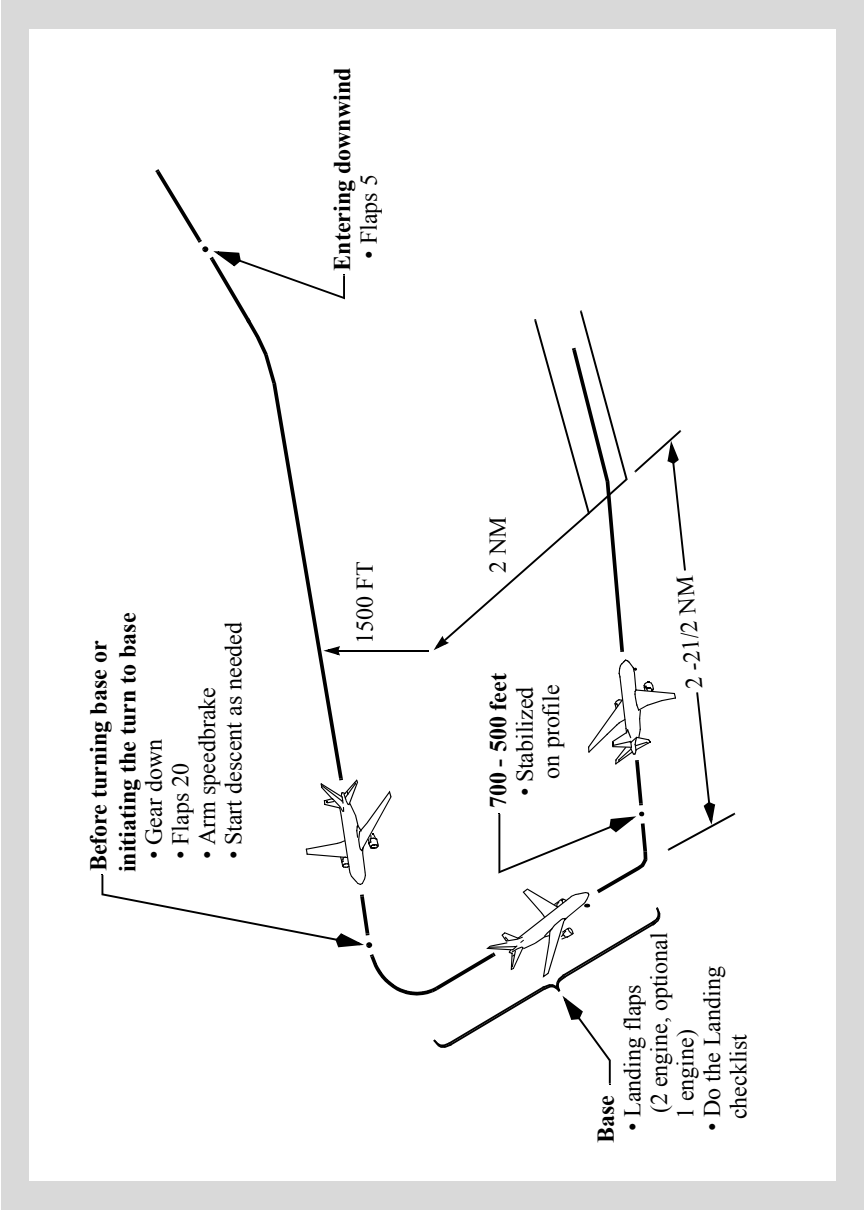
- Select ALT HOLD (as needed)
- Set missed approach altitude
- Select HDG SEL/HDG HOLD or TRK SEL/TRK HOLD

### Intercepting landing profile

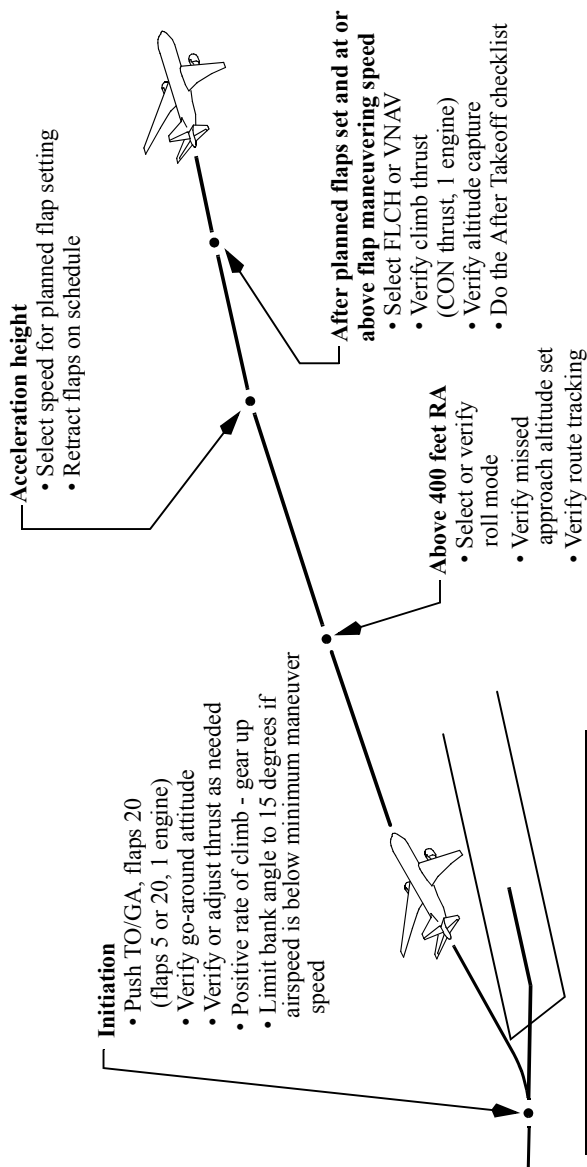
- Disconnect autopilot



Visual Traffic Pattern



## Go-Around and Missed Approach



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**Checklist Instructions**

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**Checklist Instructions****Chapter CI****Model Identification****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.

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>
200	777-200	7200	WY200
200ER	777-200ER	7250	WY250
200LR	777-200LR	7260	WY260
200FT	777-200FTR	7270	WY270
300	777-300	7300	WY300
300ER	777-300ER	7350	WY350

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**Checklist Instructions**  
**Revision Record****Chapter CI**  
**Section RR****QRH Revision Transmittal Letter**

To: All holders of The Boeing Company 777 Flight Crew Operations Manual, Boeing Document Number D632W001-TBC.

Subject: Quick Reference Handbook (QRH) Revision.

This revision reflects the most current information available to The Boeing Company 45 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
1	June 1, 1994	
3	October 17, 1994	
5	January 6, 1995	
7	April 10, 1995	
9	August 11, 1995	
11	November 28, 1995	
13	May 10, 1996	
15	November 7, 1996	
17	January 22, 1997	
19	August 18, 1997	
21	May 4, 1998	
23	December 18, 1998	
25	December 9, 1999	
27	December 11, 2000	
29	December 7, 2001	
31	December 16, 2002	

No.	Revision Date	Date Filed
2	September 1, 1994	
4	November 23, 1994	
6	February 10, 1995	
8	June 13, 1995	
10	September 15, 1995	
12	February 9, 1996	
14	August 12, 1996	
16	January 15, 1997	
18	March 11, 1997	
20	December 10, 1997	
22	August 10, 1998	
24	July 1, 1999	
26	June 26, 2000	
28	June 18, 2001	
30	June 17, 2002	
32	June 16, 2003	

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
33	December 15, 2003		34	June 14, 2004	
35	December 13, 2004		36	June 13, 2005	
37	December 12, 2005		38	June 12, 2006	
39	December 11, 2006		40	June 11, 2007	
41	December 10, 2007		42	June 16, 2008	
43	December 15, 2008		44	June 15, 2009	
45	December 14, 2009		46	June 14, 2010	

## 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.

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.

## 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.

## QRH Revision Highlights

This section (CI.RR) replaces the existing section CI.RR in your manual.

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.

---

## **Chapter NNC - Non-Normal Checklists**

### **Section 2 - Air Systems**

#### **EQUIP COOLING OVRD**

2.18-19 - Changed procedure to clarify that message blanks, and to wait 1 minute for the system to reset.

#### **TRIM AIR L, R**

2.26 - Added "affected side" to checklist step.

### **Section 7 - Engines, APU**

#### **Dual Eng Fail/Stall**

7.2 - Changed wording about EGT limit for cross-model standardization.

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

7.8 - Changed conditions for recognizing an engine surge or stall. Changed wording for standardization.

7.8-9 - Changed wording for standardization.

#### **Eng Svr Damage/Sep L, R**

7.12 - Changed wording for standardization. No technical change.

#### **ENG FAIL L, R**

7.20,26,32 - Deleted "N1 rotation" from decision to restart.

7.22 - Added information to accommodate fleet configuration.

7.23,34 - Removed "speed" from "maximum motoring".

#### **Eng In-Flight Start L, R**

7.40 - Deleted "N1 rotation" from conditions for restart.

7.42 - Added information to accommodate fleet configuration.

7.43 - Removed "speed" from "maximum motoring".

## Eng In-Flight Start L, R

7.44,47 - Deleted "N1 rotation" from conditions for restart.

7.48 - Removed "speed" from "maximum motoring".

## ENG START VALVE L, R

7.70 - Added information to accomodate fleet configuration.

## Section 8 - Fire Protection

### FIRE CARGO MAIN DECK

8.23 - Moved step to left margin to be a numbered step. No technical change.

### Smoke or Fumes Removal

8.33 - Changed the nomenclature for main deck areas.

## Section 10 - Flight Instruments, Displays

### Airspeed Unreliable

10.3 - Changed approach briefing items to Notes for cross-model standardization.

## Section 11 - Flight Management, Navigation

### GPS

11.2 - Added notes to GPS checklist.

## Section 12 - Fuel

### FUEL SCAVENGE SYS

12.30 - Added step to check if center tank quantity is available.

## Section 15 - Warning Systems

### PILOT RESPONSE

15.4 - Added PILOT RESPONSE checklist with condition statement only.

---

## Chapter PI-QRH - Performance Inflight - QRH

### Section 10 - Table of Contents

PI-QRH.TOC.10.1 - 777-200 GE90-76B KG JAA was added as Section 10.

### Section 10 - General

#### General

PI-QRH.10.1 - 777-200 GE90-76B KG JAA was added as Section 10.

### Section 20 - Table of Contents

PI-QRH.TOC.20.1 - 777-200ER TRENT892 KG FAA was added as Section 20.

**Section 20 - General****VREF**

PI-QRH.20.5 - Updated VREF data to match the FMC data.

**Section 21 - Advisory Information****Normal Configuration Landing Distance**

PI-QRH.21.1-3 - Updated data to reflect the incorporation of engine out loss of control speeds (VLOC), higher reference landing weight, and additional autobrake settings.

**Section 22 - Engine Inoperative****Holding**

PI-QRH.22.10 - Revised data to take into account the higher VREF speeds at sea level. Previous data were calculated with a speed restriction based on VREF at 10000 ft.

**Gear Down Landing Rate of Climb Available**

PI-QRH.22.11 - Revised data to reflect a higher reference weight.

**Section 23 - Gear Down****Holding**

PI-QRH.23.6 - Revised data to take into account the higher VREF speeds at sea level. Previous data were calculated with a speed restriction based on VREF at 10000 ft.

**Section 30 - Table of Contents**

PI-QRH.TOC.30.1 - 777-200LR GE90-110B1L KG FAA was added as Section 30.

**Section 30 - General****VREF**

PI-QRH.30.4 - Updated VREF data to match the FMC data.

**Section 31 - Advisory Information****Normal Configuration Landing Distance**

PI-QRH.31.1-4 - Updated data to reflect the incorporation of engine out loss of control speeds (VLOC), higher reference landing weight, and additional autobrake settings.

**Non-Normal Configuration Landing Distance**

PI-QRH.31.5-8 - Updated data to reflect the incorporation of engine out loss of control speeds (VLOC), higher reference landing weight, and additional autobrake settings.

## **Section 40 - Table of Contents**

PI-QRH.TOC.40.1 - 777F GE90-110B1L KG JAA was added as Section 40.

## **Section 40 - General**

### **VREF**

PI-QRH.40.4 - Updated VREF data to match the FMC data.

## **Section 41 - Advisory Information**

### **Normal Configuration Landing Distance**

PI-QRH.41.1-3 - Updated data to reflect the incorporation of engine out loss of control speeds (VLOC), higher reference landing weight, and additional autobrake settings.

### **Non-Normal Configuration Landing Distance**

PI-QRH.41.4-26 - Updated data to include autobrake performance and reflect a change in table format and reference weight.

PI-QRH.41.26 - Updated footnote table format

## **Section 50 - Table of Contents**

PI-QRH.TOC.50.1 - 777-300 PW4090 LB FAA was added as Section 50.

## **Section 50 - General**

### **VREF**

PI-QRH.50.5 - Updated VREF data to match the FMC data.

## **Section 60 - Table of Contents**

PI-QRH.TOC.60.1 - 777-300ER GE90-115BL LB FAA was added as Section 60.

## **Section 60 - General**

### **VREF**

PI-QRH.60.4 - Updated VREF data to match the FMC data.

---

## **Chapter MAN - Maneuvers**

## **Section 2 - Flight Patterns**

### **Circling Approach**

MAN.2.5 - Added HDG HOLD and TRK HOLD to recommended lateral modes for the maneuvering portion of circling approaches.



**Chapter CI - Checklist Instructions****Section 2 - Non-Normal Checklists****Non-Normal Checklist Operation**

CI.2.2 - Added paragraph about the risks of troubleshooting and guidance in rare situations when troubleshooting may be considered.

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**Checklist Instructions****List of Effective Pages****Chapter CI****Section LEP**

<b>Page</b>	<b>Date</b>
<b>Quick Reference Handbook</b>	
Quick Action Index	
QA.Index.1-2	December 15, 2008
EICAS Messages (tab)	
* EICAS.Index.1-12	June 14, 2010
Unannounced Index (tab)	
* Unann.Index.1-2	June 14, 2010
Alphabetical Index (tab)	
* Alpha.Index.1-14	June 14, 2010
Normal Checklists (tab)	
NC.1	June 16, 2008
NC.2-3	December 10, 2007
NC.4	June 16, 2008
0 Miscellaneous (tab)	
0.TOC.1-2	June 16, 2008
0.1	June 15, 2009
0.2	December 14, 2009
0.3	December 10, 2007
0.4	June 15, 2009
0.5-7	December 14, 2009
0.8	December 10, 2007
1 Airplane General, Emergency Equipment, Doors, Windows (tab)	
1.TOC.1-2	June 15, 2009
1.1	June 16, 2008
1.2	June 15, 2009
1.3	December 14, 2009
1.4-6	June 15, 2009

<b>Page</b>	<b>Date</b>
1 Airplane General, Emergency Equipment, Doors, Windows (cont)	
1.7	December 14, 2009
1.8	June 15, 2009
1.9	December 14, 2009
1.10-12	June 15, 2009
1.13	December 14, 2009
1.14	June 15, 2009
1.15	December 14, 2009
1.16	June 15, 2009
2 Air Systems (tab)	
* 2.TOC.1-2	June 14, 2010
2.1	June 16, 2008
2.2	December 14, 2009
2.3-4	June 16, 2008
2.5	December 10, 2007
2.6-7	December 14, 2009
2.8-9	December 10, 2007
2.10-12	June 16, 2008
2.13	December 14, 2009
2.14	December 15, 2008
2.15-17	December 14, 2009
* 2.18-26	June 14, 2010
* 2.27-30	Deleted

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Page	Date	Page	Date
3 Anti-Ice, Rain (tab)		7 Engines, APU (cont)	
3.TOC.1-2	June 15, 2009	7.4-7	December 10, 2007
3.1	December 10, 2007	* 7.8-9	June 14, 2010
3.2	December 14, 2009	7.10-11	December 14, 2009
3.3	December 10, 2007	* 7.12	June 14, 2010
3.4-5	December 14, 2009	7.13-14	December 14, 2009
3.6	December 10, 2007	7.15	December 15, 2008
3.7-9	December 14, 2009	7.16	June 15, 2009
3.10-11	December 10, 2007	7.17	December 14, 2009
3.12	June 15, 2009	7.18-19	December 15, 2008
3.13-15	December 14, 2009	* 7.20-84	June 14, 2010
3.16-18	June 15, 2009	8 Fire Protection (tab)	
4 Automatic Flight (tab)		8.TOC.1-2	June 15, 2009
4.TOC.1-2	June 16, 2008	8.1-2	December 10, 2007
4.1-2	December 10, 2007	8.3-4	December 14, 2009
5 Communications (tab)		8.5-6	December 10, 2007
5.TOC.1-2	June 15, 2009	8.7	June 15, 2009
5.1	June 15, 2009	8.8-11	December 14, 2009
5.2-4	December 10, 2007	8.12-13	June 16, 2008
6 Electrical (tab)		8.14	June 15, 2009
6.TOC.1-2	June 16, 2008	8.15	December 14, 2009
6.1	June 16, 2008	8.16	June 15, 2009
6.2	December 14, 2009	8.17	December 14, 2009
6.3-4	December 10, 2007	8.18	June 15, 2009
6.5	June 16, 2008	8.19	December 14, 2009
6.6	December 10, 2007	8.20	June 15, 2009
7 Engines, APU (tab)		8.21-22	December 14, 2009
* 7.TOC.1-4	June 14, 2010	* 8.23	June 14, 2010
7.1	December 10, 2007	8.24	December 14, 2009
* 7.2	June 14, 2010	8.25-26	June 15, 2009
7.3	December 14, 2009	8.27-28	December 14, 2009

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<b>Page</b>	<b>Date</b>	<b>Page</b>	<b>Date</b>
<b>8 Fire Protection (cont)</b>		<b>10 Flight Instruments, Displays (tab)</b>	
8.29-32	June 15, 2009	10.TOC.1-2	June 16, 2008
* 8.33	June 14, 2010	10.1	June 16, 2008
8.34	December 14, 2009	10.2	December 14, 2009
8.35-38	June 15, 2009	* 10.3	June 14, 2010
<b>9 Flight Controls (tab)</b>		10.4	December 14, 2009
9.TOC.1-2	June 16, 2008	10.5-6	June 16, 2008
9.1	December 10, 2007	<b>11 Flight Management, Navigation (tab)</b>	
9.2	December 14, 2009	11.TOC.1-2	June 16, 2008
9.3	December 15, 2008	11.1	December 10, 2007
9.4	December 10, 2007	* 11.2	June 14, 2010
9.5	December 15, 2008	11.3	December 10, 2007
9.6	December 10, 2007	11.4	June 16, 2008
9.7	December 14, 2009	11.5-6	December 14, 2009
9.8	December 10, 2007	11.7	June 16, 2008
9.9-10	December 14, 2009	11.8-9	December 14, 2009
9.11	December 10, 2007	11.10	December 15, 2008
9.12	June 16, 2008	11.11-12	December 10, 2007
9.13	December 14, 2009	<b>12 Fuel (tab)</b>	
9.14-16	December 10, 2007	* 12.TOC.1-2	June 14, 2010
9.17	December 14, 2009	12.1	December 10, 2007
9.18	December 10, 2007	12.2-3	December 14, 2009
9.19-20	December 14, 2009	12.4	June 16, 2008
9.21-22	December 10, 2007	12.5-6	December 14, 2009
9.23	December 14, 2009	12.7-8	June 16, 2008
9.24-28	December 10, 2007	12.9	December 14, 2009
		12.10	December 10, 2007
		12.11-12	December 14, 2009
		12.13	December 10, 2007
		12.14	June 16, 2008
		12.15	December 14, 2009

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Page	Date	Page	Date
12 Fuel (cont)		14 Landing Gear (tab)	
12.16	June 16, 2008	14.TOC.1-2	June 16, 2008
12.17	June 15, 2009	14.1-3	December 10, 2007
12.18-23	December 14, 2009	14.4	December 15, 2008
12.24	June 15, 2009	14.5-7	December 14, 2009
12.25	December 14, 2009	14.8	June 16, 2008
12.26-27	June 15, 2009	14.9	December 14, 2009
12.28-29	December 14, 2009	14.10	December 10, 2007
* 12.30-32	June 14, 2010	15 Warning Systems (tab)	
13 Hydraulics (tab)		* 15.TOC.1-2	June 14, 2010
13.TOC.1-2	June 16, 2008	15.1	December 15, 2008
13.1	June 16, 2008	15.2-3	December 10, 2007
13.2-3	December 10, 2007	* 15.4-8	June 14, 2010
13.4	June 16, 2008	Operations Information (tab)	
13.5-7	December 14, 2009	OI.TOC.0.1-2	December 14, 2009
13.8	December 10, 2007	OI.1.1	December 10, 2007
13.9	June 16, 2008	OI.1.2	June 16, 2008
13.10-13	December 14, 2009	Performance - Inflight (tab)	
13.14	June 16, 2008	* PI-QRH.TOC.1-2	June 14, 2010
13.15-16	December 14, 2009	* PI-QRH.TOC.10.1-4	June 14, 2010
13.17	June 16, 2008	* PI-QRH.10.1-4	June 14, 2010
13.18	June 15, 2009	* PI-QRH.11.1-30	June 14, 2010
13.19	December 14, 2009	* PI-QRH.12.1-10	June 14, 2010
13.20	December 15, 2008	* PI-QRH.13.1-4	June 14, 2010
13.21-25	December 14, 2009	* PI-QRH.14.1-4	June 14, 2010
13.26-28	June 16, 2008	* PI-QRH.15.1-6	June 14, 2010
13.29	December 14, 2009	* PI-QRH.TOC.20.1-2	June 14, 2010
13.30	June 16, 2008	PI-QRH.20.1-4	December 10, 2007
		* PI-QRH.20.5	June 14, 2010
		PI-QRH.20.6	December 10, 2007
		* PI-QRH.21.1-3	June 14, 2010

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<b>Performance - Inflight (cont)</b>		<b>Performance - Inflight (cont)</b>	
PI-QRH.21.4-7	June 16, 2008	PI-QRH.45.1-4	June 15, 2009
PI-QRH.21.8-9	December 10, 2007	* PI-QRH.45.5-6	June 14, 2010
PI-QRH.21.10	December 14, 2009	* PI-QRH.TOC.50.1-2	June 14, 2010
PI-QRH.22.1-4	December 10, 2007	PI-QRH.50.1-4	June 15, 2009
PI-QRH.22.5	December 15, 2008	* PI-QRH.50.5	June 14, 2010
PI-QRH.22.6-9	December 10, 2007	PI-QRH.50.6	June 15, 2009
* PI-QRH.22.10-11	June 14, 2010	PI-QRH.51.1-10	June 15, 2009
PI-QRH.22.12	June 16, 2008	PI-QRH.52.1-14	June 15, 2009
PI-QRH.23.1-4	December 15, 2008	PI-QRH.53.1-8	June 15, 2009
* PI-QRH.23.5-6	June 14, 2010	PI-QRH.54.1-4	June 15, 2009
PI-QRH.24.1-3	December 15, 2008	PI-QRH.55.1-4	June 15, 2009
* PI-QRH.24.4	June 14, 2010	* PI-QRH.55.5-6	June 14, 2010
PI-QRH.25.1-4	December 15, 2008	* PI-QRH.TOC.60.1-2	June 14, 2010
* PI-QRH.25.5-6	June 14, 2010	PI-QRH.60.1-3	June 15, 2009
* PI-QRH.TOC.30.1-2	June 14, 2010	* PI-QRH.60.4	June 14, 2010
PI-QRH.30.1-3	June 15, 2009	PI-QRH.61.1-12	June 15, 2009
* PI-QRH.30.4	June 14, 2010	PI-QRH.62.1-12	June 15, 2009
* PI-QRH.31.1-12	June 14, 2010	PI-QRH.63.1-8	June 15, 2009
PI-QRH.32.1-12	June 15, 2009	PI-QRH.64.1-6	June 15, 2009
PI-QRH.33.1-8	June 15, 2009	PI-QRH.65.1-4	June 15, 2009
PI-QRH.34.1-4	June 15, 2009	* PI-QRH.65.5-6	June 14, 2010
PI-QRH.35.1-4	June 15, 2009	<b>Maneuvers (tab)</b>	
* PI-QRH.35.5-6	June 14, 2010	MAN.TOC.0.1-2	December 14, 2009
* PI-QRH.TOC.40.1-4	June 14, 2010	MAN.05.1	December 10, 2007
PI-QRH.40.1-3	June 15, 2009	MAN.05.2	June 16, 2008
* PI-QRH.40.4	June 14, 2010	MAN.1.1-2	December 15, 2008
* PI-QRH.41.1-30	June 14, 2010	MAN.1.3-4	December 14, 2009
PI-QRH.42.1-12	June 15, 2009	MAN.1.5	December 10, 2007
PI-QRH.43.1-8	June 15, 2009	MAN.1.6-12	December 15, 2008
PI-QRH.44.1-4	June 15, 2009	MAN.2.1-4	December 10, 2007

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Page	Date
Maneuvers (cont)	
* MAN.2.5	June 14, 2010
MAN.2.6	December 10, 2007
MAN.2.7	December 15, 2008
MAN.2.8	June 16, 2008
Checklist Instructions (tab)	
CI.TOC.0.1-2	June 16, 2008
Model Identification	
* CI.ModID.1-2	June 14, 2010
Revision Record	
* CI.RR.1-8	June 14, 2010
List of Effective Pages	
* CI.LEP.1-6	June 14, 2010
Checklist Instructions	
CI.1.1	June 16, 2008
CI.1.2	June 15, 2009
CI.1.3-4	June 16, 2008
CI.2.1	June 16, 2008
* CI.2.2-4	June 14, 2010
CI.2.5	December 14, 2009
CI.2.6-7	June 15, 2009
CI.2.8	June 16, 2008
Evacuation	
Back Cover.1	December 10, 2007
Back Cover.2	December 14, 2009

\* = Revised, Added, or Deleted



**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.

<b>Checklist</b>	<b>Call</b>	<b>Read</b>	<b>Verify</b>	<b>Respond</b>
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 an entire procedure was not done:

- stop the checklist
- complete the entire procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The 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 the electronic normal checklist is the same as the 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 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, 747-400, 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

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## **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.

Intentionally  
Blank

**Checklist Instructions**  
**Non-Normal Checklists****Chapter CI**  
**Section 2****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.

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.

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.

A rectangle icon [ ] precedes all EICAS alert messages that have procedural steps, notes, or other information of which the flight crew should be aware. The rectangle icon is removed from the EICAS 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).

All checklists have condition statements. The condition statement briefly describes the situation that caused the EICAS alert message. Unannunciated checklists also have condition statements to help in understanding the reason for the checklist.

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.

Checklists can have both memory and reference items. Memory items are critical steps that must be done before reading the checklist. 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.

Some checklists have additional information at the end of the checklist. The additional information provides data the crew may wish to consider. The additional information does not need to be read.

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.

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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 unannunciated 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.

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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 non-normal situations are located in the Maneuvers chapter and show the sequence of configuration changes.

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 combine the elements of more than one checklist. In all situations, the captain must assess the situation and use good judgment to determine the safest course of action.

It should be noted that, in determining the safest course of action, troubleshooting, i.e. 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.

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.

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.

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.

There are no non-normal checklists for the loss of an engine indication or automatic display of the secondary engine indications. Continue normal engine operation unless an EICAS alert message shows or a limit is exceeded.

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 or operator equivalent is consulted to determine if Minimum Equipment List 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 cancelled 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.

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- Indicator lights are tested to verify suspected faults.
  - In flight, flight crew 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, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. 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 a non-normal checklist.

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## Non-Normal Checklist Use

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.

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.

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.

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.

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.



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.

The word "Confirm" is added to checklist items when both 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.

With the airplane stationary on the ground:

- the captain and 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 areas of responsibility.

After moving the control, the crewmember taking the action also states the checklist response.

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.

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.

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.

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 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.

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 may 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 may 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 crewmember taking the action also states the response.

In the printed non-normal checklists, when there are deferred items, the Deferred Items section of the non-normal checklist will include the Descent, Approach, and Landing normal checklists. These checklists should be used instead of the usual DESCENT, APPROACH, and LANDING normal checklists. If a normal checklist item is changed as a result of the non-normal situation, the changed response is printed in **bold type**. 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.

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In the printed non-normal checklists, each checklist has a checklist complete symbol at the end. The following symbol indicates that the checklist is complete.



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 body of the checklist. 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."

Additional information at the end of the checklist is not required to be read.

The flight crew must be aware that the checklists cannot be created for all conceivable situations and are not intended to replace good judgement. In some situations, at the captain's discretion, deviation from a checklist may be needed.

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## Non-Normal Checklist Legend

### Redirection Symbol



The redirection symbol is used in a non-normal checklist, with the words "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

Choose one:



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.

**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) . . . . . Push to OPEN  
and hold until the  
outflow valve displays 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 the tower. 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 warning light is  
illuminated:  
  
Illuminated fire  
switch . . . . . Rotate to the stop  
and hold for 1 second F/O
- 