

747

Quick Reference Handbook

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Normal Checklists

Chapter NC

PREFLIGHT

Oxygen..... Tested, 100%
Flight instruments Heading____, Altimeter____
Parking brakeSet
Fuel control switches..... CUTOFF

BEFORE START

806
Flight deck door Closed and locked
Passenger signs ____
MCPV2____, HDG____, ALT____
Takeoff speeds V1____, VR____, V2____
CDU preflight..... Completed
Trim ____ Units, 0, 0
Taxi and takeoff briefing Completed
Beacon..... BOTH

BEFORE TAXI

Anti-ice..... ____
Recall..... Checked
AutobrakeRTO
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
Fuel pumps Off
Flaps UP
Parking brake ____
Fuel control switches CUTOFF
Weather radar Off

SECURE

IRSOFF
Emergency lightsOFF
PacksOFF

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Ditching

Condition: Airplane ditching and evacuation are needed.

- 1 Plan to jettison fuel as needed to reduce the VREF speed.
- 2 Do **not** arm the autobrake.
- 3 Plan to ditch with the gear up.
- 4 Use flaps 30 and VREF 30.
- 5 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall Checked
Notes Checked
Autobrake **OFF**
Landing data **VREF 30**____, **Minimums**____
Approach briefing Completed

Approach Checklist

Altimeters ____

Below 5,000 feet

GND PROX GEAR OVRD switch OVRD
GND PROX TERR OVRD switch OVRD
PACK switches (all) Off

▼ Continued on next page ▼

▼ Ditching continued ▼

- OUTFLOW VALVES MAN
switches (both) ON
- OUTFLOW VALVES
manual control Hold in CLOSE
until the outflow valve
indications show fully closed
- Passenger signs ON

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- MAIN DECK ALERT switch. Push

Do **not** accomplish the following checklists:

- CABIN ALT AUTO
- OUTFLOW VLV L, R
- PACK 1+2+3

On final approach

- Omit the landing checklist.
- Landing gear lever UP
- Flaps 30
- Advise the cabin of imminent touchdown.
- Maintain airspeed at VREF 30.
- Rotate to a touchdown attitude of 10 to 12 degrees.

After impact

- FUEL CONTROL switches (all) CUTOFF

▼ Continued on next page ▼

▼ Ditching continued ▼

Engine fire switches (all) Pull,
rotate to the stop
and hold for 1 second

Deploy the slide/rafts and evacuate the airplane.



Overweight Landing

Condition: Both of these occur:

- A landing at greater than maximum landing weight is needed
- A flaps 30 landing is desired

Objective: To determine if flaps 30 is available for landing, otherwise to use flaps 25.

1 Choose one:

◆ **Two engines are inoperative:**

▶▶ **Go to the Two Engines Inop checklist on page 7.36**



◆ **One engine is inoperative:**

Note: Use flaps 25 and VREF 25 for landing.

▶▶ **Go to step 7**

◆ **All engines are operating:**

▶▶ **Go to step 2**

2 Refer to the flaps 30 Landing Climb Limit Weight table in the Performance Inflight chapter.

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

3 Choose one:

◆ Landing gross weight is **above** the limit:

Note: Use flaps 25 and VREF 25 for landing.

▶▶ **Go to step 7**

◆ Landing gross weight is **at or below** the limit:

▶▶ **Go to step 4**

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

914

5 Choose one:

◆ VREF 30 + additives is **at or below** 175 knots:

Note: Land normally using flaps 25 or 30.



◆ VREF 30 + additives is **above** 175 knots:

Note: Use flaps 25 and VREF 25 for landing.

▶▶ **Go to step 7**

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

806

6 Choose one:

◆ VREF 30 + additives is **at or below** 170 knots:

Note: Land normally using flaps 25 or 30.



◆ VREF 30 + additives is **above** 170 knots:

Note: Use flaps 25 and VREF 25 for landing.

►► Go to step 7

7 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake _____
- Landing data **VREF 25 _____, Minimums_____**
- Approach briefing Completed

Approach Checklist

- Altimeters _____

Landing Checklist

- Speedbrake Armed
- Landing gear Down

▼ Continued on next page ▼

▼Overweight Landing continued▼

Flaps.25



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DO NOT USE FOR FLIGHT

747 Flight Crew Operations Manual

Non-Normal Checklists

Chapter NNC

Airplane Gen., Emer. Equip., Doors, Windows

Section 1

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**AUTO
UNLK****Automatic Unlock****806**

Condition: The correct emergency access code is entered.

Objective: To deny unauthorized access to the flight deck before the door automatically unlocks.

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

**CREW OXY LOW**

Condition: Crew oxygen pressure is low.



[] DOOR AFT, FWD CARGO

Condition: The cargo door is not closed and secure.

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

- 1 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.
- 2 LDG ALT selector Set 8000
- 3 Choose one:
 - ◆ Airplane altitude is **at or below 8,000 feet**:
Level off at the lowest safe altitude.
▶▶ **Go to step 4**
 - ◆ Airplane altitude is **above 8,000 feet**:
Descend to the lowest safe altitude or 8,000 feet, whichever is higher.
▶▶ **Go to step 4**
- 4 **After** level off, allow sufficient time for cabin altitude to stabilize. This minimizes discomfort when the airplane is depressurized.
- 5 Choose one:
 - ◆ Airplane altitude is **at or below 10,000 feet**:
▶▶ **Go to step 10**
 - ◆ Airplane altitude is **above 10,000 feet**:
▶▶ **Go to step 6**

▼ Continued on next page ▼

▼ DOOR AFT, FWD CARGO continued ▼

- 6 Don the oxygen masks.
- 7 Establish crew communications.

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- 8 Choose one:

◆ Passenger oxygen is **needed**:

PASS OXYGEN

switch Push to ON and
hold for 1 second

Passenger signs. ON

▶▶ **Go to step 10**

◆ Passenger oxygen is **not** needed:

▶▶ **Go to step 10**

914

- 9 Choose one:

◆ Supernumerary oxygen is **needed**:

SUPRNMRY OXY

switch Push to ON and
hold for 1 second

Passenger signs. ON

MAIN DECK ALERT

switch Push

▶▶ **Go to step 10**

◆ Supernumerary oxygen is **not** needed:


▶▶ **Go to step 10**

▼ Continued on next page ▼

▼ DOOR AFT, FWD CARGO continued ▼

10 OUTFLOW VALVES MAN switches (both)ON

Use momentary actuation of the outflow valves manual control to avoid large and rapid pressurization changes.

11  OUTFLOW VALVES manual control Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

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

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

- CABIN ALT AUTO
- LANDING ALT
- OUTFLOW VLV L, R



[] DOOR BULK CARGO

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

1 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

914

►► **Go to step 2**

806

►► **Go to step 3**

914

- 2 Descend to the lowest safe altitude or 14,000 feet, whichever is higher.

806

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



[] DOOR ELEC MAIN, CTR

Condition: The electrical equipment door is not closed and secure.

1 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.

◆ Pressurization is **abnormal**:

914

▶▶ **Go to step 2**

806

▶▶ **Go to step 3**

914

2 Descend to the lowest safe altitude or 14,000 feet, whichever is higher.

806

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



[] DOOR ENTRY L, R 1, 2, 3, 4, 5

806

Condition: A main deck entry door is not closed and secure.

- 1 Instruct a cabin crewmember to check the door handle. If the handle is not in the closed position, instruct the crewmember to move the handle to the closed position.

- 2 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

►► **Go to step 3**

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



[] DOOR ENTRY L 1

914

Condition: Main deck entry door L1 is not closed and secure.

1 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.

◆ Pressurization is **abnormal**:

►► **Go to step 2**

2 Descend to the lowest safe altitude or 14,000 feet, whichever is higher.



[] DOOR F/D OVHD

Condition: The flight deck overhead door is not closed and secure.

1 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

914

►► **Go to step 2**

806

►► **Go to step 3**

914

- 2 Descend to the lowest safe altitude or 14,000 feet, whichever is higher.

806

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



[] DOOR L, R UPPER DK

806

Condition: An upper deck door is not closed and secure.

- 1 Instruct a cabin crewmember to check the upper deck door handle. If the handle is not in the closed position, instruct the crewmember to move the handle to the closed position.
- 2 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

►► **Go to step 3**

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



[] DOOR NOSE CARGO

914

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

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

- 1 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.
- 2 LDG ALT selector Set 8000
- 3 Choose one:
 - ◆ Airplane altitude is **at or below 8,000 feet**:
Level off at the lowest safe altitude.
▶▶ Go to step 4
 - ◆ Airplane altitude is **above 8,000 feet**:
Descend to the lowest safe altitude or 8,000 feet, whichever is higher.
▶▶ Go to step 4
- 4 **After** level off, allow sufficient time for cabin altitude to stabilize. This minimizes discomfort when the airplane is depressurized.

▼ Continued on next page ▼

▼ DOOR NOSE CARGO continued ▼

5 Choose one:

◆ Airplane altitude is **at or below 10,000 feet**:▶▶ **Go to step 9**◆ Airplane altitude is **above 10,000 feet**:▶▶ **Go to step 6**

6 Don the oxygen masks.

7 Establish crew communications.

8 Choose one:

◆ Supernumerary oxygen is **needed**:

SUPRNMRY OXY

switch Push to ON and
hold for 1 second

Passenger signs ON

MAIN DECK ALERT

switch Push


▶▶ **Go to step 9**◆ Supernumerary oxygen is **not** needed:▶▶ **Go to step 9**

9 OUTFLOW VALVES MAN switches (both) ON

▼ Continued on next page ▼

▼ DOOR NOSE CARGO continued ▼

Use momentary actuation of the outflow valves manual control to avoid large and rapid pressurization changes.

- 10  **OUTFLOW VALVES**
manual control Move to OPEN
until the outflow
valve indications show fully
open to depressurize the airplane
- 11 After the airplane is depressurized, the crew may
change altitude as needed.
- 12 Do **not** accomplish the following checklists:
CABIN ALT AUTO
LANDING ALT
OUTFLOW VLV L, R
■ ■ ■ ■

[] DOOR R UPPER DK

914

Condition: The right upper deck door is not closed and secure.

- 1 Instruct a supernumerary to check the right upper deck door handle. If the handle is not in the closed position, instruct the supernumerary to move the handle to the closed position.

- 2 Choose one:

◆ Pressurization is **normal**:

The door is in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

►► **Go to step 3**

- 3 Descend to the lowest safe altitude or 14,000 feet, whichever is higher.



[] DOOR SIDE CARGO

914

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

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

- 1 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.
- 2 LDG ALT selector Set 8000
- 3 Choose one:
 - ◆ Airplane altitude is **at or below 8,000 feet**:
Level off at the lowest safe altitude.
▶▶ **Go to step 4**
 - ◆ Airplane altitude is **above 8,000 feet**:
Descend to the lowest safe altitude or 8,000 feet, whichever is higher.
▶▶ **Go to step 4**
- 4 **After** level off, allow sufficient time for cabin altitude to stabilize. This minimizes discomfort when the airplane is depressurized.

▼ Continued on next page ▼

▼ DOOR SIDE CARGO continued ▼

- 5 Choose one:
- ◆ Airplane altitude is **at or below 10,000 feet**:
▶▶ **Go to step 9**
 - ◆ Airplane altitude is **above 10,000 feet**:
▶▶ **Go to step 6**
- 6 Don the oxygen masks.
- 7 Establish crew communications.
- 8 Choose one:
- ◆ Supernumerary oxygen is **needed**:
SUPRNMRY OXY
switch Push to ON and
hold for 1 second

Passenger signs ON

MAIN DECK ALERT
switch Push
▶▶ **Go to step 9**
 - ◆ Supernumerary oxygen is **not** needed:
▶▶ **Go to step 9**
- 9 OUTFLOW VALVES MAN switches (both) ON

▼ Continued on next page ▼

10 OUTFLOW VALVES

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

■ ■ ■ ■

806

- 1 Any time differential pressure is less than 3 psi, station a cabin crew member by the door to ensure no one attempts to open the door.



[] DOORS ELEC

Condition: Both electrical equipment doors are not closed and secure.

1 Choose one:

◆ Pressurization is **normal**:

The doors are in a safe configuration.
Continue normal operation.

◆ Pressurization is **abnormal**:

914

▶▶ **Go to step 2**

806

▶▶ **Go to step 3**

914

2 Descend to the lowest safe altitude or 14,000 feet, whichever is higher.

806

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



[] DOORS ENTRY L, R

806

Condition: Two or more main deck entry doors on the same side are not closed and secure.

- 1 Instruct a cabin crewmember to check the door handles. If a handle is not in the closed position, instruct the crewmember to move the handle to the closed position.

- 2 Choose one:

◆ Pressurization is **normal**:

The doors are in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

►► **Go to step 3**

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



[] DOORS UPR DECK

806

Condition: Both upper deck doors are not closed and secure.

- 1 Instruct a cabin crewmember to check the door handles. If a handle is not in the closed position, instruct the crewmember to move the handle to the closed position.

- 2 Choose one:

◆ Pressurization is **normal**:

The doors are in a safe configuration.
Continue normal operation.



◆ Pressurization is **abnormal**:

►► **Go to step 3**

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

**ELT ON**

Condition: The emergency locator transmitter is on.



EMER LIGHTS

Condition: One of these occurs:

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



**LOCK
FAIL**

Lock Fail

806

Condition: One or more of these occur:

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

Objective: To remove power from the lock to prevent a possible overheat if system is on.

Do only if conditions allow.

1



FLIGHT DECK ACCESS SYSTEM

switch OFF

Note: The door can be locked with the dead bolt.



[] PASS OXYGEN ON

806

Condition: The passenger oxygen system is on.

- 1 **When** passenger oxygen is no longer needed:
PASS OXYGEN
switchRESET, release to NORM
■ ■ ■ ■

[] SUPRNMRY OXY ON

914

Condition: Supernumerary oxygen system is on.

- 1 **When** supernumerary oxygen is no longer needed:
SUPRNMRY OXY
switchRESET, release to NORM
■ ■ ■ ■

SUPRNMRY OXY LO

914

Condition: Supernumerary oxygen pressure is low.



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Window Damage Fwd L, R

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

- An electrical arc
- A crack
- Is shattered

Objective: To remove electrical power, if needed, to prevent arcing. To reduce pressure and descend if an inner pane is shattered or cracked.

- 1 Don the seat belts and shoulder harnesses.
- 2 WINDOW HEAT switch (affected side) Off
- 3 Do **not** accomplish the following checklist:
HEAT WINDOW
- 4 Choose one:
 - ◆Forward window **is** shattered or cracked:
▶▶ **Go to step 5**
 - ◆Forward window is **not** shattered or cracked:
■ ■ ■ ■

▼ Continued on next page ▼

▼ Window Damage Fwd L, R continued ▼

5 Choose one:

◆ Only the **outer** glass pane is shattered or cracked (the inner glass pane is **not** shattered or cracked):

Continue normal operation.

Shoulder harnesses may be removed.



◆ **Inner** glass pane is shattered or cracked:

▶▶ **Go to step 6**

6 Don the oxygen masks.

7 Establish crew communications.

8 Passenger signs ON
914

9 MAIN DECK ALERT switch Push

10 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.

11 LDG ALT selector Set 9000

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

13 Start a normal descent to the lowest safe altitude or below 14,000 feet, whichever is higher.

14 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ Window Damage Fwd L, R continued ▼

Note: When cabin differential pressure is 2 psi or less, oxygen masks and shoulder harnesses may be removed.

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

15 Choose one:

- ◆ Landing field elevation is **above 8,000 feet:**
 ▶▶ **Go to step 16**
- ◆ Landing field elevation is **at or above 4,000 feet and at or below 8,000 feet:**
 ▶▶ **Go to step 17**
- ◆ Landing field elevation is **below 4,000 feet:**
 ▶▶ **Go to step 18**

16 **When** below 13,000 feet:

LDG ALT switch Push to AUTO
 AUTO landing altitude mode shows on EICAS.



▼ Continued on next page ▼

▼ Window Damage Fwd L, R continued ▼

17 **When** less than 5,000 feet above the landing field elevation:

LDG ALT switch Push to AUTO

AUTO landing altitude mode shows on EICAS.



18 **When** below 9,000 feet:

LDG ALT selectorSet 4000

19 **When** less than 4,000 feet above the landing field elevation:

LDG ALT switch Push to AUTO

AUTO landing altitude mode shows on EICAS.



Window Damage Side L, R

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

- A crack
- Is shattered

Objective: To reduce pressure and descend if an inner pane is shattered or cracked.

- 1 Don the seat belts and shoulder harnesses.
- 2 Choose one:
 - ◆ Only the **outer** glass pane is shattered or cracked (the inner glass pane is **not** shattered or cracked):

Continue normal operation.

Shoulder harnesses may be removed.

■ ■ ■ ■
 - ◆ **Inner** glass pane is shattered or cracked:

►► **Go to step 3**
- 3 Don the oxygen masks.
- 4 Establish crew communications.
- 5 Passenger signsON
- 914
- 6 MAIN DECK ALERT switch Push
- 7 LDG ALT switch Push to MAN
- MAN landing altitude mode shows on EICAS.
- 8 LDG ALT selector Set 9000

▼ Continued on next page ▼

▼ Window Damage Side L, R continued ▼

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

LANDING ALT

10 Start a normal descent to the lowest safe altitude or below 14,000 feet, whichever is higher.

11 Plan to land at the nearest suitable airport.

Note: When cabin differential pressure is 2 psi or less, oxygen masks and shoulder harnesses may be removed.

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

12 Choose one:

◆ Landing field elevation is **above 8,000 feet:**

▶▶ **Go to step 13**

◆ Landing field elevation is **at or above 4,000 feet and at or below 8,000 feet:**

▶▶ **Go to step 14**

◆ Landing field elevation is **below 4,000 feet:**

▶▶ **Go to step 15**

13 **When** below 13,000 feet:

LDG ALT switch Push to AUTO

AUTO landing altitude mode shows on EICAS.



▼ Continued on next page ▼

▼ Window Damage Side L, R continued ▼

14 **When** less than 5,000 feet above the landing field elevation:

LDG ALT switch Push to AUTO
AUTO landing altitude mode shows on
EICAS.



15 **When** below 9,000 feet:

LDG ALT selector Set 4000

16 **When** less than 4,000 feet above the landing field elevation:

LDG ALT switch Push to AUTO
AUTO landing altitude mode shows on
EICAS.



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[] CABIN ALTITUDE

Condition: Cabin altitude is excessive.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 Check the cabin altitude and rate. Verify that the packs are on and outflow valves are closed.
- 4 **If** the cabin altitude is uncontrollable:

914

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

806

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

914

Without delay, descend to the lowest safe
altitude or 14,000 feet, whichever is higher.

806

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

▼ Continued on next page ▼

▼ CABIN ALTITUDE continued ▼

5 The following messages can be shown:

CABIN ALT AUTO

OUTFLOW VLV L

OUTFLOW VLV R

6 Choose one:

◆ **One or two** of the above messages are shown:

Do the applicable checklist or checklists:

▶▶ **Go to When at level off:**

◆ **All three** of the above messages are shown:

Do **not** accomplish the following checklists:

CABIN ALT AUTO

OUTFLOW VLV L

OUTFLOW VLV R

▶▶ **Go to When at level off:**

◆ **None** of the above messages are shown:

▶▶ **Go to When at level off:**

7 **When** at level off:

Flight crew must use oxygen when cabin altitude is above 10,000 feet. If 100% or EMERGENCY is not needed, the regulator must be set to Normal.



ALTN VENT ON

Condition: The alternate ventilation system is on.



[] BLD 1, 2, 3, 4 LOW TEMP

Condition: Engine bleed air temperature is too low to provide sufficient wing anti-icing.

- 1 ENGINE BLEED air switch
(affected engine) Off

This allows the unaffected engine to provide the bleed air for wing anti-ice on the affected wing.



[] BLD DUCT LEAK C

Condition: A bleed air leak occurs in the center duct.

Objective: To isolate the bleed duct leak.

- 1 ISLN valve switches (both) Off
- 2 PACK 2 switch Off
- 3 APU selector OFF
- 914
- 4 LOWER LOBE TEMP AFT selector AUTO
- 806
- 5 AFT CARGO TEMP selector AUTO

Note: Do not use ground pneumatic air.



[] BLD DUCT LEAK L

Condition: A bleed air leak occurs in the left wing duct.

Objective: To isolate the bleed duct leak.

- 1 R ISLN valve switch On
- 2 L ISLN valve switch. Off
- 3 ENGINE 1 and 2 BLEED air switches Off
- 4 PACK 1 switch Off
- 5 DEMAND PUMP 1 selector OFF
- 6 WING ANTI-ICE switch OFF

Note: Do not use wing anti-ice. Avoid icing conditions.

Leading edge flaps move in the secondary mode. Allow more time for leading edge flap operation.

When leading edge flaps are extended or retracted, a temporary leading edge flap asymmetry occurs. This causes a mild rolling moment.

Caution! Do not deploy the thrust reversers until the nose gear contacts the runway.

Note: After landing, if towing to the gate is required, move the demand pump 1 selector to AUX. This powers body gear steering.

▼ Continued on next page ▼

▼ BLD DUCT LEAK L continued ▼

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

PACK 1

FLAPS PRIMARY

HYD PRESS DEM 1

**Additional Information**

When the thrust reversers are deployed, the inboard and midspan leading edge flaps retract, resulting in a leading edge flap asymmetry. If the thrust reversers are deployed before the nose gear contacts the runway, immediate and significant control wheel input, approximately 25 to 65 degrees, may be needed to counter the leading edge flap asymmetry.

[] BLD DUCT LEAK R

Condition: A bleed air leak occurs in the right wing duct.

Objective: To isolate the bleed duct leak.

- 1 L ISLN valve switch. On
- 2 R ISLN valve switch Off
- 3 ENGINE 3 and 4 BLEED air switches Off
- 4 PACK 3 switch Off
- 5 DEMAND PUMP 4 selector OFF
- 6 WING ANTI-ICE switch OFF

Note: Do not use wing anti-ice. Avoid icing conditions.

Leading edge flaps move in the secondary mode. Allow more time for leading edge flap operation.

When leading edge flaps are extended or retracted, a temporary leading edge flap asymmetry occurs. This causes a mild rolling moment.

Caution! Do not deploy the thrust reversers until the nose gear contacts the runway.

- 7 Do **not** accomplish the following checklists:
 - PACK 3
 - FLAPS PRIMARY

▼ Continued on next page ▼

▼BLD DUCT LEAK R continued▼

HYD PRESS DEM 4

**Additional Information**

When the thrust reversers are deployed, the inboard and midspan leading edge flaps retract, resulting in a leading edge flap asymmetry. If the thrust reversers are deployed before the nose gear contacts the runway, immediate and significant control wheel input, approximately 25 to 65 degrees, may be needed to counter the leading edge flap asymmetry.

[] BLEED 1, 2, 3, 4

Condition: A fault occurs in the engine bleed air system.

Objective: To reset the engine bleed air system, then determine whether engine anti-ice is available.

- 1 ENGINE BLEED air switch
(affected engine) Off, then ON
- 2 **Wait** 1 minute, 15 seconds.
- 3 Choose one:
 - ◆ BLEED message is **blank**:

■ ■ ■ ■
 - ◆ BLEED message **shows**:

▶ ▶ **Go to step 4**
- 4 Choose one:
 - ◆ On the **ground**:

■ ■ ■ ■
 - ◆ In **flight**:

▶ ▶ **Go to step 5**
- 5 ENGINE ANTI-ICE switch
(affected engine) ON
- 6 Wait 20 seconds.

▼ Continued on next page ▼

▼ BLEED 1, 2, 3, 4 continued ▼

7 Choose one:

◆ EAI VALVE (affected engine) message **shows**:

Note: Affected engine anti-ice is not available. Avoid icing conditions.

Do **not** accomplish the following checklist:

EAI VALVE

ANTI-ICE



◆ EAI VALVE (affected engine) message is **blank**:

►► **Go to step 8**

8 ENGINE ANTI-ICE switch
(affected engine)Set

Note: To ensure sufficient bleed air for engine anti-ice in icing conditions:

- At or above 10,000 feet, maintain affected engine N1 above 60%
- Below 10,000 feet, maintain affected engine N1 above 55%
- Plan for a lower than normal descent rate

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

BLEED HP ENG

ANTI-ICE



BLEED 1, 2, 3, 4 OFF

Condition: All of these occur:

- Engine bleed air switch is off
- Engine is running
- Engine bleed air valve is closed

**[] BLEED HP ENG 1, 2, 3, 4**

Condition: Both of these occur:

- The engine high pressure bleed valve is closed when commanded open
- The engine anti-ice is commanded on

Note: To ensure sufficient bleed air for engine anti-ice in icing conditions:

- At or above 10,000 feet, maintain affected engine N1 above 60%
- Below 10,000 feet, maintain affected engine N1 above 55%
- Plan for a lower than normal descent rate

**BLEED ISLN APU**

Condition: The APU isolation valve is not in the commanded position.



[] BLEED ISLN L, R

Condition: The bleed isolation valve is not in the commanded position.

1 Choose one:

◆ ISLN valve switch (affected side) is **on**:

■ ■ ■ ■

◆ ISLN valve switch (affected side) is **off**:

ISLN valve switch (unaffected side) . . . Off

PACK 2 switch Off

■ ■ ■ ■

[] CABIN ALT AUTO

Condition: One of these occurs:

- The automatic pressurization control is failed
- Both outflow valve manual switches are ON

Objective: To manually control the cabin altitude.

- 1 OUTFLOW VALVES MAN switches
(both) ON
- 2 PACK switches Two packs ON,
one pack off

This reduces the incoming volume of air to ease manual operation.

- 3 OUTFLOW VALVES
manual control Move to
OPEN or CLOSE to check
that manual control is normal

▼ Continued on next page ▼

▼ CABIN ALT AUTO continued ▼

4 Choose one:

◆ Outflow valves manual control is **normal**:▶▶ **Go to step 5**◆ Outflow valves manual control is **failed**:

Note: Pressurization control is lost. Check cabin altitude, cabin rate, and differential pressure regularly.

Do not climb to higher altitudes. Cabin altitude can be maintained with packs and airplane altitude.

▶▶ **Go to step 6**

5 OUTFLOW VALVES

manual control. Move to
OPEN or CLOSE
as needed to control
cabin rate and altitude

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

The recommended cabin altitude in cruise is:

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

▶▶ **Go to step 7**

▼ Continued on next page ▼

▼ CABIN ALT AUTO continued ▼**6 Recalculate fuel requirements for destination.****914**

Note: If at any time cabin altitude exceeds 10,000 feet:

- Don the oxygen masks
- Establish crew communications
- Select supernumerary oxygen on
- Descend as needed to maintain cabin altitude below 10,000 feet

If at any time cabin differential pressure exceeds 9 psi, select one or more packs off as needed to maintain differential pressure below 9 psi.

806

Note: If at any time cabin altitude exceeds 10,000 feet:

- Don the oxygen masks
- Establish crew communications
- Select passenger oxygen on
- Descend as needed to maintain cabin altitude below 10,000 feet

If at any time cabin differential pressure exceeds 9 psi, select one or more packs off as needed to maintain differential pressure below 9 psi.

7 Do **not accomplish the following checklists:****PACK 2****▼ Continued on next page ▼**

▼ CABIN ALT AUTO continued ▼

OUTFLOW VLV L, R

8 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
Notes Checked
Autobrake ____
Landing data VREF____, Minimums____
Approach briefing Completed

Choose one:

◆ Outflow valves manual control is **normal**:

▶▶ **Go to Approach Checklist**

◆ Outflow valves manual control is **failed**:

▶▶ **Go to Passing 15,000 feet**

Passing 15,000 feet

PACK switches One pack ON,
two packs off

Passing 10,000 feet

PACK switches (all) Off

▼ Continued on next page ▼

▼CABIN ALT AUTO continued ▼

Do **not** accomplish the following checklist:
PACK 1+2+3

Approach Checklist

Altimeters _____

Below 3,000 feet AGL

OUTFLOW VALVES
manual control Hold in OPEN
for 30 seconds

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps _____



[] CABIN TEMP

914

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

Objective: To descend and turn off the packs before the flight deck temperature becomes unsafe.

- 1 TRIM AIR switches (both) Off
- 2 Start a descent to the lowest safe altitude or 14,000 feet, whichever is higher.

To descend:

Move the thrust levers to idle

Extend the speedbrakes

Descend at Vmo/Mmo to rapidly reach an altitude where the packs can be selected off

- 3 Plan to land at the nearest suitable airport.

- 4 **When** below 25,000 feet:

PACK switches (all) Off

- 5 **When** at level off:

Don the oxygen masks.

Establish crew communications.

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

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

6 Choose one:

◆ Flight deck temperature is too **warm**:

▶▶▶ **Go to step 7**

◆ Flight deck temperature is too **cold**:

▶▶▶ **Go to step 19**

7 OUTFLOW VALVES MAN

switches (both) ON

Use momentary actuation of the
outflow valves manual control.

8  OUTFLOW VALVES

manual control Move to OPEN
until the outflow valve
indications show fully OPEN
to depressurize the airplane

9 **When** differential pressure is less than 1 psi:

ALTN VENT switch ON

10 **Wait** 20 seconds.

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

11 Choose one:

◆ ALTN VENT ON message is **blank**:

ALTN VENT

selector Move to OPEN
and hold for 15 seconds

►► **Go to step 12**

◆ ALTN VENT ON message **shows**:

►► **Go to step 12**

12 If supernumeraries are on board, instruct them to open the flight deck curtain.

13 UTILITY power switches (both) Off

14 SHOULDER and FOOT HEATERS
selectors (all) OFF

15 Minimize flight deck lighting intensity.

16 During daylight:

Install the flight deck sun visors

Instruct the supernumeraries to close the window shades

17 ALTN VENT
selector Move to
OPEN or CLOSE
as needed to adjust
the flight deck temperature

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

Note: If needed to increase the flight deck temperature, these may be selected on:

- Utility power
- Foot heaters
- Other heat sources

If a further increase in flight deck temperature is needed, pack 1 or pack 3 may be selected on temporarily.

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

CABIN ALTITUDE

CABIN ALT AUTO

OUTFLOW VLV L, R

PACK 1+2+3

TRIM AIR L, R OFF

ELEC UTIL BUS L, R



19 SHOULDER and FOOT HEATERS

selectors (all) ON

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

Note: If conditions permit, maximize flight deck lighting intensity.

During daylight, if conditions permit:

- Remove the flight deck sun visors
- Instruct the supernumeraries to open the window shades

If the flight deck becomes too warm, pack 1 or pack 3 may be selected on temporarily.

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

CABIN ALTITUDE

PACK 1+2+3

TRIM AIR L, R OFF



[] CABIN TEMP

806

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

Objective: To descend and turn off the packs before the flight deck temperature becomes unsafe.

- 1 TRIM AIR switches (both) Off
- 2 Start a descent to the lowest safe altitude or 10,000 feet, whichever is higher.

To descend:

- Move the thrust levers to idle
- Extend the speedbrakes
- Descend at Vmo/Mmo to rapidly reach an altitude where the packs can be selected off

- 3 Plan to land at the nearest suitable airport.
- 4 **When** below 25,000 feet:
PACK switches (all). Off

- 5 Do **not** accomplish the following checklists:
CABIN ALTITUDE
TRIM AIR L, R OFF
PACK 1+2+3

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

6 **When** at level off:

▶▶ **Go to step 7**

7 Choose one:

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

Don the oxygen masks.

Establish crew communications.

PASS OXYGEN

switch Push to ON and
hold for 1 second

▶▶ **Go to step 8**

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

▶▶ **Go to step 8**

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

8 Choose one:

◆ Flight deck or cabin temperature is too **warm**:
▶▶ **Go to step 9**

◆ Flight deck temperature is too **cold**:
FOOT HEATERS selectors (all)ON

Note: If conditions permit, maximize cabin lighting intensity.

During daylight, if conditions permit:

- Remove the flight deck sun visors
- Instruct the cabin crew to open the window shades

If the cabin becomes too warm, pack 1 or pack 3 may be selected ON temporarily.



9 OUTFLOW VALVES MAN
switches (both)ON

Use momentary actuation of the
outflow valves manual control.

10 ⚠ OUTFLOW VALVES
manual control Move to OPEN
until the outflow valve
indications show fully OPEN
to depressurize the airplane

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

11 **When** differential pressure is less than 1 psi:

ALTN VENT switch ON

12 **Wait** 20 seconds.

13 Choose one:

◆ ALTN VENT ON message is **blank**:

ALTN VENT
selector Move to OPEN
and hold for 15 seconds

▶▶ **Go to step 14**

◆ ALTN VENT ON message **shows**:

▶▶ **Go to step 14**

14 Instruct the cabin crew to open the flight deck door.

15 UTILITY power switches (both) Off

16 SHOULDER and FOOT HEATERS
selectors (all) OFF

17 Minimize flight deck lighting intensity.

18 During daylight:

Install the flight deck sun visors

Instruct the cabin crew to close the window shades

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

CABIN ALT AUTO

▼ Continued on next page ▼

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▼ CABIN TEMP continued ▼

OUTFLOW VLV L, R
ELEC UTIL BUS L, R

20 Set airspeed at 200 KIAS or less.

21 Instruct the cabin crew to open two doors:

Door 1L or 1R, then
Door 5L or 5R

Move the door mode select lever to MANUAL.
Rotate and secure the door operation handle in the 12 o'clock position.

22 **When** doors have been secured open:

Set maximum range airspeed (COST INDEX 0),
or 300 KIAS, whichever is slower.

23 ALTN VENT

selector Move to
OPEN or CLOSE
as needed to adjust
the flight deck temperature

Note: If needed to increase the cabin temperature, these may be selected on:

- Utility power
- Foot heaters
- Other heat sources

If a further increase in cabin temperature is needed, pack 1 or pack 3 may be selected on temporarily.

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

24 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
Notes Checked
Autobrake ____
Landing data VREF____, Minimums____
Approach briefing Completed

Approach Checklist

Altimeters ____

Less than 10 minutes before landing

OUTFLOW VALVES

manual control Hold in CLOSE
until the outflow valve
indications show fully CLOSED
to assist in closing the cabin doors

When airspeed is at or below 200 KIAS:

Instruct the cabin crew to close the doors. Close
the forward door first.

Move the door mode select levers to
AUTOMATIC.

▼ Continued on next page ▼

▼ CABIN TEMP continued ▼

OUTFLOW VALVES
manual control Hold in OPEN
until the outflow valve
indications show fully OPEN

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps _____
■ ■ ■ ■

E/E CLNG CARD

Condition: A fault occurs in the equipment cooling
system.

■ ■ ■ ■

Intentionally
Blank

[] EQUIP COOLING

Condition: One of these occurs:

- On the ground, the ground exhaust valve is not in the commanded position
- With equipment cooling selector in NORM or STBY, one or more of these occur:
 - Airflow is insufficient
 - An overheat is sensed
 - Smoke is sensed
- With equipment cooling selector in OVRD, differential pressure for reverse flow cooling is not sufficient

1 Choose one:

◆ On the **ground**:

EQUIP COOLING selector STBY



◆ In **flight**:

►► **Go to step 2**

2 EQUIP COOLING selector OVRD

3 Pack HI FLOW switch ON

4 **Wait** 4 minutes.

▼ Continued on next page ▼

▼ EQUIP COOLING continued ▼

5 Choose one:

◆ EQUIP COOLING message **shows**:

Note: Avionics/electronic equipment and displays may become unreliable or fail.

Plan to land at the nearest suitable airport.



◆ EQUIP COOLING message is **blank**:

Reverse flow cooling is operating.

Note: When operating at low altitude and low cabin differential pressure, the EQUIP COOLING message will show again. Thirty minutes after the message shows, electronic equipment and displays may fail.



[] LANDING ALT

Condition: One of these occurs:

- The FMC does not supply a landing altitude
- The landing altitude is selected to the manual mode

- 1 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.
- 2 LDG ALT selector Set the
landing altitude



[] OUTFLOW VLV L, R

Condition: One of these occurs:

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

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

- 1 OUTFLOW VALVE MAN
switch (affected valve)ON
- 2 PACK switches Two packs ON,
one pack off
- 3 OUTFLOW VALVES
manual controlHold in CLOSE
until the outflow valve
indication shows fully closed



[] PACK 1, 3

Condition: One of these occurs:

- A pack controller fault
- A pack operation fault
- A pack overheat

- 1 Wait 2 minutes. This allows time for an overheat condition to cool.
- 2 PACK RST switch Push and hold for 1 second
- 3 **Wait** 2 minutes.
- 4 Choose one:
 - ◆PACK message is **blank**:
■ ■ ■ ■
 - ◆PACK message **shows**:
▶▶ **Go to step 5**
- 5 PACK switch (affected pack) Off
■ ■ ■ ■

[] PACK 2

Condition: One of these occurs:

- A pack 2 controller fault
- A pack 2 operation fault
- A pack 2 overheat
- A pack 2 shutdown and a cabin pressure relief valve is open

- 1 Wait 2 minutes. This allows time for an overheat condition to cool.
- 2 PACK RST switch Push and hold for 1 second
- 3 **Wait** 2 minutes.
- 4 Choose one:
 - ◆PACK 2 message is **blank**:
 ■ ■ ■ ■
 - ◆PACK 2 message **shows**:
 ▶▶ **Go to step 5**
- 5 PACK 2 switch Off
 ■ ■ ■ ■

Intentionally
Blank

[] PACK 1+2+3

914

Condition: All packs are inoperative.

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

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 SUPRNMRY OXY switch Push to ON and hold for 1 second
- 4 Do **not** accomplish the following checklist:
CABIN ALTITUDE
- 5 Without delay, start a descent to the lowest safe altitude or 14,000 feet, whichever is higher.
To descend:
Move the thrust levers to idle
Extend the speedbrakes
Descend at Vmo/Mmo
- 6 Plan to land at the nearest suitable airport.
- 7 PACK RST switch Push and hold for 1 second
- 8 **Wait** 2 minutes unless the PACK 1+2+3 message shows again.

▼ Continued on next page ▼

▼ **PACK 1+2+3 continued** ▼

9 Choose one:

◆ **PACK 1+2+3 message is blank:**



◆ **PACK 1+2+3 message shows:**

When at level off:

►► **Go to step 10**

10 **OUTFLOW VALVES MAN**

switches (both) ON

Use momentary actuation of the
outflow valves manual control.

11  **OUTFLOW VALVES**

manual control Move to OPEN
until the outflow valve
indications show fully OPEN
to depressurize the airplane

12 **When** differential pressure is less than 1 psi:

ALTN VENT switch ON

13 **Wait** 20 seconds.

▼ **Continued on next page** ▼

▼PACK 1+2+3 continued ▼

14 Choose one:

◆ALTN VENT ON message is **blank**:

ALTN VENT

selector Move to OPEN
and hold for 15 seconds▶▶ **Go to step 15**◆ALTN VENT ON message **shows**:▶▶ **Go to step 15**15 If supernumeraries are on board, instruct them to
open the flight deck curtain.

16 UTILITY power switches (both). Off

17 SHOULDER and FOOT HEATERS

selectors (all). OFF

18 Minimize flight deck lighting intensity.

19 During daylight:

Install the flight deck sun visors

Instruct the supernumeraries to close the
window shades

20 ALTN VENT

selector Move to
OPEN or CLOSE
as needed to adjust
the flight deck temperature

▼ Continued on next page ▼

▼PACK 1+2+3 continued ▼

Note: If needed to increase the flight deck temperature, these may be selected on:

- Utility power
- Foot heaters
- Other heat sources

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

CABIN ALT AUTO

OUTFLOW VLV L, R

ELEC UTIL BUS L, R



[] PACK 1+2+3

806

Condition: All packs are inoperative.

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

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 PASS OXYGEN switch Push to ON and hold for 1 second
- 4 Do **not** accomplish the following checklist:
CABIN ALTITUDE
- 5 Without delay, start a descent to the lowest safe altitude or 10,000 feet, whichever is higher.
To descend:
Move the thrust levers to idle
Extend the speedbrakes
Descend at Vmo/Mmo
- 6 Plan to land at the nearest suitable airport.
- 7 PACK RST switch Push and hold for 1 second
- 8 **Wait** 2 minutes unless the PACK 1+2+3 message shows again.

▼ Continued on next page ▼

▼ **PACK 1+2+3 continued** ▼

9 Choose one:

◆ **PACK 1+2+3 message is blank:**



◆ **PACK 1+2+3 message shows:**

When at level off:

►► **Go to step 10**

10 **OUTFLOW VALVES MAN**

switches (both) ON

Use momentary actuation of the
outflow valves manual control.

11  **OUTFLOW VALVES**

manual control Move to OPEN
until the outflow valve
indications show fully OPEN
to depressurize the airplane

12 **When** differential pressure is less than 1 psi:

ALTN VENT switch ON

13 **Wait** 20 seconds.

▼ **Continued on next page** ▼

▼PACK 1+2+3 continued ▼

14 Choose one:

◆ALTN VENT ON message is **blank**:

ALTN VENT

selector Move to OPEN
and hold for 15 seconds

►► **Go to step 15**

◆ALTN VENT ON message **shows**:

►► **Go to step 15**

15 Instruct the cabin crew to open the flight deck door.

16 UTILITY power switches (both). Off

17 SHOULDER and FOOT HEATERS

selectors (all). OFF

18 Minimize flight deck lighting intensity.

19 During daylight:

Install the flight deck sun visors

Instruct the cabin crew to close the window shades

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

CABIN ALT AUTO

OUTFLOW VLV L, R

ELEC UTIL BUS L, R

21 Set airspeed at 200 KIAS or less.

▼ Continued on next page ▼

▼PACK 1+2+3 continued ▼

22 Instruct the cabin crew to open two doors:

Door 1L or 1R, then

Door 5L or 5R

Move the door mode select lever to MANUAL.
Rotate and secure the door operation handle in the 12 o'clock position.

23 **When** doors have been secured open:

Set COST INDEX 0 (maximum range airspeed),
or 300 KIAS, whichever is slower.

24 ALTN VENT selector Move to
OPEN or CLOSE
as needed to adjust
the flight deck temperature

Note: If needed to increase the flight deck or cabin temperature, these may be selected on:

- Utility power
- Foot heaters
- Other heat sources

Shoulder heaters are inoperative.

25 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

▼ Continued on next page ▼

▼PACK 1+2+3 continued ▼

Autobrake _____
Landing data VREF____, Minimums____
Approach briefing Completed

Approach Checklist

Altimeters _____

Less than 10 minutes before landing

OUTFLOW VALVES
manual control Hold in CLOSE
until the outflow valve
indications show fully CLOSED
to assist in closing the cabin doors

When airspeed is at or below 200 KIAS:

Instruct the cabin crew to close the doors. Close
the forward door first.

Move the door mode select levers to
AUTOMATIC.

OUTFLOW VALVES
manual control Hold in OPEN
until the outflow valve
indications show fully OPEN

Landing Checklist

Speedbrake Armed
Landing gear Down

▼ Continued on next page ▼

▼PACK 1+2+3 continued ▼

Flaps _____



[] PACK MODE 1, 2, 3

Condition: Pack is in the standby mode.

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



[] PRESS RELIEF

Condition: One or more pressure relief valves open with all packs on.

1 PACK 2 switch Off



[] TEMP CARGO HEAT

914

Condition: An aft lower cargo compartment overheat occurs.

1 LOWER LOBE TEMP AFT selector AUTO

2 LOWER LOBE TEMP AFT selector Set



Condition: An aft cargo compartment overheat occurs.

— 300 —

TEMP DEV CGO HI

Condition: The temperature in the main deck or lower cargo compartment is deviating higher than the set temperature.

Condition: The temperature in the aft lower cargo compartment is deviating higher than the set temperature.



TEMP DEV CGO LO**914**

Condition: The temperature in the main deck or lower cargo compartment is deviating lower than the set temperature.

806

Condition: The temperature in the aft lower cargo compartment is deviating lower than the set temperature.



[] TEMP ZONE L, R

Condition: One or more of these occur:

- A zone duct overheat
- Both trim air shutoff valves are failed closed

- 1 Wait 30 seconds.
- 2 PACK RST switch Push and hold for 1 second
- 3 Wait 5 minutes unless the TEMP ZONE message shows again.
- 4 Choose one:
 - ◆TEMP ZONE message is **blank**:
■ ■ ■ ■
 - ◆TEMP ZONE message **shows**:
►► **Go to step 5**
- 5 TRIM AIR switch (affected side) Off

Note: Some zones may still receive trim air for temperature control. Some zone temperatures are controlled by the pack outlet temperature alone and may not achieve the target temperature.



TRIM AIR L, R OFF

Condition: The trim air valve is commanded closed while a pack is on. Some zones may still receive trim air for temperature control. Some zone temperatures are controlled by pack outlet temperature alone and may not achieve the target temperature.



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Blank

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Blank

[] ANTI-ICE

Condition: All of these occur:

- An engine or wing anti-ice switch is ON
- TAT is above 12 degrees C
- Ice is not detected

- 1 ENGINE ANTI-ICE
switches (all) AUTO
- 2 WING ANTI-ICE switch AUTO



[] EAI VALVE 1, 2, 3, 4

Condition: Engine anti-ice valve is not in the commanded position.

1 Choose one:

◆ ENGINE ANTI-ICE switch is **ON**:

Note: Engine EAI valve is failed closed. Avoid icing conditions.



◆ ENGINE ANTI-ICE switch is **OFF**:

Note: Engine EAI valve is failed open. If conditions allow, avoid high thrust settings when TAT is above 10 degrees C.



◆ ENGINE ANTI-ICE switch is in **AUTO**:

►► **Go to step 2**

2 ENGINE ANTI-ICE switch
(affected engine) ON

▼ Continued on next page ▼

▼EAI VALVE 1, 2, 3, 4 continued▼

3 Choose one:

◆EAI VALVE message is **blank**:

Note: Engine EAI valve is failed open. If conditions allow, avoid high thrust settings when TAT is above 10 degrees C.



◆EAI VALVE message **shows**:

Note: Engine EAI valve is failed closed. Avoid icing conditions.

**[] HEAT L, R TAT**

Condition: One of these occurs:

- The TAT probe heat is failed
- On the ground, the TAT probe is heated due to an air/ground logic failure

Note: Flight in icing conditions may result in unreliable performance calculations.

**[] HEAT P/S CAPT, F/O**

Condition: A pitot static probe heat is failed.

Note: Flight in icing conditions may result in unreliable flight instrument indications in the affected system.



[] HEAT P/S L, R AUX

Condition: A auxiliary pitot static probe heat is failed.

Note: Flight in icing conditions may result in unreliable flight instrument indications.



[] HEAT WINDOW L, R

Condition: Forward window heat is inoperative.

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

1 Choose one:

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

WINDOW HEAT switch
(affected window) Off

▶▶ **Go to the Window Damage Fwd L, R checklist on page 1.24**



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

▶▶ **Go to step 2**

2 WINDOW HEAT switch
(affected window). Off

3 WINDOW HEAT switch
(affected window). . . . Wait 10 seconds, then ON

▼ **Continued on next page** ▼

▼HEAT WINDOW L, R continued▼

4 **Wait** 15 seconds.

5 Choose one:

◆HEAT WINDOW message is **blank**:



◆HEAT WINDOW message **shows**:

WINDOW HEAT switch
(affected window) Off

The window is defogged by the
backup system.



Ice Crystal Icing

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

- Amber or red weather radar returns below the airplane
- Appearance of liquid water on the windshield at temperatures too cold for rain (the sound is different than rain)
- The autothrottle is unable to maintain the selected airspeed
- TAT indication on EICAS stays near 0°C
- Abnormal engine vibration indications without other abnormal engine indications

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

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

Note: TAT probe icing can cause the reference N1 indicators to decrease while flying at a constant altitude and airspeed.

- 1 Minimize time above amber and red weather radar returns. If conditions allow, exit the ice crystal icing conditions.

▼ Continued on next page ▼

▼ Ice Crystal Icing continued ▼

2 Choose one:

◆ Autothrottle response **or** TAT indication is normal:

▶▶ **Go to step 5**

◆ Autothrottle is **unable** to maintain the selected airspeed **and** TAT indication stays near 0°C:

▶▶ **Go to step 3**

3 A/T ARM switch OFF

4 Thrust levers (all) Set to maintain airspeed and airplane flight path

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

Reference N1 indicators and reference N1.

TAS, TAT, SAT, ECON SPD, and LRC.

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

The autothrottle may be re-engaged, if needed.



▼ Continued on next page ▼

▼ Ice Crystal Icing continued ▼**Additional Information**

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

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

An erroneous TAT indication can occur as a result of ice crystals blocking the sensor. The erroneous indication can last from one minute to more than 20 minutes. TAT normally should increase approximately 2 degrees Celsius per 1,000 feet of descent.

[] ICE DETECTORS

Condition: The ice detectors are failed.

Note: Run the engine and wing anti-ice systems manually. Select ON to run the anti-ice system. Select AUTO when anti-ice is not needed.

**ICING**

Condition: Ice is detected and an engine or wing anti-ice switch is OFF.



WAI INHIBITED

Condition: Wing anti-ice is commanded on but is inhibited because of one of the following:

- The airplane is on the ground
- In flight with the leading edge flaps extended

**WAI SWITCH OFF**

Condition: The wing anti-ice switch is OFF.



[] WAI VALVE LEFT

Condition: The left wing anti-ice valve is not in the commanded position.

- 1 WING ANTI-ICE switch ON
- 2 **Wait** 10 seconds.
- 3 Choose one:

◆ WAI VALVE LEFT message **shows**:

WING ANTI-ICE switch OFF

Note: The left wing anti-ice valve is failed closed. Do not use wing anti-ice. Avoid icing conditions.



◆ WAI VALVE LEFT message is **blank**:

Note: The left wing anti-ice valve is failed open. Leave the wing anti-ice switch ON.

After landing, push the engine 1 and engine 2 bleed air switches to off, and push the left isolation valve switch to off. This removes bleed air from the left wing anti-ice system and prevents heat damage to the wing leading edge.

After landing, if towing to the gate is required, move the demand pump 1 selector to AUX. This powers body gear steering.



[] WAI VALVE RIGHT

Condition: The right wing anti-ice valve is not in the commanded position.

- 1 WING ANTI-ICE switch ON
- 2 **Wait** 10 seconds.
- 3 Choose one:

◆ WAI VALVE RIGHT message **shows**:

WING ANTI-ICE switch OFF

Note: The right wing anti-ice valve is failed closed. Do not use wing anti-ice. Avoid icing conditions.



◆ WAI VALVE RIGHT message is **blank**:

Note: The right wing anti-ice valve is failed open. Leave the wing anti-ice switch ON.

After landing, push the engine 3 and engine 4 bleed air switches to off, and push the right isolation valve switch to off. This removes bleed air from the right wing anti-ice system and prevents heat damage to the wing leading edge.



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Blank

AUTOPILOT

Condition: One or more of these occur:

- The autopilot is in a degraded mode
- The engaged roll mode is failed
- The engaged pitch mode is failed

**AUTOPILOT DISC**

Condition: All autopilots are disengaged.

**AUTOTHROT DISC**

Condition: The autothrottle is disconnected.

**NO AUTOLAND**

Condition: The autoland system is not available.

**NO AUTOLND GLS**

Condition: The autoland system is not available for a GLS approach.



NO AUTOLND ILS

Condition: The autoland system is not available for an ILS approach.

**NO LAND 3**

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

**NO LAND 3 GLS**

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

**NO LAND 3 ILS**

Condition: The autoland system does not have redundancy for a triple channel autoland on an ILS approach.



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DATALINK LOST

Condition: The ACARS datalink is temporarily lost.

**DATALINK SYS**

Condition: The ACARS datalink is failed and not available.

**HF DATA**

Condition: ACARS data communication through the selected HF radio is not available.



[] RADIO TRANSMIT

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

Objective: To identify and isolate the stuck microphone.

- 1 Transmitter select switches
(all audio select panels) FLT interphone
This deselects radios and stops radio transmissions.
- 2 The microphone or interphone with the stuck switch continuously transmits on flight interphone.
- 3 The associated audio select panel should stay on flight interphone. All other audio select panels may be used normally.

**SATCOM**

Condition: The SATCOM system is failed.

**SATCOM DATA**

Condition: ACARS data communication through the SATCOM system is not available.



SATCOM VOICE

Condition: SATCOM voice communication is not available. ACARS data communication through SATCOM is available.

**SATVOICE LOST**

Condition: SATCOM voice communication is temporarily lost.



Intentionally
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Intentionally
Blank

[] BAT DISCH APU

Condition: The APU battery is discharging.

Note: The APU battery can provide power to the APU standby bus for a minimum of 30 minutes.

**[] BAT DISCH MAIN**

Condition: The main battery is discharging.

Note: The main battery can provide power to the main standby bus for a minimum of 30 minutes.

**BATTERY OFF**

Condition: The battery switch is OFF.

**DRIVE DISC 1, 2, 3, 4**

Condition: Engine generator drive is disconnected.



[] ELEC AC BUS 1

Condition: AC bus 1 is not powered.

Objective: To reset the generator and then the bus tie.

Attempt only one reset per flight.

1  GEN CONT 1 switch Off, then ON

2 Choose one:

◆ ELEC AC BUS 1 message **shows**:

▶▶ **Go to step 3**

◆ ELEC AC BUS 1 message is **blank**:

▶▶ **Go to step 5**

3 Do not attempt to close the bus tie.

Note: Avoid icing conditions. Flight in icing conditions can result in unreliable captain's flight instrument indications. The right auxiliary pitot static probe heat is inoperative.

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

HEAT P/S R AUX

ELEC UTIL BUS L



Attempt only one reset per flight.

5  BUS TIE 1 switch Off, then AUTO

▼ **Continued on next page** ▼

▼ ELEC AC BUS 1 continued ▼

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

ELEC BUS ISLN 1



[] ELEC AC BUS 2

Condition: AC bus 2 is not powered.

Objective: To reset the generator and then the bus tie.

Attempt only one reset per flight.

1  GEN CONT 2 switch Off, then ON

2 Choose one:

◆ ELEC AC BUS 2 message **shows**:

►► **Go to step 3**

◆ ELEC AC BUS 2 message is **blank**:

►► **Go to step 5**

3 Do not attempt to close the bus tie.

Note: Avoid icing conditions. Flight in icing conditions can result in unreliable first officer's flight instrument indications.

Note: Inoperative Items

Left wing trailing edge flap indications inop

Expect all flaps to move in the primary mode.

First officer's pitot static probe heat inop

Avoid icing conditions.

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

HEAT P/S F/O



▼ Continued on next page ▼

▼ ELEC AC BUS 2 continued ▼

Attempt only one reset per flight.

5  BUS TIE 2 switch. Off, then AUTO

6 Do **not** accomplish the following checklist:
ELEC BUS ISLN 2

7 Choose one:

◆ FUEL PRESS CTR L, FUEL OVRD 2 FWD, **or** FUEL OVRD 3 FWD message **shows**:

Reset the affected fuel pump switch to restore fuel pump operation.

■ ■ ■ ■

◆ FUEL PRESS CTR L, FUEL OVRD 2 FWD, **and** FUEL OVRD 3 FWD messages are **blank**:

■ ■ ■ ■

[] ELEC AC BUS 3

Condition: AC bus 3 is not powered.

Objective: To reset the generator and then the bus tie.

Attempt only one reset per flight.

1  GEN CONT 3 switch Off, then ON

2 Choose one:

◆ ELEC AC BUS 3 message **shows**:

►► **Go to step 3**

◆ ELEC AC BUS 3 message is **blank**:

►► **Go to step 5**

3 Do not attempt to close the bus tie.

Note: Avoid icing conditions. Flight in icing conditions can result in unreliable captain's flight instrument indications. The captain's pitot static probe heat is inoperative.

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

HEAT P/S CAPT



Attempt only one reset per flight.

5  BUS TIE 3 switch Off, then AUTO

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

ELEC BUS ISLN 3

▼ **Continued on next page** ▼

▼ ELEC AC BUS 3 continued ▼

7 Choose one:

◆ FUEL PRESS CTR R message **shows**:

Reset the fuel pump switch to restore fuel pump operation.



◆ FUEL PRESS CTR R message is **blank**:



[] ELEC AC BUS 4

Condition: AC bus 4 is not powered.

Objective: To reset the generator and then the bus tie.

Attempt only one reset per flight.

1  GEN CONT 4 switch Off, then ON

2 Choose one:

◆ ELEC AC BUS 4 message **shows**:

►► **Go to step 3**

◆ ELEC AC BUS 4 message is **blank**:

►► **Go to step 5**

3 Do not attempt to close the bus tie.

Note: Avoid icing conditions. Flight in icing conditions can result in unreliable first officer's and standby flight instrument indications. The left auxiliary pitot static probe heat is inoperative.

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

HEAT P/S L AUX

ELEC UTIL BUS R



Attempt only one reset per flight.

5  BUS TIE 4 switch Off, then AUTO

▼ Continued on next page ▼

▼ ELEC AC BUS 4 continued ▼

6 Do **not** accomplish the following checklist:
ELEC BUS ISLN 4

7 Choose one:

◆ FUEL OVRD 2 AFT **or** FUEL OVRD 3 AFT message
shows:

Reset the affected fuel pump switch to
restore fuel pump operation.



◆ FUEL OVRD 2 AFT **and** FUEL OVRD 3 AFT
messages are **blank:**




[] ELEC BUS CONTROL

Condition: Both bus control units are failed. Automatic load shedding is not available.

Objective: To reset both bus control units to restore automatic load shedding capability.

Attempt only one reset of each switch per flight.

- 1  EXT PWR switches (both) Push and hold for 1 second
- 2 Wait 15 seconds.
- 3 Choose one:
 - ◆ ELEC BUS CONTROL message **shows**:
 ▶▶ **Go to step 4**
 - ◆ ELEC BUS CONTROL message is **blank**:
 ■ ■ ■ ■
- 4 UTILITY power switches (both). Off
 Multiple fuel pump messages show with utility power switches off.
- 5 Do **not** accomplish the following checklists:
 - ELEC UTIL BUS L, R
 - FUEL OVRD 2 FWD
 - FUEL OVRD 3 FWD
 - FUEL PUMP 2, 3 FWD ■ ■ ■ ■

[] ELEC BUS ISLN 1, 2, 3, 4

Condition: Bus tie is open.

Objective: To reset the bus tie.

Attempt only one reset per flight.

- 1  BUS TIE switch
(affected bus) Off, then AUTO




[] ELEC DRIVE 1, 2, 3, 4

Condition: One of these occurs:

- IDG oil pressure is low
- IDG oil temperature is high
- Generator control is open due to an uncorrectable generator frequency fault

Objective: To prevent damage to the IDG.

Action is irreversible.

- 1  Generator DRIVE DISC
switch (affected
generator) Confirm. Push
and hold
for 1 second

- 2 Do **not** accomplish the following checklist:
ELEC GEN OFF




[] ELEC GEN OFF 1, 2, 3, 4

Condition: Engine generator control is open.

Objective: To reset the generator.

Attempt only one reset per flight.

- 1  GEN CONT switch
(affected generator). Off, then ON
- ■ ■ ■

ELEC SSB OPEN

Condition: The split system breaker is failed open.

■ ■ ■ ■

[] ELEC UTIL BUS L, R

914

Condition: The utility bus is not powered.

Objective: To reset power.

Attempt only one reset per flight.

- 1  UTILITY power switch
(affected side). Off, then ON
- Multiple fuel pump messages show while
the switch is off.

Note: Leave the affected utility power switch ON.

■ ■ ■ ■

[] ELEC UTIL BUS L, R

806

Condition: One or more of these occur:

- The galley bus is not powered
- The utility bus is not powered
- The galley emergency power switch is off

Objective: To reset power.

1 The ELEC UTIL BUS message can be caused by a galley emergency power switch in the off position. If the galley power is restored by the cabin crew, the message will blank.

2 Choose one:


◆ ELEC UTIL BUS message is **blank**:



◆ ELEC UTIL BUS message **shows**:

►► **Go to step 3**

Attempt only one reset per flight.

3  UTILITY power switch
(affected side) Off, then ON

Multiple fuel pump messages show while the switch is off.

Note: Leave the affected utility power switch on.



STBY BUS APU

Condition: The APU standby bus is not powered.

**STBY BUS MAIN**

Condition: The main standby bus is not powered.



DO NOT USE FOR FLIGHT

747 Flight Crew Operations Manual

Non-Normal Checklists

Chapter NNC

Engines, APU

Section 7

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Aborted Engine Start 1, 2, 3, 4

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

- 1 Engine FUEL CONTROL switch
(affected engine) CUTOFF
- - - - -
- 2 Engine START switch
(affected engine) Pull
- 3 Motor the engine for 30 seconds.
- 4 Engine START switch
(affected engine) Push
- 5 Do **not** accomplish the following checklist:

ENG FUEL VLV



[] ENG 1, 2, 3, 4 AUTOSTART

Condition: Autostart did not start the engine.

- 1 FUEL CONTROL switch
(affected engine) CUTOFF

-
- 2 Engine START switch
(affected engine) Pull

- 3 Motor the engine for 30 seconds.

- 4 Engine START switch
(affected engine) Push

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

ENG FUEL VLV

ENG LIM EXCEED



[] ENG 1, 2, 3, 4 LIM EXCEED

Condition: An engine limit exceedance occurs.

- 1 Thrust lever
(affected engine) Confirm Retard
until the
ENG LIM EXCEED message
blanks or the thrust lever is at idle

-
- 2 Choose one:

◆ ENG LIM EXCEED message is **blank**:

▶▶ **Go to step 3**

◆ ENG LIM EXCEED message **shows**:

FUEL CONTROL switch
(affected engine) Confirm . . CUTOFF
Transponder mode selector TA ONLY



Check that RPM and EGT follow
thrust lever movement.

- 3  Thrust lever
(affected engine) Advance slowly

Note: Run the engine at a thrust setting that keeps
the engine indications within limits.

- 4 Transponder mode selector TA ONLY



[] ENG 1, 2, 3, 4 SURGE

Condition: An engine surge or stall that requires crew action is detected.

- 1 Thrust lever
(affected engine) Confirm Retard until
the ENG SURGE
message blanks or
the thrust lever is at idle

Check that RPM and EGT follow
thrust lever movement.

- 2  Thrust lever
(affected engine). Advance slowly

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

- 3 Transponder mode selector TA ONLY



Intentionally
Blank

Eng Svr Damage/Sep 1, 2, 3, 4

Condition: One or more of these occur in an engine:

- Airframe vibrations with abnormal engine indications
- Engine separation

- 1 Thrust lever
(affected engine) Confirm Idle
 - 2 FUEL CONTROL switch
(affected engine) Confirm CUTOFF
 - 3 Engine Fire switch
(affected engine) Confirm Pull
-

4 Choose one:

- ◆ High airframe vibration **occurs** and **continues** after the engine is shut down:

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.

▶▶ **Go to step 5**

- ◆ High airframe vibration does **not** occur or does **not** continue after the engine is shut down:

▶▶ **Go to step 5**

5 Transponder mode selector TA ONLY

▼ Continued on next page ▼

▼Eng Svr Damage/Sep 1, 2, 3, 4 continued▼

- 6 Plan to land at the nearest suitable airport.
- 7 Do **not** accomplish the following checklist:

ENG FAIL



Mult Eng Fail/Stall

Condition: One of these occurs on two or more engines:

- Engine flameout
- Engine indications are abnormal
- Engine indications are more than limits
- Abnormal engine noises are heard, possibly with airframe vibration
- There is no response to thrust lever movement or the response is abnormal
- Flames in the engine inlet or exhaust are reported

- 1 FUEL CONTROL switches
(affected engines) Confirm 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 discontinues the current
start attempt before EGT reaches the multiple
engine in-flight start limit (upper red line).

▼ Continued on next page ▼

▼ Mult Eng Fail/Stall continued ▼

4 Choose one:

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

▶▶ **Go to step 5**

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

PACK switches. Set a maximum
of one pack on

Engine START switch
(affected engines) Pull

▶▶ **Go to step 5**

5 Engine can accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stable idle can take up to two and a half minutes.

6 Do not interrupt the start attempts. Move the fuel control switch to CUTOFF only when no further start attempts are needed.



[] APU

Condition: One of these occurs:

- An APU automatic shutdown
- APU N1 RPM is more than 95% with the APU selector OFF

1 Choose one:

◆ APU selector is **OFF**:

APU fire switch Confirm Override
and pull



◆ APU selector is **ON**:

APU selector OFF

►► **Go to step 2**

2 Choose one:

◆ APU message is **blank**:

A restart may be attempted.



◆ APU message **shows**:

Note: Do not start the APU.



Intentionally
Blank

[] APU DOOR

Condition: The APU door is not in the commanded position.

Objective: One of the following:

- In flight, to ensure accurate fuel burn calculations
- On the ground, to attempt an APU restart

1 Choose one:

◆ In **flight**:

▶▶ Go to step 2

◆ On the **ground**:

▶▶ Go to step 3

2 Choose one:

◆ APU selector is **OFF**:

Apply the APU door open fuel burn penalty of 2%.



◆ APU selector is **ON**:

APU selector OFF



▼ Continued on next page ▼

▼ APU DOOR continued ▼

3 Choose one:

◆ APU selector is **OFF**:



◆ APU selector is **ON**:

▶▶ **Go to step 4**

4 APU selector OFF, then ON

5 **Wait** 1 minute.

6 Choose one:

◆ APU DOOR message is **blank**:

A restart may be attempted.



◆ APU DOOR message **shows**:

APU selector OFF

Note: Do not start the APU.



[] APU FUEL

Condition: One of the following occurs:

- Low pump pressure is detected when the pump is activated
- APU fuel valve is not in the commanded position

1 APU selector OFF

Note: Do not start the APU.



ENG 1, 2, 3, 4 CONTROL

Condition: An engine EEC system fault occurs.



[] ENG 1, 2, 3, 4 CORE AI

Condition: The engine booster anti-ice valve is failed closed.

1 Choose one:

◆ In **flight**:

Note: Avoid icing conditions.



◆ On the **ground**:



[] ENG 1, 2, 3, 4 EEC MODE

Condition: Engine EEC is in the alternate control mode.

Objective: To place all the EECs in alternate.

- 1 For each running engine, do these steps, one engine at a time:

Thrust lever Retard to mid position

ELEC ENG CONTROL switch ALTN

Note: Maximum thrust limiting is not available.

- 2 Autothrottle is available.
- 3 Do **not** accomplish the following checklists:

ENG EEC MODE (remaining)



[] ENG 1, 2, 3, 4 FAIL

Condition: One of these occurs on engine:

- Engine failure
- Engine flameout

1 Choose one:

◆ Thrust is lost on **only one** engine:

▶▶ **Go to step 2**

◆ Thrust is lost on **more than one** engine:

▶▶ **Go to the Mult Eng Fail/Stall checklist on page 7.8**



2 Choose one:

◆ **Airframe vibrations with abnormal engine indications** exist:

▶▶ **Go to the Eng Svr Damage/Sep 1, 2, 3, 4 checklist on page 7.6**

◆ An engine has **separated**:

▶▶ **Go to the Eng Svr Damage/Sep 1, 2, 3, 4 checklist on page 7.6**

◆ Airframe vibrations with abnormal engine indications do **not** exist **and** an engine has **not** separated:

▶▶ **Go to step 3**

3 Thrust lever
(affected engine) Confirm Idle

▼ **Continued on next page** ▼

▼ ENG 1, 2, 3, 4 FAIL continued ▼

- 4 **Wait** 30 seconds. The engine automatically attempts to relight. If N2 is above 30% and steadily increasing, the engine is starting.
- 5 Do **not** accomplish the following checklists:
- ELEC GEN OFF
 - ENG FUEL VLV
 - HYD PRESS ENG

- 6 Choose one:

◆ Engine is **starting**:

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



◆ Engine **stays failed**:

►► **Go to step 7**

- 7 FUEL CONTROL switch
(affected engine) Confirm CUTOFF
- 8 Transponder mode selector TA ONLY
- 9 A restart can be attempted if there is no abnormal airframe vibration.

▼ Continued on next page ▼

▼ ENG 1, 2, 3, 4 FAIL continued ▼

10 Choose one:

◆ Restart **is** needed:▶▶ **Go to step 11**◆ Restart is **not** needed:

11 The engines can accelerate to idle very slowly, especially at high altitudes.

12 Do not interrupt the start attempts. Move the fuel control switch to CUTOFF only when no further start attempts are needed.

13 Choose one:

◆ Crossbleed indication (X-BLD or XB) is **blank**:
 FUEL CONTROL switch
 (affected engine) RUN
▶▶ **Go to step 14**◆ Crossbleed indication (X-BLD or XB) **shows**:
 Engine START switch
 (affected engine) Pull

 FUEL CONTROL switch
 (affected engine) RUN
▶▶ **Go to step 14**

▼ Continued on next page ▼

▼ENG 1, 2, 3, 4 FAIL continued▼

14 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector.TA/RA



◆Engine stays **failed**:

FUEL CONTROL switch

(affected engine). . . . Confirm. . CUTOFF

Engine START switch

(affected engine).Push



[] ENG 1, 2, 3, 4 FUEL FILT

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

Note: Erratic engine operation and flameout may occur due to fuel contamination.



[] ENG 1, 2, 3, 4 FUEL VLV

Condition: One or more of these occur:

- Engine fuel valve is not in the commanded position
- Engine fuel spar valve is not in the commanded position

1 Choose one:

◆ In **flight**:



◆ On the **ground**:

Do not attempt to start the affected engine.

**ENG 1, 2, 3, 4 ICA SYS**

806

(914 ; SB installs IDS804 software)

Condition: The engine ice crystal anti-ice system is failed.

**ENG 1, 2, 3, 4 LIM PROT**

Condition: Engine EEC is in the alternate mode and command N1 is more than the limit.



[] ENG 1, 2, 3, 4 OIL FILT

Condition: Oil filter contamination can cause oil to bypass the engine oil filter.

- 1 Thrust lever
(affected engine) Confirm Retard
slowly until
the ENG OIL FILT message
blanks, or the thrust lever is at idle

- 2 Choose one:

◆ ENG OIL FILT message is **blank**:

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

Transponder mode selector. TA ONLY



◆ ENG OIL FILT message **shows**:

►► **Go to step 3**

- 3 FUEL CONTROL switch
(affected engine) Confirm CUTOFF
- 4 Transponder mode selector TA ONLY



[] ENG 1, 2, 3, 4 OIL PRESS

Condition: Engine oil pressure is low.

1 Choose one:

◆ Engine oil pressure is **above** the red line limit:◆ Engine oil pressure **is at or below** the red line limit:▶▶ **Go to step 2**

- 2 Thrust lever
(affected engine) Confirm Idle
- 3 FUEL CONTROL switch
(affected engine) Confirm CUTOFF
- 4 Transponder mode selector TA ONLY



[] ENG 1, 2, 3, 4 OIL TEMP

Condition: Engine oil temperature is high.

- 1 Thrust lever
(affected engine) Confirm Retard
slowly until
the ENG OIL TEMP message
blanks, or the thrust lever is at idle

- 2 Choose one:

◆ ENG OIL TEMP message is **blank**:

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

Transponder mode selector. . . . TA ONLY

▶▶ **Go to step 3**

◆ ENG OIL TEMP message **shows**:

▶▶ **Go to step 3**

- 3 Choose one:

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



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

▶▶ **Go to step 4**

- 4 FUEL CONTROL switch
(affected engine) Confirm CUTOFF

- 5 Transponder mode selector TA ONLY



ENG 1, 2, 3, 4 REV CMD

Condition: The engine reverse thrust lever is not in the down position in flight.

**[] ENG 1, 2, 3, 4 REV LIMTD**

Condition: A fault in the engine thrust reverser system limits reverse thrust.

Note: Engine thrust reverser will not deploy or reverse thrust will be limited to idle.

**ENG 1, 2, 3, 4 REVERSER**

Condition: On the ground, a fault occurs in the engine thrust reverser system.

**ENG 1, 2, 3, 4 RPM LIM**

Condition: The N2 red line limit restricts engine thrust.

**ENG 1, 2, 3, 4 SHUTDOWN**

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



[] ENG 1, 2, 3, 4 START VLV

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

- 1 Ground or in-flight start of engine using a bleed air source may be unsuccessful.
- 2 Engine START switch (affected engine) Push
- 3 Choose one:

◆ On the **ground**:



◆ In **flight**:

Increase airspeed until the crossbleed indication (X-BLD or XB) blanks.



ENG 1, 2, 3, 4 THRUST

Condition: One of these occurs on an engine:

- The thrust is more than the commanded thrust
- The thrust is less than the commanded thrust



[] ENG FL FILT MULT

Condition: Fuel contamination can cause fuel to bypass the engine fuel filter on more than one engine.

- 1 Plan to land at the nearest suitable airport.

Note: Erratic engine operation and flameout may occur on one or more engines due to fuel contamination.

**Eng In-Flight Start 1, 2, 3, 4**

Condition: An engine start is needed and all of these are true:

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

- 1 Engine can accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stable idle can take up to two and a half minutes.
- 2 Do not interrupt the start attempts. Move the fuel control switch to CUTOFF only when no further start attempts are needed.

▼ Continued on next page ▼

▼ Eng In-Flight Start 1, 2, 3, 4 continued ▼

3 Choose one:

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

FUEL CONTROL switch
(affected engine) RUN

►► **Go to step 4**

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

Engine START switch
(affected engine) Pull

FUEL CONTROL switch
(affected engine) RUN

►► **Go to step 4**

4 Choose one:

◆ Engine **starts** and runs normally:

Transponder mode selector. TA/RA



◆ Engine **fails** to start:

FUEL CONTROL switch
(affected engine) Confirm. . CUTOFF

Engine START switch
(affected engine) Push



[] ENG REV AIR/GND

Condition: The air/ground thrust reverser logic is failed.

Note: Thrust reverser in-flight protection is failed.
Reversers will deploy in flight if commanded.



[] STARTER CUTOUT 1, 2

Condition: Engine start valve does not close.

- 1 Engine START switch
(affected engine) Push
- 2 Choose one:
 - ◆ STARTER CUTOUT message is **blank**:

■ ■ ■ ■
 - ◆ STARTER CUTOUT message **shows**:

▶▶ Go to step 3
- 3 PACK 1 switch Off
- 4 L ISLN valve switch Off
- 5 ENGINE 1 and 2 BLEED air switches Off
- 6 **Wait** 20 seconds.
- 7 Choose one:
 - ◆ BLEED ISLN L message is **blank**:

▶▶ Go to step 12
 - ◆ BLEED ISLN L message **shows**:

▶▶ Go to step 8
- 8 R ISLN valve switch Off
- 9 APU BLEED air switch Off
- 10 PACK 2 switch Off

▼ Continued on next page ▼

▼ STARTER CUTOUT 1, 2 continued ▼

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

BLEED ISLN L

PACK 3

12 Choose one:

◆ On the **ground**:



◆ In **flight**:

►► **Go to step 13**

13 DEMAND PUMP 1 selector OFF

14 WING ANTI-ICE switch OFF

Note: Do not use wing anti-ice. Avoid icing conditions.

Leading edge flaps move in the secondary mode. Allow more time for leading edge flap operation.

When leading edge flaps are extended or retracted, a temporary leading edge flap asymmetry occurs. This causes a mild rolling moment.

Caution! Do not deploy the thrust reversers until the nose gear contacts the runway.

▼ Continued on next page ▼

▼ STARTER CUTOUT 1, 2 continued ▼

Note: After landing, if towing to the gate is required, move the demand pump 1 selector to AUX. This powers body gear steering.

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

FLAPS PRIMARY

HYD PRESS DEM 1

**Additional Information**

When the thrust reversers are deployed, the inboard and midspan leading edge flaps retract, resulting in a leading edge flap asymmetry. If the thrust reversers are deployed before the nose gear contacts the runway, immediate and significant control wheel input, approximately 25 to 65 degrees, may be needed to counter the leading edge flap asymmetry.

[] STARTER CUTOUT 3, 4

Condition: Engine start valve does not close.

1 Engine START switch
(affected engine) Push

2 Choose one:

◆ STARTER CUTOUT message is **blank**:



◆ STARTER CUTOUT message **shows**:

▶▶ **Go to step 3**

3 PACK 3 switch Off

4 R ISLN valve switch Off

5 ENGINE 3 and 4 BLEED air switches Off

6 **Wait** 20 seconds.

7 Choose one:

◆ BLEED ISLN R message is **blank**:

▶▶ **Go to step 12**

◆ BLEED ISLN R message **shows**:

▶▶ **Go to step 8**

8 L ISLN valve switch. Off

9 APU BLEED air switch Off

10 PACK 2 switch Off

▼ Continued on next page ▼

▼ **STARTER CUTOUT 3, 4 continued** ▼

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

BLEED ISLN R

PACK 1

12 Choose one:

◆ On the **ground**:



◆ In **flight**:

►► **Go to step 13**

13 DEMAND PUMP 4 selector OFF

14 WING ANTI-ICE switch OFF

Note: Do not use wing anti-ice. Avoid icing conditions.

Leading edge flaps move in the secondary mode. Allow more time for leading edge flap operation.

When leading edge flaps are extended or retracted, a temporary leading edge flap asymmetry occurs. This causes a mild rolling moment.

Caution! Do not deploy the thrust reversers until the nose gear contacts the runway.

▼ **Continued on next page** ▼

▼ STARTER CUTOUT 3, 4 continued ▼

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

FLAPS PRIMARY

HYD PRESS DEM 4

**Additional Information**

When the thrust reversers are deployed, the inboard and midspan leading edge flaps retract, resulting in a leading edge flap asymmetry. If the thrust reversers are deployed before the nose gear contacts the runway, immediate and significant control wheel input, approximately 25 to 65 degrees, may be needed to counter the leading edge flap asymmetry.

Intentionally
Blank

Two Engines Inop

Condition: A two engine landing is needed.

Note: The autothrottle is inoperative.

- 1 PACK switches One pack ON,
two packs off
- 2 Consider fuel jettison to improve performance.

Note: The landing commit point is gear extension.

WARNING! Go-around after passing the landing commit point is not recommended. Performance is not assured.

Do not use autoland.

Use flaps 25 and VREF 25 for landing and flaps 20 for go-around, if required.

Go-around procedure review:

If a go-around is absolutely required:

- Do not use TO/GA
- Set flaps 20, at the same time increase thrust as airspeed increases while maintaining directional control
- Retract the landing gear without delay
- Retract flaps to flaps 1 on schedule. Descent may be required
- Climb at VREF 30 + 60

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

4 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ Two Engines Inop continued ▼

Deferred Items

Descent Checklist

Recall Checked
Notes Checked
Autobrake ____
Landing data **VREF 25____, Minimums____**
Approach briefing Completed

Approach Checklist

Altimeters ____

Glideslope Alive

Select flaps 10.

Glideslope Intercept, or Final Descent Point

Extend the landing gear and select flaps 20.

Approaching 1,000 feet AGL

Select flaps 25 and center the rudder trim.

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps. **25**



Volcanic Ash

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

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

Objective: To exit the ash cloud and restart engines if needed.

Caution! Exit the volcanic ash as quickly as possible. Consider a 180 degree turn. Consider a descending turn.

- 1 Don the oxygen masks, if needed.
- 2 Establish crew communications.
- 3 Autothrottle disconnect switch Push

If conditions allow, run the engines at idle.

- 4  Thrust levers. Idle

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

- 5 PACK switches (all) ON
- 6 ENGINE ANTI-ICE switches (all) ON

This step increases bleed air extraction to improve engine stall margins.

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

7 WING ANTI-ICE switch ON

This step increases bleed air extraction to improve engine stall margins.

8 Choose one:

◆ **All engines run normally:**

▶▶ **Go to step 13**

◆ **Any engine is flamed out or stalled or EGT is rapidly approaching or exceeding limits:**

▶▶ **Go to step 9**

9 Engines can accelerate to idle very slowly, especially at high altitudes. If N2 is steadily increasing, and EGT stays within limits, the start is progressing normally.

10 Do not interrupt the start attempts. Move the fuel control switch to CUTOFF only when no further start attempts are needed.

11 FUEL CONTROL switch
(affected engines) Confirm . . . CUTOFF,
then RUN

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

12 Choose one:

◆ Crossbleed indication (X-BLD or XB) is **blank**:▶▶ **Go to step 13**◆ Crossbleed indication (X-BLD or XB) **shows**:PACK switches Set a maximum
of one pack onEngine START switch
(affected engines) Pull▶▶ **Go to step 13**13 Volcanic ash can cause abnormal system operation
such as:Engine malfunctions, increasing EGT, unusually
high EGT, compressor stall, or flameoutDecreased or complete loss of airspeed
indications

Equipment cooling system malfunctions

Cargo fire indications

14 Plan to land at the nearest suitable airport.



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[] 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 is **blank**:
 - ▶▶ **Go to step 3**
 - ◆ FIRE APU message **shows**:
 - Plan to land at the nearest suitable airport.
 - ▶▶ **Go to step 3**
- 3 Do **not** accomplish the following checklist:
APU



[] FIRE ENG 1, 2, 3, 4

Condition: Fire is detected in an engine.

- 1 Thrust lever
(affected engine) Confirm Idle
- 2 FUEL CONTROL switch
(affected engine) Confirm CUTOFF
- 3 Engine fire switch
(affected engine) Confirm Pull
- 4 **If** the FIRE ENG message stays shown:

Engine fire switch
(affected engine) Rotate to the stop
and hold for 1 second

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

Engine fire switch
(affected engine) Rotate to the
other stop and
hold for 1 second

-
- 5 Transponder mode selector TA ONLY
 - 6 Choose one:

◆ FIRE ENG message **stays shown**:

Plan to land at the nearest suitable airport.

►► Go to step 7

◆ FIRE ENG message **blanks**:

►► Go to step 7

▼ Continued on next page ▼

▼ FIRE ENG 1, 2, 3, 4 continued ▼

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

OVHT ENG NAC



Fire Eng Tailpipe 1, 2, 3, 4

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

- 1 FUEL CONTROL switch
(affected engine) 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 PACK switches (all) Off
- 5 Engine START switch
(affected engine) Pull
 - This allows the EEC to engage the starter below the maximum starter engagement speed.
- 6 Advise the tower.
- 7 **When** the tailpipe fire is extinguished:
 - Engine START switch
(affected engine) Push
 - ■ ■ ■

Smoke, Fire or Fumes

914

Condition: Smoke, fire, or fumes occur.

- 1 Diversion may be needed.
- 2 Don the oxygen masks, if needed.
- 3 Establish crew communications.
- 4 Instruct the supernumeraries to turn on the upper deck reading lights.
- 5 UTILITY power switches (both) Off
- 6 FLT DECK FAN switch Off
- 7 APU selector OFF
- 8 Passenger signs ON
- 9 MAIN DECK ALERT switch Push
- 10 **Anytime** the smoke or fumes become the greatest threat:

►► Go to the Smoke or Fumes Removal checklist on page 8.42

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

11 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 possible, remove power from the affected equipment by switch or circuit breaker in the flight deck or upper deck.

▶▶ **Go to step 12**

- ◆ Smoke or fumes **continue**:

▶▶ **Go to step 13**

12 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 step 24**

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

▶▶ **Go to step 13**

13 Divert to the nearest suitable airport while continuing the checklist.

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

- 14 Consider an immediate landing if the smoke, fire or fumes situation becomes uncontrollable.
- 15 Do not delay landing in an attempt to complete the following steps.
- 16 ISLN valve switches (both) Off
This isolates the left and right sides of the bleed air system.
- 17 PACK 2 switch Off
- 18 **Wait** 2 minutes unless the smoke or fumes are increasing. This allows time for the smoke or fumes to clear.
- 19 Choose one:
 - ◆ Smoke or fumes **continue**:
PACK 3 switch Off
Wait 2 minutes unless the smoke or fumes are increasing. This allows time for the smoke or fumes to clear.
▶▶ **Go to step 20**
 - ◆ Smoke or fumes are **decreasing**:
▶▶ **Go to step 24**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

20 Choose one:

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

PACK 3 switch ON

PACK 1 switch Off

R ISLN valve switch On

▶▶ **Go to step 21**◆ Smoke or fumes are **decreasing**:

L ISLN valve switch On

▶▶ **Go to step 21**

21 PACK 2 switch ON

22 **Wait** 2 minutes unless the smoke or fumes are increasing. This allows time for the smoke or fumes to clear.

23 Choose one:

◆ Smoke or fumes **continue**:

ISLN valve switches (both) On

PACK 1 switch ON

Consider an immediate landing.

▶▶ **Go to step 24**◆ Smoke or fumes are **decreasing**:▶▶ **Go to step 24**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

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

TEMP ZONE L, R

ELEC UTIL BUS L, R

FUEL OVRD 2, 3 FWD

FUEL PRESS CTR L

FUEL PUMP 2, 3 FWD

►► **Go to the Smoke or Fumes Removal checklist on page 8.42, if needed.**



Smoke, Fire or Fumes

806

Condition: Smoke, fire, or fumes occur.

- 1 Diversion may be needed.
- 2 Don the oxygen masks, if needed.
- 3 Establish crew and cabin communications.
- 4 Advise the cabin crew that the main cabin lighting will be turned off and the cabin night lighting will be turned on automatically.
- 5 UTILITY power switches (both). Off
- 6 APU selector OFF
- 7 Passenger signs ON
- 8 **Anytime** the smoke or fumes become the greatest threat:

►► Go to the Smoke or Fumes Removal checklist on page 8.46

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

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

▶▶ **Go to step 10**

- ◆ Smoke or fumes **continue**:

▶▶ **Go to step 11**

10 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 step 22**

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

▶▶ **Go to step 11**

11 Divert to the nearest suitable airport while continuing the checklist.

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

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

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

14 ISLN valve switches (both) Off

This isolates the left and right sides of the bleed air system.

15 PACK 2 switch Off

16 **Wait** 2 minutes unless the smoke or fumes are increasing. This allows time for the smoke or fumes to clear.

17 Choose one:

◆ Smoke or fumes **continue**:

PACK 3 switch Off

Wait 2 minutes unless the smoke or fumes are increasing. This allows time for the smoke or fumes to clear.

►► **Go to step 18**

◆ Smoke or fumes are **decreasing**:

►► **Go to step 22**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

18 Choose one:

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

PACK 3 switch ON

PACK 1 switch Off

R ISLN valve switch On

▶▶ **Go to step 19**

◆ Smoke or fumes are **decreasing**:

L ISLN valve switch On

▶▶ **Go to step 19**

19 PACK 2 switch ON

20 **Wait** 2 minutes unless the smoke or fumes are increasing. This allows time for the smoke or fumes to clear.

21 Choose one:

◆ Smoke or fumes **continue**:

ISLN valve switches (both) On

PACK 1 switch ON

Consider an immediate landing.

▶▶ **Go to step 22**

◆ Smoke or fumes are **decreasing**:

▶▶ **Go to step 22**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

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

TEMP ZONE L, R

ELEC UTIL BUS L, R

FUEL OVRD 2, 3 FWD

FUEL PRESS CTR L

FUEL PUMP 2, 3 FWD

►► **Go to the Smoke or Fumes Removal checklist on page 8.46, if needed.**

**BOTTLE LOW APU**

Condition: The APU fire bottle pressure is low.

**BTL LO L ENG A, B**

Condition: The left wing engine fire bottle A or B pressure is low.

**BTL LO R ENG A, B**

Condition: The right wing engine fire bottle A or B pressure is low.



CGO BTL DISCH

Condition: One or both rapid discharge cargo fire bottles have discharged.

**DET CARGO AFT, FWD**

Condition: Aft or forward lower cargo compartment smoke detection is inoperative.

**DET FIRE APU**

Condition: APU fire detection is inoperative.

**[] DET FIRE/OHT 1, 2, 3, 4**

Condition: Engine fire or overheat detection is inoperative.

Note: Fire or overheat alerts that occur are valid.

**DET MAIN DECK**

914

Condition: Main deck cargo compartment smoke detection is inoperative.



[] FIRE CARGO AFT

914

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

1 AFT CARGO FIRE

ARM switch Confirm ARMED

Two packs automatically shut down and the associated PACK messages show.

Warning! One pack must be operating to prevent excessive smoke accumulation on the flight deck.

2 Do **not turn off any pack switches.**

3 CARGO FIRE DEPRESS/DISCH

switch Push and hold
for 1 second

4 212 minutes of fire suppression are available.

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

5 Choose one:

◆ On the **ground**:

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



◆ In **flight**:

▶▶ **Go to step 6**

6 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.

7 LDG ALT selector Set 8000

8 Choose one:

◆ Airplane is **above** 37,000 feet:

Descend normally to 37,000 feet or below.

▶▶ **Go to step 9**

◆ Airplane is **at or below** 37,000 feet:

▶▶ **Go to step 9**

9 Maintain .80 Mach or higher, until the airplane is at
or below 29,000 feet.

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

- 10 Plan to land at the nearest suitable airport.
- 11 **When** leaving cruise altitude for landing:
LDG ALT switch Push to AUTO
- AUTO landing altitude mode shows on EICAS.
- 12 Do **not** accomplish the following checklists:
PACK 1, 2, 3
LANDING ALT

13 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data VREF____, Minimums____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

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

914

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

1 FWD CARGO FIRE

ARM switch Confirm ARMED

Two packs automatically shut down and the associated PACK messages show.

Warning! One pack must be operating to prevent excessive smoke accumulation on the flight deck.

2 Do not turn off any pack switches.

3 CARGO FIRE DEPRESS/DISCH

switch Push and hold
for 1 second

4 212 minutes of fire suppression are available.

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

5 Choose one:

◆ On the **ground**:

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



◆ In **flight**:

▶▶ **Go to step 6**

6 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.

7 LDG ALT selector Set 8000

8 Choose one:

◆ Airplane is **above** 37,000 feet:

Descend normally to 37,000 feet or below.

▶▶ **Go to step 9**

◆ Airplane is **at or below** 37,000 feet:

▶▶ **Go to step 9**

9 Maintain .80 Mach or higher, until the airplane is at
or below 29,000 feet.

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

10 Plan to land at the nearest suitable airport.

11 **When** leaving cruise altitude for landing:

LDG ALT switch Push to AUTO

AUTO landing altitude mode shows on
EICAS.

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

PACK 1, 2, 3

LANDING ALT

13 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

Autobrake ____

Landing data VREF____, Minimums____

Approach briefing Completed

Approach Checklist

Altimeters ____

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

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 AFT, FWD

806

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

- 1 Cargo fire ARM
switch Confirm ARMED
One pack automatically shuts down.

Warning! One or two packs must be operating to prevent excessive smoke accumulation in the cabin.

- 2 Do **not** turn off any pack switches.
- 3 CARGO FIRE DISCH
switch Push and hold
for 1 second
- 4 195 minutes of fire suppression are available.

▼ Continued on next page ▼

▼ FIRE CARGO AFT, FWD continued ▼

5 Choose one:

◆ On the **ground**:

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



◆ In **flight**:

▶▶ **Go to step 6**

6 LDG ALT switch Push to MAN
MAN landing altitude mode shows on EICAS.

7 LDG ALT selector Set 8000

8 Choose one:

◆ Airplane is **above** 37,000 feet:

Descend normally to 37,000 feet or below.

▶▶ **Go to step 9**

◆ Airplane is **at or below** 37,000 feet:

▶▶ **Go to step 9**

9 Maintain .80 Mach or higher, until the airplane is at
or below 29,000 feet.

▼ Continued on next page ▼

▼ FIRE CARGO AFT, FWD continued ▼

10 Plan to land at the nearest suitable airport.

11 **When** leaving cruise altitude for landing:

LDG ALT switch Push to AUTO

AUTO landing altitude mode shows on
EICAS.

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

- PACK 1, 2, 3
- LANDING ALT

13 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data VREF____, Minimums____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

▼ Continued on next page ▼

▼ FIRE CARGO AFT, FWD continued ▼

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 MAIN DECK

914

Condition: Smoke is detected in two or more main deck cargo zones.

Objective: To suppress the fire. To land as soon as possible.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 SUPRNMRY OXY switch Push to ON and hold for 1 second
- 4 Do **not** accomplish the following checklist:
CABIN ALTITUDE
- 5 MAIN DECK CARGO FIRE
ARM switch Confirm ARMED
Two packs automatically shut down and the associated PACK messages show.

Warning! One pack must be operating to prevent excessive smoke accumulation on the flight deck.

- 6 Do **not** turn off any pack switches.
- 7 CARGO FIRE DEPRESS/DISCH
switch Push and hold for 1 second

▼ Continued on next page ▼

▼ FIRE MAIN DECK continued ▼

8 Choose one:

◆ On the **ground**:

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



◆ In **flight**:

►► **Go to step 9**

- 9 Plan to land at the nearest suitable airport.
- 10 If the fire situation becomes uncontrollable, consider an immediate landing.
- 11 Distances in the following steps assume airport elevation at sea level and no wind. Adjust distances for actual conditions.

▼ Continued on next page ▼

▼ FIRE MAIN DECK continued ▼

12 Choose one:

- ◆ The distance to the nearest suitable airport is **75 nm or less**:

Start an expedited, uninterrupted descent to the lowest safe altitude or 3,000 feet AFE, whichever is higher.

►► **Go to step 13**

- ◆ The distance to the nearest suitable airport is **more than 75 nm**:

Expedite a climb or descent to 25,000 feet when conditions and terrain allow.

Plan to stay at 25,000 feet until approximately 75 nm from the runway.

At approximately 75 nm from the runway, start an expedited, uninterrupted descent to the lowest safe altitude or 3,000 feet AFE, whichever is higher.

►► **Go to step 13**

13 Descend at VMO/MMO with the speedbrakes extended.

Note: Maintain VMO/MMO until 15 nm from the runway.

14 Plan to level off 15 nm from the runway.

15 Do not delay the approach and landing.

16 AUTOBRAKE selector. MAX AUTO

▼ Continued on next page ▼

▼ FIRE MAIN DECK continued ▼

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

PACK 1, 2, 3

FIRE MN DK AFT, FWD, MID

18 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

Autobrake **MAX AUTO**

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.

Approximately 15 nm from the runway

Extend the speedbrakes, reduce speed, and configure for landing. Retract the speedbrakes, as needed.

▼ Continued on next page ▼

▼ FIRE MAIN DECK continued ▼

Landing Checklist

- Speedbrake Armed
- Landing gear Down
- Flaps _____



[] FIRE MN DK AFT, FWD, MID

914

Condition: Smoke is detected in the aft, fwd, or mid deck cargo zone.

Objective: To suppress the fire. To land as soon as possible.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 SUPRNMRY OXY switch Push to ON and hold for 1 second
- 4 If the FIRE MAIN DECK message shows, smoke is detected in other cargo zones. All needed actions are in this checklist.
- 5 Do **not** accomplish the following checklist:
CABIN ALTITUDE
- 6 MAIN DECK CARGO
FIRE ARM switch Confirm ARMED
Two packs automatically shut down and the associated PACK messages show.

Warning! One pack must be operating to prevent excessive smoke accumulation on the flight deck.

- 7 Do **not** turn off any pack switches.

▼ Continued on next page ▼

▼ FIRE MN DK AFT, FWD, MID continued ▼

- 8 CARGO FIRE DEPRESS/DISCH
switch Push and
hold for 1 second

- 9 Choose one:

◆ On the **ground**:

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



◆ In **flight**:

►► **Go to step 10**

- 10 Plan to land at the nearest suitable airport.
- 11 If the fire situation becomes uncontrollable,
consider an immediate landing.
- 12 Distances in the following steps assume airport
elevation at sea level and no wind. Adjust distances
for actual conditions.

▼ Continued on next page ▼

▼ FIRE MN DK AFT, FWD, MID continued ▼

13 Choose one:

- ◆ The distance to the nearest suitable airport is **75 nm or less**:

Start an expedited, uninterrupted descent to the lowest safe altitude or 3,000 feet AFE, whichever is higher.

►► **Go to step 14**

- ◆ The distance to the nearest suitable airport is **more than 75 nm**:

Expedite a climb or descent to 25,000 feet when conditions and terrain allow.

Plan to stay at 25,000 feet until approximately 75 nm from the runway.

At approximately 75 nm from the runway, start an expedited, uninterrupted descent to the lowest safe altitude or 3,000 feet AFE, whichever is higher.

►► **Go to step 14**

14 Descend at VMO/MMO with the speedbrakes extended.

Note: Maintain VMO/MMO until 15 nm from the runway.

15 Plan to level off 15 nm from the runway.

16 Do not delay the approach and landing.

17 AUTOBRAKE selector. MAX AUTO

▼ Continued on next page ▼

▼ FIRE MN DK AFT, FWD, MID continued ▼

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

- PACK 1, 2, 3
- FIRE MAIN DECK
- FIRE MN DK AFT, FWD, MID

19 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake **MAX AUTO**
- 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.

▼ Continued on next page ▼

▼ FIRE MN DK AFT, FWD, MID continued ▼

Approximately 15 nm from the runway

Extend the speedbrakes, reduce speed, and configure for landing. Retract the speedbrakes, as needed.

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps ____



[] FIRE WHEEL WELL

Condition: Fire is detected in a main wheel well.

- 1 **When** extending or retracting the landing gear, do not exceed the gear EXTEND limit speed (270K/.82M).
- 2 Landing gear lever DN
This attempts to remove and extinguish the fire source.
- 3 Plan to land at the nearest suitable airport.
- 4 Do not use FMC fuel predictions with gear extended.
- 5 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.
- 6 Choose one:
 - ◆ Gear **must be retracted** for airplane performance:

▶▶ **Go to step 7**
 - ◆ Gear does **not** need to be retracted for airplane performance:

■ ■ ■ ■
- 7 **When** the FIRE WHEEL WELL message blanks:
 Wait 20 minutes. This ensures the fire is extinguished.
 Landing gear lever UP

■ ■ ■ ■

[] OVHT ENG 1, 2, 3, 4 NAC

Condition: An overheat is detected in the engine.

- 1 ENGINE BLEED air switch
(affected engine) Off
- 2 Thrust lever
(affected engine) Confirm Retard
slowly until the
OVHT ENG NAC message
blanks, or the thrust lever is at idle
- 3 Choose one:
 - ◆ OVHT ENG NAC message is **blank**:

Note: Run the affected engine at a thrust setting that keeps the OVHT ENG NAC message blank.

Transponder mode selector. TA ONLY

■ ■ ■ ■
 - ◆ OVHT ENG NAC message **shows**:

▶▶ **Go to step 4**
- 4 FUEL CONTROL switch
(affected engine) Confirm CUTOFF
- 5 Transponder mode selector TA ONLY

■ ■ ■ ■

SMOKE CREW REST

Condition: Smoke is detected in the upper deck crew rest area.



[] SMOKE DR 5 REST

806

Condition: Smoke is detected in the door 5 crew rest area.

- 1 Pack HI FLOW switchON
- 2 Establish communications with the cabin crew.
- 3 Smoke in the door 5 crew rest area may cause the SMOKE IFE CLNG message to show.
- 4 Choose one:

◆ Smoke is **persistent**:

Plan to land at the nearest suitable airport.



◆ Smoke is **cleared** and the fire is visually confirmed to be **extinguished**:

►► **Go to step 5**

- 5 Instruct a cabin crew member to push the door 5 crew rest AIRFLOW RESET switch on the panel in the stairwell. This returns the door 5 crew rest airflow back to normal by resetting the door 5 crew rest supply and exhaust shut-off valves.



[] SMOKE IFE CLNG

806

Condition: Smoke is detected in the IFE cooling system.

- 1 IFE system automatically shuts down and configures to prevent smoke from spreading.



SMOKE LAVATORY

914

Condition: Smoke is detected in a lavatory.



[] SMOKE LAVATORY

806

Condition: Smoke is detected in a lavatory.

- 1 Pack HI FLOW switch ON



Smoke or Fumes Removal

914

Condition: Smoke or fumes removal is needed.

Objective: To remove smoke or fumes through the smoke override valve.

- 1 Do this checklist **only** when directed by the Smoke, Fire or Fumes checklist.
- 2 Do not delay landing in an attempt to complete the following steps.
- 3 EQUIP COOLING selectorOVRD
This attempts to discharge the smoke or fumes overboard by using the equipment cooling override mode.
- 4 Pack HI FLOW switchON

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

5 Choose one:

◆ Smoke or fumes **continue or** are **severe** and the smoke or fumes source is determined to be in the **upper deck**:

▶▶ **Go to step 6**

◆ Smoke or fumes **continue or** are **severe** and the smoke or fumes source is determined to be on the **flight deck**:

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.5 and do the remaining steps.**



◆ Smoke or fumes do **not** continue and are **not** severe:

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.5 and do the remaining steps.**



6 LDG ALT switch Push to MAN

MAN landing altitude mode shows on EICAS.

7 LDG ALT selector Set 8000

8 EQUIP COOLING selector. NORM

9 Start a descent. Level off at the lowest safe altitude or 8,500 feet, whichever is higher.

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

10 **When** at level off:

- OUTFLOW VALVES MAN
switches (both)ON
- OUTFLOW VALVES
manual control.Hold in OPEN
until the outflow valve
indications show fully open

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

- CABIN ALT AUTO
- EQUIP COOLING
- LANDING ALT
- OUTFLOW VLV L, R

►► **Go to the Smoke, Fire or Fumes checklist on page 8.5 and do the remaining steps.**



Intentionally
Blank

Smoke or Fumes Removal

806

Condition: Smoke or fumes removal is needed.

Objective: To remove smoke or fumes through the smoke override valve or a cabin door.

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

This prevents smoke or fumes from entering the flight deck.

- 4 EQUIP COOLING selector OVRD

This attempts to discharge the smoke or fumes overboard by using the equipment cooling override mode.

- 5 Pack HI FLOW switch ON
- 6 AFT CARGO TEMP selector OFF

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

7 Choose one:

◆ Smoke or fumes **continue or** are **severe** and the smoke or fumes source is determined to be in the **cabin**:

▶▶ **Go to step 8**

◆ Smoke or fumes **continue or** are **severe** and the smoke or fumes source is determined to be on the **flight deck**:

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.10 and do the remaining steps.**



◆ Smoke or fumes do **not** continue and are **not** severe:

▶▶ **Go to the Smoke, Fire or Fumes checklist on page 8.10 and do the remaining steps.**



8 LDG ALT switch Push to MAN

MAN landing altitude mode shows on EICAS.

9 LDG ALT selector Set 8000

10 EQUIP COOLING selector. NORM

11 Start a descent. Level off at the lowest safe altitude or 8,500 feet, whichever is higher.

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

12 **When** at level off:

- OUTFLOW VALVES MAN
switches (both)ON
- OUTFLOW VALVES
manual control.Hold in OPEN
until the outflow valve
indications show fully open

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

- CABIN ALT AUTO
- EQUIP COOLING
- LANDING ALT
- OUTFLOW VLV L, R

14 Set airspeed at 200 KIAS or less.

15 Choose one:

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

▶▶ **Go to step 16**
- ◆ Most of the smoke or fumes are in the **aft** section of the cabin:

▶▶▶ **Go to step 17**

16 Instruct the cabin crew to open two doors:

- Door 1L or 1R, then
- Door 5L or 5R

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

Move the door mode select lever to DISARM.
Rotate and secure the operating handle in the
12 o'clock position

▶▶ Go to step 18

17 Instruct the cabin crew to open door 2L or 2R only.

Move the door mode select lever to DISARM.
Rotate and secure the door operating handle in
the 12 o'clock position

18 **When** the smoke or fumes has cleared:

Instruct the cabin crew to close the doors. Close
the forward door first.

Move the door mode select lever to ARM.

**▶▶ Go to the Smoke, Fire or Fumes checklist on
page 8.10 and do the remaining steps.**



Intentionally
Blank

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Intentionally
Blank

[] AILERON OUTBD

Condition: One or both outboard ailerons are inoperative.

Note: When airspeed is less than 252K/.51M or flaps are extended, roll rate may be reduced.
Crosswind limit for landing is 20 knots.

**[] ELEVATOR FEEL**

Condition: An elevator feel system fault occurs.

Note: Column forces may be significantly higher than normal, particularly during landing flare.

The autopilot may disengage when pitch changes are commanded.

Do not attempt an autoland.

**FLAP RELIEF**

Condition: Flap load relief occurs.



[] FLAPS CONTROL

Condition: All flap control units are failed.

Objective: To use alternate flaps.

Note: Plan more time for alternate flap extension.

Use flaps 25 and VREF 25 for landing.

1 Choose one:

◆ Flap retraction is **needed**:

►► **Go to step 2**

◆ Flap retraction is **not** needed:

►► **Go to step 4**

2 ALTN FLAPS ARM switch ALTN

3 ALTN FLAPS selector RET

Monitor airspeed during retraction.

4 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

Autobrake ____

Landing data **VREF 25**____, **Minimums**____

Approach briefing Completed

▼ Continued on next page ▼

▼FLAPS CONTROL continued ▼

Approach Checklist

Altimeters _____

Alternate Flap Extension

ALTN FLAPS ARM switch ALTN

Alternate flaps selector EXT

Monitor airspeed during extension.

Landing Checklist

Speedbrake Armed

Landing gear Down

Flaps. **25**



[] FLAPS DRIVE

Condition: One of these occurs:

- A flap group failed to move in secondary mode
- A flap asymmetry or skew is detected
- A leading edge fault indication is detected

1 Do not use alternate flaps. Asymmetry and uncommanded motion protection are not provided in alternate mode.

2 Choose one:

◆ During flap **retraction**:

Continued flap retraction using the flap lever is possible if the trailing edge flaps are in the commanded position.

Do not exceed the flap placard speeds.

Do not exceed 20,000 feet until the flaps are UP.

Note: Do not use FMC fuel predictions with the flaps extended.

▶▶ **Go to step 3**

◆ During flap **extension**:

▶▶ **Go to step 3**

3 GND PROX FLAP OVRD switch OVRD

Note: Do not use autoland.

Use flaps 25 and VREF 30 + 25 for landing.
Use the flap lever to move the available flap groups.

▼ Continued on next page ▼

▼ FLAPS DRIVE continued ▼

4 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes Checked
- Autobrake ____
- Landing data **VREF 30+25____,**
Minimums____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake Armed
- Landing gear Down
- Flaps **25**



[] FLAPS PRIMARY

Condition: One or more flap groups primary mode is failed.

Note: Secondary flap extension from flaps 1 to 5 requires approximately 4 minutes. Plan more time for flap operation.



[] FLARE ASSIST

Condition: Landing flare assist is inoperative.

Note: Higher than normal column forces may be required during flare.
Use flaps 25 and VREF 25 for landing.

1 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 25____, Minimums____**
- Approach briefing Completed

Approach Checklist

- Altimeters ____

▼ FLARE ASSIST continued ▼

Landing Checklist

Speedbrake Armed
 Landing gear Down
 Flaps. **25**



FLIGHT CONTROLS

Condition: A flight control system fault occurs.



[] FLIGHT ENVELOPE

Condition: Pitch stability when approaching flight envelope boundaries is reduced.

Note: Avoid abrupt control inputs.

Maintain cruise altitude at or below the FMC optimum altitude.

Do not exceed LRC speed.



FLT CONT VLVS

Condition: One or more flight control shutoff valves are closed.



Jammed Flight Controls

Condition: A flight control is jammed or restricted in roll, pitch, or yaw.

- 1 Overpower the jammed or restricted flight control. Use maximum force, including a combined effort of both pilots, if needed.
- 2 Do not turn off any flight control hydraulic power switch.
- 3 Choose one:

◆ Freezing water **is** the suspected cause:

If conditions allow, consider a descent to warmer air and attempt to override the jammed or restricted control again.

►► **Go to step 4**

◆ Freezing water is **not** the suspected cause:

►► **Go to step 4**

- 4 Choose one:

◆ Controls are **normal**:



◆ Controls stay **jammed or restricted**:

Note: Use operative flight controls, trim, alternate trim, and thrust as needed for airplane control.

Do not use autoland.



Note: Do not use autoland.
Use flaps 25 and VREF 30 + 20 for landing.

Deferred Items

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF 30+20____,**
Minimums____

Approach briefing Completed

Altimeters _____

Speedbrake Armed
Landing gear Down
Flaps **25**



[] RUD RATIO DUAL

Condition: Both rudder ratio changers are failed.

Note: Use rudder only as required to maintain directional control or runway alignment during crosswind landings. Do not make excessive rudder inputs.

At high airspeed, avoid large or abrupt rudder inputs. At low airspeed, rudder control may be reduced.

Crosswind limits for landing:

- Manual landing: 10 knots
- Autoland, all engines running: 10 knots
- Autoland, one engine inoperative: 5 knots

**[] RUD RATIO SNGL**

Condition: One rudder ratio changer is failed.

Note: Use rudder only as required to maintain directional control or runway alignment during crosswind landings. Do not make excessive rudder inputs.

At high airspeed, avoid large or abrupt rudder inputs. At low airspeed, rudder control may be reduced.

Crosswind limit for landing is 20 knots.



[] SPEEDBRAKE AUTO

Condition: An automatic ground spoiler system fault occurs.

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

Extend the ground spoilers manually 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 ____



SPEEDBRAKES EXT

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
- Two or more thrust levers are not at idle

**[] SPOILERS**

Condition: One or more spoiler pairs are inoperative.

Note: Roll rate and spoiler capability are reduced.

Roll tendencies, yaw tendencies, or airframe buffet can indicate a spoiler failed in the extended position. Do not use FMC fuel predictions with a spoiler panel extended.

**STAB GREENBAND**

Condition: The nose gear pressure switch disagrees with the calculated stabilizer greenband. One or more of the following may be incorrect:

- Airplane loading
- Gross weight entry
- CG entry
- Takeoff flap entry
- Takeoff thrust entry



STAB TRIM 2, 3

Condition: One of these occurs:

- Automatic cutout of hydraulic system power to stabilizer trim
- Stabilizer trim cutout switch is in CUTOUT
- Trim is commanded and the actuator does not move




[] STAB TRIM UNSCHD

Condition: One of these occurs:

- Stabilizer movement without a signal to trim and automatic cutout does not occur
- The alternate stabilizer trim switches are used with an autopilot engaged

- 1 STAB TRIM CUTOUT switches (both) CUTOUT
- 2 Higher than normal control column force may be required to prevent unwanted pitch change.
- 3 Autopilot disengage switch Push

Immediately move the switch back to CUTOUT if unscheduled movement occurs.

- 4  STAB TRIM CUTOUT 2 switch AUTO
- 5 Trim may be available after a brief delay.
- 6 Choose one:

◆ Stabilizer movement is **normal**:

Continue normal operation.

Note: The stabilizer trim moves at half rate.

Center and right autopilots are available.



◆ **Unscheduled stabilizer** movement occurs:


▶▶ **Go to step 7**

- 7 STAB TRIM CUTOUT 2 switch CUTOUT

▼ Continued on next page ▼

▼ STAB TRIM UNSCHD continued ▼

Immediately move the switch back to CUTOUT if unscheduled movement occurs.

8  STAB TRIM CUTOUT 3 switch AUTO

9 Trim may be available after a brief delay.

10 Choose one:

◆ Stabilizer movement is **normal**:

Continue normal operation.

Note: The stabilizer trim moves at half rate.

Left and center autopilots are available.



◆ **Unscheduled stabilizer** movement occurs:

►► **Go to step 11**

11 STAB TRIM CUTOUT 3 switch CUTOUT

Note: Stabilizer trim is inoperative.

Do not use autoland.

Use flaps 25 and VREF 30 + 20 for landing.

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

Jammed Stab Landing

13 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ STAB TRIM UNSCHD 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 **25**



[] YAW DAMPER LWR, UPR

Condition: A yaw damper is inoperative because one of these occurs:

- A yaw damper system is failed
- None of the IRUs are aligned

Note: When landing flaps are selected, light airframe buffet may occur.



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TRACK 10.35

Airspeed Unreliable

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

Objective: To identify a reliable airspeed indication, if possible, or to continue the flight using the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

- 1 Autopilot disengage switch Push
- 2 A/T ARM switch OFF
- 3 F/D switches (both) OFF
- 4 Set the following gear up pitch attitude and thrust:
 Flaps extended 10° and 90% N1
 Flaps up 4° and 80% N1

Note: Incorrect aileron lockout and yaw damper motion may occur. Avoid abrupt control inputs.

- 5 The following are **reliable**:

Attitude

N1

Ground Speed

Radio Altimeter

▼ Continued on next page ▼

▼ Airspeed Unreliable continued ▼

Note: Overspeed warning and AIRSPEED LOW alerts may occur erroneously or simultaneously.

The Flight Path Vector and Pitch Limit Indicator may be unreliable.

- 6 Refer to the Flight with Unreliable Airspeed table in the Performance Inflight chapter and set the pitch attitude and thrust setting for the current airplane configuration and phase of flight.

- 7 **When** in trim and stabilized:

Cross check the PFD and standby airspeed indicators.

An airspeed indication that differs by more than 30 knots or .03 Mach from the airspeed shown in the table should be considered **unreliable**.

- 8 An ADC LEFT or ADC RIGHT message may indicate the **unreliable** side.

- 9 Choose one:

◆ **Reliable** airspeed **can** be determined:

►► **Go to step 10**

◆ **Reliable** airspeed **cannot** be determined:

Autopilots, autothrottle, and flight directors are not reliable.

►► **Go to step 16**

▼ Continued on next page ▼

▼ **Airspeed Unreliable** continued ▼

10 Choose one:

◆ **Captain's** airspeed is **reliable**:

CENTER AIR DATA selector ON R

Crosscheck PFD and standby airspeed indications.

▶▶ **Go to step 11**

◆ **First officer's** airspeed is **reliable**:

CENTER AIR DATA selector ON L

Crosscheck PFD and standby airspeed indications.

▶▶ **Go to step 12**

◆ Only the **standby** airspeed is **reliable**:

CENTER AIR DATA selector ON L

Crosscheck PFD and standby airspeed indications.

▶▶ **Go to step 13**

▼ **Continued on next page** ▼

▼ **Airspeed Unreliable continued** ▼

11 Choose one:

- ◆ First officer’s airspeed is **reliable**:
Autopilots, autothrottle, and flight directors are available.

■ ■ ■ ■
- ◆ First officer’s airspeed is **not** reliable:
First officer’s AIR DATA SOURCE selector L
First officer’s FLT DIR SOURCE selector L
FMC selector L
C and L autopilots, autothrottle, and flight director are available.

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ Airspeed Unreliable continued ▼

12 Choose one:

◆ Captain's airspeed is **reliable**:

Autopilots, autothrottle, and flight directors are available.



◆ Captain's airspeed is **not** reliable:

Captain's AIR DATA SOURCE selector . . . R

Captain's FLT DIR SOURCE selector R

FMC selector R

R autopilot, autothrottle, and flight director are available.



▼ Continued on next page ▼

▼ **Airspeed Unreliable continued** ▼

13 Choose one:

◆ Captain's airspeed is **reliable**:

First officer's AIR DATA SOURCE
selector L

First officer's FLT DIR SOURCE
selector L

FMC selector L

C and L autopilots, autothrottle, and flight
director are available.



◆ Captain's airspeed is **not** reliable:

▶▶ **Go to step 14**

14 Continue flight using only the standby flight
instruments.

15 Do not engage the A/P or A/T.

Note: Plan more time for alternate flap extension.
Use flaps 25 and VREF 25 for landing.

| ▶▶ **Go to step 18**

16 Set pitch attitude and thrust from the Flight with
Unreliable Airspeed table in the Performance
Inflight chapter for the airplane configuration and
phase of flight, as needed.

▼ **Continued on next page** ▼

▼ **Airspeed Unreliable** continued ▼

Note: Maintain visual conditions if possible.
Establish landing configuration early.
Radio altitude reference is available below 2,500 feet AGL.
Use electronic and visual glide slope indicators, where available, for approach and landing.
Do not use TO/GA for a go-around or missed approach.

Note: Plan more time for alternate flap extension.
Use flaps 25 and VREF 25 for landing.

17 Transponder mode selector TA ONLY

18 Choose one:

◆ Altitude is **reliable**:

▶▶ **Go to step 19**

◆ Altitude is **unreliable**:

Transponder mode
selector ALT RPTG OFF

▶▶ **Go to step 19**

19 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

▼ **Continued on next page** ▼

▼ **Airspeed Unreliable continued** ▼

Notes. Checked
Autobrake ____
Landing data **VREF 25____, Minimums____**
Approach briefing Completed

Approach Checklist

Altimeters ____

Flap Extension

Extend flaps normally until reaching flaps 10.
When flaps are at 10, continue extending flaps to 25
using alternate flaps:
 ALTN FLAPS ARM switch ALTN
 Alternate flaps selector EXT

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps **.25**
 ■ ■ ■ ■

▼ **Continued on next page** ▼

▼ Airspeed Unreliable continued ▼**Additional Information**

One or more of the following may indicate unreliable airspeed or Mach:

- Speed or altitude information not consistent with pitch attitude and thrust setting
- Airspeed or Mach failure flags
- PFD current airspeed box amber
- Blank or fluctuating airspeed displays
- Variation between the captain's and first officer's airspeed displays
- Amber line through one or more PFD flight mode annunciations
- Invalid minimum maneuvering speed
- Overspeed indications
- Simultaneous overspeed and stall warnings
- Radome damage or loss
- One or more of the following EICAS messages show:

ADC CENTER

ADC LEFT

ADC RIGHT

AILERON LOCKOUT

AIRSPEED LOW

OVERSPEED

RUD RATIO DUAL

RUD RATIO SNGL

[] IAS DISAGREE

Condition: The captain's and first officer's airspeed indications disagree by 5 knots or more.

Objective: To identify a reliable airspeed indication, if possible, or to continue the flight using the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

- 1 Autopilot disengage switch Push
- 2 A/T ARM switch OFF
- 3 F/D switches (both) OFF
- 4 Set the following gear up pitch attitude and thrust:
 - Flaps extended. 10° and 90% N1
 - Flaps up 4° and 80% N1



Note: Incorrect aileron lockout and yaw damper motion may occur. Avoid abrupt control inputs.

- 5 The following are **reliable**:
 - Attitude
 - N1
 - Ground Speed
 - Radio Altimeter

▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

Note: Overspeed warning and AIRSPEED LOW alerts may occur erroneously or simultaneously.

The Flight Path Vector and Pitch Limit Indicator may be unreliable.

- 6 Refer to the Flight with Unreliable Airspeed table in the Performance Inflight chapter and set the pitch attitude and thrust setting for the current airplane configuration and phase of flight.

- 7 **When** in trim and stabilized:

Cross check the PFD and standby airspeed indicators.

An airspeed indication that differs by more than 30 knots or .03 Mach from the airspeed shown in the table should be considered **unreliable**.

- 8 An ADC LEFT or ADC RIGHT message may indicate the **unreliable** side.

- 9 Choose one:

◆ **Reliable** airspeed **can** be determined:

▶▶ **Go to step 10**

◆ **Reliable** airspeed **cannot** be determined:

Autopilots, autothrottle, and flight directors are not reliable.

▶▶ **Go to step 16**

▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

10 Choose one:

◆ **Captain's** airspeed is **reliable**:

CENTER AIR DATA selector ON R

Crosscheck PFD and standby airspeed indications.

▶▶ **Go to step 11**◆ **First officer's** airspeed is **reliable**:

CENTER AIR DATA selector ON L

Crosscheck PFD and standby airspeed indications.

▶▶ **Go to step 12**◆ Only the **standby** airspeed is **reliable**:

CENTER AIR DATA selector ON L

Crosscheck PFD and standby airspeed indications.

▶▶ **Go to step 13**

▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

11 Choose one:

◆ First officer's airspeed is **reliable**:

Autopilots, autothrottle, and flight directors
are available.



◆ First officer's airspeed is **not** reliable:

First officer's AIR DATA SOURCE
selector L

First officer's FLT DIR SOURCE
selector L

FMC selector L

C and L autopilots, autothrottle, and flight
director are available.



▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

12 Choose one:

◆ Captain’s airspeed is **reliable**:
Autopilots, autothrottle, and flight directors
are available.
■ ■ ■ ■

◆ Captain’s airspeed is **not** reliable:
Captain’s AIR DATA SOURCE selector . . . R
Captain’s FLT DIR SOURCE selector R
FMC selector R
R autopilot, autothrottle, and flight director
are available.
■ ■ ■ ■

▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

13 Choose one:

◆ Captain's airspeed is **reliable**:

First officer's AIR DATA SOURCE
selector L

First officer's FLT DIR SOURCE
selector L

FMC selector L

C and L autopilots, autothrottle, and flight
director are available.



◆ Captain's airspeed is **not** reliable:

►► **Go to step 14**

14 Continue flight using only the standby flight instruments.

15 Do not engage the A/P or A/T.

Note: Plan more time for alternate flap extension.
Use flaps 25 and VREF 25 for landing.

►► **Go to step 18**

16 Set pitch attitude and thrust from the Flight with Unreliable Airspeed table in the Performance Inflight chapter for the airplane configuration and phase of flight, as needed.

▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

Note: Maintain visual conditions if possible.
Establish landing configuration early.
Radio altitude reference is available below 2,500 feet AGL.
Use electronic and visual glide slope indicators, where available, for approach and landing.

Note: Plan more time for alternate flap extension.
Use flaps 25 and VREF 25 for landing.

17 Transponder mode selectorTA ONLY

18 Choose one:

◆ Altitude is **reliable**:

▶▶ **Go to step 19**

◆ Altitude is **unreliable**:

Transponder mode selectorALT RPTG OFF

▶▶ **Go to step 19**

19 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
Notes. Checked
Autobrake _____

▼ Continued on next page ▼

▼ IAS DISAGREE continued ▼

Landing data **VREF 25**____, **Minimums**____

Approach briefing Completed

Approach Checklist

Altimeters _____

Flap Extension

Extend flaps normally until reaching flaps 10.

When flaps are at 10, continue extending flaps to 25 using alternate flaps:

ALTN FLAPS ARM switch ALTN

Alternate flaps selector EXT

Landing Checklist

Speedbrake Armed

Landing gear Down

Flaps. **25**



[] ADC CENTER

Condition: The center air data computer is failed.

Objective: To isolate the failed air data computer.

1 Choose one:

◆ADC **LEFT** and ADC **RIGHT** messages are **blank**:

Continue normal operation. The autopilot is available.

Note: Do not change center air data selector position for the rest of the flight.



◆ADC **LEFT** or ADC **RIGHT** message **shows**:

▶▶ **Go to step 2**

2 Autopilot disengage switch Push

3 Autothrottle disconnect switch Push

4 F/D switches (both) OFF

5 Choose one:

◆ADC **LEFT** message shows:

▶▶ **Go to step 6**

◆ADC **RIGHT** message shows:

▶▶ **Go to step 9**

6 Captain’s AIR DATA SOURCE selector R

▼ Continued on next page ▼

▼ ADC CENTER continued ▼

7 Engage the R autopilot, if needed.

Note: Airplane does not meet RVSM airspace requirements.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available

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

ADC LEFT



9 First officer's AIR DATA SOURCE

selector. L

10 Engage the L or C autopilot, if needed.

Note: Airplane does not meet RVSM airspace requirements.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available

▼ Continued on next page ▼

▼ ADC CENTER continued ▼

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

ADC RIGHT



[] ADC LEFT

Condition: The left air data computer is failed.

Objective: To isolate the failed air data computer and to restore air data to both PFDs.

- 1 Autopilot disengage switch Push
- 2 Autothrottle disconnect switch Push
- 3 F/D switches (both) OFF
- 4 Choose one:

◆ ADC CENTER message is **blank**:

▶▶ **Go to step 5**

◆ ADC CENTER message **shows**:

Do **not** accomplish the following checklist:

ADC CENTER

▶▶ **Go to step 7**

▼ Continued on next page ▼

▼ ADC LEFT continued ▼

- 5 Choose one:
- ◆ ADC RIGHT message is **blank**:
CENTER AIR DATA selector ON L
▶▶ **Go to step 6**
 - ◆ ADC RIGHT message **shows**:
CENTER AIR DATA selector ON R
Do **not** accomplish the following checklist:
ADC RIGHT
▶▶ **Go to step 7**

- 6 Choose one:
- ◆ ADC SEL CENTER message is **blank**:
Continue normal operation. The autopilot is available.
■ ■ ■ ■
 - ◆ ADC SEL CENTER message **shows**:
Do **not** accomplish the following checklist:
ADC SEL CENTER
▶▶ **Go to step 7**

- 7 Captain's AIR DATA SOURCE selector R
- 8 Engage the R autopilot, if needed.

▼ Continued on next page ▼

▼ ADC LEFT continued ▼

Note: Airplane does not meet RVSM airspace requirements.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available



[] ADC RIGHT

Condition: The right air data computer is failed.

Objective: To isolate the failed air data computer and to restore air data to both PFDs.

- 1 Autopilot disengage switch Push
- 2 Autothrottle disconnect switch Push
- 3 F/D switches (both) OFF
- 4 Choose one:

◆ADC CENTER message is **blank**:
▶▶ **Go to step 5**

◆ADC CENTER message **shows**:
Do **not** accomplish the following checklist:
ADC CENTER
▶▶ **Go to step 7**

▼ Continued on next page ▼

▼ ADC RIGHT continued ▼

5 Choose one:

◆ ADC LEFT message is **blank**:

CENTER AIR DATA selector ON R

▶▶ **Go to step 6**

◆ ADC LEFT message **shows**:

CENTER AIR DATA selector ON L

Do **not** accomplish the following checklist:

ADC LEFT

▶▶ **Go to step 7**

6 Choose one:

◆ ADC SEL CENTER message is **blank**:

Continue normal operation. The autopilot is available.



◆ ADC SEL CENTER message **shows**:

Do **not** accomplish the following checklist:

ADC SEL CENTER

▶▶ **Go to step 7**

7 First officer's AIR DATA SOURCE selector L

8 Engage the L or C autopilot, if needed.

▼ Continued on next page ▼

▼ ADC RIGHT continued ▼

Note: Airplane does not meet RVSM airspace requirements.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available

**[] ADC SEL CAPT**

Condition: The captain's air data source selector is failed.

Note: The captain's instruments cannot be changed to the desired source. Use indications on the first officer's or standby instruments that are confirmed to be correct.



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Blank

[] ADC SEL CENTER

Condition: The center air data selector is failed.

1 Choose one:

- ◆ CENTER AIR DATA selector is in **NORM**:
Continue normal operation. The autopilot is available.

■ ■ ■ ■
- ◆ CENTER AIR DATA selector is **ON L**:
▶▶ **Go to step 2**
- ◆ CENTER AIR DATA selector is **ON R**:
▶▶ **Go to step 4**

- 2 Captain’s AIR DATA SOURCE selector R
- 3 Engage the R autopilot, if needed.

Note: Airplane does not meet RVSM airspace requirements.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available



▼ Continued on next page ▼

▼ ADC SEL CENTER continued ▼

- 4 First officer's AIR DATA SOURCE selector L
- 5 Engage the L or C autopilot, if needed.

Note: Airplane does not meet RVSM airspace requirements.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available



[] ADC SEL F/O

Condition: The first officer's air data source selector is failed.

Note: The first officer's instruments cannot be changed to the desired source. Use indications on the captain's or standby instruments that are confirmed to be correct.



[] ALT DISAGREE

Condition: The captain’s and first officer’s uncorrected altitude indications disagree by more than 200 feet.

Note: Airplane does not meet RVSM airspace requirements.
Transponder altitude received by ATC may be unreliable.

- 1 Crosscheck PFD altitude indications and standby altitude. A PFD altitude that is more than 100 feet different than the standby altitude should be considered unreliable.
- 2 An ADC LEFT or ADC RIGHT message may indicate the unreliable side.
- 3 Choose one:
 - ◆ A reliable altitude **can** be determined:
 - ▶▶ **Go to step 5**
 - ◆ A reliable altitude **can not** be determined:
 - ▶▶ **Go to step 4**
- 4 Transponder mode selector ALT RPTG OFF

▼ Continued on next page ▼

▼ ALT DISAGREE continued ▼

Note: Do **not** use the flight path vector.

Additional approach briefing items:

- Maintain visual conditions if possible
- Establish landing configuration early
- Radio altitude reference is available below 2,500 feet AGL
- Use electronic and visual glideslope indicators, if available



5 Choose one:

◆ **Captain's** altitude is reliable:

CENTER AIR DATA selector ON R



◆ **First officer's** altitude is reliable:

CENTER AIR DATA selector ON L



◆ Only the **standby** altitude is reliable:

CENTER AIR DATA selector ON L

First officer's AIR DATA SOURCE
selector L



ATTITUDE

Condition: The captain's and first officer's attitude indications disagree.

**BARO DISAGREE**

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

**EFIS CONTROL L, R**

Condition: One of these occurs:

- The EFIS control panel is failed
- CDU control of the EFIS control panel is used

**EFIS/EICAS C/P**

Condition: One of these occurs:

- Both EFIS control panels and the display select panel are failed
- CDU control of both EFIS panels and the display select panel is used



EIU LEFT

Condition: The left EFIS/EICAS interface unit is failed.



[] HEADING

Condition: The captain's and first officer's selected IRS heading outputs disagree by 4 degrees or more.

- 1 The standby heading source is the left IRS and is not an independent source.
- 2 Captain's IRS SOURCE selector C
- 3 **Wait** 5 seconds.
- 4 Choose one:

◆ HEADING message is **blank**:



◆ HEADING message **shows**:

Captain's IRS SOURCE selector L

First officer's IRS SOURCE selector C



ISFD Use

Condition: ISFD airspeed or altitude indications must be used.

- 1 **When** using standby airspeed and altitude indications, refer to the ISFD Airspeed and Altitude Correction tables in the Performance Inflight chapter.

Note: On final approach in the landing configuration, airspeed correction is not needed. ISFD indicated airspeed should be VREF + 10.

**SNGL SOURCE RA**

Condition: Both primary flight displays use the same radio altimeter source.

**SOURCE SEL ADC**

Condition: Both primary flight displays use the same air data source.

**SOURCE SEL EIU**

Condition: Both pilots' displays use the same EFIS/EICAS interface unit source.



SOURCE SEL F/D

Condition: Both primary flight displays use the same flight director source.

**SOURCE SEL IRS**

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

**SOURCE SEL NAV**

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

**TAT DISAGREE**

Condition: Engine TAT and airplane TAT disagree.

**TRACK**

Condition: The captain's and first officer's selected track outputs disagree by 6 degrees or more.



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DO NOT USE FOR FLIGHT

747 Flight Crew Operations Manual

Non-Normal Checklists

Chapter NNC

Flight Management, Navigation

Section 11

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Intentionally
Blank

[] FMC

Condition: Both FMCs are failed.

1 Engage heading select or heading hold mode as needed.

2 **Wait** 1 minute.

3 Choose one:

◆ <FMC prompt is **shown**:

▶▶ **Go to step 4**

◆ <FMC prompt is **blank**:

▶▶ **Go to step 7**

4 On the PERF INIT page, verify or enter the following:

ZFW

RESERVES fuel

CRZ ALT

COST INDEX

5 Verify and execute the route.

6 Engage LNAV, VNAV, and the autothrottle as needed.



7 Captain's NAV SOURCE selectorCDU L or CDU C

8 First officer's NAV SOURCE selectorCDU R or CDU C

▼ **Continued on next page** ▼

▼ FMC continued ▼

Note: The autothrottle is inoperative. Manual control of thrust is needed.

914

(806 ; SB installs 2015 MAGVAR)

Note: If airplane position is one of these, set the heading reference switch to TRUE:

- North of 82 degrees N latitude
- North of 73 degrees N latitude between 80 degrees W and 170 degrees W
- South of 82 degrees S latitude
- South of 60 degrees S latitude between 120 degrees E and 160 degrees E

Note: Route modifications must be entered into all three CDUs. Enter any waypoints by latitude and longitude.

(Example: N3532.5W10434.3)

Manually tune the navigation radios through the CDUs.

The only pages available on the CDUs are IRS LEGS, IRS PROGRESS, and ALTN NAV RADIO.

▼ Continued on next page ▼

▼FMC continued▼

Note: Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF 30 + 100
FLAPS 1	VREF 30 + 60
FLAPS 5	VREF 30 + 40
FLAPS 10	VREF 30 + 20
FLAPS 20	VREF 30 + 10
FLAPS 25	VREF 25
FLAPS 30	VREF 30

9 LDG ALT switch Push to MAN

MAN landing altitude mode shows on EICAS.

10 LDG ALT selector Set the
landing altitude

Note: The VSD terrain display may show the incorrect terrain along the airplane track.

Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

When landing flaps are selected, airframe buffet may occur.

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

LANDING ALT

GND PROX SYS



[] FMC LEFT

Condition: The left FMC is failed.

- 1 FMC selector R
- 2 Re-engage the autothrottle.
- 3 NAV SOURCE selectors
(both) FMC R

Note: The VSD terrain display may show the incorrect terrain along the airplane track.



[] FMC RIGHT

Condition: The right FMC is failed.

- 1 FMC selector L
- 2 Re-engage the autothrottle.
- 3 NAV SOURCE selectors
(both) FMC L



FMC MESSAGE

Condition: An alert message is in the CDU scratchpad.



FMC RUNWAY DIS

Condition: The airplane is not on the FMC origin runway when takeoff is attempted.



[] GPS

Condition: Both GPS receivers are failed.

Note: The FMC uses inertial inputs only, unless radio updating is enabled.

ADS-B is inoperative.

1 Choose one:

◆ Radio updating is **allowed**:

Select the FMC NAV OPTIONS page.

DME UPDATE. ON

VOR UPDATE. ON

LOC UPDATE ON



◆ Radio updating is **not** allowed:



GPS LEFT

Condition: The left GPS receiver is failed.

1 XPNDR selector R



GPS RIGHT

Condition: The right GPS receiver is failed.

- 1 XPNDR selector L
- ■ ■ ■

[] ILS ANTENNA

Condition: An ILS receiver does not use the correct antenna.

Note: Threshold clearance may be reduced.



[] INSUFFCNT FUEL

Condition: FMC estimated fuel at the destination is less than the entered RESERVES fuel.

- 1 The INSUFFCNT FUEL message may be caused by a fuel leak.
- 2 A fuel leak should be suspected if one or more of the following are true:
 - The total fuel remaining on EICAS is less than the planned fuel remaining.
 - An engine has excessive fuel flow.
 - One main tank is abnormally low compared to the other tanks and to the expected fuel remaining in the tanks.

▼ Continued on next page ▼

▼INSUFFCNT FUEL continued▼

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

3 Choose one:

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

▶▶ **Go to the Fuel Leak checklist on page 12.18**



◆ There is **no** indication of a fuel leak:

**IRS AC CENTER, LEFT, RIGHT**

Condition: IRU AC power is failed.



[] IRS CENTER, LEFT, RIGHT

Condition: An IRS fault occurs.

- 1 Captain’s IRS SOURCE selectorSelect operable IRS source
- 2 First officer’s IRS SOURCE selectorSelect operable IRS source

Action is irreversible.


- 3  IRS mode selector (affected IRS) Confirm ATT

- 4 **When** straight and level constant airspeed flight has been maintained for a minimum of 30 seconds:
 ▶▶ **Go to step 5**

- 5 Choose one:
 - ◆ IRS message is **blank**:
 ▶▶ **Go to step 6**
 - ◆ IRS message **shows**:
 ▶▶ **Go to step 8**

- 6 Select POS INIT page.

Maintain straight and level flight while entering the heading.


- 7  Enter current heading on the SET IRS HEADING line.

▼ Continued on next page ▼

▼ IRS CENTER, LEFT, RIGHT continued ▼

Note: Update the SET IRS HEADING line periodically, while maintaining straight and level flight.



- Action is irreversible.
-
- 8  IRS mode selector
 (affected IRS) Confirm OFF



IRS DC CENTER, LEFT, RIGHT

Condition: IRU backup DC power is failed.



[] IRS MOTION

Condition: Airplane motion is detected while the IRS aligns.

- 1 Stop airplane motion to allow IRS alignment to complete.
- 2 **When** IRS alignment is complete:
 Select POS INIT page.
 Verify that the position is correct and re-enter if needed.



SNGL SOURCE GLS

Condition: Both primary flight displays use the same GLS source.



SNGL SOURCE ILS

Condition: Both primary flight displays use the same ILS source.



TRANSPONDER L, R

Condition: A transponder is failed.



[] UNABLE RNP

Condition: The actual navigational performance is not sufficient.

1 Choose one:

◆ On the **ground**:

Message may show with GPS disabled.

◆ In **flight**:

►► **Go to step 2**

2 Choose one:

◆ On a procedure or airway **that has an RNP alerting requirement**:

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

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

Verify position.



[] VNAV STEP CLIMB

Condition: A FMC-predicted or manually entered VNAV step climb point has sequenced and a climb has not started.

Objective: To update the VNAV profile so the FMC fuel and ETA predictions are accurate.

1 Choose one:

◆ Step climb is already **completed**:

▶▶ **Go to step 2**

◆ Step climb is needed **now**:

Start a step climb.



◆ Step climb is needed **later**:

Enter a planned step climb altitude on the RTE LEGS page.

▶▶ **Go to step 2**

◆ Step climb is **not** needed for the rest of the flight:

Enter a step size of 0 on the VNAV CRZ page.

▶▶ **Go to step 2**

2 Enter the current altitude as the cruise altitude on the VNAV CRZ page, even if it is already shown. This step updates FMC predictions.

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FUEL CTR CONFIG

Condition: The FUEL LOW CTR L or FUEL LOW CTR R message shows for 60 seconds.



[] FUEL DISAGREE

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

Objective: To decide if a fuel leak is suspected. To select the most accurate fuel value if a fuel leak is not suspected.

- 1 The FUEL DISAGREE message may be caused by a fuel leak.
- 2 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other tanks and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

▼ Continued on next page ▼

▼ FUEL DISAGREE continued ▼

3 Choose one:

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

▶▶ **Go to the Fuel Leak checklist on page 12.18, before completing this checklist.**

◆ There is **no** indication of a fuel leak:

▶▶ **Go to step 4**

4 Select PROGRESS page 2

5 TOTALIZER or
CALCULATED Select USE for
the most accurate value



[] FUEL FLOW ENG 1, 2, 3, 4

Condition: Engine fuel flow is abnormally high.

Objective: To confirm if there is an engine fuel leak. If confirmed, to shut down the engine.

- 1 A diversion may be needed.
- 2 MAIN pump switches (all)ON
- 3 CTR pump switches (both).Off
- 806
- 4 STAB pump switches (both).Off
- 5 FUEL X FEED valve switches (all)Off
- 6 OVRD 2 pump switches (both)Off
- 7 OVRD 3 pump switches (both)Off
- 8 Do **not** accomplish the following checklists:
 - FUEL IMBAL 1-4
 - FUEL IMBAL 2-3
 - FUEL IMBALANCE
 - FUEL OVD CTR L, R
 - FUEL OVRD 2, 3 OFF
 - 806
 - FUEL PMP STB L, R
 - X FEED CONFIG

9 **The following steps check for an engine fuel leak.**

▼ Continued on next page ▼

▼ FUEL FLOW ENG 1, 2, 3, 4 continued ▼

10 Record the main tank and reserve tank fuel quantities and the current time.

11 An engine fuel leak is confirmed if one or both of these are true:

Fuel spray is observed from an engine or strut

914

A change in fuel imbalance of 1,000 lbs within 30 minutes or less

806

A change in fuel imbalance of 500 kgs within 30 minutes or less

12 Choose one:

◆ Engine fuel leak is **confirmed**:

▶▶ **Go to step 13**

◆ Engine fuel leak is **not** confirmed:

Resume normal fuel management.



13 The following steps shut down the engine to stop an engine fuel leak.

14 Thrust lever

(affected engine) Confirm Idle

15 FUEL CONTROL switch

(affected engine) Confirm CUTOFF

16 Transponder mode selector TA ONLY

Note: Do **not** accomplish the Fuel Leak checklist.

▼ Continued on next page ▼

▼ FUEL FLOW ENG 1, 2, 3, 4 continued ▼

- 17 All remaining fuel can be used for the running engines.
- 18 Resume normal fuel management.
- 19 When any fuel imbalance message shows, do the appropriate checklist.

Note: The engine fuel leak indicated by the FUEL FLOW ENG message is a leak after the fuel flow sensors. The FUEL DISAGREE message will not show.



Intentionally
Blank

[] FUEL IMBAL 1-4**914**

Condition: There is a fuel imbalance of 3,000 lbs between main tanks 1 and 4.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

806

Condition: There is a fuel imbalance of 1,360 kgs between main tanks 1 and 4.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

- 1 If an engine has low fuel flow and unusual engine indications, the FUEL IMBAL 1-4 message may show due to engine damage instead of a fuel leak.
- 2 The FUEL IMBAL 1-4 message may be caused by a fuel leak or a fuel imbalance.
- 3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

▼ Continued on next page ▼

▼ FUEL IMBAL 1-4 continued ▼

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

4 Choose one:

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

▶▶ **Go to the Fuel Leak checklist on page 12.18, before completing this checklist.**

◆ There is **no** indication of a fuel leak:

▶▶ **Go to step 5**

5 Configure the fuel pumps and crossfeed valves as needed to balance fuel.

6 **When** fuel balancing is complete:

Resume normal fuel management.

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

FUEL M1 FWD+AFT

FUEL M4 FWD+AFT



[] FUEL IMBAL 2-3**914**

Condition: There is a fuel imbalance of 6,000 lbs between main tanks 2 and 3.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

806

Condition: There is a fuel imbalance of 2,720 kgs between main tanks 2 and 3.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

- 1 If an engine has low fuel flow and unusual engine indications, the FUEL IMBAL 2-3 message may show due to engine damage instead of a fuel leak.
- 2 The FUEL IMBAL 2-3 message may be caused by a fuel leak or a fuel imbalance.
- 3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

▼ Continued on next page ▼

▼ FUEL IMBAL 2-3 continued ▼

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

4 Choose one:

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

▶▶ **Go to the Fuel Leak checklist on page 12.18, before completing this checklist.**

◆ There is **no** indication of a fuel leak:

▶▶ **Go to step 5**

5 Configure the fuel pumps and crossfeed valves as needed to balance fuel.

6 **When** fuel balancing is complete:

Resume normal fuel management.

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

FUEL M2 FWD+AFT

FUEL M3 FWD+AFT



[] FUEL IMBALANCE**914**

Condition: After the FUEL TANK/ENG message shows, there is a longitudinal fuel imbalance of 6,000 lbs between the inboard main tanks, and the outboard main plus reserve tanks.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

806

Condition: After the FUEL TANK/ENG message shows, there is a longitudinal fuel imbalance of 2,720 kgs between the inboard main tanks, and the outboard main plus reserve tanks.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

- 1 If an engine has low fuel flow and unusual engine indications, the FUEL IMBALANCE message may show due to engine damage instead of a fuel leak.
- 2 The FUEL IMBALANCE message may be caused by a fuel leak or a fuel imbalance.
- 3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

▼ Continued on next page ▼

▼ FUEL IMBALANCE continued ▼

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

4 Choose one:

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

▶▶ **Go to the Fuel Leak checklist on page 12.18, before completing this checklist.**

◆ There is **no** indication of a fuel leak:

▶▶ **Go to step 5**

5 Configure the fuel pumps and crossfeed valves as needed to balance fuel.

6 **When** fuel balancing is complete:

Resume normal fuel management.

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

FUEL M1 FWD+AFT

FUEL M2 FWD+AFT

FUEL M3 FWD+AFT

▼ Continued on next page ▼

▼ FUEL IMBALANCE continued ▼

FUEL M4 FWD+AFT



FUEL JETT A, B

Condition: A fuel jettison system is failed.



[] FUEL JETT SYS

Condition: One of these occurs:

- The total fuel quantity is less than the FUEL TO REMAIN and a jettison nozzle valve is open
- Both fuel jettison systems are failed

- 1 FUEL JETTISON NOZZLE
valve switches (both) Off
- 2 FUEL JETTISON selector OFF
- 3 Resume normal fuel management.
- 4 Do **not** accomplish the following checklists:
Fuel Jettison
FUEL PRESS CTR L, R



Intentionally
Blank

Fuel Jettison

Condition: Fuel jettison is needed.

1 Choose one:

◆ Jettison to **maximum** landing weight is needed:
FUEL JETTISON
selector MLW (A or B)
▶▶ **Go to step 2**

◆ Jettison to **other than maximum** landing weight is needed:
FUEL JETTISON
selector SEL (A or B)
FUEL TO REMAIN selector Set
▶▶ **Go to step 2**

2 FUEL JETTISON NOZZLE
valve switches (both) ON

3 Fuel pump switches
(all tanks that have fuel) ON

914
This turns on center wing tank pump switches which may be off. This ensures override pumps 2 and 3 are on.

806
This turns on center wing tank and horizontal stabilizer tank pump switches which may be off. This ensures override pumps 2 and 3 are on.

▼ **Continued on next page** ▼

▼ Fuel Jettison continued ▼

- 4 Leave override pumps 2 and 3 on, even if the low pressure messages show.
- 5 If at any time a FUEL PRESS CTR message shows, push both center wing tank pump switches off.

806

- 6 If at any time a FUEL LO STAB message shows, push both stabilizer tank pump switches off.
- 7 If the FUEL TANK/ENG message shows, do **not** accomplish the fuel tank-to-engine normal procedure until after jettison is complete.
- 8 **During** jettison:

Do **not** accomplish the following checklists:

FUEL OVRD 2 AFT, FWD

FUEL OVRD 3 AFT, FWD

FUEL PRESS CTR L, R

- 9 **When** jettison is complete:

FUEL JETTISON NOZZLE

valve switches (both) Off

FUEL JETTISON selector OFF

Resume normal fuel management.



Fuel Leak

Condition: A fuel leak is suspected for the reasons listed in the Additional Information section of this checklist.

Objective: To confirm there is a fuel leak. If confirmed, to isolate the leak to one of the following:

- Engine
- Main/reserve tank
- Center wing tank
- 806**
- Stabilizer tank

- 1 A diversion may be needed.
- 2 MAIN pump switches (all)ON
- 3 CTR pump switches (both).Off
- 806**
- 4 STAB pump switches (both).Off
- 5 FUEL X FEED valve switches (all)Off
- 6 OVRD 2 pump switches (both)Off
- 7 OVRD 3 pump switches (both)Off
- 8 Do **not** accomplish the following checklists:
FUEL OVD CTR L, R
FUEL OVRD 2, 3 OFF
806
FUEL PMP STB L, R
X FEED CONFIG

▼ Continued on next page ▼

▼ Fuel Leak continued ▼**9 The following steps check for an engine/main tank/reserve tank leak.**

10 Record the main tank and reserve tank fuel quantities and the current time.

11 An engine/main tank/reserve tank leak is confirmed if one or both of these are true:

Fuel spray is observed from an engine, strut, or wing

914

A change in fuel imbalance of 1,000 lbs within 30 minutes or less

806

A change in fuel imbalance of 500 kgs within 30 minutes or less

12 Choose one:

◆ Engine/main tank/reserve tank leak is **confirmed:**

▶▶ **Go to step 13**

◆ Engine/main tank/reserve tank leak is **not** confirmed:

914

▶▶ **Go to step 30**

806

▶▶ **Go to step 31**

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

13 An engine/main tank/reserve tank leak is confirmed. The following steps shut down the engine to stop an engine fuel leak.

14 The affected engine is the one where the fuel quantity decreased faster.

15 Thrust lever
(affected engine) Confirm Idle

16 FUEL CONTROL switch
(affected engine) Confirm CUTOFF

17 Transponder mode selector TA ONLY

18 Choose one:

◆ FUEL QTY LOW message is **blank**:

►► **Go to step 19**

◆ FUEL QTY LOW message **shows**:

FUEL X FEED valve switches (all) On

This ensures that all fuel is available to the running engines.

Note: Do not accomplish the fuel tank-to-engine normal procedure.

►► **Go to step 19**

19 The following steps check for a main/reserve tank leak.

20 Select PROGRESS page 2.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

21 Record the totalizer and calculated fuel quantities, and the current time.

914

22 A main/reserve tank leak is confirmed if the difference between calculated and totalizer changes by 1,000 lbs within 30 minutes or less.

806

23 A main/reserve tank leak is confirmed if the difference between calculated and totalizer changes by 500 kgs within 30 minutes or less.

24 Choose one:

◆ Main/reserve tank leak is **confirmed**:

▶▶ **Go to step 25**

◆ Main/reserve tank leak is **not** confirmed:

The fuel leak was an engine fuel leak.

Note: All remaining fuel can be used for the running engine. Resume normal fuel management. If any fuel imbalance message shows, do the appropriate checklist.



25 The leak is not an engine fuel leak. The engine may be restarted.

26 For a long diversion, range may be improved by restarting the engine and climbing.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

27 Resume normal fuel configuration, except:
FUEL X FEED switch
(affected tank) Off

This ensures the engine uses as much fuel as possible from the leaking tank.

Note: Do not balance fuel.

28 Plan to land at the nearest suitable airport.

Note: If the FUEL QTY LOW message shows at any time, do the FUEL QTY LOW checklist.


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

- FUEL IMBAL 1-4
- FUEL IMBAL 2-3



914

30 Choose one:

- ◆ Center wing tank fuel quantity is **less than or equal to** 3,000 lbs:
Resume normal fuel management.

- ◆ Center wing tank fuel quantity is **greater than** 3,000 lbs:
▶▶ Go to step 32

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

806

31 Choose one:

- ◆ Center wing tank fuel quantity is **less than or equal to** 1,300 kgs:

Resume normal fuel management.



- ◆ Center wing tank fuel quantity is **greater than** 1,300 kgs:

► ► **Go to step 32**

32 The following steps check for a center wing tank leak.

33 CTR pump switches (both). ON

34 FUEL X FEED valve switches (all) ON

35 Select PROGRESS page 2.

36 Record the totalizer and calculated fuel quantities, and the current time.

914

37 A center wing tank leak is confirmed if the difference between calculated and totalizer changes by 1,000 lbs within 30 minutes or less.

806

38 A center wing tank leak is confirmed if the difference between calculated and totalizer changes by 500 kgs within 30 minutes or less.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

39 Choose one:

◆ Center wing tank leak is **confirmed**:

▶▶ **Go to step 40**

◆ Center wing tank leak is **not** confirmed:

914

Resume normal fuel management.



806

▶▶ **Go to step 45**

40 Continue to use all center wing tank fuel.

41 Resume normal fuel management.

42 Verify sufficient fuel is available in the main/reserve tanks to complete the flight.

43 Consider landing at the nearest suitable airport.

Note: If the FUEL DISAGREE message shows at any time, go to PROGRESS page 2 and select USE for the TOTALIZER fuel quantity.

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

FUEL DISAGREE



▼ Continued on next page ▼

▼ Fuel Leak continued ▼

806

45 Choose one:

◆ Both FUEL PMP STB messages are **blank**:

Resume normal fuel management.



◆ Any FUEL PMP STB message **shows**:

►► **Go to step 46**

46 **The following steps check for a stabilizer tank leak.**

47 STAB pump switches (both). ON

48 Select PROGRESS page 2.

49 Record the totalizer and calculated fuel quantities, and the current time.

50 A stabilizer tank leak is confirmed if the difference between calculated and totalizer changes by 500 kgs within 30 minutes or less.

51 Choose one:

◆ Stabilizer tank leak is **confirmed**:

►► **Go to step 52**

◆ Stabilizer tank leak is **not** confirmed:

Resume normal fuel management.



52 Continue to transfer stabilizer tank fuel.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

53 Resume normal fuel management.

54 Verify sufficient fuel is available in the center, main, and reserve tanks to complete the flight.

55 Consider landing at the nearest suitable airport.

Note: If the FUEL DISAGREE message shows at any time, go to PROGRESS page 2 and select USE for the TOTALIZER fuel quantity.

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

FUEL DISAGREE



Additional Information

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

- Visual observation of fuel spray
- Excessive engine fuel flow
- The total fuel quantity decreasing at an abnormal rate
- FUEL FLOW ENG message
- FUEL DISAGREE message
- INSUFFCNT FUEL message
- FUEL QTY LOW message
- FUEL IMBAL 1-4 message
- FUEL IMBAL 2-3 message
- FUEL IMBALANCE message

FUEL LO STAB L, R

806

Condition: The stabilizer tank quantity is 1,100 kgs or less with the pump switch ON.

**FUEL LOW CTR L, R**

914

Condition: One of these occurs:

- Before start, the center wing tank quantity is less than 17,000 lbs with the pump switch ON
- In climb, the center wing tank quantity is approximately 7,000 lbs with the pump switch ON
- In cruise, the center wing tank quantity is approximately 3,000 lbs with the pump switch ON

806

Condition: One of these occurs:

- Before start, the center wing tank quantity is less than 7,700 kgs with the pump switch ON
- In climb, the center wing tank quantity is approximately 3,200 kgs with the pump switch ON
- In cruise, the center wing tank quantity is approximately 1,300 kgs with the pump switch ON



[] FUEL M1, M4 FWD+AFT

Condition: Main forward and aft pump pressures are both low.

- 1 MAIN pump switches
(both affected pumps). Off
914

Note: The last 7,000 lbs of fuel in the affected main tank will be available only by suction feed.
806

Note: The last 3,200 kgs of fuel in the affected main tank are available only by suction feed.

- 2 Do **not** accomplish the fuel tank-to-engine normal procedure.
- 3 **When** the FUEL TANK/ENG message shows:
FUEL XFER MAIN 1 & 4 switch ON

This allows gravity transfer of fuel to main tanks 2 and 3. The FUEL XFER MAIN message may show during fuel transfer.

- 4 FUEL XFER RESERVE 1&4 switch AUTO
- 5 **When** all of these messages show:
FUEL OVRD 2 AFT
FUEL OVRD 2 FWD
FUEL OVRD 3 AFT
FUEL OVRD 3 FWD
▶▶ Go to step 6

▼ Continued on next page ▼

▼ FUEL M1, M4 FWD+AFT continued ▼

- 6 OVRD 2 pump switches (both) Off
- 7 OVRD 3 pump switches (both) Off
- 8 FUEL X FEED 1 and 4 valve switches. Off

This ensures affected main tank fuel is usable.
The FUEL PRESS ENG message shows. The
X FEED CONFIG message may show.

- 9 FUEL XFER MAIN 1 & 4 switch Off
- 10 Fuel in affected main tank is available only by
suction feed. Fuel feed from unaffected main tanks
is normal.

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

FUEL OVRD 2 AFT, FWD

FUEL OVRD 3 AFT, FWD

FUEL PRESS ENG (affected pumps)



[] FUEL M2, M3 FWD+AFT

Condition: Main forward and aft pump pressures are both low.

- 1 MAIN pump switches
(both affected pumps). Off
- 2 OVRD 2 pump switches (both) ON
- 3 OVRD 3 pump switches (both) ON
- 4 FUEL X FEED 1 and 4
valve switches On

914

Note: The last 7,000 lbs of fuel in the affected main tank are available only by suction feed.

806

Note: The last 3,200 kgs of fuel in the affected main tank will be available only by suction feed.

- 5 Do **not** accomplish the fuel tank-to-engine normal procedure.
- 6 **When** the FUEL TANK/ENG message shows:
FUEL X FEED 1 and 4 valve switches. Off
- 7 **When** all of these messages show:
FUEL OVRD 2 AFT
FUEL OVRD 2 FWD
FUEL OVRD 3 AFT
FUEL OVRD 3 FWD

▼ Continued on next page ▼

▼ FUEL M2, M3 FWD+AFT continued ▼

►► **Go to step 8**

- 8 OVRD 2 pump switches (both) Off
- 9 OVRD 3 pump switches (both) Off
- 10 FUEL X FEED valve switch
(affected tank) Off

This ensures affected main tank fuel is usable.
The FUEL PRESS ENG message shows. The
X FEED CONFIG message may show.

- 11 Fuel in affected main tank is available only by
suction feed. Fuel feed from unaffected main tanks
is normal.

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

FUEL OVRD 2 AFT, FWD

FUEL OVRD 3 AFT, FWD

FUEL PRESS ENG (affected pumps)



FUEL OVD CTR L, R**914**

Condition: The center wing tank pump switch is off and one of these occurs:

- On the ground, the center wing tank quantity is 17,000 lbs or more
- In cruise, the center wing tank quantity is 4,000 lbs or more

806

Condition: The center wing tank pump switch is off and one of these occurs:

- On the ground, the center wing tank quantity is 7,700 kgs or more
- In cruise, the center wing tank quantity is 1,800 kgs or more

**FUEL OVRD 2, 3 OFF**

Condition: An override pump switch is off, and fuel quantities are not in a tank-to-engine condition.



[] FUEL OVRD 2 AFT, FWD

Condition: The fuel override 2 pump pressure is low.

- 1 OVRD 2 pump switch (affected pump) Off
- 2 Choose one:

◆ **A single** OVRD pump in tank 2 is inoperative:



◆ **Both** OVRD pumps in tank 2 are inoperative:

►► **Go to step 3**

- 3 OVRD 2 pump switches (both) Off
- 4 OVRD 3 pump switches (both) Off
- 5 MAIN 1 pump switches (both) Off
- 6 MAIN 4 pump switches (both) Off
- 7 **When** the FUEL TANK/ENG message shows:

MAIN 1 pump switches (both) ON

MAIN 4 pump switches (both) ON

FUEL X FEED 1 and 4 valve switches Off

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

FUEL M1 FWD+AFT

FUEL M4 FWD+AFT



[] FUEL OVRD 3 AFT, FWD

Condition: The fuel override 3 pump pressure is low.

- 1 OVRD 3 pump switch (affected pump). Off
- 2 Choose one:

◆ **A single** OVRD pump in tank 3 is inoperative:



◆ **Both** OVRD pumps in tank 3 are inoperative:

►► **Go to step 3**

- 3 OVRD 3 pump switches (both) Off
- 4 OVRD 2 pump switches (both) Off
- 5 MAIN 1 pump switches (both) Off
- 6 MAIN 4 pump switches (both) Off
- 7 **When** the FUEL TANK/ENG message shows:

MAIN 1 pump switches (both) ON

MAIN 4 pump switches (both) ON

FUEL X FEED 1 and 4 valve switches. Off

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

FUEL M1 FWD+AFT

FUEL M4 FWD+AFT



FUEL PMP STB L, R

806

Condition: Both of these occur:

- Stabilizer tank quantity is 500 kgs or more
- The stabilizer pump switch is off



[] FUEL PRES STB L, R

806

Condition: The stabilizer fuel pump pressure is low.

1 Choose one:

◆ Stabilizer tank fuel quantity is **less than or equal to** 1,100 kgs:

▶▶ **Go to step 2**

◆ Stabilizer tank fuel quantity is **greater than** 1,100 kgs:

STAB pump switch
(affected pump). Off
■ ■ ■ ■

2 Choose one:

◆ **A single** stabilizer pump is inoperative:
■ ■ ■ ■

◆ **Both** stabilizer pumps are inoperative:

Note: Stabilizer tank fuel is unusable.
■ ■ ■ ■

Intentionally
Blank

[] FUEL PRESS CTR L, R

Condition: The center wing tank fuel pump pressure is low.

1 CTR pump switch
(affected pump) Off

2 Choose one:

◆ **Both** center wing tank fuel pumps are inoperative:

▶▶ **Go to step 3**

◆ **One** center wing tank fuel pump is inoperative:

▶▶ **Go to step 6**

3 MAIN 1 pump switches (both) ON

4 MAIN 4 pump switches (both) ON

Note: Center wing tank fuel is not available. Verify main and reserve tank quantity is sufficient.

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

FUEL PRESS CTR (for other side)

FUEL M1 FWD+AFT

FUEL M4 FWD+AFT



6 Override pumps 2 and 3 are commanded on by the center wing tank pump failure. Override pumps 2 and 3 return to armed after approximately five minutes.

7 MAIN 1 pump switches (both) Off

▼ Continued on next page ▼

▼ FUEL PRESS CTR L, R continued ▼

8 MAIN 4 pump switches (both) Off

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

FUEL M1 FWD+AFT

FUEL M4 FWD+AFT

10 **When** the FUEL LOW CTR message shows for the operable pump:

914

▶▶ **Go to step 11**

806

▶▶ **Go to step 12**

914

11 Choose one:

◆ Center wing tank quantity is **less** than or equal to 3,000 lbs in cruise:

▶▶ **Go to step 13**

◆ Center wing tank quantity is **less** than or equal to 7,000 lbs in climb:

▶▶ **Go to step 17**

▼ Continued on next page ▼

▼FUEL PRESS CTR L, R continued ▼

806

12 Choose one:

◆ Center wing tank quantity is **less** than or equal to 1,300 kgs in cruise:

▶▶ **Go to step 13**

◆ Center wing tank quantity is **less** than or equal to 3,200 kgs in climb:

▶▶ **Go to step 17**

13 MAIN 1 pump switches (both)ON

14 MAIN 4 pump switches (both)ON

15 CTR pump switch
(operable pump)Off

16 Resume normal fuel management.



17 MAIN 1 pump switches (both)ON

18 MAIN 4 pump switches (both)ON

19 CTR pump switch
(operable pump)Off

20 **When** the FUEL OVD CTR (operable pump)
message shows:

CTR pump switch
(operable pump)ON

MAIN 1 pump switches (both)Off

MAIN 4 pump switches (both)Off

▼ Continued on next page ▼

▼FUEL PRESS CTR L, R continued▼

21 **When** the FUEL LOW CTR message shows:

MAIN 1 pump switches (both) ON

MAIN 4 pump switches (both) ON

CTR pump switch
(operable pump) Off

Resume normal fuel management.



[] FUEL PRESS ENG 1, 4

Condition: The engine is on suction feed.

Objective: To open the crossfeed valves to ensure fuel flow. To reconfigure if both pumps are failed in tank.

- 1 FUEL X FEED valve switches (all) On
 - 2 MAIN pump switches
(both, related tank) ON
 - 3 Choose one:
 - ◆ **One** main tank pump (related tank) is **operative:**

■ ■ ■ ■
 - ◆ FUEL (M1, M4) FWD+AFT (related tank) message **shows:**

▶▶ **Go to step 4**
 - 4 MAIN pump switches
(affected tank, both). Off
 - 5 OVRD 2 pump switches (both) ON
 - 6 OVRD 3 pump switches (both) ON
- 914

Note: The last 7,000 lbs of fuel in the affected tank will be available only by suction feed.

806

Note: The last 3,200 kgs of fuel in the affected tank will be available only by suction feed.

▼ Continued on next page ▼

▼ FUEL PRESS ENG 1, 4 continued ▼

7 Do **not** accomplish the fuel tank-to-engine normal procedure.

8 **When** the FUEL TANK/ENG message shows:

FUEL XFER MAIN 1 & 4 switch ON

This allows gravity transfer of fuel to main tanks 2 and 3.

9 FUEL XFER RESERVE 1&4 switch AUTO

10 **When** all of these messages show:

FUEL OVRD 2 AFT

FUEL OVRD 2 FWD

FUEL OVRD 3 AFT

FUEL OVRD 3 FWD

►► **Go to step 11**

11 OVRD 2 pump switches (both) Off

12 OVRD 3 pump switches (both) Off

13 FUEL X FEED 1 and 4
valve switches Off

The FUEL PRESS ENG message shows. The X FEED CONFIG message may show. This step ensures affected main tank fuel is usable.

14 FUEL XFER MAIN 1 & 4 switch Off

▼ Continued on next page ▼

▼FUEL PRESS ENG 1, 4 continued▼

15 Fuel in the affected main tank (1 or 4) is available only by suction feed. Fuel feed from unaffected main tanks is normal.

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

FUEL M1, M4 FWD+AFT

FUEL OVRD 2 AFT, FWD

FUEL OVRD 3 AFT, FWD



[] FUEL PRESS ENG 2, 3

Condition: The engine is on suction feed.

Objective: To open the crossfeed valve to ensure fuel flow.

1 FUEL X FEED valve switch
(affected engine) On

2 Related tank MAIN pump
switches (both) ON

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

FUEL M2, M3 FWD+AFT



[] FUEL PUMP 1, 2, 3, 4 AFT, FWD

Condition: Main pump pressure is low.

1 Choose one:

◆ Tank quantity is **low and** the airplane is in a **high nose up** attitude:

When pitch attitude is reduced:

▶▶ Go to step 2

◆ Tank quantity is **not** low **or** the airplane is **not** in a high nose up attitude:

▶▶ Go to step 3

2 Choose one:

◆ FUEL PUMP message is **blank**:

■ ■ ■ ■

◆ FUEL PUMP message **shows**:

▶▶ Go to step 3

3 MAIN pump switch (affected pump) Off

■ ■ ■ ■

[] FUEL QTY LOW**914**

Condition: Fuel quantity is 2,000 lbs or less in one or more main tanks.

Objective: To decide if a fuel leak is suspected. To ensure that all fuel is available for use.

806

Condition: Fuel quantity is 900 kgs or less in one or more main tanks.

Objective: To decide if a fuel leak is suspected. To ensure that all fuel is available for use.

Note: Avoid high nose up attitude. Make thrust changes slowly and smoothly. This reduces the possibility of uncovering fuel pumps.

- 1 The FUEL QTY LOW message may be caused by a fuel leak or low fuel.
- 2 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other tanks and to the expected fuel remaining in the tanks.

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

3 Choose one:

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

▶▶ **Go to the Fuel Leak checklist on page 12.18, then finish this checklist.**

◆ There is **no** indication of a fuel leak:

▶▶ **Go to step 4**

4 FUEL X FEED valve switches (all) On

5 Fuel pump switches
(all tanks that have fuel) ON

Note: Do not accomplish the fuel tank-to-engine normal procedure.

Leave the pump switches on for the rest of the flight.

6 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

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

FUEL IMBAL 1-4

FUEL IMBAL 2-3

FUEL IMBALANCE

FUEL OVRD 2 AFT, FWD

FUEL OVRD 3 AFT, FWD

FUEL PUMP 1 AFT, FWD

FUEL PUMP 2 AFT, FWD

FUEL PUMP 3 AFT, FWD

FUEL PUMP 4 AFT, FWD



[] FUEL RES XFR 1, 4

Condition: The reserve tank transfer valve is not in the commanded position.

- 1 FUEL XFER RESERVE 1&4 switch ON
- 2 FUEL XFER MAIN 1 & 4 switch Off
- 3 Wait 1 minute.
- 4 Choose one:

◆ FUEL RES XFR message is **blank**:



◆ FUEL RES XFR message **shows**:

Note: Fuel in affected reserve tank is unusable.

Subtract affected reserve tank fuel from the total fuel quantity. Ensure the remaining fuel is sufficient to complete the flight.



[] FUEL STAB XFR

806

Condition: The stabilizer tank fuel transfer function is failed.

- 1 STAB pump switches (both) ON
- 2 Choose one:
 - ◆ FUEL STAB XFR message is **blank**:

■ ■ ■ ■
 - ◆ FUEL STAB XFR message **shows**:

▶▶ **Go to step 3**
- 3 CTR pump switches (both) Off
- 4 FUEL X FEED 1 and 4 valve switches Off
- 5 OVRD 2 pump switches (both) Off
- 6 OVRD 3 pump switches (both) Off
- 7 STAB pump switches (both) Off

Warning! Do not jettison fuel.

- 8 Do **not** accomplish the following checklists:
 - FUEL OVD CTR L, R
 - FUEL OVRD 2, 3 OFF
 - FUEL QTY LOW
 - X FEED CONFIG

▼ Continued on next page ▼

▼ FUEL STAB XFR continued ▼

Note: Stabilizer and center wing fuel tanks are not available.

Note: Usable fuel is the total of:

- All fuel in tanks 1 and 4, and
- Fuel in tanks 2 and 3 down to 13,600 kgs remaining in each tank.

Plan to land before tank 2 or 3 reaches 13,600 kgs to maintain CG within limits.

9 **When** the FUEL QTY LOW message shows:

►► **Go to step 10**

10 FUEL X FEED 1 and 4 valve switches. On

11 OVRD 2 pump switches (both) ON

12 OVRD 3 pump switches (both) ON

13 Plan to land before tank 2 or 3 reaches 13,600 kgs to maintain CG within limits.



FUEL TANK/ENG**| (914 ; before SB, earlier version of IDS software installed)**

Condition: One of these occurs with crossfeed valve 1 or 4 open:

- In either wing, an inboard tank quantity is less than or equal to the respective outboard tank plus reserve tank
- On the ground, in both wings, the inboard tank quantity is less than or equal to the respective outboard tank plus reserve tank plus 1,000 lbs

| (914 ; after SB, IDS-804 software installed)

Condition: One of these occurs with crossfeed valve 1 or 4 open:

- In either wing, an inboard tank quantity is less than or equal to the respective outboard tank plus reserve tank
- On the ground, in either wing, the inboard tank quantity is less than or equal to the respective outboard tank plus reserve tank plus 1,800 lbs

806

Condition: One of these occurs with crossfeed valve 1 or 4 open:

- In either wing, an inboard tank quantity is less than or equal to the respective outboard tank plus reserve tank
- On the ground, in either wing, the inboard tank quantity is less than or equal to the respective outboard tank plus reserve tank plus 900 kgs



[] FUEL TEMP LOW

Condition: Fuel temperature is near the minimum.

- 1 Increase airspeed, change altitude, or deviate to a warmer air mass to achieve a TAT equal to or higher than the fuel temperature limit (3 degrees C above the fuel freeze point).
- 2 TAT increases approximately 0.5 to 0.7 degrees C for each .01 Mach increase in airspeed. In extreme conditions, it may be necessary to descend as low as 25,000 feet.



[] FUEL TEMP PRED

Condition: Fuel temperature is predicted to be low after reserve transfer occurs.

Note: If enroute outside air temperature does not increase, the fuel may reach the low temperature limit after reserve transfer occurs.

The following may be used to avoid a low fuel temperature condition:

- 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).
- TAT increases approximately 0.5 to 0.7 degrees C for each .01 Mach increase in airspeed. In extreme conditions, it may be necessary to descend as low as 25,000 feet.

**[] FUEL TEMP SYS**

Condition: The fuel temperature indication is failed.

Note: Use TAT as the indication of fuel temperature.



Intentionally
Blank

[] FUEL X FEED 1, 4

Condition: The fuel crossfeed valve is not in the commanded position.

1 Choose one:

◆ FUEL TANK/ENG message is **blank**:



◆ FUEL TANK/ENG message **shows**:

▶▶ Go to step 2

2 FUEL X FEED 2 and 3 valve switches Off

This puts tanks 2 and 3 into a tank-to-engine configuration.

3 FUEL X FEED switch (affected side) Off

4 FUEL X FEED switch (unaffected side) On

5 OVRD 2 pump switches (both) Off

6 OVRD 3 pump switches (both) Off

Note: Do not accomplish the fuel tank-to-engine normal procedure.

If the FUEL IMBALANCE message shows:

- Open crossfeed valves 2 and 3
- Push all main tank 1 and 4 switches off

When the FUEL IMBALANCE message blanks:

- Push all main tank 1 and 4 switches ON
- Close crossfeed valves 2 and 3

▼ Continued on next page ▼

▼FUEL X FEED 1, 4 continued▼

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

FUEL IMBALANCE

FUEL M1 FWD+AFT

FUEL M4 FWD+AFT



[] FUEL X FEED 2, 3

Condition: The fuel crossfeed valve is not in the commanded position.

1 FUEL X FEED 2 and 3 valve switches Off

This puts tanks 2 and 3 into a tank-to-engine configuration. This prevents a lateral imbalance. The center wing tank supplies fuel to engines 1 and 4 only.

▼ Continued on next page ▼

▼ FUEL X FEED 2, 3 continued ▼

914

2 Choose one:

◆ Center wing tank **has** fuel:

Note: The main tank 1 and 4 transfer valves may open automatically to transfer fuel from the outboard main tanks to the inboard main tanks.

The last 3,000 lbs of fuel in the center wing tank may not be available. Verify the remaining fuel is sufficient.

Delay the tank-to-engine procedure until both of these occur:

- The FUEL LOW CTR L or FUEL LOW CTR R message shows
- Center wing tank quantity is less than 3,000 lbs

◆ Center wing tank does **not** have fuel:

▼ Continued on next page ▼

▼ FUEL X FEED 2, 3 continued ▼

806

3 Choose one:

◆ Center wing tank **has** fuel:

Note: The main tank 1 and 4 transfer valves may open automatically to transfer fuel from the outboard main tanks to the inboard main tanks.

The last 1,300 kgs of fuel in the center wing tank may not be available. Verify the remaining fuel is sufficient.

Delay the tank-to-engine procedure until both of these occur:

- The FUEL LOW CTR L or FUEL LOW CTR R message shows
- Center wing tank quantity is less than 1,300 kgs

◆ Center wing tank does **not** have fuel:

FUEL XFER MAIN

Condition: The fuel transfer main 1 & 4 switch is ON and one of these occurs:

- The airplane is on the ground
- In flight, the inboard main tank quantity is more than the outboard main plus reserve tank quantities

**FUEL XFR RES ON****914**

Condition: The fuel transfer reserve 1 & 4 switch is ON and one of these occurs:

- The airplane is on the ground
- In flight, an outboard main tank quantity is more than 13,400 lbs

806

Condition: The fuel transfer reserve 1 & 4 switch is ON and one of these occurs:

- The airplane is on the ground
- In flight, an outboard main tank quantity is more than 6,000 kgs

**JETT NOZ ON**

Condition: Both jettison nozzle valves are open.



JETT NOZ ON L, R

Condition: A jettison nozzle valve is open.



JETT NOZZLE L, R

Condition: The fuel jettison nozzle valve position disagrees with the commanded position.



X FEED CONFIG

Condition: A fuel crossfeed valve is not in the normal position.



Non-Normal Checklists

Chapter NNC

Hydraulics

Section 13

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[] HYD COLD SYS 1, 2, 3, 4

(914 ; before SB, IDS802 or IDS 803 installed)

Condition: The hydraulic system may be too cold for the next takeoff.

Objective: To ensure the hydraulic system is at or above 14 degrees C before the next takeoff.

- 1 Do this checklist when all engines are running.
- 2 DEMAND PUMP selector
(affected system) ON
- 3 Leave the demand pump selector ON during taxi.
- 4 Choose one:
 - ◆ HYD COLD SYS message shows **after landing**:
 ■ ■ ■ ■
 - ◆ HYD COLD SYS message shows **before takeoff**:
 ▶▶ **Go to step 5**
- 5 Move each primary flight control one full cycle.
Move the control wheel, control column, and rudder to full deflection in both directions. Hold the tiller during rudder movement.

▼ Continued on next page ▼

▼ HYD COLD SYS 1, 2, 3, 4 continued ▼

6 Choose one:

◆ Hydraulic system temperature is **below** 14 degrees C:▶▶ **Go to step 7**◆ Hydraulic system temperature is **at or above** 14 degrees C:▶▶ **Go to step 11**

7 Choose one:

◆ Outside air temperature is **below** -46 degrees C:▶▶ **Go to step 8**◆ Outside air temperature is **at or above** -46 degrees C:**Wait** until the hydraulic system temperature is at or above 14 degrees C.▶▶ **Go to step 11**8 Do **not** use the following controls to warm the hydraulic system in the next step:

Flaps

Speedbrakes

Stabilizer trim

Thrust reversers

▼ Continued on next page ▼

▼HYD COLD SYS 1, 2, 3, 4 continued▼

- 9 Moving the flight controls assists in increasing the hydraulic system temperature.

Moving the controls 1/3 to 1/2 of full deflection provides heating without excessive control force. Make slow and deliberate inputs, no faster than 4 seconds for each cycle.

- 10 **When** the hydraulic system temperature is 14 degrees C or higher:

Flight control movement may be stopped.

- 11 Leave the DEMAND PUMP selector ON as long as practicable to keep the hydraulic system temperature at or above 14 degrees C.

12 Checklist Complete Except Deferred Items

Deferred Items

Before Takeoff

When cleared for takeoff:

DEMAND PUMP selector
(affected system) AUTO

The HYD COLD SYS message can stay shown until after takeoff.



Additional Information

Using hydraulic pumps only, when outside air temperature is between -40 degrees C and -46 degrees C, it can take up to 10 minutes for the hydraulic system temperature to reach 14 degrees C.

[] HYD COLD SYS 1, 2, 3, 4

806
(914)

Condition: The hydraulic system is too cold for takeoff.

Objective: To heat the hydraulic system to 18 degrees C or higher before the next takeoff.

- 1 Do this checklist when all engines are running.
- 2 DEMAND PUMP selector
(affected system)ON
- 3 Leave the demand pump selector ON during taxi.
- 4 Choose one:
 - ◆HYD COLD SYS message shows **after landing**:
No further crew action is needed.
■ ■ ■ ■
 - ◆HYD COLD SYS message shows **before takeoff**:
▶▶ **Go to step 5**

▼ Continued on next page ▼

▼ HYD COLD SYS 1, 2, 3, 4 continued ▼

5 Choose one:

◆ Outside air temperature is **below** -46 degrees C:

▶▶ **Go to step 6**

◆ Outside air temperature is **at or above** -46 degrees C:

When the hydraulic system temperature is 18 degrees C or higher:

▶▶ **Go to step 9**

6 Do **not** use the following controls in the next step:

Flap lever

Speedbrake lever

Stabilizer trim switches

Reverse thrust levers

7 Move the flight controls 1/3 to 1/2 of full deflection. Make slow and deliberate inputs, no faster than 4 seconds for each cycle. This step assists in increasing the hydraulic system temperature without excessive control force.

8 **When** the hydraulic system temperature is 18 degrees C or higher:

Flight control movement may be stopped.

9 Leave the DEMAND PUMP selector ON as long as practicable to keep the hydraulic system temperature at or above 18 degrees C.

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▼HYD COLD SYS 1, 2, 3, 4 continued▼

10 Checklist Complete Except Deferred Items

Deferred Items

Before Takeoff

When cleared for takeoff:

DEMAND PUMP selector
(affected system) AUTO
■ ■ ■ ■

Additional Information

Using hydraulic pumps only, when outside air temperature is between -40 degrees C and -46 degrees C, it can take up to 10 minutes for the hydraulic system temperature to reach 18 degrees C.

Moving the flight controls can cause the indicated hydraulic system temperature to initially decrease, and then to increase as expected.

[] HYD CONTROL 1, 4

Condition: Hydraulic system control is inoperative.

Objective: To ensure hydraulic system pressure during periods of high demand.

- 1 DEMAND PUMP selector
(affected system) ON

Note: Hydraulic system indications may be inoperative.



[] HYD OVHT DEM 2, 3

Condition: The hydraulic system demand pump temperature is high.

- 1 DEMAND PUMP selector
(affected system) OFF
- 2 Do **not** accomplish the following checklist:

HYD PRESS DEM



[] HYD OVHT SYS 1

Condition: Hydraulic system 1 temperature is high.

Objective: To cool the system and, if the overheat persists, to configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot C is engaged, change to autopilot L or R.
- 3 ENGINE PUMP 1 switch Off
- 4 DEMAND PUMP 1 selector OFF
- 5 **When** the HYD OVHT SYS 1 message blanks:
 DEMAND PUMP 1 selector AUTO
- 6 Do **not** accomplish the following checklists:
 HYD PRESS ENG 1
 HYD PRESS SYS 1
- 7 **Wait** 10 minutes unless the HYD OVHT SYS 1 message shows again.
- 8 Choose one:
 - ◆HYD OVHT SYS 1 message is **blank**:
 ■ ■ ■ ■
 - ◆HYD OVHT SYS 1 message **shows**:
 ▶▶ **Go to step 9**
- 9 DEMAND PUMP 1 selector OFF

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▼HYD OVHT SYS 1 continued ▼

Note: Inoperative Items

Center autopilot inop

Left and right autopilots are available.

Left outboard elevator inop

Pitch control is reduced.

Inboard trailing edge flap hydraulic operation inop

Trailing edge flaps move in the secondary mode.

Nose and body gear hydraulic operation inop

Alternate gear extension is needed.

Nose and body gear steering inop

A tow will be needed after landing.

Engine 1 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

System 1 alternate brake source inop

System 4 normal and system 2 alternate brake sources are available.

Note: Secondary flap extension from flaps 1 to 5 requires approximately 4 minutes. During approach, plan more time for flap extension.

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

10 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

▼ Continued on next page ▼

▼HYD OVHT SYS 1 continued ▼

Autobrake _____
Landing data VREF____, Minimums____
Approach briefing Completed

Approach Checklist

Altimeters _____


Flap Extension


Start flap extension as needed.
Do **not** accomplish the following checklist:
FLAPS PRIMARY

Alternate Gear Extension

Do not exceed the gear EXTEND limit speed
(270K/.82M).

- Action is irreversible.

 ALTN GEAR EXTEND WING
switch ALTN
- Action is irreversible.

 ALTN GEAR EXTEND NOSE/BODY
switch ALTN
- Landing gear lever DN

▼ Continued on next page ▼

▼HYD OVHT SYS 1 continued▼

Do **not** accomplish the following checklist:

GEAR DOOR

Landing Checklist

Speedbrake Armed

Landing gear Down

Flaps _____



[] HYD OVHT SYS 2

Condition: Hydraulic system 2 temperature is high.

Objective: To cool the system and, if the overheat persists, to depressurize the system.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot R is engaged, change to autopilot L or C.
- 3 ENGINE PUMP 2 switch Off
- 4 DEMAND PUMP 2 selector OFF
- 5 **When** the HYD OVHT SYS 2 message blanks:
 DEMAND PUMP 2 selector AUTO
- 6 Do **not** accomplish the following checklists:
 SPOILERS
 HYD PRESS ENG 2
 HYD PRESS SYS 2
- 7 **Wait** 10 minutes unless the HYD OVHT SYS 2 message shows again.

▼ Continued on next page ▼

▼HYD OVHT SYS 2 continued▼

8 Choose one:

◆HYD OVHT SYS 2 message is **blank**:



◆HYD OVHT SYS 2 message **shows**:

►► **Go to step 9**

9 DEMAND PUMP 2 selector OFF

Note: Inoperative Items

Right autopilot inop

Left and center autopilots are available.

Two outboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

System 2 hydraulic power to stabilizer trim inop

System 3 powers the trim at half rate.

Engine 2 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

System 2 alternate brake source inop

System 4 normal and system 1 alternate brake sources are available.



[] HYD OVHT SYS 3

Condition: Hydraulic system 3 temperature is high.

Objective: To cool the system and, if the overheat persists, to depressurize the system.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot L is engaged, change to autopilot C or R.
- 3 ENGINE PUMP 3 switch Off
- 4 DEMAND PUMP 3 selector OFF
- 5 **When** the HYD OVHT SYS 3 message blanks:
 DEMAND PUMP 3 selector AUTO
- 6 Do **not** accomplish the following checklists:
 SPOILERS
 HYD PRESS ENG 3
 HYD PRESS SYS 3
- 7 **Wait** 10 minutes unless the HYD OVHT SYS 3 message shows again.

▼ Continued on next page ▼

▼HYD OVHT SYS 3 continued▼

8 Choose one:

◆HYD OVHT SYS 3 message is **blank**:



◆HYD OVHT SYS 3 message **shows**:

►► **Go to step 9**

9 DEMAND PUMP 3 selector OFF

Note: Inoperative Items

Left autopilot inop

Center and right autopilots are available.

Two outboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

System 3 hydraulic power to stabilizer trim inop

System 2 powers the trim at half rate.

Engine 3 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.



[] HYD OVHT SYS 4

Condition: Hydraulic system 4 temperature is high.

Objective: To cool the system and, if the overheat persists, to configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 ENGINE PUMP 4 switch Off
- 3 DEMAND PUMP 4 selector OFF
- 4 **When** the HYD OVHT SYS 4 message blanks:
DEMAND PUMP 4 selector AUTO
- 5 Do **not** accomplish the following checklists:
SPOILERS
HYD PRESS ENG 4
HYD PRESS SYS 4
- 6 **Wait** 10 minutes unless the HYD OVHT SYS 4 message shows again.
- 7 Choose one:
 - ◆ HYD OVHT SYS 4 message is **blank**:
■ ■ ■ ■
 - ◆ HYD OVHT SYS 4 message **shows**:
▶▶ **Go to step 8**
- 8 DEMAND PUMP 4 selector OFF

▼ Continued on next page ▼

▼HYD OVHT SYS 4 continued ▼

Note: Inoperative Items**Right outboard elevator inop**

Pitch control is reduced.

Outboard trailing edge flap hydraulic operation inop

Trailing edge flaps move in the secondary mode.

Two inboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

Wing gear hydraulic operation inop

Alternate gear extension is needed.

Engine 4 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

System 4 normal brake source inop

System 1 and system 2 alternate brake sources are available.

Autobrake inop

Manual braking is needed.

Note: Secondary flap extension from flaps 1 to 5 requires approximately 4 minutes. During approach, plan more time for flap extension.

Do not arm the speedbrake. Extend the ground spoilers manually and slowly. This avoids a pitch up moment caused by rapid extension of the outboard spoilers.

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

9 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼HYD OVHT SYS 4 continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake **OFF**
- Landing data VREF____, Minimums____
- Approach briefing Completed

Approach Checklist

- Altimeters _____


Flap Extension

- Start flap extension as needed.
- Do **not** accomplish the following checklist:
FLAPS PRIMARY

Alternate Gear Extension


Do not exceed the gear EXTEND limit speed (270K/.82M).

Action is irreversible.

ALTN GEAR EXTEND WING switch ALTN

▼ Continued on next page ▼

▼HYD OVHT SYS 4 continued▼

 Action is irreversible.

ALTN GEAR EXTEND NOSE/BODY
switch ALTN

Landing gear lever DN

Reduction of speed to below .60 Mach may be
necessary for the wing gear to lock down.

Do **not** accomplish the following checklist:

GEAR DOOR

Landing Checklist

Speedbrake **Down**

Landing gear Down

Flaps _____



[] HYD PRES SYS 1+4

Condition: Hydraulic systems 1 and 4 pressures are low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot C is engaged, change to autopilot L or R.
- 3 DEMAND PUMP 1 and 4 selectors ON
- 4 ENGINE PUMP 1 and 4 switches Off
- 5 Do **not** accomplish the following checklists:
 - HYD PRESS ENG 1
 - HYD PRESS ENG 4
 - HYD PRESS SYS 1
 - HYD PRESS SYS 4
 - HYD QTY LOW 4
- 6 Choose one:
 - ◆HYD PRES SYS 1+4 message **blanks**:

■ ■ ■ ■
 - ◆HYD PRES SYS 1+4 message **shows**:

▶▶**Go to step 7**
- 7 DEMAND PUMP 1 and 4 selectors OFF

▼ Continued on next page ▼

▼HYD PRES SYS 1+4 continued▼

- 8 Plan to land at the nearest suitable airport.
- 9 Consider reducing gross weight to lower the approach speed.

Note: Inoperative Items**Center autopilot inop**

Left and right autopilots are available.

Outboard elevators inop

Pitch control is reduced. Higher than normal control forces may be required during flare.

Trailing edge flap hydraulic operation inop

Trailing edge flaps move in the secondary mode.

Two inboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

Landing gear hydraulic operation inop

Alternate gear extension is needed.

Nose and body gear steering inop

A tow will be needed after landing.

Engines 1 and 4 thrust reversers inop**System 4 normal and system 1 alternate brake sources inop**

System 2 alternate brake source is available.

Autobrake inop

Manual braking is needed.

▼ Continued on next page ▼

▼HYD PRES SYS 1+4 continued▼

Note: Do not use autoland.

Use flaps 25 and VREF 30 + 20 for landing.

Secondary flap extension from flaps 1 to 5 requires approximately 4 minutes. During approach, plan more time for flap extension.

Crosswind limit for landing is 20 knots.

Do not arm the speedbrake. Extend the ground spoilers manually and slowly. This avoids a pitch up moment caused by rapid extension of the outboard spoilers.

Thrust reversers will not deploy until the nose gear is on the runway.

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

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

SPOILERS

11 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

Autobrake **OFF**

Landing data **VREF 30+20**____,
Minimums____

▼ Continued on next page ▼

▼HYD PRES SYS 1+4 continued▼

Approach briefing Completed

Approach Checklist

Altimeters _____

Flap Extension


Start flap extension as needed.


Do **not** accomplish the following checklist:

FLAPS PRIMARY

Alternate Gear Extension

Do not exceed the gear EXTEND limit speed
(270K/.82M).

 Action is irreversible.
ALTN GEAR EXTEND WING
switch ALTN

 Action is irreversible.
ALTN GEAR EXTEND NOSE/BODY
switch ALTN

Landing gear lever DN

Reduction of speed to below .60 Mach may be
necessary for the wing gear to lock down.

▼ Continued on next page ▼

▼HYD PRES SYS 1+4 continued▼

Do **not** accomplish the following checklist:
GEAR DOOR

Landing Checklist

- Speedbrake **Down**
- Landing gear Down
- Flaps **.25**



[] HYD PRES SYS 2+3

Condition: Hydraulic systems 2 and 3 pressures are low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 DEMAND PUMP 2 and 3 selectors ON
- 3 ENGINE PUMP 2 and 3 switches Off
- 4 Do **not** accomplish the following checklists:
 HYD PRESS SYS 2
 HYD PRESS SYS 3
- 5 Choose one:
 ◆ HYD PRES SYS 2+3 message **blanks:**
 ■ ■ ■ ■
 ◆ HYD PRES SYS 2+3 message **shows:**
 ▶▶ **Go to step 6**
- 6 DEMAND PUMP 2 and 3 selectors OFF
- 7 Plan to land at the nearest suitable airport.
- 8 Consider reducing gross weight to lower the approach speed.

▼ Continued on next page ▼

▼HYD PRES SYS 2+3 continued▼	
Note: Inoperative Items	
All autopilots inop	
Stabilizer trim and elevator feel inop	Avoid abrupt elevator movement.
Four outboard spoiler panels on each wing inop	Roll rate and spoiler capability are reduced.
Both yaw dampers inop	
Engines 2 and 3 thrust reversers inop	
System 2 alternate brake source inop	System 4 normal and system 1 alternate brake sources are available.
Note: Do not use autoland.	
Use flaps 25 and VREF 30 + 20 for landing.	
Crosswind limit for landing is 20 knots.	

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

10 **Checklist Complete Except Deferred Items**

Deferred Items	
Descent Checklist	
Recall	Checked
Notes.	Checked
Autobrake	___
Landing data	VREF 30+20 ___, Minimums ___

▼ Continued on next page ▼

▼HYD PRES SYS 2+3 continued▼

Approach briefing Completed

Approach Checklist

Altimeters _____

Landing Checklist

Speedbrake Armed

Landing gear Down

Flaps. **25**



[] HYD PRESS DEM 1, 2, 3, 4

Condition: Hydraulic demand pump pressure is low.

Objective: To restore pump operation, or avoid system contamination or pump damage.

- 1 DEMAND PUMP selector
(affected system) ON
- 2 Choose one:
 - ◆HYD PRESS DEM message **blanks**:
 ■ ■ ■ ■
 - ◆HYD PRESS DEM message **shows**:
 ▶▶ **Go to step 3**
- 3 DEMAND PUMP selector
(affected system) OFF
 ■ ■ ■ ■

[] HYD PRESS ENG 1, 2, 3, 4

Condition: Hydraulic engine pump pressure is low.

Objective: To avoid system contamination or pump damage.

- 1 ENGINE PUMP switch
(affected system) Off
 ■ ■ ■ ■

[] HYD PRESS SYS 1

Condition: Hydraulic system 1 pressure is low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot C is engaged, change to autopilot L or R.
- 3 DEMAND PUMP 1 selector ON
- 4 ENGINE PUMP 1 switch Off
- 5 Do **not** accomplish the following checklist:
HYD PRESS ENG 1
- 6 Choose one:
 - ◆ HYD PRESS SYS 1 message **blanks**:
■ ■ ■ ■
 - ◆ HYD PRESS SYS 1 message **shows**:
▶▶ **Go to step 7**
- 7 DEMAND PUMP 1 selector OFF

▼ Continued on next page ▼

▼ HYD PRESS SYS 1 continued ▼

Note: Inoperative Items**Center autopilot inop**

Left and right autopilots are available.

Left outboard elevator inop

Pitch control is reduced.

Inboard trailing edge flap hydraulic operation inop

Trailing edge flaps move in the secondary mode.

Nose and body gear hydraulic operation inop

Alternate gear extension is needed.

Nose and body gear steering inop

A tow will be needed after landing.

Engine 1 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

System 1 alternate brake source inop

System 4 normal and system 2 alternate brake sources are available.

Note: Do not use autoland.

Secondary flap extension from flaps 1 to 5 requires approximately 4 minutes. During approach, plan more time for flap extension.

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

▼ Continued on next page ▼

▼ HYD PRESS SYS 1 continued ▼

8 Choose one:

◆ **Only** the HYD PRESS SYS 1 message shows:

▶▶ **Go to step 11**

◆ **More than one** HYD PRESS SYS message shows:

▶▶ **Go to step 9**

9 Plan to land at the nearest suitable airport.

10 Consider reducing gross weight to lower the approach speed.

Note: Use flaps 25 and VREF 30+20 for landing.

Crosswind limit for landing is 20 knots.

11 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF ____ or
VREF 30+20 ____ with more
than one system inoperative,
Minimums ____**

Approach briefing Completed

▼ Continued on next page ▼

▼ HYD PRESS SYS 1 continued ▼

Approach Checklist

Altimeters _____

Flap Extension


Start flap extension as needed.


Do **not** accomplish the following checklist:

FLAPS PRIMARY

Alternate Gear Extension

Do not exceed the gear EXTEND limit speed (270K/.82M).

 Action is irreversible.
ALTN GEAR EXTEND WING switch ALTN

 Action is irreversible.
ALTN GEAR EXTEND NOSE/BODY switch ALTN

Landing gear lever DN

Do **not** accomplish the following checklist:

GEAR DOOR

Landing Checklist

Speedbrake Armed

▼ Continued on next page ▼

▼ HYD PRESS SYS 1 continued ▼

Landing gear Down

Flaps. ____ or
**25 with more than
one system inoperative**



[] HYD PRESS SYS 2

Condition: Hydraulic system 2 pressure is low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot R is engaged, change to autopilot L or C.
- 3 DEMAND PUMP 2 selectorON
- 4 ENGINE PUMP 2 switchOff
- 5 Do **not** accomplish the following checklist:

HYD PRESS ENG 2

- 6 Choose one:

◆HYD PRESS SYS 2 message **blanks:**



◆HYD PRESS SYS 2 message **shows:**

►► Go to step 7

- 7 DEMAND PUMP 2 selector OFF

▼ Continued on next page ▼

▼ HYD PRESS SYS 2 continued ▼

Note: Inoperative Items**Right autopilot inop**

Left and center autopilots are available.

Two outboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

System 2 hydraulic power to stabilizer trim inop

System 3 powers the trim at half rate.

Engine 2 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

System 2 alternate brake source inop

System 4 normal and system 1 alternate brake sources are available.

Note: Do not use autoland.

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

SPOILERS

9 Choose one:

◆ **Only** the HYD PRESS SYS 2 message shows:



◆ **More than one** HYD PRESS SYS message shows:

▶▶ **Go to step 10**

10 Plan to land at the nearest suitable airport.

11 Consider reducing gross weight to lower the approach speed.

▼ Continued on next page ▼

▼ HYD PRESS SYS 2 continued ▼

Note: Use flaps 25 and VREF 30+20 for landing.
Crosswind limit for landing is 20 knots.

12 Checklist Complete Except Deferred Items

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. **.25**



[] HYD PRESS SYS 3

Condition: Hydraulic system 3 pressure is low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 If autopilot L is engaged, change to autopilot C or R.
- 3 DEMAND PUMP 3 selector ON
- 4 ENGINE PUMP 3 switch Off
- 5 Do **not** accomplish the following checklist:
HYD PRESS ENG 3
- 6 Choose one:
 - ◆ HYD PRESS SYS 3 message **blanks**:
 ■ ■ ■ ■
 - ◆ HYD PRESS SYS 3 message **shows**:
 ▶▶ **Go to step 7**
- 7 DEMAND PUMP 3 selector OFF

▼ Continued on next page ▼

▼ HYD PRESS SYS 3 continued ▼

Note: Inoperative Items**Left autopilot inop**

Center and right autopilots are available.

Two outboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

System 3 hydraulic power to stabilizer trim inop

System 2 powers the trim at half rate.

Engine 3 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

Note: Do not use autoland.

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

SPOILERS

9 Choose one:

◆ **Only** the HYD PRESS SYS 3 message shows:



◆ **More than one** HYD PRESS SYS message shows:

►► **Go to step 10**

10 Plan to land at the nearest suitable airport.

11 Consider reducing gross weight to lower the approach speed.

Note: Use flaps 25 and VREF 30+20 for landing.

Crosswind limit for landing is 20 knots.

12 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ HYD PRESS SYS 3 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 **25**



[] HYD PRESS SYS 4

Condition: Hydraulic system 4 pressure is low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

- 1 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 2 DEMAND PUMP 4 selector ON
- 3 ENGINE PUMP 4 switch Off
- 4 Do **not** accomplish the following checklist:
HYD PRESS ENG 4
- 5 Choose one:
 - ◆ HYD PRESS SYS 4 message **blanks**:
 ■ ■ ■ ■
 - ◆ HYD PRESS SYS 4 message **shows**:
 ▶▶ **Go to step 6**
- 6 DEMAND PUMP 4 selector OFF

▼ Continued on next page ▼

▼ HYD PRESS SYS 4 continued ▼**Note: Inoperative Items****Right outboard elevator inop**

Pitch control is reduced.

Outboard trailing edge flap hydraulic operation inop

Trailing edge flaps move in the secondary mode.

Two inboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

Wing gear hydraulic operation inop

Alternate gear extension is needed.

Engine 4 thrust reverser inop

Use symmetrical reverse thrust unless stopping distance is critical.

System 4 normal brake source inop

System 1 and system 2 alternate brake sources are available.

Autobrake inop

Manual braking is needed.

Note: Do not use autoland.

Secondary flap extension from flaps 1 to 5 requires approximately 4 minutes. During approach, plan more time for flap extension.

Do not arm the speedbrake. Extend the ground spoilers manually and slowly. This avoids a pitch up moment caused by rapid extension of the outboard spoilers.

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

▼ Continued on next page ▼

▼ HYD PRESS SYS 4 continued ▼

Approach briefing Completed

Approach Checklist

Altimeters _____

Flap Extension


Start flap extension as needed.


Do **not** accomplish the following checklist:

FLAPS PRIMARY

Alternate Gear Extension

Do not exceed the gear EXTEND limit speed (270K/.82M).

 Action is irreversible.
ALTN GEAR EXTEND WING
switch ALTN

 Action is irreversible.
ALTN GEAR EXTEND NOSE/BODY
switch ALTN

Landing gear lever DN

Reduction of speed to below .60 Mach may be necessary for the wing gear to lock down.

▼ Continued on next page ▼

▼ **HYD PRESS SYS 4 continued** ▼

Do **not** accomplish the following checklist:
GEAR DOOR

Landing Checklist

- Speedbrake **Down**
 - Landing gear Down
 - Flaps ____ **or**
25 with more than
one system inoperative
- ■ ■ ■

HYD QTY LOW 1, 2, 3

Condition: Hydraulic system quantity is low.

■ ■ ■ ■

Intentionally
Blank

[] HYD QTY LOW 2+4

Condition: Hydraulic systems 2 and 4 quantities are low.

Objective: To reconfigure the hydraulics to avoid a progressive loss of systems.

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

HYD PRESS SYS 4

- 2 Choose one:

◆ Flight is **less than** 1 hour from landing:



◆ Flight is 1 hour or **more** from landing:

►► **Go to step 3**

- 3 **Wait** 10 seconds:

- 4 Choose one:

◆ HYD PRESS SYS 4 message is **blank**:



◆ HYD PRESS SYS 4 message **shows**
(system 4 was depressurized earlier in the flight):

►► **Go to step 5**

- 5 If autopilot R is engaged, change to autopilot L or C.

▼ Continued on next page ▼

▼ HYD QTY LOW 2+4 continued ▼

- 6 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.
- 7 ENGINE PUMP 2 switch Off
- 8 DEMAND PUMP 2 selector OFF
- 9 Do **not** accomplish the following checklists:
 - SPOILERS
 - HYD PRESS DEM 2
 - HYD PRESS ENG 2
 - HYD PRESS SYS 2
 - HYD QTY LOW 4

Note: The items below are inoperative until hydraulic systems 2 and 4 are repressurized for landing.

▼ Continued on next page ▼

▼ HYD QTY LOW 2+4 continued ▼	
Note: Inoperative Items	
Right autopilot inop	Left and center autopilots are available.
Four spoiler panels on each wing inop	Roll rate and spoiler capability are reduced.
Right inboard aileron inop	Roll rate is reduced.
Right outboard elevator inop	Pitch control is reduced.
System 2 hydraulic power to stabilizer trim inop	System 3 powers the trim at half rate.
Autobrake inop	Note: The BRAKE SOURCE message will show until hydraulic systems 2 and 4 are repressurized for landing.

10 Checklist Complete Except Deferred Items

Deferred Items	
Descent Checklist	
Recall	Checked
Notes.	Checked
AutobrakeOFF
Landing data	VREF____, Minimums____
Approach briefing	Completed
▼ Continued on next page ▼	

▼ HYD QTY LOW 2+4 continued ▼

Approach Checklist

Altimeters _____

Flap Extension

When flap extension is needed:

ENGINE PUMP 2 switch ON
DEMAND PUMP 2 selector AUTO
ENGINE PUMP 4 switch ON
DEMAND PUMP 4 selector AUTO
AUTOBRAKE selector Set

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps _____



[] HYD QTY LOW 4

Condition: Hydraulic system 4 quantity is low.

Objective: To depressurize system 4 to preserve hydraulic quantity for approach and landing.

- 1 Choose one:
 - ◆ Flight is **less than** 1 hour from landing:

■ ■ ■ ■
 - ◆ Flight is 1 hour or **more** from landing:

▶▶ **Go to step 2**

- 2 **Wait** 10 seconds:

- 3 Choose one:
 - ◆ HYD PRESS SYS 4 message **shows**:

■ ■ ■ ■
 - ◆ HYD PRESS SYS 4 message is **blank**:

▶▶ **Go to step 4**

- 4 When hydraulic system pressure is lost, a bump might be felt. This is caused by a momentary aileron movement.

- 5 ENGINE PUMP 4 switch Off

- 6 DEMAND PUMP 4 selector OFF

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

HYD PRESS DEM 4

▼ Continued on next page ▼

▼HYD QTY LOW 4 continued▼

HYD PRESS ENG 4

HYD PRESS SYS 4

Note: The items below are inoperative until hydraulic system 4 is repressurized for landing.

Note: Inoperative Items

Two inboard spoiler panels on each wing inop

Roll rate and spoiler capability are reduced.

Right outboard elevator inop

Pitch control is reduced.

Autobrake inop

8 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

Autobrake **OFF**

Landing data VREF____, Minimums____

Approach briefing Completed

Approach Checklist

Altimeters ____

▼ Continued on next page ▼

▼HYD QTY LOW 4 continued▼

Flap Extension

When flap extension is needed:

- ENGINE PUMP 4 switch ON
- DEMAND PUMP 4 selector AUTO
- AUTOBRAKE selector. Set

Landing Checklist

- Speedbrake Armed
- Landing gear Down
- Flaps _____



RAT UNLOCKED

Condition: The ram air turbine is not stowed and locked.



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Intentionally
Blank

[] AIR/GND SYSTEM

Condition: The air/ground system is failed in the air mode.

Note: Thrust reversers may be inoperative.

Do not arm the speedbrake. Automatic ground spoilers are inoperative.

Autobrakes are inoperative. Manual braking is needed.

1 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
 Notes Checked
 Autobrake **OFF**
 Landing data VREF____, Minimums____
 Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake **Down**
 Landing gear Down
 Flaps ____



[] ANTISKID

Condition: An antiskid system fault occurs.

Note: Autobrake is inoperative. Manual braking is needed.

Use minimum braking consistent with the runway length and conditions to reduce the possibility of a tire blowout.

Do not apply the brakes until the nose wheel is on the ground and the speedbrakes have extended.

914

Note: When landing weight is less than 600,000 lbs, brake initially using light steady pedal pressure. At higher landing weights, brake initially using light to moderate steady pressure. Increase pressure as ground speed decreases. Do not pump the brakes.

806

Note: When landing weight is less than 272,400 kgs, brake initially using light steady pedal pressure. At higher landing weights, brake initially using light to moderate steady pressure. Increase pressure as ground speed decreases. Do not pump the brakes.

1 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

▼ Continued on next page ▼

▼ANTISKID continued▼

Notes Checked
Autobrake **OFF**
Landing data VREF____, Minimums____
Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake Armed
Landing gear Down
Flaps ____



[] ANTISKID OFF

Condition: One or more of these occur:

- The parking brake valve is not fully open
- The antiskid system power is off

Note: Autobrake is inoperative. Manual braking is needed.

Use minimum braking consistent with runway length and conditions to reduce the possibility of a tire blowout.

Do not apply the brakes until the nose wheel is on the ground and the speedbrakes have extended.

914

Note: When landing weight is less than 600,000 lbs, brake initially using light steady pedal pressure. At higher landing weights, brake initially using light to moderate steady pressure. Increase pressure as ground speed decreases. Do not pump the brakes.

806

Note: When landing weight is less than 272,400 kgs, brake initially using light steady pedal pressure. At higher landing weights, brake initially using light to moderate steady pressure. Increase pressure as ground speed decreases. Do not pump the brakes.

1 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ ANTISKID OFF 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 ____



AUTOBRAKES

Condition: One of these occurs:

- The autobrake system is failed or disarmed
- The autobrake selector is OFF but the system is armed
- RTO is initiated above 85 knots and the autobrake has not been applied



BODY GEAR STRG

Condition: One or more of these occur:

- Body gear steering does not lock
- Body gear steering pressure is on when commanded off

**[] BRAKE LIMITER**

Condition: One or more of these occur:

- More than one brake torque limiter is failed on a single gear
- The parking brake valve is not fully open

Note: Brake with caution. Heavy braking could exceed the brake torque limit.

**BRAKE SOURCE**

Condition: Normal and alternate brake system pressures are low.



[] BRAKE TEMP

Condition: One or more brake temperatures are high.

Objective: To allow the brakes to cool.

- 1 Choose one:

◆ On the **ground**:

▶▶ Go to step 2

◆ In **flight**:

▶▶ Go to step 3

- 2 Refer to the Recommended Brake Cooling Schedule table in the Performance Inflight chapter for the needed cooling time.



- 3 **When** extending or retracting the landing gear, do not exceed the gear EXTEND limit speed (270K/.82M).

- 4 Landing gear lever DN

This step allows cooling air to flow around the brakes.

- 5 **When** the BRAKE TEMP message blanks:

Wait 8 minutes. This step ensures sufficient cooling time.

Landing gear lever UP



[] GEAR DISAGREE

Condition: The gear position disagrees with the landing gear lever position.

Objective: To extend the gear using alternate gear extension, or land on the available gear.

Note: Do not exceed the gear EXTEND limit speed (270K/.82M).

1 Choose one:

◆ Landing gear lever is **UP**:

Note: Do not use FMC fuel predictions with the gear extended. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.

Do **not** accomplish the following checklist:

GEAR DOOR



◆ Landing gear lever is **DN and any** gear indicates **not** DN:

Landing gear lever UP

►► **Go to step 2**

- 2 **Wait** 30 seconds.
- 3 ALTN GEAR EXTEND WING switch. ALTN
- 4 ALTN GEAR EXTEND NOSE/BODY switch . . . ALTN
- 5 **Wait** 1 minute and 30 seconds.

▼ Continued on next page ▼

▼ GEAR DISAGREE continued ▼

6 Landing gear lever DN

7 Reduction of speed to below .60 Mach may be necessary for the wing gear to lock down.

8 Choose one:

◆ All gear indicate **DN**:



◆ Any gear indicate **not** DN:

►► **Go to step 9**

9 GND PROX GEAR OVRD switch OVRD

Note: Land on the available gear.

If any wing or body gear is not extended, deployment of the thrust reversers may affect directional control.

If the nose gear is not extended, do not deploy the thrust reversers until the nose contacts the runway.

Do not arm the speedbrake. Delay extending the speedbrake until the nose and both sides of the airplane have touched down.

If any wing gear is not extended, use aileron control to keep the wings level during the rollout until the airplane comes to a complete stop.

If any wing or body gear is not extended, do not attempt to taxi the airplane or use the tiller. Braking effectiveness is reduced.

▼ Continued on next page ▼

▼GEAR DISAGREE continued▼

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Note: If both body gear are not extended, the airplane may tip tail down on the ground. The crew service door escape slide is then unusable.

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

GEAR DOOR

11 Checklist Complete Except Deferred Items

Deferred Items

Landing Checklist

- Speedbrake **Down**
 - Landing gear Down
 - Flaps _____
- ■ ■ ■

[] GEAR DOOR

Condition: One or more gear doors are not closed.

Note: Do not exceed the gear EXTEND limit speed (270K/.82M).

- 1 Reduction of speed to below .70 Mach may be necessary for the nose gear doors to close with the nose gear extended.



Gear Lever Locked Down

Condition: The landing gear lever cannot move to UP.

1 Choose one:

◆ **GEAR TILT or BODY GEAR STRG message shows:**

Do not retract the landing gear.

Note: Do not exceed the gear EXTENDED limit speed (320K/.82M).

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.

Do **not** accomplish the following checklist:

GEAR TILT



◆ **GEAR TILT and BODY GEAR STRG messages are both blank:**

Note: Do not exceed the gear RETRACT limit speed (270K/.82M).

►► **Go to step 2**

2 Landing gear lever
LOCK OVRD switch Push and hold

3 Landing gear lever UP



[] GEAR TILT

Condition: The main landing gear trucks are not in the fully tilted position.

- 1 Do not retract the landing gear.

Note: Do not exceed the gear EXTENDED limit speed (320K/.82M).

- 2 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.

**[] TIRE PRESSURE**

Condition: One or more tire pressures are not normal.

Note: If it can be determined that a main gear tire is flat, do not use the autobrake.



Non-Normal Checklists

Chapter NNC

Warning Systems

Section 15

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AIRSPED LOW

Condition: Airspeed is less than the minimum maneuvering speed.

**ALT ALERT SYS**

Condition: The altitude alert system is failed.

**ALT CALLOUTS**

Condition: Altitude and minimums voice annunciations during approach are not supplied.

**ALTITUDE ALERT**

Condition: A deviation from the MCP set altitude occurs.

**CHKL INCOMP NORM**

Condition: A normal checklist needs to be completed.



CHKL NON-NORMAL

Condition: There is a hidden non-normal checklist. All of these occur:

- A non-normal checklist is not complete
- The ECL is not displayed
- The related EICAS message is not shown

**CONFIG FLAPS**

Condition: The flaps are not in a takeoff position during takeoff.

**CONFIG GEAR**

Condition: A landing gear is not down and locked and one of these occurs:

- Below 800 feet radio altitude and a thrust lever is between idle and mid position
- The flaps are in a landing position

**CONFIG GEAR CTR**

Condition: Body gear steering is not centered during takeoff.



CONFIG PARK BRK

Condition: The parking brake is set during takeoff.

**CONFIG SPOILERS**

Condition: One of these occurs:

- On the ground, the speedbrake lever is not down during takeoff.
- In flight, the speedbrake lever is extended beyond ARM in flight with climb thrust or greater for 3 seconds.

**CONFIG STAB**

Condition: The stabilizer is not in the greenband during takeoff.

**CONFIG WARN SY**

Condition: A configuration warning system fault occurs.



[] 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

806

Condition: The runway awareness and advisory system override switch is in OVRD.



[] RUNWAY POS

806

Condition: The runway awareness and advisory system position data is temporarily lost.

Note: Position data for the runway awareness and advisory system is unavailable. Ground proximity alerts that occur are valid.

**[] RUNWAY SYS**

806

Condition: The runway awareness and advisory system is inoperative.

Note: Runway awareness and advisory system voice annunciations and alerts are not available.




Tail Strike

Condition: A tail strike is suspected or confirmed.

Caution! Continued pressurization of the airplane can cause further structural damage.

1 OUTFLOW VALVES MAN switches (both)ON

Use momentary actuation of the outflow valves manual control to avoid large and rapid pressurization changes.

2  OUTFLOW VALVES manual control Move to OPEN until the outflow valve indications show fully open to depressurize the airplane

3 Plan to land at the nearest suitable airport.

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

CABIN ALT AUTO

OUTFLOW VLV L, R



TCAS OFF

Condition: TCAS modes TA ONLY or TA/RA are not selected.



TCAS RA CAPT, F/O

Condition: TCAS cannot show RA guidance on the PFD.

**TCAS SYSTEM**

Condition: TCAS is failed.

**TERR OVRD**

Condition: The ground proximity terrain override switch is in OVRD.

**[] TERR POS**

Condition: Terrain position data is lost.

Note: Position data for look-ahead terrain alerting and display are unavailable. 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.



Operational Information

Chapter OI

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747 Flight Crew Operations Manual

Operational Information
Ops Info

Chapter OI
Section 1

Introduction

Note: This Section Reserved For Operator-Developed Information.

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This Section Applies to 806

Photoluminescent Strip Charging

The photoluminescent strips need to be properly charged. The tables below contain charging information and can be used to determine how long the strips remain illuminated for a given charge. For charging, the cabin ceiling and sidewall lights need to be on at a defined state and the strips should not be covered or blocked.

For charging,, the cabin ceiling and sidewall lights need to be set at a corresponding scene specified in the tables below. This can be accomplished through the Lighting menu of the Cabin Attendant Panel (CAP) located at the Purser Work Station. The strips shall not be covered or blocked.

Initial Charging Instructions

Charge Scenario	Scene	Charge Time (Minutes)	Maximum Duration Allowed (Hours)	Remarks
Bins Open or Closed No Passengers or Seated Passengers	Maintenance	30	9.00	Cabin activity is limited to minor aisle traffic of crew and personnel.
		45	10.25	
	DAY Board DAY Deboard	30	7.50	
		45	9.25	

Extended Charging Instructions

Following an initial charge, photoluminescent duration can be extended beyond the initial charge using the following scenarios.

Charge Scenario	Scene	Charge Time (Minutes)	Maximum Duration Allowed (Hours)	Remarks
Bins Closed Seated Passengers (In Flight Charging)	DAY Bright	30	7.75	Begin charging before the end of the previous photoluminescent discharge duration.
		45	9.25	
	DAY Medium	30	2.75	Cabin activity is limited to minor aisle traffic of crew and passengers.
	NIGHT Bright			

Continuous Charging Instructions

Photoluminescent duration can be extended indefinitely while one of the following scenes is being run.

Charge Scenario	Scene	Charge Time (Minutes)	Maximum Duration Allowed (Hours)	Remarks
Bins Closed Seated Passengers	Any Initial or Extended Charging Scene	Continuous	Continuous	Scene needs to be run continuously to take credit for charging.
	NIGHT Medium	Continuous	Continuous	
	DAY Low NIGHT Low	Continuous	Continuous	Cabin activity is limited to minor aisle traffic of crew and passengers.
	Default Dim State*	Continuous	Continuous	

* The default dim state "scene" values are contained within the light fixtures. This scene is initiated should the communication between the light fixtures and the aircraft cabin systems be lost.

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747-8F GENX-2B67_PIP C LB FT FAA

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Pkg Model Identification**Chapter PI-QRH**
Section 10**General**

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Errata (NOE) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Serial and tabulation number are supplied by Boeing.

Airplane Number	Registry Number
806	Intercontinental
914	Freighter

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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 (310/.83)**Flaps Up, Max Climb Thrust**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)					
		200	250	300	350	400	450
40000	PITCH ATT	4.5	4.5	5.0			
	V/S (FT/MIN)	2000	1200	600			
35000	PITCH ATT	5.5	5.0	5.0	5.0	5.0	
	V/S (FT/MIN)	3200	2300	1600	1000	400	
30000	PITCH ATT	4.5	4.5	4.5	4.5	4.5	5.0
	V/S (FT/MIN)	2900	2200	1700	1300	900	600
20000	PITCH ATT	8.0	7.0	6.5	6.5	6.5	6.5
	V/S (FT/MIN)	4500	3500	2800	2200	1800	1400
10000	PITCH ATT	11.5	10.0	9.5	9.0	8.5	8.5
	V/S (FT/MIN)	6300	5000	4000	3300	2700	2300
SEA LEVEL	PITCH ATT	16.0	13.5	12.0	11.0	10.5	10.5
	V/S (FT/MIN)	7700	6100	5000	4100	3500	2900

Cruise (.83/310)**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)					
		200	250	300	350	400	450
40000	PITCH ATT	2.5	3.0	4.0			
	%N1	81.7	85.2	90.3			
35000	PITCH ATT	1.5	2.5	3.0	3.5	4.5	
	%N1	79.3	81.3	84.0	87.6	92.7	
30000	PITCH ATT	1.5	2.0	2.5	3.0	3.5	4.0
	%N1	78.5	79.5	81.3	83.8	86.8	90.2
25000	PITCH ATT	1.5	2.0	3.0	3.5	4.0	4.5
	%N1	74.5	75.5	77.1	79.6	82.4	85.4
20000	PITCH ATT	1.5	2.0	3.0	3.5	4.0	5.0
	%N1	70.7	71.7	73.0	75.2	77.9	80.7
15000	PITCH ATT	1.5	2.0	3.0	3.5	4.0	4.5
	%N1	67.1	68.0	69.2	71.3	73.7	76.4

Descent (.83/310)**Flaps Up, Idle Thrust**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)					
		200	250	300	350	400	450
40000	PITCH ATT	-1.0	0.5	1.0	1.5	1.5	-1.0
	V/S (FT/MIN)	-2700	-2500	-2500	-2700	-2500	-5200
35000	PITCH ATT	-2.5	-1.5	-0.5	0.5	1.0	2.0
	V/S (FT/MIN)	-3600	-3100	-2900	-2900	-3000	-2200
30000	PITCH ATT	-2.5	-1.0	0.0	0.5	1.0	1.5
	V/S (FT/MIN)	-3000	-2500	-2200	-2100	-2100	-2100
20000	PITCH ATT	-2.0	-1.0	0.0	1.0	1.5	2.0
	V/S (FT/MIN)	-2800	-2300	-2000	-1900	-1900	-1900
10000	PITCH ATT	-2.5	-1.0	0.0	0.5	1.5	2.0
	V/S (FT/MIN)	-2600	-2100	-1900	-1800	-1700	-1700
SEA LEVEL	PITCH ATT	-2.5	-1.0	0.0	1.0	1.5	2.0
	V/S (FT/MIN)	-2300	-1900	-1700	-1600	-1500	-1500

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding (Flaps Up Maneuvering Speed)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)					
		200	250	300	350	400	450
10000	PITCH ATT	5.5	6.0	6.5	7.0	7.0	7.0
	%N1	51.3	55.9	60.1	64.1	68.1	71.5
	KIAS	205	217	231	243	254	268

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION		WEIGHT (1000 KG)					
		200	250	300	350	400	450
FLAPS UP (GEAR UP)	PITCH ATT	4.5	5.5	5.5	6.0	6.5	6.5
	%N1	48.6	53.4	57.9	61.5	64.9	68.3
	KIAS	205	217	230	241	253	266
FLAPS 1 (GEAR UP)	PITCH ATT	6.5	7.0	7.5	8.0	8.5	8.5
	%N1	53.6	58.4	62.8	66.9	70.7	73.9
	KIAS	185	197	210	221	233	244
FLAPS 5 (GEAR UP)	PITCH ATT	7.0	8.0	8.0	8.5	8.5	9.0
	%N1	53.0	58.4	63.4	67.4	71.5	75.1
	KIAS	165	177	190	203	213	224
FLAPS 10 (GEAR UP)	PITCH ATT	7.5	8.0	8.0	8.0	8.5	9.0
	%N1	52.9	58.6	63.2	67.6	71.8	75.8
	KIAS	145	160	176	190	197	204
FLAPS 20 (GEAR DOWN)	PITCH ATT	5.5	6.0	6.0	6.0	6.5	6.5
	%N1	60.1	65.9	70.9	76.3	80.6	84.6
	KIAS	136	149	163	175	183	194

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF+INCREMENT)		WEIGHT (1000 KG)					
		200	250	300	350	400	450
FLAPS 25 (VREF25+10)	PITCH ATT	0.5	0.5	1.0	1.0	1.0	1.5
	%N1	49.7	54.5	59.2	63.1	66.3	69.1
	KIAS	133	148	162	174	184	195
FLAPS 30 (VREF30+10)	PITCH ATT	0.5	0.5	0.5	1.0		
	%N1	52.5	57.8	62.5	66.6	*	*
	KIAS	130	145	158	170		

* Exceeds flap placard speed.

Go-Around (1500 FT)

Flaps 20, Gear Up, Go-Around Thrust, Maneuver Speed

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)					
		200	250	300	350	400	450
10000	PITCH ATT	20.5	16.5	13.5	11.0	10.5	9.0
	V/S (FT/MIN)	4300	3300	2600	2000	1600	1200
	KIAS	136	149	164	176	185	196
5000	PITCH ATT	23.5	18.5	15.0	13.0	11.5	10.5
	V/S (FT/MIN)	4700	3700	3000	2400	1900	1500
	KIAS	136	149	163	175	183	194
SEA LEVEL	PITCH ATT	24.0	19.0	15.5	13.5	12.0	11.0
	V/S (FT/MIN)	4500	3500	2900	2400	1900	1500
	KIAS	136	149	163	174	183	193

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps Up, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
200	199	199	200	201	203	205	208	212
210	209	209	210	211	212	213	215	218
220	219	219	219	220	221	222	223	225
240	239	239	239	239	240	240	241	242
260	259	258	258	259	259	259	260	261
280	279	278	278	278	278	279	279	279
300	299	298	298	298	298	298	298	299
320	319	318	318	318	318	318	318	318
340	339	339	338	338	338	338	338	338
360	359	359	358	358	358	358	358	358

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
200	20	10	0	-30	-60	-100	-160	-230
210	30	20	10	-10	-40	-70	-110	-170
220	30	30	20	0	-20	-40	-80	-120
240	40	40	30	30	10	-10	-30	-60
260	40	50	50	40	30	20	0	-20
280	40	50	50	60	50	40	30	20
300	40	50	60	60	60	60	50	40
320	40	60	60	70	70	70	70	70
340	40	50	70	70	80	80	80	80
360	30	50	70	80	80	90	90	100

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 1, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
180	180	181	182	184	186	188	191	196
190	190	190	192	193	194	196	198	201
200	199	200	201	202	203	205	206	208
210	209	210	210	211	212	213	215	216
220	219	219	220	221	222	222	224	225
240	239	239	239	240	240	241	242	243
260	259	259	259	259	260	260	261	262
280	278	278	279	279	279	279	280	280
300	298	298	298	298	299	299	299	300

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
180	0	-20	-40	-70	-100	-150	-210	-270
190	10	-10	-30	-50	-80	-120	-160	-220
200	10	0	-20	-40	-60	-90	-130	-170
210	20	10	-10	-30	-50	-80	-110	-140
220	30	20	0	-20	-40	-60	-80	-120
240	30	30	20	10	-10	-30	-50	-80
260	40	40	30	20	10	0	-20	-40
280	50	50	50	40	30	20	0	-10
300	60	60	60	50	50	40	30	10

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 5, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
160	160	162	163	166	169	174	181	
164	164	165	167	169	172	175	181	
168	168	169	170	172	175	178	182	190
172	172	173	174	175	178	180	184	190
176	176	177	178	179	181	183	187	191
180	180	180	181	183	184	186	189	193
190	189	190	191	192	193	194	196	199
200	199	199	200	201	202	203	205	207
210	209	209	210	210	211	212	213	215
220	219	219	219	220	221	221	222	223
240	239	239	239	239	240	240	241	242
260	258	258	258	259	259	259	260	261
280	278	278	278	278	279	279	279	280

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
160	-10	-30	-50	-90	-140	-210	-310	
164	0	-20	-50	-80	-130	-180	-270	
168	0	-20	-40	-70	-110	-160	-230	-330
172	0	-10	-30	-60	-100	-150	-210	-290
176	10	-10	-30	-50	-90	-130	-190	-250
180	10	-10	-20	-50	-80	-120	-170	-230
190	20	0	-10	-30	-60	-90	-130	-180
200	20	10	0	-20	-40	-70	-100	-140
210	30	20	10	-10	-30	-50	-70	-100
220	30	30	20	0	-20	-30	-50	-80
240	40	40	30	20	10	-10	-20	-40
260	40	40	40	40	30	20	0	-20
280	50	50	50	50	50	40	30	10

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 10, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
140	140	142	145	149				
144	144	145	148	151	158			
148	148	149	151	154	158			
152	152	153	154	157	160	167		
156	156	156	158	160	163	167		
160	159	160	161	163	165	169	175	
164	163	164	165	166	168	171	176	184
168	167	168	169	170	171	174	178	183
172	171	172	172	173	175	177	180	184
176	175	175	176	177	178	180	182	186
180	179	179	180	181	182	183	185	188
190	189	189	189	190	191	192	193	195
200	198	199	199	199	200	201	202	203
210	208	208	209	209	210	210	211	212
220	218	218	218	219	219	220	220	221
240	238	238	238	238	238	239	239	240
260	258	258	258	258	258	258	258	259

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
140	-10	-30	-70	-130				
144	0	-20	-50	-100	-190			
148	0	-20	-40	-80	-150			
152	0	-10	-30	-70	-120	-210		
156	10	-10	-30	-60	-100	-170		
160	10	0	-20	-50	-90	-140	-230	
164	10	0	-10	-40	-70	-120	-190	-310
168	20	10	-10	-30	-60	-100	-160	-250
172	20	10	0	-20	-50	-90	-140	-210
176	20	10	0	-20	-40	-70	-120	-180
180	20	20	0	-10	-30	-60	-100	-150
190	30	20	10	0	-20	-40	-60	-100
200	40	30	20	10	0	-20	-40	-70
210	40	40	30	20	10	0	-20	-40
220	40	40	40	30	20	10	-10	-20
240	50	50	50	50	40	30	20	10
260	50	60	60	60	60	50	40	30

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 20, Gear Up and Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
132	130	131	132	135	141			
136	134	134	136	138	142			
140	138	138	139	141	144	149		
144	142	142	143	144	146	150		
148	146	146	146	147	149	152	157	
152	150	150	150	151	152	154	158	165
156	154	154	154	154	155	157	160	164
160	158	157	158	158	159	160	162	166
164	162	161	161	162	162	164	165	168
168	165	165	165	166	166	167	168	170
172	169	169	169	169	170	171	172	173
176	173	173	173	173	174	174	175	176
180	177	177	177	177	177	178	179	180
190	187	187	187	187	187	187	188	188
200	197	197	197	197	197	197	197	197
210	207	207	207	207	207	207	207	207
220	218	217	217	217	217	217	216	217
240	238	237	237	237	236	236	236	236

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
132	30	20	0	-40	-120			
136	30	20	10	-20	-80			
140	30	30	10	-10	-50	-130		
144	40	30	20	0	-30	-90		
148	40	40	30	10	-10	-60	-130	
152	40	40	30	20	0	-40	-90	-190
156	40	40	40	30	10	-20	-60	-130
160	40	40	40	30	20	0	-40	-90
164	40	50	50	40	30	10	-20	-60
168	50	50	50	40	30	20	-10	-40
172	50	50	50	50	40	30	10	-20
176	50	50	50	50	50	40	20	-10
180	50	50	60	60	50	40	30	10
190	50	60	60	60	60	60	50	30
200	60	60	70	70	70	70	60	60
210	60	70	70	70	80	80	80	70
220	60	70	80	80	80	90	90	80
240	60	70	80	90	90	100	100	100

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 25, Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
120	118	119	121					
124	122	122	124	127				
128	126	126	127	129				
132	129	130	130	132	135			
136	133	134	134	135	137			
140	137	137	138	138	140	143		
144	141	141	142	142	143	145	149	
148	145	145	145	146	146	148	151	
152	149	149	149	149	150	151	153	157
156	153	153	153	153	154	154	156	158
160	157	157	157	157	157	158	159	161
170	167	167	167	167	167	167	168	168
180	177	177	177	176	176	177	177	177
190	187	187	187	186	186	186	186	187
200	197	197	197	196	196	196	196	196
220	217	217	217	216	216	216	216	216

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
120	30	20	-10					
124	30	20	10	-40				
128	30	30	20	-10				
132	40	30	20	0	-40			
136	40	40	30	20	-20			
140	40	40	30	20	0	-40		
144	40	40	40	30	10	-20	-80	
148	50	50	40	40	30	0	-40	
152	50	50	50	40	30	20	-20	-70
156	50	50	50	50	40	30	0	-40
160	50	50	50	50	50	40	20	-10
170	50	60	60	60	60	50	40	30
180	60	60	70	70	70	60	60	50
190	60	70	70	80	80	80	70	70
200	60	70	80	80	90	90	90	80
220	60	70	80	90	100	100	100	110

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 30, Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
120	118	118	121					
124	122	122	123	127				
128	125	126	127	129				
132	129	129	130	132	135			
136	133	133	134	135	137			
140	137	137	137	138	140	143		
144	141	141	141	142	143	145	150	
148	145	145	145	145	146	148	151	
152	149	149	149	149	150	151	153	157
156	153	153	153	153	153	154	156	158
160	157	157	157	157	157	158	159	161
170	168	167	167	167	167	167	167	168
180	178	177	177	176	176	176	177	177
190	188	187	187	186	186	186	186	186

Table 2 of 2: Pressure Altitude Adjustment

IFSD AIRSPEED (KIAS)	WEIGHT (1000 KG)							
	180	220	260	300	340	380	420	460
120	30	20	-10					
124	30	30	10	-40				
128	40	30	20	-10				
132	40	40	30	0	-50			
136	40	40	30	20	-20			
140	40	40	40	30	0	-50		
144	40	50	40	40	20	-20	-90	
148	40	50	50	40	30	0	-40	
152	40	50	50	50	40	20	-10	-80
156	40	50	50	50	50	30	0	-40
160	40	50	60	60	50	40	20	-10
170	40	50	60	60	60	60	50	30
180	40	50	60	70	70	70	70	60
190	40	50	60	70	80	80	80	80

Actual altitude = ISFD altitude + pressure altitude adjustment.

Max Climb %N1

Based on engine bleed for packs on, engine and wing anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KCAS OR MACH)									
	0	5	10	15	20	25	30	35	40	45
	340	340	340	340	340	340	0.81	0.84	0.84	0.84
60	91.0	91.6	92.9	94.1	96.1	97.6	99.8	101.2	101.5	100.7
50	92.8	93.2	93.8	93.1	94.7	96.2	98.3	99.7	100.0	99.2
40	94.2	95.0	95.4	94.8	95.0	94.9	96.7	98.2	98.4	97.7
30	92.7	95.5	97.0	96.4	96.6	96.5	95.2	96.6	96.8	96.1
20	91.2	93.9	96.6	97.9	98.2	98.0	96.9	95.5	95.2	94.5
15	90.4	93.1	95.8	97.3	99.0	98.9	97.8	96.5	95.9	95.2
10	89.6	92.3	95.0	96.5	98.7	99.7	98.7	97.6	97.0	96.3
5	88.8	91.5	94.1	95.6	97.9	99.6	99.7	98.6	98.0	97.3
0	88.0	90.7	93.3	94.8	97.0	98.7	100.8	99.6	99.0	98.3
-5	87.2	89.8	92.4	93.9	96.1	97.8	101.1	100.8	100.0	99.3
-10	86.4	89.0	91.5	93.0	95.2	96.8	100.2	101.4	100.9	100.3
-15	85.5	88.1	90.7	92.1	94.3	95.9	99.2	101.0	100.9	100.8
-20	84.7	87.3	89.8	91.2	93.4	95.0	98.3	100.0	99.9	99.9
-25	83.9	86.4	88.9	90.3	92.4	94.0	97.3	99.0	98.9	98.9
-30	83.0	85.5	88.0	89.4	91.5	93.1	96.3	98.0	97.9	97.9
-35	82.2	84.7	87.1	88.5	90.6	92.1	95.3	97.0	96.9	96.8
-40	81.3	83.8	86.2	87.5	89.6	91.2	94.3	96.0	95.9	95.8

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	45
ENGINE ANTI-ICE ON	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5
ENGINE & WING ANTI-ICE ON	-0.7	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-0.9	-0.9	-0.9

Go-around %N1

Based on engine bleed for packs on and anti-ice off

REPORTED OAT (°C)	TAT (°C)	AIRPORT PRESSURE ALTITUDE (1000 FT)										
		0	1	2	3	4	5	6	7	8	9	10
70	74	85.9	86.7	87.5	88.3	88.7	89.1	89.4	89.8	89.9	89.6	89.0
60	64	87.9	88.8	89.7	90.7	91.2	91.7	92.1	92.5	92.7	92.4	91.8
55	59	88.8	89.8	90.8	91.8	92.4	93.0	93.4	93.9	94.1	93.8	93.2
50	54	90.2	90.9	91.9	92.9	93.6	94.2	94.6	95.1	95.4	95.1	94.5
45	49	91.5	92.3	93.2	94.2	94.8	95.3	95.9	96.4	96.7	96.4	95.8
40	44	92.8	93.6	94.5	95.4	96.0	96.6	97.1	97.6	98.0	97.7	97.1
35	39	94.2	94.9	95.8	96.8	97.2	97.7	98.3	99.0	99.0	98.8	98.3
30	34	94.8	95.7	96.6	97.6	98.2	98.7	99.2	99.7	99.9	99.5	99.2
25	29	94.1	95.5	97.0	98.1	98.7	99.2	100.3	100.8	100.7	100.3	99.9
20	24	93.3	94.7	96.2	97.7	98.9	100.1	100.9	101.7	102.2	101.6	100.7
15	19	92.5	93.9	95.4	96.8	98.0	99.3	100.7	102.4	102.9	102.4	101.6
10	14	91.7	93.1	94.5	96.0	97.2	98.5	99.8	101.5	102.5	102.5	102.5
5	8	90.8	92.1	93.5	95.0	96.2	97.4	98.8	100.4	101.4	101.4	101.5
0	3	90.0	91.3	92.7	94.2	95.3	96.6	97.9	99.6	100.5	100.5	100.7
-10	-7	88.3	89.6	91.0	92.4	93.6	94.9	96.2	97.8	98.8	98.8	98.9
-20	-17	86.6	87.9	89.3	90.7	91.9	93.2	94.5	96.1	97.0	97.0	97.1
-30	-27	84.9	86.2	87.6	89.0	90.2	91.4	92.7	94.3	95.2	95.2	95.3
-40	-37	83.2	84.4	85.8	87.2	88.5	89.7	90.9	92.5	93.4	93.4	93.5
-50	-47	81.4	82.7	84.0	85.5	86.7	87.9	89.1	90.6	91.5	91.6	91.7

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)										
	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4

VREF (KIAS)

WEIGHT (1000 KG)	FLAPS	
	30	25
460	187	191
440	183	187
420	178	182
400	173	177
380	169	172
360	164	167
340	160	163
320	155	158
300	150	153
280	144	147
260	139	141
240	133	136
220	127	130
200	121	124

Takeoff Speeds - Dry Runway**Max Takeoff Thrust****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 10		
	V1	VR	V2
460	168	184	197
440	164	180	194
420	160	175	190
400	156	170	186
380	151	165	182
360	146	159	178
340	141	154	173
320	136	148	168
300	129	142	163
280	123	136	158
260	116	128	152
240	109	122	146
220	101	115	141
200	92	107	134

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	16	17						8	8						-2	-3								
60	12	12	15	17				6	6	8	9				-2	-2	-2	-3						
50	7	8	11	13	15	18	21	4	4	6	7	8	9	12	-1	-1	-2	-2	-2	-3	-3			
40	3	4	7	9	12	14	18	2	2	4	5	7	8	9	-1	-1	-1	-1	-2	-2	-3			
35	1	1	3	7	10	13	15	1	1	3	4	6	7	9	0	0	-1	-1	-1	-2	-2			
30	0	0	3	6	8	11	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-2			
20	0	0	1	3	5	8	12	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	5	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-40	0	0	3	5	7	9	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	1	1	4	6	7	10	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
460	-6	-3	0	3	6		-4	-3	-1	0	1	2	3	4
440	-6	-3	0	3	5		-4	-3	-1	0	1	2	3	3
420	-5	-2	0	3	5		-4	-3	-1	0	1	2	3	3
400	-5	-2	0	2	5		-4	-3	-1	0	1	2	2	3
380	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3
360	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3
340	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3
320	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3
300	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3
280	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3
260	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3
240	-3	-1	0	1	3		-3	-2	-1	0	1	2	2	3
220	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3
200	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3

*V1 not to exceed VR

Takeoff Speeds - Dry Runway

Max Takeoff Thrust

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	126	121	124										
50	126	129	124	127	119	123	116	120	114	118				
40	133	136	132	135	126	129	121	125	116	120	111	116	108	112
30	138	141	138	140	132	135	127	130	121	125	116	120	110	114
20	138	141	138	141	134	137	130	134	126	130	121	125	114	118
0	139	141	138	141	135	137	131	134	127	130	123	127	118	122
-60	140	141	139	140	135	137	131	134	128	131	123	127	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
320 & ABV	166	167	167	167	167	168	168	168
300	160	160	161	161	161	161	162	165
280	155	155	155	156	156	156	160	165
260	148	149	149	150	150	154	159	164
240	142	143	143	144	148	153	158	163
220	136	137	138	143	147	152	156	161
200	127	132	137	141	146	151	155	160

Takeoff Speeds - Dry Runway**Max Takeoff Thrust****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 20		
	V1	VR	V2
460	157	170	182
440	153	166	179
420	149	162	175
400	145	157	172
380	141	152	168
360	136	147	164
340	131	142	160
320	125	137	155
300	119	131	151
280	114	125	146
260	107	118	140
240	99	112	135
220	92	106	130
200	84	98	124

Check V1 (MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	16	17						8	8						-2	-3								
60	12	12	15	17				6	6	8	9				-2	-2	-2	-3						
50	7	8	11	13	15	18	21	4	4	6	7	8	9	12	-1	-1	-2	-2	-2	-3	-3			
40	3	4	7	9	12	14	18	2	2	4	5	7	8	9	-1	-1	-1	-1	-2	-2	-3			
35	1	1	3	7	10	13	15	1	1	3	4	6	7	9	0	0	-1	-1	-1	-2	-2			
30	0	0	3	6	8	11	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-2			
20	0	0	1	3	5	8	12	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	5	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-40	0	0	3	5	7	9	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	1	1	4	6	7	10	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
460	-6	-3	0	3	6		-4	-3	-1	0	1	2	3	4		
440	-6	-3	0	3	5		-4	-3	-1	0	1	2	3	3		
420	-5	-2	0	3	5		-4	-3	-1	0	1	2	3	3		
400	-5	-2	0	2	5		-4	-3	-1	0	1	2	2	3		
380	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
360	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
340	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
320	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3		
300	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3		
280	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
260	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
240	-3	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
220	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
200	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

Takeoff Speeds - Dry Runway

Max Takeoff Thrust

Flaps 20

Table 4 of 5: V1(MCG), and Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	126	121	124										
50	126	129	124	127	119	123	116	120	114	118				
40	133	136	132	135	126	129	121	125	116	120	111	116	108	112
30	138	141	138	140	132	135	127	130	121	125	116	120	110	114
20	138	141	138	141	134	137	130	134	126	130	121	125	114	118
0	139	141	138	141	135	137	131	134	127	130	123	127	118	122
-60	140	141	139	140	135	137	131	134	128	131	123	127	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
360 & ABV	162	163	163	163	163	164	164	164
340	157	157	157	158	158	158	159	162
320	152	152	153	153	153	154	157	161
300	147	148	148	148	149	151	156	161
280	142	143	143	144	146	150	155	160
260	137	137	137	140	144	149	154	159
240	131	132	134	139	144	149	153	158
220	124	128	133	138	143	147	152	157
200	123	128	132	137	142	146	151	156

Takeoff Speeds - Wet Runway**Max Takeoff Thrust****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 10		
	V1	VR	V2
460	156	184	197
440	151	180	194
420	146	175	190
400	141	170	186
380	135	165	182
360	130	159	178
340	124	154	173
320	118	148	168
300	111	142	163
280	105	136	158
260	97	128	152
240	90	122	146
220	83	115	141
200	75	107	134

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	19	19						8	8						-2	-3								
60	14	15	17	19				6	6	8	9				-2	-2	-2	-3						
50	8	9	13	15	18	20	23	4	4	6	7	9	10	11	-1	-1	-2	-2	-2	-3	-3			
40	3	4	7	10	13	15	20	2	2	4	5	7	8	10	-1	-1	-1	-1	-2	-2	-3			
30	0	0	3	5	8	12	15	0	0	2	4	5	6	8	0	0	0	-1	-1	-2	-2			
20	0	0	2	4	6	9	13	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
0	1	1	3	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-20	2	2	4	5	7	9	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	4	4	6	7	9	11	14	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
460	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6		
440	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6		
420	-6	-2	0	4	8		-6	-3	-1	0	2	4	5	7		
400	-6	-2	0	4	7		-6	-4	-1	0	2	4	5	7		
380	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7		
360	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7		
340	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7		
320	-4	-2	0	4	6		-7	-4	-1	0	2	4	6	7		
300	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7		
280	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7		
260	-3	-1	0	3	6		-7	-4	-1	0	2	4	6	7		
240	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		
220	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		
200	-2	0	0	3	5		-6	-4	-1	0	2	4	6	7		

*V1 not to exceed VR

Takeoff Speeds - Wet Runway

Max Takeoff Thrust

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	126	121	124										
50	126	129	124	127	119	123	116	120	114	118				
40	133	136	132	135	126	129	121	125	116	120	111	116	108	112
30	138	141	138	140	132	135	127	130	121	125	116	120	110	114
20	138	141	138	141	134	137	130	134	126	130	121	125	114	118
0	139	141	138	141	135	137	131	134	127	130	123	127	118	122
-60	140	141	139	140	135	137	131	134	128	131	123	127	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
320 & ABV	166	167	167	167	167	168	168	168
300	160	160	161	161	161	161	162	165
280	155	155	155	156	156	156	160	165
260	148	149	149	150	150	154	159	164
240	142	143	143	144	148	153	158	163
220	136	137	138	143	147	152	156	161
200	127	132	137	141	146	151	155	160

Takeoff Speeds - Wet Runway**Max Takeoff Thrust****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 20		
	V1	VR	V2
460	145	170	182
440	141	166	179
420	136	162	175
400	131	157	172
380	126	152	168
360	120	147	164
340	115	142	160
320	109	137	155
300	103	131	151
280	97	125	146
260	90	118	140
240	83	112	135
220	76	106	130
200	69	98	124

Check V1 (MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	18	18						8	8						-2	-3								
60	12	13	15	17				6	6	8	9				-2	-2	-2	-3						
50	7	8	11	13	15	18	21	4	4	6	7	8	9	12	-1	-1	-2	-2	-2	-3	-3			
40	3	4	6	8	12	14	18	2	2	4	5	7	8	9	-1	-1	-1	-1	-2	-2	-3			
30	0	0	3	5	8	10	15	0	0	2	4	5	6	8	0	0	0	-1	-1	-2	-2			
20	0	0	2	4	6	9	13	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
0	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-20	1	1	3	5	7	9	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	2	2	4	6	8	10	13	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
460	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6
440	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6
420	-6	-2	0	4	8		-6	-3	-1	0	2	4	5	7
400	-6	-2	0	4	7		-6	-4	-1	0	2	4	5	7
380	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
360	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
340	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
320	-4	-2	0	4	6		-7	-4	-1	0	2	4	6	7
300	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7
280	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7
260	-3	-1	0	3	6		-7	-4	-1	0	2	4	6	7
240	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
220	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
200	-2	0	0	3	5		-6	-4	-1	0	2	4	6	7

*V1 not to exceed VR

Takeoff Speeds - Wet Runway

Max Takeoff Thrust

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	126	121	124										
50	126	129	124	127	119	123	116	120	114	118				
40	133	136	132	135	126	129	121	125	116	120	111	116	108	112
30	138	141	138	140	132	135	127	130	121	125	116	120	110	114
20	138	141	138	141	134	137	130	134	126	130	121	125	114	118
0	139	141	138	141	135	137	131	134	127	130	123	127	118	122
-60	140	141	139	140	135	137	131	134	128	131	123	127	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
360 & ABV	162	163	163	163	163	164	164	164
340	157	157	157	158	158	158	159	162
320	152	152	153	153	153	154	157	161
300	147	148	148	148	149	151	156	161
280	142	143	143	144	146	150	155	160
260	137	137	137	140	144	149	154	159
240	131	132	134	139	144	149	153	158
220	124	128	133	138	143	147	152	157
200	123	128	132	137	142	146	151	156

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
2000	230
2500	270
3000	310
3500	340
4000	370
4500	400
5000	430

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
300	-4	-7	-7	-4	-4					
200	-2	-5	-5	-3	-3					
100	-1	-2	-2	-2	-2					
0	0	0	0	0	0	0	0	0	0	0
-100	1	1	1	1	1	2	2	2	2	2
-200	1	1	1	1	1	2	2	2	2	2
-300	1	1	1	1	1	2	2	2	2	2

Use of clearway not allowed on wet runways.
V1 not to exceed VR.

TO1 Takeoff Speeds - Dry Runway**10% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 10		
	V1	VR	V2
460	175	187	197
440	171	183	194
420	167	178	190
400	162	173	186
380	157	167	181
360	152	162	177
340	147	156	172
320	141	150	168
300	135	144	162
280	128	138	157
260	121	131	151
240	114	124	145
220	106	117	140
200	97	110	133

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	15	15						8	8						-2	-2								
60	10	11	13	15				5	6	7	8				-1	-2	-2	-2						
50	6	7	9	11	14	16	18	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-2			
40	2	3	6	8	11	13	16	1	2	4	5	6	8	9	0	0	-1	-1	-1	-2	-2			
30	0	0	2	5	8	11	13	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2			
20	0	0	1	3	6	8	11	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1			
10	0	0	1	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1			
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1			
-20	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1			
-40	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1			
-60	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
460	-6	-3	0	3	5		-4	-3	-1	0	1	1	2	3		
440	-6	-3	0	2	5		-4	-3	-1	0	1	1	2	3		
420	-5	-2	0	2	5		-4	-2	-1	0	1	1	2	3		
400	-5	-2	0	2	4		-4	-2	-1	0	1	1	2	3		
380	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
360	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
340	-4	-2	0	2	3		-3	-2	-1	0	1	1	2	3		
320	-3	-2	0	2	3		-3	-2	-1	0	1	1	2	3		
300	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3		
280	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3		
260	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3		
240	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3		
220	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
200	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

TO1 Takeoff Speeds - Dry Runway

10% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	105	110	115	120	125	130	135
280 & ABV	155	155	155	155	156	156	157
260	148	148	149	149	150	150	154
240	142	142	143	143	144	148	153
220	136	136	137	138	142	147	152
200	130	130	132	136	141	146	151

TO1 Takeoff Speeds - Dry Runway**10% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 20		
	V1	VR	V2
460	164	173	182
440	160	169	178
420	155	164	175
400	151	160	171
380	147	155	167
360	142	150	163
340	136	144	159
320	131	139	154
300	125	133	150
280	119	127	145
260	112	120	139
240	104	114	134
220	96	108	129
200	89	101	123

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	15	15						8	8						-2	-2								
60	10	11	13	15				5	6	7	8				-1	-2	-2	-2						
50	6	7	9	11	14	16	18	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-2			
40	2	3	6	8	11	13	16	1	2	4	5	6	8	9	0	0	-1	-1	-1	-2	-2			
30	0	0	2	5	8	11	13	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2			
20	0	0	1	3	6	8	11	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1			
10	0	0	1	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1			
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1			
-20	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1			
-40	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1			
-60	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
460	-6	-3	0	3	5		-4	-3	-1	0	1	1	2	3		
440	-6	-3	0	2	5		-4	-3	-1	0	1	1	2	3		
420	-5	-2	0	2	5		-4	-2	-1	0	1	1	2	3		
400	-5	-2	0	2	4		-4	-2	-1	0	1	1	2	3		
380	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
360	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
340	-4	-2	0	2	3		-3	-2	-1	0	1	1	2	3		
320	-3	-2	0	2	3		-3	-2	-1	0	1	1	2	3		
300	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3		
280	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3		
260	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3		
240	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3		
220	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
200	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

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TO1 Takeoff Speeds - Dry Runway

10% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	105	110	115	120	125	130	135
320 & ABV	153	153	153	153	153	153	153
300	148	148	148	148	148	148	151
280	142	142	143	143	143	146	150
260	136	137	137	138	139	144	150
240	131	132	132	134	139	144	149
220	126	126	127	132	138	143	148
200	120	121	127	132	138	143	148

TO1 Takeoff Speeds - Wet Runway**10% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 10		
	V1	VR	V2
460	164	187	197
440	159	183	194
420	154	178	190
400	148	173	186
380	143	167	181
360	137	162	177
340	130	156	172
320	124	150	168
300	117	144	162
280	111	138	157
260	103	131	151
240	96	124	145
220	89	117	140
200	81	109	133

Check V1 (MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	16	17						8	8						-2	-2					
60	12	12	15	17				5	6	7	8				-1	-1	-2	-2			
50	6	8	11	13	15	18	21	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-2
40	2	3	6	9	12	14	17	1	2	4	5	6	8	9	0	-0	-1	-1	-1	-2	-2
30	0	0	2	5	8	11	14	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	1	2	4	7	11	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1
10	0	0	1	3	4	6	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-20	1	1	3	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-40	2	2	4	4	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-60	3	3	4	5	6	9	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
460	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5		
440	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5		
420	-6	-3	0	4	7		-5	-3	-1	0	2	3	4	6		
400	-6	-3	0	4	7		-6	-3	-1	0	2	3	4	6		
380	-6	-3	0	4	7		-6	-4	-1	0	2	3	5	6		
360	-6	-2	0	4	7		-6	-4	-1	0	2	3	5	6		
340	-5	-2	0	4	6		-7	-4	-2	0	2	4	5	6		
320	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	6		
300	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	7		
280	-4	-2	0	3	6		-7	-4	-2	0	2	4	5	7		
260	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	7		
240	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7		
220	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		
200	-3	-1	0	3	4		-7	-4	-1	0	2	4	6	7		

*V1 not to exceed VR

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TO1 Takeoff Speeds - Wet Runway

10%Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	105	110	115	120	125	130	135
280 & ABV	155	155	155	155	156	156	157
260	148	148	149	149	150	150	154
240	142	142	143	143	144	148	153
220	136	136	137	138	142	147	152
200	130	130	132	136	141	146	151

TO1 Takeoff Speeds - Wet Runway**10% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 20		
	V1	VR	V2
460	154	173	182
440	148	169	178
420	143	164	175
400	138	160	171
380	133	155	167
360	127	150	163
340	121	144	159
320	115	139	154
300	109	133	150
280	103	127	145
260	96	120	139
240	89	114	134
220	81	107	129
200	74	100	123

Check V1 (MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	16	17						8	8							-2	-2							
60	12	12	15	17				5	6	7	8					-1	-1	-2	-2					
50	6	8	11	13	15	18	21	3	4	5	7	8	9	11		-1	-1	-1	-2	-2	-2	-2		
40	2	3	6	9	12	14	17	1	2	4	5	6	8	9	0	-0	-1	-1	-1	-1	-2	-2		
30	0	0	2	5	8	11	14	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-1	-2		
20	0	0	1	2	4	7	11	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1	-1		
10	0	0	1	3	4	6	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1	-1		
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1	-1		
-20	1	1	3	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	0	-1	-1		
-40	2	2	4	4	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	0	-1	-1		
-60	3	3	4	5	6	9	11	0	0	1	2	3	4	6	0	0	0	0	0	0	-1	-1		

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
460	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5		
440	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5		
420	-6	-3	0	4	7		-5	-3	-1	0	2	3	4	6		
400	-6	-3	0	4	7		-6	-3	-1	0	2	3	4	6		
380	-6	-3	0	4	7		-6	-4	-1	0	2	3	5	6		
360	-6	-2	0	4	7		-6	-4	-1	0	2	3	5	6		
340	-5	-2	0	4	6		-7	-4	-2	0	2	4	5	6		
320	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	6		
300	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	7		
280	-4	-2	0	3	6		-7	-4	-2	0	2	4	5	7		
260	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	7		
240	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7		
220	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		
200	-3	-1	0	3	4		-7	-4	-1	0	2	4	6	7		

*V1 not to exceed VR

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TO1 Takeoff Speeds - Wet Runway

10% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	105	110	115	120	125	130	135
320 & ABV	153	153	153	153	153	153	153
300	148	148	148	148	148	148	151
280	142	142	143	143	143	146	150
260	136	137	137	138	139	144	150
240	131	132	132	134	139	144	149
220	126	126	127	132	138	143	148
200	120	121	127	132	138	143	148

TO1 Maximum Allowable Clearway
10% Thrust Reduction

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
2000	230
2500	280
3000	320
3500	340
4000	370
4500	390
5000	420

TO1 Clearway and Stopway V1 Adjustments

10% Thrust Reduction

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
300	-3	-5	-6	-5	-3					
200	-2	-4	-5	-3	-2					
100	-1	-2	-3	-1	-1					
0	0	0	0	0	0	0	0	0	0	0
-100	1	1	1	1	1	1	1	1	1	1
-200	1	1	1	1	1	1	1	1	1	1
-300	1	1	1	1	1	1	1	1	1	1

Use of clearway not allowed on wet runways.

V1 not to exceed VR.

TO2 Takeoff Speeds - Dry Runway**20% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 10		
	V1	VR	V2
440	177	185	193
420	172	180	189
400	167	175	185
380	163	170	181
360	158	165	177
340	152	159	172
320	146	153	167
300	140	147	162
280	133	140	157
260	126	133	151
240	118	126	145
220	110	119	139
200	101	111	133

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	11	12						6	6						-2	-2					
60	9	10	13	15				5	5	7	8				-1	-1	-2	-2			
50	6	6	8	12	13	15	18	3	4	5	6	7	9	10	-1	-1	-1	-1	-2	-2	
40	3	3	6	8	10	13	15	2	2	3	5	6	7	9	0	0	-1	-1	-1	-2	-2
30	0	0	3	5	8	10	13	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	2	3	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
-40	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1
-60	1	1	3	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
440	-5	-3	0	2	5		-4	-2	-1	0	1	2	2	3		
420	-5	-2	0	2	5		-3	-2	-1	0	1	1	2	3		
400	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
380	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
360	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
340	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
320	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
300	-3	-1	0	2	3		-2	-1	0	0	1	1	2	2		
280	-3	-1	0	2	3		-2	-1	0	0	1	1	2	3		
260	-2	-1	0	2	3		-2	-1	0	0	1	2	2	3		
240	-2	-1	0	2	3		-2	-1	0	0	1	2	2	3		
220	-2	-1	0	2	3		-2	-1	0	0	1	2	2	3		
200	-2	-1	0	2	3		-3	-2	-1	0	1	2	3	3		

*V1 not to exceed VR

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	110	113	108	112	106	110	104	108	102	107	100	104	97	101
50	113	116	111	115	107	110	104	108	102	107	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	126	122	125	117	121	113	117	108	112	103	107	98	103
20	123	126	122	126	119	123	116	120	112	116	108	112	102	106
-60	124	126	124	126	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	100	105	110	115	120	125	130
260 & ABV	148	149	149	150	150	150	151
240	143	143	143	143	143	144	148
220	137	137	137	137	138	143	148
200	130	131	131	132	137	141	147

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 20

Table 1 of 5: V1, VR, V2 (KIAS)

WEIGHT (1000 KG)	FLAPS 20					
	V1		VR		V2	
400	156		162		170	
380	152		157		167	
360	147		152		163	
340	141		147		158	
320	135		141		154	
300	129		135		149	
280	123		129		144	
260	116		123		139	
240	108		116		134	
220	100		109		128	
200	92		102		123	

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	11	12							6	6							-2	-2						
60	9	10	13	15					5	5	7	8					-1	-1	-2	-2				
50	6	6	8	12	13	15	18		3	4	5	6	7	9	10		-1	-1	-1	-1	-2	-2		
40	3	3	6	8	10	13	15		2	2	3	5	6	7	9	0	0	0	-1	-1	-1	-2	-2	
30	0	0	3	5	8	10	13	0	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2		
20	0	0	2	3	6	8	11	0	0	1	2	3	5	6	0	0	0	0	0	-1	-1	-1		
-40	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	0	0	-1	-1		
-60	1	1	3	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	0	0	-1	-1		

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
400	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
380	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
360	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
340	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
320	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
300	-3	-1	0	2	3		-2	-1	0	0	1	1	2	2		
280	-3	-1	0	2	3		-2	-1	0	0	1	1	2	3		
260	-2	-1	0	2	3		-2	-1	0	0	1	2	2	3		
240	-2	-1	0	2	3		-2	-1	0	0	1	2	2	3		
220	-2	-1	0	2	3		-2	-1	0	0	1	2	2	3		
200	-2	-1	0	2	3		-3	-2	-1	0	1	2	3	3		

*V1 not to exceed VR

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	110	113	108	112	106	110	104	108						
50	113	116	111	115	107	110	104	108	102	107	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	126	122	125	117	121	113	117	108	112	103	107	98	103
20	123	126	122	126	119	123	116	120	112	116	108	112	102	106
-60	124	126	124	126	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	100	105	110	115	120	125	130
280 & ABV	143	143	143	144	144	144	145
260	137	137	137	137	138	139	145
240	131	132	131	132	134	139	144
220	126	126	126	128	133	138	144
200	120	120	122	127	132	137	143

TO2 Takeoff Speeds - Wet Runway**20% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 10		
	V1	VR	V2
440	166	185	193
420	161	180	189
400	155	175	185
380	149	170	181
360	143	165	177
340	137	159	172
320	130	153	167
300	124	147	162
280	117	140	157
260	109	133	151
240	102	126	145
220	94	119	139
200	86	111	133

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	12	13						6	6						-2	-2								
60	11	12	14	16				5	5	7	8				-1	-1	-2	-2						
50	7	7	9	12	15	17	20	3	4	5	6	7	9	10	-1	-1	-1	-1	-2	-2	-2			
40	3	3	5	8	10	13	16	2	2	3	5	6	7	9	-0	-0	-1	-1	-1	-2	-2			
30	0	0	3	5	7	10	13	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2			
20	0	0	2	3	5	8	11	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1			
0	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			
-20	1	1	3	4	6	8	10	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			
-40	2	2	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			
-60	2	2	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
440	-6	-3	0	4	8		-4	-3	-1	0	1	3	4	5		
420	-6	-3	0	4	8		-5	-3	-1	0	1	3	4	5		
400	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
380	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
360	-6	-3	0	4	7		-6	-4	-1	0	1	3	4	5		
340	-6	-3	0	3	6		-6	-4	-2	0	1	3	4	5		
320	-5	-2	0	3	6		-6	-4	-2	0	1	3	4	6		
300	-5	-2	0	3	6		-6	-4	-2	0	2	3	4	6		
280	-5	-2	0	3	5		-6	-4	-2	0	2	3	5	6		
260	-4	-2	0	3	5		-6	-4	-2	0	2	3	5	6		
240	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	6		
220	-3	-1	0	3	5		-7	-4	-1	0	2	4	5	7		
200	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		

*V1 not to exceed VR

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	110	113	108	112	106	110	104	108						
50	113	116	111	115	107	110	104	108	102	107	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	126	122	125	117	121	113	117	108	112	103	107	98	103
20	123	126	122	126	119	123	116	120	112	116	108	112	102	106
-60	124	126	124	126	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	100	105	110	115	120	125	130
260 & ABV	148	149	149	150	150	150	151
240	143	143	143	143	143	144	148
220	137	137	137	137	138	143	148
200	130	131	131	132	137	141	147

TO2 Takeoff Speeds - Wet Runway**20% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 KG)	FLAPS 20		
	V1	VR	V2
400	143	162	170
380	138	157	167
360	133	152	163
340	127	147	158
320	121	141	154
300	115	135	149
280	108	129	144
260	101	123	139
240	94	116	134
220	86	109	128
200	79	103	123

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	12	13						6	6						-2	-2								
60	11	12	14	16				5	5	7	8				-1	-1	-2	-2						
50	7	7	9	12	15	17	20	3	4	5	6	7	9	10	-1	-1	-1	-1	-2	-2	-2			
40	3	3	5	8	10	13	16	2	2	3	5	6	7	9	-0	-0	-1	-1	-1	-2	-2			
30	0	0	3	5	7	10	13	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2			
20	0	0	2	3	5	8	11	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1			
0	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			
-20	1	1	3	4	6	8	10	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			
-40	2	2	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			
-60	2	2	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	0	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 KG)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
400	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
380	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
360	-6	-3	0	4	7		-6	-4	-1	0	1	3	4	5		
340	-6	-3	0	3	6		-6	-4	-2	0	1	3	4	5		
320	-5	-2	0	3	6		-6	-4	-2	0	1	3	4	6		
300	-5	-2	0	3	6		-6	-4	-2	0	2	3	4	6		
280	-5	-2	0	3	5		-6	-4	-2	0	2	3	5	6		
260	-4	-2	0	3	5		-6	-4	-2	0	2	3	5	6		
240	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	6		
220	-3	-1	0	3	5		-7	-4	-1	0	2	4	5	7		
200	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		

*V1 not to exceed VR

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	110	113	108	112	106	110	104	108						
50	113	116	111	115	107	110	104	108	102	107	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	126	122	125	117	121	113	117	108	112	103	107	98	103
20	123	126	122	126	119	123	116	120	112	116	108	112	102	106
-60	124	126	124	126	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 KG)	Min VR (KIAS)						
	100	105	110	115	120	125	130
280 & ABV	143	143	143	144	144	144	145
260	137	137	137	137	138	139	145
240	131	132	131	132	134	139	144
220	126	126	126	128	133	138	144
200	120	120	122	127	132	137	143

TO2 Maximum Allowable Clearway
20% Thrust Reduction

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
2000	250
2500	290
3000	320
3500	350
4000	380
4500	410
5000	430

TO2 Clearway and Stopway V1 Adjustments
20% Thrust Reduction

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
300	-3	-3	-3	-3	-3					
200	-3	-3	-3	-3	-3					
100	-1	-1	-1	-1	-1					
0	0	0	0	0	0	0	0	0	0	0
-100	1	1	1	1	1	1	1	1	1	1
-200	1	1	1	1	1	1	1	1	1	1
-300	1	1	1	1	1	1	1	1	1	1

Use of clearway not allowed on wet runways.
V1 not to exceed VR.

Performance Inflight - QRH

Chapter PI-QRH

All Engine

Section 11

Holding Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
460	%N1	64.9	67.8	72.1	76.6	81.6	86.3	91.0			
	KIAS	267	269	271	277	318	323	316			
	FF/ENG	3300	3270	3260	3270	3440	3530	3580			
440	%N1	63.6	66.4	70.7	75.2	80.2	84.9	89.5			
	KIAS	261	263	265	269	311	315	316			
	FF/ENG	3150	3110	3100	3100	3260	3340	3400			
420	%N1	62.3	65.0	69.3	73.8	78.7	83.5	88.1			
	KIAS	257	257	259	262	303	307	312			
	FF/ENG	2990	2960	2950	2940	3080	3150	3210			
400	%N1	60.9	63.6	67.9	72.3	77.3	82.0	86.6	92.7		
	KIAS	252	252	254	255	296	299	304	283		
	FF/ENG	2850	2810	2790	2780	2910	2970	3020	3090		
380	%N1	59.5	62.1	66.4	70.8	75.8	80.5	85.1	90.4		
	KIAS	248	248	249	250	288	291	295	283		
	FF/ENG	2700	2660	2640	2620	2750	2790	2830	2870		
360	%N1	58.0	60.7	64.8	69.2	74.2	78.8	83.5	88.4		
	KIAS	243	243	244	246	280	283	287	283		
	FF/ENG	2560	2520	2560	2530	2640	2660	2650	2680		
340	%N1	56.6	59.2	63.3	67.6	72.6	77.2	81.9	86.8		
	KIAS	239	239	240	242	272	275	278	283		
	FF/ENG	2490	2450	2420	2390	2480	2500	2470	2530		
320	%N1	55.1	57.7	61.7	66.0	71.0	75.5	80.2	85.1	93.0	
	KIAS	235	235	235	237	263	266	269	273	252	
	FF/ENG	2370	2320	2290	2260	2330	2340	2300	2340	2490	
300	%N1	53.7	56.1	60.1	64.3	69.2	73.8	78.5	83.4	90.3	
	KIAS	230	230	230	231	254	257	260	264	252	
	FF/ENG	2240	2190	2160	2120	2180	2180	2140	2170	2280	
280	%N1	52.1	54.5	58.5	62.6	67.4	72.0	76.5	81.5	87.9	93.6
	KIAS	224	224	225	226	246	248	250	254	252	235
	FF/ENG	2120	2070	2030	1990	2040	2030	1970	2000	2100	2210
260	%N1	50.6	52.9	56.8	60.8	65.6	70.0	74.6	79.6	85.9	90.5
	KIAS	219	219	220	220	236	238	241	244	247	235
	FF/ENG	2000	1950	1910	1870	1890	1890	1870	1870	1980	2040
240	%N1	48.9	51.2	55.0	59.0	63.6	67.9	72.5	77.5	83.8	87.8
	KIAS	213	213	214	214	227	228	231	233	237	234
	FF/ENG	1890	1830	1780	1740	1750	1740	1720	1710	1810	1860
220	%N1	47.1	49.5	53.1	57.0	61.4	65.7	70.3	75.2	81.6	85.6
	KIAS	208	208	208	209	217	218	220	223	226	228
	FF/ENG	1770	1710	1670	1630	1620	1600	1580	1560	1640	1700
200	%N1	45.5	47.7	51.3	55.1	59.2	63.5	67.9	72.7	79.1	83.2
	KIAS	205	205	205	205	208	209	210	212	215	216
	FF/ENG	1670	1610	1560	1520	1490	1460	1450	1420	1480	1530

This table includes 5% additional fuel for holding in a racetrack pattern.

**Holding
Flaps 1**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
460	%N1	70.5	73.7	78.3	83.3	88.5
	KIAS	245	246	247	249	252
	FF/ENG	3990	3970	3980	4040	4110
440	%N1	69.2	72.3	76.9	81.9	87.0
	KIAS	241	241	243	245	247
	FF/ENG	3800	3790	3790	3850	3900
420	%N1	67.8	70.9	75.5	80.3	85.5
	KIAS	236	237	238	240	242
	FF/ENG	3620	3610	3610	3650	3690
400	%N1	66.4	69.4	74.1	78.8	83.9
	KIAS	232	232	234	235	237
	FF/ENG	3440	3430	3420	3450	3490
380	%N1	65.0	67.9	72.5	77.2	82.3
	KIAS	227	228	229	230	232
	FF/ENG	3270	3250	3240	3260	3300
360	%N1	63.5	66.4	70.9	75.6	80.6
	KIAS	223	223	224	225	227
	FF/ENG	3100	3080	3070	3080	3110
340	%N1	62.0	64.9	69.3	73.9	78.8
	KIAS	219	219	220	221	223
	FF/ENG	2930	2910	2900	2900	2930
320	%N1	60.5	63.3	67.6	72.2	76.9
	KIAS	214	215	215	216	218
	FF/ENG	2770	2740	2730	2720	2750
300	%N1	58.9	61.6	65.9	70.4	75.0
	KIAS	209	210	210	211	213
	FF/ENG	2610	2570	2620	2610	2620
280	%N1	57.2	59.9	64.1	68.5	73.1
	KIAS	204	204	205	206	207
	FF/ENG	2520	2480	2460	2440	2450
260	%N1	55.4	58.0	62.2	66.6	71.1
	KIAS	199	199	200	200	201
	FF/ENG	2370	2320	2300	2270	2280
240	%N1	53.6	56.2	60.3	64.5	69.0
	KIAS	193	193	194	194	195
	FF/ENG	2220	2170	2140	2110	2110
220	%N1	51.8	54.3	58.3	62.4	66.8
	KIAS	188	188	188	189	189
	FF/ENG	2080	2030	1990	1960	1940
200	%N1	50.1	52.5	56.4	60.4	64.7
	KIAS	185	185	185	185	185
	FF/ENG	1960	1900	1860	1820	1800

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH
Advisory Information

Chapter PI-QRH
Section 12

ADVISORY INFORMATION

Runway Surface Condition Correlation

RUNWAY CONDITION CODE	RUNWAY SURFACE CONDITION DESCRIPTION	REPORTED BRAKING ACTION
6	Dry	Dry
5	Wet (Smooth, Grooved or PFC) or Frost 3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow	Good
4	Compacted Snow at or below -15°C OAT	Good to Medium
3	Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow Compacted Snow at OAT warmer than -15°C	Medium
2	Greater than 3 mm (0.12 inches) of: Water or Slush	Medium to Poor
1	Ice	Poor
0	Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice	Nil

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABV VREF30	TWO REV NO REV

Dry Runway

MAX MANUAL	1535	25/-20	45	-70/235	0/-15	40/-40	70	50	95
AUTOBRAKE MAX	1795	20/-25	55	-85/275	0/0	50/-50	95	55	0
AUTOBRAKE 4	2235	30/-30	70	-110/365	0/0	65/-65	125	0	0
AUTOBRAKE 3	2535	35/-35	85	-125/425	0/0	75/-75	145	0	0
AUTOBRAKE 2	2855	40/-45	100	-145/490	10/-30	90/-85	145	15	15
AUTOBRAKE 1	3175	50/-50	125	-170/575	75/-90	125/-95	130	270	270

Good Reported Braking Action

MAX MANUAL	1985	35/-30	85	-110/400	45/-40	75/-65	100	155	345
AUTOBRAKE MAX	1995	35/-30	85	-105/400	50/-30	75/-65	105	150	330
AUTOBRAKE 4	2265	30/-30	75	-110/380	15/-5	65/-65	125	35	175
AUTOBRAKE 3	2550	35/-35	85	-130/435	10/-10	75/-75	145	0	25
AUTOBRAKE 2	2860	40/-45	100	-145/495	15/-35	90/-85	145	15	15
AUTOBRAKE 1	3175	50/-50	125	-170/575	80/-90	125/-95	130	270	270

Good to Medium Reported Braking Action

MAX MANUAL	2135	30/-30	85	-120/420	60/-50	80/-65	100	190	425
AUTOBRAKE MAX	2140	30/-30	90	-115/420	60/-45	80/-65	105	185	415
AUTOBRAKE 4	2285	30/-30	80	-115/400	25/-15	70/-65	125	75	315
AUTOBRAKE 3	2550	35/-35	85	-130/435	15/-10	75/-75	145	5	70
AUTOBRAKE 2	2860	40/-45	100	-145/495	15/-35	90/-85	145	15	15
AUTOBRAKE 1	3175	50/-50	125	-170/575	80/-90	125/-95	130	270	270

ADVISORY INFORMATION

Normal Configuration Landing Distance Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF30	TWO REV NO REV

Medium Reported Braking Action

MAX MANUAL	2255	35/-30	90	-120/440	70/-60	85/-65	100	230	535
AUTOBRAKE MAX	2260	35/-35	90	-120/440	75/-55	85/-65	105	230	525
AUTOBRAKE 4	2340	35/-35	85	-125/435	50/-25	75/-70	125	175	485
AUTOBRAKE 3	2575	35/-35	90	-135/460	30/-15	75/-75	145	45	265
AUTOBRAKE 2	2860	40/-45	100	-150/495	25/-35	90/-85	145	25	85
AUTOBRAKE 1	3175	50/-50	125	-170/575	80/-90	125/-95	130	270	270

Medium to Poor Reported Braking Action

MAX MANUAL	2580	45/-40	120	-155/555	100/-85	115/-85	115	390	1000
AUTOBRAKE MAX	2590	45/-40	120	-155/555	110/-85	115/-85	115	380	1010
AUTOBRAKE 4	2590	45/-40	120	-155/555	110/-90	115/-85	115	380	1010
AUTOBRAKE 3	2660	40/-40	115	-140/510	75/-35	95/-75	130	310	940
AUTOBRAKE 2	2905	40/-40	105	-150/495	45/-45	95/-85	140	120	700
AUTOBRAKE 1	3200	50/-50	125	-170/580	90/-100	130/-95	125	280	490

Poor Reported Braking Action

MAX MANUAL	3220	50/-50	130	-200/755	250/-165	145/-95	115	755	2175
AUTOBRAKE MAX	3230	50/-50	135	-205/755	260/-170	145/-95	115	745	2180
AUTOBRAKE 4	3230	50/-50	135	-205/755	260/-170	145/-95	115	745	2180
AUTOBRAKE 3	3235	50/-50	135	-205/755	255/-150	145/-100	130	745	2180
AUTOBRAKE 2	3325	50/-50	130	-205/765	230/-150	135/-100	140	660	2095
AUTOBRAKE 1	3455	55/-55	150	-210/785	245/-175	150/-105	125	660	1975

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 4 engines at maximum reverse thrust.

Max Manual assumes maximum achievable manual braking.

All reference distances and adjustments are increased by 15%.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Max Manual and autobrake data valid for auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 45 m.

For autobrake and manual speedbrakes, increase reference landing distance by 40 m.

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV NO REV

Dry Runway

MAX MANUAL	1585	25/-20	45	-70/235	0/-20	45/-40	70	50	105
AUTOBRAKE MAX	1865	20/-25	55	-85/275	0/0	50/-50	95	60	0
AUTOBRAKE 4	2330	30/-35	70	-110/370	0/0	65/-65	125	0	0
AUTOBRAKE 3	2645	30/-40	85	-130/435	0/0	80/-80	145	0	0
AUTOBRAKE 2	2970	40/-45	100	-150/500	15/-40	100/-90	145	30	30
AUTOBRAKE 1	3280	50/-55	125	-175/585	80/-95	135/-100	130	320	325

Good Reported Braking Action

MAX MANUAL	2065	30/-30	85	-115/405	50/-40	80/-65	105	170	400
AUTOBRAKE MAX	2080	30/-30	85	-110/405	50/-35	80/-65	105	170	385
AUTOBRAKE 4	2360	30/-35	80	-115/385	15/-5	70/-70	125	40	215
AUTOBRAKE 3	2665	35/-40	85	-135/440	10/-10	80/-80	150	0	45
AUTOBRAKE 2	2975	40/-45	105	-150/505	25/-40	100/-90	145	30	30
AUTOBRAKE 1	3280	50/-55	130	-175/585	85/-95	135/-100	130	320	325

Good to Medium Reported Braking Action

MAX MANUAL	2210	30/-35	90	-120/425	60/-50	85/-65	105	205	485
AUTOBRAKE MAX	2220	30/-35	90	-120/425	65/-50	85/-70	105	205	470
AUTOBRAKE 4	2380	30/-35	80	-120/405	25/-15	70/-70	125	80	355
AUTOBRAKE 3	2665	35/-40	85	-135/440	15/-10	80/-80	150	5	90
AUTOBRAKE 2	2975	40/-45	105	-150/505	25/-40	100/-90	145	30	30
AUTOBRAKE 1	3280	50/-55	130	-175/585	85/-95	135/-100	130	320	325

ADVISORY INFORMATION

Normal Configuration Landing Distance Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV NO REV

Medium Reported Braking Action

MAX MANUAL	2330	35/-35	90	-125/445	75/-60	90/-70	105	250	600
AUTOBRAKE MAX	2340	35/-35	95	-125/445	75/-60	90/-70	105	250	590
AUTOBRAKE 4	2435	30/-35	85	-125/440	45/-25	80/-70	125	180	535
AUTOBRAKE 3	2685	35/-40	90	-135/465	25/-20	80/-80	150	40	300
AUTOBRAKE 2	2975	40/-45	105	-150/505	35/-40	100/-90	145	40	105
AUTOBRAKE 1	3280	50/-55	130	-175/585	85/-95	135/-100	130	320	325

Medium to Poor Reported Braking Action

MAX MANUAL	2670	45/-45	120	-155/560	105/-85	120/-85	115	425	1165
AUTOBRAKE MAX	2685	45/-45	125	-155/560	110/-90	120/-85	120	430	1170
AUTOBRAKE 4	2685	45/-40	125	-155/560	110/-90	120/-85	115	430	1170
AUTOBRAKE 3	2770	40/-40	120	-140/510	70/-35	95/-80	135	340	1085
AUTOBRAKE 2	3020	40/-45	105	-150/505	50/-50	100/-90	140	145	840
AUTOBRAKE 1	3305	50/-55	130	-175/585	95/-105	135/-100	125	335	635

Poor Reported Braking Action

MAX MANUAL	3295	50/-55	135	-200/755	250/-165	150/-100	115	800	2420
AUTOBRAKE MAX	3305	50/-55	135	-205/755	255/-170	150/-100	120	805	2430
AUTOBRAKE 4	3305	50/-55	135	-205/755	255/-170	150/-100	115	805	2430
AUTOBRAKE 3	3320	50/-50	135	-205/755	250/-150	150/-100	130	790	2420
AUTOBRAKE 2	3420	50/-55	135	-205/765	225/-150	145/-105	140	700	2325
AUTOBRAKE 1	3545	55/-60	150	-215/785	240/-175	155/-105	125	720	2210

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 4 engines at maximum reverse thrust.

Max Manual assumes maximum achievable manual braking.

All reference distances and adjustments are increased by 15%.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Max Manual and autobrake data valid for auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 50 m.

For autobrake and manual speedbrakes, increase reference landing distance by 40 m.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

AIR/GND SYSTEM (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1730	20/-25	55	-80/265	35/-30	50/-45	90	0	110
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2325	40/-40	110	-135/485	95/-75	95/-80	130	0	415
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2540	40/-40	110	-140/505	120/-95	100/-80	130	0	495
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2705	40/-40	115	-150/530	145/-115	105/-85	130	0	605
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3175	55/-55	160	-195/715	225/-165	150/-110	150	0	1175
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4180	60/-65	185	-270/1015	530/-340	195/-130	150	0	2515
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

AIR/GND SYSTEM (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1665	20/-20	55	-80/260	35/-30	50/-45	85	0	100
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2220	40/-35	105	-130/475	90/-70	90/-75	130	0	350
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2430	40/-35	105	-140/495	115/-90	95/-80	130	0	425
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2600	40/-40	110	-145/520	140/-110	100/-80	130	0	530
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3035	55/-50	155	-190/705	215/-155	140/-105	145	0	985
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4050	60/-60	180	-270/1010	530/-335	185/-125	145	0	2215
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Airspeed Unreliable (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1500	25/-20	45	-65/215	20/-15	40/-40	N/A	50	110
AUTOBRAKE MAX	1790	20/-20	50	-75/250	5/0	50/-50	N/A	0	0
AUTOBRAKE 2	2835	35/-45	100	-135/450	25/-55	100/-85	N/A	70	70

Good Reported Braking Action

MAX MANUAL	1975	30/-30	85	-105/365	45/-40	80/-65	N/A	175	435
AUTOBRAKE MAX	1990	30/-30	85	-100/365	50/-35	80/-65	N/A	170	425
AUTOBRAKE 2	2840	35/-45	100	-135/455	35/-55	100/-85	N/A	70	70

Good To Medium Reported Braking Action

MAX MANUAL	2105	30/-30	85	-110/385	55/-50	80/-65	N/A	205	515
AUTOBRAKE MAX	2115	30/-30	85	-105/385	60/-45	80/-65	N/A	200	505
AUTOBRAKE 2	2840	35/-45	100	-135/455	35/-55	100/-85	N/A	70	70

Medium Reported Braking Action

MAX MANUAL	2205	30/-30	85	-115/400	70/-55	85/-65	N/A	245	620
AUTOBRAKE MAX	2220	30/-30	90	-110/400	70/-55	85/-65	N/A	240	610
AUTOBRAKE 3	2595	30/-35	85	-125/425	25/-25	80/-80	N/A	35	295

Medium To Poor Reported Braking Action

MAX MANUAL	2525	40/-40	115	-140/500	95/-80	115/-80	N/A	415	1205
AUTOBRAKE MAX	2540	40/-40	115	-140/500	100/-85	115/-80	N/A	415	1210
AUTOBRAKE 3	2640	35/-35	110	-125/455	55/-35	90/-80	N/A	320	1120

Poor Reported Braking Action

MAX MANUAL	3070	45/-50	125	-180/670	195/-150	140/-90	N/A	740	2365
AUTOBRAKE MAX	3080	45/-50	125	-180/670	200/-155	140/-95	N/A	740	2370
AUTOBRAKE 3	3115	45/-50	125	-180/670	180/-130	135/-95	N/A	715	2350

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ANTISKID / ANTISKID OFF (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	2325	30/-35	85	-125/435	95/-75	85/-65	105	275	740
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2520	40/-40	110	-145/530	115/-90	105/-80	100	380	1100
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2790	40/-45	120	-165/620	180/-130	120/-85	100	545	1670
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2935	45/-45	125	-180/670	220/-150	130/-85	100	655	2120
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3040	50/-50	140	-195/725	235/-160	145/-95	100	735	2480
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3520	60/-60	160	-245/985	425/-255	175/-105	110	1280	6095
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ANTISKID / ANTISKID OFF (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	2255	30/-30	85	-125/435	95/-75	80/-65	90	250	660
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2435	40/-35	105	-145/530	115/-90	100/-75	100	340	955
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2710	40/-40	115	-165/615	180/-130	115/-80	100	500	1490
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2860	45/-45	125	-180/670	225/-150	125/-85	100	605	1895
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	2960	50/-45	140	-195/725	240/-160	135/-90	110	675	2175
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3455	60/-55	155	-250/1000	445/-260	165/-105	110	1215	6095
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance BLD DUCT LEAK L / BLD DUCT LEAK R (Flaps 25) VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1415	25/-20	40	-65/210	20/-15	40/-35	65	30	60
AUTOBRAKE MAX	1625	20/-20	45	-75/240	0/0	45/-45	80	0	0
AUTOBRAKE 2	2600	35/-40	85	-130/435	5/-20	80/-80	135	5	5

Good Reported Braking Action

MAX MANUAL	1870	30/-30	75	-105/365	45/-40	70/-60	95	120	290
AUTOBRAKE MAX	1870	30/-30	80	-100/365	50/-35	70/-60	95	115	285
AUTOBRAKE 2	2605	35/-40	90	-130/445	20/-25	80/-80	135	5	5

Good To Medium Reported Braking Action

MAX MANUAL	2000	30/-30	80	-110/380	55/-50	75/-60	95	150	365
AUTOBRAKE MAX	2000	30/-30	80	-105/385	60/-45	75/-60	95	150	365
AUTOBRAKE 2	2605	35/-40	90	-130/445	20/-25	80/-80	135	5	5

Medium Reported Braking Action

MAX MANUAL	2100	30/-30	80	-110/400	65/-55	75/-60	95	185	475
AUTOBRAKE MAX	2100	30/-30	85	-110/400	70/-55	75/-60	95	185	470
AUTOBRAKE 3	2355	30/-35	80	-120/420	35/-25	75/-75	130	35	270

Medium To Poor Reported Braking Action

MAX MANUAL	2430	40/-40	105	-140/495	95/-80	105/-75	105	335	960
AUTOBRAKE MAX	2440	40/-40	110	-140/495	100/-85	105/-80	105	340	970
AUTOBRAKE 3	2510	35/-35	105	-125/450	70/-40	85/-70	115	270	900

Poor Reported Braking Action

MAX MANUAL	2970	45/-45	120	-180/665	195/-150	130/-90	105	660	2125
AUTOBRAKE MAX	2980	45/-45	120	-180/665	200/-155	130/-90	105	665	2135
AUTOBRAKE 3	2985	45/-45	120	-180/665	200/-140	130/-90	115	660	2130

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

BLD DUCT LEAK L / BLD DUCT LEAK R (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1365	25/-15	40	-65/210	20/-15	35/-35	60	25	55
AUTOBRAKE MAX	1560	20/-20	45	-70/235	0/0	40/-40	80	0	0
AUTOBRAKE 2	2495	35/-35	85	-130/430	0/-15	75/-75	135	0	0

Good Reported Braking Action

MAX MANUAL	1795	30/-25	75	-100/360	45/-40	65/-55	90	105	250
AUTOBRAKE MAX	1795	30/-25	75	-95/360	45/-30	65/-55	95	100	245
AUTOBRAKE 2	2500	35/-35	90	-130/430	10/-20	75/-75	135	0	0

Good To Medium Reported Braking Action

MAX MANUAL	1925	30/-30	75	-105/375	55/-45	70/-60	90	130	320
AUTOBRAKE MAX	1925	30/-30	80	-105/375	60/-40	70/-60	95	130	320
AUTOBRAKE 2	2500	35/-35	90	-130/430	10/-20	75/-75	135	0	0

Medium Reported Braking Action

MAX MANUAL	2030	30/-30	80	-110/395	65/-55	75/-60	90	170	420
AUTOBRAKE MAX	2030	30/-30	80	-110/395	70/-50	75/-60	95	170	420
AUTOBRAKE 3	2255	30/-30	80	-120/415	35/-25	70/-70	125	35	245

Medium To Poor Reported Braking Action

MAX MANUAL	2345	40/-35	105	-140/495	95/-75	100/-75	100	295	820
AUTOBRAKE MAX	2350	40/-35	105	-140/495	100/-80	100/-75	100	300	825
AUTOBRAKE 3	2405	35/-35	105	-125/455	70/-40	80/-70	110	240	770

Poor Reported Braking Action

MAX MANUAL	2900	45/-45	115	-180/665	200/-150	125/-85	100	615	1905
AUTOBRAKE MAX	2910	45/-45	115	-180/665	205/-155	125/-85	100	615	1915
AUTOBRAKE 3	2910	45/-45	115	-180/665	205/-140	125/-85	110	615	1915

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG 1, 2, 3, 4 SHUTDOWN (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1410	25/-20	40	-65/215	20/-15	40/-35	65	0	50
AUTOBRAKE MAX	1625	20/-20	45	-75/240	0/0	45/-45	80	0	0
AUTOBRAKE 2	2605	35/-40	85	-130/435	0/-5	80/-80	145	0	0

Good Reported Braking Action

MAX MANUAL	1920	30/-30	85	-110/400	55/-45	75/-65	105	0	210
AUTOBRAKE MAX	1925	30/-30	85	-105/400	55/-40	75/-65	105	0	200
AUTOBRAKE 2	2610	35/-40	85	-130/440	10/-5	80/-80	145	0	0

Good To Medium Reported Braking Action

MAX MANUAL	2075	30/-30	85	-115/415	70/-60	75/-65	105	0	250
AUTOBRAKE MAX	2075	30/-30	85	-110/415	70/-50	75/-65	105	0	245
AUTOBRAKE 2	2610	35/-40	85	-130/440	10/-5	80/-80	145	0	0

Medium Reported Braking Action

MAX MANUAL	2210	30/-30	85	-120/430	85/-70	80/-70	105	0	320
AUTOBRAKE MAX	2210	30/-35	90	-120/430	90/-65	80/-65	105	0	310
AUTOBRAKE 3	2360	30/-35	80	-125/420	45/-25	75/-70	130	0	220

Medium To Poor Reported Braking Action

MAX MANUAL	2645	45/-45	125	-165/595	140/-110	115/-90	125	0	660
AUTOBRAKE MAX	2655	45/-45	125	-165/595	145/-115	120/-95	125	0	665
AUTOBRAKE 3	2660	45/-45	125	-165/595	145/-105	120/-95	130	0	665

Poor Reported Braking Action

MAX MANUAL	3465	50/-55	140	-220/800	325/-230	145/-105	125	0	1415
AUTOBRAKE MAX	3475	50/-55	140	-220/805	330/-235	150/-110	125	0	1420
AUTOBRAKE 3	3480	50/-55	140	-220/805	330/-230	150/-110	130	0	1420

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG 1, 2, 3, 4 SHUTDOWN (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1365	25/-15	40	-65/210	20/-15	35/-35	65	0	45
AUTOBRAKE MAX	1560	20/-20	45	-70/235	0/0	40/-40	80	0	0
AUTOBRAKE 2	2495	35/-35	85	-130/430	0/-5	75/-75	140	0	0

Good Reported Braking Action

MAX MANUAL	1830	30/-30	80	-105/390	50/-45	70/-60	100	0	180
AUTOBRAKE MAX	1840	30/-30	80	-105/385	50/-35	70/-60	105	0	170
AUTOBRAKE 2	2495	35/-35	85	-130/430	5/-5	75/-75	140	0	0

Good To Medium Reported Braking Action

MAX MANUAL	1985	30/-30	80	-110/405	65/-55	70/-65	100	0	220
AUTOBRAKE MAX	1990	30/-30	85	-110/400	65/-50	70/-60	105	0	215
AUTOBRAKE 2	2495	35/-35	85	-130/430	5/-5	75/-75	140	0	0

Medium Reported Braking Action

MAX MANUAL	2125	30/-30	85	-115/420	85/-65	75/-65	100	0	280
AUTOBRAKE MAX	2130	30/-30	85	-115/420	85/-60	75/-65	105	0	275
AUTOBRAKE 3	2260	30/-30	80	-120/415	45/-25	70/-70	125	0	195

Medium To Poor Reported Braking Action

MAX MANUAL	2530	45/-40	120	-160/585	135/-105	110/-90	120	0	560
AUTOBRAKE MAX	2535	45/-45	120	-160/585	140/-110	110/-90	120	0	560
AUTOBRAKE 3	2540	45/-45	120	-160/585	135/-100	110/-90	125	0	565

Poor Reported Braking Action

MAX MANUAL	3350	50/-50	135	-215/795	320/-225	140/-105	120	0	1255
AUTOBRAKE MAX	3360	50/-50	135	-215/795	325/-230	140/-105	120	0	1255
AUTOBRAKE 3	3365	50/-50	135	-215/795	320/-225	140/-105	125	0	1260

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS CONTROL (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1380	25/-20	40	-65/205	15/-15	40/-35	60	45	95
AUTOBRAKE MAX	1625	20/-20	45	-75/240	0/0	45/-45	80	0	0
AUTOBRAKE 2	2580	35/-40	90	-130/435	15/-35	85/-75	125	25	25

Good Reported Braking Action

MAX MANUAL	1795	30/-30	75	-100/350	40/-35	70/-55	90	145	365
AUTOBRAKE MAX	1805	30/-30	75	-95/350	45/-30	70/-60	90	140	350
AUTOBRAKE 2	2585	35/-40	90	-130/440	25/-35	85/-75	125	25	25

Good To Medium Reported Braking Action

MAX MANUAL	1925	30/-30	75	-105/370	55/-45	75/-60	90	175	440
AUTOBRAKE MAX	1930	30/-30	80	-105/370	55/-40	75/-60	90	170	430
AUTOBRAKE 2	2585	35/-40	90	-130/440	25/-35	85/-75	125	25	25

Medium Reported Braking Action

MAX MANUAL	2025	30/-30	80	-110/385	65/-55	75/-60	90	215	550
AUTOBRAKE MAX	2035	30/-30	80	-105/390	65/-50	75/-60	90	210	535
AUTOBRAKE 3	2335	30/-35	80	-120/405	25/-15	70/-70	130	35	290

Medium To Poor Reported Braking Action

MAX MANUAL	2325	40/-40	105	-135/485	90/-75	105/-75	100	370	1065
AUTOBRAKE MAX	2335	40/-40	105	-135/485	95/-75	105/-75	100	370	1075
AUTOBRAKE 3	2410	35/-35	100	-120/440	60/-30	80/-70	115	295	1000

Poor Reported Braking Action

MAX MANUAL	2865	45/-45	120	-175/655	190/-145	130/-85	100	695	2230
AUTOBRAKE MAX	2875	45/-45	120	-175/655	195/-145	130/-85	100	700	2240
AUTOBRAKE 3	2885	45/-45	120	-175/655	185/-130	130/-85	115	690	2230

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS DRIVE (Flaps 25)

VREF30 + 25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1670	25/-20	50	-70/225	20/-20	50/-45	65	65	140
AUTOBRAKE MAX	2020	20/-25	60	-80/265	5/-5	55/-55	90	0	0
AUTOBRAKE 2	3150	40/-45	115	-145/475	50/-70	115/-95	115	130	130

Good Reported Braking Action

MAX MANUAL	2225	35/-30	95	-110/390	55/-50	90/-70	95	225	575
AUTOBRAKE MAX	2260	35/-30	100	-110/390	55/-45	90/-75	95	220	570
AUTOBRAKE 2	3155	40/-45	115	-145/475	55/-70	115/-95	115	130	130

Good To Medium Reported Braking Action

MAX MANUAL	2355	35/-35	100	-115/405	65/-55	95/-75	95	255	650
AUTOBRAKE MAX	2385	35/-35	100	-115/405	70/-55	95/-75	95	255	655
AUTOBRAKE 2	3155	40/-45	115	-145/475	55/-70	115/-95	115	130	130

Medium Reported Braking Action

MAX MANUAL	2460	35/-35	100	-120/420	75/-65	100/-75	95	295	765
AUTOBRAKE MAX	2490	35/-35	105	-120/425	80/-65	100/-75	95	295	765
AUTOBRAKE 3	2915	35/-40	100	-130/445	30/-40	90/-85	125	50	400

Medium To Poor Reported Braking Action

MAX MANUAL	2810	45/-40	130	-145/520	110/-90	130/-90	105	500	1485
AUTOBRAKE MAX	2835	45/-45	130	-145/525	115/-95	130/-90	105	505	1500
AUTOBRAKE 3	2940	45/-40	125	-130/490	70/-45	110/-85	120	410	1410

Poor Reported Braking Action

MAX MANUAL	3360	50/-50	140	-190/690	210/-160	155/-100	105	835	2705
AUTOBRAKE MAX	3385	50/-50	140	-190/690	215/-165	160/-100	105	840	2720
AUTOBRAKE 3	3440	50/-50	140	-190/695	195/-145	150/-105	120	800	2685

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Flaps Up Landing (Flaps Up)

VREF30 + 70

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	2220	40/-30	70	-80/255	25/-25	65/-60	70	95	215
AUTOBRAKE MAX	2840	30/-30	85	-95/310	5/-5	80/-80	105	10	25
AUTOBRAKE 2	4335	55/-60	170	-165/545	90/-95	180/-130	120	460	500

Good Reported Braking Action

MAX MANUAL	3015	40/-40	130	-130/440	70/-60	130/-100	95	340	885
AUTOBRAKE MAX	3060	40/-35	130	-125/440	60/-55	130/-100	100	345	895
AUTOBRAKE 2	4335	55/-60	170	-165/545	95/-95	180/-130	120	460	500

Good To Medium Reported Braking Action

MAX MANUAL	3145	40/-40	135	-135/460	80/-70	130/-100	95	370	960
AUTOBRAKE MAX	3185	40/-40	135	-135/455	75/-65	135/-100	100	375	970
AUTOBRAKE 2	4335	55/-60	170	-165/545	95/-95	180/-130	120	460	500

Medium Reported Braking Action

MAX MANUAL	3250	40/-40	135	-140/475	90/-75	135/-100	95	410	1070
AUTOBRAKE MAX	3290	40/-40	135	-140/475	85/-75	135/-100	100	415	1085
AUTOBRAKE 3	4090	45/-50	150	-155/510	70/-75	150/-125	120	180	365

Medium To Poor Reported Braking Action

MAX MANUAL	3815	55/-55	175	-170/585	140/-115	185/-125	105	760	2325
AUTOBRAKE MAX	3825	55/-55	175	-170/585	145/-120	185/-125	105	760	2320
AUTOBRAKE 3	4120	55/-50	175	-155/555	95/-85	165/-125	115	525	2080

Poor Reported Braking Action

MAX MANUAL	4395	60/-60	185	-205/750	240/-190	210/-135	105	1125	3675
AUTOBRAKE MAX	4405	60/-60	185	-205/750	245/-190	210/-135	105	1125	3670
AUTOBRAKE 3	4630	60/-65	190	-215/765	235/-190	215/-140	115	960	3495

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLARE ASSIST (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1380	25/-20	40	-65/205	15/-15	40/-35	60	45	95
AUTOBRAKE MAX	1625	20/-20	45	-75/240	0/0	45/-45	80	0	0
AUTOBRAKE 2	2580	35/-40	90	-130/435	15/-35	85/-75	125	25	25

Good Reported Braking Action

MAX MANUAL	1795	30/-30	75	-100/350	40/-35	70/-55	90	145	365
AUTOBRAKE MAX	1805	30/-30	75	-95/350	45/-30	70/-60	90	140	350
AUTOBRAKE 2	2585	35/-40	90	-130/440	25/-35	85/-75	125	25	25

Good To Medium Reported Braking Action

MAX MANUAL	1925	30/-30	75	-105/370	55/-45	75/-60	90	175	440
AUTOBRAKE MAX	1930	30/-30	80	-105/370	55/-40	75/-60	90	170	430
AUTOBRAKE 2	2585	35/-40	90	-130/440	25/-35	85/-75	125	25	25

Medium Reported Braking Action

MAX MANUAL	2025	30/-30	80	-110/385	65/-55	75/-60	90	215	550
AUTOBRAKE MAX	2035	30/-30	80	-105/390	65/-50	75/-60	90	210	535
AUTOBRAKE 3	2335	30/-35	80	-120/405	25/-15	70/-70	130	35	290

Medium To Poor Reported Braking Action

MAX MANUAL	2325	40/-40	105	-135/485	90/-75	105/-75	100	370	1065
AUTOBRAKE MAX	2335	40/-40	105	-135/485	95/-75	105/-75	100	370	1075
AUTOBRAKE 3	2410	35/-35	100	-120/440	60/-30	80/-70	115	295	1000

Poor Reported Braking Action

MAX MANUAL	2865	45/-45	120	-175/655	190/-145	130/-85	100	695	2230
AUTOBRAKE MAX	2875	45/-45	120	-175/655	195/-145	130/-85	100	700	2240
AUTOBRAKE 3	2885	45/-45	120	-175/655	185/-130	130/-85	115	690	2230

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1500	30/-25	45	-70/230	25/-20	45/-40	65	65	145
AUTOBRAKE MAX	1635	25/-20	50	-75/245	5/-5	45/-45	85	10	100
AUTOBRAKE 2	2585	35/-40	85	-130/435	10/-30	85/-75	130	20	20

Good Reported Braking Action

MAX MANUAL	1820	30/-30	75	-100/355	45/-40	70/-60	90	150	380
AUTOBRAKE MAX	1830	30/-30	75	-100/355	45/-35	70/-60	95	145	370
AUTOBRAKE 2	2595	35/-40	90	-130/440	20/-30	85/-80	130	20	20

Good To Medium Reported Braking Action

MAX MANUAL	1935	30/-30	80	-105/370	55/-45	75/-60	90	180	450
AUTOBRAKE MAX	1940	30/-30	80	-105/370	55/-45	75/-60	95	175	440
AUTOBRAKE 2	2595	35/-40	90	-130/440	20/-30	85/-80	130	20	20

Medium Reported Braking Action

MAX MANUAL	2035	30/-30	80	-110/390	65/-55	75/-60	90	220	560
AUTOBRAKE MAX	2045	30/-30	80	-110/390	65/-55	80/-60	95	215	550
AUTOBRAKE 3	2340	30/-35	80	-120/405	25/-15	70/-70	130	35	310

Medium To Poor Reported Braking Action

MAX MANUAL	2340	40/-40	105	-135/490	90/-75	105/-75	105	380	1100
AUTOBRAKE MAX	2350	40/-40	110	-135/490	100/-80	105/-75	105	380	1110
AUTOBRAKE 3	2420	35/-35	105	-120/445	65/-35	85/-70	115	310	1040

Poor Reported Braking Action

MAX MANUAL	2890	45/-45	120	-175/660	195/-145	135/-85	105	715	2310
AUTOBRAKE MAX	2900	45/-45	120	-180/660	200/-150	135/-85	105	720	2320
AUTOBRAKE 3	2910	45/-45	120	-180/660	190/-135	130/-90	115	710	2310

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1450	30/-20	45	-70/230	20/-20	40/-40	65	55	130
AUTOBRAKE MAX	1575	30/-20	45	-75/245	5/-5	40/-40	80	10	90
AUTOBRAKE 2	2485	35/-35	85	-130/425	5/-25	80/-75	130	10	10

Good Reported Braking Action

MAX MANUAL	1755	30/-30	75	-100/350	40/-35	65/-55	90	135	330
AUTOBRAKE MAX	1760	30/-25	75	-95/350	45/-35	65/-55	90	130	320
AUTOBRAKE 2	2495	35/-35	90	-130/430	15/-25	80/-75	130	10	10

Good To Medium Reported Braking Action

MAX MANUAL	1870	30/-30	75	-105/365	50/-45	70/-55	90	160	395
AUTOBRAKE MAX	1875	30/-30	75	-100/365	55/-40	70/-55	90	160	385
AUTOBRAKE 2	2495	35/-35	90	-130/430	15/-25	80/-75	130	10	10

Medium Reported Braking Action

MAX MANUAL	1975	30/-30	80	-105/385	65/-55	75/-60	90	200	500
AUTOBRAKE MAX	1980	30/-30	80	-105/385	65/-50	75/-60	90	195	490
AUTOBRAKE 3	2240	30/-30	75	-115/400	25/-15	65/-65	125	40	280

Medium To Poor Reported Braking Action

MAX MANUAL	2260	40/-35	105	-135/485	90/-75	100/-75	105	340	950
AUTOBRAKE MAX	2270	40/-35	105	-135/490	95/-75	100/-75	105	340	960
AUTOBRAKE 3	2325	40/-35	105	-120/450	70/-35	85/-65	110	285	905

Poor Reported Braking Action

MAX MANUAL	2825	45/-45	115	-175/660	195/-145	125/-85	105	625	2075
AUTOBRAKE MAX	2835	45/-45	120	-180/660	200/-150	130/-85	105	625	2085
AUTOBRAKE 3	2835	45/-45	115	-180/660	200/-140	130/-85	110	625	2080

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1810	35/-35	60	-90/300	40/-35	60/-50	75	125	305
AUTOBRAKE MAX	1830	35/-30	60	-90/300	40/-35	60/-50	80	130	310
AUTOBRAKE 2	2595	35/-40	85	-130/435	5/-25	80/-80	135	10	10

Good Reported Braking Action

MAX MANUAL	1950	35/-35	80	-105/375	50/-45	75/-60	95	170	420
AUTOBRAKE MAX	1950	35/-35	80	-105/375	55/-45	75/-60	95	170	420
AUTOBRAKE 2	2610	35/-40	90	-135/450	25/-30	85/-80	135	10	10

Good To Medium Reported Braking Action

MAX MANUAL	1980	35/-30	80	-105/375	55/-45	75/-60	95	180	450
AUTOBRAKE MAX	1980	35/-30	80	-105/380	60/-50	75/-60	95	180	450
AUTOBRAKE 2	2610	35/-40	90	-135/450	25/-30	85/-80	135	10	10

Medium Reported Braking Action

MAX MANUAL	2085	30/-30	80	-110/395	65/-55	80/-60	95	220	560
AUTOBRAKE MAX	2085	30/-30	85	-110/395	70/-55	80/-60	95	220	560
AUTOBRAKE 3	2360	30/-35	80	-120/410	30/-20	70/-70	130	40	320

Medium To Poor Reported Braking Action

MAX MANUAL	2395	40/-40	110	-140/495	95/-75	105/-75	105	385	1125
AUTOBRAKE MAX	2410	40/-40	110	-140/495	100/-85	110/-80	105	390	1140
AUTOBRAKE 3	2470	40/-35	105	-125/455	70/-40	90/-70	115	325	1075

Poor Reported Braking Action

MAX MANUAL	2950	45/-45	120	-180/665	195/-150	135/-90	105	725	2365
AUTOBRAKE MAX	2965	45/-45	125	-180/665	205/-155	135/-90	105	730	2380
AUTOBRAKE 3	2970	45/-45	120	-180/665	200/-140	135/-90	115	725	2380

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1750	35/-30	60	-85/295	40/-35	55/-45	75	115	270
AUTOBRAKE MAX	1765	35/-30	60	-90/295	40/-35	55/-50	80	115	275
AUTOBRAKE 2	2495	35/-35	85	-130/430	0/-20	75/-75	135	0	0

Good Reported Braking Action

MAX MANUAL	1880	35/-30	75	-105/370	50/-40	70/-60	95	150	365
AUTOBRAKE MAX	1880	35/-30	80	-105/370	55/-45	70/-60	95	150	365
AUTOBRAKE 2	2505	35/-35	90	-130/440	15/-25	75/-75	135	5	5

Good To Medium Reported Braking Action

MAX MANUAL	1915	35/-30	75	-105/370	55/-45	70/-60	95	160	395
AUTOBRAKE MAX	1915	35/-30	80	-105/375	60/-45	70/-60	95	160	395
AUTOBRAKE 2	2505	35/-35	90	-130/440	15/-25	75/-75	135	5	5

Medium Reported Braking Action

MAX MANUAL	2020	30/-30	80	-110/390	65/-55	75/-60	90	200	500
AUTOBRAKE MAX	2020	30/-30	80	-110/390	70/-55	75/-60	95	200	500
AUTOBRAKE 3	2260	30/-30	80	-120/405	30/-20	70/-70	125	40	295

Medium To Poor Reported Braking Action

MAX MANUAL	2310	40/-40	105	-140/495	90/-75	100/-75	105	340	965
AUTOBRAKE MAX	2330	40/-40	110	-140/495	100/-80	105/-75	105	345	980
AUTOBRAKE 3	2375	40/-35	105	-125/460	75/-40	90/-70	110	300	935

Poor Reported Braking Action

MAX MANUAL	2880	45/-45	120	-180/665	200/-150	130/-85	105	675	2125
AUTOBRAKE MAX	2900	45/-45	120	-180/670	205/-155	130/-85	105	680	2140
AUTOBRAKE 3	2900	45/-45	120	-180/670	205/-145	130/-85	110	680	2140

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance GEAR DISAGREE - Nose and Body Gear Up (Flaps 25) VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1810	35/-35	60	-90/300	40/-35	60/-50	75	125	305
AUTOBRAKE MAX	1830	35/-30	60	-90/300	40/-35	60/-50	80	130	310
AUTOBRAKE 2	2595	35/-40	85	-130/435	5/-25	80/-80	135	10	10

Good Reported Braking Action

MAX MANUAL	1950	35/-35	80	-105/375	50/-45	75/-60	95	170	420
AUTOBRAKE MAX	1950	35/-35	80	-105/375	55/-45	75/-60	95	170	420
AUTOBRAKE 2	2610	35/-40	90	-135/450	25/-30	85/-80	135	10	10

Good To Medium Reported Braking Action

MAX MANUAL	1980	35/-30	80	-105/375	55/-45	75/-60	95	180	450
AUTOBRAKE MAX	1980	35/-30	80	-105/380	60/-50	75/-60	95	180	450
AUTOBRAKE 2	2610	35/-40	90	-135/450	25/-30	85/-80	135	10	10

Medium Reported Braking Action

MAX MANUAL	2085	30/-30	80	-110/395	65/-55	80/-60	95	220	560
AUTOBRAKE MAX	2085	30/-30	85	-110/395	70/-55	80/-60	95	220	560
AUTOBRAKE 3	2360	30/-35	80	-120/410	30/-20	70/-70	130	40	320

Medium To Poor Reported Braking Action

MAX MANUAL	2395	40/-40	110	-140/495	95/-75	105/-75	105	385	1125
AUTOBRAKE MAX	2410	40/-40	110	-140/495	100/-85	110/-80	105	390	1140
AUTOBRAKE 3	2470	40/-35	105	-125/455	70/-40	90/-70	115	325	1075

Poor Reported Braking Action

MAX MANUAL	2950	45/-45	120	-180/665	195/-150	135/-90	105	725	2365
AUTOBRAKE MAX	2965	45/-45	125	-180/665	205/-155	135/-90	105	730	2380
AUTOBRAKE 3	2970	45/-45	120	-180/665	200/-140	135/-90	115	725	2380

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Nose and Body Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1750	35/-30	60	-85/295	40/-35	55/-45	75	115	270
AUTOBRAKE MAX	1765	35/-30	60	-90/295	40/-35	55/-50	80	115	275
AUTOBRAKE 2	2495	35/-35	85	-130/430	0/-20	75/-75	135	0	0

Good Reported Braking Action

MAX MANUAL	1880	35/-30	75	-105/370	50/-40	70/-60	95	150	365
AUTOBRAKE MAX	1880	35/-30	80	-105/370	55/-45	70/-60	95	150	365
AUTOBRAKE 2	2505	35/-35	90	-130/440	15/-25	75/-75	135	5	5

Good To Medium Reported Braking Action

MAX MANUAL	1915	35/-30	75	-105/370	55/-45	70/-60	95	160	395
AUTOBRAKE MAX	1915	35/-30	80	-105/375	60/-45	70/-60	95	160	395
AUTOBRAKE 2	2505	35/-35	90	-130/440	15/-25	75/-75	135	5	5

Medium Reported Braking Action

MAX MANUAL	2020	30/-30	80	-110/390	65/-55	75/-60	90	200	500
AUTOBRAKE MAX	2020	30/-30	80	-110/390	70/-55	75/-60	95	200	500
AUTOBRAKE 3	2260	30/-30	80	-120/405	30/-20	70/-70	125	40	295

Medium To Poor Reported Braking Action

MAX MANUAL	2310	40/-40	105	-140/495	90/-75	100/-75	105	340	965
AUTOBRAKE MAX	2330	40/-40	110	-140/495	100/-80	105/-75	105	345	980
AUTOBRAKE 3	2375	40/-35	105	-125/460	75/-40	90/-70	110	300	935

Poor Reported Braking Action

MAX MANUAL	2880	45/-45	120	-180/665	200/-150	130/-85	105	675	2125
AUTOBRAKE MAX	2900	45/-45	120	-180/670	205/-155	130/-85	105	680	2140
AUTOBRAKE 3	2900	45/-45	120	-180/670	205/-145	130/-85	110	680	2140

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRES SYS 1+4 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	2150	25/-25	70	-90/300	50/-45	65/-60	105	0	150
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2935	45/-45	140	-155/555	135/-110	125/-100	145	0	610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	3160	45/-45	140	-165/575	165/-130	130/-105	145	0	700
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3335	45/-45	145	-170/600	195/-150	135/-105	145	0	825
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3870	65/-60	195	-215/785	285/-210	185/-135	155	0	1560
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4915	70/-70	220	-295/1100	620/-400	230/-155	155	0	3060
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRES SYS 2+3 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1845	25/-20	60	-75/250	35/-30	55/-50	95	0	115
AUTOBRAKE MAX	1920	20/-25	60	-80/260	20/-10	55/-55	95	0	90
AUTOBRAKE 2	3095	40/-40	105	-145/475	0/0	95/-95	160	0	0

Good Reported Braking Action

MAX MANUAL	2605	40/-40	125	-135/485	105/-85	110/-90	135	0	505
AUTOBRAKE MAX	2610	40/-40	125	-140/485	110/-90	110/-90	140	0	500
AUTOBRAKE 2	3135	40/-40	115	-150/490	35/-15	100/-100	160	0	240

Good To Medium Reported Braking Action

MAX MANUAL	2775	40/-40	125	-140/495	120/-95	115/-90	135	0	555
AUTOBRAKE MAX	2775	40/-40	130	-140/500	125/-105	115/-95	140	0	555
AUTOBRAKE 2	3135	40/-40	115	-150/490	35/-15	100/-100	160	0	240

Medium Reported Braking Action

MAX MANUAL	2925	40/-40	130	-145/515	140/-110	115/-95	135	0	645
AUTOBRAKE MAX	2925	40/-40	130	-145/515	150/-120	120/-95	140	0	645
AUTOBRAKE 3	2935	40/-40	130	-145/515	145/-75	115/-95	140	0	645

Medium To Poor Reported Braking Action

MAX MANUAL	3495	60/-55	180	-195/700	230/-170	165/-125	150	0	1340
AUTOBRAKE MAX	3510	60/-55	180	-195/700	235/-180	170/-125	150	0	1345
AUTOBRAKE 3	3510	60/-55	180	-195/700	235/-180	170/-125	150	0	1345

Poor Reported Braking Action

MAX MANUAL	4430	65/-65	195	-255/930	455/-320	205/-140	150	0	2395
AUTOBRAKE MAX	4445	65/-65	195	-255/930	465/-325	205/-140	150	0	2405
AUTOBRAKE 3	4445	65/-65	195	-255/930	465/-325	205/-140	150	0	2405

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 / HYD PRESS SYS 2 / HYD PRESS SYS 3 (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1490	25/-20	45	-70/220	25/-20	40/-40	75	0	65
AUTOBRAKE MAX	1625	20/-20	45	-75/240	0/0	45/-45	80	0	20
AUTOBRAKE 2	2605	35/-40	85	-130/435	0/0	80/-80	150	0	0

Good Reported Braking Action

MAX MANUAL	2050	35/-35	95	-120/425	70/-55	80/-70	115	0	275
AUTOBRAKE MAX	2050	35/-35	95	-120/425	70/-60	85/-70	120	0	270
AUTOBRAKE 2	2620	35/-40	90	-135/445	15/-5	80/-80	150	0	35

Good To Medium Reported Braking Action

MAX MANUAL	2215	30/-35	95	-125/440	85/-70	85/-70	115	0	325
AUTOBRAKE MAX	2215	30/-35	95	-125/440	90/-70	85/-70	120	0	320
AUTOBRAKE 2	2620	35/-40	90	-135/445	15/-5	80/-80	150	0	35

Medium Reported Braking Action

MAX MANUAL	2360	35/-35	95	-130/455	100/-80	90/-75	115	0	400
AUTOBRAKE MAX	2360	35/-35	100	-130/460	105/-85	90/-75	120	0	400
AUTOBRAKE 3	2410	30/-35	95	-130/450	85/-40	85/-75	130	0	380

Medium To Poor Reported Braking Action

MAX MANUAL	2845	50/-50	140	-175/635	170/-130	130/-100	135	0	860
AUTOBRAKE MAX	2855	50/-50	140	-175/635	180/-135	130/-100	135	0	865
AUTOBRAKE 3	2855	50/-50	140	-175/635	180/-135	130/-100	135	0	865

Poor Reported Braking Action

MAX MANUAL	3745	55/-55	160	-235/865	390/-270	165/-115	135	0	1800
AUTOBRAKE MAX	3760	55/-55	160	-235/865	395/-275	165/-120	135	0	1805
AUTOBRAKE 3	3760	55/-55	160	-235/865	395/-275	165/-120	135	0	1805

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 / HYD PRESS SYS 2 / HYD PRESS SYS 3 (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1435	25/-20	45	-65/220	20/-20	40/-40	70	0	55
AUTOBRAKE MAX	1560	20/-20	45	-70/235	0/0	40/-40	80	0	20
AUTOBRAKE 2	2495	35/-35	85	-130/430	0/0	75/-75	145	0	0

Good Reported Braking Action

MAX MANUAL	1955	35/-30	90	-115/415	65/-55	75/-65	115	0	230
AUTOBRAKE MAX	1955	35/-30	90	-115/415	65/-55	75/-65	115	0	225
AUTOBRAKE 2	2505	35/-35	90	-130/435	10/-5	75/-75	145	0	20

Good To Medium Reported Braking Action

MAX MANUAL	2120	35/-30	90	-120/430	80/-65	80/-70	115	0	280
AUTOBRAKE MAX	2120	35/-30	95	-120/430	85/-70	80/-70	115	0	275
AUTOBRAKE 2	2505	35/-35	90	-130/435	10/-5	75/-75	145	0	20

Medium Reported Braking Action

MAX MANUAL	2270	35/-30	95	-125/445	100/-80	85/-70	110	0	350
AUTOBRAKE MAX	2270	35/-30	95	-125/450	105/-80	85/-70	115	0	345
AUTOBRAKE 3	2310	35/-35	95	-125/440	85/-40	80/-70	125	0	340

Medium To Poor Reported Braking Action

MAX MANUAL	2715	50/-45	135	-170/625	160/-125	120/-95	135	0	720
AUTOBRAKE MAX	2725	50/-45	140	-170/625	170/-130	125/-95	135	0	725
AUTOBRAKE 3	2725	50/-45	140	-170/625	170/-130	125/-95	135	0	725

Poor Reported Braking Action

MAX MANUAL	3620	55/-55	155	-230/860	385/-265	155/-115	135	0	1580
AUTOBRAKE MAX	3630	55/-55	155	-235/860	390/-270	155/-115	135	0	1585
AUTOBRAKE 3	3630	55/-55	155	-235/860	390/-270	155/-115	135	0	1585

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 4 (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1805	20/-25	60	-85/275	40/-35	55/-50	95	0	135
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2425	40/-40	115	-140/505	105/-85	105/-85	140	0	490
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2650	40/-40	115	-150/530	135/-105	105/-85	140	0	580
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2825	40/-40	120	-155/555	165/-125	115/-90	140	0	705
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3295	55/-55	170	-205/745	250/-180	160/-115	155	0	1345
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4340	65/-70	195	-280/1060	585/-370	205/-135	155	0	2850
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 4 (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1740	20/-25	55	-85/275	40/-35	50/-45	95	0	120
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2315	40/-35	110	-135/495	100/-80	95/-80	135	0	415
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2540	40/-40	115	-145/520	130/-100	100/-80	135	0	495
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2715	40/-40	120	-150/545	160/-120	105/-85	135	0	615
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3155	55/-55	165	-200/735	240/-170	150/-110	155	0	1130
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4205	65/-65	190	-280/1055	585/-365	195/-130	155	0	2505
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 and HYD PRESS SYS 2 / HYD PRESS SYS 1 and HYD PRESS SYS 3 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1810	25/-20	55	-75/250	35/-30	50/-50	85	0	0
AUTOBRAKE MAX	1915	25/-20	60	-80/260	30/-15	50/-55	95	0	0
AUTOBRAKE 2	3095	40/-40	105	-145/475	0/-5	95/-95	160	0	0

Good Reported Braking Action

MAX MANUAL	2800	45/-40	135	-160/580	135/-110	110/-105	155	0	0
AUTOBRAKE MAX	2805	45/-40	140	-160/585	145/-115	110/-110	155	0	0
AUTOBRAKE 2	3155	45/-40	135	-155/565	95/-35	105/-105	160	0	0

Good To Medium Reported Braking Action

MAX MANUAL	3015	40/-40	135	-165/590	160/-125	110/-105	155	0	0
AUTOBRAKE MAX	3015	40/-40	140	-165/590	170/-130	110/-110	155	0	0
AUTOBRAKE 2	3155	45/-40	135	-155/565	115/-35	105/-105	160	0	0

Medium Reported Braking Action

MAX MANUAL	3235	40/-40	140	-170/605	200/-150	110/-110	155	0	0
AUTOBRAKE MAX	3240	45/-40	140	-170/610	205/-155	110/-110	155	0	0
AUTOBRAKE 3	3280	45/-40	140	-170/605	195/-150	110/-110	160	0	0

Medium To Poor Reported Braking Action

MAX MANUAL	4325	65/-65	220	-270/1005	450/-295	170/-170	190	0	0
AUTOBRAKE MAX	4345	65/-65	225	-270/1005	460/-305	175/-175	190	0	0
AUTOBRAKE 3	4345	65/-65	225	-270/1005	460/-295	175/-175	195	0	0

Poor Reported Braking Action

MAX MANUAL	6160	65/-65	235	-370/1330	1125/-665	200/-200	190	0	0
AUTOBRAKE MAX	6180	70/-65	240	-370/1330	1135/-670	200/-200	190	0	0
AUTOBRAKE 3	6180	70/-65	240	-370/1330	1135/-660	200/-200	195	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 2 and HYD PRESS SYS 4 / HYD PRESS SYS 3 and HYD PRESS SYS 4 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	2565	25/-30	90	-110/350	100/-80	75/-75	170	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	4050	60/-60	210	-235/845	395/-260	160/-160	260	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	4375	60/-55	215	-235/850	450/-300	160/-160	260	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	4705	60/-55	215	-245/865	535/-345	165/-165	260	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	6230	90/-90	345	-395/1465	1230/-635	255/-255	295	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	9040	90/-80	380	-545/1970	2895/-1345	295/-290	295	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Jammed Stab Landing (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1630	25/-20	50	-70/225	20/-20	45/-45	70	65	140
AUTOBRAKE MAX	1915	20/-20	55	-80/260	5/-5	50/-50	95	0	0
AUTOBRAKE 2	3025	40/-45	110	-140/465	30/-50	105/-90	130	70	70

Good Reported Braking Action

MAX MANUAL	2170	35/-30	95	-110/385	55/-50	90/-70	100	225	575
AUTOBRAKE MAX	2195	35/-30	95	-110/385	60/-50	90/-70	100	220	575
AUTOBRAKE 2	3050	40/-45	110	-145/470	40/-60	110/-90	125	75	95

Good To Medium Reported Braking Action

MAX MANUAL	2300	35/-30	95	-115/405	65/-55	90/-70	100	255	655
AUTOBRAKE MAX	2320	35/-35	100	-115/405	70/-60	95/-70	100	250	655
AUTOBRAKE 2	3050	40/-45	110	-145/470	40/-60	110/-90	125	75	95

Medium Reported Braking Action

MAX MANUAL	2405	35/-35	100	-120/420	80/-65	95/-75	100	295	775
AUTOBRAKE MAX	2425	35/-35	100	-120/420	80/-70	95/-75	100	295	775
AUTOBRAKE 3	2785	35/-35	95	-130/435	25/-25	85/-85	135	50	465

Medium To Poor Reported Braking Action

MAX MANUAL	2750	45/-40	130	-145/520	110/-90	130/-90	105	505	1525
AUTOBRAKE MAX	2770	45/-40	130	-145/520	115/-95	130/-90	110	510	1540
AUTOBRAKE 3	2840	45/-35	125	-130/495	85/-45	110/-85	120	440	1470

Poor Reported Braking Action

MAX MANUAL	3305	50/-50	140	-190/690	215/-165	155/-100	105	850	2800
AUTOBRAKE MAX	3325	50/-50	140	-190/690	220/-165	155/-100	110	855	2815
AUTOBRAKE 3	3355	50/-50	140	-190/695	205/-150	150/-100	120	830	2790

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

SPOILERS (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1540	20/-20	50	-70/225	25/-25	45/-40	85	70	165
AUTOBRAKE MAX	1630	20/-20	50	-75/240	5/-5	45/-45	85	25	105
AUTOBRAKE 2	2605	35/-40	85	-130/435	0/-10	80/-80	145	0	0

Good Reported Braking Action

MAX MANUAL	2015	30/-30	90	-110/385	60/-50	85/-65	115	235	645
AUTOBRAKE MAX	2015	35/-30	90	-110/385	65/-50	85/-65	115	235	635
AUTOBRAKE 2	2640	35/-40	90	-135/450	20/-20	80/-80	145	25	240

Good To Medium Reported Braking Action

MAX MANUAL	2145	30/-35	90	-115/400	70/-60	90/-65	115	270	735
AUTOBRAKE MAX	2145	30/-35	90	-115/400	75/-65	90/-65	115	270	730
AUTOBRAKE 2	2640	35/-40	90	-135/450	20/-20	80/-80	145	25	250

Medium Reported Braking Action

MAX MANUAL	2255	35/-35	95	-120/415	85/-70	90/-65	115	320	875
AUTOBRAKE MAX	2255	35/-35	95	-120/415	90/-70	95/-70	115	315	870
AUTOBRAKE 3	2385	30/-35	85	-125/430	55/-30	80/-75	135	185	740

Medium To Poor Reported Braking Action

MAX MANUAL	2560	45/-45	125	-145/520	120/-95	125/-85	120	535	1755
AUTOBRAKE MAX	2575	45/-45	125	-145/520	125/-100	125/-85	120	540	1770
AUTOBRAKE 3	2575	45/-40	125	-135/520	125/-70	125/-85	120	535	1765

Poor Reported Braking Action

MAX MANUAL	3130	50/-50	135	-190/690	225/-170	155/-95	120	915	3265
AUTOBRAKE MAX	3145	50/-50	140	-190/690	235/-175	155/-95	120	920	3280
AUTOBRAKE 3	3145	50/-50	140	-190/690	235/-175	155/-95	120	920	3280

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

SPOILERS (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1490	20/-20	50	-70/225	25/-20	45/-40	85	65	150
AUTOBRAKE MAX	1570	20/-20	50	-75/240	5/-5	45/-40	85	25	95
AUTOBRAKE 2	2495	35/-35	85	-130/430	0/-5	75/-75	145	0	0

Good Reported Braking Action

MAX MANUAL	1940	35/-30	85	-105/380	60/-50	80/-65	110	210	555
AUTOBRAKE MAX	1940	35/-30	90	-105/380	60/-50	80/-65	115	205	545
AUTOBRAKE 2	2525	35/-35	90	-130/440	20/-10	75/-75	145	20	190

Good To Medium Reported Braking Action

MAX MANUAL	2075	35/-30	90	-110/395	70/-60	85/-65	110	245	640
AUTOBRAKE MAX	2075	35/-30	90	-110/395	75/-60	85/-65	115	240	635
AUTOBRAKE 2	2525	35/-35	90	-130/440	20/-10	75/-75	145	20	200

Medium Reported Braking Action

MAX MANUAL	2185	35/-30	90	-115/410	85/-70	85/-65	110	290	775
AUTOBRAKE MAX	2185	35/-35	95	-115/415	90/-70	90/-65	115	285	770
AUTOBRAKE 3	2280	30/-30	85	-120/425	55/-25	75/-70	130	185	670

Medium To Poor Reported Braking Action

MAX MANUAL	2480	45/-40	120	-145/520	120/-95	120/-80	120	480	1500
AUTOBRAKE MAX	2490	45/-40	125	-145/520	125/-100	120/-80	120	485	1510
AUTOBRAKE 3	2490	45/-35	125	-135/520	125/-75	120/-80	120	485	1510

Poor Reported Braking Action

MAX MANUAL	3070	50/-50	135	-190/695	230/-175	150/-95	120	855	2915
AUTOBRAKE MAX	3075	50/-50	135	-190/695	235/-180	150/-95	120	860	2925
AUTOBRAKE 3	3075	50/-50	135	-190/695	235/-180	150/-95	120	860	2925

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

STAB TRIM UNSCHD (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1630	25/-20	50	-70/225	20/-20	45/-45	70	65	140
AUTOBRAKE MAX	1915	20/-20	55	-80/260	5/-5	50/-50	95	0	0
AUTOBRAKE 2	3025	40/-45	110	-140/465	30/-50	105/-90	130	70	70

Good Reported Braking Action

MAX MANUAL	2170	35/-30	95	-110/385	55/-50	90/-70	100	225	575
AUTOBRAKE MAX	2195	35/-30	95	-110/385	60/-50	90/-70	100	220	575
AUTOBRAKE 2	3050	40/-45	110	-145/470	40/-60	110/-90	125	75	95

Good To Medium Reported Braking Action

MAX MANUAL	2300	35/-30	95	-115/405	65/-55	90/-70	100	255	655
AUTOBRAKE MAX	2320	35/-35	100	-115/405	70/-60	95/-70	100	250	655
AUTOBRAKE 2	3050	40/-45	110	-145/470	40/-60	110/-90	125	75	95

Medium Reported Braking Action

MAX MANUAL	2405	35/-35	100	-120/420	80/-65	95/-75	100	295	775
AUTOBRAKE MAX	2425	35/-35	100	-120/420	80/-70	95/-75	100	295	775
AUTOBRAKE 3	2785	35/-35	95	-130/435	25/-25	85/-85	135	50	465

Medium To Poor Reported Braking Action

MAX MANUAL	2750	45/-40	130	-145/520	110/-90	130/-90	105	505	1525
AUTOBRAKE MAX	2770	45/-40	130	-145/520	115/-95	130/-90	110	510	1540
AUTOBRAKE 3	2840	45/-35	125	-130/495	85/-45	110/-85	120	440	1470

Poor Reported Braking Action

MAX MANUAL	3305	50/-50	140	-190/690	215/-165	155/-100	105	850	2800
AUTOBRAKE MAX	3325	50/-50	140	-190/690	220/-165	155/-100	110	855	2815
AUTOBRAKE 3	3355	50/-50	140	-190/695	205/-150	150/-100	120	830	2790

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Two Engines Inop (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	310000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 310000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	1450	25/-20	40	-65/220	20/-20	40/-40	70	0	0
AUTOBRAKE MAX	1625	25/-20	45	-75/240	0/0	45/-45	80	0	0
AUTOBRAKE 2	2605	35/-40	85	-130/435	0/-10	80/-80	140	0	0

Good Reported Braking Action

MAX MANUAL	2095	35/-35	95	-130/475	80/-65	80/-75	125	0	0
AUTOBRAKE MAX	2095	35/-35	95	-125/465	75/-55	75/-75	130	0	0
AUTOBRAKE 2	2605	35/-40	85	-130/440	5/-10	80/-80	140	0	0

Good To Medium Reported Braking Action

MAX MANUAL	2285	35/-35	95	-130/480	100/-80	80/-75	125	0	0
AUTOBRAKE MAX	2290	35/-35	95	-130/475	100/-70	75/-75	130	0	0
AUTOBRAKE 2	2605	35/-40	85	-130/440	5/-10	80/-80	140	0	0

Medium Reported Braking Action

MAX MANUAL	2480	35/-35	95	-135/500	130/-100	80/-80	125	0	0
AUTOBRAKE MAX	2485	35/-35	95	-135/490	130/-90	80/-80	130	0	0
AUTOBRAKE 3	2540	35/-35	95	-135/500	125/-85	80/-80	130	0	0

Medium To Poor Reported Braking Action

MAX MANUAL	3225	55/-55	155	-220/820	270/-190	130/-125	165	0	0
AUTOBRAKE MAX	3230	55/-55	155	-220/820	280/-195	130/-130	165	0	0
AUTOBRAKE 3	3245	55/-60	155	-220/825	270/-190	130/-130	175	0	0

Poor Reported Braking Action

MAX MANUAL	4685	60/-65	160	-300/1075	725/-455	150/-150	165	0	0
AUTOBRAKE MAX	4695	60/-65	160	-300/1075	735/-460	150/-150	165	0	0
AUTOBRAKE 3	4710	60/-65	160	-300/1080	725/-455	150/-150	175	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

Based on engine bleed for packs on and anti-ice off

AIRPORT OAT (°C)	LANDING CLIMB LIMIT WEIGHT (1000 KG)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	330.7					
52	338.6					
50	347.6	335.9				
48	355.8	344.6				
46	364.0	352.9	329.9			
44	372.3	361.2	337.0			
42	380.6	369.6	345.5	317.1		
40	389.2	377.9	353.1	324.3		
38	398.6	386.4	360.7	331.7	304.5	
36	407.5	394.9	368.4	338.4	310.4	
34	415.4	403.3	376.2	345.6	316.4	284.8
32	422.1	410.8	383.9	352.0	322.1	289.7
30	428.9	417.6	389.8	358.5	327.4	294.7
28	429.1	423.7	395.5	365.2	332.7	299.5
26	429.3	429.6	401.1	373.8	338.0	304.1
24	429.6	429.8	406.6	378.4	343.9	308.7
22	429.8	430.0	411.7	382.7	353.0	313.0
20	430.0	430.1	411.9	386.7	357.4	317.3
18	430.3	430.3	412.0	390.5	361.2	321.9
16	430.5	430.5	412.1	390.5	364.6	326.1
14	430.6	430.6	412.2	390.6	367.6	329.8
12	430.8	430.8	412.3	390.7	367.7	333.1
10	430.9	430.9	412.4	390.7	367.7	336.2
-40	431.7	431.7	415.2	391.9	368.6	337.3

With engine bleed for packs off, increase weight by 3700 kg.

With engine anti-ice on, decrease weight by 4500 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by 21900 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Table 1 of 3: Reference Brake Energy (Millions of Foot Pounds)

		BRAKES-ON SPEED (KIAS)														
		100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)														
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
450	0	33.9	38.5	43.8	45.9	52.5	60.2	59.3	68.3	78.9	73.8	85.5	99.6	89.0	103.9	122.0
	10	35.0	39.7	45.3	47.4	54.2	62.2	61.3	70.5	81.5	76.3	88.4	103.0	92.0	107.5	126.3
	15	35.5	40.3	46.0	48.2	55.1	63.2	62.3	71.7	82.9	77.5	89.9	104.7	93.5	109.3	128.4
	20	36.0	41.0	46.7	48.9	55.9	64.2	63.2	72.8	84.2	78.7	91.3	106.4	95.0	111.1	130.5
	30	37.0	42.1	48.0	50.3	57.5	66.0	65.1	74.9	86.7	81.1	94.1	109.7	97.9	114.5	134.7
	40	37.3	42.4	48.4	50.8	58.2	66.9	65.9	76.0	88.2	82.3	95.8	112.1	99.8	117.1	138.3
400	0	37.2	42.4	48.5	50.9	58.5	67.4	66.4	76.9	89.4	83.4	97.4	114.5	101.6	119.8	142.3
	10	30.9	35.0	39.8	41.7	47.6	54.4	53.8	61.7	71.1	66.8	77.2	89.5	80.5	93.6	109.4
	15	31.9	36.2	41.1	43.1	49.1	56.2	55.6	63.8	73.5	69.0	79.7	92.5	83.2	96.8	113.2
	20	32.4	36.7	41.8	43.8	49.9	57.1	56.4	64.8	74.7	70.1	81.0	94.1	84.6	98.4	115.1
	30	32.8	37.3	42.4	44.4	50.7	58.0	57.3	65.8	75.8	71.2	82.3	95.6	85.9	100.0	116.9
	40	33.8	38.3	43.6	45.7	52.1	59.7	59.0	67.7	78.1	73.3	84.8	98.5	88.5	103.1	120.6
350	0	34.0	38.6	43.9	46.1	52.6	60.4	59.6	68.6	79.3	74.4	86.2	100.4	90.0	105.1	123.5
	10	33.9	38.5	44.0	46.1	52.8	60.7	60.0	69.2	80.2	75.1	87.4	102.2	91.4	107.2	126.6
	15	27.9	31.5	35.8	37.5	42.7	48.7	48.2	55.1	63.3	59.7	68.8	79.5	71.9	83.3	96.9
	20	28.8	32.6	37.0	38.7	44.1	50.3	49.8	57.0	65.4	61.7	71.1	82.2	74.3	86.1	100.2
	30	29.2	33.1	37.5	39.3	44.8	51.1	50.5	57.9	66.5	62.7	72.2	83.5	75.5	87.5	101.8
	40	29.6	33.6	38.1	39.9	45.4	51.9	51.3	58.7	67.5	63.7	73.3	84.8	76.7	88.9	103.5
300	0	30.4	34.5	39.2	41.0	46.7	53.4	52.8	60.4	69.5	65.5	75.5	87.4	79.0	91.6	106.7
	10	30.6	34.7	39.5	41.3	47.1	53.9	53.3	61.1	70.4	66.4	76.6	88.9	80.2	93.2	108.9
	15	30.5	34.6	39.4	41.3	47.2	54.1	53.5	61.5	71.0	66.9	77.4	90.2	81.2	94.7	111.2
	20	24.9	28.1	31.9	33.2	37.8	43.0	42.5	48.5	55.5	52.6	60.3	69.4	63.2	72.9	84.4
	30	25.7	29.0	32.9	34.3	39.0	44.4	43.9	50.1	57.4	54.3	62.3	71.7	65.3	75.4	87.3
	40	26.0	29.5	33.4	34.9	39.6	45.1	44.6	50.9	58.3	55.1	63.3	72.8	66.4	76.6	88.7
250	0	26.4	29.9	33.9	35.4	40.2	45.8	45.3	51.7	59.2	56.0	64.2	74.0	67.4	77.8	90.1
	10	27.2	30.7	34.8	36.4	41.3	47.1	46.5	53.1	60.9	57.6	66.1	76.2	69.4	80.1	92.9
	15	27.3	30.9	35.1	36.6	41.6	47.5	47.0	53.7	61.6	58.2	67.0	77.3	70.3	81.3	94.6
	20	27.2	30.8	35.0	36.5	41.6	47.6	47.0	53.9	62.0	58.5	67.5	78.2	71.0	82.3	96.1
	30	21.9	24.7	28.0	29.0	32.9	37.3	36.8	41.9	47.8	45.2	51.6	59.2	54.1	62.1	71.5
	40	22.6	25.5	28.9	29.9	33.9	38.5	38.0	43.2	49.3	46.7	53.3	61.1	55.9	64.1	73.9
200	0	22.9	26.4	30.4	31.9	36.4	41.9	41.3	46.8	52.9	49.4	54.2	62.1	56.8	65.2	75.1
	10	23.3	26.3	29.8	30.8	35.0	39.7	39.2	44.6	50.9	48.1	55.0	63.1	57.6	66.2	76.3
	15	23.9	27.0	30.6	31.7	35.9	40.8	40.3	45.8	52.3	49.5	56.6	64.9	59.3	68.1	78.6
	20	24.0	27.1	30.7	31.9	36.2	41.1	40.6	46.2	52.8	49.9	57.2	65.7	60.0	69.0	79.8
	30	23.9	27.0	30.6	31.8	36.1	41.1	40.5	46.3	53.0	50.1	57.5	66.2	60.3	69.6	80.7
	40	23.9	27.0	30.6	31.8	36.1	41.1	40.5	46.3	53.0	50.1	57.5	66.2	60.3	69.6	80.7

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 at sea level, 15°C.

Event Adjusted Brake Energy (Millions of Foot Pounds)

Table 2(a) of 3: 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	130
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120	130
LANDING	MAX MAN	7.4	15.2	23.5	32.2	41.2	50.5	60.0	69.7	79.6	89.5	99.5	109.5	119.4
	MAX AUTO	6.8	14.2	22.1	30.4	39.1	48.1	57.5	67.0	76.7	86.5	96.5	106.4	116.3
	AUTOBRAKE 4	6.7	13.8	21.2	29.1	37.2	45.7	54.4	63.4	72.6	82.0	91.5	101.2	111.0
	AUTOBRAKE 3	6.5	13.4	20.6	28.1	35.9	44.0	52.3	60.8	69.6	78.5	87.6	96.8	106.1
	AUTOBRAKE 2	6.3	12.9	19.8	26.9	34.3	41.9	49.7	57.8	66.0	74.3	82.8	91.4	100.1
	AUTOBRAKE 1	5.9	12.0	18.4	24.9	31.6	38.4	45.5	52.6	60.0	67.5	75.1	82.9	90.7

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Table 2(b) of 3: 4 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	130
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120	130
LANDING	MAX MAN	6.6	13.7	21.1	28.9	36.9	45.2	53.7	62.3	71.1	79.8	88.6	97.4	106.0
	MAX AUTO	5.0	10.6	16.8	23.6	30.8	38.5	46.6	55.0	63.6	72.4	81.3	90.4	99.4
	AUTOBRAKE 4	3.7	8.0	12.9	18.3	24.3	30.6	37.4	44.4	51.8	59.4	67.1	75.0	83.0
	AUTOBRAKE 3	2.7	6.1	10.1	14.6	19.7	25.1	31.0	37.2	43.7	50.4	57.3	64.3	71.4
	AUTOBRAKE 2	1.6	3.9	6.8	10.2	14.1	18.5	23.3	28.4	33.8	39.5	45.4	51.4	57.5
	AUTOBRAKE 1	1.0	2.4	4.1	6.2	8.6	11.3	14.3	17.5	21.0	24.7	28.7	32.8	37.1

Table 3 of 3: Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)							
		BELOW 21	21	23	27	31	34	ABOVE 34 TO 48	48 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	0.1	1.0	2.0	3.1	3.9		CAUTION	FUSE PLUG MELT ZONE
GROUND		1	9	20	31	39			
BRAKE TEMPERATURE INDICATION	UP TO 2.91	3.00	3.35	3.88	4.50	5.00	5.0 TO 7.0	7.0 & 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.

With one brake deactivated, increase brake energy by 7 percent.

With two brakes deactivated, increase brake energy by 15 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 4 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt 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 indication on Multifunction Display may be used 10 to 15 minutes after airplane has come to a complete stop, or in flight with gear retracted, to determine recommended cooling schedule.

Performance Inflight - QRH
Engine Inoperative

Chapter PI-QRH
Section 13

1 ENGINE INOP

Max Continuous %N1

37000 FT to 27000 FT Pressure Altitudes

Based on engine bleed for packs on and anti-ice off

37000 FT PRESS ALT		TAT (°C)											
KCAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	93.8	94.9	95.9	96.9	97.9	98.9	98.3	96.9	95.9	94.8	93.7	93.3
240	0.74	93.7	94.7	95.8	96.8	97.8	98.8	99.8	100.3	99.0	97.9	96.9	95.7
280	0.86	93.6	94.6	95.6	96.6	97.7	98.7	99.6	100.6	100.9	100.3	99.2	98.2
35000 FT PRESS ALT		TAT (°C)											
KCAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	93.9	94.9	96.0	97.0	98.0	99.0	98.7	97.2	96.1	95.1	94.0	93.3
240	0.71	93.8	94.8	95.8	96.9	97.9	98.9	99.8	100.5	99.1	97.9	96.9	95.8
280	0.82	93.6	94.6	95.6	96.7	97.7	98.7	99.7	100.6	100.9	100.2	99.1	98.1
33000 FT PRESS ALT		TAT (°C)											
KCAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.58	95.1	96.1	97.2	98.2	99.2	100.1	98.8	97.5	96.4	95.3	94.2	94.4
240	0.68	94.9	96.0	97.0	98.0	99.0	100.0	100.6	100.0	98.7	97.6	96.5	95.4
280	0.79	94.4	95.4	96.4	97.4	98.4	99.4	100.4	101.0	100.6	99.4	98.3	97.3
31000 FT PRESS ALT		TAT (°C)											
KCAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	95.3	96.3	97.3	98.3	99.3	100.3	100.4	99.0	97.8	96.7	95.6	94.6
240	0.66	95.1	96.2	97.2	98.2	99.2	100.2	101.0	101.1	99.8	98.6	97.5	96.3
280	0.76	94.5	95.5	96.5	97.5	98.5	99.5	100.5	101.5	101.0	99.9	98.8	97.7
29000 FT PRESS ALT		TAT (°C)											
KCAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	96.0	97.1	98.1	99.1	100.1	100.5	99.6	98.3	97.2	96.1	95.0	95.0
240	0.63	95.8	96.8	97.8	98.8	99.8	100.8	100.8	99.8	98.6	97.6	96.5	95.5
280	0.73	94.8	95.9	96.9	97.8	98.8	99.8	100.8	100.9	99.9	98.8	97.8	96.8
27000 FT PRESS ALT		TAT (°C)											
KCAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.51	96.7	97.7	98.7	99.7	100.5	100.0	98.8	97.6	96.6	95.5	94.5	95.3
240	0.60	96.3	97.3	98.3	99.2	100.2	101.0	99.9	98.7	97.7	96.7	95.8	94.8
280	0.70	95.1	96.1	97.1	98.0	99.0	99.9	100.9	99.9	98.9	98.0	97.1	96.2
320	0.79	93.4	94.3	95.3	96.3	97.2	98.1	99.1	100.0	99.9	99.0	98.1	97.2

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	27	29	31	33	35	37
PACKS OFF	0.3	0.3	0.3	0.3	0.4	0.4
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9

1 ENGINE INOP

Max Continuous %N1

25000 FT to 18000 FT Pressure Altitudes

Based on engine bleed for packs on and anti-ice off

25000 FT PRESS ALT													TAT (°C)	
KCAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
200	0.49	96.3	97.3	98.3	99.2	100.2	100.1	99.1	97.9	96.8	95.8	94.9	94.6	
240	0.58	95.3	96.3	97.3	98.3	99.2	100.2	100.0	98.9	97.8	96.8	95.9	95.0	
280	0.67	94.1	95.1	96.1	97.0	98.0	98.9	99.9	100.0	99.0	98.0	97.0	96.2	
320	0.76	92.6	93.6	94.5	95.5	96.4	97.4	98.3	99.2	99.8	99.0	98.1	97.3	
24000 FT PRESS ALT													TAT (°C)	
KCAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.48	96.7	97.7	98.7	99.6	100.2	99.2	98.1	97.0	95.9	95.0	94.2	95.0	
240	0.57	95.8	96.8	97.7	98.7	99.6	100.1	99.1	98.0	97.0	96.1	95.2	94.3	
280	0.66	94.7	95.6	96.6	97.6	98.5	99.4	100.0	99.0	98.0	97.1	96.3	95.4	
320	0.75	93.3	94.2	95.2	96.1	97.0	97.9	98.8	99.8	99.1	98.2	97.3	96.5	
22000 FT PRESS ALT													TAT (°C)	
KCAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.46	95.6	96.6	97.5	98.5	99.5	99.3	98.3	97.3	96.3	95.4	94.4	94.2	
240	0.55	94.8	95.7	96.7	97.7	98.6	99.5	99.3	98.4	97.3	96.4	95.5	94.6	
280	0.63	93.7	94.7	95.6	96.6	97.5	98.4	99.3	99.1	98.2	97.3	96.5	95.6	
320	0.72	92.6	93.6	94.5	95.4	96.3	97.3	98.2	99.1	99.2	98.3	97.4	96.6	
20000 FT PRESS ALT													TAT (°C)	
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.44	95.6	96.6	97.5	98.5	99.4	98.6	97.6	96.6	95.7	94.8	93.9	94.3	
240	0.53	94.9	95.9	96.8	97.7	98.6	99.4	98.6	97.6	96.7	95.8	94.9	94.0	
280	0.61	93.8	94.7	95.7	96.6	97.5	98.4	99.2	98.5	97.6	96.7	95.8	95.0	
320	0.69	92.8	93.8	94.7	95.6	96.5	97.4	98.3	99.2	98.4	97.6	96.7	95.9	
360	0.77	91.6	92.5	93.4	94.3	95.2	96.1	97.0	97.9	98.7	98.4	97.6	96.8	
18000 FT PRESS ALT													TAT (°C)	
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.42	94.6	95.5	96.5	97.4	98.3	98.8	97.8	96.9	95.9	95.0	94.1	93.4	
240	0.51	94.0	94.9	95.8	96.8	97.7	98.6	98.7	97.8	96.9	96.0	95.1	94.2	
280	0.59	93.0	93.9	94.8	95.7	96.7	97.5	98.4	98.5	97.7	96.8	95.9	95.0	
320	0.67	92.0	92.9	93.8	94.7	95.6	96.5	97.4	98.2	98.4	97.6	96.7	95.9	
360	0.75	90.9	91.8	92.7	93.6	94.5	95.4	96.2	97.1	97.9	98.3	97.5	96.8	

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	18	20	22	24	25
PACKS OFF	0.2	0.2	0.2	0.2	0.2
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON	-0.8	-0.8	-0.8	-0.8	-0.9

1 ENGINE INOP

Max Continuous %N1

16000 FT to 5000 FT Pressure Altitudes

Based on engine bleed for packs on and anti-ice off

16000 FT PRESS ALT		TAT (°C)											
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	93.5	94.5	95.4	96.3	97.2	98.1	98.0	97.1	96.1	95.2	94.3	93.4
240	0.49	93.0	93.9	94.9	95.8	96.7	97.6	98.5	97.9	97.0	96.1	95.2	94.4
280	0.57	92.2	93.1	94.0	94.9	95.8	96.7	97.6	98.4	97.7	96.9	96.0	95.1
320	0.64	91.1	92.0	92.9	93.8	94.7	95.6	96.5	97.3	98.2	97.6	96.7	95.9
360	0.72	90.1	91.0	91.9	92.8	93.6	94.5	95.4	96.2	97.1	97.9	97.5	96.7
14000 FT PRESS ALT		TAT (°C)											
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.39	92.5	93.4	94.3	95.2	96.1	97.0	97.9	97.2	96.3	95.4	94.5	93.6
240	0.47	92.1	93.0	94.0	94.9	95.8	96.6	97.5	98.1	97.3	96.4	95.5	94.6
280	0.54	91.4	92.3	93.2	94.1	95.0	95.8	96.6	97.5	97.9	97.1	96.2	95.4
320	0.62	90.4	91.3	92.2	93.1	94.0	94.8	95.7	96.6	97.4	97.6	96.9	96.0
360	0.69	89.4	90.3	91.2	92.1	93.0	93.8	94.7	95.5	96.4	97.2	97.5	96.8
12000 FT PRESS ALT		TAT (°C)											
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.38	91.5	92.4	93.3	94.2	95.1	96.0	96.9	97.4	96.6	95.7	94.8	93.9
240	0.45	91.3	92.2	93.1	94.0	94.9	95.8	96.7	97.6	97.5	96.7	95.9	95.0
280	0.52	90.7	91.6	92.5	93.4	94.3	95.1	96.0	96.8	97.6	97.4	96.6	95.7
320	0.60	89.8	90.7	91.6	92.5	93.3	94.2	95.1	95.9	96.7	97.6	97.1	96.3
360	0.67	88.9	89.8	90.7	91.6	92.4	93.3	94.1	95.0	95.8	96.6	97.4	97.0
10000 FT PRESS ALT		TAT (°C)											
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.36	90.5	91.4	92.3	93.2	94.1	95.0	95.8	96.7	96.7	95.9	95.0	94.2
240	0.43	90.6	91.5	92.4	93.3	94.1	95.0	95.9	96.7	97.6	97.0	96.2	95.3
280	0.51	90.0	90.9	91.8	92.7	93.6	94.5	95.3	96.2	97.0	97.7	96.9	96.0
320	0.58	89.2	90.1	91.0	91.9	92.7	93.6	94.4	95.3	96.1	96.9	97.4	96.6
360	0.65	88.4	89.2	90.1	91.0	91.8	92.7	93.5	94.4	95.2	96.0	96.8	97.2
5000 FT PRESS ALT		TAT (°C)											
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.33	87.5	88.3	89.2	90.1	90.9	91.8	92.6	93.4	94.2	95.1	94.7	93.9
240	0.40	87.8	88.6	89.5	90.4	91.2	92.1	92.9	93.7	94.6	95.4	95.9	95.2
280	0.46	87.3	88.2	89.1	89.9	90.8	91.6	92.4	93.3	94.1	94.9	95.7	95.7
320	0.53	86.7	87.5	88.4	89.3	90.1	90.9	91.8	92.6	93.4	94.2	95.0	95.8
360	0.59	85.9	86.8	87.6	88.4	89.3	90.1	90.9	91.7	92.6	93.4	94.1	94.9

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	5	10	12	14	16
PACKS OFF	0.1	0.1	0.2	0.3	0.2
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.2	-0.3
ENGINE & WING ANTI-ICE ON	-0.6	-0.6	-0.6	-0.7	-0.7

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA+10°C & BELOW	ISA+15°C	ISA+20°C
460	450	323	25600	24200	22600
440	431	316	27000	25700	24200
420	412	311	28400	27100	25700
400	393	303	29900	28700	27300
380	374	297	31100	30300	28800
360	354	288	32400	31800	30500
340	335	284	33700	33200	32000
320	314	273	34900	34700	33600
300	294	264	36200	36100	35200
280	275	257	37500	37400	36500
260	255	247	39000	38800	37900
240	235	239	40500	40200	39300

Altitude reduced by 1000 ft for additional margin.

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability
Based on engine bleed for packs on or off

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
460	23200	21100	19200
440	24900	22800	20600
420	26700	24600	22400
400	28400	26400	24300
380	30200	28300	26200
360	31700	30300	28000
340	33100	32000	29900
320	34500	33700	31800
300	35700	35400	33700
280	37100	36600	35500
260	38500	38000	36900
240	40000	39400	38300
220	41700	40900	39700
200	43100	42400	41300

Altitude reduced by 1000 ft for additional margin.
With engine anti-ice on, decrease altitude capability by 400 ft.
With engine and wing anti-ice on, decrease altitude capability by 1200 ft.

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	25	27	29	31	33	35	37
460	%N1	83.9	87.3	92.6							
	MACH	.655	.703	.784							
	KIAS	365	365	365							
	FF/ENG	4827	4896	4988							
440	%N1	83.1	86.4	91.6	95.9						
	MACH	.655	.703	.781	.831						
	KIAS	365	365	364	352						
	FF/ENG	4689	4755	4819	4830						
420	%N1	81.7	85.1	90.2	94.4	96.5					
	MACH	.643	.692	.768	.823	.838					
	KIAS	358	359	357	348	341					
	FF/ENG	4464	4527	4566	4593	4553					
400	%N1	80.2	83.5	88.8	93.0	94.9	96.9				
	MACH	.629	.677	.753	.812	.830	.843				
	KIAS	350	351	350	343	337	329				
	FF/ENG	4227	4275	4315	4359	4321	4300				
380	%N1	78.6	82.0	87.3	91.6	93.3	95.2	97.6			
	MACH	.614	.661	.738	.799	.820	.836	.846			
	KIAS	341	342	342	337	333	326	316			
	FF/ENG	3996	4025	4066	4120	4089	4072	4022			
360	%N1	76.9	80.4	85.6	90.0	91.7	93.5	95.6			
	MACH	.598	.645	.721	.785	.808	.827	.841			
	KIAS	332	333	334	331	327	322	314			
	FF/ENG	3770	3782	3821	3880	3859	3845	3793			
340	%N1	75.3	78.7	84.0	88.5	90.2	91.9	93.9	95.9		
	MACH	.582	.627	.703	.769	.793	.815	.833	.845		
	KIAS	323	324	325	323	321	317	311	302		
	FF/ENG	3555	3554	3587	3646	3635	3626	3583	3556		
320	%N1	73.6	77.1	82.3	86.9	88.6	90.3	92.2	94.1	96.4	
	MACH	.565	.610	.684	.750	.777	.801	.822	.838	.847	
	KIAS	314	315	316	315	314	311	306	300	290	
	FF/ENG	3346	3336	3361	3415	3410	3408	3369	3355	3338	
300	%N1	71.9	75.3	80.5	85.1	86.9	88.6	90.4	92.3	94.2	
	MACH	.549	.591	.664	.731	.758	.784	.808	.828	.842	
	KIAS	304	305	306	306	305	304	300	295	288	
	FF/ENG	3140	3121	3140	3185	3183	3189	3151	3148	3126	
280	%N1	70.0	73.5	78.6	83.3	85.1	86.8	88.6	90.4	92.3	94.7
	MACH	.532	.572	.643	.709	.736	.764	.790	.813	.832	.844
	KIAS	295	295	296	296	296	295	293	290	284	276
	FF/ENG	2936	2911	2921	2957	2956	2966	2936	2935	2925	2927
240	%N1	66.2	69.4	74.6	79.1	81.0	82.8	84.8	86.5	88.2	90.5
	MACH	.496	.532	.597	.661	.688	.716	.745	.772	.798	.821
	KIAS	275	274	274	275	275	275	275	274	271	267
	FF/ENG	2539	2504	2578	2586	2579	2518	2498	2508	2509	2523
200	%N1	62.0	65.0	69.9	74.4	76.2	78.0	80.0	81.9	83.7	85.9
	MACH	.460	.491	.548	.606	.632	.660	.688	.717	.746	.775
	KIAS	254	252	251	251	252	252	252	252	252	251
	FF/ENG	2256	2206	2169	2155	2146	2069	2050	2065	2077	2099

1 ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Table 1 of 3: 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
706	653	606	566	531	500	479	459	441	424	409
1414	1308	1214	1133	1063	1000	959	920	885	852	822
2129	1968	1825	1703	1596	1500	1438	1381	1328	1279	1235
2851	2633	2439	2273	2129	2000	1918	1842	1771	1706	1647
3579	3302	3056	2846	2664	2500	2398	2302	2214	2132	2058
4315	3976	3675	3420	3198	3000	2877	2762	2656	2558	2468
5059	4656	4299	3996	3734	3500	3356	3221	3097	2983	2878
5812	5342	4926	4574	4271	4000	3835	3681	3538	3406	3286
6573	6034	5557	5155	4809	4500	4313	4139	3978	3829	3693
7343	6732	6192	5738	5348	5000	4791	4597	4417	4251	4099

Table 2 of 3: Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		22		29		33	
	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)
500	13.3	1:32	12.1	1:27	10.4	1:19	9.2	1:14	8.5	1:12
1000	26.4	3:00	24.4	2:51	21.4	2:32	19.2	2:20	18.0	2:15
1500	39.3	4:30	36.5	4:15	32.2	3:47	29.0	3:26	27.4	3:18
2000	51.9	6:03	48.3	5:42	42.7	5:02	38.6	4:34	36.4	4:23
2500	64.1	7:37	59.8	7:10	53.0	6:19	48.0	5:42	45.3	5:27
3000	76.1	9:13	71.3	8:41	63.3	7:38	57.2	6:52	54.0	6:33
3500	88.3	10:52	82.7	10:13	73.4	8:59	66.2	8:03	62.5	7:39
4000	100.2	12:33	93.9	11:48	83.4	10:21	74.9	9:15	70.8	8:47
4500	111.8	14:16	104.8	13:25	93.1	11:44	83.5	10:28	78.9	9:55
5000	123.2	16:02	115.5	15:04	102.6	13:10	91.8	11:43	86.8	11:04

Table 3 of 3: Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	200	250	300	350	400	450
10	-1.3	-1.0	0.0	1.1	3.3	6.7
20	-2.6	-1.6	0.0	2.4	6.2	12.4
30	-3.8	-2.2	0.0	3.7	9.1	17.8
40	-5.1	-2.7	0.0	4.9	11.8	22.7
50	-6.5	-3.3	0.0	6.1	14.4	27.2
60	-7.9	-3.9	0.0	7.3	16.8	31.2
70	-9.3	-4.5	0.0	8.5	19.2	34.8
80	-10.8	-5.2	0.0	9.6	21.4	38.0
90	-12.3	-5.9	0.0	10.8	23.5	40.7
100	-13.8	-6.6	0.0	11.9	25.4	43.0
110	-15.4	-7.4	0.0	12.9	27.3	44.9
120	-17.0	-8.2	0.0	14.0	29.0	46.3
130	-18.7	-9.0	0.0	15.0	30.6	47.3

1 ENGINE INOP

MAX CONTINUOUS THRUST

Holding Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
440	%N1	70.9	74.0	78.7	83.6	88.9	94.2			
	KIAS	261	263	265	269	311	315			
	FF/ENG	4070	4060	4080	4150	4390	4570			
420	%N1	69.3	72.5	77.1	82.0	87.4	92.5			
	KIAS	257	257	259	262	303	307			
	FF/ENG	3860	3850	3860	3920	4140	4300			
400	%N1	67.8	70.9	75.5	80.4	85.8	90.8	97.2		
	KIAS	252	253	254	256	296	299	304		
	FF/ENG	3650	3640	3650	3700	3900	4040	4250		
380	%N1	66.2	69.2	73.9	78.7	84.1	89.2	95.0		
	KIAS	248	248	249	251	288	291	295		
	FF/ENG	3450	3440	3440	3470	3660	3780	3940		
360	%N1	64.6	67.5	72.2	76.9	82.4	87.4	92.9		
	KIAS	244	244	244	246	280	283	287		
	FF/ENG	3250	3230	3240	3260	3430	3530	3650		
340	%N1	63.0	65.9	70.4	75.1	80.6	85.7	90.8		
	KIAS	240	240	241	242	272	275	278		
	FF/ENG	3070	3040	3050	3060	3220	3300	3390		
320	%N1	61.4	64.2	68.7	73.3	78.8	83.9	88.9	95.5	
	KIAS	235	235	236	237	263	266	269	273	
	FF/ENG	2890	2860	2860	2870	3010	3080	3150	3320	
300	%N1	59.8	62.5	66.9	71.5	76.8	81.9	87.0	92.9	
	KIAS	230	230	231	232	254	257	260	264	
	FF/ENG	2730	2690	2680	2680	2810	2860	2910	3030	
280	%N1	58.1	60.8	65.1	69.6	74.9	79.9	84.9	90.5	
	KIAS	225	225	225	226	246	248	250	254	
	FF/ENG	2560	2520	2610	2600	2700	2730	2690	2760	
260	%N1	56.3	59.0	63.2	67.6	72.8	77.7	82.8	88.1	
	KIAS	219	219	220	221	236	238	241	244	
	FF/ENG	2510	2460	2440	2420	2500	2520	2470	2520	
240	%N1	54.5	57.1	61.2	65.6	70.7	75.4	80.5	85.7	93.6
	KIAS	214	214	214	215	227	228	231	233	237
	FF/ENG	2360	2300	2280	2250	2310	2320	2250	2300	2490
220	%N1	52.6	55.1	59.2	63.5	68.3	73.0	78.0	83.3	90.6
	KIAS	209	209	209	209	217	218	220	223	226
	FF/ENG	2210	2150	2120	2090	2120	2120	2040	2070	2220
200	%N1	50.8	53.2	57.2	61.3	65.8	70.5	75.3	80.7	87.5
	KIAS	205	205	205	205	208	209	210	212	215
	FF/ENG	2070	2010	1970	1940	1940	1940	1930	1930	2040

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH **Chapter PI-QRH**
Two Engines Inoperative **Section 14**

2 ENGINES INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
460	444	314	10600	9000	7100
440	425	307	12200	10700	8900
420	405	301	13900	12400	10700
400	386	294	15700	14200	12500
380	367	287	17600	16200	14500
360	348	280	19400	18100	16500
340	329	273	21200	19900	18400
320	310	265	23100	21700	20300
300	291	258	24900	23700	22200
280	272	249	26600	25700	24300
260	252	241	28300	27800	26500
240	233	231	29900	29700	28700
220	214	222	31600	31500	30500
200	194	212	33400	33400	32300

Altitude reduced by 2000 ft for additional margin.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Table 1 of 2: 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
671	628	590	556	526	500	475	453	433	415	398
1337	1252	1178	1112	1053	1000	951	908	868	832	798
1999	1874	1764	1666	1578	1500	1428	1363	1304	1250	1200
2659	2494	2349	2220	2104	2000	1905	1819	1740	1668	1602
3319	3115	2934	2773	2629	2500	2382	2275	2177	2087	2005
3980	3736	3520	3327	3155	3000	2859	2730	2613	2506	2407
4644	4359	4107	3882	3681	3500	3335	3185	3049	2923	2808
5313	4986	4696	4438	4208	4000	3811	3640	3483	3339	3207
5989	5617	5289	4997	4735	4500	4286	4092	3915	3753	3603
6674	6255	5885	5557	5264	5000	4761	4544	4345	4164	3997

Table 2 of 2: Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)														TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)														
	200	220	240	260	280	300	320	340	360	380	400	420	440	460	
500	7.1	7.7	8.2	8.7	9.4	10.0	10.7	11.2	11.8	12.3	13.0	13.6	14.3	15.1	1:17
1000	14.5	15.7	17.0	18.2	19.5	20.8	22.2	23.4	24.7	25.9	27.4	28.8	30.4	32.1	2:32
1500	21.7	23.6	25.5	27.4	29.3	31.2	33.3	35.1	37.1	39.0	41.2	43.5	45.9	48.3	3:45
2000	28.7	31.2	33.8	36.3	38.9	41.4	44.1	46.7	49.3	51.8	54.8	57.8	61.0	64.1	4:58
2500	35.5	38.6	41.8	44.9	48.2	51.3	54.7	57.9	61.1	64.2	68.0	71.7	75.6	79.5	6:10
3000	42.1	45.8	49.5	53.3	57.2	60.9	64.9	68.7	72.6	76.4	80.8	85.3	89.9	94.5	7:23
3500	48.4	52.7	57.1	61.4	65.9	70.2	74.9	79.3	83.8	88.2	93.3	98.4	103.8	109.1	8:38
4000	54.6	59.5	64.4	69.3	74.4	79.3	84.6	89.7	94.7	99.7	105.4	111.3	117.3	123.2	9:53
4500	60.7	66.1	71.5	77.0	82.7	88.1	94.0	99.7	105.3	110.9	117.2	123.8	130.4	137.0	11:12
5000	66.5	72.4	78.4	84.4	90.7	96.7	103.2	109.5	115.7	121.8	128.8	135.9	143.2	150.4	12:33

Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		10	14	17	20	23	25	27	29	31
420	%N1	94.3								
	MACH	.643								
	KIAS	358								
	FF/ENG	6903								
400	%N1	92.6								
	MACH	.629								
	KIAS	350								
	FF/ENG	6510								
380	%N1	90.9	94.6							
	MACH	.614	.661							
	KIAS	341	342							
	FF/ENG	6121	6215							
360	%N1	89.0	92.8							
	MACH	.598	.645							
	KIAS	332	333							
	FF/ENG	5740	5822							
340	%N1	87.1	91.0	93.8						
	MACH	.582	.627	.664						
	KIAS	323	324	325						
	FF/ENG	5378	5448	5501						
320	%N1	85.2	89.2	91.9	95.1					
	MACH	.565	.610	.646	.684					
	KIAS	314	315	315	316					
	FF/ENG	5030	5087	5131	5197					
300	%N1	83.2	87.1	90.0	92.9	96.5				
	MACH	.549	.591	.626	.664	.703				
	KIAS	304	305	305	306	306				
	FF/ENG	4691	4732	4767	4821	4945				
280	%N1	81.1	85.0	88.0	90.8	93.9	96.6			
	MACH	.532	.572	.606	.643	.682	.709			
	KIAS	295	295	295	296	296	296			
	FF/ENG	4357	4388	4411	4457	4551	4627			
260	%N1	78.9	82.7	85.7	88.6	91.6	93.8	96.6		
	MACH	.514	.552	.585	.621	.659	.686	.713		
	KIAS	285	284	285	285	286	286	286		
	FF/ENG	4025	4055	4066	4101	4182	4226	4294		
240	%N1	76.7	80.3	83.2	86.3	89.2	91.2	93.6	96.5	
	MACH	.496	.532	.563	.597	.635	.661	.688	.716	
	KIAS	275	274	274	274	275	275	275	275	
	FF/ENG	3699	3725	3732	3752	3824	3856	3886	3977	
220	%N1	74.3	77.8	80.6	83.6	86.7	88.6	90.7	93.2	96.3
	MACH	.478	.512	.541	.573	.609	.635	.661	.689	.718
	KIAS	265	263	262	262	263	263	264	264	264
	FF/ENG	3398	3399	3410	3417	3471	3501	3514	3568	3629
200	%N1	71.8	75.2	77.9	80.8	83.9	85.9	87.9	89.9	92.6
	MACH	.460	.491	.518	.548	.582	.606	.632	.660	.688
	KIAS	254	252	251	251	251	251	252	252	252
	FF/ENG	3109	3079	3094	3096	3130	3150	3161	3196	3220

Performance Inflight - QRH
Gear Down

Chapter PI-QRH
Section 15

GEAR DOWN

Max Climb %N1

Based on engine bleed for packs on, engine and wing anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KCAS OR MACH)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
	240	240	240	240	240	240	240	240	240	240	240	0.60	0.60	0.60	0.60
55	90.4	91.1	93.9	94.6	94.0	96.0	96.9	97.7	98.5	99.1	99.8	100.8	101.5	102.0	101.8
50	91.3	91.8	93.2	93.9	94.5	95.3	96.2	97.0	97.7	98.4	99.1	100.0	100.8	101.2	101.0
45	92.3	92.6	92.9	93.2	93.8	94.5	95.4	96.2	96.9	97.6	98.3	99.3	100.0	100.4	100.2
40	93.2	93.5	93.8	93.4	93.0	93.8	94.7	95.5	96.2	96.8	97.5	98.5	99.2	99.6	99.4
35	94.0	94.5	94.6	94.3	93.9	93.6	93.9	94.7	95.4	96.1	96.8	97.7	98.4	98.8	98.6
30	93.9	95.3	95.5	95.1	94.7	94.5	94.4	94.2	94.6	95.3	96.0	96.9	97.6	98.0	97.8
25	93.1	96.1	96.4	96.0	95.6	95.4	95.2	95.1	94.8	94.5	95.2	96.1	96.8	97.2	97.0
20	92.3	95.5	97.2	96.9	96.5	96.3	96.1	96.0	95.7	95.4	95.2	95.3	96.0	96.4	96.2
15	91.5	94.7	97.7	97.7	97.4	97.2	97.1	96.9	96.6	96.3	96.1	95.7	95.1	95.6	95.4
10	90.7	93.9	96.9	97.7	98.2	98.1	98.0	97.8	97.5	97.3	97.0	96.7	96.0	94.7	94.6
5	89.9	93.0	96.0	96.8	97.7	98.6	98.9	98.8	98.6	98.3	98.0	97.7	97.2	95.9	94.0
0	89.1	92.2	95.1	96.0	96.8	97.7	98.8	99.6	99.5	99.3	99.1	98.7	98.2	97.0	95.2
-5	88.3	91.4	94.3	95.1	95.9	96.8	97.8	98.8	99.7	100.3	100.2	99.9	99.4	98.1	96.3
-10	87.5	90.5	93.4	94.2	95.0	95.9	96.9	97.9	98.8	99.9	100.9	101.0	100.7	99.3	97.3
-15	86.6	89.6	92.5	93.3	94.1	95.0	96.0	97.0	97.9	98.9	99.9	101.2	101.0	100.8	98.5
-20	85.8	88.8	91.6	92.4	93.2	94.1	95.1	96.0	96.9	98.0	99.0	100.2	100.2	100.4	100.1

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)						
	0	5	10	15	20	25	30
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5	-0.5
ENGINE & WING ANTI-ICE ON	-0.7	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9

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
460	18200	16700	14900
440	19300	17900	16100
420	20300	19000	17200
400	21500	20200	18500
380	23300	21900	20400
360	25100	23700	22200
340	26700	25500	24000
320	28300	27400	25900
300	29700	29200	27900
280	31100	31000	29600
260	32500	32400	31400
240	33900	33800	32800
220	35400	35300	34300
200	36700	36600	35600

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	21	23	25	27	29	31	33
460	%N1	84.3	88.6								
	MACH	.488	.525								
	KIAS	270	270								
	FF/ENG	4683	4757								
440	%N1	83.4	87.5								
	MACH	.488	.525								
	KIAS	270	270								
	FF/ENG	4544	4607								
420	%N1	82.5	86.6	93.1							
	MACH	.488	.525	.589							
	KIAS	270	270	270							
	FF/ENG	4417	4477	4601							
400	%N1	81.6	85.6	91.9	93.1						
	MACH	.488	.523	.586	.597						
	KIAS	270	269	269	269						
	FF/ENG	4290	4325	4432	4465						
380	%N1	80.0	83.8	90.1	91.2	93.6					
	MACH	.477	.511	.573	.584	.606					
	KIAS	264	262	262	262	262					
	FF/ENG	4051	4070	4158	4188	4248					
360	%N1	78.4	82.1	88.2	89.3	91.5	94.1				
	MACH	.466	.499	.559	.570	.592	.615				
	KIAS	258	256	256	256	255	255				
	FF/ENG	3821	3825	3889	3919	3969	4020				
340	%N1	76.7	80.3	86.3	87.4	89.6	91.9	94.8			
	MACH	.456	.487	.544	.555	.577	.600	.624			
	KIAS	252	250	249	249	249	248	248			
	FF/ENG	3603	3593	3630	3658	3707	3742	3805			
320	%N1	75.1	78.5	84.3	85.4	87.6	89.8	92.3			
	MACH	.445	.474	.529	.539	.561	.584	.607			
	KIAS	246	243	241	241	242	241	241			
	FF/ENG	3397	3369	3382	3404	3451	3482	3505			
300	%N1	73.4	76.6	82.3	83.3	85.5	87.6	89.9	92.5		
	MACH	.434	.462	.513	.523	.545	.567	.590	.613		
	KIAS	240	236	234	234	234	234	234	233		
	FF/ENG	3198	3151	3145	3161	3197	3227	3241	3277		
280	%N1	71.6	74.8	80.2	81.3	83.4	85.6	87.8	90.1	93.2	
	MACH	.423	.449	.498	.509	.530	.552	.575	.599	.625	
	KIAS	233	230	227	227	228	228	228	228	228	
	FF/ENG	3004	2942	2923	2943	2975	2997	3011	3036	3072	
240	%N1	67.8	70.9	76.2	77.2	79.4	81.5	83.6	85.7	88.1	90.8
	MACH	.398	.423	.473	.483	.503	.524	.546	.569	.594	.620
	KIAS	220	217	215	215	216	216	216	216	216	216
	FF/ENG	2612	2551	2598	2606	2628	2636	2641	2608	2603	2653
200	%N1	63.4	66.9	72.4	73.4	75.3	77.4	79.5	81.6	83.9	86.1
	MACH	.371	.401	.451	.460	.479	.499	.520	.543	.566	.591
	KIAS	205	205	205	205	205	205	205	205	205	205
	FF/ENG	2287	2269	2273	2273	2279	2288	2285	2244	2232	2258

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Table 1 of 3: 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
609	553	505	464	430	400	379	360	342	326	312
1226	1112	1012	930	861	800	758	719	684	652	624
1852	1677	1524	1399	1293	1200	1136	1078	1025	977	935
2485	2246	2038	1868	1726	1600	1514	1436	1364	1300	1243
3128	2823	2558	2341	2160	2000	1892	1793	1703	1623	1551
3780	3405	3080	2816	2594	2400	2269	2149	2040	1942	1856
4443	3995	3607	3292	3030	2800	2646	2505	2377	2262	2161
5118	4593	4139	3772	3467	3200	3022	2860	2712	2580	2464
5805	5199	4675	4254	3905	3600	3398	3214	3047	2898	2766
6494	5805	5211	4736	4343	4000	3774	3568	3381	3214	3067

Table 2 of 3: Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		25	
	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)
400	19.5	1:27	18.2	1:23	17.0	1:19	16.1	1:15	15.5	1:13
800	38.7	2:51	36.4	2:43	34.3	2:35	32.7	2:26	31.6	2:20
1200	57.3	4:18	54.0	4:05	51.0	3:53	48.8	3:39	47.2	3:30
1600	75.2	5:46	71.0	5:30	67.1	5:12	64.2	4:54	62.2	4:41
2000	92.6	7:17	87.4	6:56	82.7	6:33	79.2	6:10	76.7	5:53
2400	109.4	8:50	103.3	8:24	97.8	7:57	93.7	7:27	90.7	7:06
2800	125.6	10:26	118.7	9:54	112.6	9:21	107.8	8:46	104.3	8:21
3200	141.6	12:04	133.8	11:27	127.1	10:48	121.6	10:07	117.7	9:38
3600	157.1	13:45	148.5	13:02	141.1	12:16	135.1	11:29	130.7	10:55
4000	172.2	15:26	162.8	14:37	154.8	13:45	148.1	12:52	143.3	12:14

Table 3 of 3: Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	250	300	350	400	450
20	-3.1	-1.5	0.0	2.3	5.1
40	-6.4	-3.3	0.0	4.7	10.1
60	-9.5	-5.0	0.0	6.9	14.8
80	-12.3	-6.5	0.0	8.9	19.1
100	-14.9	-8.0	0.0	10.7	23.1
120	-17.3	-9.3	0.0	12.4	26.6
140	-19.4	-10.5	0.0	13.9	29.8
160	-21.3	-11.6	0.0	15.2	32.7
180	-23.0	-12.5	0.0	16.4	35.1

GEAR DOWN

Descent at .66/250

PRESSURE ALT (1000 FT)	5	10	15	17	19	21	23	25	27	29	31	33	35	37
DISTANCE (NM)	12	23	35	40	45	49	54	59	64	69	73	77	82	86
TIME (MINUTES)	7	9	11	12	13	14	15	16	16	17	18	18	19	20

GEAR DOWN

**Holding
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
440	%N1	74.4	77.7	82.8	88.4			
	KIAS	261	263	265	269			
	FF/ENG	4560	4570	4670	4830			
420	%N1	73.0	76.3	81.2	86.6	93.1		
	KIAS	256	257	259	262	270		
	FF/ENG	4350	4340	4410	4530	4830		
400	%N1	71.6	74.8	79.6	84.9	91.1		
	KIAS	252	252	254	255	263		
	FF/ENG	4140	4140	4180	4270	4520		
380	%N1	70.1	73.4	78.1	83.3	89.1		
	KIAS	247	248	249	250	255		
	FF/ENG	3940	3940	3960	4040	4210		
360	%N1	68.7	71.9	76.6	81.7	87.4	93.7	
	KIAS	243	243	244	246	250	252	
	FF/ENG	3750	3750	3750	3830	3960	4150	
340	%N1	67.4	70.5	75.2	80.2	86.0	91.9	
	KIAS	239	239	240	242	246	248	
	FF/ENG	3570	3570	3570	3640	3770	3930	
320	%N1	66.0	69.0	73.7	78.5	83.9	89.4	
	KIAS	234	235	235	237	238	239	
	FF/ENG	3390	3380	3380	3430	3490	3610	
300	%N1	64.5	67.4	72.1	76.8	82.1	87.5	94.0
	KIAS	229	230	230	231	233	233	233
	FF/ENG	3210	3200	3190	3220	3280	3370	3480
280	%N1	62.9	65.8	70.4	75.1	80.2	85.6	91.5
	KIAS	224	224	225	226	227	228	228
	FF/ENG	3030	3010	3010	3020	3070	3150	3220
260	%N1	61.4	64.2	68.6	73.3	78.2	83.6	89.1
	KIAS	219	219	220	220	221	222	222
	FF/ENG	2860	2830	2830	2830	2870	2930	2970
240	%N1	59.6	62.4	66.8	71.4	76.2	81.5	86.8
	KIAS	213	213	214	214	215	216	216
	FF/ENG	2690	2650	2650	2640	2730	2770	2750
220	%N1	58.0	60.7	65.0	69.5	74.2	79.4	84.6
	KIAS	208	208	208	209	209	210	210
	FF/ENG	2530	2490	2540	2530	2540	2570	2540
200	%N1	56.6	59.2	63.4	67.8	72.4	77.4	82.7
	KIAS	205	205	205	205	205	205	205
	FF/ENG	2470	2430	2400	2380	2390	2400	2360

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH **Chapter PI-QRH**
Gear Down, One Engine Inop **Section 16**

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

Based on engine bleed for packs on

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
440	426	270	11900	10500	8800
420	409	269	13100	11800	10300
400	390	263	14800	13500	12000
380	370	257	16600	15300	13900
360	350	250	18400	17300	15800
340	331	246	20000	18900	17600
320	311	238	21900	20800	19500
300	292	232	23600	22500	21200
280	273	227	25200	24300	23100
260	253	221	26800	26100	24900
240	235	215	28300	27900	26800
220	215	209	29800	29800	28600
200	194	205	31000	31000	30100

Altitude reduced by 1000 ft for additional margin.

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

Based on engine bleed for packs on or off

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
460	10300	8700	6500
440	11300	9700	7800
420	12200	10700	9000
400	13200	11800	10000
380	15100	13600	12000
360	17000	15600	13900
340	18900	17600	16000
320	20800	19700	18200
300	22800	21700	20300
280	24600	23600	22300
260	26300	25500	24200
240	27800	27400	26200
220	29400	29300	28100
200	30800	30800	29800

Altitude reduced by 1000 ft for additional margin.

With engine anti-ice on, decrease altitude capability by 300 ft.

With engine and wing anti-ice on, decrease altitude capability by 900 ft.

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	14	17	20	23	25	27	29
400	%N1	90.8	95.1						
	MACH	.488	.523						
	KIAS	270	269						
	FF/ENG	5787	5886						
380	%N1	89.1	93.1						
	MACH	.477	.511						
	KIAS	264	262						
	FF/ENG	5450	5512						
360	%N1	87.3	91.2	94.6					
	MACH	.466	.499	.527					
	KIAS	258	256	256					
	FF/ENG	5126	5163	5237					
340	%N1	85.4	89.3	92.5					
	MACH	.456	.487	.513					
	KIAS	252	250	249					
	FF/ENG	4817	4833	4875					
320	%N1	83.5	87.4	90.4	93.9				
	MACH	.445	.474	.500	.529				
	KIAS	246	243	242	241				
	FF/ENG	4522	4518	4539	4617				
300	%N1	81.6	85.3	88.2	91.4	95.6			
	MACH	.434	.462	.486	.513	.545			
	KIAS	240	236	235	234	234			
	FF/ENG	4236	4214	4218	4263	4400			
280	%N1	79.6	83.2	86.0	89.2	92.9	96.1		
	MACH	.423	.449	.472	.498	.530	.552		
	KIAS	233	230	228	227	228	228		
	FF/ENG	3959	3923	3908	3940	4051	4146		
260	%N1	77.6	81.0	83.7	87.0	90.5	93.2	96.8	
	MACH	.411	.436	.457	.486	.517	.538	.561	
	KIAS	227	223	221	221	222	222	222	
	FF/ENG	3684	3644	3613	3661	3754	3810	3898	
240	%N1	75.5	78.7	81.5	84.8	88.2	90.5	93.5	
	MACH	.398	.423	.445	.473	.503	.524	.546	
	KIAS	220	217	215	215	216	216	216	
	FF/ENG	3412	3372	3353	3391	3470	3508	3559	
220	%N1	73.1	76.3	79.3	82.5	85.9	88.2	90.6	93.7
	MACH	.385	.409	.433	.461	.490	.510	.532	.554
	KIAS	212	209	209	209	210	210	210	210
	FF/ENG	3144	3100	3115	3141	3204	3233	3257	3336
200	%N1	70.7	74.5	77.4	80.5	83.9	86.1	88.3	90.9
	MACH	.371	.401	.425	.451	.479	.499	.520	.543
	KIAS	205	205	205	205	205	205	205	205
	FF/ENG	2883	2896	2916	2934	2983	3007	3022	3070

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Table 1 of 3: 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
313	282	256	234	216	200	189	179	170	161	154
629	567	513	469	432	400	378	357	339	323	308
948	853	771	705	649	600	567	536	508	483	461
1268	1140	1030	940	866	800	755	714	677	644	615
1592	1430	1290	1177	1083	1000	944	893	846	805	768
1917	1721	1551	1414	1300	1200	1132	1071	1015	965	921
2245	2013	1812	1651	1517	1400	1321	1249	1183	1125	1073
2576	2308	2076	1890	1735	1600	1509	1426	1351	1284	1225
2910	2604	2340	2128	1953	1800	1697	1603	1519	1443	1377
3247	2903	2606	2368	2172	2000	1886	1781	1687	1603	1528

Table 2 of 3: Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		25	
	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	8.8	0:48	8.1	0:46	7.4	0:44	6.9	0:43	6.7	0:41
400	17.8	1:32	16.6	1:28	15.5	1:24	14.8	1:20	14.4	1:17
600	26.7	2:16	25.0	2:11	23.5	2:05	22.5	1:58	22.0	1:53
800	35.3	3:02	33.3	2:54	31.3	2:46	30.0	2:36	29.4	2:30
1000	43.9	3:47	41.4	3:37	39.0	3:27	37.4	3:15	36.6	3:06
1200	52.2	4:34	49.3	4:22	46.5	4:09	44.7	3:54	43.7	3:44
1400	60.5	5:21	57.1	5:06	53.9	4:51	51.8	4:33	50.7	4:21
1600	68.5	6:08	64.8	5:51	61.2	5:33	58.8	5:13	57.5	4:59
1800	76.5	6:56	72.3	6:37	68.3	6:16	65.7	5:53	64.2	5:37
2000	84.2	7:45	79.7	7:23	75.4	7:00	72.5	6:34	70.8	6:15

Table 3 of 3: Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	200	250	300	350	400
10	-1.8	-0.9	0.0	1.9	3.9
20	-3.7	-1.9	0.0	3.8	8.3
30	-5.5	-2.9	0.0	5.6	12.3
40	-7.3	-3.9	0.0	7.2	16.0
50	-8.9	-4.9	0.0	8.6	19.3
60	-10.5	-5.8	0.0	9.8	22.3
70	-12.1	-6.7	0.0	10.9	25.0
80	-13.5	-7.6	0.0	11.8	27.4
90	-14.9	-8.5	0.0	12.6	29.4

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

**Holding
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
460	%N1	84.4	88.2	93.8			
	KIAS	267	269	270			
	FF/ENG	6370	6480	6670			
440	%N1	82.8	86.5	92.1			
	KIAS	261	263	265			
	FF/ENG	6030	6120	6310			
420	%N1	81.2	84.8	90.4			
	KIAS	256	257	259			
	FF/ENG	5720	5790	5950			
400	%N1	79.7	83.2	88.7	94.5		
	KIAS	252	252	254	255		
	FF/ENG	5430	5480	5620	5810		
380	%N1	78.2	81.6	87.0	92.6		
	KIAS	247	248	249	250		
	FF/ENG	5150	5190	5310	5480		
360	%N1	76.6	80.0	85.3	90.9		
	KIAS	243	243	244	246		
	FF/ENG	4880	4910	5010	5170		
340	%N1	75.1	78.5	83.6	89.3	96.1	
	KIAS	239	239	240	242	246	
	FF/ENG	4640	4660	4750	4890	5180	
320	%N1	73.6	76.9	81.9	87.5	93.4	
	KIAS	234	235	235	237	238	
	FF/ENG	4410	4410	4480	4600	4760	
300	%N1	71.9	75.2	80.1	85.5	91.2	
	KIAS	229	230	230	231	233	
	FF/ENG	4170	4160	4210	4310	4440	
280	%N1	70.2	73.4	78.2	83.6	89.2	96.1
	KIAS	224	224	225	226	227	228
	FF/ENG	3930	3920	3950	4030	4140	4350
260	%N1	68.4	71.6	76.4	81.5	87.0	93.2
	KIAS	219	219	220	220	221	222
	FF/ENG	3690	3680	3700	3770	3840	4000
240	%N1	66.5	69.6	74.4	79.4	84.8	90.5
	KIAS	213	213	214	214	215	216
	FF/ENG	3450	3440	3450	3500	3560	3680
220	%N1	64.7	67.7	72.4	77.2	82.5	88.2
	KIAS	208	208	208	209	209	210
	FF/ENG	3230	3220	3220	3250	3300	3390
200	%N1	63.2	66.1	70.7	75.4	80.5	86.1
	KIAS	205	205	205	205	205	205
	FF/ENG	3050	3030	3030	3050	3080	3160

This table includes 5% additional fuel for holding in a racetrack pattern.

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Performance Inflight - QRH
Text

Chapter PI-QRH
Section 17

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). 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 Airplane Flight Manual (AFM), the AFM takes precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

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 or turbulent air may also cause unreliable airspeed/Mach indications.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

ISFD Airspeed and Altitude Correction

In the event of loss of primary air data, Integrated Standby Flight Display (ISFD) airspeed and pressure altitude correction are provided. The first table provides the ISFD airspeed for a given gross weight and target airspeed. The second table provides a pressure altitude adjustment for a given gross weight and ISFD airspeed. The pressure altitude adjustment is added to the ISFD altitude to get the actual pressure altitude.

Max Climb %N1

This table shows Max Climb %N1 for a 340/.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. Adjustments are also shown for anti-ice operation.

Go-Around %N1

To find Max Go-Around %N1 based on normal engine bleed for packs on, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs off operation, apply the %N1 adjustments provided below the table. %N1 adjustments are shown for engine anti-ice operation.

VREF

The Reference Speed table contains flaps 30 and 25 reference speeds for a given weight.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, anti-skid inoperative, brake energy limits, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded.

The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce minimum control speeds. Note that the assumed temperature method may not help this condition as minimum control speeds are determined at the actual temperature and, therefore, are not reduced.

Takeoff speeds are determined as follows:

- (1) Determine V1, VR, and V2 from the Takeoff Speeds table (Table 1) with brake release weight.
- (2) Adjust V1, VR and V2 for temperature and pressure altitude from the V1, VR, V2 Adjustments table (Table 2).
- (3) Adjust V1 for slope and wind from the Slope and Wind V1 Adjustment table (Table 3).
- (4) Determine V1(MCG) and Min VR from the V1(MCG) and Minimum VR table (Table 4).
- (5) If V1 from Step 3 is less than V1(MCG), set $V1 = V1(MCG)$.
- (6) If VR from Step 2 is less than Min VR, Set $VR = \text{Min VR}$.
- (7) Using Min VR from Step (4), determine V2 from the V2 for Minimum VR table (Table 5).

(8) If V_2 from Step 2 is less than V_2 for Minimum VR, set $V_2 = V_2$ for Minimum VR.

Note: Regulations prohibit scheduling takeoff with a V_1 less than minimum V_1 for control on the ground, $V_1(\text{MCG})$, VR less than Minimum VR (Min VR), and V_2 less than V_2 for Minimum VR. It is necessary to compare the adjusted V_1 , VR and V_2 to $V_1(\text{MCG})$, Minimum VR and V_2 for Minimum VR, respectively. No takeoff weight adjustment is necessary provided that the actual field length exceeds 1860 m for a dry runway, or 2680 m for a wet runway.

Clearway and Stopway V_1 Adjustments

Takeoff speed corrections are to be applied to V_1 when using takeoff weights based on the use of clearway and stopway.

Adjust V_1 by the amount shown in the table. The adjusted V_1 must not exceed VR. If V_1 is greater than VR, VR may be increased to equal V_1 . Increase V_2 by the same amount that VR is increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

All Engines

Holding

Target %N1, KIAS, and fuel flow per engine information are tabulated for holding with Flaps Up and Flaps 1 based on the FMC optimum holding speed schedule. This is the higher of maximum endurance speed and maneuvering speed for the selected flap setting. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, KIAS and fuel flow per engine.

Advisory Information

Runway Surface Condition Correlation

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. A table is provided that correlates runway condition code to runway surface condition description and reported braking action that can then be used to determine the appropriate Normal Configuration Landing Distance or Non-Normal Configuration Landing Distance.

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are 115% of the actual landing distance. The Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, four-engine maximum reverse thrust, and auto speedbrakes.

To use these tables, determine the reference landing distance for the selected braking configuration and reported braking action. Adjust this reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is applied independently to the reference landing distance. A correction for use of manual speedbrakes is provided in the table notes.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" reported braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing. Landing distances and adjustments are provided for dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are representative of the actual landing distance, and are not factored. The Non-Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, and maximum available symmetrical reverse thrust.

Tables for Non-Normal Configuration Landing Distance in this section are similar in format and used in the same manner as tables for the Normal Configuration Landing Distance previously described.

Landing Climb Limit Weight

Enter the Landing Climb Limit Weight table with airport OAT and pressure altitude and read landing climb limit weight. Apply the noted adjustments as required.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. Although for normal operations most landings are at weights below the AFM quick turnaround limit weight, brakes can still get hot enough that cooling is recommended. Use of the recommended cooling schedule can help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Reference Brake Energy table (Table 1) with 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 Event Adjusted Brake Energy table (Table 2) for no reverse thrust or 4 engine reverse thrust 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 (Table 3) 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 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 on the GEAR synoptic display and disappears as the hottest brake cools to an indication of 4. Note that even without an EICAS advisory message, brake cooling is recommended.

One Engine Inoperative

Max Continuous %N1

Power setting is based on one engine inoperative with packs on and anti-ice bleeds off. Enter the table with pressure altitude and KIAS 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 Driftdown Speed/Level Off Altitude 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.

Level off altitude is dependent on air temperature (ISA deviation). Note that the maximum altitude shown has been reduced by 1000 ft to maintain consistency with the FMC.

Long Range Cruise Altitude Capability

The Long Range Cruise Altitude Capability table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 1000 ft to maintain consistency with the FMC.

Long Range Cruise Control

The Long Range Cruise Control table provides target %N1, one engine inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect fuel burn per engine.

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 are based on three-engine Long Range Cruise speed and .84/290/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table (Table 1) and read Fuel and Time (Table 2) required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the Fuel Required Adjustment table (Table 3) with fuel required for the reference weight and the actual weight at checkpoint.

Holding

Power setting required (%N1), indicated airspeed, and fuel flow are shown for one engine inoperative holding based on the recommended speeds. Fuel flow is based on a racetrack holding pattern and may be reduced by 5% for holding in straight and level flight.

Two Engines Inoperative

Driftdown Speed/Level Off Altitude

The Driftdown Speed/Level Off Altitude table shows optimum driftdown speed as a function of cruise weight at the start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off.

Level off altitude is dependent on air temperature (ISA deviation). Note that the maximum altitude shown has been reduced by 2000 ft to maintain consistency with the FMC.

Driftdown/LRC Cruise Range Capability

This table shows range capability from the start of driftdown until the airplane levels off. As weight decreases due to fuel burn, the airplane accelerates to Long Range Cruise speed and maintains this speed at the level off altitude.

To determine fuel required, enter the Ground to Air Miles Conversion table (Table 1) with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Next, enter the Driftdown/Cruise Fuel and Time table (Table 2) with air distance and weight at start of driftdown to determine fuel and time required.

Long Range Cruise Altitude Capability

The Long Range Cruise Altitude Capability table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 2000 ft to be consistent with the FMC logic.

Long Range Cruise Control

The Long Range Cruise Control table provides target %N1, two engines inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect fuel burn for each engine.

Gear Down

This section contains performance for airplane operation with landing gear extended for all phases of flight. Data are based on engine bleeds for normal air conditioning.

Note: The FMC does not contain special provisions for operation with landing gear extended. As a result, the FMC 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.

DO NOT USE FOR FLIGHT

747 Flight Crew Operations Manual

Performance Inflight - QRH

Chapter PI-QRH

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Section 20**General**

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Errata (NOE) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Serial and tabulation number are supplied by Boeing.

Airplane Number	Registry Number
806	Intercontinental
914	Freighter

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Performance Inflight - QRH**Chapter PI-QRH****General****Section 20****Flight With Unreliable Airspeed / Turbulent Air Penetration**

Altitude and/or vertical speed indications may also be unreliable.

Climb (310/.83)**Flaps Up, Max Climb Thrust**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
40000	PITCH ATT	4.5	5.0				
	V/S (FT/MIN)	1600	1000				
35000	PITCH ATT	5.0	5.0	5.0	5.0	5.0	
	V/S (FT/MIN)	2700	2000	1400	900	400	
30000	PITCH ATT	4.5	4.5	4.5	4.5	4.5	5.0
	V/S (FT/MIN)	2500	2000	1500	1200	800	500
20000	PITCH ATT	7.5	7.0	6.5	6.5	6.5	6.5
	V/S (FT/MIN)	3900	3200	2600	2100	1700	1400
10000	PITCH ATT	10.5	9.5	9.0	8.5	8.5	8.5
	V/S (FT/MIN)	5600	4500	3800	3200	2700	2200
SEA LEVEL	PITCH ATT	14.5	12.5	11.5	11.0	10.5	10.5
	V/S (FT/MIN)	6700	5500	4600	3900	3400	2900

Cruise (.83/310)**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
40000	PITCH ATT	3.0	3.5	4.5			
	%N1	83.4	87.1	92.4			
35000	PITCH ATT	2.0	2.5	3.0	4.0	4.5	
	%N1	80.2	82.4	85.1	88.6	93.5	
30000	PITCH ATT	1.5	2.0	2.5	3.0	3.5	4.0
	%N1	79.1	80.3	82.2	84.5	87.1	90.4
25000	PITCH ATT	2.0	2.5	3.0	3.5	4.0	5.0
	%N1	75.0	76.2	78.0	80.3	82.7	85.8
20000	PITCH ATT	2.0	2.5	3.0	3.5	4.0	5.0
	%N1	71.1	72.1	73.8	75.9	78.2	81.0
15000	PITCH ATT	2.0	2.5	3.0	3.5	4.0	5.0
	%N1	67.4	68.3	69.9	71.9	74.0	76.6

Descent (.83/310)**Flaps Up, Idle Thrust**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
40000	PITCH ATT	0.0	0.5	1.5	2.0	0.5	-2.0
	V/S (FT/MIN)	-2600	-2500	-2600	-2800	-3100	-5900
35000	PITCH ATT	-2.0	-1.0	0.0	0.5	1.0	2.0
	V/S (FT/MIN)	-3300	-3000	-2900	-2900	-3000	-2300
30000	PITCH ATT	-1.5	-0.5	0.0	0.5	1.5	2.0
	V/S (FT/MIN)	-2700	-2400	-2200	-2100	-2000	-2100
20000	PITCH ATT	-1.5	-0.5	0.5	1.0	1.5	2.5
	V/S (FT/MIN)	-2500	-2200	-2000	-1900	-1900	-1900
10000	PITCH ATT	-1.5	-0.5	0.0	1.0	1.5	2.0
	V/S (FT/MIN)	-2300	-2000	-1800	-1700	-1700	-1700
SEA LEVEL	PITCH ATT	-1.5	-0.5	0.0	1.0	1.5	2.5
	V/S (FT/MIN)	-2000	-1800	-1600	-1500	-1500	-1500

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding (Flaps Up Maneuvering Speed)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		450	550	650	750	850	950
10000	PITCH ATT	5.5	6.0	6.5	6.5	7.0	7.0
	%N1	51.8	56.0	59.9	63.4	66.9	70.3
	KIAS	205	217	229	241	250	262

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
FLAPS UP (GEAR UP)	PITCH ATT	5.0	5.5	6.0	6.0	6.5	6.5
	%N1	51.2	55.4	59.3	62.4	65.5	68.6
	KIAS	210	223	235	244	255	267
FLAPS 1 (GEAR UP)	PITCH ATT	7.0	7.5	7.5	8.0	8.5	8.5
	%N1	56.1	60.4	64.3	67.9	71.3	74.2
	KIAS	190	203	214	224	235	244
FLAPS 5 (GEAR UP)	PITCH ATT	7.5	8.0	8.0	8.5	9.0	9.0
	%N1	55.9	60.7	64.9	68.5	72.2	75.4
	KIAS	170	183	195	204	215	224
FLAPS 10 (GEAR UP)	PITCH ATT	8.0	8.0	8.0	8.0	8.5	9.0
	%N1	56.1	60.8	64.8	68.7	72.5	76.0
	KIAS	152	167	181	192	198	205
FLAPS 20 (GEAR DOWN)	PITCH ATT	6.0	6.0	5.5	6.0	6.5	6.5
	%N1	63.4	68.4	72.7	77.4	81.3	84.9
	KIAS	142	155	168	176	185	195

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF+INCREMENT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
FLAPS 25 (VREF25+10)	PITCH ATT	1.0	1.0	1.0	1.0	1.5	1.5
	%N1	52.5	56.6	60.6	64.0	66.9	69.9
	KIAS	141	154	166	177	186	196
FLAPS 30 (VREF30+10)	PITCH ATT	0.5	0.5	0.5	1.0		
	%N1	55.4	59.9	64.0	67.6	*	*
	KIAS	138	151	162	173		

* Exceeds flap placard speed.

Go-Around (1500 FT)

Flaps 20, Gear Up, Go-Around Thrust, Maneuver Speed

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
10000	PITCH ATT	18.5	15.0	12.5	11.0	10.0	9.0
	VS (FT/MIN)	3700	3000	2400	1900	1500	1200
	KIAS	142	156	168	177	187	197
5000	PITCH ATT	21.0	17.0	14.5	13.0	11.5	10.5
	VS (FT/MIN)	4100	3400	2800	2300	1800	1500
	KIAS	142	155	168	176	185	195
SEA LEVEL	PITCH ATT	21.0	17.5	14.5	13.0	12.0	11.0
	VS (FT/MIN)	3900	3200	2700	2200	1800	1500
	KIAS	142	155	167	175	184	194

ISFD Airspeed and Altitude Correction**Applicable to low speed operations below 15000 ft pressure altitude****Flaps Up, Gear Up****Table 1 of 2: ISFD Airspeed**

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
200	199	200	201	202	204	207	211
210	209	209	210	211	212	214	217
220	219	219	219	220	221	223	225
240	239	239	239	239	240	241	242
260	259	258	258	259	259	260	261
280	279	278	278	278	279	279	279
300	299	298	298	298	298	298	299
320	319	318	318	318	318	318	318
340	339	339	338	338	338	338	338
360	359	359	358	358	358	358	358

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
200	20	10	-10	-40	-80	-140	-220
210	30	20	0	-20	-50	-100	-160
220	30	30	10	-10	-30	-70	-120
240	40	40	30	20	0	-30	-60
260	40	50	50	40	30	10	-20
280	40	50	50	50	50	40	20
300	40	50	60	60	60	60	50
320	40	60	60	70	70	70	70
340	40	60	70	70	80	80	80
360	30	60	70	80	90	90	100

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 1, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
180	180	181	183	185	187	190	195
190	190	191	192	193	195	198	201
200	199	200	201	202	204	206	208
210	209	210	211	212	213	214	216
220	219	219	220	221	222	223	225
240	239	239	239	240	241	242	243
260	259	259	259	259	260	261	261
280	278	278	279	279	279	280	280
300	298	298	298	298	299	299	300

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
180	0	-20	-50	-80	-130	-190	-260
190	10	-10	-40	-70	-100	-150	-210
200	10	0	-30	-50	-80	-120	-170
210	20	10	-10	-40	-60	-100	-140
220	30	10	0	-20	-50	-80	-110
240	30	30	20	0	-20	-50	-70
260	40	40	30	20	0	-20	-40
280	50	50	50	40	30	10	-10
300	60	60	60	50	40	30	20

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 5, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
160	161	162	164	167	171	179	
164	164	165	167	170	174	179	
168	168	169	171	173	176	181	188
172	172	173	174	176	179	183	189
176	176	177	178	180	182	186	190
180	180	181	182	183	185	188	192
190	189	190	191	192	194	196	199
200	199	200	200	201	203	204	206
210	209	209	210	211	212	213	214
220	219	219	219	220	221	222	223
240	239	239	239	239	240	241	242
260	258	258	259	259	259	260	260
280	278	278	278	278	279	279	279

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
160	-10	-30	-60	-110	-180	-280	
164	0	-30	-60	-100	-160	-240	
168	0	-20	-50	-90	-140	-210	-310
172	0	-20	-40	-80	-120	-190	-270
176	10	-10	-40	-70	-110	-170	-240
180	10	-10	-30	-60	-100	-150	-220
190	20	0	-20	-40	-70	-110	-170
200	20	10	-10	-30	-50	-90	-130
210	30	20	0	-20	-40	-70	-100
220	30	20	10	0	-20	-50	-80
240	40	40	30	20	0	-20	-40
260	40	50	40	30	20	10	-10
280	50	50	50	50	40	30	20

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 10, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
140	140	142	146	152			
144	144	146	149	153			
148	148	149	152	155	163		
152	152	153	155	158	163		
156	156	157	158	161	165	173	
160	159	160	162	164	167	173	
164	163	164	165	167	170	174	182
168	167	168	169	170	173	176	182
172	171	172	173	174	176	179	183
176	175	175	176	177	179	182	185
180	179	179	180	181	182	185	188
190	189	189	190	190	191	193	195
200	198	199	199	200	201	202	203
210	208	208	209	209	210	211	212
220	218	218	218	219	219	220	221
240	238	238	238	238	239	239	240
260	258	258	258	258	258	258	259

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
140	-10	-30	-80	-170			
144	0	-30	-70	-130			
148	0	-20	-50	-110	-210		
152	0	-10	-40	-90	-170		
156	10	-10	-30	-80	-140	-250	
160	10	0	-30	-60	-120	-200	
164	10	0	-20	-50	-100	-170	-280
168	20	0	-20	-40	-80	-140	-230
172	20	10	-10	-30	-70	-120	-190
176	20	10	0	-30	-60	-100	-160
180	20	10	0	-20	-50	-90	-140
190	30	20	10	-10	-30	-60	-100
200	40	30	20	10	-10	-30	-60
210	40	40	30	20	0	-20	-40
220	40	40	40	30	10	0	-20
240	50	50	50	50	40	20	10
260	50	60	60	60	60	50	30

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 20, Gear Up and Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
132	130	131	133	137			
136	134	135	136	139	146		
140	138	138	139	142	146		
144	142	142	143	145	148	155	
148	146	146	147	148	150	155	
152	150	150	150	151	153	157	163
156	154	154	154	155	156	159	163
160	158	157	158	158	160	162	165
164	162	161	161	162	163	165	167
168	165	165	165	166	167	168	170
172	169	169	169	170	170	171	173
176	173	173	173	173	174	175	176
180	177	177	177	177	178	178	179
190	187	187	187	187	187	187	188
200	197	197	197	197	197	197	197
210	207	207	207	207	207	207	207
220	218	217	217	217	217	216	217
240	238	237	237	237	236	236	236

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
132	30	10	-10	-70			
136	30	20	0	-40	-130		
140	30	30	10	-30	-90		
144	40	30	20	-10	-60	-150	
148	40	40	20	0	-40	-110	
152	40	40	30	10	-20	-70	-170
156	40	40	40	20	-10	-50	-120
160	40	40	40	30	10	-30	-80
164	40	50	40	30	20	-10	-60
168	50	50	50	40	30	0	-30
172	50	50	50	50	30	10	-20
176	50	50	50	50	40	20	0
180	50	50	60	50	50	30	10
190	50	60	60	60	60	50	40
200	60	60	70	70	70	70	60
210	60	70	70	70	80	80	70
220	60	70	80	80	80	90	80
240	60	80	90	90	100	100	100

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 25, Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	118	119	122				
124	122	122	124				
128	126	126	127	131			
132	129	130	131	133			
136	133	134	134	136	139		
140	137	137	138	139	141		
144	141	141	142	142	144	148	
148	145	145	145	146	147	150	
152	149	149	149	150	150	152	156
156	153	153	153	153	154	155	158
160	157	157	157	157	158	159	160
170	167	167	167	167	167	167	168
180	177	177	177	176	177	177	177
190	187	187	186	186	186	186	187
200	197	197	196	196	196	196	196
220	217	217	217	216	216	216	216

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	30	20	-20				
124	30	20	0				
128	30	30	10	-40			
132	40	30	20	-10			
136	40	40	30	0	-50		
140	40	40	30	20	-20		
144	40	40	40	30	0	-50	
148	50	50	40	30	10	-30	
152	50	50	50	40	30	-10	-60
156	50	50	50	40	30	10	-30
160	50	50	50	50	40	30	-10
170	50	60	60	60	50	50	30
180	60	60	70	70	70	60	50
190	60	70	70	80	80	80	70
200	60	70	80	80	90	90	80
220	60	80	80	90	100	100	110

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 30, Gear Down**Table 1 of 2: ISFD Airspeed**

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	118	119	122				
124	122	122	124				
128	125	126	127	131			
132	129	129	130	133			
136	133	133	134	136	140		
140	137	137	137	139	141		
144	141	141	141	142	144	148	
148	145	145	145	146	147	150	
152	149	149	149	149	150	152	156
156	153	153	153	153	154	155	158
160	157	157	157	157	157	158	160
170	168	167	167	167	167	167	168
180	178	177	177	176	176	176	177
190	188	187	187	186	186	186	186

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	30	20	-20				
124	30	30	0				
128	40	30	10	-40			
132	40	40	20	-10			
136	40	40	30	10	-50		
140	40	40	40	20	-20		
144	40	50	40	30	0	-60	
148	40	50	50	40	20	-30	
152	40	50	50	50	30	0	-70
156	40	50	50	50	40	10	-30
160	40	50	60	50	50	30	-10
170	40	60	60	60	60	50	40
180	40	60	70	70	70	70	60
190	40	60	70	80	80	80	80

Actual altitude = ISFD altitude + pressure altitude adjustment.

Max Climb %N1

Based on engine bleed for packs on, engine and wing anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KCAS OR MACH)									
	0	5	10	15	20	25	30	35	40	45
	340	340	340	340	340	340	0.81	0.84	0.84	0.84
60	91.0	91.6	92.9	94.1	96.1	97.6	99.8	101.2	101.5	100.7
50	92.8	93.2	93.8	93.1	94.7	96.2	98.3	99.7	100.0	99.2
40	94.2	95.0	95.4	94.8	95.0	94.9	96.7	98.2	98.4	97.7
30	92.7	95.5	97.0	96.4	96.6	96.5	95.2	96.6	96.8	96.1
20	91.2	93.9	96.6	97.9	98.2	98.0	96.9	95.5	95.2	94.5
15	90.4	93.1	95.8	97.3	99.0	98.9	97.8	96.5	95.9	95.2
10	89.6	92.3	95.0	96.5	98.7	99.7	98.7	97.6	97.0	96.3
5	88.8	91.5	94.1	95.6	97.9	99.6	99.7	98.6	98.0	97.3
0	88.0	90.7	93.3	94.8	97.0	98.7	100.8	99.6	99.0	98.3
-5	87.2	89.8	92.4	93.9	96.1	97.8	101.1	100.8	100.0	99.3
-10	86.4	89.0	91.5	93.0	95.2	96.8	100.2	101.4	100.9	100.3
-15	85.5	88.1	90.7	92.1	94.3	95.9	99.2	101.0	100.9	100.8
-20	84.7	87.3	89.8	91.2	93.4	95.0	98.3	100.0	99.9	99.9
-25	83.9	86.4	88.9	90.3	92.4	94.0	97.3	99.0	98.9	98.9
-30	83.0	85.5	88.0	89.4	91.5	93.1	96.3	98.0	97.9	97.9
-35	82.2	84.7	87.1	88.5	90.6	92.1	95.3	97.0	96.9	96.8
-40	81.3	83.8	86.2	87.5	89.6	91.2	94.3	96.0	95.9	95.8

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	45
ENGINE ANTI-ICE ON	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5
ENGINE & WING ANTI-ICE ON	-0.7	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-0.9	-0.9	-0.9

Go-around %N1**Based on engine bleed for packs on and anti-ice off**

REPORTED OAT (°C)	TAT (°C)	AIRPORT PRESSURE ALTITUDE (1000 FT)										
		0	1	2	3	4	5	6	7	8	9	10
70	74	85.9	86.7	87.5	88.3	88.7	89.1	89.4	89.8	89.9	89.6	89.0
60	64	87.9	88.8	89.7	90.7	91.2	91.7	92.1	92.5	92.7	92.4	91.8
55	59	88.8	89.8	90.8	91.8	92.4	93.0	93.4	93.9	94.1	93.8	93.2
50	54	90.2	90.9	91.9	92.9	93.6	94.2	94.6	95.1	95.4	95.1	94.5
45	49	91.5	92.3	93.2	94.2	94.8	95.3	95.9	96.4	96.7	96.4	95.8
40	44	92.8	93.6	94.5	95.4	96.0	96.6	97.1	97.6	98.0	97.7	97.1
35	39	94.2	94.9	95.8	96.8	97.2	97.7	98.3	99.0	99.0	98.8	98.3
30	34	94.8	95.7	96.6	97.6	98.2	98.7	99.2	99.7	99.9	99.5	99.2
25	29	94.1	95.5	97.0	98.1	98.7	99.2	100.3	100.8	100.7	100.3	99.9
20	24	93.3	94.7	96.2	97.7	98.9	100.1	100.9	101.7	102.2	101.6	100.7
15	19	92.5	93.9	95.4	96.8	98.0	99.3	100.7	102.4	102.9	102.4	101.6
10	14	91.7	93.1	94.5	96.0	97.2	98.5	99.8	101.5	102.5	102.5	102.5
5	8	90.8	92.1	93.5	95.0	96.2	97.4	98.8	100.4	101.4	101.4	101.5
0	3	90.0	91.3	92.7	94.2	95.3	96.6	97.9	99.6	100.5	100.5	100.7
-10	-7	88.3	89.6	91.0	92.4	93.6	94.9	96.2	97.8	98.8	98.8	98.9
-20	-17	86.6	87.9	89.3	90.7	91.9	93.2	94.5	96.1	97.0	97.0	97.1
-30	-27	84.9	86.2	87.6	89.0	90.2	91.4	92.7	94.3	95.2	95.2	95.3
-40	-37	83.2	84.4	85.8	87.2	88.5	89.7	90.9	92.5	93.4	93.4	93.5
-50	-47	81.4	82.7	84.0	85.5	86.7	87.9	89.1	90.6	91.5	91.6	91.7

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)										
	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4

VREF (KIAS)

WEIGHT (1000 LB)	FLAPS	
	30	25
1000	186	190
950	181	184
900	175	179
850	170	173
800	165	168
750	160	163
700	154	158
650	148	152
600	142	145
550	136	138
500	129	132
450	122	125

Takeoff Speeds - Dry Runway**Max Takeoff Thrust****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	166	182	196
950	162	177	192
900	157	172	188
850	151	165	183
800	146	159	178
750	140	153	173
700	134	146	167
650	127	139	161
600	120	132	155
550	112	125	149
500	103	117	142
450	94	109	136

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	17	17							8	8							-2	-2						
60	12	12	15	17					6	6	8	9					-2	-2	-2	-2				
50	7	8	11	13	16	18	20		4	4	6	8	9	10	12		-1	-1	-2	-2	-2	-3	-3	
40	3	4	7	9	12	15	18		2	2	4	5	7	8	10		-1	-1	-1	-1	-2	-2	-3	
30	0	0	3	6	8	11	14		0	0	2	4	5	7	8		0	0	0	-1	-1	-2	-2	
20	0	0	2	4	6	9	12		0	0	1	2	4	5	7		0	0	0	0	-1	-1	-2	
10	0	0	2	4	6	8	11		0	0	1	2	3	5	6		0	0	0	0	-1	-1	-1	
-40	0	0	2	4	6	8	11		0	0	1	2	3	5	6		0	0	0	0	-1	-1	-1	
-60	1	1	2	4	6	8	11		0	0	1	2	3	5	6		0	0	0	0	-1	-1	-1	

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-6	-3	0	3	5		-4	-3	-1	0	1	2	3	3		
950	-5	-2	0	3	5		-4	-3	-1	0	1	2	3	3		
900	-5	-2	0	2	5		-4	-3	-1	0	1	2	3	3		
850	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
800	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
750	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
700	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3		
650	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
600	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
550	-3	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
500	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

Takeoff Speeds - Dry Runway

Max Takeoff Thrust

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	133	126	130	121	124	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	133	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR							
	110	115	120	125	130	135	140	145
700 & ABV	164	164	165	165	165	166	166	167
650	158	158	159	159	159	160	161	166
600	152	152	152	153	153	155	160	165
550	146	146	146	147	149	154	159	164
500	139	140	140	143	148	153	158	163
450	133	133	137	142	147	152	157	162

Takeoff Speeds - Dry Runway**Max Takeoff Thrust****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	155	169	180
950	151	164	177
900	146	159	173
850	141	153	168
800	136	147	164
750	130	142	159
700	124	135	154
650	117	129	148
600	110	122	143
550	103	115	137
500	94	107	131
450	86	100	125

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	17	17						8	8						-2	-2					
60	12	12	15	17				6	6	8	9				-2	-2	-2	-2			
50	7	8	11	13	16	18	20	4	4	6	8	9	10	12	-1	-1	-2	-2	-2	-3	-3
40	3	4	7	9	12	15	18	2	2	4	5	7	8	10	-1	-1	-1	-1	-2	-2	-3
30	0	0	3	6	8	11	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-2
20	0	0	2	4	6	9	12	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2
10	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
-40	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
-60	1	1	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)								
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40	
1000	-6	-3	0	3	5	-4	-3	-1	0	1	2	3	3	
950	-5	-2	0	3	5	-4	-3	-1	0	1	2	3	3	
900	-5	-2	0	2	5	-4	-3	-1	0	1	2	3	3	
850	-4	-2	0	2	4	-4	-2	-1	0	1	2	2	3	
800	-4	-2	0	2	4	-4	-2	-1	0	1	2	2	3	
750	-4	-2	0	2	4	-4	-2	-1	0	1	2	2	3	
700	-3	-2	0	2	3	-4	-2	-1	0	1	2	2	3	
650	-3	-1	0	2	3	-3	-2	-1	0	1	2	2	3	
600	-3	-1	0	2	3	-3	-2	-1	0	1	2	2	3	
550	-3	-1	0	1	3	-3	-2	-1	0	1	2	2	3	
500	-2	-1	0	1	3	-3	-2	-1	0	1	2	2	3	

*V1 not to exceed VR

Takeoff Speeds - Dry Runway

Max Takeoff Thrust

Flaps 20

Table 4 of 5: V1(MCG), and Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	133	126	130	121	124	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	133	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
800 & ABV	161	162	162	163	163	164	164	164
750	157	157	157	158	158	158	159	162
700	151	151	151	152	152	153	156	161
650	145	146	146	146	147	151	155	160
600	140	140	141	141	145	150	155	160
550	134	135	136	139	144	149	154	159
500	126	129	133	138	143	149	154	159
450	122	127	133	138	143	148	153	158

Takeoff Speeds - Wet Runway**Max Takeoff Thrust****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	154	182	196
950	149	177	192
900	143	172	188
850	136	165	183
800	130	159	178
750	124	153	173
700	116	146	167
650	109	139	161
600	102	132	155
550	94	125	149
500	85	117	142
450	77	109	136

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	19	19						8	8						-2	-2					
60	14	15	17	19				6	7	8	9				-2	-2	-2	-2			
50	8	9	13	15	17	20	23	4	4	6	7	9	10	12	-1	-1	-2	-2	-2	-3	-3
40	2	4	7	10	13	15	19	2	2	4	5	7	8	10	-1	-1	-1	-1	-2	-2	-3
30	0	0	2	5	8	12	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-3
20	0	0	1	4	6	8	11	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2
10	1	1	2	4	5	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
0	1	1	3	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
-20	2	2	3	5	7	9	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
-40	3	3	4	6	8	10	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1
-60	4	4	5	7	9	11	13	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6
950	-6	-2	0	5	8		-6	-3	-1	0	2	4	5	7
900	-6	-2	0	4	8		-6	-4	-1	0	2	4	5	7
850	-5	-2	0	4	7		-7	-4	-1	0	2	4	5	7
800	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
750	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
700	-4	-2	0	4	6		-7	-4	-1	0	2	4	6	7
650	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7
600	-4	-1	0	3	6		-7	-4	-1	0	2	4	6	7
550	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
500	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
450	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7

*V1 not to exceed VR

Takeoff Speeds - Wet Runway

Max Takeoff Thrust

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	134	126	130	121	125	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	134	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
700 & ABV	164	164	165	165	165	166	166	167
650	158	158	159	159	159	160	161	166
600	152	152	152	153	153	155	160	165
550	146	146	146	147	149	154	159	164
500	139	140	140	143	148	153	158	163
450	133	133	137	142	147	152	157	162

Takeoff Speeds - Wet Runway**Max Takeoff Thrust****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	144	169	180
950	139	164	177
900	133	159	173
850	127	153	168
800	121	147	164
750	115	142	159
700	108	135	154
650	101	129	148
600	94	122	143
550	87	115	137
500	79	107	131
450	70	100	125

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	18	18						8	8						-2	-2								
60	12	13	15	18				6	7	8	9				-2	-2	-2	-2						
50	7	8	11	13	16	18	21	4	4	6	7	8	11	13	-1	-1	-2	-2	-2	-3	-3			
40	2	3	6	8	12	14	17	2	2	4	5	7	9	11	-1	-1	-1	-1	-2	-2	-3			
30	0	0	2	5	8	10	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-2			
20	0	0	1	4	6	8	11	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
0	0	0	2	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-20	0	0	2	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-40	2	2	4	5	7	9	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	3	3	5	6	8	10	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6		
950	-6	-2	0	5	8		-6	-3	-1	0	2	4	5	7		
900	-6	-2	0	4	8		-6	-4	-1	0	2	4	5	7		
850	-5	-2	0	4	7		-7	-4	-1	0	2	4	5	7		
800	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7		
750	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7		
700	-4	-2	0	4	6		-7	-4	-1	0	2	4	6	7		
650	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7		
600	-4	-1	0	3	6		-7	-4	-1	0	2	4	6	7		
550	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		
500	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		
450	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7		

*V1 not to exceed VR

Takeoff Speeds - Wet Runway

Max Takeoff Thrust

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	134	126	130	121	125	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	134	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
800 & ABV	161	162	162	163	163	164	164	164
750	157	157	157	158	158	158	159	162
700	151	151	151	152	152	153	156	161
650	145	146	146	146	147	151	155	160
600	140	140	141	141	145	150	155	160
550	134	135	136	139	144	149	154	159
500	126	129	133	138	143	149	154	159
450	122	127	133	138	143	148	153	158

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	700
8000	900
10000	1050
12000	1150
14000	1250
16000	1400

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
1000	-4	-7	-7	-4	-4					
800	-3	-6	-6	-3	-3					
600	-2	-5	-5	-3	-3					
400	-1	-3	-3	-2	-2					
200	-1	-1	-1	-1	-1					
0	0	0	0	0	0	0	0	0	0	0
-200	1	1	1	1	1	2	2	2	2	2
-400	1	1	1	1	1	2	2	2	2	2
-600	1	1	1	1	1	2	2	2	2	2
-800	1	1	1	1	1	2	2	2	2	2
-1000	1	1	1	1	1	2	2	2	2	2

Use of clearway not allowed on wet runways.
V1 not to exceed VR.

TO1 Takeoff Speeds - Dry Runway**10% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	174	185	196
950	169	180	192
900	164	174	187
850	158	168	182
800	152	162	177
750	147	156	172
700	140	149	166
650	133	142	160
600	125	135	154
550	117	127	148
500	108	120	142
450	99	111	135

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1										VR										V2									
	PRESS ALT (1000 FT)										PRESS ALT (1000 FT)										PRESS ALT (1000 FT)									
	-2	0	2	4	6	8	10				-2	0	2	4	6	8	10				-2	0	2	4	6	8	10			
70	14	15									7	8									-2	-2								
60	10	11	13	15							5	6	7	8							-1	-2	-2	-2						
50	6	7	9	11	13	16	18				3	4	5	7	8	9	10				-1	-1	-1	-2	-2	-2	-2	-2	-3	
40	2	3	6	8	10	13	15				1	2	4	5	6	8	9				0	0	-1	-1	-1	-1	-2	-2		
30	0	0	2	5	8	10	13				0	0	2	3	5	6	8				0	0	0	-1	-1	-1	-1	-2		
20	0	0	1	3	5	8	10				0	0	1	2	3	5	7				0	0	0	0	-1	-1	-1			
10	0	0	2	3	5	7	8				0	0	1	2	3	4	6				0	0	0	0	0	-1	-1			
0	0	0	2	3	5	7	9				0	0	1	2	3	4	6				0	0	0	0	0	0	-1	-1		
-20	0	0	2	3	5	7	9				0	0	1	2	3	4	6				0	0	0	0	0	0	-1	-1		
-40	1	1	2	4	6	8	9				0	0	1	2	3	4	6				0	0	0	0	0	0	-1	-1		
-60	1	1	3	4	6	8	10				0	0	1	2	3	4	6				0	0	0	0	0	0	-1	-1		

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-6	-3	0	3	5		-4	-3	-1	0	1	1	2	3		
950	-5	-3	0	2	5		-4	-2	-1	0	1	1	2	3		
900	-5	-2	0	2	4		-4	-2	-1	0	1	1	2	3		
850	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
800	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
750	-4	-2	0	2	3		-3	-2	-1	0	1	1	2	3		
700	-3	-2	0	2	3		-3	-2	-1	0	1	1	2	3		
650	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3		
600	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3		
550	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3		
500	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
450	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

TO1 Takeoff Speeds - Dry Runway

10% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)															
	-2000				0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114								
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107		
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107		
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109		
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113		
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116		

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
650 & ABV	159	159	159	159	154	151	155
600	152	152	152	153	150	150	154
550	145	145	146	146	146	149	153
500	138	138	139	140	142	147	152
450	131	132	132	136	141	146	151

TO1 Takeoff Speeds - Dry Runway**10% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	163	172	181
950	158	167	177
900	153	161	172
850	147	156	168
800	142	150	163
750	136	144	158
700	129	137	153
650	123	131	148
600	116	124	142
550	108	117	137
500	99	110	131
450	91	102	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	14	15							7	8							-2	-2						
60	10	11	13	15					5	6	7	8					-1	-2	-2	-2				
50	6	7	9	11	13	16	18		3	4	5	7	8	9	10		-1	-1	-1	-2	-2	-2	-3	
40	2	3	6	8	10	13	15	1	2	4	5	6	8	9	0	0	0	-1	-1	-1	-2	-2		
30	0	0	2	5	8	10	13	0	0	2	3	5	6	8	0	0	0	0	-1	-1	-1	-2		
20	0	0	1	3	5	8	10	0	0	1	2	3	5	7	0	0	0	0	0	-1	-1	-1		
10	0	0	2	3	5	7	8	0	0	1	2	3	4	6		0	0	0	0	0	0	-1	-1	
0	0	0	2	3	5	7	9	0	0	1	2	3	4	6	0	0	0	0	0	0	0	-1	-1	
-20	0	0	2	3	5	7	9	0	0	1	2	3	4	6	0	0	0	0	0	0	0	-1	-1	
-40	1	1	2	4	6	8	9	0	0	1	2	3	4	6	0	0	0	0	0	0	0	-1	-1	
-60	1	1	3	4	6	8	10	0	0	1	2	3	4	6	0	0	0	0	0	0	0	-1	-1	

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-3	0	3	5		-4	-3	-1	0	1	1	2	3
950	-5	-3	0	2	5		-4	-2	-1	0	1	1	2	3
900	-5	-2	0	2	4		-4	-2	-1	0	1	1	2	3
850	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3
800	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3
750	-4	-2	0	2	3		-3	-2	-1	0	1	1	2	3
700	-3	-2	0	2	3		-3	-2	-1	0	1	1	2	3
650	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3
600	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3
550	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3
500	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3
450	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3

*V1 not to exceed VR

TO1 Takeoff Speeds - Dry Runway

10% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
750 & ABV	152	152	152	152	153	153	153
700	151	151	151	152	152	152	153
650	145	146	146	146	146	146	150
600	139	140	140	141	141	144	150
550	133	134	134	135	139	144	149
500	127	128	129	133	138	143	148
450	121	122	127	132	137	143	148

TO1 Takeoff Speeds - Wet Runway**10% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	162	185	196
950	157	180	192
900	150	174	187
850	144	168	182
800	137	162	177
750	130	156	172
700	123	149	166
650	115	142	160
600	108	135	154
550	100	127	148
500	91	120	142
450	83	111	135

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	16	17						7	8						-2	-2					
60	11	12	15	17				5	6	7	8				-1	-2	-2	-2			
50	6	7	10	13	15	17	21	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-3
40	2	2	5	8	11	14	17	1	2	3	5	6	8	9	-0	-0	-1	-1	-1	-2	-2
30	0	0	2	5	8	11	14	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	8	12	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1
10	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-20	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-40	2	2	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-60	3	3	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
950	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
900	-6	-3	0	4	7		-6	-3	-1	0	2	3	4	6
850	-6	-3	0	4	7		-6	-4	-1	0	2	3	5	6
800	-6	-2	0	4	7		-6	-4	-1	0	2	3	5	6
750	-5	-2	0	4	6		-6	-4	-1	0	2	4	5	6
700	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	6
650	-4	-2	0	3	6		-7	-4	-2	0	2	4	5	7
600	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	7
550	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	7
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7
450	-3	-1	0	3	4		-7	-4	-2	0	2	4	6	7

*V1 not to exceed VR

TO1 Takeoff Speeds - Wet Runway

10% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)															
	-2000				0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114								
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107		
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107		
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109		
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113		
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116		

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
650 & ABV	159	159	159	159	154	151	155
600	152	152	152	153	150	150	154
550	145	145	146	146	146	149	153
500	138	138	139	140	142	147	152
450	131	132	132	136	141	146	151

TO1 Takeoff Speeds - Wet Runway**10% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	151	172	181
950	146	167	177
900	140	161	172
850	134	156	168
800	127	150	163
750	121	144	158
700	114	137	153
650	107	131	148
600	100	124	142
550	92	117	137
500	84	110	131
450	75	102	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	16	17						7	8						-2	-2					
60	11	12	15	17				5	6	7	8				-1	-2	-2	-2			
50	6	7	10	13	15	17	21	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-3
40	2	2	5	8	11	14	17	1	2	3	5	6	8	9	-0	-0	-1	-1	-1	-2	-2
30	0	0	2	5	8	11	14	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	8	12	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1
10	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-20	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-40	2	2	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-60	3	3	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
950	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
900	-6	-3	0	4	7		-6	-3	-1	0	2	3	4	6
850	-6	-3	0	4	7		-6	-4	-1	0	2	3	5	6
800	-6	-2	0	4	7		-6	-4	-1	0	2	3	5	6
750	-5	-2	0	4	6		-6	-4	-1	0	2	4	5	6
700	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	6
650	-4	-2	0	3	6		-7	-4	-2	0	2	4	5	7
600	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	7
550	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	7
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7
450	-3	-1	0	3	4		-7	-4	-2	0	2	4	6	7

*V1 not to exceed VR

TO1 Takeoff Speeds - Wet Runway

10% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
750 & ABV	152	152	152	152	153	153	153
700	151	151	151	152	152	152	153
650	145	146	146	146	146	146	150
600	139	140	140	141	141	144	150
550	133	134	134	135	139	144	149
500	127	128	129	133	138	143	148
450	121	122	127	132	137	143	148

TO1 Maximum Allowable Clearway

10% Thrust Reduction

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	700
8000	900
10000	1050
12000	1150
14000	1250
16000	1350

TO1 Clearway and Stopway V1 Adjustments
10% Thrust Reduction

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
1000	-6	-6	-6	-6	-3					
800	-5	-5	-6	-5	-2					
600	-3	-4	-5	-3	-2					
400	-1	-3	-4	-2	-1					
200	0	-1	-1	-1	0					
0	0	0	0	0	0	0	0	0	0	0
-200	1	1	1	1	1	1	1	1	1	1
-400	1	1	1	1	1	1	1	1	1	1
-600	1	1	1	1	1	1	1	1	1	1
-800	1	1	1	1	1	1	1	1	1	1
-1000	1	1	1	1	1	1	1	1	1	1

Use of clearway not allowed on wet runways.
V1 not to exceed VR.

TO2 Takeoff Speeds - Dry Runway**20% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
950	175	183	191
900	169	177	186
850	163	171	182
800	158	165	177
750	152	158	171
700	145	151	166
650	137	144	160
600	130	137	154
550	122	129	148
500	113	121	141
450	103	113	134

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	10	12						5	6						-2	-2								
60	9	10	12	15				4	5	7	8				-1	-1	-2	-2						
50	5	6	8	11	13	15	18	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2			
40	1	2	5	8	10	12	15	1	1	3	4	6	7	8	-0	-1	-1	-1	-1	-2	-2			
30	0	0	3	5	8	10	13	0	0	1	3	4	6	7	0	0	-0	-1	-1	-1	-1			
20	0	0	2	3	5	7	11	0	0	1	2	3	4	6	0	0	-0	-0	-1	-1	-1			
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1			
-40	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1			
-60	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)									
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40		
1000	-5	-3	0	3	5	-4	-2	-1	0	1	2	2	3		
950	-5	-2	0	2	5	-3	-2	-1	0	1	2	2	3		
900	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3		
850	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2		
800	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2		
750	-3	-1	0	2	3	-2	-2	-1	0	1	1	2	2		
700	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	2		
650	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	2		
600	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	3		
550	-2	-1	0	2	3	-2	-1	-1	0	1	2	2	3		
500	-2	-1	0	2	3	-3	-2	-1	0	1	2	2	3		
450	-2	-1	0	2	3	-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
550 & ABV	145	145	145	146	146	146	149
500	138	138	139	139	139	143	148
450	131	132	132	133	137	142	147

TO2 Takeoff Speeds - Dry Runway**20% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
850	152	158	167
800	147	152	163
750	141	146	158
700	134	140	152
650	127	133	147
600	120	126	142
550	112	119	136
500	103	112	130
450	94	104	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	10	12						5	6						-2	-2					
60	9	10	12	15				4	5	7	8				-1	-1	-2	-2			
50	5	6	8	11	13	15	18	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2
40	1	2	5	8	10	12	15	1	1	3	4	6	7	8	-0	-1	-1	-1	-1	-2	-2
30	0	0	3	5	8	10	13	0	0	1	3	4	6	7	0	0	-0	-1	-1	-1	-2
20	0	0	2	3	5	7	11	0	0	1	2	3	4	6	0	0	-0	-0	-1	-1	-1
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1
-40	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1
-60	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-5	-3	0	3	5		-4	-2	-1	0	1	2	2	3		
950	-5	-2	0	2	5		-3	-2	-1	0	1	2	2	3		
900	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
850	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
800	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
750	-3	-1	0	2	3		-2	-2	-1	0	1	1	2	2		
700	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
650	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
600	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	3		
550	-2	-1	0	2	3		-2	-1	-1	0	1	2	2	3		
500	-2	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
450	-2	-1	0	2	3		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
650 & ABV	145	145	146	146	146	147	148
600	139	139	140	140	141	141	145
550	133	134	134	134	135	139	144
500	127	128	128	129	133	138	143
450	121	121	123	127	132	137	142

TO2 Takeoff Speeds - Wet Runway**20% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
950	164	183	191
900	157	177	186
850	150	171	182
800	143	165	177
750	137	158	171
700	129	151	166
650	121	144	160
600	113	137	154
550	105	129	148
500	97	121	141
450	88	113	134

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	11	12						5	6						-2	-2					
60	10	11	13	15				4	5	7	8				-1	-1	-2	-2			
50	6	7	9	11	14	16	19	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2
40	1	2	5	7	10	12	16	1	1	3	4	6	7	8	0	-1	-1	-1	-1	-2	-2
30	0	0	2	4	7	10	13	0	0	1	3	4	6	7	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	-1	-1	
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
0	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
-20	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
-40	2	2	3	4	6	8	10	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
-60	3	3	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-6	-3	0	5	8		-4	-3	-1	0	1	3	4	5		
950	-6	-3	0	4	8		-4	-3	-1	0	1	3	4	5		
900	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
850	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
800	-6	-3	0	4	7		-6	-3	-1	0	1	3	4	5		
750	-6	-2	0	3	6		-6	-4	-2	0	1	3	4	5		
700	-5	-2	0	3	6		-6	-4	-2	0	1	3	4	6		
650	-5	-2	0	3	6		-6	-4	-2	0	2	3	4	6		
600	-4	-2	0	3	5		-6	-4	-2	0	2	3	5	6		
550	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	6		
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7		
450	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7		

*V1 not to exceed VR

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
550 & ABV	145	145	145	146	146	146	149
500	138	138	139	139	139	143	148
450	131	132	132	133	137	142	147

TO2 Takeoff Speeds - Wet Runway**20% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
850	139	158	167
800	133	152	163
750	127	146	158
700	120	140	152
650	112	133	147
600	105	126	142
550	97	119	136
500	89	112	130
450	80	104	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR								V2							
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10		
70	11	12						5	6						-2	-2							
60	10	11	13	15				4	5	7	8				-1	-1	-2	-2					
50	6	7	9	11	14	16	19	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2		
40	1	2	5	7	10	12	16	1	1	3	4	6	7	8	0	-1	-1	-1	-1	-2	-2		
30	0	0	2	4	7	10	13	0	0	1	3	4	6	7	0	0	0	-1	-1	-1	-2		
20	0	0	1	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	-1	-1	-1		
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1		
0	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1		
-20	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1		
-40	2	2	3	4	6	8	10	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1		
-60	3	3	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1		

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-3	0	5	8		-4	-3	-1	0	1	3	4	5
950	-6	-3	0	4	8		-4	-3	-1	0	1	3	4	5
900	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5
850	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5
800	-6	-3	0	4	7		-6	-3	-1	0	1	3	4	5
750	-6	-2	0	3	6		-6	-4	-2	0	1	3	4	5
700	-5	-2	0	3	6		-6	-4	-2	0	1	3	4	6
650	-5	-2	0	3	6		-6	-4	-2	0	2	3	4	6
600	-4	-2	0	3	5		-6	-4	-2	0	2	3	5	6
550	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	6
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7
450	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7

*V1 not to exceed VR

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
650 & ABV	145	145	146	146	146	147	148
600	139	139	140	140	141	141	145
550	133	134	134	134	135	139	144
500	127	128	128	129	133	138	143
450	121	121	123	127	132	137	142

TO2 Clearway and Stopway V1 Adjustments
20% Thrust Reduction

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
1000	-3	-3	-3	-3	-3					
800	-3	-3	-3	-3	-3					
600	-3	-3	-3	-3	-3					
400	-1	-1	-1	-1	-1					
200	0	0	0	0	0					
0	0	0	0	0	0	0	0	0	0	0
-200	1	1	1	1	1	1	1	1	1	1
-400	1	1	1	1	1	1	1	1	1	1
-600	1	1	1	1	1	1	1	1	1	1
-800	1	1	1	1	1	1	1	1	1	1
-1000	1	1	1	1	1	1	1	1	1	1

Use of clearway not allowed on wet runways.
V1 not to exceed VR.

Performance Inflight - QRH**Chapter PI-QRH****All Engine****Section 21****Holding****Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
1000	%N1	64.8	67.6	71.9	76.3	81.1	85.8	90.4			
	KIAS	265	267	269	274	316	320	316			
	FF/ENG	7200	7130	7090	7060	7420	7580	7710			
950	%N1	63.3	66.0	70.3	74.7	79.5	84.2	88.8			
	KIAS	259	260	262	265	308	312	316			
	FF/ENG	6820	6740	6690	6650	6980	7120	7290			
900	%N1	61.8	64.4	68.7	73.1	77.8	82.6	87.1	93.5		
	KIAS	254	254	256	257	299	303	307	283		
	FF/ENG	6450	6350	6300	6260	6540	6670	6780	6950		
850	%N1	60.3	62.8	66.9	71.3	76.2	80.9	85.4	90.8		
	KIAS	249	249	250	252	290	294	298	283		
	FF/ENG	6080	5970	5910	5870	6100	6230	6310	6390		
800	%N1	58.6	61.2	65.2	69.5	74.4	79.0	83.7	88.6		
	KIAS	244	244	245	246	281	284	288	283		
	FF/ENG	5730	5610	5680	5620	5820	5900	5860	5930		
750	%N1	57.0	59.5	63.4	67.6	72.6	77.2	81.8	86.7		
	KIAS	239	239	240	242	272	275	278	283		
	FF/ENG	5410	5420	5330	5260	5440	5480	5430	5550		
700	%N1	55.4	57.8	61.7	65.8	70.7	75.3	80.0	84.8	92.4	
	KIAS	234	234	235	236	262	265	268	272	252	
	FF/ENG	5240	5100	5000	4910	5060	5060	5010	5080	5370	
650	%N1	53.7	56.1	59.9	63.9	68.7	73.3	77.9	82.8	89.4	
	KIAS	228	228	229	230	252	255	257	261	252	
	FF/ENG	4930	4790	4670	4580	4680	4680	4610	4660	4880	
600	%N1	52.0	54.3	58.0	61.9	66.7	71.2	75.8	80.7	87.1	92.1
	KIAS	222	222	223	224	242	244	247	250	252	235
	FF/ENG	4620	4490	4360	4260	4320	4320	4210	4240	4490	4720
550	%N1	50.1	52.4	56.0	59.9	64.5	68.8	73.5	78.5	84.7	88.9
	KIAS	216	216	217	217	231	233	235	238	242	235
	FF/ENG	4310	4190	4060	3940	3960	3950	3940	3930	4140	4260
500	%N1	48.1	50.4	53.9	57.7	62.1	66.4	71.1	75.9	82.3	86.3
	KIAS	210	210	210	211	220	222	224	226	230	232
	FF/ENG	4010	3880	3760	3640	3620	3590	3580	3540	3710	3870
450	%N1	46.1	48.3	51.8	55.5	59.5	63.8	68.4	73.2	79.6	83.6
	KIAS	205	205	205	205	209	210	212	214	217	219
	FF/ENG	3720	3590	3480	3360	3290	3240	3230	3180	3310	3430

This table includes 5% additional fuel for holding in a racetrack pattern.

Holding

Flaps 1

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
1000	%N1	70.0	73.3	77.9	82.9	88.0
	KIAS	243	244	246	248	250
	FF/ENG	8630	8590	8620	8740	8870
950	%N1	68.5	71.7	76.3	81.2	86.3
	KIAS	239	239	241	243	245
	FF/ENG	8170	8150	8130	8240	8350
900	%N1	67.0	70.0	74.7	79.4	84.6
	KIAS	234	234	236	237	239
	FF/ENG	7720	7700	7660	7760	7840
850	%N1	65.4	68.4	73.0	77.6	82.7
	KIAS	229	229	230	232	234
	FF/ENG	7280	7250	7220	7290	7360
800	%N1	63.8	66.6	71.2	75.8	80.8
	KIAS	223	224	225	226	228
	FF/ENG	6850	6800	6780	6810	6880
750	%N1	62.1	64.9	69.3	74.0	78.8
	KIAS	219	219	220	221	223
	FF/ENG	6440	6380	6360	6350	6430
700	%N1	60.3	63.1	67.4	72.0	76.7
	KIAS	214	214	215	216	217
	FF/ENG	6040	5960	5930	5910	5990
650	%N1	58.5	61.2	65.4	69.9	74.5
	KIAS	208	208	209	210	211
	FF/ENG	5640	5550	5650	5620	5640
600	%N1	56.5	59.1	63.3	67.8	72.3
	KIAS	202	202	203	204	205
	FF/ENG	5400	5290	5240	5200	5200
550	%N1	54.5	57.1	61.2	65.5	70.0
	KIAS	196	196	197	197	198
	FF/ENG	5030	4910	4840	4790	4780
500	%N1	52.4	54.9	58.9	63.1	67.5
	KIAS	189	190	190	191	191
	FF/ENG	4670	4540	4460	4400	4380
450	%N1	50.4	52.8	56.7	60.8	65.0
	KIAS	185	185	185	185	185
	FF/ENG	4350	4220	4110	4030	3980

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH
Advisory Information

Chapter PI-QRH
Section 22

ADVISORY INFORMATION
Runway Surface Condition Correlation

RUNWAY CONDITION CODE	RUNWAY SURFACE CONDITION DESCRIPTION	REPORTED BRAKING ACTION
6	Dry	Dry
5	Wet (Smooth, Grooved or PFC) or Frost 3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow	Good
4	Compacted Snow at or below -15°C OAT	Good to Medium
3	Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow Compacted Snow at OAT warmer than -15°C	Medium
2	Greater than 3 mm (0.12 inches) of: Water or Slush	Medium to Poor
1	Ice	Poor
0	Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice	Nil

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABV VREF30	TWO REV NO REV

Dry Runway

MAX MANUAL	5020	80/-60	150	-230/770	0/-60	140/-130	230	160	310
AUTOBRAKE MAX	5870	70/-70	170	-270/890	0/0	160/-160	300	190	0
AUTOBRAKE 4	7310	90/-90	240	-360/1190	0/0	210/-210	400	0	0
AUTOBRAKE 3	8280	100/-110	280	-420/1390	0/0	240/-250	470	0	0
AUTOBRAKE 2	9330	120/-130	320	-480/1610	20/-110	300/-280	480	50	50
AUTOBRAKE 1	10370	140/-150	410	-560/1890	250/-290	420/-310	430	880	890

Good Reported Braking Action

MAX MANUAL	6480	100/-90	280	-370/1310	150/-130	250/-210	340	510	1130
AUTOBRAKE MAX	6520	100/-90	280	-350/1310	160/-110	250/-210	350	500	1090
AUTOBRAKE 4	7400	90/-90	250	-370/1240	40/-20	220/-210	410	110	580
AUTOBRAKE 3	8330	100/-110	280	-430/1420	30/-30	250/-250	470	0	90
AUTOBRAKE 2	9330	120/-130	330	-480/1620	60/-110	300/-280	480	50	50
AUTOBRAKE 1	10370	140/-150	410	-560/1890	260/-290	420/-310	430	880	890

Good to Medium Reported Braking Action

MAX MANUAL	6970	100/-90	280	-390/1370	190/-160	260/-210	340	620	1390
AUTOBRAKE MAX	6990	100/-90	290	-380/1380	200/-150	260/-210	350	610	1350
AUTOBRAKE 4	7470	90/-90	260	-380/1310	90/-50	220/-220	410	250	1030
AUTOBRAKE 3	8330	100/-110	280	-430/1420	50/-30	250/-250	470	20	220
AUTOBRAKE 2	9330	120/-130	330	-480/1620	60/-110	300/-280	480	50	50
AUTOBRAKE 1	10370	140/-150	410	-560/1890	260/-290	420/-310	430	880	890

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF30	TWO REV NO REV

Medium Reported Braking Action

MAX MANUAL	7360	100/-100	290	-400/1440	230/-200	270/-220	330	760	1750
AUTOBRAKE MAX	7380	100/-100	300	-400/1440	240/-180	270/-220	350	750	1720
AUTOBRAKE 4	7650	100/-100	280	-410/1420	160/-90	250/-220	410	570	1600
AUTOBRAKE 3	8410	100/-110	290	-440/1510	90/-60	250/-250	470	140	880
AUTOBRAKE 2	9340	120/-130	330	-480/1630	80/-110	300/-280	480	80	270
AUTOBRAKE 1	10370	140/-150	410	-560/1890	260/-290	420/-310	430	880	890

Medium to Poor Reported Braking Action

MAX MANUAL	8430	130/-120	390	-510/1820	340/-270	370/-270	380	1280	3290
AUTOBRAKE MAX	8450	130/-120	390	-510/1830	350/-290	380/-280	380	1250	3310
AUTOBRAKE 4	8450	130/-120	390	-510/1830	350/-290	380/-280	380	1250	3310
AUTOBRAKE 3	8680	130/-110	380	-450/1680	240/-120	300/-250	430	1030	3080
AUTOBRAKE 2	9490	120/-130	340	-490/1630	150/-150	310/-280	460	390	2300
AUTOBRAKE 1	10440	140/-150	410	-560/1900	290/-330	420/-310	410	920	1610

Poor Reported Braking Action

MAX MANUAL	10510	150/-150	430	-660/2480	830/-550	470/-320	380	2480	7140
AUTOBRAKE MAX	10540	150/-150	440	-660/2480	850/-560	470/-320	380	2450	7160
AUTOBRAKE 4	10540	150/-150	440	-660/2480	850/-560	470/-320	380	2450	7160
AUTOBRAKE 3	10550	150/-150	440	-670/2480	840/-500	470/-320	430	2440	7150
AUTOBRAKE 2	10860	150/-150	420	-680/2510	750/-480	450/-330	460	2170	6870
AUTOBRAKE 1	11280	160/-170	490	-700/2570	800/-570	490/-340	410	2160	6480

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 4 engines at maximum reverse thrust.

Max Manual assumes maximum achievable manual braking.

All reference distances and adjustments are increased by 15%.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Max Manual and autobrake data valid for auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 150 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 120 ft.

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV NO REV

Dry Runway

MAX MANUAL	5190	80/-60	150	-240/780	0/-60	140/-130	230	160	340
AUTOBRAKE MAX	6100	60/-70	180	-280/910	0/0	160/-170	310	190	0
AUTOBRAKE 4	7610	80/-100	240	-370/1220	0/0	220/-220	410	0	0
AUTOBRAKE 3	8640	100/-110	280	-430/1420	0/0	250/-260	480	0	0
AUTOBRAKE 2	9690	110/-140	330	-490/1640	50/-120	320/-290	480	100	100
AUTOBRAKE 1	10700	140/-160	420	-570/1920	270/-310	440/-320	430	1060	1070

Good Reported Braking Action

MAX MANUAL	6740	100/-100	280	-370/1330	160/-140	260/-220	340	550	1320
AUTOBRAKE MAX	6780	100/-90	290	-360/1330	160/-120	270/-220	350	560	1260
AUTOBRAKE 4	7720	90/-100	260	-380/1260	50/-20	230/-220	420	130	700
AUTOBRAKE 3	8710	100/-110	290	-440/1450	30/-30	260/-260	480	0	150
AUTOBRAKE 2	9710	120/-140	340	-490/1650	90/-130	320/-290	480	100	100
AUTOBRAKE 1	10700	140/-160	420	-570/1920	280/-310	440/-320	430	1060	1070

Good to Medium Reported Braking Action

MAX MANUAL	7220	90/-100	290	-390/1390	200/-170	270/-220	340	670	1590
AUTOBRAKE MAX	7250	90/-100	290	-390/1400	210/-160	280/-220	350	680	1550
AUTOBRAKE 4	7780	90/-100	260	-390/1330	90/-50	240/-230	420	260	1170
AUTOBRAKE 3	8710	100/-110	290	-440/1450	50/-30	260/-260	480	20	300
AUTOBRAKE 2	9710	120/-140	340	-490/1650	90/-130	320/-290	480	100	100
AUTOBRAKE 1	10700	140/-160	420	-570/1920	280/-310	440/-320	430	1060	1070

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV NO REV

Medium Reported Braking Action

MAX MANUAL	7610	100/-100	300	-410/1460	240/-200	290/-230	340	810	1970
AUTOBRAKE MAX	7640	100/-100	300	-410/1460	250/-190	290/-230	350	820	1930
AUTOBRAKE 4	7950	90/-100	280	-410/1440	150/-80	260/-230	420	590	1760
AUTOBRAKE 3	8780	100/-120	290	-450/1530	90/-60	260/-260	480	140	980
AUTOBRAKE 2	9710	120/-140	340	-490/1660	110/-130	320/-290	480	130	340
AUTOBRAKE 1	10700	140/-160	420	-570/1920	280/-310	440/-320	430	1060	1070

Medium to Poor Reported Braking Action

MAX MANUAL	8720	130/-130	400	-510/1830	340/-280	390/-280	380	1390	3820
AUTOBRAKE MAX	8760	130/-130	400	-510/1830	360/-290	400/-290	390	1400	3840
AUTOBRAKE 4	8760	130/-130	400	-510/1830	360/-290	400/-290	380	1400	3840
AUTOBRAKE 3	9050	120/-120	390	-450/1670	220/-120	310/-260	430	1110	3550
AUTOBRAKE 2	9860	120/-130	350	-500/1660	170/-170	330/-290	460	470	2760
AUTOBRAKE 1	10780	140/-160	420	-570/1920	320/-350	450/-320	410	1100	2080

Poor Reported Braking Action

MAX MANUAL	10760	150/-160	440	-660/2470	810/-540	490/-320	380	2630	7950
AUTOBRAKE MAX	10790	150/-160	450	-670/2470	830/-550	500/-330	390	2640	7980
AUTOBRAKE 4	10790	150/-160	450	-670/2470	830/-560	500/-330	380	2640	7980
AUTOBRAKE 3	10830	150/-150	440	-670/2480	810/-490	480/-330	430	2600	7940
AUTOBRAKE 2	11160	150/-160	440	-680/2510	740/-490	470/-340	460	2300	7630
AUTOBRAKE 1	11580	160/-170	500	-700/2580	790/-580	520/-350	410	2360	7250

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 4 engines at maximum reverse thrust.

Max Manual assumes maximum achievable manual braking.

All reference distances and adjustments are increased by 15%.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Max Manual and autobrake data valid for auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 160 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 130 ft.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****AIR/GND SYSTEM (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5650	60/-70	180	-260/870	120/-100	170/-150	290	0	360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7590	110/-110	350	-440/1590	310/-250	320/-260	430	0	1360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8290	110/-120	360	-460/1660	390/-310	330/-270	430	0	1620
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	8840	110/-120	370	-490/1740	480/-370	350/-280	430	0	1990
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	10360	160/-160	520	-640/2350	730/-540	490/-360	490	0	3850
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	13660	190/-190	610	-890/3320	1740/-1120	640/-430	490	0	8250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****AIR/GND SYSTEM (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5440	60/-60	180	-260/850	110/-100	160/-150	280	0	320
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7240	110/-110	340	-430/1560	290/-230	300/-250	420	0	1150
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	7940	110/-110	350	-450/1630	370/-300	310/-260	420	0	1390
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	8490	120/-110	360	-470/1710	460/-360	320/-260	420	0	1730
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	9900	160/-150	510	-630/2310	700/-510	460/-350	480	0	3240
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	13230	190/-180	590	-880/3310	1730/-1110	600/-420	480	0	7270
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Airspeed Unreliable (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4910	70/-50	150	-210/700	60/-60	140/-130	N/A	160	360
AUTOBRAKE MAX	5840	60/-70	170	-250/820	10/0	160/-160	N/A	0	0
AUTOBRAKE 2	9260	110/-130	330	-450/1480	90/-180	330/-280	N/A	230	230

Good Reported Braking Action

MAX MANUAL	6450	90/-90	270	-340/1200	150/-130	260/-210	N/A	570	1430
AUTOBRAKE MAX	6500	90/-90	280	-330/1200	160/-110	260/-210	N/A	550	1390
AUTOBRAKE 2	9280	110/-130	330	-450/1490	110/-190	330/-280	N/A	240	240

Good To Medium Reported Braking Action

MAX MANUAL	6870	90/-90	280	-360/1260	190/-160	270/-210	N/A	670	1680
AUTOBRAKE MAX	6910	90/-90	280	-350/1260	200/-150	270/-210	N/A	660	1650
AUTOBRAKE 2	9280	110/-130	330	-450/1490	110/-190	330/-280	N/A	240	240

Medium Reported Braking Action

MAX MANUAL	7210	90/-90	290	-370/1320	220/-190	280/-220	N/A	800	2030
AUTOBRAKE MAX	7240	90/-90	290	-370/1320	230/-170	280/-220	N/A	780	2000
AUTOBRAKE 3	8470	90/-110	280	-410/1390	80/-90	260/-260	N/A	120	970

Medium To Poor Reported Braking Action

MAX MANUAL	8250	120/-120	370	-460/1640	320/-260	370/-270	N/A	1360	3950
AUTOBRAKE MAX	8290	120/-120	380	-460/1640	330/-270	380/-270	N/A	1360	3970
AUTOBRAKE 3	8620	110/-110	360	-410/1500	180/-120	290/-250	N/A	1060	3670

Poor Reported Braking Action

MAX MANUAL	10020	140/-140	410	-590/2190	640/-490	460/-300	N/A	2430	7760
AUTOBRAKE MAX	10060	140/-140	420	-590/2190	660/-500	460/-300	N/A	2440	7780
AUTOBRAKE 3	10180	140/-140	410	-600/2210	590/-430	440/-310	N/A	2350	7700

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID / ANTISKID OFF (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7600	90/-100	280	-410/1430	310/-250	280/-210	350	910	2430
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	8220	120/-120	360	-480/1740	380/-300	350/-250	320	1250	3610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	9110	130/-130	390	-550/2030	590/-420	390/-270	340	1780	5480
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	9580	130/-140	420	-590/2200	720/-490	420/-280	340	2140	6950
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	9930	150/-150	470	-630/2380	770/-520	470/-310	330	2410	8130
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	11490	170/-170	520	-810/3240	1400/-840	570/-350	360	4200	20000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID / ANTISKID OFF (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7370	90/-90	270	-410/1430	310/-250	270/-210	290	820	2160
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7950	120/-110	350	-470/1730	380/-300	330/-250	330	1120	3130
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8850	130/-120	380	-540/2030	590/-420	380/-260	330	1640	4890
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	9340	130/-130	410	-590/2200	740/-490	400/-280	330	1980	6220
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	9660	150/-140	460	-630/2390	780/-520	450/-300	350	2210	7140
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	11280	170/-170	510	-810/3270	1450/-860	550/-340	350	3990	20000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****BLD DUCT LEAK L / BLD DUCT LEAK R (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4620	70/-50	130	-210/690	60/-50	120/-120	210	90	200
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8500	100/-120	280	-430/1430	10/-70	260/-260	440	20	20

Good Reported Braking Action

MAX MANUAL	6100	80/-80	250	-340/1200	150/-130	230/-200	310	390	960
AUTOBRAKE MAX	6110	90/-80	260	-330/1200	160/-110	230/-200	310	380	940
AUTOBRAKE 2	8510	100/-120	300	-430/1460	60/-80	270/-260	440	20	20

Good To Medium Reported Braking Action

MAX MANUAL	6520	80/-90	260	-350/1250	180/-160	240/-200	310	490	1200
AUTOBRAKE MAX	6520	80/-90	260	-350/1260	200/-150	240/-200	310	490	1200
AUTOBRAKE 2	8510	100/-120	300	-430/1460	60/-80	270/-260	440	20	20

Medium Reported Braking Action

MAX MANUAL	6860	90/-90	270	-370/1310	220/-180	250/-200	300	610	1550
AUTOBRAKE MAX	6860	90/-90	270	-360/1310	230/-180	250/-210	310	610	1550
AUTOBRAKE 3	7700	90/-100	270	-400/1380	110/-90	240/-240	420	120	880

Medium To Poor Reported Braking Action

MAX MANUAL	7930	110/-110	350	-460/1630	320/-260	340/-250	340	1100	3150
AUTOBRAKE MAX	7960	110/-120	360	-460/1630	330/-270	340/-250	340	1110	3180
AUTOBRAKE 3	8190	110/-100	340	-410/1480	220/-140	280/-230	370	880	2950

Poor Reported Braking Action

MAX MANUAL	9700	130/-140	390	-590/2180	640/-490	430/-290	340	2170	6970
AUTOBRAKE MAX	9740	130/-140	390	-590/2190	660/-500	430/-290	340	2180	7000
AUTOBRAKE 3	9750	130/-130	390	-590/2190	650/-450	430/-290	370	2170	6990

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

BLD DUCT LEAK L / BLD DUCT LEAK R (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4460	70/-50	130	-210/680	60/-50	120/-120	200	80	180
AUTOBRAKE MAX	5110	60/-60	150	-240/780	0/0	140/-140	260	0	0
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-50	250/-250	450	0	0

Good Reported Braking Action

MAX MANUAL	5860	90/-80	250	-330/1180	140/-120	220/-190	300	340	810
AUTOBRAKE MAX	5860	90/-80	250	-320/1180	150/-100	220/-190	310	330	800
AUTOBRAKE 2	8160	100/-110	290	-420/1420	40/-60	250/-250	450	0	0

Good To Medium Reported Braking Action

MAX MANUAL	6280	90/-80	250	-350/1230	180/-150	230/-190	300	430	1050
AUTOBRAKE MAX	6280	90/-80	260	-340/1240	190/-140	230/-190	310	430	1040
AUTOBRAKE 2	8160	100/-110	290	-420/1420	40/-60	250/-250	450	0	0

Medium Reported Braking Action

MAX MANUAL	6630	90/-80	260	-360/1290	210/-180	240/-190	300	550	1380
AUTOBRAKE MAX	6630	90/-80	270	-350/1290	230/-160	240/-190	310	550	1370
AUTOBRAKE 3	7360	90/-90	260	-390/1350	110/-70	230/-230	410	120	800

Medium To Poor Reported Braking Action

MAX MANUAL	7650	110/-110	340	-450/1620	310/-250	320/-250	340	970	2700
AUTOBRAKE MAX	7680	120/-110	350	-450/1620	330/-270	330/-250	340	980	2710
AUTOBRAKE 3	7870	110/-100	340	-420/1490	240/-130	270/-230	360	790	2530

Poor Reported Braking Action

MAX MANUAL	9470	130/-130	380	-590/2190	650/-490	410/-280	340	2010	6260
AUTOBRAKE MAX	9490	130/-130	380	-590/2190	670/-510	410/-280	340	2020	6270
AUTOBRAKE 3	9490	140/-130	380	-590/2190	660/-470	410/-280	360	2020	6280

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG 1, 2, 3, 4 SHUTDOWN (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4610	80/-50	140	-210/700	60/-60	130/-120	210	0	170
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8520	100/-110	280	-430/1430	0/-20	260/-260	480	0	0

Good Reported Braking Action

MAX MANUAL	6260	90/-90	270	-360/1310	180/-150	240/-210	340	0	680
AUTOBRAKE MAX	6280	90/-90	270	-350/1310	190/-130	240/-210	350	0	660
AUTOBRAKE 2	8520	100/-110	290	-430/1440	30/-20	260/-260	480	0	0

Good To Medium Reported Braking Action

MAX MANUAL	6770	90/-90	280	-380/1360	230/-190	250/-220	340	0	830
AUTOBRAKE MAX	6770	90/-90	280	-370/1350	240/-170	250/-210	350	0	810
AUTOBRAKE 2	8520	100/-110	290	-430/1440	30/-20	260/-260	480	0	0

Medium Reported Braking Action

MAX MANUAL	7220	90/-100	280	-390/1410	280/-230	260/-220	340	0	1040
AUTOBRAKE MAX	7220	90/-100	290	-390/1410	290/-210	260/-220	350	0	1020
AUTOBRAKE 3	7710	90/-100	270	-400/1380	150/-80	240/-230	420	0	730

Medium To Poor Reported Braking Action

MAX MANUAL	8630	130/-130	410	-540/1950	460/-360	380/-300	400	0	2160
AUTOBRAKE MAX	8660	130/-130	410	-540/1950	480/-380	390/-310	400	0	2180
AUTOBRAKE 3	8680	130/-130	410	-540/1950	480/-350	390/-310	420	0	2180

Poor Reported Braking Action

MAX MANUAL	11310	150/-160	450	-710/2630	1070/-760	480/-350	400	0	4650
AUTOBRAKE MAX	11340	150/-160	460	-720/2630	1090/-780	490/-350	400	0	4660
AUTOBRAKE 3	11360	150/-160	460	-720/2640	1080/-750	490/-350	420	0	4660

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG 1, 2, 3, 4 SHUTDOWN (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4460	80/-50	130	-210/690	60/-60	120/-120	210	0	150
AUTOBRAKE MAX	5110	60/-60	150	-240/780	0/0	140/-140	260	0	0
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-20	250/-250	460	0	0

Good Reported Braking Action

MAX MANUAL	5980	90/-90	260	-350/1280	170/-140	230/-200	330	0	580
AUTOBRAKE MAX	6000	90/-80	270	-340/1270	170/-120	230/-200	340	0	560
AUTOBRAKE 2	8150	100/-110	280	-420/1410	20/-20	250/-250	460	0	0

Good To Medium Reported Braking Action

MAX MANUAL	6490	90/-90	270	-370/1320	220/-180	240/-210	330	0	720
AUTOBRAKE MAX	6500	90/-90	270	-360/1310	220/-160	230/-200	340	0	700
AUTOBRAKE 2	8150	100/-110	280	-420/1410	20/-20	250/-250	460	0	0

Medium Reported Braking Action

MAX MANUAL	6940	90/-90	280	-380/1380	270/-220	250/-210	330	0	920
AUTOBRAKE MAX	6950	90/-90	280	-380/1370	270/-200	240/-210	340	0	900
AUTOBRAKE 3	7390	90/-100	260	-400/1360	160/-80	230/-220	410	0	640

Medium To Poor Reported Braking Action

MAX MANUAL	8250	130/-130	390	-530/1920	440/-340	360/-290	400	0	1830
AUTOBRAKE MAX	8270	130/-130	400	-530/1920	460/-360	360/-290	400	0	1840
AUTOBRAKE 3	8290	130/-130	400	-530/1920	450/-330	360/-290	420	0	1850

Poor Reported Braking Action

MAX MANUAL	10940	150/-150	440	-710/2610	1050/-740	460/-340	400	0	4110
AUTOBRAKE MAX	10960	150/-150	440	-710/2610	1070/-760	460/-340	400	0	4120
AUTOBRAKE 3	10980	160/-150	440	-710/2620	1050/-740	460/-340	420	0	4130

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS CONTROL (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4510	70/-50	130	-210/680	60/-50	130/-120	200	140	310
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8430	100/-120	290	-430/1420	40/-110	280/-250	410	90	90

Good Reported Braking Action

MAX MANUAL	5860	80/-80	250	-320/1160	140/-120	230/-190	300	480	1200
AUTOBRAKE MAX	5900	80/-80	250	-310/1160	140/-100	230/-190	300	460	1150
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Good To Medium Reported Braking Action

MAX MANUAL	6280	80/-90	250	-340/1210	170/-150	240/-190	300	580	1440
AUTOBRAKE MAX	6310	80/-90	260	-340/1210	180/-140	240/-190	300	570	1410
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Medium Reported Braking Action

MAX MANUAL	6620	90/-90	260	-350/1270	210/-170	250/-200	290	710	1800
AUTOBRAKE MAX	6640	90/-90	260	-350/1270	220/-170	250/-200	300	690	1760
AUTOBRAKE 3	7630	90/-100	260	-390/1330	80/-50	230/-230	420	120	950

Medium To Poor Reported Braking Action

MAX MANUAL	7580	110/-110	350	-440/1590	300/-240	340/-250	330	1210	3500
AUTOBRAKE MAX	7620	110/-110	350	-440/1600	310/-250	340/-250	340	1220	3530
AUTOBRAKE 3	7870	110/-100	340	-390/1450	190/-110	270/-230	380	970	3280

Poor Reported Braking Action

MAX MANUAL	9360	130/-140	390	-580/2150	620/-470	430/-280	330	2290	7320
AUTOBRAKE MAX	9390	130/-140	390	-580/2150	640/-480	430/-280	340	2290	7340
AUTOBRAKE 3	9420	130/-130	390	-580/2150	620/-430	420/-290	380	2260	7310

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS DRIVE (Flaps 25)

VREF30 + 25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO NO REV REV

Dry Runway

MAX MANUAL	5460	80/-60	170	-220/730	70/-60	160/-140	220	210	460
AUTOBRAKE MAX	6610	60/-70	200	-270/870	10/-20	180/-180	300	0	0
AUTOBRAKE 2	10290	120/-130	380	-470/1550	160/-230	380/-310	380	430	430

Good Reported Braking Action

MAX MANUAL	7270	100/-90	320	-360/1270	180/-160	300/-240	320	730	1880
AUTOBRAKE MAX	7380	100/-90	320	-360/1270	190/-150	300/-240	320	720	1880
AUTOBRAKE 2	10310	120/-130	380	-470/1560	170/-230	380/-310	370	430	430

Good To Medium Reported Braking Action

MAX MANUAL	7690	100/-100	320	-380/1330	220/-180	310/-240	320	830	2140
AUTOBRAKE MAX	7790	100/-100	330	-380/1330	230/-180	310/-240	320	830	2140
AUTOBRAKE 2	10310	120/-130	380	-470/1560	170/-230	380/-310	370	430	430

Medium Reported Braking Action

MAX MANUAL	8030	100/-100	330	-400/1380	250/-210	320/-240	320	960	2500
AUTOBRAKE MAX	8130	100/-100	340	-400/1390	260/-210	320/-250	320	960	2510
AUTOBRAKE 3	9530	100/-110	330	-430/1450	100/-130	300/-290	410	160	1310

Medium To Poor Reported Braking Action

MAX MANUAL	9170	130/-130	430	-480/1710	360/-290	430/-300	340	1640	4860
AUTOBRAKE MAX	9260	130/-130	430	-480/1720	370/-310	430/-300	340	1650	4920
AUTOBRAKE 3	9610	130/-110	420	-430/1610	230/-140	350/-280	400	1340	4620

Poor Reported Braking Action

MAX MANUAL	10970	150/-150	460	-620/2260	690/-530	510/-330	340	2750	8870
AUTOBRAKE MAX	11050	150/-150	470	-620/2270	700/-540	520/-340	340	2760	8930
AUTOBRAKE 3	11230	150/-150	460	-620/2290	640/-480	500/-340	400	2620	8810

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****Flaps Up Landing (Flaps Up)****VREF30 + 70**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7250	120/-80	230	-260/840	90/-80	220/-190	230	310	710
AUTOBRAKE MAX	9290	90/-80	280	-320/1020	10/-10	260/-260	340	30	90
AUTOBRAKE 2	14160	160/-170	550	-550/1780	300/-310	590/-430	390	1510	1640

Good Reported Braking Action

MAX MANUAL	9850	120/-120	430	-420/1450	220/-200	420/-330	310	1120	2910
AUTOBRAKE MAX	10000	120/-110	430	-410/1440	200/-170	430/-330	330	1130	2930
AUTOBRAKE 2	14160	160/-170	550	-550/1780	310/-310	590/-430	390	1510	1640

Good To Medium Reported Braking Action

MAX MANUAL	10280	120/-120	440	-440/1500	260/-230	430/-330	310	1220	3160
AUTOBRAKE MAX	10410	120/-120	440	-440/1500	250/-210	440/-330	330	1240	3190
AUTOBRAKE 2	14160	160/-170	550	-550/1780	310/-310	590/-430	390	1510	1640

Medium Reported Braking Action

MAX MANUAL	10620	120/-120	450	-450/1560	290/-250	450/-340	310	1350	3520
AUTOBRAKE MAX	10750	120/-120	450	-450/1550	280/-240	450/-340	330	1370	3550
AUTOBRAKE 3	13370	130/-150	490	-500/1670	220/-250	490/-400	390	600	1200

Medium To Poor Reported Braking Action

MAX MANUAL	12460	160/-160	580	-550/1920	450/-380	600/-400	340	2490	7620
AUTOBRAKE MAX	12490	160/-160	580	-550/1920	470/-390	600/-410	340	2490	7610
AUTOBRAKE 3	13460	160/-160	580	-510/1830	310/-280	550/-410	380	1730	6820

Poor Reported Braking Action

MAX MANUAL	14350	180/-180	610	-680/2450	790/-620	690/-440	340	3690	12060
AUTOBRAKE MAX	14390	180/-180	610	-680/2460	810/-630	700/-440	340	3690	12050
AUTOBRAKE 3	15130	180/-190	620	-700/2510	780/-630	700/-470	380	3150	11470

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLARE ASSIST (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4510	70/-50	130	-210/680	60/-50	130/-120	200	140	310
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8430	100/-120	290	-430/1420	40/-110	280/-250	410	90	90

Good Reported Braking Action

MAX MANUAL	5860	80/-80	250	-320/1160	140/-120	230/-190	300	480	1200
AUTOBRAKE MAX	5900	80/-80	250	-310/1160	140/-100	230/-190	300	460	1150
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Good To Medium Reported Braking Action

MAX MANUAL	6280	80/-90	250	-340/1210	170/-150	240/-190	300	580	1440
AUTOBRAKE MAX	6310	80/-90	260	-340/1210	180/-140	240/-190	300	570	1410
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Medium Reported Braking Action

MAX MANUAL	6620	90/-90	260	-350/1270	210/-170	250/-200	290	710	1800
AUTOBRAKE MAX	6640	90/-90	260	-350/1270	220/-170	250/-200	300	690	1760
AUTOBRAKE 3	7630	90/-100	260	-390/1330	80/-50	230/-230	420	120	950

Medium To Poor Reported Braking Action

MAX MANUAL	7580	110/-110	350	-440/1590	300/-240	340/-250	330	1210	3500
AUTOBRAKE MAX	7620	110/-110	350	-440/1600	310/-250	340/-250	340	1220	3530
AUTOBRAKE 3	7870	110/-100	340	-390/1450	190/-110	270/-230	380	970	3280

Poor Reported Braking Action

MAX MANUAL	9360	130/-140	390	-580/2150	620/-470	430/-280	330	2290	7320
AUTOBRAKE MAX	9390	130/-140	390	-580/2150	640/-480	430/-280	340	2290	7340
AUTOBRAKE 3	9420	130/-130	390	-580/2150	620/-430	420/-290	380	2260	7310

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4890	90/-70	150	-230/760	80/-70	140/-130	210	210	480
AUTOBRAKE MAX	5340	80/-70	160	-250/810	20/-10	140/-140	270	40	320
AUTOBRAKE 2	8450	100/-120	290	-430/1430	30/-90	280/-250	420	70	70

Good Reported Braking Action

MAX MANUAL	5950	90/-90	250	-330/1170	140/-120	230/-190	300	500	1240
AUTOBRAKE MAX	5970	90/-90	250	-320/1170	150/-120	230/-190	310	480	1210
AUTOBRAKE 2	8470	100/-120	290	-430/1450	70/-100	280/-260	420	70	70

Good To Medium Reported Braking Action

MAX MANUAL	6320	80/-90	250	-340/1220	170/-150	240/-190	300	590	1480
AUTOBRAKE MAX	6340	80/-90	260	-340/1220	180/-150	240/-200	310	580	1450
AUTOBRAKE 2	8470	100/-120	290	-430/1450	70/-100	280/-260	420	70	70

Medium Reported Braking Action

MAX MANUAL	6650	90/-90	260	-360/1280	210/-180	250/-200	300	720	1840
AUTOBRAKE MAX	6680	90/-90	270	-360/1280	220/-170	260/-200	310	710	1810
AUTOBRAKE 3	7650	90/-100	260	-390/1330	80/-50	230/-230	420	120	1010

Medium To Poor Reported Braking Action

MAX MANUAL	7640	110/-110	350	-450/1600	300/-250	350/-250	340	1240	3610
AUTOBRAKE MAX	7680	120/-120	350	-450/1610	320/-260	350/-250	340	1250	3650
AUTOBRAKE 3	7910	110/-100	340	-400/1460	210/-110	280/-230	370	1020	3410

Poor Reported Braking Action

MAX MANUAL	9440	130/-140	390	-580/2160	630/-480	430/-280	340	2350	7570
AUTOBRAKE MAX	9470	130/-140	400	-580/2160	650/-490	440/-290	340	2360	7610
AUTOBRAKE 3	9500	130/-140	390	-580/2160	630/-440	430/-290	370	2330	7580

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4720	90/-70	150	-230/750	70/-70	140/-120	210	190	420
AUTOBRAKE MAX	5140	80/-60	160	-240/800	20/-10	140/-140	270	40	290
AUTOBRAKE 2	8120	100/-110	280	-420/1400	10/-80	250/-240	420	30	30

Good Reported Braking Action

MAX MANUAL	5730	90/-80	240	-320/1150	140/-120	220/-180	300	440	1080
AUTOBRAKE MAX	5750	90/-80	250	-320/1160	150/-110	220/-180	300	430	1040
AUTOBRAKE 2	8140	100/-110	290	-420/1420	50/-90	260/-250	430	30	30

Good To Medium Reported Braking Action

MAX MANUAL	6100	90/-80	250	-340/1200	170/-150	230/-190	300	530	1300
AUTOBRAKE MAX	6120	90/-80	250	-330/1210	180/-140	230/-190	300	520	1270
AUTOBRAKE 2	8140	100/-110	290	-420/1420	50/-90	260/-250	430	30	30

Medium Reported Braking Action

MAX MANUAL	6450	90/-80	260	-350/1260	210/-170	240/-190	300	650	1640
AUTOBRAKE MAX	6460	90/-90	260	-350/1260	220/-170	240/-190	300	640	1610
AUTOBRAKE 3	7320	90/-90	250	-380/1310	80/-50	220/-220	410	130	920

Medium To Poor Reported Braking Action

MAX MANUAL	7380	120/-110	340	-440/1600	300/-240	330/-240	340	1110	3120
AUTOBRAKE MAX	7410	120/-110	350	-440/1600	310/-250	330/-240	340	1120	3140
AUTOBRAKE 3	7590	110/-100	340	-400/1480	230/-110	270/-220	370	940	2960

Poor Reported Braking Action

MAX MANUAL	9230	140/-130	380	-580/2160	640/-480	420/-280	340	2050	6810
AUTOBRAKE MAX	9260	140/-130	390	-580/2170	660/-490	420/-280	340	2060	6840
AUTOBRAKE 3	9260	140/-130	390	-580/2170	660/-450	420/-280	370	2050	6830

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5910	110/-100	190	-290/980	130/-120	190/-160	250	420	1000
AUTOBRAKE MAX	5970	110/-90	200	-290/980	130/-110	190/-160	270	420	1020
AUTOBRAKE 2	8480	100/-120	280	-430/1430	20/-80	270/-260	430	30	30

Good Reported Braking Action

MAX MANUAL	6360	110/-100	260	-350/1230	170/-140	240/-200	310	550	1370
AUTOBRAKE MAX	6360	110/-100	260	-350/1230	190/-150	250/-200	320	550	1370
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Good To Medium Reported Braking Action

MAX MANUAL	6470	100/-90	260	-350/1240	180/-150	240/-200	310	590	1470
AUTOBRAKE MAX	6470	100/-90	260	-350/1240	200/-160	250/-200	320	590	1470
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Medium Reported Braking Action

MAX MANUAL	6810	90/-90	270	-360/1290	210/-180	260/-200	310	720	1840
AUTOBRAKE MAX	6810	90/-90	270	-360/1300	230/-190	260/-200	320	720	1840
AUTOBRAKE 3	7710	90/-100	260	-400/1350	100/-70	230/-230	430	130	1050

Medium To Poor Reported Braking Action

MAX MANUAL	7810	120/-120	350	-450/1630	310/-250	350/-250	350	1260	3680
AUTOBRAKE MAX	7870	120/-120	360	-460/1630	330/-270	360/-260	350	1270	3740
AUTOBRAKE 3	8080	110/-100	350	-400/1500	230/-130	290/-230	380	1070	3530

Poor Reported Braking Action

MAX MANUAL	9630	140/-140	400	-590/2180	640/-490	440/-290	350	2380	7760
AUTOBRAKE MAX	9680	140/-140	400	-590/2190	670/-510	450/-290	350	2400	7820
AUTOBRAKE 3	9700	140/-140	400	-590/2190	650/-460	440/-290	380	2380	7800

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5700	110/-90	190	-290/960	130/-110	180/-150	240	370	880
AUTOBRAKE MAX	5760	110/-90	190	-290/970	130/-110	180/-160	260	380	900
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-60	250/-250	440	10	10

Good Reported Braking Action

MAX MANUAL	6130	110/-90	250	-340/1210	160/-140	230/-190	300	490	1200
AUTOBRAKE MAX	6130	110/-90	260	-340/1220	180/-140	230/-190	310	490	1200
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Good To Medium Reported Braking Action

MAX MANUAL	6250	110/-80	250	-340/1220	170/-150	230/-190	300	530	1300
AUTOBRAKE MAX	6250	110/-80	260	-340/1230	190/-150	240/-190	310	530	1300
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Medium Reported Braking Action

MAX MANUAL	6600	90/-90	260	-360/1280	210/-170	240/-190	300	650	1640
AUTOBRAKE MAX	6600	90/-90	270	-360/1280	230/-180	250/-200	310	650	1640
AUTOBRAKE 3	7380	90/-90	260	-390/1330	100/-70	220/-220	420	130	970

Medium To Poor Reported Braking Action

MAX MANUAL	7550	120/-110	350	-450/1620	300/-250	330/-240	350	1120	3170
AUTOBRAKE MAX	7600	120/-110	360	-450/1630	330/-270	340/-250	350	1140	3220
AUTOBRAKE 3	7760	120/-100	350	-400/1510	250/-130	290/-230	370	980	3060

Poor Reported Braking Action

MAX MANUAL	9410	140/-130	390	-590/2190	650/-490	420/-280	350	2210	6980
AUTOBRAKE MAX	9460	140/-140	390	-590/2190	680/-510	430/-280	350	2230	7020
AUTOBRAKE 3	9460	140/-130	390	-590/2190	680/-480	430/-290	370	2230	7020

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****GEAR DISAGREE - Nose and Body Gear Up (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5910	110/-100	190	-290/980	130/-120	190/-160	250	420	1000
AUTOBRAKE MAX	5970	110/-90	200	-290/980	130/-110	190/-160	270	420	1020
AUTOBRAKE 2	8480	100/-120	280	-430/1430	20/-80	270/-260	430	30	30

Good Reported Braking Action

MAX MANUAL	6360	110/-100	260	-350/1230	170/-140	240/-200	310	550	1370
AUTOBRAKE MAX	6360	110/-100	260	-350/1230	190/-150	250/-200	320	550	1370
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Good To Medium Reported Braking Action

MAX MANUAL	6470	100/-90	260	-350/1240	180/-150	240/-200	310	590	1470
AUTOBRAKE MAX	6470	100/-90	260	-350/1240	200/-160	250/-200	320	590	1470
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Medium Reported Braking Action

MAX MANUAL	6810	90/-90	270	-360/1290	210/-180	260/-200	310	720	1840
AUTOBRAKE MAX	6810	90/-90	270	-360/1300	230/-190	260/-200	320	720	1840
AUTOBRAKE 3	7710	90/-100	260	-400/1350	100/-70	230/-230	430	130	1050

Medium To Poor Reported Braking Action

MAX MANUAL	7810	120/-120	350	-450/1630	310/-250	350/-250	350	1260	3680
AUTOBRAKE MAX	7870	120/-120	360	-460/1630	330/-270	360/-260	350	1270	3740
AUTOBRAKE 3	8080	110/-100	350	-400/1500	230/-130	290/-230	380	1070	3530

Poor Reported Braking Action

MAX MANUAL	9630	140/-140	400	-590/2180	640/-490	440/-290	350	2380	7760
AUTOBRAKE MAX	9680	140/-140	400	-590/2190	670/-510	450/-290	350	2400	7820
AUTOBRAKE 3	9700	140/-140	400	-590/2190	650/-460	440/-290	380	2380	7800

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Nose and Body Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5700	110/-90	190	-290/960	130/-110	180/-150	240	370	880
AUTOBRAKE MAX	5760	110/-90	190	-290/970	130/-110	180/-160	260	380	900
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-60	250/-250	440	10	10

Good Reported Braking Action

MAX MANUAL	6130	110/-90	250	-340/1210	160/-140	230/-190	300	490	1200
AUTOBRAKE MAX	6130	110/-90	260	-340/1220	180/-140	230/-190	310	490	1200
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Good To Medium Reported Braking Action

MAX MANUAL	6250	110/-80	250	-340/1220	170/-150	230/-190	300	530	1300
AUTOBRAKE MAX	6250	110/-80	260	-340/1230	190/-150	240/-190	310	530	1300
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Medium Reported Braking Action

MAX MANUAL	6600	90/-90	260	-360/1280	210/-170	240/-190	300	650	1640
AUTOBRAKE MAX	6600	90/-90	270	-360/1280	230/-180	250/-200	310	650	1640
AUTOBRAKE 3	7380	90/-90	260	-390/1330	100/-70	220/-220	420	130	970

Medium To Poor Reported Braking Action

MAX MANUAL	7550	120/-110	350	-450/1620	300/-250	330/-240	350	1120	3170
AUTOBRAKE MAX	7600	120/-110	360	-450/1630	330/-270	340/-250	350	1140	3220
AUTOBRAKE 3	7760	120/-100	350	-400/1510	250/-130	290/-230	370	980	3060

Poor Reported Braking Action

MAX MANUAL	9410	140/-130	390	-590/2190	650/-490	420/-280	350	2210	6980
AUTOBRAKE MAX	9460	140/-140	390	-590/2190	680/-510	430/-280	350	2230	7020
AUTOBRAKE 3	9460	140/-130	390	-590/2190	680/-480	430/-290	370	2230	7020

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRES SYS 1+4 (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7030	70/-70	230	-300/980	170/-150	210/-190	350	0	500
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	9590	140/-130	460	-510/1810	440/-350	410/-330	480	0	2000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	10320	140/-130	470	-540/1890	540/-420	420/-340	480	0	2290
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	10890	140/-140	480	-560/1970	630/-480	440/-350	480	0	2700
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	12640	190/-180	640	-710/2580	940/-680	600/-440	510	0	5120
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	16050	210/-210	720	-970/3610	2040/-1310	750/-500	510	0	10030
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRES SYS 2+3 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	6040	70/-60	200	-250/820	120/-100	180/-170	310	0	380
AUTOBRAKE MAX	6280	70/-70	200	-260/850	60/-30	180/-170	320	0	300
AUTOBRAKE 2	10110	110/-120	350	-470/1550	0/0	310/-310	530	0	0

Good Reported Braking Action

MAX MANUAL	8510	120/-110	410	-450/1590	340/-280	360/-300	450	0	1650
AUTOBRAKE MAX	8520	120/-110	410	-450/1590	360/-290	370/-300	460	0	1650
AUTOBRAKE 2	10240	120/-120	380	-490/1620	120/-40	330/-320	530	0	790

Good To Medium Reported Braking Action

MAX MANUAL	9060	120/-120	410	-460/1630	390/-320	370/-300	450	0	1820
AUTOBRAKE MAX	9060	120/-120	420	-470/1640	420/-340	370/-300	460	0	1820
AUTOBRAKE 2	10240	120/-120	380	-490/1620	120/-40	330/-320	530	0	790

Medium Reported Braking Action

MAX MANUAL	9560	120/-120	420	-480/1690	460/-370	380/-310	450	0	2110
AUTOBRAKE MAX	9560	120/-120	430	-480/1690	480/-390	390/-310	460	0	2110
AUTOBRAKE 3	9580	120/-120	430	-480/1680	480/-240	380/-300	460	0	2120

Medium To Poor Reported Braking Action

MAX MANUAL	11410	170/-160	580	-640/2300	750/-560	550/-400	490	0	4390
AUTOBRAKE MAX	11460	170/-160	590	-640/2300	780/-590	550/-410	490	0	4420
AUTOBRAKE 3	11460	170/-160	590	-640/2300	780/-590	550/-410	490	0	4420

Poor Reported Braking Action

MAX MANUAL	14470	190/-190	640	-840/3050	1500/-1050	670/-460	490	0	7860
AUTOBRAKE MAX	14520	190/-190	640	-840/3050	1530/-1070	670/-460	490	0	7890
AUTOBRAKE 3	14520	190/-190	640	-840/3050	1530/-1070	670/-460	490	0	7890

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS 1 / HYD PRESS SYS 2 / HYD PRESS SYS 3 (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4860	70/-60	150	-220/730	80/-70	140/-130	240	0	210
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	60
AUTOBRAKE 2	8520	100/-110	280	-430/1430	0/0	260/-260	490	0	0

Good Reported Braking Action

MAX MANUAL	6700	100/-100	300	-390/1400	220/-190	270/-230	380	0	900
AUTOBRAKE MAX	6700	100/-100	310	-390/1400	240/-190	270/-230	390	0	890
AUTOBRAKE 2	8560	100/-120	290	-440/1460	40/-20	260/-260	490	0	120

Good To Medium Reported Braking Action

MAX MANUAL	7230	100/-100	310	-400/1440	270/-230	280/-230	380	0	1060
AUTOBRAKE MAX	7230	100/-100	320	-400/1440	290/-230	280/-240	390	0	1050
AUTOBRAKE 2	8560	100/-120	290	-440/1460	40/-20	260/-260	490	0	120

Medium Reported Braking Action

MAX MANUAL	7710	100/-100	320	-420/1500	340/-270	290/-240	380	0	1310
AUTOBRAKE MAX	7710	100/-100	320	-420/1500	350/-280	290/-240	390	0	1310
AUTOBRAKE 3	7870	100/-100	310	-420/1470	280/-130	280/-250	420	0	1250

Medium To Poor Reported Braking Action

MAX MANUAL	9280	140/-140	460	-570/2090	560/-420	430/-330	450	0	2820
AUTOBRAKE MAX	9320	140/-140	470	-580/2090	580/-450	430/-330	450	0	2840
AUTOBRAKE 3	9320	140/-140	470	-580/2090	580/-440	430/-330	450	0	2840

Poor Reported Braking Action

MAX MANUAL	12230	160/-170	520	-770/2840	1280/-890	540/-380	450	0	5900
AUTOBRAKE MAX	12270	160/-170	530	-770/2850	1300/-910	550/-390	450	0	5930
AUTOBRAKE 3	12270	160/-170	530	-770/2850	1300/-910	550/-390	450	0	5930

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 / HYD PRESS SYS 2 / HYD PRESS SYS 3 (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4690	70/-50	150	-220/720	70/-70	130/-120	240	0	190
AUTOBRAKE MAX	5110	60/-60	150	-240/780	10/0	140/-140	260	0	60
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/0	250/-250	480	0	0

Good Reported Braking Action

MAX MANUAL	6390	100/-90	290	-380/1360	210/-170	250/-220	370	0	760
AUTOBRAKE MAX	6390	100/-90	300	-380/1360	220/-180	250/-220	380	0	750
AUTOBRAKE 2	8180	100/-110	290	-430/1430	40/-10	250/-250	480	0	60

Good To Medium Reported Braking Action

MAX MANUAL	6930	100/-90	300	-390/1410	260/-210	260/-220	370	0	910
AUTOBRAKE MAX	6930	100/-90	310	-390/1410	280/-220	260/-230	380	0	900
AUTOBRAKE 2	8180	100/-110	290	-430/1430	40/-10	250/-250	480	0	60

Medium Reported Braking Action

MAX MANUAL	7410	100/-100	310	-410/1470	320/-260	270/-230	370	0	1150
AUTOBRAKE MAX	7410	100/-100	310	-410/1470	340/-270	270/-230	380	0	1140
AUTOBRAKE 3	7540	100/-100	310	-410/1450	290/-130	260/-230	410	0	1110

Medium To Poor Reported Braking Action

MAX MANUAL	8860	140/-130	450	-560/2050	530/-400	400/-320	440	0	2360
AUTOBRAKE MAX	8890	140/-130	450	-560/2050	550/-420	400/-320	440	0	2380
AUTOBRAKE 3	8890	140/-130	450	-560/2060	550/-420	400/-320	440	0	2380

Poor Reported Braking Action

MAX MANUAL	11820	160/-160	500	-760/2820	1260/-870	510/-370	440	0	5190
AUTOBRAKE MAX	11860	160/-160	510	-760/2820	1280/-890	520/-370	440	0	5200
AUTOBRAKE 3	11860	160/-160	510	-760/2820	1280/-880	520/-370	440	0	5200

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS 4 (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5900	60/-70	190	-280/910	140/-120	180/-160	310	0	440
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7920	120/-120	370	-460/1660	350/-280	340/-280	450	0	1610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8650	120/-120	380	-490/1740	440/-350	350/-280	450	0	1900
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	9220	120/-130	400	-510/1820	540/-410	370/-290	450	0	2310
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	10760	170/-170	550	-670/2440	810/-590	520/-380	510	0	4410
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	14170	190/-200	650	-920/3470	1930/-1220	670/-450	510	0	9350
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 4 (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5690	60/-70	190	-270/900	130/-110	170/-160	310	0	390
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7550	120/-110	360	-450/1630	330/-260	320/-260	440	0	1360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8290	120/-110	370	-470/1700	430/-330	330/-270	440	0	1630
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	8870	120/-120	390	-500/1790	520/-400	350/-280	440	0	2020
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	10290	170/-160	530	-650/2410	780/-560	490/-360	500	0	3700
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	13730	190/-190	620	-920/3460	1920/-1200	640/-430	500	0	8220
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS 1 and HYD PRESS SYS 2 / HYD PRESS SYS 1 and HYD PRESS SYS 3 (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	5920	80/-60	190	-250/820	110/-100	160/-160	280	0	0
AUTOBRAKE MAX	6270	80/-60	190	-260/850	100/-40	170/-170	310	0	0
AUTOBRAKE 2	10110	110/-120	350	-470/1550	0/-20	310/-310	530	0	0

Good Reported Braking Action

MAX MANUAL	9150	130/-120	450	-530/1910	450/-350	350/-350	510	0	0
AUTOBRAKE MAX	9160	130/-120	450	-530/1920	480/-370	360/-350	510	0	0
AUTOBRAKE 2	10310	130/-130	440	-510/1860	310/-120	350/-350	520	0	0

Good To Medium Reported Braking Action

MAX MANUAL	9840	120/-120	450	-540/1940	530/-410	360/-350	510	0	0
AUTOBRAKE MAX	9850	130/-120	460	-540/1940	560/-430	360/-360	510	0	0
AUTOBRAKE 2	10310	130/-130	440	-510/1860	380/-120	350/-350	520	0	0

Medium Reported Braking Action

MAX MANUAL	10580	130/-120	460	-560/1990	650/-490	360/-360	510	0	0
AUTOBRAKE MAX	10580	130/-120	470	-560/2000	680/-510	370/-360	510	0	0
AUTOBRAKE 3	10720	130/-120	460	-560/1990	640/-490	370/-360	520	0	0

Medium To Poor Reported Braking Action

MAX MANUAL	14130	190/-190	720	-890/3290	1470/-970	570/-560	620	0	0
AUTOBRAKE MAX	14190	200/-190	730	-890/3300	1510/-1000	570/-570	620	0	0
AUTOBRAKE 3	14190	200/-190	730	-890/3300	1510/-970	570/-570	640	0	0

Poor Reported Braking Action

MAX MANUAL	20140	200/-200	770	-1210/4360	3690/-2170	650/-650	620	0	0
AUTOBRAKE MAX	20200	200/-200	780	-1210/4370	3730/-2210	650/-660	620	0	0
AUTOBRAKE 3	20200	200/-200	780	-1210/4370	3730/-2170	650/-660	640	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 2 and HYD PRESS SYS 4 / HYD PRESS SYS 3 and HYD PRESS SYS 4 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	8400	80/-80	290	-360/1150	330/-270	240/-250	550	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	13230	180/-170	690	-770/2770	1300/-860	530/-520	860	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	14300	180/-170	700	-780/2790	1480/-980	530/-530	860	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	15370	180/-170	710	-800/2840	1760/-1140	540/-530	860	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	20350	270/-270	1120	-1290/4800	4030/-2080	840/-830	970	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	29570	270/-240	1250	-1790/6460	9500/-4410	970/-950	960	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****Jammed Stab Landing (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5330	80/-60	170	-220/730	70/-70	150/-140	230	210	470
AUTOBRAKE MAX	6260	60/-70	190	-260/850	10/-10	170/-170	310	0	10
AUTOBRAKE 2	9880	120/-130	360	-460/1530	100/-170	350/-300	430	230	230

Good Reported Braking Action

MAX MANUAL	7080	100/-90	310	-360/1270	180/-160	290/-230	320	730	1890
AUTOBRAKE MAX	7170	100/-90	320	-360/1270	190/-160	300/-230	330	720	1880
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Good To Medium Reported Braking Action

MAX MANUAL	7510	100/-100	320	-380/1320	220/-190	300/-230	320	830	2150
AUTOBRAKE MAX	7580	100/-100	320	-380/1330	230/-200	310/-240	330	830	2160
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Medium Reported Braking Action

MAX MANUAL	7850	100/-100	330	-390/1380	250/-210	320/-240	320	970	2540
AUTOBRAKE MAX	7920	100/-100	330	-400/1380	270/-220	320/-240	330	960	2540
AUTOBRAKE 3	9100	100/-110	310	-420/1430	80/-90	270/-270	440	160	1520

Medium To Poor Reported Braking Action

MAX MANUAL	8970	130/-130	420	-480/1710	360/-300	420/-290	350	1660	5000
AUTOBRAKE MAX	9040	130/-130	430	-480/1710	380/-310	430/-290	360	1670	5060
AUTOBRAKE 3	9270	130/-110	420	-430/1620	270/-140	360/-280	400	1440	4830

Poor Reported Braking Action

MAX MANUAL	10790	150/-150	460	-620/2260	700/-530	510/-330	350	2790	9190
AUTOBRAKE MAX	10860	150/-150	460	-620/2270	720/-550	520/-330	360	2810	9240
AUTOBRAKE 3	10950	150/-150	450	-620/2280	670/-490	490/-340	400	2720	9150

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

SPOILERS (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5040	60/-60	160	-230/740	80/-70	150/-130	270	230	540
AUTOBRAKE MAX	5340	60/-70	160	-240/790	20/-10	150/-140	280	90	340
AUTOBRAKE 2	8520	100/-120	280	-430/1430	0/-40	260/-260	470	0	0

Good Reported Braking Action

MAX MANUAL	6570	100/-100	290	-360/1260	200/-170	280/-210	370	780	2110
AUTOBRAKE MAX	6570	100/-100	300	-350/1260	210/-170	280/-220	380	770	2090
AUTOBRAKE 2	8630	100/-120	300	-440/1480	70/-70	260/-270	480	80	780

Good To Medium Reported Braking Action

MAX MANUAL	7010	100/-100	300	-370/1310	240/-200	290/-220	370	890	2400
AUTOBRAKE MAX	7010	100/-100	300	-370/1310	250/-210	290/-220	380	890	2390
AUTOBRAKE 2	8630	100/-120	300	-440/1480	70/-70	260/-270	480	80	820

Medium Reported Braking Action

MAX MANUAL	7370	100/-100	310	-390/1360	280/-230	300/-220	370	1050	2870
AUTOBRAKE MAX	7370	100/-100	310	-390/1370	290/-240	300/-220	380	1040	2860
AUTOBRAKE 3	7790	90/-100	280	-410/1410	180/-100	260/-240	440	610	2430

Medium To Poor Reported Braking Action

MAX MANUAL	8360	130/-130	400	-480/1710	390/-310	410/-270	400	1750	5750
AUTOBRAKE MAX	8400	130/-130	410	-480/1710	410/-330	410/-280	400	1770	5800
AUTOBRAKE 3	8410	130/-110	410	-440/1710	410/-220	410/-270	400	1760	5790

Poor Reported Braking Action

MAX MANUAL	10220	150/-150	450	-620/2270	740/-560	500/-310	400	3010	10720
AUTOBRAKE MAX	10260	150/-150	450	-620/2270	760/-580	510/-310	400	3020	10770
AUTOBRAKE 3	10260	150/-150	450	-620/2270	760/-580	510/-310	400	3020	10770

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****SPOILERS (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4880	60/-60	160	-220/730	80/-70	140/-130	270	210	480
AUTOBRAKE MAX	5140	60/-60	160	-240/780	20/-10	140/-140	280	90	320
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-20	250/-250	480	0	0

Good Reported Braking Action

MAX MANUAL	6330	100/-90	290	-350/1240	190/-160	260/-210	370	690	1820
AUTOBRAKE MAX	6330	100/-90	290	-350/1250	200/-170	260/-210	370	680	1790
AUTOBRAKE 2	8250	100/-110	300	-430/1440	60/-40	250/-250	480	70	630

Good To Medium Reported Braking Action

MAX MANUAL	6780	100/-90	290	-370/1290	230/-190	270/-210	370	800	2100
AUTOBRAKE MAX	6780	100/-90	300	-370/1300	250/-200	270/-210	370	790	2080
AUTOBRAKE 2	8250	100/-110	300	-430/1440	60/-40	250/-250	480	70	660

Medium Reported Braking Action

MAX MANUAL	7140	100/-100	300	-380/1350	270/-230	290/-210	370	950	2540
AUTOBRAKE MAX	7140	100/-100	310	-380/1350	290/-230	290/-220	370	940	2520
AUTOBRAKE 3	7450	100/-100	280	-390/1390	180/-90	250/-230	430	610	2190

Medium To Poor Reported Braking Action

MAX MANUAL	8100	130/-120	400	-470/1710	390/-310	390/-270	400	1580	4930
AUTOBRAKE MAX	8130	130/-120	400	-480/1710	410/-320	390/-270	400	1590	4960
AUTOBRAKE 3	8130	130/-110	400	-450/1710	410/-240	390/-270	400	1590	4960

Poor Reported Braking Action

MAX MANUAL	10010	150/-150	440	-620/2280	760/-570	480/-300	400	2810	9570
AUTOBRAKE MAX	10040	150/-150	440	-620/2280	780/-590	490/-310	400	2820	9600
AUTOBRAKE 3	10040	150/-150	440	-620/2280	780/-590	490/-310	400	2820	9600

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

STAB TRIM UNSCHD (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5330	80/-60	170	-220/730	70/-70	150/-140	230	210	470
AUTOBRAKE MAX	6260	60/-70	190	-260/850	10/-10	170/-170	310	0	10
AUTOBRAKE 2	9880	120/-130	360	-460/1530	100/-170	350/-300	430	230	230

Good Reported Braking Action

MAX MANUAL	7080	100/-90	310	-360/1270	180/-160	290/-230	320	730	1890
AUTOBRAKE MAX	7170	100/-90	320	-360/1270	190/-160	300/-230	330	720	1880
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Good To Medium Reported Braking Action

MAX MANUAL	7510	100/-100	320	-380/1320	220/-190	300/-230	320	830	2150
AUTOBRAKE MAX	7580	100/-100	320	-380/1330	230/-200	310/-240	330	830	2160
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Medium Reported Braking Action

MAX MANUAL	7850	100/-100	330	-390/1380	250/-210	320/-240	320	970	2540
AUTOBRAKE MAX	7920	100/-100	330	-400/1380	270/-220	320/-240	330	960	2540
AUTOBRAKE 3	9100	100/-110	310	-420/1430	80/-90	270/-270	440	160	1520

Medium To Poor Reported Braking Action

MAX MANUAL	8970	130/-130	420	-480/1710	360/-300	420/-290	350	1660	5000
AUTOBRAKE MAX	9040	130/-130	430	-480/1710	380/-310	430/-290	360	1670	5060
AUTOBRAKE 3	9270	130/-110	420	-430/1620	270/-140	360/-280	400	1440	4830

Poor Reported Braking Action

MAX MANUAL	10790	150/-150	460	-620/2260	700/-530	510/-330	350	2790	9190
AUTOBRAKE MAX	10860	150/-150	460	-620/2270	720/-550	520/-330	360	2810	9240
AUTOBRAKE 3	10950	150/-150	450	-620/2280	670/-490	490/-340	400	2720	9150

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****Two Engines Inop (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4740	80/-60	140	-220/720	70/-70	130/-130	220	0	0
AUTOBRAKE MAX	5310	70/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8520	100/-110	280	-430/1430	0/-30	260/-260	470	0	0

Good Reported Braking Action

MAX MANUAL	6830	100/-100	310	-420/1550	260/-210	260/-250	400	0	0
AUTOBRAKE MAX	6850	100/-100	310	-410/1530	250/-180	250/-250	420	0	0
AUTOBRAKE 2	8520	100/-110	290	-430/1440	20/-30	260/-260	470	0	0

Good To Medium Reported Braking Action

MAX MANUAL	7470	100/-100	310	-430/1580	330/-260	260/-250	400	0	0
AUTOBRAKE MAX	7470	100/-100	310	-420/1560	330/-240	250/-250	420	0	0
AUTOBRAKE 2	8520	100/-110	290	-430/1440	20/-30	260/-260	470	0	0

Medium Reported Braking Action

MAX MANUAL	8110	100/-110	320	-450/1630	420/-330	260/-260	400	0	0
AUTOBRAKE MAX	8110	100/-110	320	-440/1610	420/-300	260/-250	420	0	0
AUTOBRAKE 3	8290	100/-110	320	-450/1640	420/-280	270/-260	420	0	0

Medium To Poor Reported Braking Action

MAX MANUAL	10520	160/-170	500	-720/2690	880/-620	420/-420	540	0	0
AUTOBRAKE MAX	10550	160/-170	510	-720/2700	910/-640	430/-420	540	0	0
AUTOBRAKE 3	10600	160/-170	510	-730/2700	890/-620	430/-420	570	0	0

Poor Reported Braking Action

MAX MANUAL	15310	180/-190	520	-980/3530	2380/-1490	490/-490	540	0	0
AUTOBRAKE MAX	15340	180/-190	530	-980/3530	2410/-1510	490/-500	540	0	0
AUTOBRAKE 3	15380	180/-190	530	-980/3540	2370/-1490	490/-500	570	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

Based on engine bleed for packs on and anti-ice off

AIRPORT OAT (°C)	LANDING CLIMB LIMIT WEIGHT (1000 LB)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	729.1					
52	746.6					
50	766.5	740.7				
48	784.4	759.8				
46	802.6	778.0	727.3			
44	820.8	796.3	743.0			
42	839.2	814.9	761.7	699.1		
40	858.2	833.2	778.5	715.0		
38	878.7	851.9	795.2	731.2	671.4	
36	898.4	870.6	812.3	746.1	684.3	
34	915.9	889.2	829.4	762.0	697.6	627.9
32	930.6	905.6	846.4	776.2	710.2	638.8
30	945.5	920.6	859.3	790.5	721.8	649.8
28	946.1	934.1	871.9	805.1	733.5	660.3
26	946.6	947.1	884.4	824.2	745.1	670.5
24	947.1	947.5	896.5	834.3	758.2	680.5
22	947.6	947.9	907.6	843.8	778.2	690.1
20	948.1	948.3	908.0	852.7	788.0	699.6
18	948.6	948.7	908.3	860.9	796.5	709.7
16	949.1	949.1	908.6	861.1	803.8	718.9
14	949.5	949.4	908.8	861.2	810.5	727.1
12	949.7	949.8	909.0	861.3	810.7	734.5
10	950.0	950.1	909.2	861.4	810.8	741.3
-40	951.8	951.8	915.3	864.1	812.7	743.7

With engine bleed for packs off, increase weight by 8200 lb.

With engine anti-ice on, decrease weight by 9900 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by 48300 lb.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Table 1 of 3: Reference Brake Energy (Millions of Foot Pounds)**

		BRAKES-ON SPEED (KIAS)														
		100			120			140			160			180		
WEIGHT (1000 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)														
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
1000	0	34.1	38.7	44.1	46.2	52.8	60.6	59.7	68.7	79.4	74.3	86.1	100.3	89.6	104.7	122.9
	10	35.2	40.0	45.6	47.7	54.6	62.6	61.7	71.0	82.1	76.8	89.0	103.8	92.6	108.3	127.2
	15	35.7	40.6	46.3	48.5	55.4	63.6	62.7	72.2	83.4	78.0	90.5	105.5	94.2	110.1	129.3
	20	36.3	41.2	47.0	49.2	56.3	64.6	63.6	73.3	84.8	79.3	91.9	107.2	95.7	111.8	131.5
	30	37.3	42.4	48.3	50.6	57.9	66.5	65.5	75.5	87.3	81.6	94.7	110.5	98.6	115.4	135.7
	40	37.5	42.7	48.7	51.1	58.6	67.3	66.3	76.6	88.8	82.9	96.5	112.9	100.5	118.0	139.4
900	0	37.5	42.7	48.8	51.3	58.9	67.9	66.8	77.4	90.1	84.0	98.1	115.4	102.3	120.7	143.5
	10	31.4	35.6	40.5	42.4	48.4	55.4	54.7	62.8	72.4	68.0	78.5	91.2	81.9	95.3	111.5
	15	32.4	36.7	41.8	43.8	50.0	57.2	56.5	64.9	74.8	70.2	81.2	94.3	84.7	98.6	115.3
	20	32.9	37.3	42.5	44.5	50.8	58.1	57.4	65.9	76.0	71.3	82.5	95.8	86.0	100.2	117.2
	30	33.4	37.9	43.1	45.2	51.5	59.0	58.3	67.0	77.2	72.5	83.8	97.4	87.4	101.8	119.2
	40	34.3	38.9	44.3	46.4	53.0	60.7	60.0	68.9	79.5	74.6	86.3	100.3	90.1	104.9	123.0
800	0	34.5	39.2	44.7	46.8	53.5	61.4	60.7	69.8	80.7	75.7	87.8	102.3	91.6	107.1	125.9
	10	28.6	32.4	36.8	38.6	43.9	50.2	49.6	56.8	65.3	61.6	70.9	82.0	74.1	85.9	100.1
	15	29.6	33.5	38.0	39.8	45.4	51.8	51.3	58.7	67.5	63.6	73.3	84.8	76.6	88.8	103.5
	20	30.0	34.0	38.6	40.5	46.1	52.7	52.1	59.6	68.6	64.6	74.5	86.2	77.9	90.3	105.2
	30	30.5	34.5	39.2	41.1	46.8	53.5	52.9	60.6	69.6	65.6	75.6	87.6	79.1	91.7	106.9
	40	31.3	35.5	40.3	42.2	48.1	55.0	54.4	62.3	71.7	67.5	77.9	90.2	81.4	94.5	110.3
700	0	31.5	35.7	40.6	42.6	48.6	55.6	54.9	63.1	72.7	68.4	79.1	91.8	82.7	96.3	112.7
	10	25.9	29.3	33.2	34.7	39.5	45.0	44.5	50.8	58.3	55.1	63.3	73.0	66.3	76.5	88.8
	15	26.7	30.3	34.3	35.9	40.8	46.5	46.0	52.5	60.2	57.0	65.4	75.4	68.5	79.1	91.8
	20	27.1	30.7	34.8	36.4	41.4	47.2	46.7	53.3	61.2	57.9	66.5	76.6	69.6	80.4	93.3
	30	27.6	31.2	35.4	37.0	42.0	47.9	47.4	54.2	62.1	58.7	67.5	77.8	70.7	81.7	94.8
	40	28.3	32.0	36.3	38.0	43.2	49.3	48.7	55.7	63.9	60.4	69.5	80.2	72.8	84.1	97.7
600	0	28.4	32.2	36.6	38.3	43.6	49.7	49.2	56.3	64.7	61.1	70.4	81.4	73.8	85.5	99.6
	10	23.2	26.2	29.7	30.9	35.0	39.8	39.3	44.8	51.2	48.5	55.4	63.7	58.2	66.9	77.2
	15	23.9	27.1	30.6	31.9	36.2	41.1	40.6	46.3	52.9	50.0	57.3	65.8	60.1	69.1	79.8
	20	24.3	27.5	31.1	32.4	36.7	41.8	41.2	47.0	53.7	50.8	58.2	66.8	61.0	70.2	81.1
	30	24.7	27.9	31.6	32.9	37.3	42.4	41.9	47.7	54.5	51.6	59.1	67.9	62.0	71.3	82.4
	40	25.3	28.6	32.4	33.8	38.3	43.6	43.0	49.1	56.1	53.1	60.8	69.9	63.8	73.4	84.9
500	0	25.5	28.8	32.6	34.0	38.6	44.0	43.4	49.5	56.7	53.6	61.5	70.8	64.6	74.5	86.3
	10	20.6	23.2	26.2	27.0	30.6	34.7	34.1	38.7	44.1	41.7	47.5	54.4	49.8	57.0	65.5
	15	21.2	24.0	27.1	27.9	31.6	35.9	35.2	40.0	45.6	43.1	49.1	56.2	51.4	58.9	67.7
	20	21.6	24.3	27.5	28.3	32.1	36.4	35.7	40.6	46.3	43.7	49.9	57.1	52.2	59.8	68.8
	30	21.9	24.7	27.9	28.8	32.6	37.0	36.3	41.2	47.0	44.4	50.6	58.0	53.0	60.7	69.8
	40	22.5	25.4	28.7	29.5	33.5	38.0	37.3	42.4	48.3	45.6	52.1	59.6	54.5	62.5	71.9
500	0	22.6	25.5	28.8	29.7	33.7	38.3	37.5	42.7	48.8	46.0	52.6	60.3	55.1	63.2	72.9
	10	22.4	25.3	28.7	29.6	33.6	38.2	37.5	42.7	48.9	46.1	52.8	60.7	55.3	63.7	73.6

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 at sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****Table 2(a) of 3: 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	130
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120	130
	MAX MAN	7.4	15.2	23.5	32.2	41.2	50.5	60.0	69.7	79.6	89.5	99.5	109.5	119.4
	MAX AUTO	6.8	14.2	22.1	30.4	39.1	48.1	57.5	67.0	76.7	86.5	96.5	106.4	116.3
	AUTOBRAKE 4	6.7	13.8	21.2	29.1	37.2	45.7	54.4	63.4	72.6	82.0	91.5	101.2	111.0
	AUTOBRAKE 3	6.5	13.4	20.6	28.1	35.9	44.0	52.3	60.8	69.6	78.5	87.6	96.8	106.1
	AUTOBRAKE 2	6.3	12.9	19.8	26.9	34.3	41.9	49.7	57.8	66.0	74.3	82.8	91.4	100.1
	AUTOBRAKE 1	5.9	12.0	18.4	24.9	31.6	38.4	45.5	52.6	60.0	67.5	75.1	82.9	90.7

Table 2(b) of 3: 4 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	130
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120	130
LANDING	MAX MAN	6.6	13.7	21.1	28.9	36.9	45.2	53.7	62.3	71.1	79.8	88.6	97.4	106.0
	MAX AUTO	5.0	10.6	16.8	23.6	30.8	38.5	46.6	55.0	63.6	72.4	81.3	90.4	99.4
	AUTOBRAKE 4	3.7	8.0	12.9	18.3	24.3	30.6	37.4	44.4	51.8	59.4	67.1	75.0	83.0
	AUTOBRAKE 3	2.7	6.1	10.1	14.6	19.7	25.1	31.0	37.2	43.7	50.4	57.3	64.3	71.4
	AUTOBRAKE 2	1.6	3.9	6.8	10.2	14.1	18.5	23.3	28.4	33.8	39.5	45.4	51.4	57.5
	AUTOBRAKE 1	1.0	2.4	4.1	6.2	8.6	11.3	14.3	17.5	21.0	24.7	28.7	32.8	37.1

Table 3 of 3: Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)						
		BELOW 21	21	23	27	31	34	ABOVE 34 TO 48
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	0.1	1.0	2.0	3.1	3.9		CAUTION
GROUND		1	9	20	31	39		
BRAKE TEMPERATURE INDICATION	UP TO 2.91	3.00	3.35	3.88	4.50	5.00	5.0 TO 7.0	7.0 & 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.

With one brake deactivated, increase brake energy by 7 percent.

With two brakes deactivated, increase brake energy by 15 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 4 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt 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 indication on Multifunction Display may be used 10 to 15 minutes after airplane has come to a complete stop, or in flight with gear retracted, to determine recommended cooling schedule.

Performance Inflight - QRH**Chapter PI-QRH****Engine Inoperative****Section 23****1 ENGINE INOP****Max Continuous %N1****37000 FT to 27000 FT Pressure Altitudes****Based on engine bleed for packs on and anti-ice off**

37000 FT PRESS ALT		TAT (°C)											
KCAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	93.8	94.9	95.9	96.9	97.9	98.9	98.3	96.9	95.9	94.8	93.7	93.3
240	0.74	93.7	94.7	95.8	96.8	97.8	98.8	99.8	100.3	99.0	97.9	96.9	95.7
280	0.86	93.6	94.6	95.6	96.6	97.7	98.7	99.6	100.6	100.9	100.3	99.2	98.2
35000 FT PRESS ALT		TAT (°C)											
KCAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	93.9	94.9	96.0	97.0	98.0	99.0	98.7	97.2	96.1	95.1	94.0	93.3
240	0.71	93.8	94.8	95.8	96.9	97.9	98.9	99.8	100.5	99.1	97.9	96.9	95.8
280	0.82	93.6	94.6	95.6	96.7	97.7	98.7	99.7	100.6	100.9	100.2	99.1	98.1
33000 FT PRESS ALT		TAT (°C)											
KCAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.58	95.1	96.1	97.2	98.2	99.2	100.1	98.8	97.5	96.4	95.3	94.2	94.4
240	0.68	94.9	96.0	97.0	98.0	99.0	100.0	100.6	100.0	98.7	97.6	96.5	95.4
280	0.79	94.4	95.4	96.4	97.4	98.4	99.4	100.4	101.0	100.6	99.4	98.3	97.3
31000 FT PRESS ALT		TAT (°C)											
KCAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	95.3	96.3	97.3	98.3	99.3	100.3	100.4	99.0	97.8	96.7	95.6	94.6
240	0.66	95.1	96.2	97.2	98.2	99.2	100.2	101.0	101.1	99.8	98.6	97.5	96.3
280	0.76	94.5	95.5	96.5	97.5	98.5	99.5	100.5	101.5	101.0	99.9	98.8	97.7
29000 FT PRESS ALT		TAT (°C)											
KCAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	96.0	97.1	98.1	99.1	100.1	100.5	99.6	98.3	97.2	96.1	95.0	95.0
240	0.63	95.8	96.8	97.8	98.8	99.8	100.8	100.8	99.8	98.6	97.6	96.5	95.5
280	0.73	94.8	95.9	96.9	97.8	98.8	99.8	100.8	100.9	99.9	98.8	97.8	96.8
27000 FT PRESS ALT		TAT (°C)											
KCAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.51	96.7	97.7	98.7	99.7	100.5	100.0	98.8	97.6	96.6	95.5	94.5	95.3
240	0.60	96.3	97.3	98.3	99.2	100.2	101.0	99.9	98.7	97.7	96.7	95.8	94.8
280	0.70	95.1	96.1	97.1	98.0	99.0	99.9	100.9	99.9	98.9	98.0	97.1	96.2
320	0.79	93.4	94.3	95.3	96.3	97.2	98.1	99.1	100.0	99.9	99.0	98.1	97.2

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	27	29	31	33	35	37
PACKS OFF	0.3	0.3	0.3	0.3	0.4	0.4
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9

1 ENGINE INOP

Max Continuous %N1

25000 FT to 18000 FT Pressure Altitudes

Based on engine bleed for packs on and anti-ice off

25000 FT PRESS ALT													TAT (°C)	
KCAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
200	0.49	96.3	97.3	98.3	99.2	100.2	100.1	99.1	97.9	96.8	95.8	94.9	94.6	
240	0.58	95.3	96.3	97.3	98.3	99.2	100.2	100.0	98.9	97.8	96.8	95.9	95.0	
280	0.67	94.1	95.1	96.1	97.0	98.0	98.9	99.9	100.0	99.0	98.0	97.0	96.2	
320	0.76	92.6	93.6	94.5	95.5	96.4	97.4	98.3	99.2	99.8	99.0	98.1	97.3	
24000 FT PRESS ALT													TAT (°C)	
KCAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.48	96.7	97.7	98.7	99.6	100.2	99.2	98.1	97.0	95.9	95.0	94.2	95.0	
240	0.57	95.8	96.8	97.7	98.7	99.6	100.1	99.1	98.0	97.0	96.1	95.2	94.3	
280	0.66	94.7	95.6	96.6	97.6	98.5	99.4	100.0	99.0	98.0	97.1	96.3	95.4	
320	0.75	93.3	94.2	95.2	96.1	97.0	97.9	98.8	99.8	99.1	98.2	97.3	96.5	
22000 FT PRESS ALT													TAT (°C)	
KCAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.46	95.6	96.6	97.5	98.5	99.5	99.3	98.3	97.3	96.3	95.4	94.4	94.2	
240	0.55	94.8	95.7	96.7	97.7	98.6	99.5	99.3	98.4	97.3	96.4	95.5	94.6	
280	0.63	93.7	94.7	95.6	96.6	97.5	98.4	99.3	99.1	98.2	97.3	96.5	95.6	
320	0.72	92.6	93.6	94.5	95.4	96.3	97.3	98.2	99.1	99.2	98.3	97.4	96.6	
20000 FT PRESS ALT													TAT (°C)	
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.44	95.6	96.6	97.5	98.5	99.4	98.6	97.6	96.6	95.7	94.8	93.9	94.3	
240	0.53	94.9	95.9	96.8	97.7	98.6	99.4	98.6	97.6	96.7	95.8	94.9	94.0	
280	0.61	93.8	94.7	95.7	96.6	97.5	98.4	99.2	98.5	97.6	96.7	95.8	95.0	
320	0.69	92.8	93.8	94.7	95.6	96.5	97.4	98.3	99.2	98.4	97.6	96.7	95.9	
360	0.77	91.6	92.5	93.4	94.3	95.2	96.1	97.0	97.9	98.7	98.4	97.6	96.8	
18000 FT PRESS ALT													TAT (°C)	
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.42	94.6	95.5	96.5	97.4	98.3	98.8	97.8	96.9	95.9	95.0	94.1	93.4	
240	0.51	94.0	94.9	95.8	96.8	97.7	98.6	98.7	97.8	96.9	96.0	95.1	94.2	
280	0.59	93.0	93.9	94.8	95.7	96.7	97.5	98.4	98.5	97.7	96.8	95.9	95.0	
320	0.67	92.0	92.9	93.8	94.7	95.6	96.5	97.4	98.2	98.4	97.6	96.7	95.9	
360	0.75	90.9	91.8	92.7	93.6	94.5	95.4	96.2	97.1	97.9	98.3	97.5	96.8	

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	18	20	22	24	25
PACKS OFF	0.2	0.2	0.2	0.2	0.2
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON	-0.8	-0.8	-0.8	-0.8	-0.9

1 ENGINE INOP**Max Continuous %N1****16000 FT to 5000 FT Pressure Altitudes****Based on engine bleed for packs on and anti-ice off**

16000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	93.5	94.5	95.4	96.3	97.2	98.1	98.0	97.1	96.1	95.2	94.3	93.4
240	0.49	93.0	93.9	94.9	95.8	96.7	97.6	98.5	97.9	97.0	96.1	95.2	94.4
280	0.57	92.2	93.1	94.0	94.9	95.8	96.7	97.6	98.4	97.7	96.9	96.0	95.1
320	0.64	91.1	92.0	92.9	93.8	94.7	95.6	96.5	97.3	98.2	97.6	96.7	95.9
360	0.72	90.1	91.0	91.9	92.8	93.6	94.5	95.4	96.2	97.1	97.9	97.5	96.7
14000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.39	92.5	93.4	94.3	95.2	96.1	97.0	97.9	97.2	96.3	95.4	94.5	93.6
240	0.47	92.1	93.0	94.0	94.9	95.8	96.6	97.5	98.1	97.3	96.4	95.5	94.6
280	0.54	91.4	92.3	93.2	94.1	95.0	95.8	96.6	97.5	97.9	97.1	96.2	95.4
320	0.62	90.4	91.3	92.2	93.1	94.0	94.8	95.7	96.6	97.4	97.6	96.9	96.0
360	0.69	89.4	90.3	91.2	92.1	93.0	93.8	94.7	95.5	96.4	97.2	97.5	96.8
12000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.38	91.5	92.4	93.3	94.2	95.1	96.0	96.9	97.4	96.6	95.7	94.8	93.9
240	0.45	91.3	92.2	93.1	94.0	94.9	95.8	96.7	97.6	97.5	96.7	95.9	95.0
280	0.52	90.7	91.6	92.5	93.4	94.3	95.1	96.0	96.8	97.6	97.4	96.6	95.7
320	0.60	89.8	90.7	91.6	92.5	93.3	94.2	95.1	95.9	96.7	97.6	97.1	96.3
360	0.67	88.9	89.8	90.7	91.6	92.4	93.3	94.1	95.0	95.8	96.6	97.4	97.0
10000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.36	90.5	91.4	92.3	93.2	94.1	95.0	95.8	96.7	96.7	95.9	95.0	94.2
240	0.43	90.6	91.5	92.4	93.3	94.1	95.0	95.9	96.7	97.6	97.0	96.2	95.3
280	0.51	90.0	90.9	91.8	92.7	93.6	94.5	95.3	96.2	97.0	97.7	96.9	96.0
320	0.58	89.2	90.1	91.0	91.9	92.7	93.6	94.4	95.3	96.1	96.9	97.4	96.6
360	0.65	88.4	89.2	90.1	91.0	91.8	92.7	93.5	94.4	95.2	96.0	96.8	97.2
5000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.33	87.5	88.3	89.2	90.1	90.9	91.8	92.6	93.4	94.2	95.1	94.7	93.9
240	0.40	87.8	88.6	89.5	90.4	91.2	92.1	92.9	93.7	94.6	95.4	95.9	95.2
280	0.46	87.3	88.2	89.1	89.9	90.8	91.6	92.4	93.3	94.1	94.9	95.7	95.7
320	0.53	86.7	87.5	88.4	89.3	90.1	90.9	91.8	92.6	93.4	94.2	95.0	95.8
360	0.59	85.9	86.8	87.6	88.4	89.3	90.1	90.9	91.7	92.6	93.4	94.1	94.9

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	5	10	12	14	16
PACKS OFF	0.1	0.1	0.2	0.3	0.2
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.2	-0.3
ENGINE & WING ANTI-ICE ON	-0.6	-0.6	-0.6	-0.7	-0.7

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	981	321	26100	24700	23200
950	932	314	27800	26500	24900
900	886	307	29300	28100	26700
850	838	299	30900	30000	28500
800	787	289	32300	31700	30400
750	740	283	33800	33300	32100
700	690	272	35200	35000	33900
650	640	262	36600	36500	35600
600	589	252	38200	38000	37100
550	541	244	39800	39500	38700

Altitude reduced by 1000 ft for additional margin.

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	25	27	29	31	33	35	37
1000	%N1	83.7	87.2	92.1	96.7						
	MACH	.655	.703	.777	.833						
	KIAS	365	365	362	353						
	FF/ENG	10538	10706	10768	10878						
950	%N1	82.2	85.5	90.6	95.0	97.2					
	MACH	.644	.689	.761	.823	.837					
	KIAS	359	357	354	348	341					
	FF/ENG	10001	10095	10125	10264	10199					
900	%N1	80.5	83.8	89.0	93.3	95.3					
	MACH	.629	.673	.745	.809	.830					
	KIAS	350	349	346	342	337					
	FF/ENG	9426	9491	9504	9658	9614					
850	%N1	78.8	82.1	87.3	91.7	93.5	95.4	98.1			
	MACH	.613	.657	.728	.793	.817	.835	.841			
	KIAS	341	340	337	335	332	325	314			
	FF/ENG	8845	8895	8902	9047	9016	9006	8904			
800	%N1	77.0	80.3	85.5	89.9	91.6	93.5	95.7			
	MACH	.596	.640	.710	.775	.801	.824	.838			
	KIAS	331	331	329	326	324	321	313			
	FF/ENG	8283	8302	8314	8433	8417	8424	8325			
750	%N1	75.1	78.5	83.7	88.1	89.9	91.6	93.7	95.8		
	MACH	.579	.622	.692	.754	.782	.808	.829	.840		
	KIAS	322	321	320	317	316	314	309	300		
	FF/ENG	7761	7732	7757	7840	7842	7852	7792	7740		
700	%N1	73.2	76.7	81.8	86.3	88.0	89.7	91.7	93.7	95.9	
	MACH	.561	.603	.672	.734	.760	.788	.814	.833	.841	
	KIAS	312	311	310	307	306	306	303	298	288	
	FF/ENG	7254	7198	7227	7278	7269	7296	7237	7240	7190	
650	%N1	71.3	74.7	79.8	84.3	86.1	87.8	89.6	91.5	93.5	96.5
	MACH	.543	.583	.651	.712	.738	.765	.793	.819	.836	.842
	KIAS	301	301	300	298	297	296	295	292	286	275
	FF/ENG	6750	6683	6705	6733	6711	6732	6677	6702	6685	6704
600	%N1	69.2	72.5	77.6	82.2	84.0	85.7	87.5	89.3	91.3	93.7
	MACH	.524	.562	.628	.689	.714	.740	.768	.797	.822	.838
	KIAS	290	289	289	287	287	285	285	283	280	273
	FF/ENG	6249	6177	6162	6194	6172	6181	6127	6151	6166	6190
550	%N1	67.1	70.3	75.4	79.8	81.7	83.4	85.4	87.1	88.9	91.3
	MACH	.504	.540	.604	.664	.689	.715	.742	.770	.799	.824
	KIAS	279	278	277	276	276	275	274	273	272	268
	FF/ENG	5758	5678	5633	5833	5797	5646	5584	5609	5624	5678
500	%N1	64.7	67.9	72.9	77.3	79.1	80.9	82.9	84.7	86.4	88.7
	MACH	.483	.518	.579	.637	.662	.687	.714	.741	.770	.799
	KIAS	267	266	265	265	264	263	263	262	261	259
	FF/ENG	5485	5392	5319	5304	5275	5106	5053	5064	5088	5138
450	%N1	62.3	65.4	70.2	74.7	76.4	78.2	80.2	82.0	83.8	86.0
	MACH	.461	.494	.552	.608	.632	.657	.683	.710	.738	.767
	KIAS	255	254	252	252	252	251	251	250	249	248
	FF/ENG	5009	4910	4822	4767	4762	4574	4517	4534	4545	4596

1 ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Table 1 of 3: 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
700	649	604	565	531	500	479	459	441	424	409
1401	1299	1208	1130	1062	1000	959	921	886	853	823
2109	1954	1816	1697	1594	1500	1439	1382	1329	1280	1236
2823	2613	2426	2266	2126	2000	1919	1843	1773	1708	1649
3543	3276	3039	2836	2659	2500	2398	2304	2216	2135	2061
4270	3945	3655	3408	3193	3000	2878	2764	2658	2560	2471
5005	4619	4275	3982	3728	3500	3357	3223	3099	2985	2881
5748	5298	4898	4558	4264	4000	3836	3682	3540	3410	3290
6499	5983	5525	5137	4801	4500	4314	4141	3980	3833	3698
7259	6674	6155	5717	5339	5000	4793	4599	4420	4255	4104

Table 2 of 3: Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		22		29		33	
	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)
500	29.7	1:29	27.1	1:25	23.5	1:18	20.6	1:13	19.1	1:11
1000	59.4	2:55	55.0	2:46	48.5	2:30	43.4	2:18	40.9	2:13
1500	88.5	4:23	82.2	4:09	73.0	3:44	65.8	3:25	62.1	3:16
2000	116.8	5:53	108.8	5:34	96.9	4:58	87.6	4:32	82.8	4:20
2500	144.6	7:25	134.9	7:00	120.3	6:14	109.0	5:40	103.0	5:24
3000	171.7	8:59	160.4	8:28	143.1	7:31	129.9	6:49	122.7	6:29
3500	198.2	10:35	185.4	9:58	165.8	8:50	150.3	8:00	142.0	7:35
4000	224.9	12:13	210.7	11:30	188.3	10:10	170.3	9:11	160.9	8:42
4500	251.2	13:54	235.4	13:03	210.2	11:32	189.8	10:23	179.4	9:50
5000	277.0	15:37	259.6	14:40	231.8	12:55	208.8	11:37	197.5	10:59

Table 3 of 3: Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)					
	500	600	700	800	900	1000
20	-2.5	-1.8	0.0	2.2	6.6	6.6
40	-4.6	-3.1	0.0	4.6	12.3	16.6
60	-6.7	-4.3	0.0	6.9	17.7	26.1
80	-8.9	-5.5	0.0	9.2	22.9	35.0
100	-11.1	-6.7	0.0	11.4	27.8	43.4
120	-13.4	-7.8	0.0	13.5	32.4	51.3
140	-15.7	-9.0	0.0	15.6	36.7	58.6
160	-18.1	-10.1	0.0	17.7	40.8	65.4
180	-20.5	-11.2	0.0	19.6	44.6	71.7
200	-23.0	-12.3	0.0	21.5	48.1	77.4
220	-25.5	-13.4	0.0	23.4	51.3	82.6
240	-28.1	-14.5	0.0	25.1	54.3	87.3
260	-30.8	-15.5	0.0	26.9	57.0	91.4
280	-33.5	-16.5	0.0	28.5	59.4	95.0

1 ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
1000	%N1	72.2	75.3	79.9	84.8	89.9	95.3			
	KIAS	265	267	269	274	316	320			
	FF/ENG	9370	9310	9400	9510	10020	10450			
950	%N1	70.6	73.7	78.2	83.1	88.2	93.3			
	KIAS	259	260	262	265	308	312			
	FF/ENG	8840	8800	8820	8930	9380	9740			
900	%N1	68.8	71.8	76.4	81.3	86.5	91.4			
	KIAS	254	255	256	258	299	303			
	FF/ENG	8320	8280	8250	8380	8770	9080			
850	%N1	67.1	70.0	74.5	79.3	84.6	89.6	95.4		
	KIAS	249	249	250	252	290	294	298		
	FF/ENG	7800	7760	7710	7820	8180	8450	8790		
800	%N1	65.3	68.1	72.6	77.2	82.6	87.7	93.0		
	KIAS	244	244	245	247	281	284	288		
	FF/ENG	7310	7250	7210	7260	7600	7830	8070		
750	%N1	63.5	66.2	70.6	75.2	80.6	85.7	90.7		
	KIAS	240	240	241	242	272	275	278		
	FF/ENG	6850	6770	6730	6730	7070	7240	7420		
700	%N1	61.7	64.4	68.6	73.2	78.5	83.6	88.6	94.9	
	KIAS	234	234	235	236	262	265	268	272	
	FF/ENG	6420	6320	6270	6250	6560	6680	6830	7140	
650	%N1	59.9	62.4	66.6	71.1	76.3	81.4	86.4	92.2	
	KIAS	229	229	229	230	252	255	257	261	
	FF/ENG	5990	5880	5830	5790	6040	6150	6260	6450	
600	%N1	57.9	60.4	64.5	68.9	74.0	79.1	84.1	89.5	
	KIAS	223	223	223	224	242	244	247	250	
	FF/ENG	5580	5690	5620	5560	5720	5800	5710	5820	
550	%N1	55.8	58.4	62.3	66.6	71.6	76.5	81.6	86.8	94.9
	KIAS	216	217	217	218	231	233	235	238	242
	FF/ENG	5420	5290	5200	5130	5250	5290	5160	5250	5710
500	%N1	53.6	56.1	60.1	64.2	69.0	73.8	78.9	84.1	91.5
	KIAS	210	210	210	211	220	222	224	226	230
	FF/ENG	5030	4890	4790	4710	4780	4780	4620	4700	5020
450	%N1	51.4	53.8	57.7	61.8	66.2	70.9	75.8	81.2	88.1
	KIAS	205	205	205	205	209	210	212	214	217
	FF/ENG	4650	4510	4410	4320	4300	4310	4310	4310	4550

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH **Chapter PI-QRH**
Two Engines Inoperative **Section 24**

2 ENGINES INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	967	312	11100	9600	7800
950	917	304	12900	11500	9800
900	869	297	14900	13400	11800
850	822	289	17100	15600	13900
800	774	281	19200	17800	16200
750	726	273	21200	19900	18400
700	679	265	23300	22000	20600
650	631	256	25400	24300	22800
600	583	246	27300	26500	25200
550	535	236	29200	28900	27600
500	486	225	31000	30900	29900
450	438	214	33100	33000	32000

Altitude reduced by 2000 ft for additional margin.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Table 1 of 2: 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
670	627	590	556	526	500	475	453	433	415	398
1337	1252	1178	1112	1053	1000	952	908	868	832	798
2000	1875	1764	1666	1579	1500	1428	1363	1304	1249	1199
2662	2497	2351	2221	2104	2000	1905	1818	1740	1667	1601
3324	3119	2937	2775	2630	2500	2381	2274	2176	2085	2003
3988	3742	3524	3330	3156	3000	2858	2729	2611	2503	2404
4656	4367	4112	3885	3682	3500	3334	3183	3046	2920	2803
5327	4996	4703	4442	4209	4000	3810	3637	3479	3335	3201
6006	5629	5296	5001	4737	4500	4285	4089	3911	3748	3597
6692	6267	5894	5562	5266	5000	4759	4540	4341	4158	3990

Table 2 of 2: Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)												TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)												
	450	500	550	600	650	700	750	800	850	900	950	***	
500	15.3	16.7	18.3	19.9	21.2	22.8	24.3	25.9	27.2	28.8	30.2	32.0	1:16
1000	31.5	34.6	37.9	41.2	44.1	47.5	50.8	53.9	57.1	60.8	64.3	68.1	2:31
1500	47.3	52.0	57.0	62.0	66.4	71.5	76.3	81.1	85.9	91.6	97.1	102.9	3:45
2000	62.6	68.9	75.4	82.2	88.2	94.9	101.4	107.7	114.2	121.7	129.2	136.8	4:59
2500	77.5	85.3	93.3	101.8	109.2	117.6	125.7	133.6	141.7	151.0	160.3	169.8	6:12
3000	91.9	101.2	110.7	120.8	129.7	139.7	149.3	158.8	168.4	179.5	190.6	201.8	7:26
3500	105.9	116.6	127.6	139.2	149.6	161.1	172.4	183.3	194.5	207.2	220.0	232.9	8:41
4000	119.5	131.7	143.9	157.1	168.9	182.0	194.8	207.1	219.8	234.2	248.7	263.2	9:57
4500	132.8	146.3	159.9	174.6	187.7	202.4	216.6	230.4	244.5	260.5	276.6	292.7	11:16
5000	145.7	160.5	175.4	191.6	206.1	222.2	237.8	253.0	268.5	286.1	303.8	321.4	12:37

Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.

2 ENGINES INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)								
		10	14	17	20	23	25	27	29	31
950	%N1	94.9								
	MACH	.644								
	KIAS	359								
	FF/ENG	15277								
900	%N1	93.0								
	MACH	.629								
	KIAS	350								
	FF/ENG	14333								
850	%N1	91.1	94.7							
	MACH	.613	.657							
	KIAS	341	340							
	FF/ENG	13395	13543							
800	%N1	89.0	92.7							
	MACH	.596	.640							
	KIAS	331	331							
	FF/ENG	12471	12600							
750	%N1	86.9	90.7							
	MACH	.579	.622							
	KIAS	322	321							
	FF/ENG	11593	11703							
700	%N1	84.7	88.7	94.4						
	MACH	.561	.603	.672						
	KIAS	312	311	310						
	FF/ENG	10749	10836	11003						
650	%N1	82.5	86.4	92.1						
	MACH	.543	.583	.651						
	KIAS	301	301	300						
	FF/ENG	9925	9986	10111						
600	%N1	80.1	83.9	89.7	95.1					
	MACH	.524	.562	.628	.689					
	KIAS	290	289	289	287					
	FF/ENG	9114	9160	9250	9522					
550	%N1	77.7	81.3	87.2	92.1	94.7	97.6			
	MACH	.504	.540	.604	.664	.689	.715			
	KIAS	279	278	277	276	276	275			
	FF/ENG	8291	8354	8403	8616	8676	8849			
500	%N1	75.0	78.5	84.3	89.3	91.3	93.8	97.0		
	MACH	.483	.518	.579	.637	.662	.687	.714		
	KIAS	267	266	265	265	264	263	263		
	FF/ENG	7528	7555	7583	7758	7771	7870	7973		
450	%N1	72.1	75.6	81.2	86.3	88.2	90.2	92.9		
	MACH	.461	.494	.552	.608	.632	.657	.683		
	KIAS	255	254	252	252	252	251	251		
	FF/ENG	6810	6755	6798	6917	6924	6974	6996		

Performance Inflight - QRH**Chapter PI-QRH****Gear Down****Section 25****GEAR DOWN****Max Climb %N1****Based on engine bleed for packs on, engine and wing anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KCAS OR MACH)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
	240	240	240	240	240	240	240	240	240	240	240	0.60	0.60	0.60	0.60
55	90.4	91.1	93.9	94.6	94.0	96.0	96.9	97.7	98.5	99.1	99.8	100.8	101.5	102.0	101.8
50	91.3	91.8	93.2	93.9	94.5	95.3	96.2	97.0	97.7	98.4	99.1	100.0	100.8	101.2	101.0
45	92.3	92.6	92.9	93.2	93.8	94.5	95.4	96.2	96.9	97.6	98.3	99.3	100.0	100.4	100.2
40	93.2	93.5	93.8	93.4	93.0	93.8	94.7	95.5	96.2	96.8	97.5	98.5	99.2	99.6	99.4
35	94.0	94.5	94.6	94.3	93.9	93.6	93.9	94.7	95.4	96.1	96.8	97.7	98.4	98.8	98.6
30	93.9	95.3	95.5	95.1	94.7	94.5	94.4	94.2	94.6	95.3	96.0	96.9	97.6	98.0	97.8
25	93.1	96.1	96.4	96.0	95.6	95.4	95.2	95.1	94.8	94.5	95.2	96.1	96.8	97.2	97.0
20	92.3	95.5	97.2	96.9	96.5	96.3	96.1	96.0	95.7	95.4	95.2	95.3	96.0	96.4	96.2
15	91.5	94.7	97.7	97.7	97.4	97.2	97.1	96.9	96.6	96.3	96.1	95.7	95.1	95.6	95.4
10	90.7	93.9	96.9	97.7	98.2	98.1	98.0	97.8	97.5	97.3	97.0	96.7	96.0	94.7	94.6
5	89.9	93.0	96.0	96.8	97.7	98.6	98.9	98.8	98.6	98.3	98.0	97.7	97.2	95.9	94.0
0	89.1	92.2	95.1	96.0	96.8	97.7	98.8	99.6	99.5	99.3	99.1	98.7	98.2	97.0	95.2
-5	88.3	91.4	94.3	95.1	95.9	96.8	97.8	98.8	99.7	100.3	100.2	99.9	99.4	98.1	96.3
-10	87.5	90.5	93.4	94.2	95.0	95.9	96.9	97.9	98.8	99.9	100.9	101.0	100.7	99.3	97.3
-15	86.6	89.6	92.5	93.3	94.1	95.0	96.0	97.0	97.9	98.9	99.9	101.2	101.0	100.8	98.5
-20	85.8	88.8	91.6	92.4	93.2	94.1	95.1	96.0	96.9	98.0	99.0	100.2	100.2	100.4	100.1

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)						
	0	5	10	15	20	25	30
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5	-0.5
ENGINE & WING ANTI-ICE ON	-0.7	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9

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
1000	18400	17000	15200
950	19700	18300	16500
900	20900	19600	17800
850	22800	21400	19800
800	24800	23400	21900
750	26700	25500	23900
700	28500	27600	26100
650	30100	29600	28300
600	31600	31500	30300
550	33200	33100	32100
500	34800	34700	33700
450	36500	36400	35400

GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	21	23	25	27	29	31	33
1000	%N1	84.1	88.3								
	MACH	.488	.525								
	KIAS	270	270								
	FF/ENG	10220	10378								
950	%N1	83.0	87.2	93.8							
	MACH	.488	.525	.589							
	KIAS	270	270	270							
	FF/ENG	9865	10004	10294							
900	%N1	82.0	86.1	92.5	93.8						
	MACH	.488	.525	.589	.600						
	KIAS	270	270	270	270						
	FF/ENG	9552	9677	9931	10016						
850	%N1	80.5	84.4	90.7	91.8	94.3					
	MACH	.480	.514	.577	.588	.610					
	KIAS	266	264	264	264	264					
	FF/ENG	9064	9102	9311	9376	9514					
800	%N1	78.6	82.3	88.5	89.6	91.9	94.5				
	MACH	.468	.501	.561	.572	.594	.617				
	KIAS	259	257	257	257	256	256				
	FF/ENG	8481	8482	8636	8700	8810	8926				
750	%N1	76.8	80.3	86.4	87.5	89.6	92.0	94.9			
	MACH	.456	.487	.544	.555	.577	.600	.624			
	KIAS	252	250	249	249	249	248	248			
	FF/ENG	7915	7906	7985	8047	8153	8228	8365			
700	%N1	74.9	78.2	84.1	85.2	87.4	89.6	92.0	94.9		
	MACH	.443	.473	.527	.537	.559	.582	.605	.628		
	KIAS	245	242	240	240	241	241	240	239		
	FF/ENG	7393	7351	7364	7413	7514	7581	7626	7773		
650	%N1	73.0	76.2	81.7	82.8	85.0	87.1	89.4	91.9		
	MACH	.431	.458	.509	.519	.540	.562	.586	.610		
	KIAS	238	235	232	232	232	232	232	232		
	FF/ENG	6904	6798	6774	6808	6883	6947	6978	7083		
600	%N1	70.9	74.0	79.4	80.5	82.7	84.9	87.1	89.3	92.2	
	MACH	.418	.444	.493	.504	.525	.547	.569	.593	.619	
	KIAS	231	227	225	225	225	225	225	225	225	
	FF/ENG	6426	6276	6253	6289	6361	6406	6437	6506	6564	
550	%N1	68.7	71.8	77.1	78.2	80.4	82.6	84.7	86.8	89.4	92.2
	MACH	.404	.429	.479	.489	.510	.531	.553	.577	.601	.627
	KIAS	223	220	218	218	219	219	219	219	219	219
	FF/ENG	5940	5791	5790	5809	5862	5895	5918	5975	5977	6106
500	%N1	66.4	69.5	74.8	75.8	78.0	80.1	82.2	84.4	86.7	89.2
	MACH	.390	.414	.465	.474	.494	.515	.536	.559	.583	.609
	KIAS	215	212	211	211	212	212	212	212	212	212
	FF/ENG	5457	5440	5432	5453	5485	5503	5510	5461	5444	5526
450	%N1	63.9	67.2	72.6	73.5	75.5	77.6	79.7	81.8	84.2	86.4
	MACH	.374	.401	.451	.460	.479	.499	.520	.543	.566	.591
	KIAS	206	205	205	205	205	205	205	205	205	205
	FF/ENG	5108	5013	4992	4999	5034	5049	5045	4984	4960	5021

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Table 1 of 3: 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
622	562	510	467	432	400	378	358	340	324	309
1253	1130	1023	936	864	800	756	716	679	647	618
1892	1704	1540	1408	1297	1200	1134	1073	1018	969	926
2542	2284	2062	1881	1732	1600	1511	1430	1356	1290	1232
3202	2873	2588	2358	2167	2000	1888	1786	1693	1610	1536
3873	3467	3117	2836	2604	2400	2264	2140	2028	1928	1840
4557	4071	3652	3317	3041	2800	2640	2495	2363	2245	2142
5247	4679	4190	3800	3480	3200	3016	2849	2697	2562	2443
5937	5286	4727	4282	3918	3600	3391	3201	3030	2877	2743
6628	5894	5265	4765	4356	4000	3767	3554	3363	3192	3043

Table 2 of 3: Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		25	
	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)
400	40.4	1:29	37.7	1:26	35.1	1:22	33.1	1:18	31.7	1:15
800	80.2	2:57	75.3	2:49	70.7	2:41	67.2	2:32	64.7	2:26
1200	118.8	4:27	111.5	4:15	105.3	4:02	100.2	3:48	96.6	3:38
1600	156.2	5:59	146.6	5:42	138.6	5:25	132.1	5:05	127.5	4:51
2000	192.2	7:34	180.6	7:12	171.1	6:49	163.0	6:24	157.4	6:06
2400	227.4	9:11	214.1	8:44	202.9	8:16	193.5	7:44	186.8	7:23
2800	261.9	10:51	246.6	10:18	233.7	9:44	223.0	9:06	215.3	8:40
3200	295.4	12:32	278.2	11:54	263.7	11:13	251.6	10:29	243.0	9:59
3600	328.1	14:14	309.1	13:29	293.0	12:42	279.4	11:53	269.8	11:19
4000	360.2	15:55	339.3	15:04	321.6	14:12	306.5	13:17	296.1	12:39

Table 3 of 3: Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)					
	500	600	700	800	900	1000
40	-5.4	-3.0	0.0	4.0	8.8	14.2
80	-11.4	-6.2	0.0	8.1	17.5	28.2
120	-16.8	-9.2	0.0	11.9	25.7	41.3
160	-21.8	-11.9	0.0	15.6	33.4	53.5
200	-26.3	-14.4	0.0	18.9	40.5	64.8
240	-30.3	-16.7	0.0	22.1	47.1	75.1
280	-33.8	-18.8	0.0	25.0	53.1	84.5
320	-36.8	-20.6	0.0	27.7	58.5	92.9
360	-39.4	-22.2	0.0	30.2	63.4	100.4

GEAR DOWN

Descent at .66/250

PRESSURE ALT (1000 FT)	5	10	15	17	19	21	23	25	27	29	31	33	35	37
DISTANCE (NM)	12	23	35	40	45	49	54	59	64	69	73	77	82	86
TIME (MINUTES)	6	8	10	11	12	13	14	15	16	16	17	18	18	19

GEAR DOWN

**Holding
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
1000	%N1	75.6	79.0	84.0	89.4			
	KIAS	265	267	269	270			
	FF/ENG	10400	10500	10700	10950			
950	%N1	74.0	77.2	82.2	87.7	93.8		
	KIAS	259	260	262	265	270		
	FF/ENG	9850	9850	10040	10340	10810		
900	%N1	72.4	75.6	80.4	85.7	92.0		
	KIAS	254	254	256	257	266		
	FF/ENG	9370	9300	9430	9630	10230		
850	%N1	70.8	74.0	78.7	83.9	89.7		
	KIAS	249	249	250	252	257		
	FF/ENG	8880	8810	8880	9040	9430		
800	%N1	69.2	72.3	76.9	82.0	87.6	93.9	
	KIAS	243	244	245	246	250	252	
	FF/ENG	8380	8340	8330	8490	8760	9170	
750	%N1	67.7	70.7	75.3	80.3	86.1	91.9	
	KIAS	239	239	240	242	246	248	
	FF/ENG	7940	7900	7850	8000	8280	8640	
700	%N1	66.1	69.0	73.6	78.3	83.7	89.2	
	KIAS	234	234	235	236	238	238	
	FF/ENG	7490	7440	7380	7480	7610	7860	
650	%N1	64.5	67.2	71.7	76.4	81.6	87.1	93.4
	KIAS	228	228	229	230	231	232	232
	FF/ENG	7040	6970	6920	6960	7080	7280	7520
600	%N1	62.7	65.4	69.8	74.4	79.4	84.9	90.6
	KIAS	222	222	223	224	225	225	225
	FF/ENG	6590	6510	6460	6460	6570	6730	6880
550	%N1	60.8	63.5	67.8	72.4	77.1	82.6	88.0
	KIAS	216	216	217	217	218	219	219
	FF/ENG	6150	6060	6010	5990	6080	6190	6300
500	%N1	58.8	61.5	65.7	70.2	74.8	80.1	85.5
	KIAS	209	210	210	211	211	212	212
	FF/ENG	5710	5620	5710	5670	5700	5780	5760
450	%N1	57.0	59.6	63.7	68.1	72.6	77.6	83.0
	KIAS	205	205	205	205	205	205	205
	FF/ENG	5490	5380	5320	5260	5240	5300	5250

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH
Gear Down, One Engine Inop

Chapter PI-QRH
Section 26

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
Based on engine bleed for packs on

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	970	270	11200	9700	7900
950	923	270	12300	10900	9300
900	877	265	14000	12800	11300
850	828	259	16000	14800	13300
800	780	251	18100	16900	15500
750	731	246	19900	18900	17600
700	681	237	22100	21000	19700
650	633	231	24000	22900	21700
600	586	224	25700	24900	23700
550	537	218	27500	27000	25900
500	489	211	29200	29100	28000
450	438	205	30800	30800	29900

Altitude reduced by 1000 ft for additional margin.

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

Based on engine bleed for packs on or off

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	10500	8900	6700
950	11600	10100	8300
900	12700	11200	9500
850	14500	13100	11400
800	16600	15300	13600
750	18800	17600	16000
700	21000	19900	18400
650	23300	22200	20800
600	25200	24300	23000
550	27100	26400	25200
500	28800	28600	27400
450	30600	30600	29600

Altitude reduced by 1000 ft for additional margin.
With engine anti-ice on, decrease altitude capability by 300 ft.
With engine and wing anti-ice on, decrease altitude capability by 900 ft.

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)							
		10	14	17	20	23	25	27	29
900	%N1	91.3							
	MACH	.488							
	KIAS	270							
	FF/ENG	12907							
850	%N1	89.6	93.8						
	MACH	.480	.514						
	KIAS	266	264						
	FF/ENG	12202	12364						
800	%N1	87.6	91.6	95.1					
	MACH	.468	.501	.529					
	KIAS	259	257	257					
	FF/ENG	11383	11473	11654					
750	%N1	85.5	89.4	92.5					
	MACH	.456	.487	.514					
	KIAS	252	250	249					
	FF/ENG	10607	10646	10741					
700	%N1	83.3	87.2	90.2	93.7				
	MACH	.443	.473	.498	.527				
	KIAS	245	242	241	240				
	FF/ENG	9870	9858	9902	10064				
650	%N1	81.1	84.8	87.7	90.9	95.0			
	MACH	.431	.458	.482	.509	.540			
	KIAS	238	235	233	232	232			
	FF/ENG	9163	9102	9101	9188	9458			
600	%N1	78.9	82.4	85.2	88.4	92.0	95.1		
	MACH	.418	.444	.466	.493	.525	.547		
	KIAS	231	227	225	225	225	225		
	FF/ENG	8485	8385	8336	8425	8653	8830		
550	%N1	76.5	79.8	82.6	85.9	89.4	91.9	95.2	
	MACH	.404	.429	.451	.479	.510	.531	.553	
	KIAS	223	220	218	218	219	219	219	
	FF/ENG	7798	7699	7633	7732	7922	8023	8179	
500	%N1	74.0	77.2	80.1	83.3	86.7	89.0	91.7	95.0
	MACH	.390	.414	.437	.465	.494	.515	.536	.559
	KIAS	215	212	211	211	212	212	212	212
	FF/ENG	7112	7028	7014	7075	7228	7299	7371	7569
450	%N1	71.3	74.8	77.6	80.7	84.1	86.4	88.6	91.3
	MACH	.374	.401	.425	.451	.479	.499	.520	.543
	KIAS	206	205	205	205	205	205	205	205
	FF/ENG	6463	6416	6460	6488	6596	6650	6689	6802

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Table 1 of 3: 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	188	178	168	160	153
622	562	510	467	432	400	377	357	338	321	307
936	845	766	702	648	600	566	534	506	481	459
1253	1130	1023	936	864	800	754	712	675	641	612
1571	1416	1282	1172	1081	1000	943	890	843	801	764
1892	1704	1540	1408	1297	1200	1131	1068	1011	961	916
2215	1993	1800	1644	1514	1400	1319	1245	1179	1119	1067
2541	2284	2061	1881	1732	1600	1507	1422	1346	1278	1218
2870	2577	2324	2119	1949	1800	1695	1599	1513	1436	1369
3201	2872	2588	2358	2167	2000	1882	1775	1679	1594	1519

Table 2 of 3: 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	19.9	0:46	18.3	0:44	16.8	0:43	15.8	0:41
400	40.4	1:29	37.7	1:25	35.4	1:22	33.8	1:18
600	60.5	2:13	56.9	2:07	53.6	2:01	51.4	1:55
800	80.3	2:57	75.6	2:49	71.4	2:41	68.7	2:32
1000	99.7	3:42	94.1	3:32	88.9	3:21	85.6	3:10
1200	118.8	4:27	112.2	4:15	106.1	4:02	102.3	3:48
1400	137.6	5:13	130.0	4:58	123.0	4:43	118.6	4:27
1600	156.0	5:59	147.5	5:43	139.6	5:25	134.6	5:06
1800	174.0	6:46	164.6	6:27	155.9	6:07	150.4	5:45
2000	191.8	7:34	181.5	7:12	171.9	6:50	165.8	6:24

Table 3 of 3: Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	500	600	700	800	900
20	-3.1	-1.5	0.0	2.6	3.4
40	-6.7	-3.3	0.0	5.3	7.9
60	-10.2	-5.0	0.0	7.9	13.0
80	-13.6	-6.7	0.0	10.3	18.1
100	-17.0	-8.5	0.0	12.5	23.0
120	-20.2	-10.2	0.0	14.7	27.9
140	-23.4	-12.0	0.0	16.7	32.7
160	-26.4	-13.7	0.0	18.5	37.4
180	-29.4	-15.5	0.0	20.3	42.0
200	-32.3	-17.2	0.0	21.9	46.4

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

**Holding
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
1000	%N1	84.2	87.9	93.5			
	KIAS	265	267	269			
	FF/ENG	13880	14090	14530			
950	%N1	82.4	85.9	91.5			
	KIAS	259	260	262			
	FF/ENG	13060	13200	13580			
900	%N1	80.7	84.1	89.5	95.5		
	KIAS	254	254	256	257		
	FF/ENG	12340	12420	12700	13160		
850	%N1	78.9	82.3	87.7	93.3		
	KIAS	249	249	250	252		
	FF/ENG	11630	11690	11920	12280		
800	%N1	77.2	80.5	85.7	91.2		
	KIAS	243	244	245	246		
	FF/ENG	10920	10990	11160	11480		
750	%N1	75.5	78.8	83.8	89.3	96.2	
	KIAS	239	239	240	242	246	
	FF/ENG	10310	10360	10490	10780	11410	
700	%N1	73.8	76.9	81.8	87.3	93.2	
	KIAS	234	234	235	236	238	
	FF/ENG	9730	9710	9820	10030	10390	
650	%N1	71.9	75.0	79.7	85.1	90.8	
	KIAS	228	228	229	230	231	
	FF/ENG	9140	9070	9150	9320	9600	
600	%N1	69.8	73.0	77.6	82.8	88.4	95.1
	KIAS	222	222	223	224	225	225
	FF/ENG	8540	8480	8510	8640	8850	9270
550	%N1	67.8	70.8	75.5	80.4	85.9	91.9
	KIAS	216	216	217	217	218	219
	FF/ENG	7930	7900	7870	7980	8120	8420
500	%N1	65.6	68.6	73.2	78.0	83.3	89.0
	KIAS	209	210	210	211	211	212
	FF/ENG	7320	7290	7250	7340	7430	7660
450	%N1	63.6	66.5	71.0	75.7	80.7	86.4
	KIAS	205	205	205	205	205	205
	FF/ENG	6810	6760	6720	6760	6810	6980

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight - QRH**Chapter PI-QRH****Text****Section 27****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). 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 Airplane Flight Manual (AFM), the AFM takes precedence.

General**Flight with Unreliable Airspeed / Turbulent Air Penetration**

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 or turbulent air may also cause unreliable airspeed/Mach indications.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

ISFD Airspeed and Altitude Correction

In the event of loss of primary air data, Integrated Standby Flight Display (ISFD) airspeed and pressure altitude correction are provided. The first table provides the ISFD airspeed for a given gross weight and target airspeed. The second table provides a pressure altitude adjustment for a given gross weight and ISFD airspeed. The pressure altitude adjustment is added to the ISFD altitude to get the actual pressure altitude.

Max Climb %N1

This table shows Max Climb %N1 for a 340/.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. Adjustments are also shown for anti-ice operation.

Go-Around %N1

To find Max Go-Around %N1 based on normal engine bleed for packs on, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs off operation, apply the %N1 adjustments provided below the table. %N1 adjustments are shown for engine anti-ice operation.

VREF

The Reference Speed table contains flaps 30 and 25 reference speeds for a given weight.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, anti-skid inoperative, brake energy limits, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded.

The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce minimum control speeds. Note that the assumed temperature method may not help this condition as minimum control speeds are determined at the actual temperature and, therefore, are not reduced.

Takeoff speeds are determined as follows:

- (1) Determine V1, VR, and V2 from the Takeoff Speeds table (Table 1) with brake release weight.
- (2) Adjust V1, VR and V2 for temperature and pressure altitude from the V1, VR, V2 Adjustments table (Table 2).
- (3) Adjust V1 for slope and wind from the Slope and Wind V1 Adjustment table (Table 3).
- (4) Determine V1(MCG) and Min VR from the V1(MCG) and Minimum VR table (Table 4).
- (5) If V1 from Step 3 is less than V1(MCG), set $V1 = V1(MCG)$.
- (6) If VR from Step 2 is less than Min VR, Set $VR = \text{Min VR}$.
- (7) Using Min VR from Step (4), determine V2 from the V2 for Minimum VR table (Table 5).

(8) If V_2 from Step 2 is less than V_2 for Minimum VR, set $V_2 = V_2$ for Minimum VR.

Note: Regulations prohibit scheduling takeoff with a V_1 less than minimum V_1 for control on the ground, $V_1(\text{MCG})$, VR less than Minimum VR (Min VR), and V_2 less than V_2 for Minimum VR. It is necessary to compare the adjusted V_1 , VR and V_2 to $V_1(\text{MCG})$, Minimum VR and V_2 for Minimum VR, respectively. No takeoff weight adjustment is necessary provided that the actual field length exceeds 6100 ft for a dry runway, or 8800 ft for a wet runway.

Clearway and Stopway V_1 Adjustments

Takeoff speed corrections are to be applied to V_1 when using takeoff weights based on the use of clearway and stopway.

Adjust V_1 by the amount shown in the table. The adjusted V_1 must not exceed VR. If V_1 is greater than VR, VR may be increased to equal V_1 . Increase V_2 by the same amount that VR is increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

All Engines

Holding

Target %N1, KIAS, and fuel flow per engine information are tabulated for holding with Flaps Up and Flaps 1 based on the FMC optimum holding speed schedule. This is the higher of maximum endurance speed and maneuvering speed for the selected flap setting. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, KIAS and fuel flow per engine.

Advisory Information

Runway Surface Condition Correlation

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. A table is provided that correlates runway condition code to runway surface condition description and reported braking action that can then be used to determine the appropriate Normal Configuration Landing Distance or Non-Normal Configuration Landing Distance.

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are 115% of the actual landing distance. The Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, four-engine maximum reverse thrust, and auto speedbrakes.

To use these tables, determine the reference landing distance for the selected braking configuration and reported braking action. Adjust this reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is applied independently to the reference landing distance. A correction for use of manual speedbrakes is provided in the table notes.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" reported braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing. Landing distances and adjustments are provided for dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are representative of the actual landing distance, and are not factored. The Non-Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, and maximum available symmetrical reverse thrust.

Tables for Non-Normal Configuration Landing Distance in this section are similar in format and used in the same manner as tables for the Normal Configuration Landing Distance previously described.

Landing Climb Limit Weight

Enter the Landing Climb Limit Weight table with airport OAT and pressure altitude and read landing climb limit weight. Apply the noted adjustments as required.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. Although for normal operations most landings are at weights below the AFM quick turnaround limit weight, brakes can still get hot enough that cooling is recommended. Use of the recommended cooling schedule can help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Reference Brake Energy table (Table 1) with 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 Event Adjusted Brake Energy table (Table 2) for no reverse thrust or 4 engine reverse thrust 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 (Table 3) 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 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 on the GEAR synoptic display and disappears as the hottest brake cools to an indication of 4. Note that even without an EICAS advisory message, brake cooling is recommended.

One Engine Inoperative

Max Continuous %N1

Power setting is based on one engine inoperative with packs on and anti-ice bleeds off. Enter the table with pressure altitude and KIAS 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 Driftdown Speed/Level Off Altitude 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.

Level off altitude is dependent on air temperature (ISA deviation). Note that the maximum altitude shown has been reduced by 1000 ft to maintain consistency with the FMC.

Long Range Cruise Altitude Capability

The Long Range Cruise Altitude Capability table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 1000 ft to maintain consistency with the FMC.

Long Range Cruise Control

The Long Range Cruise Control table provides target %N1, one engine inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect fuel burn per engine.

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 are based on three-engine Long Range Cruise speed and .84/290/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table (Table 1) and read Fuel and Time (Table 2) required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the Fuel Required Adjustment table (Table 3) with fuel required for the reference weight and the actual weight at checkpoint.

Holding

Power setting required (%N1), indicated airspeed, and fuel flow are shown for one engine inoperative holding based on the recommended speeds. Fuel flow is based on a racetrack holding pattern and may be reduced by 5% for holding in straight and level flight.

Two Engines Inoperative

Driftdown Speed/Level Off Altitude

The Driftdown Speed/Level Off Altitude table shows optimum driftdown speed as a function of cruise weight at the start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off.

Level off altitude is dependent on air temperature (ISA deviation). Note that the maximum altitude shown has been reduced by 2000 ft to maintain consistency with the FMC.

Driftdown/LRC Cruise Range Capability

This table shows range capability from the start of driftdown until the airplane levels off. As weight decreases due to fuel burn, the airplane accelerates to Long Range Cruise speed and maintains this speed at the level off altitude.

To determine fuel required, enter the Ground to Air Miles Conversion table (Table 1) with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Next, enter the Driftdown/Cruise Fuel and Time table (Table 2) with air distance and weight at start of driftdown to determine fuel and time required.

Long Range Cruise Altitude Capability

The Long Range Cruise Altitude Capability table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 2000 ft to be consistent with the FMC logic.

Long Range Cruise Control

The Long Range Cruise Control table provides target %N1, two engines inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect fuel burn for each engine.

Gear Down

This section contains performance for airplane operation with landing gear extended for all phases of flight. Data are based on engine bleeds for normal air conditioning.

Note: The FMC does not contain special provisions for operation with landing gear extended. As a result, the FMC 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.

DO NOT USE FOR FLIGHT

747 Flight Crew Operations Manual

Performance Inflight - QRH

Chapter PI-QRH

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General

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Errata (NOE) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Serial and tabulation number are supplied by Boeing.

Airplane Number	Registry Number
806	Intercontinental
914	Freighter

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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 (310/.83)**Flaps Up, Max Climb Thrust**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
40000	PITCH ATT	4.5	5.0				
	V/S (FT/MIN)	1600	1000				
35000	PITCH ATT	5.0	5.0	5.0	5.0	5.0	
	V/S (FT/MIN)	2700	2000	1400	900	400	
30000	PITCH ATT	4.5	4.5	4.5	4.5	4.5	5.0
	V/S (FT/MIN)	2500	2000	1500	1200	800	500
20000	PITCH ATT	7.5	7.0	6.5	6.5	6.5	6.5
	V/S (FT/MIN)	3900	3200	2600	2100	1700	1400
10000	PITCH ATT	10.5	9.5	9.0	8.5	8.5	8.5
	V/S (FT/MIN)	5600	4500	3800	3200	2700	2200
SEA LEVEL	PITCH ATT	14.5	12.5	11.5	11.0	10.5	10.5
	V/S (FT/MIN)	6700	5500	4600	3900	3400	2900

Cruise (.83/310)**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
40000	PITCH ATT	3.0	3.5	4.5			
	%N1	83.4	87.1	92.4			
35000	PITCH ATT	2.0	2.5	3.0	4.0	4.5	
	%N1	80.2	82.4	85.1	88.6	93.5	
30000	PITCH ATT	1.5	2.0	2.5	3.0	3.5	4.0
	%N1	79.1	80.3	82.2	84.5	87.1	90.4
25000	PITCH ATT	2.0	2.5	3.0	3.5	4.0	5.0
	%N1	75.0	76.2	78.0	80.3	82.7	85.8
20000	PITCH ATT	2.0	2.5	3.0	3.5	4.0	5.0
	%N1	71.1	72.1	73.8	75.9	78.2	81.0
15000	PITCH ATT	2.0	2.5	3.0	3.5	4.0	5.0
	%N1	67.4	68.3	69.9	71.9	74.0	76.6

Descent (.83/310)**Flaps Up, Idle Thrust**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
40000	PITCH ATT	0.0	0.5	1.5	2.0	0.5	-2.0
	V/S (FT/MIN)	-2600	-2500	-2600	-2800	-3100	-5900
35000	PITCH ATT	-2.0	-1.0	0.0	0.5	1.0	2.0
	V/S (FT/MIN)	-3300	-3000	-2900	-2900	-3000	-2300
30000	PITCH ATT	-1.5	-0.5	0.0	0.5	1.5	2.0
	V/S (FT/MIN)	-2700	-2400	-2200	-2100	-2000	-2100
20000	PITCH ATT	-1.5	-0.5	0.5	1.0	1.5	2.5
	V/S (FT/MIN)	-2500	-2200	-2000	-1900	-1900	-1900
10000	PITCH ATT	-1.5	-0.5	0.0	1.0	1.5	2.0
	V/S (FT/MIN)	-2300	-2000	-1800	-1700	-1700	-1700
SEA LEVEL	PITCH ATT	-1.5	-0.5	0.0	1.0	1.5	2.5
	V/S (FT/MIN)	-2000	-1800	-1600	-1500	-1500	-1500

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding (Flaps Up Maneuvering Speed)**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		450	550	650	750	850	950
10000	PITCH ATT	5.5	6.0	6.5	6.5	7.0	7.0
	%N1	51.8	56.0	59.9	63.4	66.9	70.3
	KIAS	205	217	229	241	250	262

Terminal Area (5000 FT)**%N1 for Level Flight**

FLAP POSITION		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
FLAPS UP (GEAR UP)	PITCH ATT	5.0	5.5	6.0	6.0	6.5	6.5
	%N1	51.2	55.4	59.3	62.4	65.5	68.6
	KIAS	210	223	235	244	255	267
FLAPS 1 (GEAR UP)	PITCH ATT	7.0	7.5	7.5	8.0	8.5	8.5
	%N1	56.1	60.4	64.3	67.9	71.3	74.2
	KIAS	190	203	214	224	235	244
FLAPS 5 (GEAR UP)	PITCH ATT	7.5	8.0	8.0	8.5	9.0	9.0
	%N1	55.9	60.7	64.9	68.5	72.2	75.4
	KIAS	170	183	195	204	215	224
FLAPS 10 (GEAR UP)	PITCH ATT	8.0	8.0	8.0	8.0	8.5	9.0
	%N1	56.1	60.8	64.8	68.7	72.5	76.0
	KIAS	152	167	181	192	198	205
FLAPS 20 (GEAR DOWN)	PITCH ATT	6.0	6.0	5.5	6.0	6.5	6.5
	%N1	63.4	68.4	72.7	77.4	81.3	84.9
	KIAS	142	155	168	176	185	195

Final Approach (1500 FT)**Gear Down, %N1 for 3° Glideslope**

FLAP POSITION (VREF+INCREMENT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
FLAPS 25 (VREF25+10)	PITCH ATT	1.0	1.0	1.0	1.0	1.5	1.5
	%N1	52.5	56.6	60.6	64.0	66.9	69.9
	KIAS	141	154	166	177	186	196
FLAPS 30 (VREF30+10)	PITCH ATT	0.5	0.5	0.5	1.0		
	%N1	55.4	59.9	64.0	67.6	*	*
	KIAS	138	151	162	173		

* Exceeds flap placard speed.

Go-Around (1500 FT)**Flaps 20, Gear Up, Go-Around Thrust, Maneuver Speed**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		500	600	700	800	900	1000
10000	PITCH ATT	18.5	15.0	12.5	11.0	10.0	9.0
	VS (FT/MIN)	3700	3000	2400	1900	1500	1200
	KIAS	142	156	168	177	187	197
5000	PITCH ATT	21.0	17.0	14.5	13.0	11.5	10.5
	VS (FT/MIN)	4100	3400	2800	2300	1800	1500
	KIAS	142	155	168	176	185	195
SEA LEVEL	PITCH ATT	21.0	17.5	14.5	13.0	12.0	11.0
	VS (FT/MIN)	3900	3200	2700	2200	1800	1500
	KIAS	142	155	167	175	184	194

ISFD Airspeed and Altitude Correction**Applicable to low speed operations below 15000 ft pressure altitude****Flaps Up, Gear Up****Table 1 of 2: ISFD Airspeed**

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
200	199	200	201	202	204	207	211
210	209	209	210	211	212	214	217
220	219	219	219	220	221	223	225
240	239	239	239	239	240	241	242
260	259	258	258	259	259	260	261
280	279	278	278	278	279	279	279
300	299	298	298	298	298	298	299
320	319	318	318	318	318	318	318
340	339	339	338	338	338	338	338
360	359	359	358	358	358	358	358

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
200	20	10	-10	-40	-80	-140	-220
210	30	20	0	-20	-50	-100	-160
220	30	30	10	-10	-30	-70	-120
240	40	40	30	20	0	-30	-60
260	40	50	50	40	30	10	-20
280	40	50	50	50	50	40	20
300	40	50	60	60	60	60	50
320	40	60	60	70	70	70	70
340	40	60	70	70	80	80	80
360	30	60	70	80	90	90	100

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 1, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
180	180	181	183	185	187	190	195
190	190	191	192	193	195	198	201
200	199	200	201	202	204	206	208
210	209	210	211	212	213	214	216
220	219	219	220	221	222	223	225
240	239	239	239	240	241	242	243
260	259	259	259	259	260	261	261
280	278	278	279	279	279	280	280
300	298	298	298	298	299	299	300

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
180	0	-20	-50	-80	-130	-190	-260
190	10	-10	-40	-70	-100	-150	-210
200	10	0	-30	-50	-80	-120	-170
210	20	10	-10	-40	-60	-100	-140
220	30	10	0	-20	-50	-80	-110
240	30	30	20	0	-20	-50	-70
260	40	40	30	20	0	-20	-40
280	50	50	50	40	30	10	-10
300	60	60	60	50	40	30	20

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 5, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
160	161	162	164	167	171	179	
164	164	165	167	170	174	179	
168	168	169	171	173	176	181	188
172	172	173	174	176	179	183	189
176	176	177	178	180	182	186	190
180	180	181	182	183	185	188	192
190	189	190	191	192	194	196	199
200	199	200	200	201	203	204	206
210	209	209	210	211	212	213	214
220	219	219	219	220	221	222	223
240	239	239	239	239	240	241	242
260	258	258	259	259	259	260	260
280	278	278	278	278	279	279	279

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
160	-10	-30	-60	-110	-180	-280	
164	0	-30	-60	-100	-160	-240	
168	0	-20	-50	-90	-140	-210	-310
172	0	-20	-40	-80	-120	-190	-270
176	10	-10	-40	-70	-110	-170	-240
180	10	-10	-30	-60	-100	-150	-220
190	20	0	-20	-40	-70	-110	-170
200	20	10	-10	-30	-50	-90	-130
210	30	20	0	-20	-40	-70	-100
220	30	20	10	0	-20	-50	-80
240	40	40	30	20	0	-20	-40
260	40	50	40	30	20	10	-10
280	50	50	50	50	40	30	20

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 10, Gear Up

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
140	140	142	146	152			
144	144	146	149	153			
148	148	149	152	155	163		
152	152	153	155	158	163		
156	156	157	158	161	165	173	
160	159	160	162	164	167	173	
164	163	164	165	167	170	174	182
168	167	168	169	170	173	176	182
172	171	172	173	174	176	179	183
176	175	175	176	177	179	182	185
180	179	179	180	181	182	185	188
190	189	189	190	190	191	193	195
200	198	199	199	200	201	202	203
210	208	208	209	209	210	211	212
220	218	218	218	219	219	220	221
240	238	238	238	238	239	239	240
260	258	258	258	258	258	258	259

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
140	-10	-30	-80	-170			
144	0	-30	-70	-130			
148	0	-20	-50	-110	-210		
152	0	-10	-40	-90	-170		
156	10	-10	-30	-80	-140	-250	
160	10	0	-30	-60	-120	-200	
164	10	0	-20	-50	-100	-170	-280
168	20	0	-20	-40	-80	-140	-230
172	20	10	-10	-30	-70	-120	-190
176	20	10	0	-30	-60	-100	-160
180	20	10	0	-20	-50	-90	-140
190	30	20	10	-10	-30	-60	-100
200	40	30	20	10	-10	-30	-60
210	40	40	30	20	0	-20	-40
220	40	40	40	30	10	0	-20
240	50	50	50	50	40	20	10
260	50	60	60	60	60	50	30

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 20, Gear Up and Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
132	130	131	133	137			
136	134	135	136	139	146		
140	138	138	139	142	146		
144	142	142	143	145	148	155	
148	146	146	147	148	150	155	
152	150	150	150	151	153	157	163
156	154	154	154	155	156	159	163
160	158	157	158	158	160	162	165
164	162	161	161	162	163	165	167
168	165	165	165	166	167	168	170
172	169	169	169	170	170	171	173
176	173	173	173	173	174	175	176
180	177	177	177	177	178	178	179
190	187	187	187	187	187	187	188
200	197	197	197	197	197	197	197
210	207	207	207	207	207	207	207
220	218	217	217	217	217	216	217
240	238	237	237	237	236	236	236

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
132	30	10	-10	-70			
136	30	20	0	-40	-130		
140	30	30	10	-30	-90		
144	40	30	20	-10	-60	-150	
148	40	40	20	0	-40	-110	
152	40	40	30	10	-20	-70	-170
156	40	40	40	20	-10	-50	-120
160	40	40	40	30	10	-30	-80
164	40	50	40	30	20	-10	-60
168	50	50	50	40	30	0	-30
172	50	50	50	50	30	10	-20
176	50	50	50	50	40	20	0
180	50	50	60	50	50	30	10
190	50	60	60	60	60	50	40
200	60	60	70	70	70	70	60
210	60	70	70	70	80	80	70
220	60	70	80	80	80	90	80
240	60	80	90	90	100	100	100

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 25, Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	118	119	122				
124	122	122	124				
128	126	126	127	131			
132	129	130	131	133			
136	133	134	134	136	139		
140	137	137	138	139	141		
144	141	141	142	142	144	148	
148	145	145	145	146	147	150	
152	149	149	149	150	150	152	156
156	153	153	153	153	154	155	158
160	157	157	157	157	158	159	160
170	167	167	167	167	167	167	168
180	177	177	177	176	177	177	177
190	187	187	186	186	186	186	187
200	197	197	196	196	196	196	196
220	217	217	217	216	216	216	216

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	30	20	-20				
124	30	20	0				
128	30	30	10	-40			
132	40	30	20	-10			
136	40	40	30	0	-50		
140	40	40	30	20	-20		
144	40	40	40	30	0	-50	
148	50	50	40	30	10	-30	
152	50	50	50	40	30	-10	-60
156	50	50	50	40	30	10	-30
160	50	50	50	50	40	30	-10
170	50	60	60	60	50	50	30
180	60	60	70	70	70	60	50
190	60	70	70	80	80	80	70
200	60	70	80	80	90	90	80
220	60	80	80	90	100	100	110

Actual altitude = ISFD altitude + pressure altitude adjustment.

ISFD Airspeed and Altitude Correction

Applicable to low speed operations below 15000 ft pressure altitude

Flaps 30, Gear Down

Table 1 of 2: ISFD Airspeed

TARGET AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	118	119	122				
124	122	122	124				
128	125	126	127	131			
132	129	129	130	133			
136	133	133	134	136	140		
140	137	137	137	139	141		
144	141	141	141	142	144	148	
148	145	145	145	146	147	150	
152	149	149	149	149	150	152	156
156	153	153	153	153	154	155	158
160	157	157	157	157	157	158	160
170	168	167	167	167	167	167	168
180	178	177	177	176	176	176	177
190	188	187	187	186	186	186	186

Table 2 of 2: Pressure Altitude Adjustment

ISFD AIRSPEED (KIAS)	WEIGHT (1000 LB)						
	400	500	600	700	800	900	1000
120	30	20	-20				
124	30	30	0				
128	40	30	10	-40			
132	40	40	20	-10			
136	40	40	30	10	-50		
140	40	40	40	20	-20		
144	40	50	40	30	0	-60	
148	40	50	50	40	20	-30	
152	40	50	50	50	30	0	-70
156	40	50	50	50	40	10	-30
160	40	50	60	50	50	30	-10
170	40	60	60	60	60	50	40
180	40	60	70	70	70	70	60
190	40	60	70	80	80	80	80

Actual altitude = ISFD altitude + pressure altitude adjustment.

Max Climb %N1

Based on engine bleed for packs on, engine and wing anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KCAS OR MACH)									
	0	5	10	15	20	25	30	35	40	45
	340	340	340	340	340	340	0.81	0.84	0.84	0.84
60	91.0	91.6	92.9	94.1	96.1	97.6	99.8	101.2	101.5	100.7
50	92.8	93.2	93.8	93.1	94.7	96.2	98.3	99.7	100.0	99.2
40	94.2	95.0	95.4	94.8	95.0	94.9	96.7	98.2	98.4	97.7
30	92.7	95.5	97.0	96.4	96.6	96.5	95.2	96.6	96.8	96.1
20	91.2	93.9	96.6	97.9	98.2	98.0	96.9	95.5	95.2	94.5
15	90.4	93.1	95.8	97.3	99.0	98.9	97.8	96.5	95.9	95.2
10	89.6	92.3	95.0	96.5	98.7	99.7	98.7	97.6	97.0	96.3
5	88.8	91.5	94.1	95.6	97.9	99.6	99.7	98.6	98.0	97.3
0	88.0	90.7	93.3	94.8	97.0	98.7	100.8	99.6	99.0	98.3
-5	87.2	89.8	92.4	93.9	96.1	97.8	101.1	100.8	100.0	99.3
-10	86.4	89.0	91.5	93.0	95.2	96.8	100.2	101.4	100.9	100.3
-15	85.5	88.1	90.7	92.1	94.3	95.9	99.2	101.0	100.9	100.8
-20	84.7	87.3	89.8	91.2	93.4	95.0	98.3	100.0	99.9	99.9
-25	83.9	86.4	88.9	90.3	92.4	94.0	97.3	99.0	98.9	98.9
-30	83.0	85.5	88.0	89.4	91.5	93.1	96.3	98.0	97.9	97.9
-35	82.2	84.7	87.1	88.5	90.6	92.1	95.3	97.0	96.9	96.8
-40	81.3	83.8	86.2	87.5	89.6	91.2	94.3	96.0	95.9	95.8

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	45
ENGINE ANTI-ICE ON	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5	-0.5	-0.5
ENGINE & WING ANTI-ICE ON	-0.7	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-0.9	-0.9	-0.9

Go-around %N1**Based on engine bleed for packs on and anti-ice off**

REPORTED OAT (°C)	TAT (°C)	AIRPORT PRESSURE ALTITUDE (1000 FT)										
		0	1	2	3	4	5	6	7	8	9	10
70	74	85.9	86.7	87.5	88.3	88.7	89.1	89.4	89.8	89.9	89.6	89.0
60	64	87.9	88.8	89.7	90.7	91.2	91.7	92.1	92.5	92.7	92.4	91.8
55	59	88.8	89.8	90.8	91.8	92.4	93.0	93.4	93.9	94.1	93.8	93.2
50	54	90.2	90.9	91.9	92.9	93.6	94.2	94.6	95.1	95.4	95.1	94.5
45	49	91.5	92.3	93.2	94.2	94.8	95.3	95.9	96.4	96.7	96.4	95.8
40	44	92.8	93.6	94.5	95.4	96.0	96.6	97.1	97.6	98.0	97.7	97.1
35	39	94.2	94.9	95.8	96.8	97.2	97.7	98.3	99.0	99.0	98.8	98.3
30	34	94.8	95.7	96.6	97.6	98.2	98.7	99.2	99.7	99.9	99.5	99.2
25	29	94.1	95.5	97.0	98.1	98.7	99.2	100.3	100.8	100.7	100.3	99.9
20	24	93.3	94.7	96.2	97.7	98.9	100.1	100.9	101.7	102.2	101.6	100.7
15	19	92.5	93.9	95.4	96.8	98.0	99.3	100.7	102.4	102.9	102.4	101.6
10	14	91.7	93.1	94.5	96.0	97.2	98.5	99.8	101.5	102.5	102.5	102.5
5	8	90.8	92.1	93.5	95.0	96.2	97.4	98.8	100.4	101.4	101.4	101.5
0	3	90.0	91.3	92.7	94.2	95.3	96.6	97.9	99.6	100.5	100.5	100.7
-10	-7	88.3	89.6	91.0	92.4	93.6	94.9	96.2	97.8	98.8	98.8	98.9
-20	-17	86.6	87.9	89.3	90.7	91.9	93.2	94.5	96.1	97.0	97.0	97.1
-30	-27	84.9	86.2	87.6	89.0	90.2	91.4	92.7	94.3	95.2	95.2	95.3
-40	-37	83.2	84.4	85.8	87.2	88.5	89.7	90.9	92.5	93.4	93.4	93.5
-50	-47	81.4	82.7	84.0	85.5	86.7	87.9	89.1	90.6	91.5	91.6	91.7

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)										
	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4

VREF (KIAS)

WEIGHT (1000 LB)	FLAPS	
	30	25
1000	186	190
950	181	184
900	175	179
850	170	173
800	165	168
750	160	163
700	154	158
650	148	152
600	142	145
550	136	138
500	129	132
450	122	125

Takeoff Speeds - Dry Runway**Max Takeoff Thrust****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	166	182	196
950	162	177	192
900	157	172	188
850	151	165	183
800	146	159	178
750	140	153	173
700	134	146	167
650	127	139	161
600	120	132	155
550	112	125	149
500	103	117	142
450	94	109	136

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	17	17							8	8							-2	-2						
60	12	12	15	17					6	6	8	9					-2	-2	-2	-2				
50	7	8	11	13	16	18	20		4	4	6	8	9	10	12		-1	-1	-2	-2	-2	-3	-3	
40	3	4	7	9	12	15	18		2	2	4	5	7	8	10		-1	-1	-1	-1	-2	-2	-3	
30	0	0	3	6	8	11	14		0	0	2	4	5	7	8		0	0	0	-1	-1	-2	-2	
20	0	0	2	4	6	9	12		0	0	1	2	4	5	7		0	0	0	0	-1	-1	-2	
10	0	0	2	4	6	8	11		0	0	1	2	3	5	6		0	0	0	0	-1	-1	-1	
-40	0	0	2	4	6	8	11		0	0	1	2	3	5	6		0	0	0	0	-1	-1	-1	
-60	1	1	2	4	6	8	11		0	0	1	2	3	5	6		0	0	0	0	-1	-1	-1	

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-6	-3	0	3	5		-4	-3	-1	0	1	2	3	3		
950	-5	-2	0	3	5		-4	-3	-1	0	1	2	3	3		
900	-5	-2	0	2	5		-4	-3	-1	0	1	2	3	3		
850	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
800	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
750	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3		
700	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3		
650	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
600	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
550	-3	-1	0	1	3		-3	-2	-1	0	1	2	2	3		
500	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

Takeoff Speeds - Dry Runway

Max Takeoff Thrust

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	133	126	130	121	124	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	133	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR							
	110	115	120	125	130	135	140	145
700 & ABV	164	164	165	165	165	166	166	167
650	158	158	159	159	159	160	161	166
600	152	152	152	153	153	155	160	165
550	146	146	146	147	149	154	159	164
500	139	140	140	143	148	153	158	163
450	133	133	137	142	147	152	157	162

Takeoff Speeds - Dry Runway**Max Takeoff Thrust****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	155	169	180
950	151	164	177
900	146	159	173
850	141	153	168
800	136	147	164
750	130	142	159
700	124	135	154
650	117	129	148
600	110	122	143
550	103	115	137
500	94	107	131
450	86	100	125

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	17	17						8	8						-2	-2								
60	12	12	15	17				6	6	8	9				-2	-2	-2	-2						
50	7	8	11	13	16	18	20	4	4	6	8	9	10	12	-1	-1	-2	-2	-2	-3	-3			
40	3	4	7	9	12	15	18	2	2	4	5	7	8	10	-1	-1	-1	-1	-2	-2	-3			
30	0	0	3	6	8	11	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-2			
20	0	0	2	4	6	9	12	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-40	0	0	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	1	1	2	4	6	8	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-3	0	3	5		-4	-3	-1	0	1	2	3	3
950	-5	-2	0	3	5		-4	-3	-1	0	1	2	3	3
900	-5	-2	0	2	5		-4	-3	-1	0	1	2	3	3
850	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3
800	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3
750	-4	-2	0	2	4		-4	-2	-1	0	1	2	2	3
700	-3	-2	0	2	3		-4	-2	-1	0	1	2	2	3
650	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3
600	-3	-1	0	2	3		-3	-2	-1	0	1	2	2	3
550	-3	-1	0	1	3		-3	-2	-1	0	1	2	2	3
500	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3

*V1 not to exceed VR

Takeoff Speeds - Dry Runway

Max Takeoff Thrust

Flaps 20

Table 4 of 5: V1(MCG), and Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	133	126	130	121	124	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	133	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
800 & ABV	161	162	162	163	163	164	164	164
750	157	157	157	158	158	158	159	162
700	151	151	151	152	152	153	156	161
650	145	146	146	146	147	151	155	160
600	140	140	141	141	145	150	155	160
550	134	135	136	139	144	149	154	159
500	126	129	133	138	143	149	154	159
450	122	127	133	138	143	148	153	158

Takeoff Speeds - Wet Runway**Max Takeoff Thrust****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	154	182	196
950	149	177	192
900	143	172	188
850	136	165	183
800	130	159	178
750	124	153	173
700	116	146	167
650	109	139	161
600	102	132	155
550	94	125	149
500	85	117	142
450	77	109	136

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	19	19						8	8						-2	-2								
60	14	15	17	19				6	7	8	9				-2	-2	-2	-2						
50	8	9	13	15	17	20	23	4	4	6	7	9	10	12	-1	-1	-2	-2	-2	-3	-3			
40	2	4	7	10	13	15	19	2	2	4	5	7	8	10	-1	-1	-1	-1	-2	-2	-3			
30	0	0	2	5	8	12	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-3			
20	0	0	1	4	6	8	11	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2			
10	1	1	2	4	5	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
0	1	1	3	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-20	2	2	3	5	7	9	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-40	3	3	4	6	8	10	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	4	4	5	7	9	11	13	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6
950	-6	-2	0	5	8		-6	-3	-1	0	2	4	5	7
900	-6	-2	0	4	8		-6	-4	-1	0	2	4	5	7
850	-5	-2	0	4	7		-7	-4	-1	0	2	4	5	7
800	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
750	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
700	-4	-2	0	4	6		-7	-4	-1	0	2	4	6	7
650	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7
600	-4	-1	0	3	6		-7	-4	-1	0	2	4	6	7
550	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
500	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
450	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7

*V1 not to exceed VR

Takeoff Speeds - Wet Runway

Max Takeoff Thrust

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	134	126	130	121	125	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	134	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
700 & ABV	164	164	165	165	165	166	166	167
650	158	158	159	159	159	160	161	166
600	152	152	152	153	153	155	160	165
550	146	146	146	147	149	154	159	164
500	139	140	140	143	148	153	158	163
450	133	133	137	142	147	152	157	162

Takeoff Speeds - Wet Runway**Max Takeoff Thrust****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	144	169	180
950	139	164	177
900	133	159	173
850	127	153	168
800	121	147	164
750	115	142	159
700	108	135	154
650	101	129	148
600	94	122	143
550	87	115	137
500	79	107	131
450	70	100	125

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	18	18						8	8						-2	-2								
60	12	13	15	18				6	7	8	9				-2	-2	-2	-2						
50	7	8	11	13	16	18	21	4	4	6	7	8	11	13	-1	-1	-2	-2	-2	-3	-3			
40	2	3	6	8	12	14	17	2	2	4	5	7	9	11	-1	-1	-1	-1	-2	-2	-3			
30	0	0	2	5	8	10	14	0	0	2	4	5	7	8	0	0	0	-1	-1	-2	-2			
20	0	0	1	4	6	8	11	0	0	1	2	4	5	7	0	0	0	0	-1	-1	-2			
10	0	0	2	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
0	0	0	2	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-20	0	0	2	4	6	8	10	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-40	2	2	4	5	7	9	11	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			
-60	3	3	5	6	8	10	12	0	0	1	2	3	5	6	0	0	0	0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-2	0	5	8		-5	-3	-1	0	2	4	5	6
950	-6	-2	0	5	8		-6	-3	-1	0	2	4	5	7
900	-6	-2	0	4	8		-6	-4	-1	0	2	4	5	7
850	-5	-2	0	4	7		-7	-4	-1	0	2	4	5	7
800	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
750	-5	-2	0	4	7		-7	-4	-1	0	2	4	6	7
700	-4	-2	0	4	6		-7	-4	-1	0	2	4	6	7
650	-4	-1	0	4	6		-7	-4	-1	0	2	4	6	7
600	-4	-1	0	3	6		-7	-4	-1	0	2	4	6	7
550	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
500	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7
450	-3	-1	0	3	5		-7	-4	-1	0	2	4	6	7

*V1 not to exceed VR

Takeoff Speeds - Wet Runway

Max Takeoff Thrust

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	122	125	121	124										
50	126	129	124	127	119	122	116	120	114	118				
40	133	136	132	134	126	129	121	124	116	120	111	115	108	112
30	138	140	138	140	132	135	127	130	121	125	116	120	110	114
20	138	140	138	140	134	137	130	134	126	130	121	125	114	118
0	139	141	138	140	135	137	131	134	127	130	123	126	118	122
-60	140	140	139	140	135	137	131	134	128	130	123	126	119	122

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)							
	110	115	120	125	130	135	140	145
800 & ABV	161	162	162	163	163	164	164	164
750	157	157	157	158	158	158	159	162
700	151	151	151	152	152	153	156	161
650	145	146	146	146	147	151	155	160
600	140	140	141	141	145	150	155	160
550	134	135	136	139	144	149	154	159
500	126	129	133	138	143	149	154	159
450	122	127	133	138	143	148	153	158

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	700
8000	900
10000	1050
12000	1150
14000	1250
16000	1400

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
1000	-4	-7	-7	-4	-4					
800	-3	-6	-6	-3	-3					
600	-2	-5	-5	-3	-3					
400	-1	-3	-3	-2	-2					
200	-1	-1	-1	-1	-1					
0	0	0	0	0	0	0	0	0	0	0
-200	1	1	1	1	1	2	2	2	2	2
-400	1	1	1	1	1	2	2	2	2	2
-600	1	1	1	1	1	2	2	2	2	2
-800	1	1	1	1	1	2	2	2	2	2
-1000	1	1	1	1	1	2	2	2	2	2

Use of clearway not allowed on wet runways.
V1 not to exceed VR.

TO1 Takeoff Speeds - Dry Runway**10% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	174	185	196
950	169	180	192
900	164	174	187
850	158	168	182
800	152	162	177
750	147	156	172
700	140	149	166
650	133	142	160
600	125	135	154
550	117	127	148
500	108	120	142
450	99	111	135

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	14	15						7	8						-2	-2					
60	10	11	13	15				5	6	7	8				-1	-2	-2	-2			
50	6	7	9	11	13	16	18	3	4	5	7	8	9	10	-1	-1	-1	-2	-2	-2	-3
40	2	3	6	8	10	13	15	1	2	4	5	6	8	9	0	0	-1	-1	-1	-2	-2
30	0	0	2	5	8	10	13	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	8	10	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1
10	0	0	2	3	5	7	8	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
0	0	0	2	3	5	7	9	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-20	0	0	2	3	5	7	9	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-40	1	1	2	4	6	8	9	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-60	1	1	3	4	6	8	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)								
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40	
1000	-6	-3	0	3	5	-4	-3	-1	0	1	1	2	3	
950	-5	-3	0	2	5	-4	-2	-1	0	1	1	2	3	
900	-5	-2	0	2	4	-4	-2	-1	0	1	1	2	3	
850	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3	
800	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3	
750	-4	-2	0	2	3	-3	-2	-1	0	1	1	2	3	
700	-3	-2	0	2	3	-3	-2	-1	0	1	1	2	3	
650	-3	-1	0	2	3	-3	-2	-1	0	1	1	2	3	
600	-3	-1	0	2	3	-3	-2	-1	0	1	1	2	3	
550	-3	-1	0	1	3	-3	-2	-1	0	1	1	2	3	
500	-2	-1	0	1	3	-3	-2	-1	0	1	2	2	3	
450	-2	-1	0	1	2	-3	-2	-1	0	1	2	2	3	

*V1 not to exceed VR

TO1 Takeoff Speeds - Dry Runway

10%Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
650 & ABV	159	159	159	159	154	151	155
600	152	152	152	153	150	150	154
550	145	145	146	146	146	149	153
500	138	138	139	140	142	147	152
450	131	132	132	136	141	146	151

TO1 Takeoff Speeds - Dry Runway**10% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	163	172	181
950	158	167	177
900	153	161	172
850	147	156	168
800	142	150	163
750	136	144	158
700	129	137	153
650	123	131	148
600	116	124	142
550	108	117	137
500	99	110	131
450	91	102	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	14	15							7	8							-2	-2						
60	10	11	13	15					5	6	7	8					-1	-2	-2	-2				
50	6	7	9	11	13	16	18		3	4	5	7	8	9	10		-1	-1	-1	-2	-2	-2	-3	
40	2	3	6	8	10	13	15	1	2	4	5	6	8	9	0		0	0	-1	-1	-1	-2	-2	
30	0	0	2	5	8	10	13	0	0	2	3	5	6	8	0		0	0	0	-1	-1	-1	-2	
20	0	0	1	3	5	8	10	0	0	1	2	3	5	7	0		0	0	0	0	-1	-1	-1	
10	0	0	2	3	5	7	8	0	0	1	2	3	4	6	0		0	0	0	0	0	-1	-1	
0	0	0	2	3	5	7	9	0	0	1	2	3	4	6	0		0	0	0	0	0	0	-1	-1
-20	0	0	2	3	5	7	9	0	0	1	2	3	4	6	0		0	0	0	0	0	0	-1	-1
-40	1	1	2	4	6	8	9	0	0	1	2	3	4	6	0		0	0	0	0	0	0	-1	-1
-60	1	1	3	4	6	8	10	0	0	1	2	3	4	6	0		0	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-3	0	3	5		-4	-3	-1	0	1	1	2	3
950	-5	-3	0	2	5		-4	-2	-1	0	1	1	2	3
900	-5	-2	0	2	4		-4	-2	-1	0	1	1	2	3
850	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3
800	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3
750	-4	-2	0	2	3		-3	-2	-1	0	1	1	2	3
700	-3	-2	0	2	3		-3	-2	-1	0	1	1	2	3
650	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3
600	-3	-1	0	2	3		-3	-2	-1	0	1	1	2	3
550	-3	-1	0	1	3		-3	-2	-1	0	1	1	2	3
500	-2	-1	0	1	3		-3	-2	-1	0	1	2	2	3
450	-2	-1	0	1	2		-3	-2	-1	0	1	2	2	3

*V1 not to exceed VR

TO1 Takeoff Speeds - Dry Runway

10% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
750 & ABV	152	152	152	152	153	153	153
700	151	151	151	152	152	152	153
650	145	146	146	146	146	146	150
600	139	140	140	141	141	144	150
550	133	134	134	135	139	144	149
500	127	128	129	133	138	143	148
450	121	122	127	132	137	143	148

TO1 Takeoff Speeds - Wet Runway**10% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
1000	162	185	196
950	157	180	192
900	150	174	187
850	144	168	182
800	137	162	177
750	130	156	172
700	123	149	166
650	115	142	160
600	108	135	154
550	100	127	148
500	91	120	142
450	83	111	135

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	16	17						7	8						-2	-2					
60	11	12	15	17				5	6	7	8				-1	-2	-2	-2			
50	6	7	10	13	15	17	21	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-3
40	2	2	5	8	11	14	17	1	2	3	5	6	8	9	-0	-0	-1	-1	-1	-2	-2
30	0	0	2	5	8	11	14	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	8	12	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1
10	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-20	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-40	2	2	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-60	3	3	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
950	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
900	-6	-3	0	4	7		-6	-3	-1	0	2	3	4	6
850	-6	-3	0	4	7		-6	-4	-1	0	2	3	5	6
800	-6	-2	0	4	7		-6	-4	-1	0	2	3	5	6
750	-5	-2	0	4	6		-6	-4	-1	0	2	4	5	6
700	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	6
650	-4	-2	0	3	6		-7	-4	-2	0	2	4	5	7
600	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	7
550	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	7
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7
450	-3	-1	0	3	4		-7	-4	-2	0	2	4	6	7

*V1 not to exceed VR

TO1 Takeoff Speeds - Wet Runway

10% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
650 & ABV	159	159	159	159	154	151	155
600	152	152	152	153	150	150	154
550	145	145	146	146	146	149	153
500	138	138	139	140	142	147	152
450	131	132	132	136	141	146	151

TO1 Takeoff Speeds - Wet Runway**10% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
1000	151	172	181
950	146	167	177
900	140	161	172
850	134	156	168
800	127	150	163
750	121	144	158
700	114	137	153
650	107	131	148
600	100	124	142
550	92	117	137
500	84	110	131
450	75	102	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	16	17						7	8						-2	-2					
60	11	12	15	17				5	6	7	8				-1	-2	-2	-2			
50	6	7	10	13	15	17	21	3	4	5	7	8	9	11	-1	-1	-1	-2	-2	-2	-3
40	2	2	5	8	11	14	17	1	2	3	5	6	8	9	-0	-0	-1	-1	-1	-2	-2
30	0	0	2	5	8	11	14	0	0	2	3	5	6	8	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	8	12	0	0	1	2	3	5	7	0	0	0	0	-1	-1	-1
10	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
0	0	0	2	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-20	1	1	2	4	5	7	10	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-40	2	2	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1
-60	3	3	4	5	6	8	11	0	0	1	2	3	4	6	0	0	0	0	0	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
950	-7	-3	0	4	8		-5	-3	-1	0	1	3	4	5
900	-6	-3	0	4	7		-6	-3	-1	0	2	3	4	6
850	-6	-3	0	4	7		-6	-4	-1	0	2	3	5	6
800	-6	-2	0	4	7		-6	-4	-1	0	2	3	5	6
750	-5	-2	0	4	6		-6	-4	-1	0	2	4	5	6
700	-5	-2	0	3	6		-7	-4	-2	0	2	4	5	6
650	-4	-2	0	3	6		-7	-4	-2	0	2	4	5	7
600	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	7
550	-4	-1	0	3	5		-7	-4	-2	0	2	4	5	7
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7
450	-3	-1	0	3	4		-7	-4	-2	0	2	4	6	7

*V1 not to exceed VR

TO1 Takeoff Speeds - Wet Runway

10% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	116	120	114	118	113	116	111	114						
50	119	123	118	121	113	117	111	114	108	113	106	110	102	107
40	126	129	125	128	119	123	115	118	110	114	106	110	102	107
30	130	133	130	133	125	128	120	124	115	118	110	114	104	109
20	130	133	130	133	127	130	123	127	120	123	115	119	108	113
-60	132	133	131	133	128	130	125	127	121	124	117	121	113	116

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	105	110	115	120	125	130	135
750 & ABV	152	152	152	152	153	153	153
700	151	151	151	152	152	152	153
650	145	146	146	146	146	146	150
600	139	140	140	141	141	144	150
550	133	134	134	135	139	144	149
500	127	128	129	133	138	143	148
450	121	122	127	132	137	143	148

TO1 Maximum Allowable Clearway
10% Thrust Reduction

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	700
8000	900
10000	1050
12000	1150
14000	1250
16000	1350

TO1 Clearway and Stopway V1 Adjustments

10% Thrust Reduction

[illegible]

Use of clearway not allowed on wet runways.

V1 not to exceed VR.

TO2 Takeoff Speeds - Dry Runway**20% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
950	175	183	191
900	169	177	186
850	163	171	182
800	158	165	177
750	152	158	171
700	145	151	166
650	137	144	160
600	130	137	154
550	122	129	148
500	113	121	141
450	103	113	134

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10			
70	10	12						5	6						-2	-2								
60	9	10	12	15				4	5	7	8				-1	-1	-2	-2						
50	5	6	8	11	13	15	18	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2			
40	1	2	5	8	10	12	15	1	1	3	4	6	7	8	-0	-1	-1	-1	-1	-2	-2			
30	0	0	3	5	8	10	13	0	0	1	3	4	6	7	0	0	-0	-1	-1	-1	-1			
20	0	0	2	3	5	7	11	0	0	1	2	3	4	6	0	0	-0	-0	-1	-1	-1			
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1			
-40	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1			
-60	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1			

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)									
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40		
1000	-5	-3	0	3	5	-4	-2	-1	0	1	2	2	3		
950	-5	-2	0	2	5	-3	-2	-1	0	1	2	2	3		
900	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3		
850	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2		
800	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2		
750	-3	-1	0	2	3	-2	-2	-1	0	1	1	2	2		
700	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	2		
650	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	2		
600	-3	-1	0	2	3	-2	-1	-1	0	1	1	2	3		
550	-2	-1	0	2	3	-2	-1	-1	0	1	2	2	3		
500	-2	-1	0	2	3	-3	-2	-1	0	1	2	2	3		
450	-2	-1	0	2	3	-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
550 & ABV	145	145	145	146	146	146	149
500	138	138	139	139	139	143	148
450	131	132	132	133	137	142	147

TO2 Takeoff Speeds - Dry Runway**20% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
850	152	158	167
800	147	152	163
750	141	146	158
700	134	140	152
650	127	133	147
600	120	126	142
550	112	119	136
500	103	112	130
450	94	104	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	10	12						5	6						-2	-2					
60	9	10	12	15				4	5	7	8				-1	-1	-2	-2			
50	5	6	8	11	13	15	18	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2
40	1	2	5	8	10	12	15	1	1	3	4	6	7	8	-0	-1	-1	-1	-1	-2	-2
30	0	0	3	5	8	10	13	0	0	1	3	4	6	7	0	0	-0	-1	-1	-1	-2
20	0	0	2	3	5	7	11	0	0	1	2	3	4	6	0	0	-0	-0	-1	-1	-1
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1
-40	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1
-60	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	-0	-0	-1	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-5	-3	0	3	5		-4	-2	-1	0	1	2	2	3		
950	-5	-2	0	2	5		-3	-2	-1	0	1	2	2	3		
900	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	3		
850	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
800	-4	-2	0	2	4		-3	-2	-1	0	1	1	2	2		
750	-3	-1	0	2	3		-2	-2	-1	0	1	1	2	2		
700	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
650	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	2		
600	-3	-1	0	2	3		-2	-1	-1	0	1	1	2	3		
550	-2	-1	0	2	3		-2	-1	-1	0	1	2	2	3		
500	-2	-1	0	2	3		-3	-2	-1	0	1	2	2	3		
450	-2	-1	0	2	3		-3	-2	-1	0	1	2	2	3		

*V1 not to exceed VR

TO2 Takeoff Speeds - Dry Runway

20% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
650 & ABV	145	145	146	146	146	147	148
600	139	139	140	140	141	141	145
550	133	134	134	134	135	139	144
500	127	128	128	129	133	138	143
450	121	121	123	127	132	137	142

TO2 Takeoff Speeds - Wet Runway**20% Thrust Reduction****Flaps 10****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 10		
	V1	VR	V2
950	164	183	191
900	157	177	186
850	150	171	182
800	143	165	177
750	137	158	171
700	129	151	166
650	121	144	160
600	113	137	154
550	105	129	148
500	97	121	141
450	88	113	134

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1							VR							V2						
	PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	11	12						5	6						-2	-2					
60	10	11	13	15				4	5	7	8				-1	-1	-2	-2			
50	6	7	9	11	14	16	19	3	4	5	6	7	9	10	-1	-1	-1	-2	-2	-2	-2
40	1	2	5	7	10	12	16	1	1	3	4	6	7	8	0	-1	-1	-1	-1	-2	-2
30	0	0	2	4	7	10	13	0	0	1	3	4	6	7	0	0	0	-1	-1	-1	-2
20	0	0	1	3	5	7	10	0	0	1	2	3	4	6	0	0	0	0	-1	-1	-1
10	0	0	2	3	5	7	8	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
0	0	0	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
-20	1	1	2	3	5	7	9	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
-40	2	2	3	4	6	8	10	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1
-60	3	3	4	5	7	9	11	0	0	1	2	3	4	5	0	0	0	0	-1	-1	-1

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)									
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40		
1000	-6	-3	0	5	8		-4	-3	-1	0	1	3	4	5		
950	-6	-3	0	4	8		-4	-3	-1	0	1	3	4	5		
900	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
850	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5		
800	-6	-3	0	4	7		-6	-3	-1	0	1	3	4	5		
750	-6	-2	0	3	6		-6	-4	-2	0	1	3	4	5		
700	-5	-2	0	3	6		-6	-4	-2	0	1	3	4	6		
650	-5	-2	0	3	6		-6	-4	-2	0	2	3	4	6		
600	-4	-2	0	3	5		-6	-4	-2	0	2	3	5	6		
550	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	6		
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7		
450	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7		

*V1 not to exceed VR

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

Flaps 10

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
550 & ABV	145	145	145	146	146	146	149
500	138	138	139	139	139	143	148
450	131	132	132	133	137	142	147

TO2 Takeoff Speeds - Wet Runway**20% Thrust Reduction****Flaps 20****Table 1 of 5: V1, VR, V2 (KIAS)**

WEIGHT (1000 LB)	FLAPS 20		
	V1	VR	V2
850	139	158	167
800	133	152	163
750	127	146	158
700	120	140	152
650	112	133	147
600	105	126	142
550	97	119	136
500	89	112	130
450	80	104	124

Check V1(MCG), Minimum VR, V2 for Minimum VR and Minimum Takeoff Weight.

Table 2 of 5: V1, VR, V2 Adjustments (KIAS)*

TEMP (°C)	V1								VR								V2							
	PRESS ALT (1000 FT)								PRESS ALT (1000 FT)								PRESS ALT (1000 FT)							
	-2	0	2	4	6	8	10		-2	0	2	4	6	8	10		-2	0	2	4	6	8	10	
70	11	12							5	6							-2	-2						
60	10	11	13	15					4	5	7	8					-1	-1	-2	-2				
50	6	7	9	11	14	16	19		3	4	5	6	7	9	10		-1	-1	-1	-2	-2	-2	-2	
40	1	2	5	7	10	12	16		1	1	3	4	6	7	8		0	-1	-1	-1	-1	-2	-2	
30	0	0	2	4	7	10	13		0	0	1	3	4	6	7		0	0	0	-1	-1	-1	-2	
20	0	0	1	3	5	7	10		0	0	1	2	3	4	6		0	0	0	0	-1	-1	-1	
10	0	0	2	3	5	7	8		0	0	1	2	3	4	5		0	0	0	0	-1	-1	-1	
0	0	0	2	3	5	7	9		0	0	1	2	3	4	5		0	0	0	0	-1	-1	-1	
-20	1	1	2	3	5	7	9		0	0	1	2	3	4	5		0	0	0	0	-1	-1	-1	
-40	2	2	3	4	6	8	10		0	0	1	2	3	4	5		0	0	0	0	-1	-1	-1	
-60	3	3	4	5	7	9	11		0	0	1	2	3	4	5		0	0	0	0	-1	-1	-1	

*V1 not to exceed VR

Table 3 of 5: Slope and Wind V1 Adjustments (KIAS)*

WEIGHT (1000 LB)	SLOPE (%)						WIND (KTS)							
	-2	-1	0	1	2		-15	-10	-5	0	10	20	30	40
1000	-6	-3	0	5	8		-4	-3	-1	0	1	3	4	5
950	-6	-3	0	4	8		-4	-3	-1	0	1	3	4	5
900	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5
850	-6	-3	0	4	7		-5	-3	-1	0	1	3	4	5
800	-6	-3	0	4	7		-6	-3	-1	0	1	3	4	5
750	-6	-2	0	3	6		-6	-4	-2	0	1	3	4	5
700	-5	-2	0	3	6		-6	-4	-2	0	1	3	4	6
650	-5	-2	0	3	6		-6	-4	-2	0	2	3	4	6
600	-4	-2	0	3	5		-6	-4	-2	0	2	3	5	6
550	-4	-2	0	3	5		-7	-4	-2	0	2	4	5	6
500	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7
450	-3	-1	0	3	5		-7	-4	-2	0	2	4	5	7

*V1 not to exceed VR

TO2 Takeoff Speeds - Wet Runway

20% Thrust Reduction

Flaps 20

Table 4 of 5: V1(MCG), Minimum VR (KIAS)

TEMP (°C)	PRESSURE ALTITUDE (FT)													
	-2000		0		2000		4000		6000		8000		10000	
	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
70	110	113	108	111										
60	110	113	108	111	106	110	104	108						
50	113	116	111	114	107	110	104	108	102	106	100	104	97	101
40	119	122	118	121	113	116	108	112	104	108	100	104	97	101
30	122	125	122	125	117	121	113	116	108	112	103	107	98	102
20	123	125	122	125	119	123	116	119	112	116	108	112	102	106
-60	124	126	124	125	121	123	118	120	114	117	111	114	107	110

Table 5 of 5: V2 for Minimum VR (KIAS)

WEIGHT (1000 LB)	Min VR (KIAS)						
	100	105	110	115	120	125	130
650 & ABV	145	145	146	146	146	147	148
600	139	139	140	140	141	141	145
550	133	134	134	134	135	139	144
500	127	128	128	129	133	138	143
450	121	121	123	127	132	137	142

TO2 Maximum Allowable Clearway
20% Thrust Reduction

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	750
8000	950
10000	1100
12000	1200
14000	1300
16000	1400

TO2 Clearway and Stopway V1 Adjustments

20% Thrust Reduction

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
1000	-3	-3	-3	-3	-3					
800	-3	-3	-3	-3	-3					
600	-3	-3	-3	-3	-3					
400	-1	-1	-1	-1	-1					
200	0	0	0	0	0					
0	0	0	0	0	0	0	0	0	0	0
-200	1	1	1	1	1	1	1	1	1	1
-400	1	1	1	1	1	1	1	1	1	1
-600	1	1	1	1	1	1	1	1	1	1
-800	1	1	1	1	1	1	1	1	1	1
-1000	1	1	1	1	1	1	1	1	1	1

Use of clearway not allowed on wet runways.

V1 not to exceed VR.

Performance Inflight - QRH**Chapter PI-QRH****All Engine****Section 31****Holding****Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
1000	%N1	64.5	67.2	71.5	75.9	80.7	85.4	90.1			
	KIAS	266	269	272	274	316	322	316			
	FF/ENG	7040	6940	6960	6910	7240	7430	7410			
950	%N1	63	65.7	70.1	74.4	79.2	83.8	88.4			
	KIAS	261	264	266	265	308	314	316			
	FF/ENG	6660	6550	6550	6520	6810	6980	7000			
900	%N1	61.7	64.1	68.5	72.8	77.6	82.2	86.8	93		
	KIAS	255	258	259	258	299	305	307	283		
	FF/ENG	6300	6180	6160	6130	6390	6530	6500	6710		
850	%N1	60.3	62.5	66.8	71.2	75.9	80.5	85.1	90.4		
	KIAS	250	253	254	252	290	295	298	283		
	FF/ENG	5940	5820	5790	5740	5960	6090	6040	6170		
800	%N1	58.9	60.9	64.9	69.6	74.1	78.7	83.3	88.2		
	KIAS	245	247	248	247	281	286	288	283		
	FF/ENG	5570	5470	5420	5370	5550	5660	5590	5720		
750	%N1	57.4	59.4	63.1	67.7	72.3	76.9	81.5	86.4		
	KIAS	241	243	244	242	272	276	278	283		
	FF/ENG	5240	5140	5070	5010	5170	5230	5170	5350		
700	%N1	55.6	57.9	61.4	65.7	70.5	75	79.7	84.5	92	
	KIAS	235	238	238	236	262	266	268	272	252	
	FF/ENG	4930	4820	4740	4670	4850	4920	4770	4910	5190	
650	%N1	53.8	56.1	59.6	63.7	68.5	73	77.6	82.5	89.1	
	KIAS	230	232	232	230	252	256	257	261	252	
	FF/ENG	4650	4520	4460	4360	4550	4610	4390	4510	4720	
600	%N1	51.8	54.3	57.7	61.7	66.5	70.9	75.5	80.4	86.8	91.7
	KIAS	224	226	226	224	242	246	247	250	252	235
	FF/ENG	4380	4270	4220	4140	4200	4230	4020	4110	4350	4480
550	%N1	49.9	52.3	55.8	59.6	64.2	68.6	73.2	78.2	84.4	88.6
	KIAS	217	219	220	218	231	235	235	238	242	235
	FF/ENG	4120	4040	3980	3880	3860	3870	3660	3740	3920	4040
500	%N1	47.9	50.3	53.7	57.4	61.8	66.1	70.8	75.6	82	86
	KIAS	211	213	213	211	220	223	224	226	230	232
	FF/ENG	3850	3800	3700	3580	3540	3540	3300	3380	3530	3660
450	%N1	45.9	48.1	51.6	55.2	59.3	63.6	68.1	72.9	79.3	83.3
	KIAS	206	208	207	205	209	211	212	214	217	219
	FF/ENG	3590	3530	3420	3300	3240	3190	3070	3090	3190	3310

This table includes 5% additional fuel for holding in a racetrack pattern.

**Holding
Flaps 1**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
1000	%N1	70	73.2	77.8	82.8	88
	KIAS	243	244	246	248	250
	FF/ENG	8520	8500	8540	8590	8770
950	%N1	68.5	71.6	76.3	81.1	86.3
	KIAS	239	239	241	243	245
	FF/ENG	8080	8040	8080	8110	8250
900	%N1	67	70	74.6	79.4	84.5
	KIAS	234	234	236	237	239
	FF/ENG	7640	7600	7630	7640	7750
850	%N1	65.4	68.3	72.9	77.6	82.7
	KIAS	229	229	230	232	234
	FF/ENG	7210	7180	7180	7180	7280
800	%N1	63.7	66.6	71.1	75.8	80.8
	KIAS	223	224	225	226	228
	FF/ENG	6800	6740	6740	6730	6810
750	%N1	62.1	64.8	69.3	73.9	78.8
	KIAS	219	219	220	221	223
	FF/ENG	6380	6280	6310	6300	6350
700	%N1	60.4	63	67.4	72	76.7
	KIAS	214	214	215	216	217
	FF/ENG	5960	5860	5880	5870	5890
650	%N1	58.6	61.2	65.4	70	74.5
	KIAS	208	208	209	210	211
	FF/ENG	5540	5460	5460	5430	5450
600	%N1	56.6	59.2	63.3	67.8	72.3
	KIAS	202	202	203	204	205
	FF/ENG	5120	5070	5040	5010	5000
550	%N1	54.5	57.2	61.2	65.5	70
	KIAS	196	196	197	197	198
	FF/ENG	4750	4670	4640	4620	4660
500	%N1	52.4	55	58.9	63.1	67.5
	KIAS	189	190	190	191	191
	FF/ENG	4430	4270	4280	4310	4280
450	%N1	50.3	52.8	56.7	60.7	65
	KIAS	185	185	185	185	185
	FF/ENG	4140	3970	3990	4000	3900

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH**Chapter PI-QRH****Advisory Information****Section 32****ADVISORY INFORMATION****Runway Surface Condition Correlation**

RUNWAY CONDITION CODE	RUNWAY SURFACE CONDITION DESCRIPTION	REPORTED BRAKING ACTION
6	Dry	Dry
5	Wet (Smooth, Grooved or PFC) or Frost 3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow	Good
4	Compacted Snow at or below -15°C OAT	Good to Medium
3	Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow Compacted Snow at OAT warmer than -15°C	Medium
2	Greater than 3 mm (0.12 inches) of: Water or Slush	Medium to Poor
1	Ice	Poor
0	Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice	Nil

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABV VREF30	TWO REV NO REV

Dry Runway

MAX MANUAL	5020	80/-60	150	-230/770	0/-60	140/-130	230	160	310
AUTOBRAKE MAX	5870	70/-70	170	-270/890	0/0	160/-160	300	190	0
AUTOBRAKE 4	7310	90/-90	240	-360/1190	0/0	210/-210	400	0	0
AUTOBRAKE 3	8280	100/-110	280	-420/1390	0/0	240/-250	470	0	0
AUTOBRAKE 2	9330	120/-130	320	-480/1610	20/-110	300/-280	480	50	50
AUTOBRAKE 1	10370	140/-150	410	-560/1890	250/-290	420/-310	430	880	890

Good Reported Braking Action

MAX MANUAL	6480	100/-90	280	-370/1310	150/-130	250/-210	340	510	1130
AUTOBRAKE MAX	6520	100/-90	280	-350/1310	160/-110	250/-210	350	500	1090
AUTOBRAKE 4	7400	90/-90	250	-370/1240	40/-20	220/-210	410	110	580
AUTOBRAKE 3	8330	100/-110	280	-430/1420	30/-30	250/-250	470	0	90
AUTOBRAKE 2	9330	120/-130	330	-480/1620	60/-110	300/-280	480	50	50
AUTOBRAKE 1	10370	140/-150	410	-560/1890	260/-290	420/-310	430	880	890

Good to Medium Reported Braking Action

MAX MANUAL	6970	100/-90	280	-390/1370	190/-160	260/-210	340	620	1390
AUTOBRAKE MAX	6990	100/-90	290	-380/1380	200/-150	260/-210	350	610	1350
AUTOBRAKE 4	7470	90/-90	260	-380/1310	90/-50	220/-220	410	250	1030
AUTOBRAKE 3	8330	100/-110	280	-430/1420	50/-30	250/-250	470	20	220
AUTOBRAKE 2	9330	120/-130	330	-480/1620	60/-110	300/-280	480	50	50
AUTOBRAKE 1	10370	140/-150	410	-560/1890	260/-290	420/-310	430	880	890

ADVISORY INFORMATION

Normal Configuration Landing Distance Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF30	TWO REV NO REV

Medium Reported Braking Action

MAX MANUAL	7360	100/-100	290	-400/1440	230/-200	270/-220	330	760	1750
AUTOBRAKE MAX	7380	100/-100	300	-400/1440	240/-180	270/-220	350	750	1720
AUTOBRAKE 4	7650	100/-100	280	-410/1420	160/-90	250/-220	410	570	1600
AUTOBRAKE 3	8410	100/-110	290	-440/1510	90/-60	250/-250	470	140	880
AUTOBRAKE 2	9340	120/-130	330	-480/1630	80/-110	300/-280	480	80	270
AUTOBRAKE 1	10370	140/-150	410	-560/1890	260/-290	420/-310	430	880	890

Medium to Poor Reported Braking Action

MAX MANUAL	8430	130/-120	390	-510/1820	340/-270	370/-270	380	1280	3290
AUTOBRAKE MAX	8450	130/-120	390	-510/1830	350/-290	380/-280	380	1250	3310
AUTOBRAKE 4	8450	130/-120	390	-510/1830	350/-290	380/-280	380	1250	3310
AUTOBRAKE 3	8680	130/-110	380	-450/1680	240/-120	300/-250	430	1030	3080
AUTOBRAKE 2	9490	120/-130	340	-490/1630	150/-150	310/-280	460	390	2300
AUTOBRAKE 1	10440	140/-150	410	-560/1900	290/-330	420/-310	410	920	1610

Poor Reported Braking Action

MAX MANUAL	10510	150/-150	430	-660/2480	830/-550	470/-320	380	2480	7140
AUTOBRAKE MAX	10540	150/-150	440	-660/2480	850/-560	470/-320	380	2450	7160
AUTOBRAKE 4	10540	150/-150	440	-660/2480	850/-560	470/-320	380	2450	7160
AUTOBRAKE 3	10550	150/-150	440	-670/2480	840/-500	470/-320	430	2440	7150
AUTOBRAKE 2	10860	150/-150	420	-680/2510	750/-480	450/-330	460	2170	6870
AUTOBRAKE 1	11280	160/-170	490	-700/2570	800/-570	490/-340	410	2160	6480

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 4 engines at maximum reverse thrust.

Max Manual assumes maximum achievable manual braking.

All reference distances and adjustments are increased by 15%.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Max Manual and autobrake data valid for auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 150 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 120 ft.

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV NO REV

Dry Runway

MAX MANUAL	5190	80/-60	150	-240/780	0/-60	140/-130	230	160	340
AUTOBRAKE MAX	6100	60/-70	180	-280/910	0/0	160/-170	310	190	0
AUTOBRAKE 4	7610	80/-100	240	-370/1220	0/0	220/-220	410	0	0
AUTOBRAKE 3	8640	100/-110	280	-430/1420	0/0	250/-260	480	0	0
AUTOBRAKE 2	9690	110/-140	330	-490/1640	50/-120	320/-290	480	100	100
AUTOBRAKE 1	10700	140/-160	420	-570/1920	270/-310	440/-320	430	1060	1070

Good Reported Braking Action

MAX MANUAL	6740	100/-100	280	-370/1330	160/-140	260/-220	340	550	1320
AUTOBRAKE MAX	6780	100/-90	290	-360/1330	160/-120	270/-220	350	560	1260
AUTOBRAKE 4	7720	90/-100	260	-380/1260	50/-20	230/-220	420	130	700
AUTOBRAKE 3	8710	100/-110	290	-440/1450	30/-30	260/-260	480	0	150
AUTOBRAKE 2	9710	120/-140	340	-490/1650	90/-130	320/-290	480	100	100
AUTOBRAKE 1	10700	140/-160	420	-570/1920	280/-310	440/-320	430	1060	1070

Good to Medium Reported Braking Action

MAX MANUAL	7220	90/-100	290	-390/1390	200/-170	270/-220	340	670	1590
AUTOBRAKE MAX	7250	90/-100	290	-390/1400	210/-160	280/-220	350	680	1550
AUTOBRAKE 4	7780	90/-100	260	-390/1330	90/-50	240/-230	420	260	1170
AUTOBRAKE 3	8710	100/-110	290	-440/1450	50/-30	260/-260	480	20	300
AUTOBRAKE 2	9710	120/-140	340	-490/1650	90/-130	320/-290	480	100	100
AUTOBRAKE 1	10700	140/-160	420	-570/1920	280/-310	440/-320	430	1060	1070

ADVISORY INFORMATION

Normal Configuration Landing Distance Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	VREF ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV NO REV

Medium Reported Braking Action

MAX MANUAL	7610	100/-100	300	-410/1460	240/-200	290/-230	340	810	1970
AUTOBRAKE MAX	7640	100/-100	300	-410/1460	250/-190	290/-230	350	820	1930
AUTOBRAKE 4	7950	90/-100	280	-410/1440	150/-80	260/-230	420	590	1760
AUTOBRAKE 3	8780	100/-120	290	-450/1530	90/-60	260/-260	480	140	980
AUTOBRAKE 2	9710	120/-140	340	-490/1660	110/-130	320/-290	480	130	340
AUTOBRAKE 1	10700	140/-160	420	-570/1920	280/-310	440/-320	430	1060	1070

Medium to Poor Reported Braking Action

MAX MANUAL	8720	130/-130	400	-510/1830	340/-280	390/-280	380	1390	3820
AUTOBRAKE MAX	8760	130/-130	400	-510/1830	360/-290	400/-290	390	1400	3840
AUTOBRAKE 4	8760	130/-130	400	-510/1830	360/-290	400/-290	380	1400	3840
AUTOBRAKE 3	9050	120/-120	390	-450/1670	220/-120	310/-260	430	1110	3550
AUTOBRAKE 2	9860	120/-130	350	-500/1660	170/-170	330/-290	460	470	2760
AUTOBRAKE 1	10780	140/-160	420	-570/1920	320/-350	450/-320	410	1100	2080

Poor Reported Braking Action

MAX MANUAL	10760	150/-160	440	-660/2470	810/-540	490/-320	380	2630	7950
AUTOBRAKE MAX	10790	150/-160	450	-670/2470	830/-550	500/-330	390	2640	7980
AUTOBRAKE 4	10790	150/-160	450	-670/2470	830/-560	500/-330	380	2640	7980
AUTOBRAKE 3	10830	150/-150	440	-670/2480	810/-490	480/-330	430	2600	7940
AUTOBRAKE 2	11160	150/-160	440	-680/2510	740/-490	470/-340	460	2300	7630
AUTOBRAKE 1	11580	160/-170	500	-700/2580	790/-580	520/-350	410	2360	7250

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 4 engines at maximum reverse thrust.

Max Manual assumes maximum achievable manual braking.

All reference distances and adjustments are increased by 15%.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Max Manual and autobrake data valid for auto speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 160 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 130 ft.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****AIR/GND SYSTEM (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5650	60/-70	180	-260/870	120/-100	170/-150	290	0	360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7590	110/-110	350	-440/1590	310/-250	320/-260	430	0	1360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8290	110/-120	360	-460/1660	390/-310	330/-270	430	0	1620
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	8840	110/-120	370	-490/1740	480/-370	350/-280	430	0	1990
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	10360	160/-160	520	-640/2350	730/-540	490/-360	490	0	3850
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	13660	190/-190	610	-890/3320	1740/-1120	640/-430	490	0	8250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

AIR/GND SYSTEM (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5440	60/-60	180	-260/850	110/-100	160/-150	280	0	320
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7240	110/-110	340	-430/1560	290/-230	300/-250	420	0	1150
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	7940	110/-110	350	-450/1630	370/-300	310/-260	420	0	1390
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	8490	120/-110	360	-470/1710	460/-360	320/-260	420	0	1730
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	9900	160/-150	510	-630/2310	700/-510	460/-350	480	0	3240
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	13230	190/-180	590	-880/3310	1730/-1110	600/-420	480	0	7270
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Airspeed Unreliable (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4910	70/-50	150	-210/700	60/-60	140/-130	N/A	160	360
AUTOBRAKE MAX	5840	60/-70	170	-250/820	10/0	160/-160	N/A	0	0
AUTOBRAKE 2	9260	110/-130	330	-450/1480	90/-180	330/-280	N/A	230	230

Good Reported Braking Action

MAX MANUAL	6450	90/-90	270	-340/1200	150/-130	260/-210	N/A	570	1430
AUTOBRAKE MAX	6500	90/-90	280	-330/1200	160/-110	260/-210	N/A	550	1390
AUTOBRAKE 2	9280	110/-130	330	-450/1490	110/-190	330/-280	N/A	240	240

Good To Medium Reported Braking Action

MAX MANUAL	6870	90/-90	280	-360/1260	190/-160	270/-210	N/A	670	1680
AUTOBRAKE MAX	6910	90/-90	280	-350/1260	200/-150	270/-210	N/A	660	1650
AUTOBRAKE 2	9280	110/-130	330	-450/1490	110/-190	330/-280	N/A	240	240

Medium Reported Braking Action

MAX MANUAL	7210	90/-90	290	-370/1320	220/-190	280/-220	N/A	800	2030
AUTOBRAKE MAX	7240	90/-90	290	-370/1320	230/-170	280/-220	N/A	780	2000
AUTOBRAKE 3	8470	90/-110	280	-410/1390	80/-90	260/-260	N/A	120	970

Medium To Poor Reported Braking Action

MAX MANUAL	8250	120/-120	370	-460/1640	320/-260	370/-270	N/A	1360	3950
AUTOBRAKE MAX	8290	120/-120	380	-460/1640	330/-270	380/-270	N/A	1360	3970
AUTOBRAKE 3	8620	110/-110	360	-410/1500	180/-120	290/-250	N/A	1060	3670

Poor Reported Braking Action

MAX MANUAL	10020	140/-140	410	-590/2190	640/-490	460/-300	N/A	2430	7760
AUTOBRAKE MAX	10060	140/-140	420	-590/2190	660/-500	460/-300	N/A	2440	7780
AUTOBRAKE 3	10180	140/-140	410	-600/2210	590/-430	440/-310	N/A	2350	7700

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ANTISKID / ANTISKID OFF (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	7600	90/-100	280	-410/1430	310/-250	280/-210	350	910	2430
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	8220	120/-120	360	-480/1740	380/-300	350/-250	320	1250	3610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	9110	130/-130	390	-550/2030	590/-420	390/-270	340	1780	5480
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	9580	130/-140	420	-590/2200	720/-490	420/-280	340	2140	6950
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	9930	150/-150	470	-630/2380	770/-520	470/-310	330	2410	8130
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	11490	170/-170	520	-810/3240	1400/-840	570/-350	360	4200	20000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID / ANTISKID OFF (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7370	90/-90	270	-410/1430	310/-250	270/-210	290	820	2160
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7950	120/-110	350	-470/1730	380/-300	330/-250	330	1120	3130
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8850	130/-120	380	-540/2030	590/-420	380/-260	330	1640	4890
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	9340	130/-130	410	-590/2200	740/-490	400/-280	330	1980	6220
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	9660	150/-140	460	-630/2390	780/-520	450/-300	350	2210	7140
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	11280	170/-170	510	-810/3270	1450/-860	550/-340	350	3990	20000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance BLD DUCT LEAK L / BLD DUCT LEAK R (Flaps 25) VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4620	70/-50	130	-210/690	60/-50	120/-120	210	90	200
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8500	100/-120	280	-430/1430	10/-70	260/-260	440	20	20

Good Reported Braking Action

MAX MANUAL	6100	80/-80	250	-340/1200	150/-130	230/-200	310	390	960
AUTOBRAKE MAX	6110	90/-80	260	-330/1200	160/-110	230/-200	310	380	940
AUTOBRAKE 2	8510	100/-120	300	-430/1460	60/-80	270/-260	440	20	20

Good To Medium Reported Braking Action

MAX MANUAL	6520	80/-90	260	-350/1250	180/-160	240/-200	310	490	1200
AUTOBRAKE MAX	6520	80/-90	260	-350/1260	200/-150	240/-200	310	490	1200
AUTOBRAKE 2	8510	100/-120	300	-430/1460	60/-80	270/-260	440	20	20

Medium Reported Braking Action

MAX MANUAL	6860	90/-90	270	-370/1310	220/-180	250/-200	300	610	1550
AUTOBRAKE MAX	6860	90/-90	270	-360/1310	230/-180	250/-210	310	610	1550
AUTOBRAKE 3	7700	90/-100	270	-400/1380	110/-90	240/-240	420	120	880

Medium To Poor Reported Braking Action

MAX MANUAL	7930	110/-110	350	-460/1630	320/-260	340/-250	340	1100	3150
AUTOBRAKE MAX	7960	110/-120	360	-460/1630	330/-270	340/-250	340	1110	3180
AUTOBRAKE 3	8190	110/-100	340	-410/1480	220/-140	280/-230	370	880	2950

Poor Reported Braking Action

MAX MANUAL	9700	130/-140	390	-590/2180	640/-490	430/-290	340	2170	6970
AUTOBRAKE MAX	9740	130/-140	390	-590/2190	660/-500	430/-290	340	2180	7000
AUTOBRAKE 3	9750	130/-130	390	-590/2190	650/-450	430/-290	370	2170	6990

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****BLD DUCT LEAK L / BLD DUCT LEAK R (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4460	70/-50	130	-210/680	60/-50	120/-120	200	80	180
AUTOBRAKE MAX	5110	60/-60	150	-240/780	0/0	140/-140	260	0	0
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-50	250/-250	450	0	0

Good Reported Braking Action

MAX MANUAL	5860	90/-80	250	-330/1180	140/-120	220/-190	300	340	810
AUTOBRAKE MAX	5860	90/-80	250	-320/1180	150/-100	220/-190	310	330	800
AUTOBRAKE 2	8160	100/-110	290	-420/1420	40/-60	250/-250	450	0	0

Good To Medium Reported Braking Action

MAX MANUAL	6280	90/-80	250	-350/1230	180/-150	230/-190	300	430	1050
AUTOBRAKE MAX	6280	90/-80	260	-340/1240	190/-140	230/-190	310	430	1040
AUTOBRAKE 2	8160	100/-110	290	-420/1420	40/-60	250/-250	450	0	0

Medium Reported Braking Action

MAX MANUAL	6630	90/-80	260	-360/1290	210/-180	240/-190	300	550	1380
AUTOBRAKE MAX	6630	90/-80	270	-350/1290	230/-160	240/-190	310	550	1370
AUTOBRAKE 3	7360	90/-90	260	-390/1350	110/-70	230/-230	410	120	800

Medium To Poor Reported Braking Action

MAX MANUAL	7650	110/-110	340	-450/1620	310/-250	320/-250	340	970	2700
AUTOBRAKE MAX	7680	120/-110	350	-450/1620	330/-270	330/-250	340	980	2710
AUTOBRAKE 3	7870	110/-100	340	-420/1490	240/-130	270/-230	360	790	2530

Poor Reported Braking Action

MAX MANUAL	9470	130/-130	380	-590/2190	650/-490	410/-280	340	2010	6260
AUTOBRAKE MAX	9490	130/-130	380	-590/2190	670/-510	410/-280	340	2020	6270
AUTOBRAKE 3	9490	140/-130	380	-590/2190	660/-470	410/-280	360	2020	6280

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG 1, 2, 3, 4 SHUTDOWN (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4610	80/-50	140	-210/700	60/-60	130/-120	210	0	170
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8520	100/-110	280	-430/1430	0/-20	260/-260	480	0	0

Good Reported Braking Action

MAX MANUAL	6260	90/-90	270	-360/1310	180/-150	240/-210	340	0	680
AUTOBRAKE MAX	6280	90/-90	270	-350/1310	190/-130	240/-210	350	0	660
AUTOBRAKE 2	8520	100/-110	290	-430/1440	30/-20	260/-260	480	0	0

Good To Medium Reported Braking Action

MAX MANUAL	6770	90/-90	280	-380/1360	230/-190	250/-220	340	0	830
AUTOBRAKE MAX	6770	90/-90	280	-370/1350	240/-170	250/-210	350	0	810
AUTOBRAKE 2	8520	100/-110	290	-430/1440	30/-20	260/-260	480	0	0

Medium Reported Braking Action

MAX MANUAL	7220	90/-100	280	-390/1410	280/-230	260/-220	340	0	1040
AUTOBRAKE MAX	7220	90/-100	290	-390/1410	290/-210	260/-220	350	0	1020
AUTOBRAKE 3	7710	90/-100	270	-400/1380	150/-80	240/-230	420	0	730

Medium To Poor Reported Braking Action

MAX MANUAL	8630	130/-130	410	-540/1950	460/-360	380/-300	400	0	2160
AUTOBRAKE MAX	8660	130/-130	410	-540/1950	480/-380	390/-310	400	0	2180
AUTOBRAKE 3	8680	130/-130	410	-540/1950	480/-350	390/-310	420	0	2180

Poor Reported Braking Action

MAX MANUAL	11310	150/-160	450	-710/2630	1070/-760	480/-350	400	0	4650
AUTOBRAKE MAX	11340	150/-160	460	-720/2630	1090/-780	490/-350	400	0	4660
AUTOBRAKE 3	11360	150/-160	460	-720/2640	1080/-750	490/-350	420	0	4660

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG 1, 2, 3, 4 SHUTDOWN (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4460	80/-50	130	-210/690	60/-60	120/-120	210	0	150
AUTOBRAKE MAX	5110	60/-60	150	-240/780	0/0	140/-140	260	0	0
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-20	250/-250	460	0	0

Good Reported Braking Action

MAX MANUAL	5980	90/-90	260	-350/1280	170/-140	230/-200	330	0	580
AUTOBRAKE MAX	6000	90/-80	270	-340/1270	170/-120	230/-200	340	0	560
AUTOBRAKE 2	8150	100/-110	280	-420/1410	20/-20	250/-250	460	0	0

Good To Medium Reported Braking Action

MAX MANUAL	6490	90/-90	270	-370/1320	220/-180	240/-210	330	0	720
AUTOBRAKE MAX	6500	90/-90	270	-360/1310	220/-160	230/-200	340	0	700
AUTOBRAKE 2	8150	100/-110	280	-420/1410	20/-20	250/-250	460	0	0

Medium Reported Braking Action

MAX MANUAL	6940	90/-90	280	-380/1380	270/-220	250/-210	330	0	920
AUTOBRAKE MAX	6950	90/-90	280	-380/1370	270/-200	240/-210	340	0	900
AUTOBRAKE 3	7390	90/-100	260	-400/1360	160/-80	230/-220	410	0	640

Medium To Poor Reported Braking Action

MAX MANUAL	8250	130/-130	390	-530/1920	440/-340	360/-290	400	0	1830
AUTOBRAKE MAX	8270	130/-130	400	-530/1920	460/-360	360/-290	400	0	1840
AUTOBRAKE 3	8290	130/-130	400	-530/1920	450/-330	360/-290	420	0	1850

Poor Reported Braking Action

MAX MANUAL	10940	150/-150	440	-710/2610	1050/-740	460/-340	400	0	4110
AUTOBRAKE MAX	10960	150/-150	440	-710/2610	1070/-760	460/-340	400	0	4120
AUTOBRAKE 3	10980	160/-150	440	-710/2620	1050/-740	460/-340	420	0	4130

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS CONTROL (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4510	70/-50	130	-210/680	60/-50	130/-120	200	140	310
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8430	100/-120	290	-430/1420	40/-110	280/-250	410	90	90

Good Reported Braking Action

MAX MANUAL	5860	80/-80	250	-320/1160	140/-120	230/-190	300	480	1200
AUTOBRAKE MAX	5900	80/-80	250	-310/1160	140/-100	230/-190	300	460	1150
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Good To Medium Reported Braking Action

MAX MANUAL	6280	80/-90	250	-340/1210	170/-150	240/-190	300	580	1440
AUTOBRAKE MAX	6310	80/-90	260	-340/1210	180/-140	240/-190	300	570	1410
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Medium Reported Braking Action

MAX MANUAL	6620	90/-90	260	-350/1270	210/-170	250/-200	290	710	1800
AUTOBRAKE MAX	6640	90/-90	260	-350/1270	220/-170	250/-200	300	690	1760
AUTOBRAKE 3	7630	90/-100	260	-390/1330	80/-50	230/-230	420	120	950

Medium To Poor Reported Braking Action

MAX MANUAL	7580	110/-110	350	-440/1590	300/-240	340/-250	330	1210	3500
AUTOBRAKE MAX	7620	110/-110	350	-440/1600	310/-250	340/-250	340	1220	3530
AUTOBRAKE 3	7870	110/-100	340	-390/1450	190/-110	270/-230	380	970	3280

Poor Reported Braking Action

MAX MANUAL	9360	130/-140	390	-580/2150	620/-470	430/-280	330	2290	7320
AUTOBRAKE MAX	9390	130/-140	390	-580/2150	640/-480	430/-280	340	2290	7340
AUTOBRAKE 3	9420	130/-130	390	-580/2150	620/-430	420/-290	380	2260	7310

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE (Flaps 25)****VREF30 + 25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5460	80/-60	170	-220/730	70/-60	160/-140	220	210	460
AUTOBRAKE MAX	6610	60/-70	200	-270/870	10/-20	180/-180	300	0	0
AUTOBRAKE 2	10290	120/-130	380	-470/1550	160/-230	380/-310	380	430	430

Good Reported Braking Action

MAX MANUAL	7270	100/-90	320	-360/1270	180/-160	300/-240	320	730	1880
AUTOBRAKE MAX	7380	100/-90	320	-360/1270	190/-150	300/-240	320	720	1880
AUTOBRAKE 2	10310	120/-130	380	-470/1560	170/-230	380/-310	370	430	430

Good To Medium Reported Braking Action

MAX MANUAL	7690	100/-100	320	-380/1330	220/-180	310/-240	320	830	2140
AUTOBRAKE MAX	7790	100/-100	330	-380/1330	230/-180	310/-240	320	830	2140
AUTOBRAKE 2	10310	120/-130	380	-470/1560	170/-230	380/-310	370	430	430

Medium Reported Braking Action

MAX MANUAL	8030	100/-100	330	-400/1380	250/-210	320/-240	320	960	2500
AUTOBRAKE MAX	8130	100/-100	340	-400/1390	260/-210	320/-250	320	960	2510
AUTOBRAKE 3	9530	100/-110	330	-430/1450	100/-130	300/-290	410	160	1310

Medium To Poor Reported Braking Action

MAX MANUAL	9170	130/-130	430	-480/1710	360/-290	430/-300	340	1640	4860
AUTOBRAKE MAX	9260	130/-130	430	-480/1720	370/-310	430/-300	340	1650	4920
AUTOBRAKE 3	9610	130/-110	420	-430/1610	230/-140	350/-280	400	1340	4620

Poor Reported Braking Action

MAX MANUAL	10970	150/-150	460	-620/2260	690/-530	510/-330	340	2750	8870
AUTOBRAKE MAX	11050	150/-150	470	-620/2270	700/-540	520/-340	340	2760	8930
AUTOBRAKE 3	11230	150/-150	460	-620/2290	640/-480	500/-340	400	2620	8810

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Flaps Up Landing (Flaps Up)

VREF30 + 70

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7250	120/-80	230	-260/840	90/-80	220/-190	230	310	710
AUTOBRAKE MAX	9290	90/-80	280	-320/1020	10/-10	260/-260	340	30	90
AUTOBRAKE 2	14160	160/-170	550	-550/1780	300/-310	590/-430	390	1510	1640

Good Reported Braking Action

MAX MANUAL	9850	120/-120	430	-420/1450	220/-200	420/-330	310	1120	2910
AUTOBRAKE MAX	10000	120/-110	430	-410/1440	200/-170	430/-330	330	1130	2930
AUTOBRAKE 2	14160	160/-170	550	-550/1780	310/-310	590/-430	390	1510	1640

Good To Medium Reported Braking Action

MAX MANUAL	10280	120/-120	440	-440/1500	260/-230	430/-330	310	1220	3160
AUTOBRAKE MAX	10410	120/-120	440	-440/1500	250/-210	440/-330	330	1240	3190
AUTOBRAKE 2	14160	160/-170	550	-550/1780	310/-310	590/-430	390	1510	1640

Medium Reported Braking Action

MAX MANUAL	10620	120/-120	450	-450/1560	290/-250	450/-340	310	1350	3520
AUTOBRAKE MAX	10750	120/-120	450	-450/1550	280/-240	450/-340	330	1370	3550
AUTOBRAKE 3	13370	130/-150	490	-500/1670	220/-250	490/-400	390	600	1200

Medium To Poor Reported Braking Action

MAX MANUAL	12460	160/-160	580	-550/1920	450/-380	600/-400	340	2490	7620
AUTOBRAKE MAX	12490	160/-160	580	-550/1920	470/-390	600/-410	340	2490	7610
AUTOBRAKE 3	13460	160/-160	580	-510/1830	310/-280	550/-410	380	1730	6820

Poor Reported Braking Action

MAX MANUAL	14350	180/-180	610	-680/2450	790/-620	690/-440	340	3690	12060
AUTOBRAKE MAX	14390	180/-180	610	-680/2460	810/-630	700/-440	340	3690	12050
AUTOBRAKE 3	15130	180/-190	620	-700/2510	780/-630	700/-470	380	3150	11470

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLARE ASSIST (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4510	70/-50	130	-210/680	60/-50	130/-120	200	140	310
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8430	100/-120	290	-430/1420	40/-110	280/-250	410	90	90

Good Reported Braking Action

MAX MANUAL	5860	80/-80	250	-320/1160	140/-120	230/-190	300	480	1200
AUTOBRAKE MAX	5900	80/-80	250	-310/1160	140/-100	230/-190	300	460	1150
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Good To Medium Reported Braking Action

MAX MANUAL	6280	80/-90	250	-340/1210	170/-150	240/-190	300	580	1440
AUTOBRAKE MAX	6310	80/-90	260	-340/1210	180/-140	240/-190	300	570	1410
AUTOBRAKE 2	8440	100/-120	290	-430/1440	80/-110	280/-250	420	90	90

Medium Reported Braking Action

MAX MANUAL	6620	90/-90	260	-350/1270	210/-170	250/-200	290	710	1800
AUTOBRAKE MAX	6640	90/-90	260	-350/1270	220/-170	250/-200	300	690	1760
AUTOBRAKE 3	7630	90/-100	260	-390/1330	80/-50	230/-230	420	120	950

Medium To Poor Reported Braking Action

MAX MANUAL	7580	110/-110	350	-440/1590	300/-240	340/-250	330	1210	3500
AUTOBRAKE MAX	7620	110/-110	350	-440/1600	310/-250	340/-250	340	1220	3530
AUTOBRAKE 3	7870	110/-100	340	-390/1450	190/-110	270/-230	380	970	3280

Poor Reported Braking Action

MAX MANUAL	9360	130/-140	390	-580/2150	620/-470	430/-280	330	2290	7320
AUTOBRAKE MAX	9390	130/-140	390	-580/2150	640/-480	430/-280	340	2290	7340
AUTOBRAKE 3	9420	130/-130	390	-580/2150	620/-430	420/-290	380	2260	7310

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4890	90/-70	150	-230/760	80/-70	140/-130	210	210	480
AUTOBRAKE MAX	5340	80/-70	160	-250/810	20/-10	140/-140	270	40	320
AUTOBRAKE 2	8450	100/-120	290	-430/1430	30/-90	280/-250	420	70	70

Good Reported Braking Action

MAX MANUAL	5950	90/-90	250	-330/1170	140/-120	230/-190	300	500	1240
AUTOBRAKE MAX	5970	90/-90	250	-320/1170	150/-120	230/-190	310	480	1210
AUTOBRAKE 2	8470	100/-120	290	-430/1450	70/-100	280/-260	420	70	70

Good To Medium Reported Braking Action

MAX MANUAL	6320	80/-90	250	-340/1220	170/-150	240/-190	300	590	1480
AUTOBRAKE MAX	6340	80/-90	260	-340/1220	180/-150	240/-200	310	580	1450
AUTOBRAKE 2	8470	100/-120	290	-430/1450	70/-100	280/-260	420	70	70

Medium Reported Braking Action

MAX MANUAL	6650	90/-90	260	-360/1280	210/-180	250/-200	300	720	1840
AUTOBRAKE MAX	6680	90/-90	270	-360/1280	220/-170	260/-200	310	710	1810
AUTOBRAKE 3	7650	90/-100	260	-390/1330	80/-50	230/-230	420	120	1010

Medium To Poor Reported Braking Action

MAX MANUAL	7640	110/-110	350	-450/1600	300/-250	350/-250	340	1240	3610
AUTOBRAKE MAX	7680	120/-120	350	-450/1610	320/-260	350/-250	340	1250	3650
AUTOBRAKE 3	7910	110/-100	340	-400/1460	210/-110	280/-230	370	1020	3410

Poor Reported Braking Action

MAX MANUAL	9440	130/-140	390	-580/2160	630/-480	430/-280	340	2350	7570
AUTOBRAKE MAX	9470	130/-140	400	-580/2160	650/-490	440/-290	340	2360	7610
AUTOBRAKE 3	9500	130/-140	390	-580/2160	630/-440	430/-290	370	2330	7580

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4720	90/-70	150	-230/750	70/-70	140/-120	210	190	420
AUTOBRAKE MAX	5140	80/-60	160	-240/800	20/-10	140/-140	270	40	290
AUTOBRAKE 2	8120	100/-110	280	-420/1400	10/-80	250/-240	420	30	30

Good Reported Braking Action

MAX MANUAL	5730	90/-80	240	-320/1150	140/-120	220/-180	300	440	1080
AUTOBRAKE MAX	5750	90/-80	250	-320/1160	150/-110	220/-180	300	430	1040
AUTOBRAKE 2	8140	100/-110	290	-420/1420	50/-90	260/-250	430	30	30

Good To Medium Reported Braking Action

MAX MANUAL	6100	90/-80	250	-340/1200	170/-150	230/-190	300	530	1300
AUTOBRAKE MAX	6120	90/-80	250	-330/1210	180/-140	230/-190	300	520	1270
AUTOBRAKE 2	8140	100/-110	290	-420/1420	50/-90	260/-250	430	30	30

Medium Reported Braking Action

MAX MANUAL	6450	90/-80	260	-350/1260	210/-170	240/-190	300	650	1640
AUTOBRAKE MAX	6460	90/-90	260	-350/1260	220/-170	240/-190	300	640	1610
AUTOBRAKE 3	7320	90/-90	250	-380/1310	80/-50	220/-220	410	130	920

Medium To Poor Reported Braking Action

MAX MANUAL	7380	120/-110	340	-440/1600	300/-240	330/-240	340	1110	3120
AUTOBRAKE MAX	7410	120/-110	350	-440/1600	310/-250	330/-240	340	1120	3140
AUTOBRAKE 3	7590	110/-100	340	-400/1480	230/-110	270/-220	370	940	2960

Poor Reported Braking Action

MAX MANUAL	9230	140/-130	380	-580/2160	640/-480	420/-280	340	2050	6810
AUTOBRAKE MAX	9260	140/-130	390	-580/2170	660/-490	420/-280	340	2060	6840
AUTOBRAKE 3	9260	140/-130	390	-580/2170	660/-450	420/-280	370	2050	6830

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5910	110/-100	190	-290/980	130/-120	190/-160	250	420	1000
AUTOBRAKE MAX	5970	110/-90	200	-290/980	130/-110	190/-160	270	420	1020
AUTOBRAKE 2	8480	100/-120	280	-430/1430	20/-80	270/-260	430	30	30

Good Reported Braking Action

MAX MANUAL	6360	110/-100	260	-350/1230	170/-140	240/-200	310	550	1370
AUTOBRAKE MAX	6360	110/-100	260	-350/1230	190/-150	250/-200	320	550	1370
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Good To Medium Reported Braking Action

MAX MANUAL	6470	100/-90	260	-350/1240	180/-150	240/-200	310	590	1470
AUTOBRAKE MAX	6470	100/-90	260	-350/1240	200/-160	250/-200	320	590	1470
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Medium Reported Braking Action

MAX MANUAL	6810	90/-90	270	-360/1290	210/-180	260/-200	310	720	1840
AUTOBRAKE MAX	6810	90/-90	270	-360/1300	230/-190	260/-200	320	720	1840
AUTOBRAKE 3	7710	90/-100	260	-400/1350	100/-70	230/-230	430	130	1050

Medium To Poor Reported Braking Action

MAX MANUAL	7810	120/-120	350	-450/1630	310/-250	350/-250	350	1260	3680
AUTOBRAKE MAX	7870	120/-120	360	-460/1630	330/-270	360/-260	350	1270	3740
AUTOBRAKE 3	8080	110/-100	350	-400/1500	230/-130	290/-230	380	1070	3530

Poor Reported Braking Action

MAX MANUAL	9630	140/-140	400	-590/2180	640/-490	440/-290	350	2380	7760
AUTOBRAKE MAX	9680	140/-140	400	-590/2190	670/-510	450/-290	350	2400	7820
AUTOBRAKE 3	9700	140/-140	400	-590/2190	650/-460	440/-290	380	2380	7800

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5700	110/-90	190	-290/960	130/-110	180/-150	240	370	880
AUTOBRAKE MAX	5760	110/-90	190	-290/970	130/-110	180/-160	260	380	900
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-60	250/-250	440	10	10

Good Reported Braking Action

MAX MANUAL	6130	110/-90	250	-340/1210	160/-140	230/-190	300	490	1200
AUTOBRAKE MAX	6130	110/-90	260	-340/1220	180/-140	230/-190	310	490	1200
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Good To Medium Reported Braking Action

MAX MANUAL	6250	110/-80	250	-340/1220	170/-150	230/-190	300	530	1300
AUTOBRAKE MAX	6250	110/-80	260	-340/1230	190/-150	240/-190	310	530	1300
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Medium Reported Braking Action

MAX MANUAL	6600	90/-90	260	-360/1280	210/-170	240/-190	300	650	1640
AUTOBRAKE MAX	6600	90/-90	270	-360/1280	230/-180	250/-200	310	650	1640
AUTOBRAKE 3	7380	90/-90	260	-390/1330	100/-70	220/-220	420	130	970

Medium To Poor Reported Braking Action

MAX MANUAL	7550	120/-110	350	-450/1620	300/-250	330/-240	350	1120	3170
AUTOBRAKE MAX	7600	120/-110	360	-450/1630	330/-270	340/-250	350	1140	3220
AUTOBRAKE 3	7760	120/-100	350	-400/1510	250/-130	290/-230	370	980	3060

Poor Reported Braking Action

MAX MANUAL	9410	140/-130	390	-590/2190	650/-490	420/-280	350	2210	6980
AUTOBRAKE MAX	9460	140/-140	390	-590/2190	680/-510	430/-280	350	2230	7020
AUTOBRAKE 3	9460	140/-130	390	-590/2190	680/-480	430/-290	370	2230	7020

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance GEAR DISAGREE - Nose and Body Gear Up (Flaps 25) VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5910	110/-100	190	-290/980	130/-120	190/-160	250	420	1000
AUTOBRAKE MAX	5970	110/-90	200	-290/980	130/-110	190/-160	270	420	1020
AUTOBRAKE 2	8480	100/-120	280	-430/1430	20/-80	270/-260	430	30	30

Good Reported Braking Action

MAX MANUAL	6360	110/-100	260	-350/1230	170/-140	240/-200	310	550	1370
AUTOBRAKE MAX	6360	110/-100	260	-350/1230	190/-150	250/-200	320	550	1370
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Good To Medium Reported Braking Action

MAX MANUAL	6470	100/-90	260	-350/1240	180/-150	240/-200	310	590	1470
AUTOBRAKE MAX	6470	100/-90	260	-350/1240	200/-160	250/-200	320	590	1470
AUTOBRAKE 2	8530	100/-120	300	-430/1470	80/-100	280/-260	440	40	40

Medium Reported Braking Action

MAX MANUAL	6810	90/-90	270	-360/1290	210/-180	260/-200	310	720	1840
AUTOBRAKE MAX	6810	90/-90	270	-360/1300	230/-190	260/-200	320	720	1840
AUTOBRAKE 3	7710	90/-100	260	-400/1350	100/-70	230/-230	430	130	1050

Medium To Poor Reported Braking Action

MAX MANUAL	7810	120/-120	350	-450/1630	310/-250	350/-250	350	1260	3680
AUTOBRAKE MAX	7870	120/-120	360	-460/1630	330/-270	360/-260	350	1270	3740
AUTOBRAKE 3	8080	110/-100	350	-400/1500	230/-130	290/-230	380	1070	3530

Poor Reported Braking Action

MAX MANUAL	9630	140/-140	400	-590/2180	640/-490	440/-290	350	2380	7760
AUTOBRAKE MAX	9680	140/-140	400	-590/2190	670/-510	450/-290	350	2400	7820
AUTOBRAKE 3	9700	140/-140	400	-590/2190	650/-460	440/-290	380	2380	7800

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Nose and Body Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5700	110/-90	190	-290/960	130/-110	180/-150	240	370	880
AUTOBRAKE MAX	5760	110/-90	190	-290/970	130/-110	180/-160	260	380	900
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-60	250/-250	440	10	10

Good Reported Braking Action

MAX MANUAL	6130	110/-90	250	-340/1210	160/-140	230/-190	300	490	1200
AUTOBRAKE MAX	6130	110/-90	260	-340/1220	180/-140	230/-190	310	490	1200
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Good To Medium Reported Braking Action

MAX MANUAL	6250	110/-80	250	-340/1220	170/-150	230/-190	300	530	1300
AUTOBRAKE MAX	6250	110/-80	260	-340/1230	190/-150	240/-190	310	530	1300
AUTOBRAKE 2	8190	100/-110	290	-430/1440	60/-80	250/-250	440	10	10

Medium Reported Braking Action

MAX MANUAL	6600	90/-90	260	-360/1280	210/-170	240/-190	300	650	1640
AUTOBRAKE MAX	6600	90/-90	270	-360/1280	230/-180	250/-200	310	650	1640
AUTOBRAKE 3	7380	90/-90	260	-390/1330	100/-70	220/-220	420	130	970

Medium To Poor Reported Braking Action

MAX MANUAL	7550	120/-110	350	-450/1620	300/-250	330/-240	350	1120	3170
AUTOBRAKE MAX	7600	120/-110	360	-450/1630	330/-270	340/-250	350	1140	3220
AUTOBRAKE 3	7760	120/-100	350	-400/1510	250/-130	290/-230	370	980	3060

Poor Reported Braking Action

MAX MANUAL	9410	140/-130	390	-590/2190	650/-490	420/-280	350	2210	6980
AUTOBRAKE MAX	9460	140/-140	390	-590/2190	680/-510	430/-280	350	2230	7020
AUTOBRAKE 3	9460	140/-130	390	-590/2190	680/-480	430/-290	370	2230	7020

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRES SYS 1+4 (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	7030	70/-70	230	-300/980	170/-150	210/-190	350	0	500
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	9590	140/-130	460	-510/1810	440/-350	410/-330	480	0	2000
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	10320	140/-130	470	-540/1890	540/-420	420/-340	480	0	2290
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	10890	140/-140	480	-560/1970	630/-480	440/-350	480	0	2700
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	12640	190/-180	640	-710/2580	940/-680	600/-440	510	0	5120
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	16050	210/-210	720	-970/3610	2040/-1310	750/-500	510	0	10030
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRES SYS 2+3 (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	6040	70/-60	200	-250/820	120/-100	180/-170	310	0	380
AUTOBRAKE MAX	6280	70/-70	200	-260/850	60/-30	180/-170	320	0	300
AUTOBRAKE 2	10110	110/-120	350	-470/1550	0/0	310/-310	530	0	0

Good Reported Braking Action

MAX MANUAL	8510	120/-110	410	-450/1590	340/-280	360/-300	450	0	1650
AUTOBRAKE MAX	8520	120/-110	410	-450/1590	360/-290	370/-300	460	0	1650
AUTOBRAKE 2	10240	120/-120	380	-490/1620	120/-40	330/-320	530	0	790

Good To Medium Reported Braking Action

MAX MANUAL	9060	120/-120	410	-460/1630	390/-320	370/-300	450	0	1820
AUTOBRAKE MAX	9060	120/-120	420	-470/1640	420/-340	370/-300	460	0	1820
AUTOBRAKE 2	10240	120/-120	380	-490/1620	120/-40	330/-320	530	0	790

Medium Reported Braking Action

MAX MANUAL	9560	120/-120	420	-480/1690	460/-370	380/-310	450	0	2110
AUTOBRAKE MAX	9560	120/-120	430	-480/1690	480/-390	390/-310	460	0	2110
AUTOBRAKE 3	9580	120/-120	430	-480/1680	480/-240	380/-300	460	0	2120

Medium To Poor Reported Braking Action

MAX MANUAL	11410	170/-160	580	-640/2300	750/-560	550/-400	490	0	4390
AUTOBRAKE MAX	11460	170/-160	590	-640/2300	780/-590	550/-410	490	0	4420
AUTOBRAKE 3	11460	170/-160	590	-640/2300	780/-590	550/-410	490	0	4420

Poor Reported Braking Action

MAX MANUAL	14470	190/-190	640	-840/3050	1500/-1050	670/-460	490	0	7860
AUTOBRAKE MAX	14520	190/-190	640	-840/3050	1530/-1070	670/-460	490	0	7890
AUTOBRAKE 3	14520	190/-190	640	-840/3050	1530/-1070	670/-460	490	0	7890

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 / HYD PRESS SYS 2 / HYD PRESS SYS 3 (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4860	70/-60	150	-220/730	80/-70	140/-130	240	0	210
AUTOBRAKE MAX	5310	60/-60	150	-240/790	0/0	140/-140	270	0	60
AUTOBRAKE 2	8520	100/-110	280	-430/1430	0/0	260/-260	490	0	0

Good Reported Braking Action

MAX MANUAL	6700	100/-100	300	-390/1400	220/-190	270/-230	380	0	900
AUTOBRAKE MAX	6700	100/-100	310	-390/1400	240/-190	270/-230	390	0	890
AUTOBRAKE 2	8560	100/-120	290	-440/1460	40/-20	260/-260	490	0	120

Good To Medium Reported Braking Action

MAX MANUAL	7230	100/-100	310	-400/1440	270/-230	280/-230	380	0	1060
AUTOBRAKE MAX	7230	100/-100	320	-400/1440	290/-230	280/-240	390	0	1050
AUTOBRAKE 2	8560	100/-120	290	-440/1460	40/-20	260/-260	490	0	120

Medium Reported Braking Action

MAX MANUAL	7710	100/-100	320	-420/1500	340/-270	290/-240	380	0	1310
AUTOBRAKE MAX	7710	100/-100	320	-420/1500	350/-280	290/-240	390	0	1310
AUTOBRAKE 3	7870	100/-100	310	-420/1470	280/-130	280/-250	420	0	1250

Medium To Poor Reported Braking Action

MAX MANUAL	9280	140/-140	460	-570/2090	560/-420	430/-330	450	0	2820
AUTOBRAKE MAX	9320	140/-140	470	-580/2090	580/-450	430/-330	450	0	2840
AUTOBRAKE 3	9320	140/-140	470	-580/2090	580/-440	430/-330	450	0	2840

Poor Reported Braking Action

MAX MANUAL	12230	160/-170	520	-770/2840	1280/-890	540/-380	450	0	5900
AUTOBRAKE MAX	12270	160/-170	530	-770/2850	1300/-910	550/-390	450	0	5930
AUTOBRAKE 3	12270	160/-170	530	-770/2850	1300/-910	550/-390	450	0	5930

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 / HYD PRESS SYS 2 / HYD PRESS SYS 3 (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO NO REV REV

Dry Runway

MAX MANUAL	4690	70/-50	150	-220/720	70/-70	130/-120	240	0	190
AUTOBRAKE MAX	5110	60/-60	150	-240/780	10/0	140/-140	260	0	60
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/0	250/-250	480	0	0

Good Reported Braking Action

MAX MANUAL	6390	100/-90	290	-380/1360	210/-170	250/-220	370	0	760
AUTOBRAKE MAX	6390	100/-90	300	-380/1360	220/-180	250/-220	380	0	750
AUTOBRAKE 2	8180	100/-110	290	-430/1430	40/-10	250/-250	480	0	60

Good To Medium Reported Braking Action

MAX MANUAL	6930	100/-90	300	-390/1410	260/-210	260/-220	370	0	910
AUTOBRAKE MAX	6930	100/-90	310	-390/1410	280/-220	260/-230	380	0	900
AUTOBRAKE 2	8180	100/-110	290	-430/1430	40/-10	250/-250	480	0	60

Medium Reported Braking Action

MAX MANUAL	7410	100/-100	310	-410/1470	320/-260	270/-230	370	0	1150
AUTOBRAKE MAX	7410	100/-100	310	-410/1470	340/-270	270/-230	380	0	1140
AUTOBRAKE 3	7540	100/-100	310	-410/1450	290/-130	260/-230	410	0	1110

Medium To Poor Reported Braking Action

MAX MANUAL	8860	140/-130	450	-560/2050	530/-400	400/-320	440	0	2360
AUTOBRAKE MAX	8890	140/-130	450	-560/2050	550/-420	400/-320	440	0	2380
AUTOBRAKE 3	8890	140/-130	450	-560/2060	550/-420	400/-320	440	0	2380

Poor Reported Braking Action

MAX MANUAL	11820	160/-160	500	-760/2820	1260/-870	510/-370	440	0	5190
AUTOBRAKE MAX	11860	160/-160	510	-760/2820	1280/-890	520/-370	440	0	5200
AUTOBRAKE 3	11860	160/-160	510	-760/2820	1280/-880	520/-370	440	0	5200

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 4 (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5900	60/-70	190	-280/910	140/-120	180/-160	310	0	440
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7920	120/-120	370	-460/1660	350/-280	340/-280	450	0	1610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8650	120/-120	380	-490/1740	440/-350	350/-280	450	0	1900
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	9220	120/-130	400	-510/1820	540/-410	370/-290	450	0	2310
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	10760	170/-170	550	-670/2440	810/-590	520/-380	510	0	4410
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	14170	190/-200	650	-920/3470	1930/-1220	670/-450	510	0	9350
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS 4 (Flaps 30)****VREF30**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5690	60/-70	190	-270/900	130/-110	170/-160	310	0	390
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	7550	120/-110	360	-450/1630	330/-260	320/-260	440	0	1360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	8290	120/-110	370	-470/1700	430/-330	330/-270	440	0	1630
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	8870	120/-120	390	-500/1790	520/-400	350/-280	440	0	2020
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	10290	170/-160	530	-650/2410	780/-560	490/-360	500	0	3700
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	13730	190/-190	620	-920/3460	1920/-1200	640/-430	500	0	8220
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1 and HYD PRESS SYS 2 / HYD PRESS SYS 1 and HYD PRESS SYS 3 (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	5920	80/-60	190	-250/820	110/-100	160/-160	280	0	0
AUTOBRAKE MAX	6270	80/-60	190	-260/850	100/-40	170/-170	310	0	0
AUTOBRAKE 2	10110	110/-120	350	-470/1550	0/-20	310/-310	530	0	0

Good Reported Braking Action

MAX MANUAL	9150	130/-120	450	-530/1910	450/-350	350/-350	510	0	0
AUTOBRAKE MAX	9160	130/-120	450	-530/1920	480/-370	360/-350	510	0	0
AUTOBRAKE 2	10310	130/-130	440	-510/1860	310/-120	350/-350	520	0	0

Good To Medium Reported Braking Action

MAX MANUAL	9840	120/-120	450	-540/1940	530/-410	360/-350	510	0	0
AUTOBRAKE MAX	9850	130/-120	460	-540/1940	560/-430	360/-360	510	0	0
AUTOBRAKE 2	10310	130/-130	440	-510/1860	380/-120	350/-350	520	0	0

Medium Reported Braking Action

MAX MANUAL	10580	130/-120	460	-560/1990	650/-490	360/-360	510	0	0
AUTOBRAKE MAX	10580	130/-120	470	-560/2000	680/-510	370/-360	510	0	0
AUTOBRAKE 3	10720	130/-120	460	-560/1990	640/-490	370/-360	520	0	0

Medium To Poor Reported Braking Action

MAX MANUAL	14130	190/-190	720	-890/3290	1470/-970	570/-560	620	0	0
AUTOBRAKE MAX	14190	200/-190	730	-890/3300	1510/-1000	570/-570	620	0	0
AUTOBRAKE 3	14190	200/-190	730	-890/3300	1510/-970	570/-570	640	0	0

Poor Reported Braking Action

MAX MANUAL	20140	200/-200	770	-1210/4360	3690/-2170	650/-650	620	0	0
AUTOBRAKE MAX	20200	200/-200	780	-1210/4370	3730/-2210	650/-660	620	0	0
AUTOBRAKE 3	20200	200/-200	780	-1210/4370	3730/-2170	650/-660	640	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS 2 and HYD PRESS SYS 4 / HYD PRESS SYS 3 and HYD PRESS SYS 4 (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	8400	80/-80	290	-360/1150	330/-270	240/-250	550	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	13230	180/-170	690	-770/2770	1300/-860	530/-520	860	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	14300	180/-170	700	-780/2790	1480/-980	530/-530	860	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	15370	180/-170	710	-800/2840	1760/-1140	540/-530	860	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	20350	270/-270	1120	-1290/4800	4030/-2080	840/-830	970	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	29570	270/-240	1250	-1790/6460	9500/-4410	970/-950	960	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****Jammed Stab Landing (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5330	80/-60	170	-220/730	70/-70	150/-140	230	210	470
AUTOBRAKE MAX	6260	60/-70	190	-260/850	10/-10	170/-170	310	0	10
AUTOBRAKE 2	9880	120/-130	360	-460/1530	100/-170	350/-300	430	230	230

Good Reported Braking Action

MAX MANUAL	7080	100/-90	310	-360/1270	180/-160	290/-230	320	730	1890
AUTOBRAKE MAX	7170	100/-90	320	-360/1270	190/-160	300/-230	330	720	1880
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Good To Medium Reported Braking Action

MAX MANUAL	7510	100/-100	320	-380/1320	220/-190	300/-230	320	830	2150
AUTOBRAKE MAX	7580	100/-100	320	-380/1330	230/-200	310/-240	330	830	2160
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Medium Reported Braking Action

MAX MANUAL	7850	100/-100	330	-390/1380	250/-210	320/-240	320	970	2540
AUTOBRAKE MAX	7920	100/-100	330	-400/1380	270/-220	320/-240	330	960	2540
AUTOBRAKE 3	9100	100/-110	310	-420/1430	80/-90	270/-270	440	160	1520

Medium To Poor Reported Braking Action

MAX MANUAL	8970	130/-130	420	-480/1710	360/-300	420/-290	350	1660	5000
AUTOBRAKE MAX	9040	130/-130	430	-480/1710	380/-310	430/-290	360	1670	5060
AUTOBRAKE 3	9270	130/-110	420	-430/1620	270/-140	360/-280	400	1440	4830

Poor Reported Braking Action

MAX MANUAL	10790	150/-150	460	-620/2260	700/-530	510/-330	350	2790	9190
AUTOBRAKE MAX	10860	150/-150	460	-620/2270	720/-550	520/-330	360	2810	9240
AUTOBRAKE 3	10950	150/-150	450	-620/2280	670/-490	490/-340	400	2720	9150

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****SPOILERS (Flaps 25)****VREF25**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5040	60/-60	160	-230/740	80/-70	150/-130	270	230	540
AUTOBRAKE MAX	5340	60/-70	160	-240/790	20/-10	150/-140	280	90	340
AUTOBRAKE 2	8520	100/-120	280	-430/1430	0/-40	260/-260	470	0	0

Good Reported Braking Action

MAX MANUAL	6570	100/-100	290	-360/1260	200/-170	280/-210	370	780	2110
AUTOBRAKE MAX	6570	100/-100	300	-350/1260	210/-170	280/-220	380	770	2090
AUTOBRAKE 2	8630	100/-120	300	-440/1480	70/-70	260/-270	480	80	780

Good To Medium Reported Braking Action

MAX MANUAL	7010	100/-100	300	-370/1310	240/-200	290/-220	370	890	2400
AUTOBRAKE MAX	7010	100/-100	300	-370/1310	250/-210	290/-220	380	890	2390
AUTOBRAKE 2	8630	100/-120	300	-440/1480	70/-70	260/-270	480	80	820

Medium Reported Braking Action

MAX MANUAL	7370	100/-100	310	-390/1360	280/-230	300/-220	370	1050	2870
AUTOBRAKE MAX	7370	100/-100	310	-390/1370	290/-240	300/-220	380	1040	2860
AUTOBRAKE 3	7790	90/-100	280	-410/1410	180/-100	260/-240	440	610	2430

Medium To Poor Reported Braking Action

MAX MANUAL	8360	130/-130	400	-480/1710	390/-310	410/-270	400	1750	5750
AUTOBRAKE MAX	8400	130/-130	410	-480/1710	410/-330	410/-280	400	1770	5800
AUTOBRAKE 3	8410	130/-110	410	-440/1710	410/-220	410/-270	400	1760	5790

Poor Reported Braking Action

MAX MANUAL	10220	150/-150	450	-620/2270	740/-560	500/-310	400	3010	10720
AUTOBRAKE MAX	10260	150/-150	450	-620/2270	760/-580	510/-310	400	3020	10770
AUTOBRAKE 3	10260	150/-150	450	-620/2270	760/-580	510/-310	400	3020	10770

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

SPOILERS (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4880	60/-60	160	-220/730	80/-70	140/-130	270	210	480
AUTOBRAKE MAX	5140	60/-60	160	-240/780	20/-10	140/-140	280	90	320
AUTOBRAKE 2	8150	100/-110	280	-420/1410	0/-20	250/-250	480	0	0

Good Reported Braking Action

MAX MANUAL	6330	100/-90	290	-350/1240	190/-160	260/-210	370	690	1820
AUTOBRAKE MAX	6330	100/-90	290	-350/1250	200/-170	260/-210	370	680	1790
AUTOBRAKE 2	8250	100/-110	300	-430/1440	60/-40	250/-250	480	70	630

Good To Medium Reported Braking Action

MAX MANUAL	6780	100/-90	290	-370/1290	230/-190	270/-210	370	800	2100
AUTOBRAKE MAX	6780	100/-90	300	-370/1300	250/-200	270/-210	370	790	2080
AUTOBRAKE 2	8250	100/-110	300	-430/1440	60/-40	250/-250	480	70	660

Medium Reported Braking Action

MAX MANUAL	7140	100/-100	300	-380/1350	270/-230	290/-210	370	950	2540
AUTOBRAKE MAX	7140	100/-100	310	-380/1350	290/-230	290/-220	370	940	2520
AUTOBRAKE 3	7450	100/-100	280	-390/1390	180/-90	250/-230	430	610	2190

Medium To Poor Reported Braking Action

MAX MANUAL	8100	130/-120	400	-470/1710	390/-310	390/-270	400	1580	4930
AUTOBRAKE MAX	8130	130/-120	400	-480/1710	410/-320	390/-270	400	1590	4960
AUTOBRAKE 3	8130	130/-110	400	-450/1710	410/-240	390/-270	400	1590	4960

Poor Reported Braking Action

MAX MANUAL	10010	150/-150	440	-620/2280	760/-570	480/-300	400	2810	9570
AUTOBRAKE MAX	10040	150/-150	440	-620/2280	780/-590	490/-310	400	2820	9600
AUTOBRAKE 3	10040	150/-150	440	-620/2280	780/-590	490/-310	400	2820	9600

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****STAB TRIM UNSCHD (Flaps 25)****VREF30 + 20**

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	5330	80/-60	170	-220/730	70/-70	150/-140	230	210	470
AUTOBRAKE MAX	6260	60/-70	190	-260/850	10/-10	170/-170	310	0	10
AUTOBRAKE 2	9880	120/-130	360	-460/1530	100/-170	350/-300	430	230	230

Good Reported Braking Action

MAX MANUAL	7080	100/-90	310	-360/1270	180/-160	290/-230	320	730	1890
AUTOBRAKE MAX	7170	100/-90	320	-360/1270	190/-160	300/-230	330	720	1880
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Good To Medium Reported Braking Action

MAX MANUAL	7510	100/-100	320	-380/1320	220/-190	300/-230	320	830	2150
AUTOBRAKE MAX	7580	100/-100	320	-380/1330	230/-200	310/-240	330	830	2160
AUTOBRAKE 2	9970	120/-130	370	-470/1550	130/-200	360/-300	410	250	320

Medium Reported Braking Action

MAX MANUAL	7850	100/-100	330	-390/1380	250/-210	320/-240	320	970	2540
AUTOBRAKE MAX	7920	100/-100	330	-400/1380	270/-220	320/-240	330	960	2540
AUTOBRAKE 3	9100	100/-110	310	-420/1430	80/-90	270/-270	440	160	1520

Medium To Poor Reported Braking Action

MAX MANUAL	8970	130/-130	420	-480/1710	360/-300	420/-290	350	1660	5000
AUTOBRAKE MAX	9040	130/-130	430	-480/1710	380/-310	430/-290	360	1670	5060
AUTOBRAKE 3	9270	130/-110	420	-430/1620	270/-140	360/-280	400	1440	4830

Poor Reported Braking Action

MAX MANUAL	10790	150/-150	460	-620/2260	700/-530	510/-330	350	2790	9190
AUTOBRAKE MAX	10860	150/-150	460	-620/2270	720/-550	520/-330	360	2810	9240
AUTOBRAKE 3	10950	150/-150	450	-620/2280	670/-490	490/-340	400	2720	9150

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Two Engines Inop (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	680000 LB LANDING WEIGHT	PER 10000 LB ABV/BLW 680000 LB	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV NO REV

Dry Runway

MAX MANUAL	4740	80/-60	140	-220/720	70/-70	130/-130	220	0	0
AUTOBRAKE MAX	5310	70/-60	150	-240/790	0/0	140/-140	270	0	0
AUTOBRAKE 2	8520	100/-110	280	-430/1430	0/-30	260/-260	470	0	0

Good Reported Braking Action

MAX MANUAL	6830	100/-100	310	-420/1550	260/-210	260/-250	400	0	0
AUTOBRAKE MAX	6850	100/-100	310	-410/1530	250/-180	250/-250	420	0	0
AUTOBRAKE 2	8520	100/-110	290	-430/1440	20/-30	260/-260	470	0	0

Good To Medium Reported Braking Action

MAX MANUAL	7470	100/-100	310	-430/1580	330/-260	260/-250	400	0	0
AUTOBRAKE MAX	7470	100/-100	310	-420/1560	330/-240	250/-250	420	0	0
AUTOBRAKE 2	8520	100/-110	290	-430/1440	20/-30	260/-260	470	0	0

Medium Reported Braking Action

MAX MANUAL	8110	100/-110	320	-450/1630	420/-330	260/-260	400	0	0
AUTOBRAKE MAX	8110	100/-110	320	-440/1610	420/-300	260/-250	420	0	0
AUTOBRAKE 3	8290	100/-110	320	-450/1640	420/-280	270/-260	420	0	0

Medium To Poor Reported Braking Action

MAX MANUAL	10520	160/-170	500	-720/2690	880/-620	420/-420	540	0	0
AUTOBRAKE MAX	10550	160/-170	510	-720/2700	910/-640	430/-420	540	0	0
AUTOBRAKE 3	10600	160/-170	510	-730/2700	890/-620	430/-420	570	0	0

Poor Reported Braking Action

MAX MANUAL	15310	180/-190	520	-980/3530	2380/-1490	490/-490	540	0	0
AUTOBRAKE MAX	15340	180/-190	530	-980/3530	2410/-1510	490/-500	540	0	0
AUTOBRAKE 3	15380	180/-190	530	-980/3540	2370/-1490	490/-500	570	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.

Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

Based on engine bleed for packs on and anti-ice off

AIRPORT OAT (°C)	LANDING CLIMB LIMIT WEIGHT (1000 LB)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	729.1					
52	746.6					
50	766.5	740.7				
48	784.4	759.8				
46	802.6	778.0	727.3			
44	820.8	796.3	743.0			
42	839.2	814.9	761.7	699.1		
40	858.2	833.2	778.5	715.0		
38	878.7	851.9	795.2	731.2	671.4	
36	898.4	870.6	812.3	746.1	684.3	
34	915.9	889.2	829.4	762.0	697.6	627.9
32	930.6	905.6	846.4	776.2	710.2	638.8
30	945.5	920.6	859.3	790.5	721.8	649.8
28	946.1	934.1	871.9	805.1	733.5	660.3
26	946.6	947.1	884.4	824.2	745.1	670.5
24	947.1	947.5	896.5	834.3	758.2	680.5
22	947.6	947.9	907.6	843.8	778.2	690.1
20	948.1	948.3	908.0	852.7	788.0	699.6
18	948.6	948.7	908.3	860.9	796.5	709.7
16	949.1	949.1	908.6	861.1	803.8	718.9
14	949.5	949.4	908.8	861.2	810.5	727.1
12	949.7	949.8	909.0	861.3	810.7	734.5
10	950.0	950.1	909.2	861.4	810.8	741.3
-40	951.8	951.8	915.3	864.1	812.7	743.7

With engine bleed for packs off, increase weight by 8200 lb.

With engine anti-ice on, decrease weight by 9900 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by 48300 lb.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Table 1 of 3: Reference Brake Energy (Millions of Foot Pounds)**

		BRAKES-ON SPEED (KIAS)														
		100			120			140			160			180		
WEIGHT (1000 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)														
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
1000	0	34.1	38.7	44.1	46.2	52.8	60.6	59.7	68.7	79.4	74.3	86.1	100.3	89.6	104.7	122.9
	10	35.2	40.0	45.6	47.7	54.6	62.6	61.7	71.0	82.1	76.8	89.0	103.8	92.6	108.3	127.2
	15	35.7	40.6	46.3	48.5	55.4	63.6	62.7	72.2	83.4	78.0	90.5	105.5	94.2	110.1	129.3
	20	36.3	41.2	47.0	49.2	56.3	64.6	63.6	73.3	84.8	79.3	91.9	107.2	95.7	111.8	131.5
	30	37.3	42.4	48.3	50.6	57.9	66.5	65.5	75.5	87.3	81.6	94.7	110.5	98.6	115.4	135.7
	40	37.5	42.7	48.7	51.1	58.6	67.3	66.3	76.6	88.8	82.9	96.5	112.9	100.5	118.0	139.4
900	50	37.5	42.7	48.8	51.3	58.9	67.9	66.8	77.4	90.1	84.0	98.1	115.4	102.3	120.7	143.5
	0	31.4	35.6	40.5	42.4	48.4	55.4	54.7	62.8	72.4	68.0	78.5	91.2	81.9	95.3	111.5
	10	32.4	36.7	41.8	43.8	50.0	57.2	56.5	64.9	74.8	70.2	81.2	94.3	84.7	98.6	115.3
	15	32.9	37.3	42.5	44.5	50.8	58.1	57.4	65.9	76.0	71.3	82.5	95.8	86.0	100.2	117.2
	20	33.4	37.9	43.1	45.2	51.5	59.0	58.3	67.0	77.2	72.5	83.8	97.4	87.4	101.8	119.2
	30	34.3	38.9	44.3	46.4	53.0	60.7	60.0	68.9	79.5	74.6	86.3	100.3	90.1	104.9	123.0
800	40	34.5	39.2	44.7	46.8	53.5	61.4	60.7	69.8	80.7	75.7	87.8	102.3	91.6	107.1	125.9
	50	34.4	39.2	44.7	46.9	53.8	61.8	61.0	70.5	81.7	76.5	89.0	104.2	93.1	109.3	129.2
	0	28.6	32.4	36.8	38.6	43.9	50.2	49.6	56.8	65.3	61.6	70.9	82.0	74.1	85.9	100.1
	10	29.6	33.5	38.0	39.8	45.4	51.8	51.3	58.7	67.5	63.6	73.3	84.8	76.6	88.8	103.5
	15	30.0	34.0	38.6	40.5	46.1	52.7	52.1	59.6	68.6	64.6	74.5	86.2	77.9	90.3	105.2
	20	30.5	34.5	39.2	41.1	46.8	53.5	52.9	60.6	69.6	65.6	75.6	87.6	79.1	91.7	106.9
700	30	31.3	35.5	40.3	42.2	48.1	55.0	54.4	62.3	71.7	67.5	77.9	90.2	81.4	94.5	110.3
	40	31.5	35.7	40.6	42.6	48.6	55.6	54.9	63.1	72.7	68.4	79.1	91.8	82.7	96.3	112.7
	50	31.4	35.6	40.6	42.6	48.7	55.8	55.2	63.5	73.4	69.0	80.0	93.2	83.8	97.9	115.1
	0	25.9	29.3	33.2	34.7	39.5	45.0	44.5	50.8	58.3	55.1	63.3	73.0	66.3	76.5	88.8
	10	26.7	30.3	34.3	35.9	40.8	46.5	46.0	52.5	60.2	57.0	65.4	75.4	68.5	79.1	91.8
	15	27.1	30.7	34.8	36.4	41.4	47.2	46.7	53.3	61.2	57.9	66.5	76.6	69.6	80.4	93.3
600	20	27.6	31.2	35.4	37.0	42.0	47.9	47.4	54.2	62.1	58.7	67.5	77.8	70.7	81.7	94.8
	30	28.3	32.0	36.3	38.0	43.2	49.3	48.7	55.7	63.9	60.4	69.5	80.2	72.8	84.1	97.7
	40	28.4	32.2	36.6	38.3	43.6	49.7	49.2	56.3	64.7	61.1	70.4	81.4	73.8	85.5	99.6
	50	28.3	32.1	36.5	38.2	43.6	49.9	49.3	56.6	65.2	61.5	71.0	82.4	74.5	86.6	101.3
	0	23.2	26.2	29.7	30.9	35.0	39.8	39.3	44.8	51.2	48.5	55.4	63.7	58.2	66.9	77.2
	10	23.9	27.1	30.6	31.9	36.2	41.1	40.6	46.3	52.9	50.0	57.3	65.8	60.1	69.1	79.8
500	15	24.3	27.5	31.1	32.4	36.7	41.8	41.2	47.0	53.7	50.8	58.2	66.8	61.0	70.2	81.1
	20	24.7	27.9	31.6	32.9	37.3	42.4	41.9	47.7	54.5	51.6	59.1	67.9	62.0	71.3	82.4
	30	25.3	28.6	32.4	33.8	38.3	43.6	43.0	49.1	56.1	53.1	60.8	69.9	63.8	73.4	84.9
	40	25.5	28.8	32.6	34.0	38.6	44.0	43.4	49.5	56.7	53.6	61.5	70.8	64.6	74.5	86.3
	50	25.3	28.7	32.5	33.9	38.6	44.0	43.4	49.6	57.0	53.8	61.9	71.5	65.0	75.2	87.5
	0	20.6	23.2	26.2	27.0	30.6	34.7	34.1	38.7	44.1	41.7	47.5	54.4	49.8	57.0	65.5
500	10	21.2	24.0	27.1	27.9	31.6	35.9	35.2	40.0	45.6	43.1	49.1	56.2	51.4	58.9	67.7
	15	21.6	24.3	27.5	28.3	32.1	36.4	35.7	40.6	46.3	43.7	49.9	57.1	52.2	59.8	68.8
	20	21.9	24.7	27.9	28.8	32.6	37.0	36.3	41.2	47.0	44.4	50.6	58.0	53.0	60.7	69.8
	30	22.5	25.4	28.7	29.5	33.5	38.0	37.3	42.4	48.3	45.6	52.1	59.6	54.5	62.5	71.9
	40	22.6	25.5	28.8	29.7	33.7	38.3	37.5	42.7	48.8	46.0	52.6	60.3	55.1	63.2	72.9
	50	22.4	25.3	28.7	29.6	33.6	38.2	37.5	42.7	48.9	46.1	52.8	60.7	55.3	63.7	73.6

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 at sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****Table 2(a) of 3: 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	130
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120	130
	MAX MAN	7.4	15.2	23.5	32.2	41.2	50.5	60.0	69.7	79.6	89.5	99.5	109.5	119.4
	MAX AUTO	6.8	14.2	22.1	30.4	39.1	48.1	57.5	67.0	76.7	86.5	96.5	106.4	116.3
	AUTOBRAKE 4	6.7	13.8	21.2	29.1	37.2	45.7	54.4	63.4	72.6	82.0	91.5	101.2	111.0
	AUTOBRAKE 3	6.5	13.4	20.6	28.1	35.9	44.0	52.3	60.8	69.6	78.5	87.6	96.8	106.1
	AUTOBRAKE 2	6.3	12.9	19.8	26.9	34.3	41.9	49.7	57.8	66.0	74.3	82.8	91.4	100.1
	AUTOBRAKE 1	5.9	12.0	18.4	24.9	31.6	38.4	45.5	52.6	60.0	67.5	75.1	82.9	90.7

Table 2(b) of 3: 4 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	130
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120	130
	MAX MAN	6.6	13.7	21.1	28.9	36.9	45.2	53.7	62.3	71.1	79.8	88.6	97.4	106.0
	MAX AUTO	5.0	10.6	16.8	23.6	30.8	38.5	46.6	55.0	63.6	72.4	81.3	90.4	99.4
	AUTOBRAKE 4	3.7	8.0	12.9	18.3	24.3	30.6	37.4	44.4	51.8	59.4	67.1	75.0	83.0
	AUTOBRAKE 3	2.7	6.1	10.1	14.6	19.7	25.1	31.0	37.2	43.7	50.4	57.3	64.3	71.4
	AUTOBRAKE 2	1.6	3.9	6.8	10.2	14.1	18.5	23.3	28.4	33.8	39.5	45.4	51.4	57.5
	AUTOBRAKE 1	1.0	2.4	4.1	6.2	8.6	11.3	14.3	17.5	21.0	24.7	28.7	32.8	37.1

Table 3 of 3: Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)						
		BELOW 21	21	23	27	31	34	ABOVE 34 TO 48
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	0.1	1.0	2.0	3.1	3.9		CAUTION
GROUND		1	9	20	31	39		
BRAKE TEMPERATURE INDICATION	UP TO 2.91	3.00	3.35	3.88	4.50	5.00	5.0 TO 7.0	7.0 & 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.

With one brake deactivated, increase brake energy by 7 percent.

With two brakes deactivated, increase brake energy by 15 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 4 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt 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 indication on Multifunction Display may be used 10 to 15 minutes after airplane has come to a complete stop, or in flight with gear retracted, to determine recommended cooling schedule.

Performance Inflight - QRH**Chapter PI-QRH****Engine Inoperative****Section 33****1 ENGINE INOP****Max Continuous %N1****37000 FT to 27000 FT Pressure Altitudes****Based on engine bleed for packs on and anti-ice off**

37000 FT PRESS ALT		TAT (°C)											
KCAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	93.8	94.9	95.9	96.9	97.9	98.9	98.3	96.9	95.9	94.8	93.7	93.3
240	0.74	93.7	94.7	95.8	96.8	97.8	98.8	99.8	100.3	99.0	97.9	96.9	95.7
280	0.86	93.6	94.6	95.6	96.6	97.7	98.7	99.6	100.6	100.9	100.3	99.2	98.2
35000 FT PRESS ALT		TAT (°C)											
KCAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	93.9	94.9	96.0	97.0	98.0	99.0	98.7	97.2	96.1	95.1	94.0	93.3
240	0.71	93.8	94.8	95.8	96.9	97.9	98.9	99.8	100.5	99.1	97.9	96.9	95.8
280	0.82	93.6	94.6	95.6	96.7	97.7	98.7	99.7	100.6	100.9	100.2	99.1	98.1
33000 FT PRESS ALT		TAT (°C)											
KCAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.58	95.1	96.1	97.2	98.2	99.2	100.1	98.8	97.5	96.4	95.3	94.2	94.4
240	0.68	94.9	96.0	97.0	98.0	99.0	100.0	100.6	100.0	98.7	97.6	96.5	95.4
280	0.79	94.4	95.4	96.4	97.4	98.4	99.4	100.4	101.0	100.6	99.4	98.3	97.3
31000 FT PRESS ALT		TAT (°C)											
KCAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	95.3	96.3	97.3	98.3	99.3	100.3	100.4	99.0	97.8	96.7	95.6	94.6
240	0.66	95.1	96.2	97.2	98.2	99.2	100.2	101.0	101.1	99.8	98.6	97.5	96.3
280	0.76	94.5	95.5	96.5	97.5	98.5	99.5	100.5	101.5	101.0	99.9	98.8	97.7
29000 FT PRESS ALT		TAT (°C)											
KCAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	96.0	97.1	98.1	99.1	100.1	100.5	99.6	98.3	97.2	96.1	95.0	95.0
240	0.63	95.8	96.8	97.8	98.8	99.8	100.8	100.8	99.8	98.6	97.6	96.5	95.5
280	0.73	94.8	95.9	96.9	97.8	98.8	99.8	100.8	100.9	99.9	98.8	97.8	96.8
27000 FT PRESS ALT		TAT (°C)											
KCAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.51	96.7	97.7	98.7	99.7	100.5	100.0	98.8	97.6	96.6	95.5	94.5	95.3
240	0.60	96.3	97.3	98.3	99.2	100.2	101.0	99.9	98.7	97.7	96.7	95.8	94.8
280	0.70	95.1	96.1	97.1	98.0	99.0	99.9	100.9	99.9	98.9	98.0	97.1	96.2
320	0.79	93.4	94.3	95.3	96.3	97.2	98.1	99.1	100.0	99.9	99.0	98.1	97.2

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	27	29	31	33	35	37
PACKS OFF	0.3	0.3	0.3	0.3	0.4	0.4
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9

1 ENGINE INOP

Max Continuous %N1

25000 FT to 18000 FT Pressure Altitudes

Based on engine bleed for packs on and anti-ice off

25000 FT PRESS ALT													TAT (°C)	
KCAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
200	0.49	96.3	97.3	98.3	99.2	100.2	100.1	99.1	97.9	96.8	95.8	94.9	94.6	
240	0.58	95.3	96.3	97.3	98.3	99.2	100.2	100.0	98.9	97.8	96.8	95.9	95.0	
280	0.67	94.1	95.1	96.1	97.0	98.0	98.9	99.9	100.0	99.0	98.0	97.0	96.2	
320	0.76	92.6	93.6	94.5	95.5	96.4	97.4	98.3	99.2	99.8	99.0	98.1	97.3	
24000 FT PRESS ALT													TAT (°C)	
KCAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.48	96.7	97.7	98.7	99.6	100.2	99.2	98.1	97.0	95.9	95.0	94.2	95.0	
240	0.57	95.8	96.8	97.7	98.7	99.6	100.1	99.1	98.0	97.0	96.1	95.2	94.3	
280	0.66	94.7	95.6	96.6	97.6	98.5	99.4	100.0	99.0	98.0	97.1	96.3	95.4	
320	0.75	93.3	94.2	95.2	96.1	97.0	97.9	98.8	99.8	99.1	98.2	97.3	96.5	
22000 FT PRESS ALT													TAT (°C)	
KCAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.46	95.6	96.6	97.5	98.5	99.5	99.3	98.3	97.3	96.3	95.4	94.4	94.2	
240	0.55	94.8	95.7	96.7	97.7	98.6	99.5	99.3	98.4	97.3	96.4	95.5	94.6	
280	0.63	93.7	94.7	95.6	96.6	97.5	98.4	99.3	99.1	98.2	97.3	96.5	95.6	
320	0.72	92.6	93.6	94.5	95.4	96.3	97.3	98.2	99.1	99.2	98.3	97.4	96.6	
20000 FT PRESS ALT													TAT (°C)	
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.44	95.6	96.6	97.5	98.5	99.4	98.6	97.6	96.6	95.7	94.8	93.9	94.3	
240	0.53	94.9	95.9	96.8	97.7	98.6	99.4	98.6	97.6	96.7	95.8	94.9	94.0	
280	0.61	93.8	94.7	95.7	96.6	97.5	98.4	99.2	98.5	97.6	96.7	95.8	95.0	
320	0.69	92.8	93.8	94.7	95.6	96.5	97.4	98.3	99.2	98.4	97.6	96.7	95.9	
360	0.77	91.6	92.5	93.4	94.3	95.2	96.1	97.0	97.9	98.7	98.4	97.6	96.8	
18000 FT PRESS ALT													TAT (°C)	
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
200	0.42	94.6	95.5	96.5	97.4	98.3	98.8	97.8	96.9	95.9	95.0	94.1	93.4	
240	0.51	94.0	94.9	95.8	96.8	97.7	98.6	98.7	97.8	96.9	96.0	95.1	94.2	
280	0.59	93.0	93.9	94.8	95.7	96.7	97.5	98.4	98.5	97.7	96.8	95.9	95.0	
320	0.67	92.0	92.9	93.8	94.7	95.6	96.5	97.4	98.2	98.4	97.6	96.7	95.9	
360	0.75	90.9	91.8	92.7	93.6	94.5	95.4	96.2	97.1	97.9	98.3	97.5	96.8	

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	18	20	22	24	25
PACKS OFF	0.2	0.2	0.2	0.2	0.2
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON	-0.8	-0.8	-0.8	-0.8	-0.9

1 ENGINE INOP**Max Continuous %N1****16000 FT to 5000 FT Pressure Altitudes****Based on engine bleed for packs on and anti-ice off**

16000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	93.5	94.5	95.4	96.3	97.2	98.1	98.0	97.1	96.1	95.2	94.3	93.4
240	0.49	93.0	93.9	94.9	95.8	96.7	97.6	98.5	97.9	97.0	96.1	95.2	94.4
280	0.57	92.2	93.1	94.0	94.9	95.8	96.7	97.6	98.4	97.7	96.9	96.0	95.1
320	0.64	91.1	92.0	92.9	93.8	94.7	95.6	96.5	97.3	98.2	97.6	96.7	95.9
360	0.72	90.1	91.0	91.9	92.8	93.6	94.5	95.4	96.2	97.1	97.9	97.5	96.7
14000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.39	92.5	93.4	94.3	95.2	96.1	97.0	97.9	97.2	96.3	95.4	94.5	93.6
240	0.47	92.1	93.0	94.0	94.9	95.8	96.6	97.5	98.1	97.3	96.4	95.5	94.6
280	0.54	91.4	92.3	93.2	94.1	95.0	95.8	96.6	97.5	97.9	97.1	96.2	95.4
320	0.62	90.4	91.3	92.2	93.1	94.0	94.8	95.7	96.6	97.4	97.6	96.9	96.0
360	0.69	89.4	90.3	91.2	92.1	93.0	93.8	94.7	95.5	96.4	97.2	97.5	96.8
12000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.38	91.5	92.4	93.3	94.2	95.1	96.0	96.9	97.4	96.6	95.7	94.8	93.9
240	0.45	91.3	92.2	93.1	94.0	94.9	95.8	96.7	97.6	97.5	96.7	95.9	95.0
280	0.52	90.7	91.6	92.5	93.4	94.3	95.1	96.0	96.8	97.6	97.4	96.6	95.7
320	0.60	89.8	90.7	91.6	92.5	93.3	94.2	95.1	95.9	96.7	97.6	97.1	96.3
360	0.67	88.9	89.8	90.7	91.6	92.4	93.3	94.1	95.0	95.8	96.6	97.4	97.0
10000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.36	90.5	91.4	92.3	93.2	94.1	95.0	95.8	96.7	96.7	95.9	95.0	94.2
240	0.43	90.6	91.5	92.4	93.3	94.1	95.0	95.9	96.7	97.6	97.0	96.2	95.3
280	0.51	90.0	90.9	91.8	92.7	93.6	94.5	95.3	96.2	97.0	97.7	96.9	96.0
320	0.58	89.2	90.1	91.0	91.9	92.7	93.6	94.4	95.3	96.1	96.9	97.4	96.6
360	0.65	88.4	89.2	90.1	91.0	91.8	92.7	93.5	94.4	95.2	96.0	96.8	97.2
5000 FT PRESS ALT			TAT (°C)										
KCAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.33	87.5	88.3	89.2	90.1	90.9	91.8	92.6	93.4	94.2	95.1	94.7	93.9
240	0.40	87.8	88.6	89.5	90.4	91.2	92.1	92.9	93.7	94.6	95.4	95.9	95.2
280	0.46	87.3	88.2	89.1	89.9	90.8	91.6	92.4	93.3	94.1	94.9	95.7	95.7
320	0.53	86.7	87.5	88.4	89.3	90.1	90.9	91.8	92.6	93.4	94.2	95.0	95.8
360	0.59	85.9	86.8	87.6	88.4	89.3	90.1	90.9	91.7	92.6	93.4	94.1	94.9

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	5	10	12	14	16
PACKS OFF	0.1	0.1	0.2	0.3	0.2
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.2	-0.3
ENGINE & WING ANTI-ICE ON	-0.6	-0.6	-0.6	-0.7	-0.7

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	982	322	26400	25100	23500
950	934	314	28000	26800	25300
900	889	308	29600	28400	27000
850	839	299	31100	30300	28800
800	789	289	32600	32000	30700
750	740	280	34000	33600	32500
700	691	273	35400	35200	34200
650	641	262	36800	36700	35800
600	590	252	38400	38200	37400
550	541	241	40100	39800	38900

Altitude reduced by 1000 ft for additional margin.

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	25	27	29	31	33	35	37
1000	%N1	83.3	86.7	91.7	96.2						
	MACH	.654	.701	.777	.832						
	KIAS	364	364	362	353						
	FF/ENG	10461	10433	10508	10602						
950	%N1	81.6	85.0	90.2	94.5	96.6					
	MACH	.639	.686	.761	.823	.836					
	KIAS	356	356	354	348	340					
	FF/ENG	9846	9819	9879	10034	9964					
900	%N1	79.9	83.3	88.6	92.9	94.8	96.9				
	MACH	.623	.670	.743	.810	.830	.839				
	KIAS	347	347	345	342	337	327				
	FF/ENG	9236	9225	9263	9451	9426	9268				
850	%N1	78.1	81.6	86.9	91.3	93.0	95.0	97.5			
	MACH	.607	.653	.726	.793	.818	.834	.840			
	KIAS	337	338	337	335	332	325	314			
	FF/ENG	8627	8640	8669	8849	8872	8730	8622			
800	%N1	76.3	79.8	85.1	89.5	91.2	93.1	95.2			
	MACH	.590	.635	.708	.774	.801	.824	.837			
	KIAS	328	328	328	326	325	321	313			
	FF/ENG	8034	8063	8091	8246	8280	8187	8053			
750	%N1	74.4	77.9	83.2	87.7	89.5	91.2	93.3	95.3		
	MACH	.572	.616	.689	.753	.782	.809	.829	.839		
	KIAS	317	318	318	316	316	314	309	300		
	FF/ENG	7487	7506	7538	7663	7709	7638	7550	7494		
700	%N1	72.5	76.0	81.3	85.9	87.6	89.4	91.3	93.2	95.3	
	MACH	.553	.596	.668	.732	.760	.788	.815	.833	.840	
	KIAS	307	308	308	307	306	305	303	297	287	
	FF/ENG	6983	6967	7001	7109	7144	7082	7028	6999	6992	
650	%N1	70.7	74.0	79.3	83.9	85.6	87.4	89.3	91.2	93.1	95.9
	MACH	.534	.576	.646	.710	.736	.765	.793	.819	.835	.841
	KIAS	296	297	298	297	296	296	295	292	285	275
	FF/ENG	6482	6443	6473	6564	6587	6524	6472	6497	6470	6538
600	%N1	68.7	72.0	77.1	81.7	83.5	85.3	87.2	89.0	90.9	93.3
	MACH	.513	.554	.623	.686	.712	.739	.768	.797	.822	.837
	KIAS	284	285	286	286	286	285	284	283	280	273
	FF/ENG	5972	5933	5943	6019	6043	5969	5923	5955	5981	5995
550	%N1	66.2	69.8	74.9	79.3	81.2	83.0	85.0	86.7	88.6	90.9
	MACH	.492	.531	.598	.660	.686	.713	.740	.770	.799	.824
	KIAS	272	273	274	275	274	274	273	273	272	268
	FF/ENG	5468	5429	5412	5485	5497	5431	5376	5416	5456	5499
500	%N1	63.7	67.3	72.2	76.8	78.6	80.5	82.5	84.3	86.1	88.3
	MACH	.470	.507	.571	.632	.658	.684	.712	.740	.770	.799
	KIAS	260	260	261	262	262	262	262	261	261	259
	FF/ENG	4972	4928	4891	4937	4963	4893	4844	4881	4924	4980
450	%N1	61.1	64.5	69.6	74.1	75.9	77.7	79.8	81.6	83.4	85.7
	MACH	.448	.482	.543	.601	.627	.653	.680	.708	.736	.767
	KIAS	248	247	248	249	249	249	249	249	248	248
	FF/ENG	4505	4459	4443	4537	4428	4375	4316	4359	4399	4451

1 ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
1000	%N1	71.9	74.9	79.5	84.4	89.5	94.8			
	KIAS	266	269	272	274	316	322			
	FF/ENG	9150	9120	9170	9230	9790	10250			
950	%N1	70.2	73.2	77.8	82.7	87.8	92.9			
	KIAS	261	264	266	265	308	314			
	FF/ENG	8630	8580	8630	8670	9170	9570			
900	%N1	68.5	71.5	76	80.9	86.1	91.1	97.4		
	KIAS	255	258	259	258	299	305	307		
	FF/ENG	8140	8060	8110	8130	8570	8920	9250		
850	%N1	66.7	69.7	74.1	78.9	84.2	89.3	94.9		
	KIAS	250	253	254	252	290	295	298		
	FF/ENG	7640	7560	7600	7600	7990	8300	8490		
800	%N1	65	67.8	72.3	76.9	82.3	87.3	92.6		
	KIAS	245	247	248	247	281	286	288		
	FF/ENG	7160	7080	7090	7080	7430	7690	7780		
750	%N1	63.2	65.9	70.4	74.9	80.3	85.4	90.3		
	KIAS	241	243	244	242	272	276	278		
	FF/ENG	6710	6600	6620	6590	6900	7120	7150		
700	%N1	61.6	64.1	68.6	72.9	78.2	83.3	88.3	94.5	
	KIAS	235	238	238	236	262	266	268	272	
	FF/ENG	6280	6150	6160	6130	6380	6570	6570	6950	
650	%N1	60	62.2	66.5	71	76	81.1	86.1	91.8	
	KIAS	230	232	232	230	252	256	257	261	
	FF/ENG	5850	5730	5720	5670	5870	6040	6010	6270	
600	%N1	58.2	60.4	64.3	69	73.7	78.8	83.7	89.1	
	KIAS	224	226	226	224	242	246	247	250	
	FF/ENG	5410	5330	5280	5230	5370	5500	5460	5690	
550	%N1	56	58.4	62.1	66.5	71.4	76.2	81.2	86.5	94.4
	KIAS	217	219	220	218	231	235	235	238	242
	FF/ENG	4990	4920	4860	4820	4950	5060	4920	5150	5550
500	%N1	53.6	56.4	59.9	64	68.8	73.5	78.6	83.8	91.1
	KIAS	211	213	213	211	220	223	224	226	230
	FF/ENG	4610	4520	4460	4510	4550	4600	4410	4610	4870
450	%N1	51.3	53.9	57.6	61.5	66	70.7	75.5	80.8	87.7
	KIAS	206	208	207	205	209	211	212	214	217
	FF/ENG	4280	4170	4140	4160	4080	4120	3930	4050	4280

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH **Chapter PI-QRH**
Two Engines Inoperative **Section 34**

2 ENGINES INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	967	312	11400	9900	8200
950	917	305	13300	11800	10100
900	870	297	15300	13800	12100
850	822	289	17400	16000	14300
800	774	282	19500	18200	16600
750	726	273	21600	20200	18800
700	678	265	23600	22400	20900
650	631	256	25700	24600	23100
600	583	246	27600	26900	25500
550	535	236	29400	29200	28000
500	486	225	31300	31200	30200
450	438	214	33300	33300	32200

Altitude reduced by 2000 ft for additional margin.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Table 1 of 2: 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
669	626	589	556	526	500	475	454	434	415	399
1335	1251	1177	1111	1052	1000	952	908	869	832	799
2000	1875	1764	1666	1579	1500	1428	1363	1304	1249	1199
2665	2499	2352	2221	2105	2000	1904	1818	1739	1666	1600
3332	3124	2940	2777	2631	2500	2381	2272	2174	2083	2000
4002	3751	3530	3334	3158	3000	2856	2726	2608	2499	2399
4677	4382	4122	3891	3685	3500	3332	3179	3040	2913	2796
5358	5017	4717	4451	4213	4000	3806	3631	3471	3325	3191
6047	5658	5316	5013	4742	4500	4280	4082	3901	3735	3583
6745	6305	5919	5577	5272	5000	4753	4530	4328	4142	3972

Table 2 of 2: Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)												TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)												
	450	500	550	600	650	700	750	800	850	900	950	1000	
500	16.4	17.9	19.6	21.5	22.8	24.5	26.1	27.8	29.2	31.0	32.5	34.5	1:16
1000	32.8	35.8	39.1	42.8	45.9	49.3	52.6	56.0	59.3	63.2	66.9	70.9	2:31
1500	48.6	53.0	58.0	63.4	68.2	73.3	78.2	83.3	88.4	94.3	100.0	106.1	3:45
2000	63.9	69.7	76.3	83.5	90.0	96.6	103.1	109.9	116.8	124.5	132.1	140.1	5:00
2500	78.7	86.0	94.0	103.0	111.1	119.2	127.4	135.8	144.4	153.8	163.2	173.1	6:15
3000	93.2	101.7	111.3	121.9	131.7	141.3	151.1	161.0	171.2	182.3	193.5	205.1	7:31
3500	107.1	117.0	128.1	140.4	151.8	162.8	174.1	185.6	197.4	210.1	222.9	236.2	8:49
4000	120.7	131.9	144.4	158.4	171.3	183.8	196.5	209.5	222.8	237.2	251.5	266.5	10:08
4500	133.8	146.3	160.3	176.0	190.3	204.2	218.4	232.8	247.6	263.5	279.4	296.0	11:31
5000	146.5	160.4	175.8	193.0	208.9	224.1	239.7	255.5	271.8	289.2	306.6	324.7	12:56

Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)								
		10	14	17	20	23	25	27	29	31
950	%N1	94.2								
	MACH	.639								
	KIAS	356								
	FF/ENG	14975								
900	%N1	92.3								
	MACH	.623								
	KIAS	347								
	FF/ENG	13984								
850	%N1	90.4	94.1							
	MACH	.607	.653							
	KIAS	337	338							
	FF/ENG	13015	13233							
800	%N1	88.2	92.1	95.0						
	MACH	.590	.635	.671						
	KIAS	328	328	328						
	FF/ENG	12079	12268	12394						
750	%N1	86.0	90.1	92.9						
	MACH	.572	.616	.652						
	KIAS	317	318	318						
	FF/ENG	11209	11353	11501						
700	%N1	83.8	87.9	90.8	93.8					
	MACH	.553	.596	.632	.668					
	KIAS	307	308	308	308					
	FF/ENG	10385	10482	10620	10788					
650	%N1	81.5	85.5	88.5	91.4	94.7				
	MACH	.534	.576	.610	.646	.684				
	KIAS	296	297	297	298	297				
	FF/ENG	9570	9638	9749	9910	10101				
600	%N1	79.1	83.0	86.1	89.0	92.0	94.4	97.2		
	MACH	.513	.554	.587	.623	.660	.686	.712		
	KIAS	284	285	286	286	286	286	286		
	FF/ENG	8777	8829	8904	9041	9194	9344	9503		
550	%N1	76.5	80.3	83.3	86.5	89.4	91.4	93.9	96.8	
	MACH	.492	.531	.563	.598	.635	.660	.686	.713	
	KIAS	272	273	274	274	275	275	274	274	
	FF/ENG	8009	8034	8089	8196	8330	8442	8545	8653	
500	%N1	73.8	77.5	80.4	83.5	86.6	88.6	90.6	93.1	96.3
	MACH	.470	.507	.538	.571	.607	.632	.658	.684	.712
	KIAS	260	260	261	261	262	262	262	262	262
	FF/ENG	7264	7254	7295	7373	7480	7586	7648	7668	7832
450	%N1	70.9	74.5	77.3	80.3	83.4	85.6	87.6	89.6	92.2
	MACH	.448	.482	.511	.543	.577	.601	.627	.653	.680
	KIAS	248	247	248	248	249	249	249	249	249
	FF/ENG	6526	6499	6512	6575	6653	6744	6801	6770	6820

Performance Inflight - QRH**Chapter PI-QRH****Gear Down****Section 35****GEAR DOWN****Max Climb %N1****Based on engine bleed for packs on, engine and wing anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KCAS OR MACH)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
	240	240	240	240	240	240	240	240	240	240	240	0.60	0.60	0.60	0.60
55	90.4	91.1	93.9	94.6	94.0	96.0	96.9	97.7	98.5	99.1	99.8	100.8	101.5	102.0	101.8
50	91.3	91.8	93.2	93.9	94.5	95.3	96.2	97.0	97.7	98.4	99.1	100.0	100.8	101.2	101.0
45	92.3	92.6	92.9	93.2	93.8	94.5	95.4	96.2	96.9	97.6	98.3	99.3	100.0	100.4	100.2
40	93.2	93.5	93.8	93.4	93.0	93.8	94.7	95.5	96.2	96.8	97.5	98.5	99.2	99.6	99.4
35	94.0	94.5	94.6	94.3	93.9	93.6	93.9	94.7	95.4	96.1	96.8	97.7	98.4	98.8	98.6
30	93.9	95.3	95.5	95.1	94.7	94.5	94.4	94.2	94.6	95.3	96.0	96.9	97.6	98.0	97.8
25	93.1	96.1	96.4	96.0	95.6	95.4	95.2	95.1	94.8	94.5	95.2	96.1	96.8	97.2	97.0
20	92.3	95.5	97.2	96.9	96.5	96.3	96.1	96.0	95.7	95.4	95.2	95.3	96.0	96.4	96.2
15	91.5	94.7	97.7	97.7	97.4	97.2	97.1	96.9	96.6	96.3	96.1	95.7	95.1	95.6	95.4
10	90.7	93.9	96.9	97.7	98.2	98.1	98.0	97.8	97.5	97.3	97.0	96.7	96.0	94.7	94.6
5	89.9	93.0	96.0	96.8	97.7	98.6	98.9	98.8	98.6	98.3	98.0	97.7	97.2	95.9	94.0
0	89.1	92.2	95.1	96.0	96.8	97.7	98.8	99.6	99.5	99.3	99.1	98.7	98.2	97.0	95.2
-5	88.3	91.4	94.3	95.1	95.9	96.8	97.8	98.8	99.7	100.3	100.2	99.9	99.4	98.1	96.3
-10	87.5	90.5	93.4	94.2	95.0	95.9	96.9	97.9	98.8	99.9	100.9	101.0	100.7	99.3	97.3
-15	86.6	89.6	92.5	93.3	94.1	95.0	96.0	97.0	97.9	98.9	99.9	101.2	101.0	100.8	98.5
-20	85.8	88.8	91.6	92.4	93.2	94.1	95.1	96.0	96.9	98.0	99.0	100.2	100.2	100.4	100.1

%N1 Adjustments for Engine Bleed

ENGINE BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)						
	0	5	10	15	20	25	30
ENGINE ANTI-ICE ON	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5	-0.5
ENGINE & WING ANTI-ICE ON	-0.7	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9

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
1000	18700	17200	15400
950	20000	18500	16700
900	21100	19800	18000
850	23000	21600	20000
800	25000	23600	22100
750	26700	25600	24100
700	28700	27700	26300
650	30200	29800	28500
600	31800	31600	30500
550	33300	33200	32200
500	34900	34900	33800
450	36600	36500	35500

GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	21	23	25	27	29	31	33
1000	%N1	83.8	88.1								
	MACH	.488	.525								
	KIAS	270	270								
	FF/ENG	10019	10137								
950	%N1	82.8	86.9	93.5							
	MACH	.488	.525	.589							
	KIAS	270	270	270							
	FF/ENG	9682	9770	10140							
900	%N1	81.8	85.9	92.3	93.5						
	MACH	.488	.525	.589	.600						
	KIAS	270	270	270	270						
	FF/ENG	9380	9449	9779	9857						
850	%N1	80.3	84.1	90.4	91.5	93.9					
	MACH	.480	.514	.577	.588	.610					
	KIAS	266	264	264	264	264					
	FF/ENG	8906	8888	9162	9219	9345					
800	%N1	78.4	82.1	88.3	89.4	91.6	94.1				
	MACH	.468	.501	.561	.572	.594	.617				
	KIAS	259	257	257	257	256	256				
	FF/ENG	8350	8288	8485	8541	8646	8779				
750	%N1	76.6	80.1	86.1	87.2	89.4	91.6	94.5			
	MACH	.456	.487	.544	.555	.577	.600	.624			
	KIAS	252	250	249	249	249	248	248			
	FF/ENG	7821	7731	7839	7886	7990	8095	8238			
700	%N1	74.7	78.0	83.9	84.9	87.1	89.3	91.7	94.5		
	MACH	.443	.473	.527	.537	.559	.582	.605	.628		
	KIAS	245	242	240	240	241	241	240	239		
	FF/ENG	7317	7200	7228	7258	7351	7457	7525	7568		
650	%N1	72.8	75.9	81.5	82.5	84.7	86.9	89.1	91.6		
	MACH	.431	.458	.509	.519	.540	.562	.586	.610		
	KIAS	238	235	232	232	232	232	232	232		
	FF/ENG	6824	6686	6659	6670	6724	6832	6886	6903		
600	%N1	70.8	73.8	79.2	80.3	82.5	84.7	86.8	89.1	92.0	
	MACH	.418	.444	.493	.504	.525	.547	.569	.593	.619	
	KIAS	231	227	225	225	225	225	225	225	225	
	FF/ENG	6342	6193	6142	6172	6211	6296	6353	6335	6395	
550	%N1	68.6	71.7	76.9	78.0	80.2	82.3	84.5	86.6	89.2	92.0
	MACH	.404	.429	.479	.489	.510	.531	.553	.577	.601	.627
	KIAS	223	220	218	218	219	219	219	219	219	219
	FF/ENG	5858	5708	5662	5691	5729	5787	5839	5806	5822	6000
500	%N1	66.2	69.3	74.6	75.6	77.7	79.9	82.0	84.2	86.5	89.0
	MACH	.390	.414	.465	.474	.494	.515	.536	.559	.583	.609
	KIAS	215	212	211	211	212	212	212	212	212	212
	FF/ENG	5375	5231	5206	5225	5282	5289	5335	5297	5289	5398
450	%N1	63.8	67.0	72.4	73.3	75.3	77.4	79.5	81.7	84.0	86.2
	MACH	.374	.401	.451	.460	.479	.499	.520	.543	.566	.591
	KIAS	206	205	205	205	205	205	205	205	205	205
	FF/ENG	4892	4798	4779	4787	4851	4921	4860	4828	4805	4892

Table 1 of 3: Ground to Air Miles Conversion

GEAR DOWN

Descent at .66/250

PRESSURE ALT (1000 FT)	5	10	15	17	19	21	23	25	27	29	31	33	35	37
DISTANCE (NM)	13	24	36	41	46	51	56	61	66	71	76	81	85	89
TIME (MINUTES)	6	8	11	12	13	13	14	15	16	17	18	18	19	19

GEAR DOWN

**Holding
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
1000	%N1	75.4	78.7	83.8	89.1			
	KIAS	265	267	269	270			
	FF/ENG	10240	10350	10490	10700			
950	%N1	73.8	77	81.9	87.5	93.5		
	KIAS	259	260	262	265	270		
	FF/ENG	9680	9730	9850	10100	10650		
900	%N1	72.2	75.4	80.1	85.4	91.7		
	KIAS	254	254	256	257	266		
	FF/ENG	9180	9190	9260	9400	10070		
850	%N1	70.6	73.8	78.4	83.6	89.4		
	KIAS	249	249	250	252	257		
	FF/ENG	8700	8680	8730	8830	9270		
800	%N1	69	72.1	76.7	81.7	87.4	93.6	
	KIAS	243	244	245	246	250	252	
	FF/ENG	8240	8180	8210	8290	8590	9030	
750	%N1	67.5	70.5	75.1	80	85.8	91.6	
	KIAS	239	239	240	242	246	248	
	FF/ENG	7810	7740	7760	7820	8130	8500	
700	%N1	65.9	68.8	73.4	78.1	83.4	89	
	KIAS	234	234	235	236	238	238	
	FF/ENG	7370	7320	7300	7320	7470	7730	
650	%N1	64.3	67	71.5	76.2	81.4	86.9	93.1
	KIAS	228	228	229	230	231	232	232
	FF/ENG	6940	6870	6830	6830	6960	7160	7280
600	%N1	62.5	65.2	69.6	74.2	79.2	84.7	90.4
	KIAS	222	222	223	224	225	225	225
	FF/ENG	6490	6380	6380	6370	6450	6610	6660
550	%N1	60.7	63.3	67.6	72.2	76.9	82.3	87.8
	KIAS	216	216	217	217	218	219	219
	FF/ENG	6040	5930	5930	5900	5940	6080	6080
500	%N1	58.8	61.4	65.5	70.1	74.6	79.9	85.3
	KIAS	209	210	210	211	211	212	212
	FF/ENG	5590	5500	5480	5450	5470	5550	5540
450	%N1	57	59.6	63.5	67.9	72.4	77.4	82.8
	KIAS	205	205	205	205	205	205	205
	FF/ENG	5200	5130	5090	5040	5020	5170	5040

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH
Gear Down, One Engine Inop

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Section 36

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
Based on engine bleed for packs on

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	970	270	11400	10000	8200
950	923	270	12500	11200	9600
900	877	266	14200	13000	11500
850	828	259	16300	15000	13500
800	780	251	18300	17100	15700
750	732	246	20100	19000	17800
700	681	237	22200	21100	19800
650	633	231	24100	23100	21800
600	586	224	25900	25100	23900
550	538	218	27600	27200	26000
500	488	211	29400	29300	28200
450	438	205	31000	30900	30000

Altitude reduced by 1000 ft for additional margin.

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

Based on engine bleed for packs on or off

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
1000	10700	9200	7000
950	11800	10400	8600
900	12900	11500	9800
850	14700	13300	11600
800	16900	15500	13800
750	19100	17700	16200
700	21200	20000	18600
650	23400	22400	21000
600	25300	24500	23100
550	27200	26600	25300
500	29000	28800	27600
450	30700	30700	29700

Altitude reduced by 1000 ft for additional margin.

With engine anti-ice on, decrease altitude capability by 300 ft.

With engine and wing anti-ice on, decrease altitude capability by 800 ft.

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)							
		10	14	17	20	23	25	27	29
900	%N1	91.1							
	MACH	.488							
	KIAS	270							
	FF/ENG	12660							
850	%N1	89.4	93.5						
	MACH	.480	.514						
	KIAS	266	264						
	FF/ENG	11957	12137						
800	%N1	87.4	91.3	94.8					
	MACH	.468	.501	.529					
	KIAS	259	257	257					
	FF/ENG	11145	11242	11461					
750	%N1	85.3	89.2	92.3	96.3				
	MACH	.456	.487	.514	.544				
	KIAS	252	250	249	249				
	FF/ENG	10388	10413	10547	10856				
700	%N1	83.1	86.9	89.9	93.4				
	MACH	.443	.473	.498	.527				
	KIAS	245	242	241	240				
	FF/ENG	9679	9638	9710	9903				
650	%N1	80.9	84.6	87.5	90.6	94.6			
	MACH	.431	.458	.482	.509	.540			
	KIAS	238	235	233	232	232			
	FF/ENG	8997	8895	8918	9033	9264			
600	%N1	78.7	82.2	85.0	88.1	91.7	94.7		
	MACH	.418	.444	.466	.493	.525	.547		
	KIAS	231	227	225	225	225	225		
	FF/ENG	8338	8193	8172	8277	8478	8671		
550	%N1	76.4	79.6	82.4	85.7	89.1	91.6	94.8	
	MACH	.404	.429	.451	.479	.510	.531	.553	
	KIAS	223	220	218	218	219	219	219	
	FF/ENG	7682	7526	7476	7601	7755	7888	8068	
500	%N1	73.8	77.0	79.9	83.1	86.5	88.8	91.3	94.7
	MACH	.390	.414	.437	.465	.494	.515	.536	.559
	KIAS	215	212	211	211	212	212	212	212
	FF/ENG	7033	6880	6863	6956	7075	7168	7276	7403
450	%N1	71.1	74.6	77.4	80.5	83.9	86.2	88.4	91.0
	MACH	.374	.401	.425	.451	.479	.499	.520	.543
	KIAS	206	205	205	205	205	205	205	205
	FF/ENG	6384	6303	6316	6371	6462	6541	6597	6645

GEAR DOWN

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Table 1 of 3: 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	188	178	168	160	153
622	562	510	467	432	400	377	357	338	321	307
936	845	766	702	648	600	566	534	506	481	459
1253	1130	1023	936	864	800	754	712	675	641	612
1571	1416	1282	1172	1081	1000	943	890	843	801	764
1892	1704	1540	1408	1297	1200	1131	1068	1011	961	916
2215	1993	1800	1644	1514	1400	1319	1245	1179	1119	1067
2541	2284	2061	1881	1732	1600	1507	1422	1346	1278	1218
2870	2577	2324	2119	1949	1800	1695	1599	1513	1436	1369
3201	2872	2588	2358	2167	2000	1882	1775	1679	1594	1519

Table 2 of 3: 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	19.5	0:46	17.9	0:44	16.5	0:43	15.5	0:41
400	39.6	1:29	36.9	1:25	34.8	1:22	33.2	1:18
600	59.4	2:13	55.7	2:07	52.7	2:01	50.5	1:55
800	78.9	2:57	74.0	2:49	70.2	2:41	67.4	2:32
1000	98.0	3:42	92.1	3:32	87.4	3:21	84.1	3:10
1200	116.8	4:27	109.8	4:15	104.3	4:02	100.4	3:48
1400	135.3	5:12	127.3	4:58	120.9	4:43	116.4	4:26
1600	153.4	5:59	144.4	5:42	137.3	5:25	132.2	5:05
1800	171.3	6:46	161.2	6:27	153.3	6:07	147.6	5:45
2000	188.8	7:33	177.8	7:12	169.1	6:49	162.8	6:24

Table 3 of 3: Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	500	600	700	800	900
20	-2.9	-1.5	0.0	2.8	6.1
40	-6.4	-3.2	0.0	5.6	12.6
60	-9.8	-4.9	0.0	8.3	18.6
80	-13.1	-6.5	0.0	10.8	24.3
100	-16.4	-8.2	0.0	13.1	29.6
120	-19.6	-9.9	0.0	15.2	34.5
140	-22.7	-11.5	0.0	17.2	39.0
160	-25.7	-13.2	0.0	19.1	43.1
180	-28.7	-14.9	0.0	20.7	46.8
200	-31.6	-16.6	0.0	22.2	50.1

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

**Holding
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
1000	%N1	83.9	87.6	93.2			
	KIAS	265	267	269			
	FF/ENG	13660	13810	14280			
950	%N1	82.1	85.7	91.2			
	KIAS	259	260	262			
	FF/ENG	12820	12950	13320			
900	%N1	80.4	83.9	89.3	95.1		
	KIAS	254	254	256	257		
	FF/ENG	12090	12200	12440	12920		
850	%N1	78.7	82.1	87.4	93.0		
	KIAS	249	249	250	252		
	FF/ENG	11400	11490	11660	12050		
800	%N1	77.0	80.3	85.4	91.0		
	KIAS	243	244	245	246		
	FF/ENG	10730	10800	10910	11240		
750	%N1	75.3	78.5	83.6	89.1	95.9	
	KIAS	239	239	240	242	246	
	FF/ENG	10140	10190	10270	10540	11240	
700	%N1	73.5	76.7	81.6	87.0	92.9	
	KIAS	234	234	235	236	238	
	FF/ENG	9560	9570	9620	9810	10220	
650	%N1	71.6	74.8	79.5	84.9	90.5	
	KIAS	228	228	229	230	231	
	FF/ENG	8970	8950	8980	9100	9430	
600	%N1	69.6	72.8	77.4	82.6	88.1	94.7
	KIAS	222	222	223	224	225	225
	FF/ENG	8370	8340	8370	8440	8690	9100
550	%N1	67.6	70.6	75.3	80.2	85.7	91.6
	KIAS	216	216	217	217	218	219
	FF/ENG	7770	7730	7760	7790	7980	8280
500	%N1	65.4	68.4	73.0	77.8	83.1	88.8
	KIAS	209	210	210	211	211	212
	FF/ENG	7190	7130	7170	7170	7300	7530
450	%N1	63.4	66.3	70.8	75.5	80.5	86.2
	KIAS	205	205	205	205	205	205
	FF/ENG	6720	6600	6640	6620	6690	6870

This table includes 5% additional fuel for holding in a racetrack pattern.

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Performance Inflight - QRH

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Text

Section 37

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). 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 Airplane Flight Manual (AFM), the AFM takes precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

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 or turbulent air may also cause unreliable airspeed/Mach indications.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

ISFD Airspeed and Altitude Correction

In the event of loss of primary air data, Integrated Standby Flight Display (ISFD) airspeed and pressure altitude correction are provided. The first table provides the ISFD airspeed for a given gross weight and target airspeed. The second table provides a pressure altitude adjustment for a given gross weight and ISFD airspeed. The pressure altitude adjustment is added to the ISFD altitude to get the actual pressure altitude.

Max Climb %N1

This table shows Max Climb %N1 for a 340/.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. Adjustments are also shown for anti-ice operation.

Go-Around %N1

To find Max Go-Around %N1 based on normal engine bleed for packs on, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs off operation, apply the %N1 adjustments provided below the table. %N1 adjustments are shown for engine anti-ice operation.

VREF

The Reference Speed table contains flaps 30 and 25 reference speeds for a given weight.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, anti-skid inoperative, brake energy limits, or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

The FMC will protect for minimum control speeds by increasing V1, VR and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. Takeoff is not permitted in this condition as certified limits have been exceeded.

The options are to select a smaller flap setting, select derate thrust and/or add weight (fuel). Selecting derate thrust is the preferred method as this will reduce minimum control speeds. Note that the assumed temperature method may not help this condition as minimum control speeds are determined at the actual temperature and, therefore, are not reduced.

Takeoff speeds are determined as follows:

- (1) Determine V1, VR, and V2 from the Takeoff Speeds table (Table 1) with brake release weight.
- (2) Adjust V1, VR and V2 for temperature and pressure altitude from the V1, VR, V2 Adjustments table (Table 2).
- (3) Adjust V1 for slope and wind from the Slope and Wind V1 Adjustment table (Table 3).
- (4) Determine V1(MCG) and Min VR from the V1(MCG) and Minimum VR table (Table 4).
- (5) If V1 from Step 3 is less than V1(MCG), set $V1=V1(MCG)$.
- (6) If VR from Step 2 is less than Min VR, Set $VR=Min VR$.
- (7) Using Min VR from Step (4), determine V2 from the V2 for Minimum VR table (Table 5).

(8) If V_2 from Step 2 is less than V_2 for Minimum VR, set $V_2 = V_2$ for Minimum VR.

Note: Regulations prohibit scheduling takeoff with a V_1 less than minimum V_1 for control on the ground, $V_1(\text{MCG})$, VR less than Minimum VR (Min VR), and V_2 less than V_2 for Minimum VR. It is necessary to compare the adjusted V_1 , VR and V_2 to $V_1(\text{MCG})$, Minimum VR and V_2 for Minimum VR, respectively. No takeoff weight adjustment is necessary provided that the actual field length exceeds 6100 ft for a dry runway, or 8800 ft for a wet runway.

Clearway and Stopway V_1 Adjustments

Takeoff speed corrections are to be applied to V_1 when using takeoff weights based on the use of clearway and stopway.

Adjust V_1 by the amount shown in the table. The adjusted V_1 must not exceed VR. If V_1 is greater than VR, VR may be increased to equal V_1 . Increase V_2 by the same amount that VR is increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

All Engines

Holding

Target %N1, KIAS, and fuel flow per engine information are tabulated for holding with Flaps Up and Flaps 1 based on the FMC optimum holding speed schedule. This is the higher of maximum endurance speed and maneuvering speed for the selected flap setting. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, KIAS and fuel flow per engine.

Advisory Information

Runway Surface Condition Correlation

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. A table is provided that correlates runway condition code to runway surface condition description and reported braking action that can then be used to determine the appropriate Normal Configuration Landing Distance or Non-Normal Configuration Landing Distance.

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are 115% of the actual landing distance. The Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, four-engine maximum reverse thrust, and auto speedbrakes.

To use these tables, determine the reference landing distance for the selected braking configuration and reported braking action. Adjust this reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is applied independently to the reference landing distance. A correction for use of manual speedbrakes is provided in the table notes.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" reported braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing. Landing distances and adjustments are provided for dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are representative of the actual landing distance, and are not factored. The Non-Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, and maximum available symmetrical reverse thrust.

Tables for Non-Normal Configuration Landing Distance in this section are similar in format and used in the same manner as tables for the Normal Configuration Landing Distance previously described.

Landing Climb Limit Weight

Enter the Landing Climb Limit Weight table with airport OAT and pressure altitude and read landing climb limit weight. Apply the noted adjustments as required.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. Although for normal operations most landings are at weights below the AFM quick turnaround limit weight, brakes can still get hot enough that cooling is recommended. Use of the recommended cooling schedule can help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Reference Brake Energy table (Table 1) with 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 Event Adjusted Brake Energy table (Table 2) for no reverse thrust or 4 engine reverse thrust 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 (Table 3) 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 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 on the GEAR synoptic display and disappears as the hottest brake cools to an indication of 4. Note that even without an EICAS advisory message, brake cooling is recommended.

One Engine Inoperative

Max Continuous %N1

Power setting is based on one engine inoperative with packs on and anti-ice bleeds off. Enter the table with pressure altitude and KIAS 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 Driftdown Speed/Level Off Altitude 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.

Level off altitude is dependent on air temperature (ISA deviation). Note that the maximum altitude shown has been reduced by 1000 ft to maintain consistency with the FMC.

Long Range Cruise Altitude Capability

The Long Range Cruise Altitude Capability table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 1000 ft to maintain consistency with the FMC.

Long Range Cruise Control

The Long Range Cruise Control table provides target %N1, one engine inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect fuel burn per engine.

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 are based on three-engine Long Range Cruise speed and .84/290/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table (Table 1) and read Fuel and Time (Table 2) required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the Fuel Required Adjustment table (Table 3) with fuel required for the reference weight and the actual weight at checkpoint.

Holding

Power setting required (%N1), indicated airspeed, and fuel flow are shown for one engine inoperative holding based on the recommended speeds. Fuel flow is based on a racetrack holding pattern and may be reduced by 5% for holding in straight and level flight.

Two Engines Inoperative

Driftdown Speed/Level Off Altitude

The Driftdown Speed/Level Off Altitude table shows optimum driftdown speed as a function of cruise weight at the start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off.

Level off altitude is dependent on air temperature (ISA deviation). Note that the maximum altitude shown has been reduced by 2000 ft to maintain consistency with the FMC.

Driftdown/LRC Cruise Range Capability

This table shows range capability from the start of driftdown until the airplane levels off. As weight decreases due to fuel burn, the airplane accelerates to Long Range Cruise speed and maintains this speed at the level off altitude.

To determine fuel required, enter the Ground to Air Miles Conversion table (Table 1) with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Next, enter the Driftdown/Cruise Fuel and Time table (Table 2) with air distance and weight at start of driftdown to determine fuel and time required.

Long Range Cruise Altitude Capability

The Long Range Cruise Altitude Capability table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 2000 ft to be consistent with the FMC logic.

Long Range Cruise Control

The Long Range Cruise Control table provides target %N1, two engines inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect fuel burn for each engine.

Gear Down

This section contains performance for airplane operation with landing gear extended for all phases of flight. Data are based on engine bleeds for normal air conditioning.

Note: The FMC does not contain special provisions for operation with landing gear extended. As a result, the FMC 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
Introduction

Chapter MAN
Section 05

General

Non-Normal Maneuvers and Flight Patterns are included for training and review purposes.

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

Non-Normal Maneuvers

Chapter Man

Section 1

Approach to Stall or Stall Recovery

All recoveries from approach to stall should be done as if an actual stall has occurred.

Immediately do the following at the first indication of stall (buffet or stick shaker).

Note: Do not use flight director commands during the recovery.

Pilot Flying	Pilot Monitoring
<ul style="list-style-type: none">Initiate the recovery:<ul style="list-style-type: none">Hold the control column firmly.Disengage autopilot and disconnect autothrottle.Smoothly apply nose down elevator to reduce the angle of attack until buffet or stick shaker stops. Nose down stabilizer trim may be needed.*	<ul style="list-style-type: none">Monitor altitude and airspeed.Verify all required actions have been done and call out any omissions.Call out any trend toward terrain contact.
<ul style="list-style-type: none">Continue the recovery:<ul style="list-style-type: none">Roll in the shortest direction to wings level if needed.**Advance thrust levers as needed.Retract the speedbrakes.Do not change gear or flap configuration, except<ul style="list-style-type: none">During liftoff, if flaps are up, call for flaps 1.	<ul style="list-style-type: none">Monitor altitude and airspeed.Verify all required actions have been done and call out any omissions.Call out any trend toward terrain contact.Set the FLAP lever as directed.
<ul style="list-style-type: none">Complete the recovery:<ul style="list-style-type: none">Check airspeed and adjust thrust as needed.Establish pitch attitude.Return to the desired flight path.Re-engage the autopilot and activate autothrottle, if desired.	<ul style="list-style-type: none">Monitor altitude and airspeed.Verify all required actions have been done and call out any omissions.Call out any trend toward terrain contact.

WARNING: *If the control column does not provide the needed response, stabilizer trim may be necessary. Excessive use of pitch trim may aggravate the condition, or may result in loss of control or in high structural loads.

WARNING: **Excessive use of pitch trim or rudder may aggravate the condition, or may result in loss of control or in high structural loads.

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
- unusual noise or vibration
- tire failure
- abnormally slow acceleration
- takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- 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 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 thrust levers, disconnect autothrottle, and apply maximum manual wheel brakes or verify operation of RTO autobrake.</p> <p>If RTO autobrake selected, monitor system performance and apply manual wheel brakes if AUTOBRAKES message displayed or deceleration not adequate.</p> <p>Raise speedbrake lever.</p> <p>Apply the maximum amount of reverse thrust on symmetric engines 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>Autothrottle disconnected.</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 symmetrically. When all REV indications are green, call "REVERSERS NORMAL."</p> <p>If there is no REV indication(s) or the indications(s) stays amber, call "NO REVERSER ENGINE(S) NUMBER ____" or "NO REVERSERS".</p> <p>Call out any omitted action items.</p>
<p>Field length permitting:</p> <p>Initiate movement of reverse thrust levers to reach reverse idle detent by taxi speed.</p>	<p>Call out 60 knots.</p> <p>Communicate reject decision to control tower and cabin as soon as practical.</p>
<p>When the airplane is stopped, perform procedures as required.</p> <p>Review Brake Cooling Schedule for brake cooling time and precautions (refer to Performance Inflight chapter).</p> <p>Consider the following:</p> <ul style="list-style-type: none"> • the possibility of wheel fuse plugs melting • the need to clear the runway • the requirement for remote parking • wind direction in case of fire • alerting fire equipment • not setting parking brake unless passenger evacuation is necessary • advising the ground crew of the hot brake hazard • advising the passengers of the need to remain seated or evacuate • completion of the Non-Normal checklist (if appropriate) for conditions which caused the RTO 	

Runway Awareness and Advisory System (RAAS)

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Accomplish the following if a RAAS voice annunciation or alert differs from the flight crew's expectation:

Pilot Flying	Pilot Monitoring
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
- SINK RATE
- TERRAIN
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- GLIDESLOPE
- BANK ANGLE

Pilot Flying	Pilot Monitoring
Correct flightpath or 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 “PULL UP” or “OBSTACLE OBSTACLE PULLUP” or “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain.

Pilot Flying	Pilot Monitoring
Disengage autopilot. Disconnect autothrottle. Aggressively apply maximum* thrust. Simultaneously roll wings level and rotate to an initial pitch attitude of 20°. Retract speedbrakes. If terrain remains a threat, continue rotation up to the pitch limit indicator or stick shaker or initial buffet.	Assure maximum* thrust. Verify all required actions have been completed and call out any omissions.
Do not change gear or flap configuration until terrain separation is assured. Monitor radio altimeter for sustained or increasing terrain separation. When clear of terrain, slowly decrease pitch attitude and accelerate.	Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude). Call out any trend toward terrain contact.

Note: Aft control column force increases as 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 when 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** warning, the alert may be regarded as cautionary and the approach may be continued.

** as installed

Traffic Avoidance

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with the RA if there is a direct conflict between the RA and air traffic control.

WARNING: Once an RA has been issued, safe separation can 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 pitch commands 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 1,000 feet AGL should not be followed.

Pilot Flying	Pilot Monitoring
If maneuvering is required, disengage autopilot and disconnect 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:

Pilot Flying	Pilot Monitoring
Disengage autopilot and disconnect 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 the 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 the airplane is not stalled. A stalled condition can exist at any altitude 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">• Recognize and confirm the situation	
<ul style="list-style-type: none">• Disengage autopilot and disconnect autothrottle• Apply as much as full nose-down elevator• *Apply appropriate nose-down stabilizer trim• Reduce thrust• *Roll (adjust bank angle) to obtain a nose down pitch rate• Complete the recovery:<ul style="list-style-type: none">- When approaching the horizon, roll to wings level- Check airspeed and adjust thrust- Establish pitch attitude	<ul style="list-style-type: none">• Call out attitude, airspeed and altitude throughout the recovery• Verify all required actions have been completed and call out any omissions

Nose Low Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
<ul style="list-style-type: none">• Disengage autopilot and disconnect autothrottle• Recover from stall, if required• *Roll in the shortest direction to wings level (unload and roll if bank angle is more than 90 degrees)• Recover to level flight:<ul style="list-style-type: none">- Apply nose up elevator- *Apply nose-up trim, if required- Adjust thrust and drag as required	<ul style="list-style-type: none">• Call out attitude, airspeed and altitude throughout the recovery• Verify all required actions have been completed and call out any omissions

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.

Windshear

Windshear Caution

For predictive windshear caution alert (“MONITOR RADAR DISPLAY” aural):

Pilot Flying	Pilot Monitoring
Maneuver as required to avoid windshear.	

Windshear Warning

Predictive windshear warning during takeoff roll (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural):

- prior to V1, reject takeoff
- after V1, perform Windshear Escape Maneuver.

Windshear encountered during takeoff roll:

- if windshear encountered prior to V1, there may not be sufficient runway remaining to stop if an RTO is initiated at V1. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once in flight, perform Windshear Escape Maneuver
- if windshear encountered near 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 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 1,000 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

Pilot Flying	Pilot Monitoring
MANUAL FLIGHT: <ul style="list-style-type: none"> • Disengage autopilot. • Push either TO/GA switch • Aggressively apply maximum* thrust • Disconnect autothrottle • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15° • Retract speedbrakes • Follow flight director TO/GA guidance (if available)** 	<ul style="list-style-type: none"> • Verify maximum* thrust • Verify all required actions have been completed and call out any omissions
AUTOMATIC FLIGHT: <ul style="list-style-type: none"> • Press either TO/GA switch.*** • Verify TO/GA mode annunciation. • Verify GA thrust. • Retract speedbrakes. • Monitor system performance**** 	<ul style="list-style-type: none"> • Verify GA* thrust • Verify all required actions have been completed and call out any omissions.

Pilot Flying	Pilot Monitoring
MANUAL OR AUTOMATIC FLIGHT: <ul style="list-style-type: none"> • Do not change gear or flap configuration until windshear is no longer a factor • Monitor vertical speed and altitude • Do not attempt to regain lost airspeed until windshear is no longer a factor. 	<ul style="list-style-type: none"> • Monitor vertical speed and altitude • Call out any trend toward terrain contact, descending flight path, or significant airspeed changes

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 when the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: ** Do not exceed the pitch limit indication.

Note: *** If TO/GA is not available, disengage autopilot and disconnect autothrottle and fly manually.

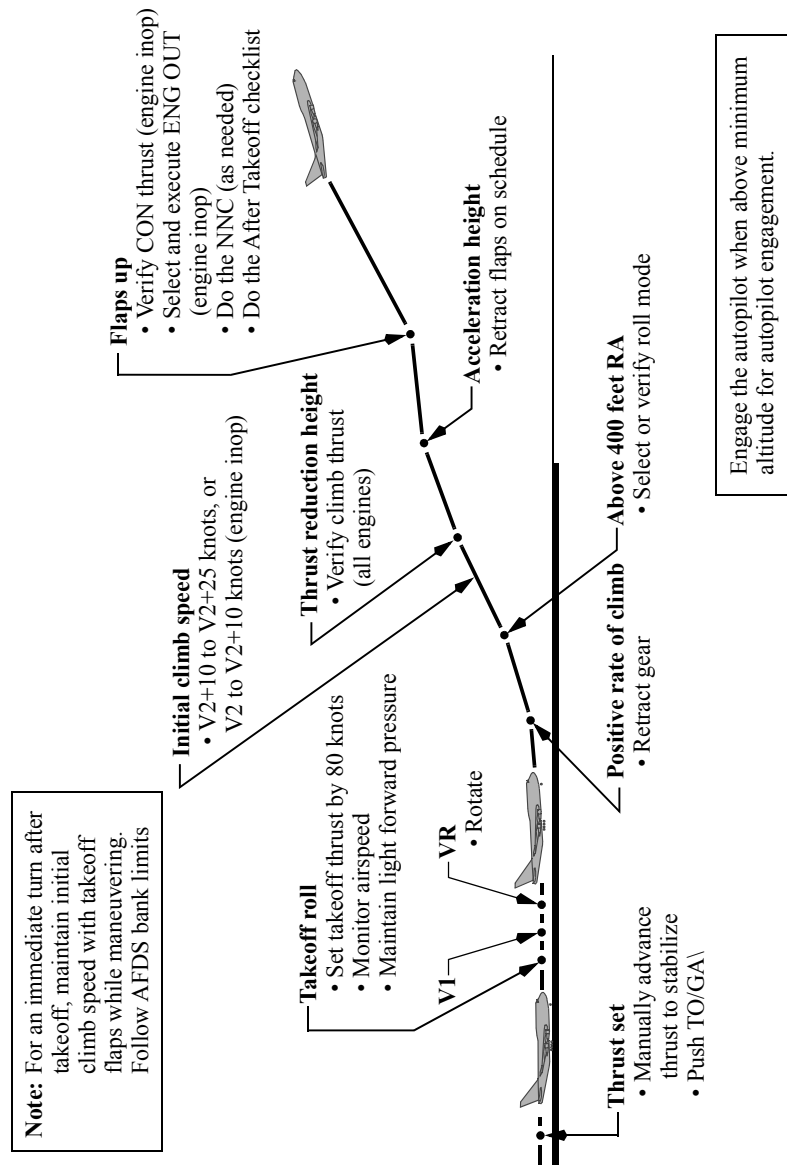
WARNING: ** Severe windshear may exceed the performance capability of the AFDS. The pilot flying must be prepared to disengage the autopilot and disconnect the autothrottle and fly manually.**

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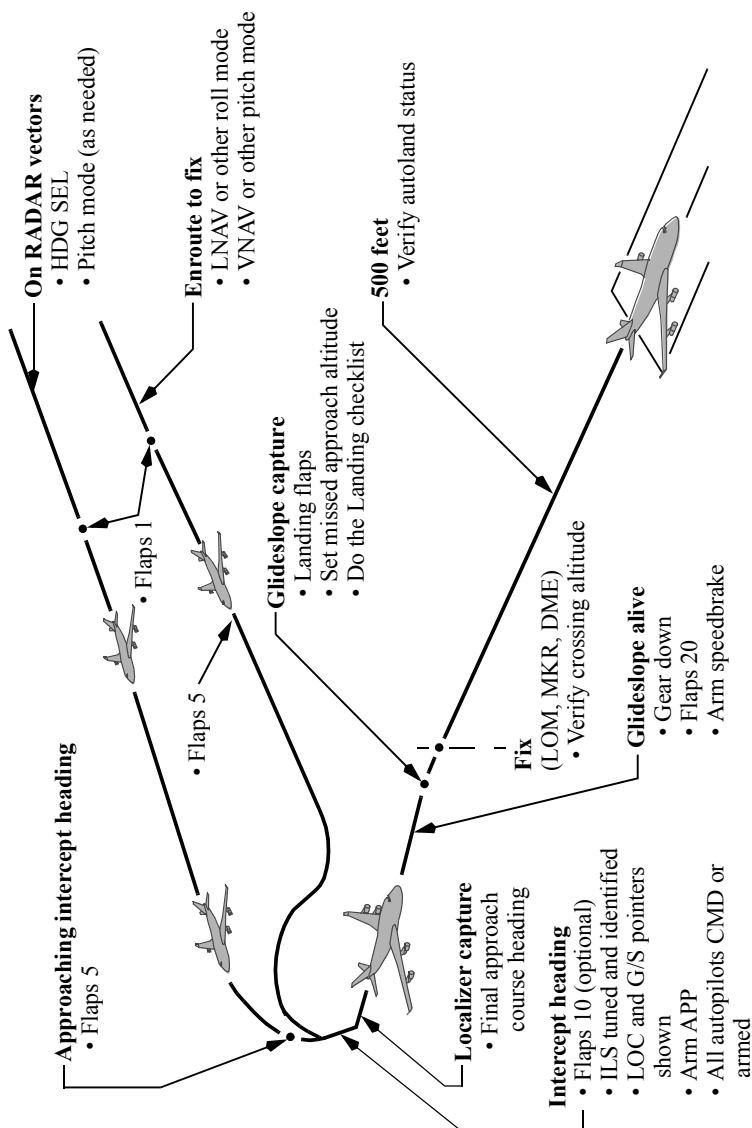
Maneuvers Flight Patterns

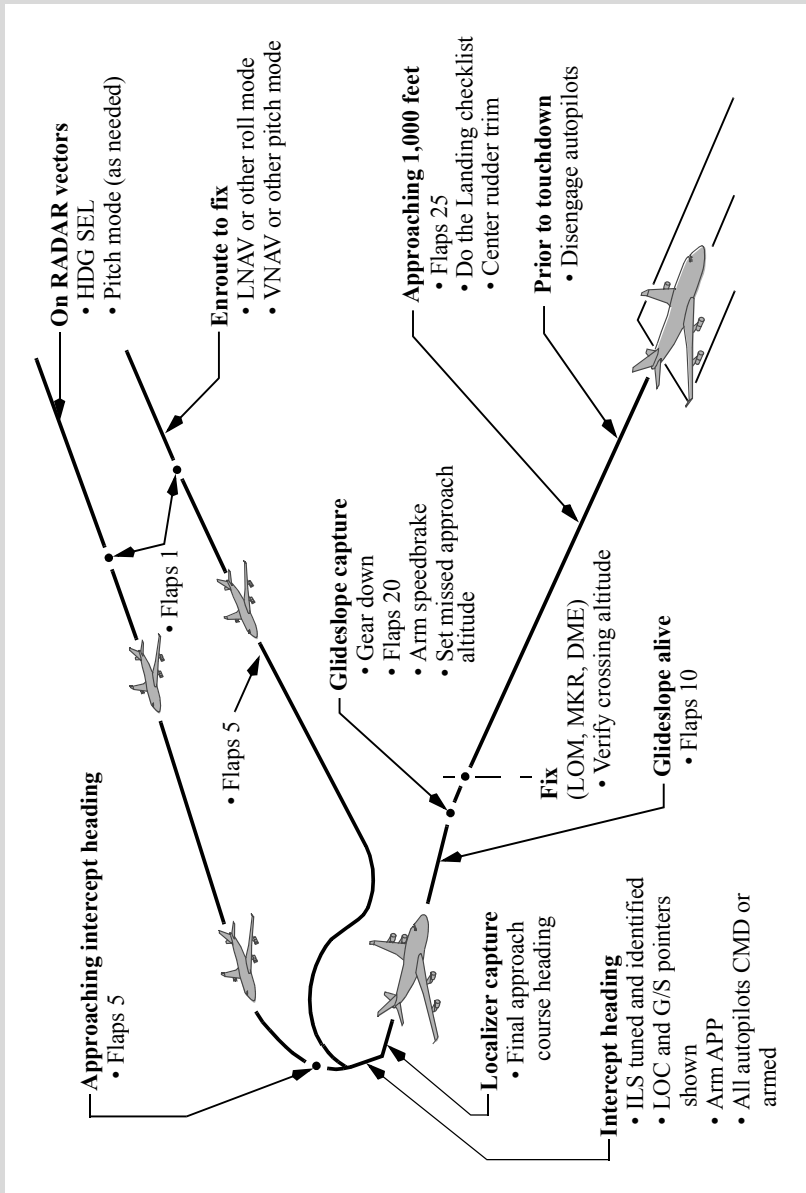
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Takeoff

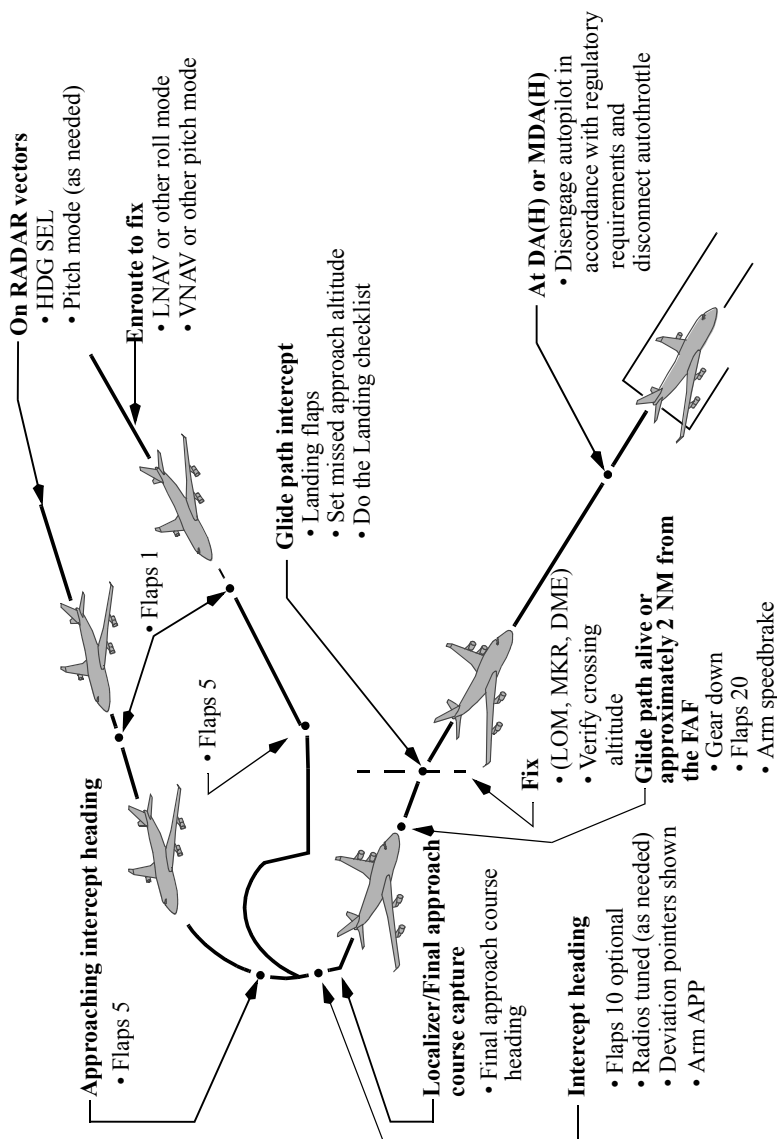


ILS/GLS Approach - Normal/One Engine Inoperative

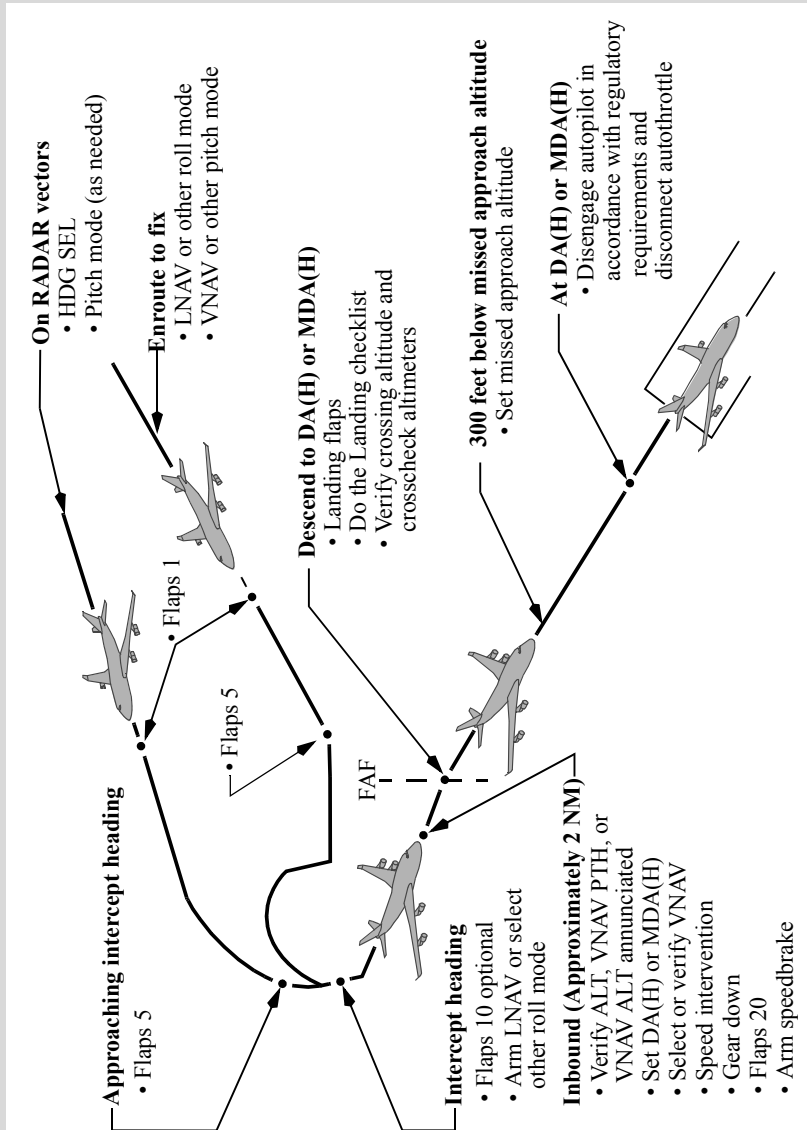


ILS/GLS Approach - Two Engines Inoperative

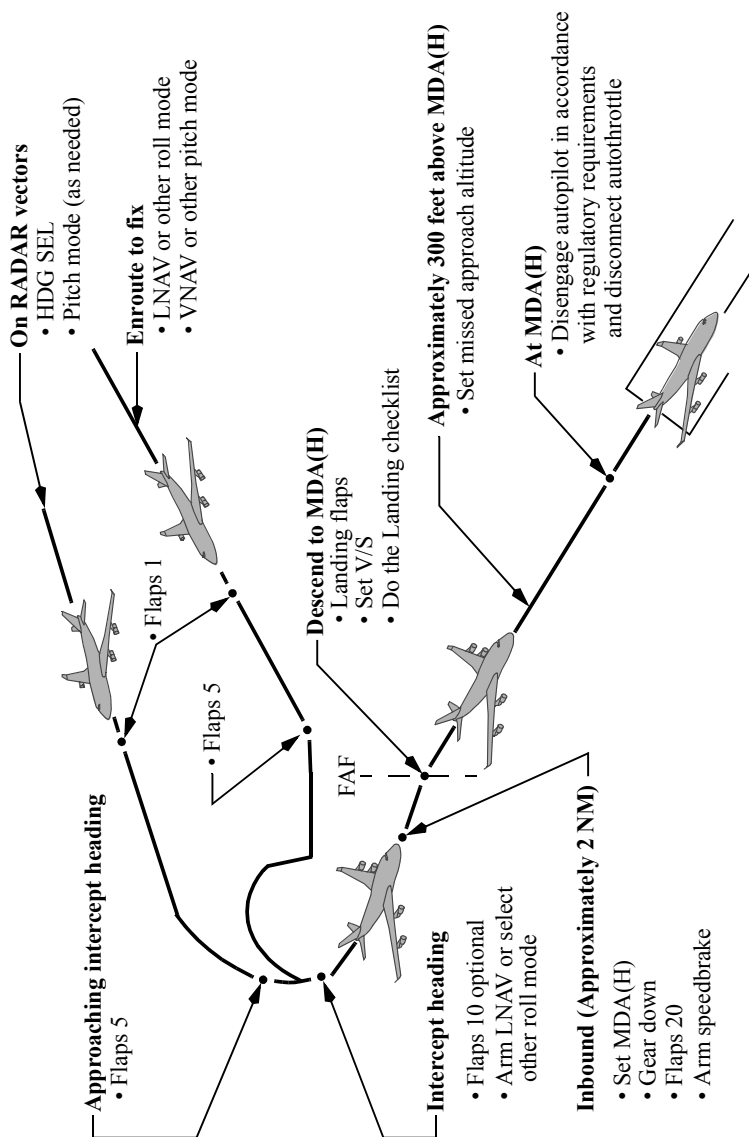
Instrument Approach Using IAN



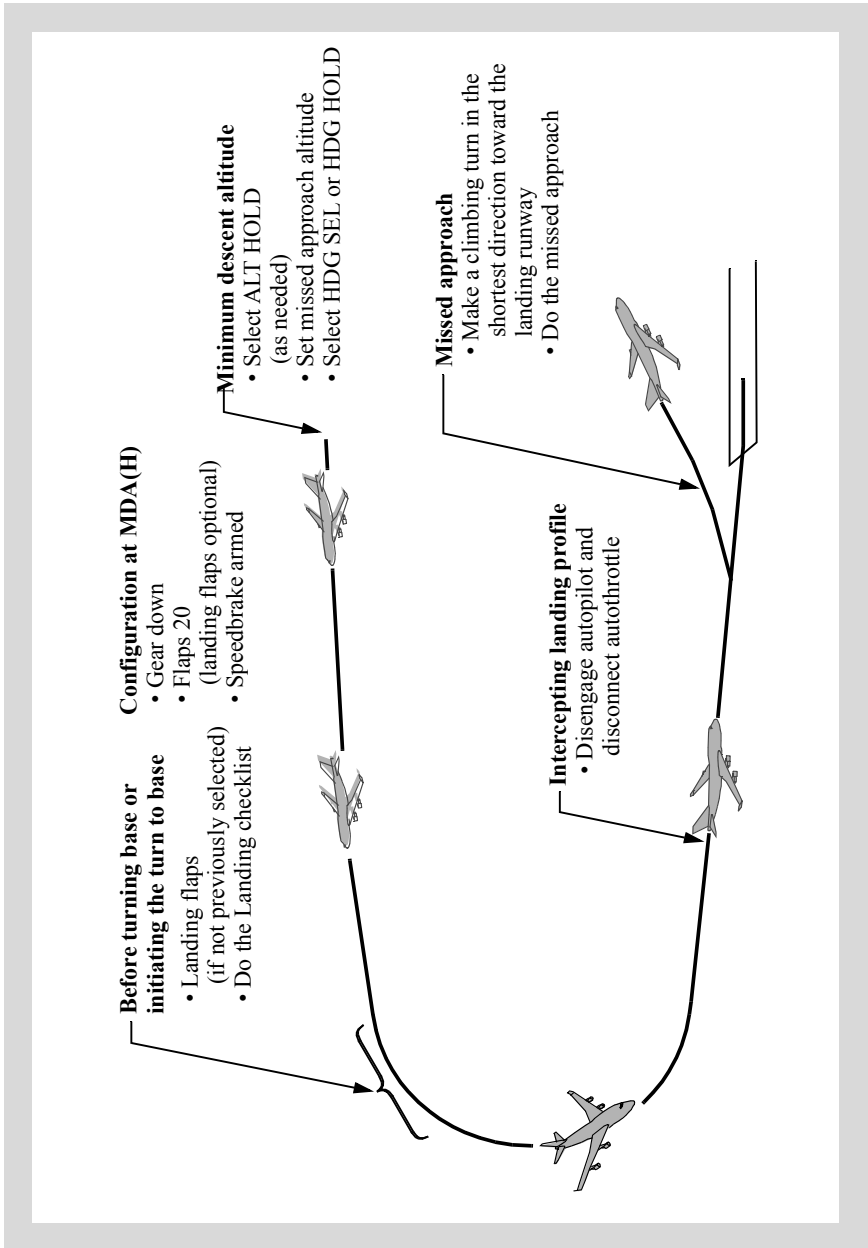
Instrument Approach Using VNAV



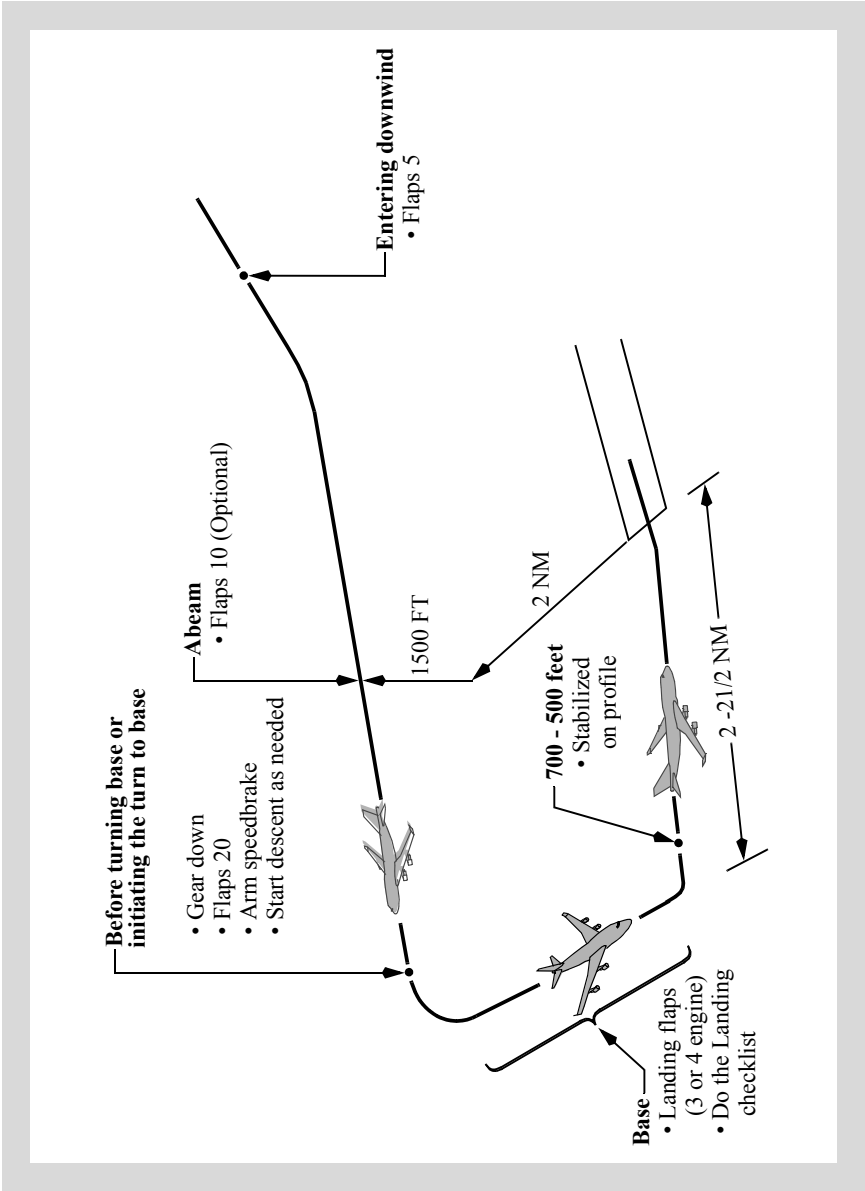
Instrument Approach Using V/S

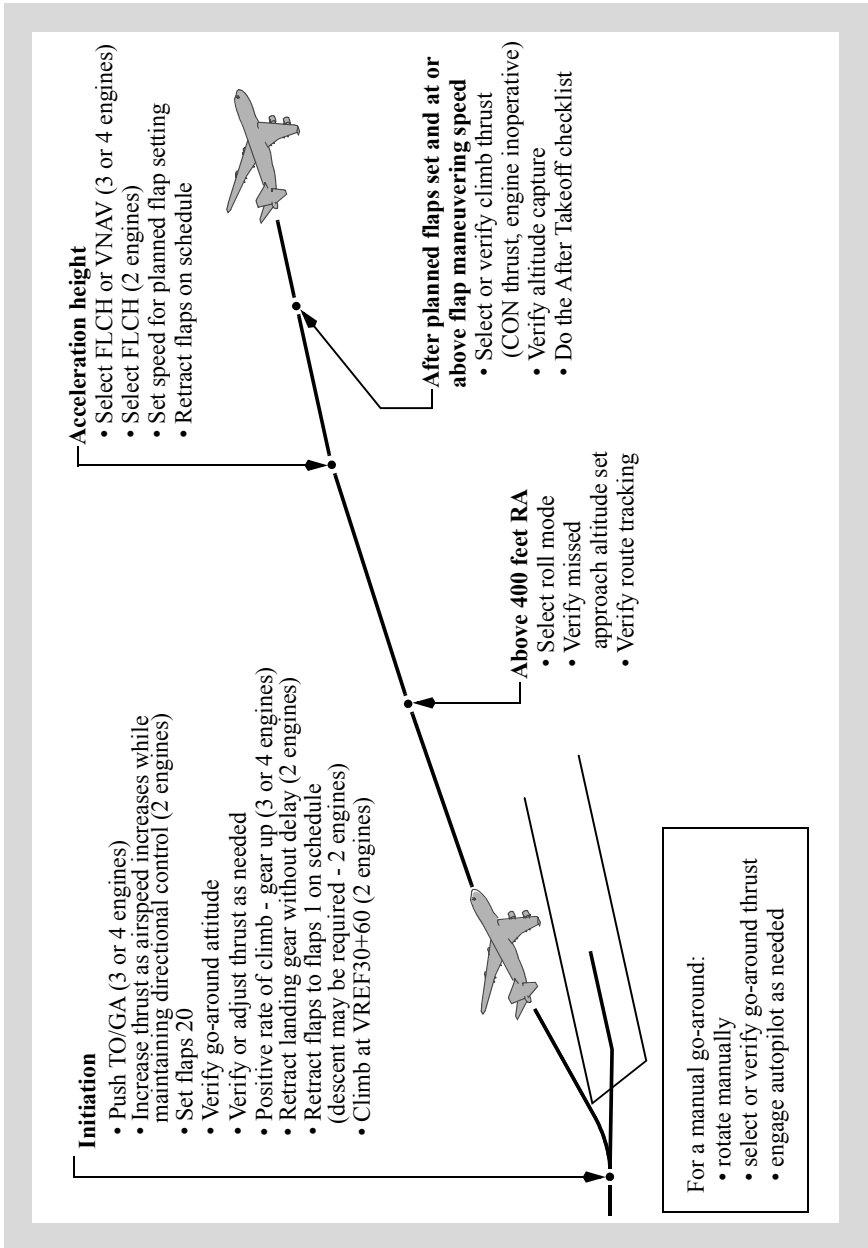


Circling Approach



Visual Traffic Pattern



Go-Around and Missed Approach - All Approaches

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DO NOT USE FOR FLIGHT

747 Flight Crew Operations Manual

Checklist Instructions

Chapter CI

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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.

Airplane Number	Registry Number
806	Intercontinental
914	Freighter

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Checklist Instructions
Revision Record**Chapter CI**
Section RR**QRH Revision Transmittal Letter**

To: All holders of The Boeing Company 747 Flight Crew Operations Manual, Boeing Document Number D6-30151-8.

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
0	March 1, 2011	
2	October 1, 2011	
4	October 1, 2012	
6	October 1, 2013	
8	October 1, 2014	
10	October 1, 2015	
12	October 1, 2016	

No.	Revision Date	Date Filed
1	May 18, 2011	
3	April 1, 2012	
5	April 1, 2013	
7	April 1, 2014	
9	April 1, 2015	
11	April 1, 2016	

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

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.

The Performance Package title descriptions are being updated to have commonality among all models. This update may generate rev bars and new page dates in the complete packages.

In this revision the following engineering changes are being introduced all Performance Packages:

The Performance Package descriptions are being updated to have commonality among all models. This update may generate rev bars and new page dates in the complete packages.

Performance Inflight - V1 and QRH - In the Advisory Section - Updated Runway Surface Condition table to add Runway Condition Code in reference to FAA AC 25-32. Added Non-Normal Landing Distances (NNL) associated with the Airspeed Unreliable Non-Normal Checklist (NNC). Also changed title of select NNLs to match associated NNC title. Added Go-around %N1 to the PI-QRH Text.

Checklist Instructions
Revision Highlights**Chapter CI**
Section RR**Chapter NNC - Non-Normal Checklists****Section 2 - Air Systems****CABIN ALTITUDE**

NNC.2.1 - Expanded the step concerning the OUTFLOW VLV and CABIN ALT AUTO message showing a more explicit choose one step.

NNC.2.2 - Expanded the step concerning the OUTFLOW VLV and CABIN ALT AUTO message showing a more explicit choose one step.

Section 3 - Anti-Ice, Rain**HEAT WINDOW L, R**

NNC.3.4 - Added objective statement for cross-model standardization.

NNC.3.4 - Added a “choose one” step with a cross-reference to the Window Damage NNC in QRH Ch 1 to ensure that it is executed when appropriate.

Section 7 - Engines, APU**ENG 1, 2, 3, 4 FAIL**

NNC.7.16 - Revised to redirect crews to the engine severe damage or separation checklist when appropriate. During training, occasionally crews incorrectly do the engine failure checklist when they should do the engine severe damage or separation checklist.

Section 9 - Flight Controls**STAB GREENBAND**

NNC.9.12 - Added bullet "Takeoff flap entry" to condition statement correcting inadvertent deletion.

Section 10 - Flight Instruments, Displays**Airspeed Unreliable**

NNC.10.7 - Added a step to turn the transponder off if altitude is unreliable. Some causes of airspeed unreliable can also interfere with altitude. If altitude is unreliable, there is a chance that an RA would decrease separation and increase the risk of a mid-air collision.

NNC.10.7 - Added a step to turn the transponder off if altitude is unreliable. Some causes of airspeed unreliable can also interfere with altitude. If altitude is unreliable, there is a chance that an RA would decrease separation and increase the risk of a mid-air collision.

NNC.10.7 - Added transponder step to reflect fleet configuration.

IAS DISAGREE

NNC.10.16 - Added a step to turn the transponder off if altitude is unreliable. Some causes of airspeed unreliable can also interfere with altitude. If altitude is unreliable, there is a chance that an RA would decrease separation and increase the risk of a mid-air collision.

NNC.10.16 - Added a step to turn the transponder off if altitude is unreliable. Some causes of airspeed unreliable can also interfere with altitude. If altitude is unreliable, there is a chance that an RA would decrease separation and increase the risk of a mid-air collision.

NNC.10.16 - Added transponder step to reflect fleet configuration.

ALT DISAGREE

NNC.10.30 - Added a step to turn the transponder off if altitude is unreliable. Some causes of airspeed unreliable can also interfere with altitude. If altitude is unreliable, there is a chance that an RA would decrease separation and increase the risk of a mid-air collision. Since the transponder does not have a selection to turn altitude reporting off, the transponder is put in standby.

NNC.10.30 - Added transponder step to reflect fleet configuration.

NNC.10.30 - Added transponder step to reflect fleet configuration.

NNC.10.31 - Added a step to turn the transponder off if altitude is unreliable. Some causes of airspeed unreliable can also interfere with altitude. If altitude is unreliable, there is a chance that an RA would decrease separation and increase the risk of a mid-air collision. Since the transponder does not have a selection to turn altitude reporting off, the transponder is put in standby.

Section 11 - Flight Management, Navigation

GPS

NNC.11.5 - Changed to refer to "ADS-B" instead of "ADS-B Out. This change makes it more generic, to cover both ADS-B Out and ADS-B In operations.

VNAV STEP CLIMB

NNC.11.12 - Revised checklist to address the case in which the step climb was accomplished early, and also to add a step that will prevent nuisance repeated appearances of the EICAS message.

Section 14 - Landing Gear

BRAKE TEMP

NNC.14.7 - Removed unnecessary minimum cooling time, and revised text for standardization.

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NNC.14.7 - Removed unnecessary minimum cooling time, and revised text for standardization.

NNC.14.7 - Removed unnecessary minimum cooling time, and revised text for standardization.

Performance Package 10**747-8 GENX-2B67 C KG M EASA TO1-10% TO2-20%****Section 10 - Pkg Model Identification**

747-8 GENX-2B67 C KG M EASA TO1-10% TO2-20% was added as Section 10.

Section 10 - General

747-8 GENX-2B67 C KG M EASA TO1-10% TO2-20% was added as Section 10.

Section 11 - All Engine

Added section "11".

Section 12 - Advisory Information

Added section "12".

Section 13 - Engine Inoperative

Added section "13".

Section 14 - Two Engines Inoperative

Added section "14".

Section 15 - Gear Down

Added section "15".

Section 16 - Gear Down, One Engine Inoperative

Added section "16".

Section 17 - Text

Added section "17".

Performance Package 20**747-8F GENX-2B67 C FT LB FAA TO1-10% TO2-20%****Section 20 - Pkg Model Identification**

747-8F GENX-2B67 C FT LB FAA TO1-10% TO2-20% was added as Section 20.

Section 20 - General

747-8F GENX-2B67 C FT LB FAA TO1-10% TO2-20% was added as Section 20.

Section 21 - All Engine

Added section "21".

Section 22 - Advisory Information

Added section "22".

Section 23 - Engine Inoperative

Added section "23".

Section 24 - Two Engines Inoperative

Added section "24".

Section 25 - Gear Down

Added section "25".

Section 26 - Gear Down, One Engine Inoperative

Added section "26".

Section 27 - Text

Added section "27".

Performance Package 30

747-8F GENX-2B67_PIP C LB FT FAA TO1-10% TO2-20%

Section 30 - Pkg Model Identification

747-8F GENX-2B67_PIP C LB FT FAA TO1-10% TO2-20% was added as Section 30.

Section 30 - General

747-8F GENX-2B67_PIP C LB FT FAA TO1-10% TO2-20% was added as Section 30.

Section 31 - All Engine

Added section "31".

Section 32 - Advisory Information

Added section "32".

Section 33 - Engine Inoperative

Added section "33".

Section 34 - Two Engines Inoperative

Added section "34".

Section 35 - Gear Down

Added section "35".

Section 36 - Gear Down, One Engine Inoperative

Added section "36".

Section 37 - Text

Added section "37".

Chapter Man - Maneuvers**Section 1 - Non-Normal Maneuvers****Rejected Takeoff**

Man.1.2 - Deleted '(as installed)' since the predictive windshear feature is installed on all airplanes.

Man.1.2 - Deleted '(as installed)' since the predictive windshear feature is installed on all airplanes.

Man.1.3 - Changed mixed case terms to lower-case for standardization.

Man.1.3 - Changed mixed case terms to lower-case for standardization.

Man.1.3 - Changed mixed case terms to lower-case for standardization.

Man.1.3 - Changed mixed case terms to lower-case for standardization.

Terrain Avoidance

Man.1.5 - Changed mixed case terms to lower-case for standardization.

Traffic Avoidance

Man.1.8 - Changed mixed case terms to lower-case for standardization.

Man.1.8 - Changed mixed case to lower-case for standardization.

Windshear

Man.1.13 - Changed mixed case terms to lower-case for standardization.

Man.1.13 - Changed mixed case terms to lower-case for standardization.

Chapter CI - Checklist Instructions

Section 2 - Non-Normal Checklists

Non-Normal Checklist Use

CI.2.5 - Revised to advise the pilot monitoring to read aloud the checklist title and the Objective statement, if any, for cross model commonality and good crew resource management.

Preface**QRH List of Effective Pages****Chapter CI****Section LEP****Quick Reference Handbook****Quick Action Index**

QA.Index.1-2 April 1, 2014

EICAS Messages (tab)

* EICAS.Index.1-14 October 1, 2016

Unannunciated Checklists (tab)

* Unann.Index.1-2 October 1, 2016

Alphabetical (tab)

* Alpha.Index.1-14 October 1, 2016

Normal Checklists (tab)

NC.1 October 1, 2012

NC.2 April 1, 2012

NC.3 April 1, 2012

NC.4 October 1, 2011

0 Miscellaneous (tab)

0.TOC.1-2 October 1, 2012

0.1 April 1, 2015

0.2 April 1, 2015

0.3 April 1, 2015

* 0.4 October 1, 2016

0.5 October 1, 2012

0.6 April 1, 2014

0.7 April 1, 2014

0.8 October 1, 2012

**1 Airplane Gen., Emer. Equip., Doors,
Windows (tab)**

1.TOC.1-2 April 1, 2014

1.1 October 1, 2012

1.2 April 1, 2014

1.3 April 1, 2014

1.4 October 1, 2015

1.5 April 1, 2014

1.6 April 1, 2014

1.7 April 1, 2014

1.8 April 1, 2014

1.9 April 1, 2014

1.10 April 1, 2014
 1.11 April 1, 2014
 1.12 April 1, 2014
 1.13 October 1, 2015
 1.14 April 1, 2014
 1.15 April 1, 2014
 1.16 April 1, 2014
 1.17 October 1, 2015
 1.18 April 1, 2014
 1.19 April 1, 2014
 1.20 April 1, 2014
 1.21 April 1, 2014
 1.22 April 1, 2014
 1.23 April 1, 2014
 1.24 April 1, 2014
 1.25 April 1, 2014
 1.26 April 1, 2014
 1.27 April 1, 2014
 1.28 April 1, 2014
 1.29 April 1, 2014
 1.30 April 1, 2014

2 Air Systems (tab)

* 2.TOC.1-2 October 1, 2016
 * 2.1 October 1, 2016
 * 2.2 October 1, 2016
 * 2.3 October 1, 2016
 2.4 April 1, 2015
 2.5 April 1, 2015
 2.6 April 1, 2014
 2.7 April 1, 2014
 2.8 October 1, 2011
 2.9 April 1, 2015
 2.10 April 1, 2015
 2.11 April 1, 2012
 2.12 October 1, 2011
 2.13 October 1, 2011
 2.14 October 1, 2012
 2.15 April 1, 2014
 2.16 October 1, 2012
 2.17 April 1, 2016
 2.18 April 1, 2016
 2.19 April 1, 2013
 2.20 April 1, 2013

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2.21	April 1, 2013		
2.22	April 1, 2014		
2.23	April 1, 2014		
2.24	April 1, 2012		
2.25	April 1, 2013		
2.26	April 1, 2014		
2.27	April 1, 2014		
2.28	April 1, 2014		
2.29	April 1, 2012		
2.30	April 1, 2012		
2.31	April 1, 2012		
2.32	April 1, 2013		
2.33	April 1, 2012		
2.34	April 1, 2012		
2.35	April 1, 2012		
2.36	April 1, 2013		
2.37	April 1, 2013		
2.38	April 1, 2013		
2.39	April 1, 2013		
2.40	April 1, 2013		
2.41	April 1, 2013		
2.42	April 1, 2012		
2.43	April 1, 2013		
2.44	April 1, 2014		
2.45	October 1, 2012		
2.46	October 1, 2012		
2.47	October 1, 2012		
2.48	October 1, 2014		
2.49	April 1, 2012		
2.50	April 1, 2012		
3 Anti-Ice, Rain (tab)			
* 3.TOC.1-2	October 1, 2016		
3.1	October 1, 2011		
3.2	October 1, 2011		
3.3	April 1, 2014		
* 3.4	October 1, 2016		
* 3.5	October 1, 2016		
* 3.6	October 1, 2016		
* 3.7	October 1, 2016		
* 3.8	October 1, 2016		
* 3.9	October 1, 2016		
* 3.10	October 1, 2016		
* 3.11	October 1, 2016		
* 3.12	October 1, 2016		
		4 Automatic Flight (tab)	
		4.TOC.1-2	October 1, 2011
		4.1	October 1, 2011
		4.2	October 1, 2011
		5 Communications (tab)	
		5.TOC.1-2	October 1, 2011
		5.1	October 1, 2011
		5.2	April 1, 2012
		5.3	April 1, 2012
		5.4	October 1, 2011
		6 Electrical (tab)	
		6.TOC.1-2	October 1, 2012
		6.1	October 1, 2012
		6.2	October 1, 2014
		6.3	October 1, 2014
		6.4	October 1, 2014
		6.5	April 1, 2014
		6.6	October 1, 2014
		6.7	April 1, 2014
		6.8	October 1, 2014
		6.9	October 1, 2014
		6.10	April 1, 2012
		6.11	April 1, 2012
		6.12	October 1, 2012
		6.13	April 1, 2013
		6.14	October 1, 2012
		7 Engines, APU (tab)	
		* 7.TOC.1-2	October 1, 2016
		7.1	April 1, 2014
		7.2	October 1, 2013
		7.3	October 1, 2015
		7.4	October 1, 2015
		7.5	April 1, 2014
		7.6	April 1, 2014
		7.7	April 1, 2014
		7.8	October 1, 2014
		7.9	October 1, 2014
		7.10	April 1, 2014
		7.11	April 1, 2014
		7.12	April 1, 2014
		7.13	April 1, 2014
		7.14	April 1, 2014
		7.15	April 1, 2014
		* 7.16	October 1, 2016

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* 7.17	October 1, 2016	8.21	October 1, 2014
* 7.18	October 1, 2016	8.22	October 1, 2014
* 7.19	October 1, 2016	8.23	October 1, 2014
* 7.20	October 1, 2016	8.24	October 1, 2014
* 7.21	October 1, 2016	8.25	October 1, 2014
* 7.22	October 1, 2016	8.26	October 1, 2014
* 7.23	October 1, 2016	8.27	October 1, 2014
* 7.24	October 1, 2016	8.28	April 1, 2015
* 7.25	October 1, 2016	8.29	April 1, 2015
* 7.26	October 1, 2016	8.30	April 1, 2015
* 7.27	October 1, 2016	8.31	April 1, 2015
* 7.28	October 1, 2016	8.32	April 1, 2015
* 7.29	October 1, 2016	8.33	April 1, 2015
* 7.30	October 1, 2016	8.34	April 1, 2015
* 7.31	October 1, 2016	8.35	April 1, 2015
* 7.32	October 1, 2016	8.36	April 1, 2016
* 7.33	October 1, 2016	8.37	April 1, 2016
* 7.34	October 1, 2016	8.38	April 1, 2015
* 7.35	October 1, 2016	8.39	April 1, 2016
* 7.36	October 1, 2016	8.40	April 1, 2016
* 7.37	October 1, 2016	8.41	April 1, 2016
* 7.38	October 1, 2016	8.42	April 1, 2016
* 7.39	October 1, 2016	8.43	April 1, 2016
* 7.40	October 1, 2016	8.44	April 1, 2016
8 Fire Protection (tab)		8.45	April 1, 2016
8.TOC.1-2	April 1, 2016	8.46	April 1, 2015
8.1	October 1, 2011	8.47	April 1, 2015
8.2	April 1, 2014	8.48	April 1, 2015
8.3	October 1, 2011	8.49	April 1, 2015
8.4	October 1, 2012	8.50	April 1, 2015
8.5	April 1, 2016	9 Flight Controls (tab)	
8.6	April 1, 2014	9.TOC.1-2	April 1, 2016
8.7	October 1, 2011	9.1	October 1, 2011
8.8	April 1, 2013	9.2	April 1, 2012
8.9	April 1, 2016	9.3	October 1, 2011
8.10	April 1, 2015	9.4	April 1, 2016
8.11	April 1, 2014	9.5	April 1, 2016
8.12	April 1, 2012	9.6	April 1, 2016
8.13	April 1, 2012	9.7	April 1, 2016
8.14	April 1, 2015	9.8	April 1, 2014
8.15	October 1, 2012	9.9	April 1, 2012
8.16	April 1, 2015	9.10	October 1, 2011
8.17	October 1, 2014	9.11	October 1, 2011
8.18	October 1, 2014	* 9.12	October 1, 2016
8.19	October 1, 2014	9.13	October 1, 2011
8.20	April 1, 2015	9.14	October 1, 2012

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9.15	April 1, 2014	11.4	October 1, 2014
9.16	April 1, 2012	* 11.5	October 1, 2016
10 Flight Instruments, Displays (tab)		11.6	October 1, 2015
* 10.TOC.1-2	October 1, 2016	11.7	October 1, 2015
10.1	April 1, 2014	11.8	October 1, 2014
10.2	October 1, 2015	11.9	October 1, 2014
10.3	April 1, 2014	11.10	October 1, 2014
10.4	October 1, 2015	11.11	October 1, 2014
10.5	October 1, 2015	* 11.12	October 1, 2016
* 10.6	October 1, 2016	12 Fuel (tab)	
* 10.7	October 1, 2016	12.TOC.1-2	April 1, 2014
* 10.8	October 1, 2016	12.1	October 1, 2011
10.9	April 1, 2014	12.2	April 1, 2014
10.10	April 1, 2014	12.3	April 1, 2014
10.11	October 1, 2015	12.4	October 1, 2013
10.12	April 1, 2014	12.5	April 1, 2014
10.13	October 1, 2015	12.6	October 1, 2013
10.14	October 1, 2015	12.7	October 1, 2013
* 10.15	October 1, 2016	12.8	October 1, 2014
* 10.16	October 1, 2016	12.9	October 1, 2014
* 10.17	October 1, 2016	12.10	October 1, 2014
10.18	April 1, 2014	12.11	October 1, 2014
10.19	April 1, 2014	12.12	October 1, 2014
10.20	April 1, 2014	12.13	October 1, 2014
10.21	April 1, 2014	12.14	October 1, 2014
10.22	April 1, 2014	12.15	October 1, 2013
10.23	April 1, 2014	12.16	October 1, 2013
10.24	April 1, 2014	12.17	April 1, 2014
10.25	April 1, 2014	* 12.18	October 1, 2016
10.26	April 1, 2014	12.19	October 1, 2013
10.27	April 1, 2014	12.20	April 1, 2014
10.28	April 1, 2014	12.21	April 1, 2014
10.29	April 1, 2014	12.22	October 1, 2013
* 10.30	October 1, 2016	12.23	October 1, 2013
* 10.31	October 1, 2016	12.24	October 1, 2013
* 10.32	October 1, 2016	12.25	April 1, 2014
* 10.33	October 1, 2016	12.26	October 1, 2013
* 10.34	October 1, 2016	12.27	October 1, 2013
* 10.35	October 1, 2016	12.28	October 1, 2013
* 10.36	October 1, 2016	12.29	October 1, 2013
11 Flight Management, Navigation (tab)		12.30	October 1, 2014
11.TOC.1-2	October 1, 2015	12.31	October 1, 2013
11.1	April 1, 2014	12.32	October 1, 2013
11.2	April 1, 2015	12.33	October 1, 2013
11.3	October 1, 2014	12.34	October 1, 2013
		12.35	October 1, 2013

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12.36	October 1, 2013	13.18	October 1, 2015
12.37	October 1, 2013	13.19	October 1, 2015
12.38	April 1, 2014	13.20	October 1, 2015
12.39	April 1, 2014	13.21	October 1, 2015
12.40	October 1, 2013	13.22	October 1, 2015
12.41	October 1, 2013	13.23	October 1, 2015
12.42	October 1, 2013	13.24	October 1, 2015
12.43	October 1, 2013	13.25	October 1, 2015
12.44	October 1, 2013	13.26	October 1, 2015
12.45	October 1, 2013	13.27	October 1, 2015
12.46	April 1, 2014	13.28	October 1, 2015
12.47	October 1, 2014	13.29	October 1, 2015
12.48	April 1, 2014	13.30	October 1, 2015
12.49	April 1, 2014	13.31	October 1, 2015
12.50	April 1, 2014	13.32	October 1, 2015
12.51	October 1, 2014	13.33	October 1, 2015
* 12.52	October 1, 2016	13.34	October 1, 2015
12.53	October 1, 2013	13.35	October 1, 2015
12.54	October 1, 2013	13.36	October 1, 2015
12.55	October 1, 2013	13.37	October 1, 2015
12.56	October 1, 2013	13.38	October 1, 2015
12.57	October 1, 2013	13.39	October 1, 2015
12.58	April 1, 2014	13.40	October 1, 2015
12.59	April 1, 2014	13.41	October 1, 2015
12.60	April 1, 2014	13.42	October 1, 2015
12.61	April 1, 2014	13.43	October 1, 2015
12.62	April 1, 2014	13.44	October 1, 2015
13 Hydraulics (tab)		13.45	October 1, 2015
13.TOC.1-2	October 1, 2015	13.46	October 1, 2015
13.1	October 1, 2015	13.47	October 1, 2015
13.2	November 11, 2013	13.48	October 1, 2015
13.3	November 11, 2013	13.49	October 1, 2015
13.4	October 1, 2015	13.50	October 1, 2015
13.5	October 1, 2015	13.51	October 1, 2015
13.6	October 1, 2015	13.52	October 1, 2015
13.7	October 1, 2015	14 Landing Gear (tab)	
13.8	October 1, 2015	14.TOC.1-2	April 1, 2013
13.9	October 1, 2015	14.1	October 1, 2011
13.10	October 1, 2015	14.2	October 1, 2012
13.11	October 1, 2015	14.3	October 1, 2011
13.12	October 1, 2015	14.4	April 1, 2014
13.13	October 1, 2015	14.5	April 1, 2013
13.14	October 1, 2015	14.6	April 1, 2013
13.15	October 1, 2015	* 14.7	October 1, 2016
13.16	October 1, 2015	14.8	April 1, 2013
13.17	October 1, 2015	14.9	April 1, 2013

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14.10	April 1, 2013	* PI-QRH.10.18	October 1, 2016
14.11	April 1, 2013	* PI-QRH.10.19	October 1, 2016
14.12	April 1, 2013	* PI-QRH.10.20	October 1, 2016
15 Warning Systems (tab)		* PI-QRH.10.21	October 1, 2016
15.TOC.1-2	October 1, 2015	* PI-QRH.10.22	October 1, 2016
15.1	October 1, 2011	* PI-QRH.10.23	October 1, 2016
15.2	October 1, 2011	* PI-QRH.10.24	October 1, 2016
15.3	April 1, 2012	* PI-QRH.10.25	October 1, 2016
15.4	October 1, 2012	* PI-QRH.10.26	October 1, 2016
15.5	October 1, 2012	* PI-QRH.10.27	October 1, 2016
15.6	October 1, 2015	* PI-QRH.10.28	October 1, 2016
15.7	October 1, 2015	* PI-QRH.10.29	October 1, 2016
15.8	October 1, 2015	* PI-QRH.10.30	October 1, 2016
Operational Information (tab)		* PI-QRH.10.31	October 1, 2016
OI.TOC.1-2	April 1, 2015	* PI-QRH.10.32	October 1, 2016
OI.1.1	October 1, 2011	* PI-QRH.10.33	October 1, 2016
OI.1.2	October 1, 2011	* PI-QRH.10.34	October 1, 2016
OI.2.1	October 1, 2012	* PI-QRH.10.35	October 1, 2016
OI.2.2	October 1, 2012	* PI-QRH.10.36	October 1, 2016
OI.2.3	October 1, 2014	* PI-QRH.10.37	October 1, 2016
OI.2.4	April 1, 2012	* PI-QRH.10.38	October 1, 2016
Performance Inflight - QRH (tab)		* PI-QRH.10.39	October 1, 2016
* PI-QRH.TOC.1-2	October 1, 2016	* PI-QRH.10.40	October 1, 2016
747-8 GENX-2B67 C KG M EASA TO1-10% TO2-20%		* PI-QRH.10.41	October 1, 2016
* PI-QRH.TOC.10.1-4	October 1, 2016	* PI-QRH.10.42	October 1, 2016
* PI-QRH.ModID.10.1-2	October 1, 2016	* PI-QRH.11.1	October 1, 2016
* PI-QRH.10.1	October 1, 2016	* PI-QRH.11.2	October 1, 2016
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Checklist Instructions
Normal Checklists**Chapter CI**
Section 1**Introduction**

This introduction gives guidelines for use of the Normal Checklist (NC).

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation

Normal checklists are used after doing all respective procedural items.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Captain	First officer	Both	Area of responsibility
BEFORE START	Captain	First officer	Both	Area of responsibility
BEFORE TAXI	Captain	First officer	Both	Area of responsibility
BEFORE TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot flying
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring
DESCENT	Pilot flying	Pilot monitoring	Both	Area of responsibility
APPROACH	Pilot flying	Pilot monitoring	Both	Area of responsibility
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Area of responsibility
SECURE	Captain	First officer	Both	Area of responsibility

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that 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
- items 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

Checklist Construction

When a checklist challenge does not end with “switch or lever”, then the challenge refers to system status. For example, “Landing Gear...Down”, refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with “switch or lever”, then the challenge refers to the position of the switch or lever. For example, “FUEL CONTROL switches...CUTOFF” refers to the position of the switches.

Because normal checklists are done routinely, some checklist items are simplified to be more conversational, such as: "Autobrake..RTO" instead of "AUTOBRAKES selector...RTO".

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 alert EICAS message (such as Ditching) are called unannunciated checklists. Most unannunciated checklists are in the associated system section. For example, Fuel Leak 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. The last memory item is followed by a dashed horizontal line. Reference items are 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 AUTOBRAKES) are annunciated by an EICAS alert message or other indication. Checklist titles in upper and lower case (such as Window Damage) are not annunciated.

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 messages without [] symbols.

The non-normal menu is also used to access checklists for EICAS messages with [] symbols to allow review of the checklist. Operation of the electronic checklist is described in section 10; Flight Instruments, Displays.

Non-Normal Checklist Operation

Non-normal checklists start with steps to correct the situation. If needed, information for planning the rest of the flight is included. In the printed non-normal checklists, when special items are needed to configure the airplane for landing, the items are included in the Deferred Items section of the checklist. In the electronic checklists, deferred items are automatically added to the end of the applicable normal checklist. Flight patterns for some engine(s) out 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 situations 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 main power source remains
- 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.
- Indicator lights are tested to verify suspected faults.

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- Flight crew reset of a tripped fuel pump circuit breaker or refuel circuit breakers is prohibited. In flight, reset of any other tripped circuit breaker is not recommended. However, these other tripped breakers 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 any other 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.
 - When a non-normal checklist directs the flight crew to attempt only one reset of a switch per flight, a second reset of the switch should not be done until maintenance has cleared the malfunction. After the one reset attempt, the flight crew should select ITEM OVRD for any additional checklist steps directing the flight crew to attempt a reset of the same switch.
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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.

The pilot monitoring reads aloud:

- the checklist title
- as much of the objective statement (if applicable) as needed to understand the expected result of doing the checklist.

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood.

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist. With the electronic checklist, items that are complete (green) do not need to be read or verified. The item numbers do not need to be read.

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 in-flight non-normal situation, verbal confirmation is required for:

- 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
- an IRS mode selector

With the airplane stationary on the ground:

- the captain and the first officer take action based on preflight and postflight areas of responsibility

With the airplane in flight or in motion on the ground:

- the pilot flying and the pilot monitoring take action based on each crewmember's 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 messages can show as a result of a primary failure condition (such as FUEL IMBAL 1-4 as a result of Fuel Leak) or as a result of doing a non-normal checklist (such as HYD PRESS ENG 1, 2, 3, 4 as a result of doing the HYD OVHT SYS checklist). In the printed primary checklist, do the checklists for consequential EICAS alert messages, unless the statement "Do not accomplish the following checklists." is included. In the electronic primary checklist, do the checklists for consequential EICAS alert unless the statement "Inhibited checklists." is included. 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 checklist, 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 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.

The Deferred Items section of the printed non-normal checklists includes the Decent, Approach and Landing normal checklists if one or more of the following occur:

- an item is deferred
- a normal checklist response is changed as a result of the non-normal situation. (The changed response is printed in **bold** type.)

Use these checklists instead of the usual DESCENT, APPROACH, and LANDING normal checklists. In the electronic checklists, when there are deferred items, the items are 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.

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 the 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 checklists cannot be created for all conceivable situations and are not intended to replace good judgment. In some situations, at the captain's discretion, deviation from a checklist may be needed.

Non-Normal Checklist Legend

Redirection Symbol



The redirection symbol is used in a non-normal checklist with the word "Go to", to direct the flight crew to a different checklist or to a different step in the current checklist.

Separator Symbol



The separator symbol is used in two ways:

- In the Table of Contents of a system section, to separate the Quick Action Index checklists from the checklists that are not in the Quick Action Index.
- In a non-normal checklist, to separate the memory items from the reference items.

Task Divider Symbol

The task divider symbol is used to indicate the end of one task and the beginning of another task.

Decision Symbol

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: Evacuation is needed.

- 1 Parking brake. Set C
- 2 OUTFLOW VALVES MAN
switches (both) ON F/O
- 3 OUTFLOW VALVES
manual control. Hold in OPEN F/O
until the outflow valve
indications show fully open
to depressurize the airplane
- 4 FUEL CONTROL
switches (all) CUTOFF C
- 5 Advise the cabin to evacuate. C
- 6 Advise the tower. F/O
- 7 Engine fire switches (all) Pull F/O
- 8 APU fire switch Override and pull F/O
- 9 If an engine or APU fire warning occurs:
Related fire
switch Rotate to the stop
and hold for 1 second F/O

