QATAR AIRWAYS

777
Quick Reference Handbook

Quick Action Index

Intentionally
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A

B

C

D

E

F

G

H

R

S

T

V

W

Intentionally
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A

B

D

E

G

H

I

L

M

N

V

W

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PREFLIGHT

Oxygen. . . . . Tested, 100%

Flight instruments . . . . . Heading___, Altimeter___

Parking brake . . . . . .Set

Fuel control switches. . . . . CUTOFF

BEFORE START

Gear pins & covers. . . . . Removed

A7-BAA - A7-BBH

Flight deck door . . . . . Closed and locked

Seat belts. . . . . ___

MCP . . . . . V2___, HDG/TRK___, ALTITUDE___

Takeoff speeds . . . . . V1___, VR___, V2___

CDU preflight. . . . . Completed

Trim . . . . . ___ Units, 0, 0

Taxi and takeoff briefing . . . . . Completed

Beacon. . . . . .ON

BEFORE TAXI

Anti-ice. . . . . ___

Recall . . . . . .Checked

Autobrake . . . . . .RTO

Flight controls. . . . . .Checked

Ground equipment . . . . . .Clear

BEFORE TAKEOFF

Flaps . . . . . ___

AFTER TAKEOFF

Landing gear . . . . . **UP**

Flaps . . . . . **UP**

DESCENT

Recall . . . . . **Checked**

Notes . . . . . **Checked**

Autobrake . . . . . ___

Landing data . . . . . **VREF___, Minimums___**

Approach briefing . . . . . **Completed**

Seat belts . . . . . ___

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

ADIRU . . . . . OFF

Emergency lights . . . . . OFF

Packs . . . . . OFF

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Table of Contents

Table of Contents

Intentionally
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Ditching

Condition: Airplane ditching and evacuation are needed.

1 Plan to jettison fuel as needed to reduce VREF speeds.

2 **Checklist Complete Except Deferred Items**

Deferred Items

Below 5,000 feet

GND PROX GEAR OVRD switch . . . . . OVRD

GND PROX TERR OVRD switch . . . . . OVRD

PACK switches (both) . . . . . Off

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

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

A7-BAA - A7-BBH
PASS SIGNS selectors (both) . . . . . ON

A7-BFA, A7-BFB
SEAT BELTS selector . . . . . ON

Do **not** accomplish the following checklists:

PACK L

PACK R

CABIN ALTITUDE AUTO

▼ Continued on next page ▼

▼ Ditching continued ▼

On final approach (omit Landing checklist)

Landing gear lever . . . . . UP

Flaps 30

Advise the cabin of imminent touchdown.

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

After impact

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

APU fire switch . . . . . Override and pull

■ ■ ■ ■

Overweight Landing

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

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

2 Choose one:

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

GND PROX FLAP OVRD switch . . . . . OVRD

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

►►**Go to step 5**

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

►►**Go to step 3**

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

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

4 Choose one:

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

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

■ ■ ■ ■

◆VREF 30 + additives (wind and gusts, 5 knots minimum) is **above** 170 knots:

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

►►Go to step 5

5 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 20 or VREF 25, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . **20 or 25**

■ ■ ■ ■

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Table of Contents

Automatic Unlock 1.1

Table of Contents

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Automatic Unlock

A7-BAA - A7-BBH

Condition: The correct emergency access code is entered.

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

■ ■ ■ ■

CREW OXYGEN LOW

Condition: Crew oxygen pressure is low.

■ ■ ■ ■

[ ] DOOR AFT CARGO

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

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

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

2 Choose one:

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

Level off at the lowest safe altitude.

►►**Go to step 3**

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

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

►►**Go to step 3**

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

▼ Continued on next page ▼

▼ DOOR AFT CARGO continued ▼

4 Choose one:

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

►►**Go to step 5**

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

Don the oxygen masks.

Establish crew communications.

►►**Go to step 5**

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

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

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

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

CABIN ALTITUDE AUTO

LANDING ALTITUDE

■ ■ ■ ■

[ ] DOOR BULK CARGO

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

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

■ ■ ■ ■

[ ] DOOR E/E ACCESS

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

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

■ ■ ■ ■

[ ] DOOR ENTRY 1L, 1R

A7-BFA, A7-BFB

Condition: An entry door is not closed and secure.

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

■ ■ ■ ■

[ ] DOOR ENTRY 1–4L, R

A7-BBA - A7-BBH

Condition: An entry door is not closed and secure.

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

■ ■ ■ ■

[ ] DOOR ENTRY 1–5L, R

A7-BAA - A7-BAO

Condition: An entry door is not closed and secure.

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

■ ■ ■ ■

[ ] DOOR FWD ACCESS

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

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

■ ■ ■ ■

[ ] DOOR FWD CARGO

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

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

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

2 Choose one:

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

Level off at the lowest safe altitude.

►►**Go to step 3**

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

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

►►**Go to step 3**

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

▼ Continued on next page ▼

▼ DOOR FWD CARGO continued ▼

4 Choose one:

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

►►**Go to step 5**

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

Don the oxygen masks.

Establish crew communications.

►►**Go to step 5**

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

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

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

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

CABIN ALTITUDE AUTO

LANDING ALTITUDE

■ ■ ■ ■

[ ] DOOR MAIN DECK CARGO

A7-BFA, A7-BFB

Condition: The main deck cargo door is not closed and secure.

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

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

2 Choose one:

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

Level off at the lowest safe altitude.

►►**Go to step 3**

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

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

►►**Go to step 3**

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

▼ Continued on next page ▼

▼ DOOR MAIN DECK CARGO continued ▼

4 Choose one:

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

►►**Go to step 5**

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

Don the oxygen masks.

Establish crew communications.

►►**Go to step 5**

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

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

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

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

CABIN ALTITUDE AUTO

LANDING ALTITUDE

■ ■ ■ ■

DOOR WING SLIDE L, R

A7-BAA - A7-BAO

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

■ ■ ■ ■

DOORS

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

■ ■ ■ ■

ELT ON

Condition: The emergency locator transmitter is on.

■ ■ ■ ■

EMER LIGHTS

Condition: One of these occurs:
- The emergency lights are on
- The emergency lights switch is not ARMED

■ ■ ■ ■

Lock Fail

A7-BAA - A7-BBH

Condition: One or more of these occur:
- The FLIGHT DECK ACCESS SYSTEM switch is off
- The lock is failed

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

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

1 ⚠ FLIGHT DECK ACCESS SYSTEM switch . . . . OFF

2 The door can be locked with the deadbolt.

■ ■ ■ ■

PASS OXYGEN ON

A7-BAA - A7-BBH

Condition: The passenger oxygen system is on.

■ ■ ■ ■

SUPRNMRY OXYGEN LOW

A7-BFA, A7-BFB

Condition: The supernumerary oxygen pressure is low.

■ ■ ■ ■

SUPRNMRY OXYGEN ON

A7-BFA, A7-BFB

Condition: The supernumerary oxygen system is on.

■ ■ ■ ■

Window Damage L, R

Condition: A flight deck window has one or more of these:
- An electrical arc
- A delamination
- A crack
- Is shattered

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

1 **If** a forward window is arcing, shattered, or cracked:

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

Do **not** accomplish the following checklist:

WINDOW HEAT FWD

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

Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

If the airplane altitude is above 10,000 feet:

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

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

■ ■ ■ ■

[] WINDOW FLT DECK L, R

Condition: The side window is not closed and secure.

1 Maintain the maneuvering speed for the existing flap setting until the window is closed.

2 The force required to close the window increases with airspeed. It may not be possible to close the window at speeds above 250 knots.

3 Close and lock the window.

4 Choose one:

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

Continue normal operation.

■ ■ ■ ■

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

Level off at the lowest safe altitude.

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

■ ■ ■ ■

[] WINDOWS

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

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

▼ Continued on next page ▼

▼ WINDOWS continued ▼

2 The force required to close the windows increases with airspeed. It may not be possible to close the windows at speeds above 250 knots.

3 Close and lock the windows.

4 Choose one:

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

Continue normal operation.

■ ■ ■ ■

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

Level off at the lowest safe altitude.

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

■ ■ ■ ■

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Table of Contents

Table of Contents

[ ] CABIN ALTITUDE

A7-BAA - A7-BAC, A7-BAI, A7-BAO - A7-BBB

Condition: A cabin altitude exceedance occurs.

1 Don the oxygen masks.

2 Establish crew communications.

3 Check the cabin altitude and rate.

4 **If** the cabin altitude is uncontrollable:

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

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

To descend:

Move the thrust levers to idle

Extend the speedbrakes

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

Descend at VMO/MMO

- -

When at level off:

►►**Go to step 6**

▼ **Continued on next page** ▼

▼ CABIN ALTITUDE continued ▼

5 **If** the cabin altitude is controllable:

Continue normal operation.

■ ■ ■ ■

6 Choose one:

- PACK L+R message **shows**:

■ ■ ■ ■

- PACK L+R message is **blank and at least one** pack OFF light is **extinguished**:

■ ■ ■ ■

- PACK L+R message is **blank and both** pack OFF lights are **illuminated**:

►►Go to step 7

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

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

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

10 CABIN/UTILITY power switch . . . . . OFF

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

12 Minimize the flight deck lighting intensity.

13 Open the flight deck door.

14 **During** daylight:

Install the flight deck sunvisors.

▼ Continued on next page ▼

Advise the cabin to close the cabin window shades.

15 Plan to land at the nearest suitable airport.

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

CABIN ALTITUDE AUTO

■ ■ ■ ■

[] CABIN ALTITUDE

A7-BAE - A7-BAH, A7-BAJ, A7-BAK, A7-BBC - A7-BBH

Condition: A cabin altitude exceedance occurs.

1 Don the oxygen masks.

2 Establish crew communications.

3 Check the cabin altitude and rate.

4 **If** the cabin altitude is uncontrollable:

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

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

To descend:

Move the thrust levers to idle

Extend the speedbrakes

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

Descend at VMO/MMO

- -

5 **If** the cabin altitude is controllable:

Continue normal operation.

■ ■ ■ ■

[ ] CABIN ALTITUDE

A7-BFA, A7-BFB

Condition: A cabin altitude exceedance occurs.

1 Don the oxygen masks.

2 Establish crew communications.

3 Check the cabin altitude and rate.

4 **If** the cabin altitude is uncontrollable:

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

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

To descend:

Move the thrust levers to idle

Extend the speedbrakes

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

Descend at VMO/MMO

- -

5 **If** the cabin altitude is controllable:

Continue normal operation.

■ ■ ■ ■

ALTN VENT SYS

A7-BFA, A7-BFB

Condition: Alternate ventilation system is inoperative.

■ ■ ■ ■

BLEED ISLN CLOSED C, L, R

Condition: One of the following occurs:
- The isolation valve is failed closed
- The bleed isolation switch is OFF

■ ■ ■ ■

BLEED ISLN OPEN C, L, R

Condition: The isolation valve is failed open.

■ ■ ■ ■

[ ] BLEED LEAK BODY

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

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

2 Pilot action will be required when a BLEED LOSS message shows.

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

HYD PRESS DEM C1

HYD PRESS DEM C2

■ ■ ■ ■

[ ] BLEED LEAK L, R

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

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

2 Pilot action will be required when a BLEED LOSS message shows.

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

PACK

HYD PRESS DEM

■ ■ ■ ■

[ ] BLEED LEAK STRUT L, R

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

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

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

PACK

3 **Wait** 1 minute.

4 Choose one:

◆BLEED LEAK STRUT message **blanks**:

■ ■ ■ ■

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

▶▶**Go to step 5**

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

6 Thrust lever (affected side) . . . . . Retard slowly until the BLEED LEAK STRUT message blanks or the thrust lever is at idle

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

AUTOTHROTTLE

▼ Continued on next page ▼

▼ BLEED LEAK STRUT L, R continued ▼

8 Choose one:

◆BLEED LEAK STRUT message **blanks**:

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

■ ■ ■ ■

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

Transponder mode selector . . . . . TA ONLY

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

►►Go to step 9

9 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

►►Go to step 10

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

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

■ ■ ■ ■

▼ Continued on next page ▼

▼ BLEED LEAK STRUT L, R continued ▼

10 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked
Notes. . . . . Checked
Autobrake . . . . . ___
Landing data **. . . . . VREF 20, Minimums** ___
Approach briefing . . . . . Completed
Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

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

■ ■ ■ ■

[ ] BLEED LOSS BODY

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

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

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

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

HYD PRESS DEM C1

HYD PRESS DEM C2

■ ■ ■ ■

[ ] BLEED LOSS BODY L

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

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

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

HYD PRESS DEM C1

■ ■ ■ ■

[ ] BLEED LOSS BODY R

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

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

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

HYD PRESS DEM C2

■ ■ ■ ■

[ ] BLEED LOSS WING L, R

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

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

1 WING ANTI–ICE selector . . . . . OFF

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

PACK

■ ■ ■ ■

BLEED OFF APU

Condition: One of the following occurs:
- The APU bleed valve is closed because of a system fault
- The APU bleed switch is OFF

■ ■ ■ ■

BLEED OFF ENG L, R

Condition: One of the following occurs:

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

■ ■ ■ ■

[ ] CABIN ALTITUDE AUTO

Condition: One of these occurs:
- Automatic pressurization control is failed
- Both outflow valve switches are in manual

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

Valves may take up to 6 seconds to begin moving.

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

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

Recommended cabin altitude in cruise is:

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

3 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

▼ Continued on next page ▼

▼ CABIN ALTITUDE AUTO continued ▼

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

At pattern altitude

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[ ] CABIN TEMPERATURE

A7-BFA, A7-BFB

Condition: Conditioned air is too hot or too cold.

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

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

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

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

TRIM AIR L

TRIM AIR R

4 Choose one:

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

►►**Go to step 5**

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

►►**Go to step 20**

5 CABIN/UTILITY power switch . . . . . Off

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

7 Minimize the flight deck lighting intensity.

8 **During** daylight, install the flight deck sunvisors.

9 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ CABIN TEMPERATURE continued ▼

10 **When** at level off:

Choose one:

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

  ▶▶**Go to step 11**

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

  ▶▶**Go to step 14**

11 Don the oxygen masks.

12 Establish crew communications.

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

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

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

15 ALTN VENT switch. . . . . ON

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

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

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

▼ Continued on next page ▼

▼ CABIN TEMPERATURE continued ▼

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

CABIN ALTITUDE

CABIN ALTITUDE AUTO

PACK L

PACK R

PACK L+R

■ ■ ■ ■

20 Plan to land at the nearest suitable airport.

21 **When** at level off:

Choose one:

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

▶▶**Go to step 22**

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

▶▶**Go to step 25**

22 Don the oxygen masks.

23 Establish crew communications.

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

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

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

▼ Continued on next page ▼

▼ CABIN TEMPERATURE continued ▼

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

CABIN ALTITUDE

PACK L

PACK R

PACK L+R

■ ■ ■ ■

CARGO A/C FWD

A7-BAA - A7-BBH

Condition: Forward lower cargo air conditioning is inoperative.

■ ■ ■ ■

CARGO A/C LWR AFT

A7-BFA, A7-BFB

Condition: Aft lower cargo air conditioning is inoperative.

■ ■ ■ ■

CARGO A/C LWR FWD

A7-BFA, A7-BFB

Condition: Forward lower cargo air conditioning is inoperative.

■ ■ ■ ■

CARGO HEAT AFT

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

■ ■ ■ ■

CARGO HEAT BULK

A7-BAA - A7-BBH

Condition: One of these occurs:
- Bulk cargo heat is inoperative
- The bulk cargo temperature selector is off

■ ■ ■ ■

EQUIP COOLING

Condition: The forward equipment cooling system is failed.

■ ■ ■ ■

[ ] EQUIP COOLING OVRD

Condition: The equipment cooling system is in override mode.

1 **Wait** 2 minutes. This allows time for any smoke in the system to clear.

2 EQUIP COOLING switch . . . . . Off, then AUTO

3 Choose one:

◆EQUIP COOLING OVRD message **blanks**:

■ ■ ■ ■

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

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

■ ■ ■ ■

[ ] LANDING ALTITUDE

Condition: One of these occur:
- The FMC does not supply a landing altitude
- The landing altitude selector is pulled

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

■ ■ ■ ■

MAIN DECK A/C

A7-BFA, A7-BFB

Condition: Main deck cargo air conditioning is inoperative.

■ ■ ■ ■

[ ] OUTFLOW VALVE AFT, FWD

Condition: One of these occurs:
- Automatic outflow valve control is inoperative
- The outflow valve switch is in manual

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

1 OUTFLOW VALVE switch (affected side) . . . . . MAN

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

■ ■ ■ ■

[ ] PACK L

Condition: The left pack is shut down.

1 **Wait** 2 minutes. This allows time for an overheat condition to cool.

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

▼ Continued on next page ▼

▼ PACK L continued ▼

3 **Wait** 2 minutes.

4 Choose one:

◆PACK L message **stays blank**:

■ ■ ■ ■

◆PACK L message **shows again**:

L PACK switch . . . . . Off

A7-BFA, A7-BFB
RECIRC FANS switch . . . . . Off

■ ■ ■ ■

[ ] PACK R

Condition: The right pack is shut down.

1 **Wait** 2 minutes. This allows time for an overheat condition to cool.

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

3 **Wait** 2 minutes.

4 Choose one:

◆PACK R message **stays blank**:

■ ■ ■ ■

◆PACK R message **shows again**:

R PACK switch . . . . . Off

■ ■ ■ ■

[ ] PACK L+R

Condition: Both packs are shut down.

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

1 **Wait** 2 minutes. This allows time for an overheat condition to cool.

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

3 **Wait** 2 minutes.

4 Choose one:

◆PACK L+R message **stays blank**:

■ ■ ■ ■

◆PACK L+R message **shows again**:

►►**Go to step 5**

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

If needed to prevent excessive cabin altitude, descend with speedbrakes extended at VMO/MMO

6 **When** at level off:

A7-BAA - A7-BBH
►►**Go to step 7**

▼ Continued on next page ▼

▼ PACK L+R continued ▼

A7-BFA, A7-BFB
►►Go to step 18

A7-BAA - A7-BBH

7 Choose one:

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

►►Go to step 8

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

Don the oxygen masks.

Establish crew communications.

►►Go to step 8

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

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

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

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

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

13 Minimize the flight deck lighting intensity.

14 Open the flight deck door.

▼ Continued on next page ▼

▼ PACK L+R continued ▼

15 **During** daylight:

Install the flight deck sunvisors.

Advise the cabin to close the cabin window shades.

16 Plan to land at the nearest suitable airport.

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

CABIN ALTITUDE AUTO

■ ■ ■ ■

A7-BFA, A7-BFB

18 Choose one:

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

►►**Go to step 19**

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

Don the oxygen masks.

Establish crew communications.

►►**Go to step 19**

19 ALTN VENT switch. . . . . .ON

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

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

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

▼ Continued on next page ▼

▼ PACK L+R continued ▼

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

24 Minimize the flight deck lighting intensity.

25 **During** daylight, install the flight deck sunvisors.

26 Plan to land at the nearest suitable airport.

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

CABIN ALTITUDE AUTO

■ ■ ■ ■

[ ] PACK MODE L, R

Condition: The pack is in the standby mode.

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

■ ■ ■ ■

[ ] TRIM AIR L, R

Condition: The trim air valve is closed.

1 **Wait** 2 minutes. This allows time for any overheat condition to cool.

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

3 **Wait** 2 minutes.

4 Choose one:

◆TRIM AIR message **stays blank**:

■ ■ ■ ■

◆TRIM AIR message **shows again**:

TRIM AIR switch . . . . . Off

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

[ ] ANTI–ICE ENG L, R

Condition: An engine anti–ice valve remains closed when commanded open.

1 Choose one:

◆On the **ground**:

▶▶**Go to step 2**

◆In **flight**:

▶▶**Go to step 6**

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

3 Choose one:

◆ANTI-ICE ENG message **blanks**:

■ ■ ■ ■

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

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

▶▶**Go to step 4**

4 Choose one:

◆ANTI-ICE ENG message **blanks**:

■ ■ ■ ■

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

▶▶**Go to step 5**

▼ Continued on next page ▼

▼ ANTI–ICE ENG L, R continued ▼

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

Note: Avoid icing conditions.

■ ■ ■ ■

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

7 Choose one:

◆ANTI-ICE ENG message **blanks**:

Note: Operate the affected engine anti-ice system manually.

■ ■ ■ ■

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

►►**Go to step 8**

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

Note: Avoid icing conditions.

■ ■ ■ ■

[ ] ANTI–ICE LEAK ENG L, R

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

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

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

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

2 **Wait** 2 minutes.

3 Choose one:

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

■ ■ ■ ■

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

►►**Go to step 4**

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

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

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

AUTOTHROTTLE

▼ Continued on next page ▼

▼ ANTI–ICE LEAK ENG L, R continued ▼

7 Choose one:

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

■ ■ ■ ■

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

▶▶Go to step 8

8 Transponder mode selector . . . . . TA ONLY

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

9 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . .OVRD

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

▶▶Go to step 10

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

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

■ ■ ■ ■

10 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

▼ Continued on next page ▼

▼ ANTI–ICE LEAK ENG L, R continued ▼

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

ANTI–ICE LOSS ENG L, R

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

■ ■ ■ ■

[] ANTI–ICE ON

Condition: All of these occur:
- An ANTI-ICE selector is ON
- TAT is more than 10 degrees C
- Ice is not detected

Objective: To correctly configure the ANTI-ICE selectors.

1 ENGINE ANTI–ICE selectors (both) . . . . . AUTO or OFF

2 WING ANTI–ICE selector . . . . . AUTO or OFF

■ ■ ■ ■

[] ANTI–ICE WING

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

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

2 Choose one:

◆ANTI–ICE WING message **blanks**:

Operate wing anti–ice manually.

■ ■ ■ ■

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

WING ANTI–ICE selector. . . . . OFF

■ ■ ■ ■

[ ] HEAT PITOT C

Condition: The center pitot probe heat is failed.

Note: Standby air data is unreliable in icing conditions.

■ ■ ■ ■

[ ] HEAT PITOT L

Condition: The left pitot probe heat is failed.

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

■ ■ ■ ■

[ ] HEAT PITOT L+C+R

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

Note: The air data is unreliable in icing conditions.

■ ■ ■ ■

[ ] HEAT PITOT R

Condition: The right pitot probe heat is failed.

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

■ ■ ■ ■

[ ] ICE DETECTORS

Condition: The ice detectors are failed.

Note: Operate the engine and wing anti–ice systems manually.

■ ■ ■ ■

ICING ENG

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

■ ■ ■ ■

ICING WING

Condition: Ice is detected and one of these occurs:
- The wing anti-ice selector is off
- The wing anti-ice takeoff inhibit is active

■ ■ ■ ■

TAT Probe Icing

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

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

1 Autothrottle disconnect switch . . . . . .Push

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

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

Push one switch at a time.

3 ⚠ ENGINE EEC MODE switches (both) . . . . . .Off

4 Thrust levers (both) . . . . . Set to maintain the desired airspeed and rate of climb or descent

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

▼ Continued on next page ▼

▼ TAT Probe Icing continued ▼

5 Choose one:

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

  ▶▶**Go to step 6**

- TAT is **not** near 0 degrees C:

  Engine TAT probe icing is suspected:

  Airplane TAT display is reliable.

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

  Maximum N1 display is reliable if shown.

  ▶▶**Go to step 8**

6 Airplane TAT probe icing is suspected:

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

Observe EGT caution limits.

Maximum N1 display may be temporarily unreliable.

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

ENG LIMIT PROT L

ENG LIMIT PROT R

▼ Continued on next page ▼

▼ TAT Probe Icing continued ▼

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

The reference/target N1 and reference N1 displays show.

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

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

ENG EEC MODE L

ENG EEC MODE R

■ ■ ■ ■

Additional Information

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

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

WINDOW HEAT

Condition: Two or more window heats are off.

■ ■ ■ ■

[ ] WINDOW HEAT L, R FWD

Condition: A primary window heat is off.

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

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

2 Choose one:

◆WINDOW HEAT FWD message **blanks**:

■ ■ ■ ■

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

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

The window is defogged by the backup system.

■ ■ ■ ■

[ ] WINDOW HEAT L, R SIDE

Condition: A window heat is off.

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

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

2 Choose one:

◆WINDOW HEAT SIDE message **blanks**:

■ ■ ■ ■

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

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

■ ■ ■ ■

Intentionally
Blank

Table of Contents

Table of Contents

Intentionally
Blank

AUTOPILOT

Condition: One or more of these occur:

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

■ ■ ■ ■

AUTOPILOT DISC

Condition: All autopilots are disconnected.

■ ■ ■ ■

AUTOTHROTTLE DISC

Condition: Both autothrottles are disconnected.

■ ■ ■ ■

[ ] AUTOTHROTTLE L, R

Condition: One autothrottle is failed.

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

2 The other autothrottle may be re-engaged if needed.

■ ■ ■ ■

NO AUTOLAND

Condition: The autoland system is not available.

■ ■ ■ ■

NO LAND 3

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

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally Blank

ATC DATALINK LOST

A7-BAA - A7-BAC, A7-BAI, A7-BAO - A7-BBB

Condition: The ATC datalink is lost.

■ ■ ■ ■

DATALINK LOST

Condition: The ACARS datalink is temporarily lost.

■ ■ ■ ■

DATALINK SYS

Condition: The datalink system is failed.

■ ■ ■ ■

[] RADIO TRANSMIT

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

Objective: To identify and isolate the stuck microphone switch.

1 Transmitter select switches
(all audio control panels) . . . . . FLT interphone

This deselects the radios and stops radio transmissions.

2 The microphone/interphone with the stuck switch continuously transmits on flight interphone.

3 The associated audio select panel should remain on flight interphone. All other audio panels may be used normally.

■ ■ ■ ■

SATCOM

Condition: The SATCOM system is failed.

■ ■ ■ ■

SATCOM DATALINK

Condition: The SATCOM datalink is failed.

■ ■ ■ ■

SATCOM VOICE

Condition: SATCOM voice communication is failed.

■ ■ ■ ■

SATVOICE LOST

Condition: SATCOM voice communication is temporarily lost.

■ ■ ■ ■

VHF DATALINK

Condition: The VHF datalink is failed.

■ ■ ■ ■

Intentionally
Blank

Table of Contents

Table of Contents

Intentionally
Blank

[ ] ELEC AC BUS L, R

Condition: The AC bus is not energized.

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

Attempt only one reset.

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

2 Choose one:

◆ELEC AC BUS message **blanks:**

■ ■ ■ ■

◆ELEC AC BUS message **stays shown:**

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

Do **not** accomplish the following checklist:

ELEC GEN OFF

When the APU is running:

▶▶Go to step 3

3 Choose one:

◆ELEC AC BUS message **blanks**:

■ ■ ■ ■

◆ELEC AC BUS message **stays shown**:

▶▶Go to step 4

▼ Continued on next page ▼

▼ ELEC AC BUS L, R continued ▼

Attempt only one reset.

4 BUS TIE switch . . . . . Off, then AUTO

5 Choose one:

◆ELEC AC BUS message **blanks**:

■ ■ ■ ■

◆ELEC AC BUS message **stays shown**:

Do **not** accomplish the following checklists:

WINDOW HEAT

HYD PRESS PRI

■ ■ ■ ■

[ ] ELEC BACKUP GEN L, R

Condition: The backup generator is failed.

Attempt only one reset.

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

■ ■ ■ ■

[ ] ELEC BACKUP SYS

Condition: The backup power system is failed.

Attempt only one reset.

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

Attempt only one reset.

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

■ ■ ■ ■

ELEC BATTERY OFF

Condition: The battery switch is OFF.

■ ■ ■ ■

ELEC BUS ISLN L, R

Condition: The bus tie breaker is open.

■ ■ ■ ■

ELEC CABIN/UTIL OFF

Condition: The CABIN/UTILITY power switch is OFF.

■ ■ ■ ■

[ ] ELEC GEN DRIVE L, R

Condition: A generator drive malfunction occurs.

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

Action is irreversible.

1 DRIVE DISC switch . . . . . .Confirm . . . . . Push and hold for 1 second

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

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

ELEC GEN OFF

■ ■ ■ ■

[ ] ELEC GEN OFF APU

Condition: The generator control breaker is open.

Attempt only one reset.

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

■ ■ ■ ■

[ ] ELEC GEN OFF L, R

Condition: The generator control breaker is open.

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

Attempt only one reset.

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

2 Choose one:

◆ELEC GEN OFF message **blanks**:

■ ■ ■ ■

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

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

■ ■ ■ ■

ELEC GND HDLG BUS

Condition: A fault occurs in the ground handling bus.

■ ■ ■ ■

ELEC IFE/SEATS OFF

A7-BAA - A7-BBH

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

■ ■ ■ ■

ELEC STANDBY SYS

Condition: A standby power system failure occurs.

■ ■ ■ ■

MAIN BATTERY DISCH

Condition: One of these occurs:

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

■ ■ ■ ■

Table of Contents

Table of Contents

Aborted Engine Start L, R

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

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

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

3 Motor the engine for 30 seconds.

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

Dual Eng Fail/Stall

Condition: Engine speed for both engines is below idle.

1 FUEL CONTROL switches
(both) . . . . . CUTOFF, then RUN

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

- -

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

4 Set airspeed **above 270 knots**.

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

6 Engines may accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stabilized idle may be as long as two and a half minutes.

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

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

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

▼ Continued on next page ▼

▼ Dual Eng Fail / Stall continued ▼

This restores the flight control normal mode.

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

■ ■ ■ ■

[ ] ENG AUTOSTART L, R

Condition: During a ground start, one of these occurs:
- Autostart did not start the engine
- Fuel control switch is in RUN at low engine RPM with the autostart switch off

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

- -

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

3 Motor the engine for 30 seconds.

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

■ ■ ■ ■

Eng Lim / Surge / Stall L, R

Condition: One or more of these occur:
- Engine displays are unusual
- Engine displays are quickly nearing or show an exceedance
- Unusual engine noises are heard
- There is no response to thrust lever movement

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

2 Thrust lever
(affected side) . . . Confirm . . . . . .Retard until displays remain within appropriate limits or the thrust lever is at idle

▼ Continued on next page ▼

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

3 Choose one:

◆Displays are **abnormal or** EGT continues to **increase**:

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

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

Transponder mode selector . . . . . TA ONLY

Plan to land at the nearest suitable airport.

►►**Go to step 6**

◆Displays are **stabilized and** EGT is **stabilized or decreasing**:

►►**Go to step 4**

Check that RPM and EGT follow thrust lever movement.

4 ⚠ Thrust lever
(affected side) . . . . . Advance slowly

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

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

AUTOTHROTTLE

▼ Continued on next page ▼

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

7 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

▶▶Go to step 8

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

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

■ ■ ■ ■

8 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

▼ Continued on next page ▼

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

Eng Svr Damage / Sep L, R

Condition: One or more of these occur:
- Airframe vibrations with unusual engine displays
- Engine separation

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

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

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

4 Engine fire switch
(affected side) . . . . . Confirm . . . . . Pull

- -

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

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

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

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

7 Transponder mode selector . . . . . TA ONLY

8 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ Eng Svr Damage / Sep L, R continued ▼

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

AUTOTHROTTLE

10 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

►►Go to step 11

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

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

■ ■ ■ ■

11 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Eng Svr Damage / Sep L, R continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

[ ] APU LIMIT

Condition: An APU limit exceedance occurs.

1 APU selector . . . . . OFF

■ ■ ■ ■

[] APU SHUTDOWN

Condition: An APU automatic shutdown occurs.

Objective: To attempt to reset the APU controller.

1 APU selector . . . . . OFF

2 APU selector . . . . . START, then ON

■ ■ ■ ■

ENG AUTOSTART OFF

Condition: The engine autostart switch is OFF.

■ ■ ■ ■

ENG CONTROL L, R

Condition: An EEC system fault occurs.

■ ■ ■ ■

[ ] ENG EEC MODE L, R

Condition: An EEC operates in the alternate control mode.

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

1 Autothrottle disconnect switch . . . . . Push

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

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

Push one switch at a time.

3 ⚠ ENGINE EEC MODE switches (both) . . . . . Off

4 Engage the autothrottle.

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

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

ENG EEC MODE (for other engine)

■ ■ ■ ■

Intentionally
Blank

[ ] ENG FAIL L, R

Condition: Engine speed is below idle.

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

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

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

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

4 A restart may be attempted if there is N1 rotation and no abnormal airframe vibration.

5 Choose one:

◆Restart **is** needed:

▶▶**Go to step 6**

◆Restart is **not** needed:

▶▶**Go to step 13**

6 Monitor EGT during start to prevent an EGT exceedance. Autostart allows EGT to exceed the in-flight start limit.

7 Engine may accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stabilized idle may be as long as two and a half minutes.

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

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

A7-BAA - A7-BAO

9 Choose one:

◆X-BLD **shows**:

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

►►**Go to step 11**

◆X-BLD is **blank**:

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

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

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

►►**Go to step 13**

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

A7-BBA - A7-BFB

10 Choose one:

◆Airspeed is **below** 270 knots:

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

►►**Go to step 11**

◆Airspeed is **at or above** 270 knots:

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

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

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

►►**Go to step 13**

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

11 Choose one:

◆Autostart is **on**:

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

►►**Go to step 12**

◆Autostart is **off**:

When at maximum motoring speed:

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

►►**Go to step 12**

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

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

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

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

AUTOTHROTTLE

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

14 Choose one:

◆**Both** engines run **normally**:

■ ■ ■ ■

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

►►**Go to step 15**

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

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

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

18 Transponder mode selector . . . . . TA ONLY

19 Plan to land at the nearest suitable airport.

20 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . .OVRD

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

►►**Go to step 21**

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

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

■ ■ ■ ■

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

21 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

[ ] ENG FUEL FILTER L, R

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

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

■ ■ ■ ■

[ ] ENG FUEL VALVE L, R

Condition: One or more of these occur:

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

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

2 **If** on the ground:

Do not attempt engine start.

■ ■ ■ ■

ENG IDLE DISAGREE

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

■ ■ ■ ■

Intentionally
Blank

Eng In–Flight Start L, R

Condition: An engine start is needed after a shutdown and there is:
- N1 rotation
- No fire
- No abnormal airframe vibration

1 Monitor EGT during start to prevent an EGT exceedance. Autostart allows EGT to exceed the in-flight start limit.

2 The engine may accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stabilized idle may be as long as two and a half minutes.

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

▼ Continued on next page ▼

▼ Eng In–Flight Start L, R continued ▼

A7-BAA - A7-BAO

4 Choose one:

◆X-BLD **shows**:

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

►►**Go to step 6**

◆X-BLD is **blank**:

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

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

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

►►**Go to step 8**

▼ Continued on next page ▼

▼ Eng In–Flight Start L, R continued ▼

A7-BBA - A7-BFB

5 Choose one:

◆Airspeed is **below** 270 knots:

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

►►**Go to step 6**

◆Airspeed is **at or above** 270 knots:

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

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

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

►►**Go to step 8**

▼ Continued on next page ▼

▼ Eng In–Flight Start L, R continued ▼

6 Choose one:

◆Autostart is **on**:

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

►►**Go to step 7**

◆Autostart is **off**:

When at maximum motoring speed:

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

►►**Go to step 7**

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

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

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

8 Choose one:

◆Engine **starts** and runs normally:

GND PROX FLAP OVRD switch . . . . . Off

Transponder mode selector . . . . . TA/RA

■ ■ ■ ■

◆Engine **fails** to start:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

[ ] ENG LIMIT PROT L, R

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

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

■ ■ ■ ■

[ ] ENG OIL FILTER L, R

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

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

2 Thrust lever
(affected side) . . . . . Confirm. . . . . Retard slowly until the ENG OIL FILTER message blanks or the thrust lever is at idle

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

AUTOTHROTTLE

4 Choose one:

◆ENG OIL FILTER message **blanks**:

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

■ ■ ■ ■

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

▶▶Go to step 5

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

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

7 Transponder mode selector . . . . . TA ONLY

8 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ ENG OIL FILTER L, R continued ▼

9 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

▶▶Go to step 10

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

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

■ ■ ■ ■

10 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

▼ Continued on next page ▼

▼ ENG OIL FILTER L, R continued ▼

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

[ ] ENG OIL PRESS L, R

Condition: Engine oil pressure is low.

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

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

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

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

5 Transponder mode selector . . . . . TA ONLY

6 Plan to land at the nearest suitable airport.

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

AUTOTHROTTLE

8 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

►►Go to step 9

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

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

■ ■ ■ ■

▼ Continued on next page ▼

▼ ENG OIL PRESS L, R continued ▼

9 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps**. 20**

■ ■ ■ ■

[ ] ENG OIL TEMP L, R

Condition: Engine oil temperature is high.

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

2 Thrust lever
(affected side) . . . . . Confirm . . . . . Move to mid position

This allows the oil to cool.

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

AUTOTHROTTLE

4 Choose one:

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

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

■ ■ ■ ■

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

▶▶Go to step 5

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

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

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

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

8 Transponder mode selector . . . . . TA ONLY

9 Plan to land at the nearest suitable airport.

10 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

►►**Go to step 11**

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

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

■ ■ ■ ■

11 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

ENG REV LIMITED L, R

Condition: One of these will occur after landing:
- The thrust reverser will not deploy
- Only idle reverse thrust will be available

■ ■ ■ ■

ENG REVERSER L, R

Condition: A fault occurs in the thrust reverser system.

■ ■ ■ ■

ENG RPM LIMITED L, R

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

■ ■ ■ ■

ENG SHUTDOWN

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

■ ■ ■ ■

ENG SHUTDOWN L, R

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

■ ■ ■ ■

[ ] ENG START VALVE L, R

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

1 Ground or in–flight start using a bleed air source may be unsuccessful.

2 Choose one:

◆On the **ground**:

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

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

■ ■ ■ ■

◆In the **air**:

►►**Go to step 3**

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

A7-BAA - A7-BAO

4 Increase airspeed until X–BLD blanks.

A7-BBA - A7-BFB

5 Increase airspeed above 270 knots.

■ ■ ■ ■

[ ] ENG STARTER CUTOUT L, R

Condition: One of these occurs:
- The start valve fails to close
- The start selector stays in start

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

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

2 Choose one:

◆ENG STARTER CUTOUT message **blanks**:

■ ■ ■ ■

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

►►**Go to step 3**

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

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

5 **If** on the ground:

Disconnect the ground air source if it is in use.

6 WING ANTI–ICE selector . . . . . OFF

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

BLEED LOSS WING

PACK

■ ■ ■ ■

ENG THRUST L, R

Condition: The engine does not reach commanded thrust.

■ ■ ■ ■

Volcanic Ash

Condition: Volcanic ash is suspected when one or more of these occur:
- A static discharge around the windshield
- A bright glow in the engine inlets
- Smoke or dust on the flight deck
- An acrid odor

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

1 Exit volcanic ash as quickly as possible. Consider a 180 degree turn.

2 Don oxygen masks and smoke goggles, if needed.

3 Establish crew communications, if needed.

4 Autothrottle disconnect switch . . . . . .Push

If conditions allow, run the engines at idle.

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

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

6 ENGINE ANTI–ICE selectors (both) . . . . . .ON

7 WING ANTI–ICE selector . . . . . .ON

A7-BAA - A7-BBH

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

A7-BFA, A7-BFB

9 RECIRC FANS switch . . . . . .Off

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

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

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

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

11 Choose one:

◆Engines run **normally**:

Plan to land at the nearest suitable airport

■ ■ ■ ■

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

▶▶**Go to step 12**

12 FUEL CONTROL switches (both) . . . . . CUTOFF, then RUN

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

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

15 Set airspeed **above 270 knots**.

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

16 Engines may accelerate to idle very slowly, especially at high altitudes. The time from fuel control switch to RUN to stabilized idle may be as long as two and a half minutes.

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

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

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

This restores flight control normal mode.

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

19 Plan to land at the nearest suitable airport.

■ ■ ■ ■

Intentionally
Blank

Table of Contents

Table of Contents

[ ] FIRE APU

Condition: Fire is detected in the APU.

1 APU fire switch. . . . . Confirm . . . . . Pull, rotate to the stop and hold for 1 second

2 Choose one:

◆FIRE APU message **blanks**:

►►**Go to step 3**

◆FIRE APU message **stays shown**:

Plan to land at the nearest suitable airport.

►►**Go to step 3**

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

APU SHUTDOWN

■ ■ ■ ■

[ ] FIRE ENG L, R

Condition: Fire is detected in the engine.

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

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

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

4 Engine fire switch
(affected side) . . . . . Confirm . . . . . Pull

5 **If** the FIRE ENG message stays shown:

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

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

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

- -

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

7 Transponder mode selector . . . . . TA ONLY

8 Plan to land at the nearest suitable airport.

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

AUTOTHROTTLE

▼ Continued on next page ▼

▼ FIRE ENG L, R continued ▼

10 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

►►Go to step 11

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

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

■ ■ ■ ■

11 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE ENG L, R continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

Fire Engine Tailpipe L, R

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

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

2 Advise the cabin.

3 Choose one:

◆Bleed air **is** available:

►►**Go to step 4**

◆Bleed air is **not** available:

Advise the tower.

■ ■ ■ ■

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

5 Advise the tower.

6 Continue to motor the engine until the tailpipe fire is extinguished.

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

■ ■ ■ ■

Smoke, Fire or Fumes

Condition: Smoke, fire or fumes occurs.

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

1 Diversion may be needed.

2 Don oxygen masks and smoke goggles, if needed.

3 Establish crew and cabin communications.

A7-BAA - A7-BBH

4 IFE/PASS SEATS switch . . . . . OFF

A7-BAA - A7-BBH

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

A7-BFA, A7-BFB

6 RECIRC FANS switch . . . . . Off

A7-BAA - A7-BBH

7 GASPER switch . . . . . Off

8 APU BLEED AIR switch . . . . . Off

9 **Any time** the smoke or fumes becomes the greatest threat:

►►**Go to the Smoke or Fumes Removal checklist on page 8.30**

▼ **Continued on next page** ▼

▼ Smoke, Fire or Fumes continued ▼

10 Choose one:

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

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

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

  ►►Go to step 11

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

  ►►Go to step 12

11 Choose one:

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

  Continue the flight at the Captain's discretion.

  Restore unpowered items at the Captain's discretion.

  ►►Go to the Smoke or Fumes Removal checklist on page 8.30, if needed.

  ■ ■ ■ ■

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

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

►►Go to step 12

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

13 CABIN/UTILITY switch . . . . . OFF

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

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

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

17 C BLEED AIR ISLN switch . . . . . Off

18 L PACK switch . . . . . Off

19 L TRIM AIR switch . . . . . Off

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

PACK L

TRIM AIR L

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

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

22 Choose one:

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

L PACK switch . . . . . AUTO

L TRIM AIR switch . . . . . ON

R PACK switch . . . . . Off

R TRIM AIR switch . . . . . Off

►►**Go to step 23**

◆Smoke or fumes are **decreasing**:

►►**Go to the Smoke or Fumes Removal checklist on page 8.30, if needed.**

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

PACK R

TRIM AIR R

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

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

25 Choose one:

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

C BLEED AIR ISLN switch . . . . . AUTO

R PACK switch . . . . . AUTO

R TRIM AIR switch . . . . . .ON

Consider an immediate landing.

►►**Go to the Smoke or Fumes Removal checklist on page 8.30, if needed.**

◆Smoke or fumes are **decreasing**:

►►**Go to the Smoke or Fumes Removal checklist on page 8.30, if needed.**

■ ■ ■ ■

BOTTLE 1, 2 DISCH ENG

Condition: The fire bottle pressure is low.

■ ■ ■ ■

BOTTLE DISCH APU

Condition: The fire bottle pressure is low.

■ ■ ■ ■

BOTTLE DISCH CARGO

Condition: Both rapid discharge fire bottle pressures are low.

■ ■ ■ ■

[] DET FIRE APU

Condition: APU fire detection is inoperative.

1 Choose one:

◆APU **is** running:

Plan to shut down the APU as soon as practical.

■ ■ ■ ■

◆APU is **not** running:

Note: Do not start the APU unless use is required.

■ ■ ■ ■

DET FIRE CARGO AFT, FWD

Condition: Lower cargo compartment smoke detection is inoperative.

■ ■ ■ ■

DET FIRE CARGO MAIN

A7-BFA, A7-BFB

Condition: Main deck cargo compartment smoke detection is inoperative.

■ ■ ■ ■

DET FIRE ENG L, R

Condition: Engine fire and overheat detection is inoperative.

■ ■ ■ ■

Intentionally
Blank

[ ] FIRE CARGO AFT

A7-BAA - A7-BBH

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

1 AFT CARGO FIRE ARM switch . . . . . Confirm . . . . . ARMED

2 CARGO FIRE DISCH switch . . . . . Push and hold for 1 second

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

This minimizes extinguisher agent leakage out of the compartment.

4 Plan to land at the nearest suitable airport.

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

LANDING ALTITUDE

6 **When** at top of descent:

LDG ALT selector . . . . . Push off

7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[ ] FIRE CARGO AFT

A7-BFA, A7-BFB

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

1 LWR AFT CARGO
FIRE ARM switch. . . . . Confirm . . . . . ARMED

2 CARGO FIRE DEPR/DISCH
switch . . . . . Push and hold for 1 second

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

This minimizes extinguisher agent leakage out of the compartment.

4 Plan to land at the nearest suitable airport.

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

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

EQUIP COOLING OVRD

LANDING ALTITUDE

6 **When** at top of descent:

LDG ALT selector . . . . . Push off

7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[] FIRE CARGO FWD

A7-BAA - A7-BBH

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

1 FWD CARGO FIRE ARM switch . . . . . Confirm . . . . . ARMED

2 CARGO FIRE DISCH switch . . . . . Push and hold for 1 second

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

This minimizes extinguisher agent leakage out of the compartment.

4 Plan to land at the nearest suitable airport.

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

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

EQUIP COOLING OVRD

LANDING ALTITUDE

6 **When** at top of descent:

LDG ALT selector . . . . . Push off

7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[] FIRE CARGO FWD

A7-BFA, A7-BFB

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

1 LWR FWD CARGO
FIRE ARM switch. . . . . Confirm . . . . . ARMED

2 CARGO FIRE DEPR/DISCH
switch . . . . . Push and hold for 1 second

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

This minimizes extinguisher agent leakage out of the compartment.

4 Plan to land at the nearest suitable airport.

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

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

EQUIP COOLING OVRD

LANDING ALTITUDE

6 **When** at top of descent:

LDG ALT selector . . . . . Push off

7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[ ] FIRE CARGO MAIN DECK

A7-BFA, A7-BFB

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

1 Don oxygen masks and smoke goggles.

2 Establish crew and cabin communications.

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

4 MAIN DK ALERT switch . . . . . Push

5 FWD OUTFLOW VALVE switch . . . . . MAN

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

7 MAIN DECK CARGO FIRE ARM switch . . . . . Confirm . . . . . ARMED

8 L TRIM AIR switch . . . . . Off

9 CARGO FIRE DEPR/DISCH switch . . . . . Push and hold for 1 second

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

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

PACK R

TRIM AIR L

▼ Continued on next page ▼

▼ FIRE CARGO MAIN DECK continued ▼

CABIN ALTITUDE

OUTFLOW VALVE FWD

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

12 **When** at level off:

FWD OUTFLOW VALVE switch . . . . . AUTO

L TRIM AIR switch . . . . . ON

Plan to land at the nearest suitable airport.

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

13 **When** at top of descent:

L TRIM AIR switch . . . . . Off

14 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FIRE CARGO MAIN DECK continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

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

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[ ] FIRE WHEEL WELL

Condition: Fire is detected in a main wheel well.

1 Do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

2 Landing gear lever . . . . . DN

This attempts to remove and extinguish the fire source.

3 Plan to land at the nearest suitable airport.

4 Flight with the gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.

5 Choose one:

◆Gear **does not need to be retracted** for airplane performance:

■ ■ ■ ■

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

▶▶**Go to step 6**

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

Wait 20 minutes. This ensures the fire is extinguished.

Landing gear lever . . . . . UP

■ ■ ■ ■

[ ] OVERHEAT ENG L, R

Condition: An overheat is detected in the engine.

1 ENG BLEED AIR switch
(affected side) . . . . . Off

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

3 Thrust lever
(affected side) . . . . . Confirm . . . . . Retard slowly until the OVERHEAT ENG message blanks or the thrust lever is at idle

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

AUTOTHROTTLE

5 Choose one:

◆OVERHEAT ENG message **blanks**:

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

■ ■ ■ ■

◆OVERHEAT ENG message **stays shown**:

▶▶**Go to step 6**

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

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

8 Transponder mode selector . . . . . TA ONLY

▼ Continued on next page ▼

▼ OVERHEAT ENG L, R continued ▼

9 Plan to land at the nearest suitable airport.

10 Choose one:

◆Landing using flaps **20**:

GND PROX FLAP OVRD switch . . . . . OVRD

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

▶▶**Go to step 11**

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

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

■ ■ ■ ■

11 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ OVERHEAT ENG L, R continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

SMOKE CREW REST F/D

A7-BFA, A7-BFB

Condition: Smoke is detected in the crew rest area.

■ ■ ■ ■

[ ] SMOKE EQUIP COOLING

A7-BFA, A7-BFB

Condition: Smoke is detected in the equipment cooling system.

1 **Wait** 2 minutes. This allows time for any smoke in the system to clear.

2 EQUIP COOLING switch . . . . . Off, then AUTO

3 Choose one:

◆SMOKE EQUIP COOLING message **blanks**:

■ ■ ■ ■

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

Plan to land at the nearest suitable airport.

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

Do **not** accomplish the following checklist:

EQUIP COOLING OVRD

■ ■ ■ ■

Smoke or Fumes Removal

Condition: Smoke or fumes removal is needed.

1 Do this checklist **only** when directed by the Smoke, Fire or Fumes checklist.

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

A7-BAA - A7-BBH

3 Close the flight deck door.

4 EQUIP COOLING switch . . . . . Off

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

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

EQUIP COOLING OVRD

A7-BAA - A7-BBH

6 Choose one:

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

  ▶▶**Go to step 8**

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

  ▶▶**Go to step 11**

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

A7-BFA, A7-BFB

7 Choose one:

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

►►**Go to step 8**

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

►►**Go to step 11**

8 AFT OUTFLOW VALVE switch . . . . . MAN

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

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

OUTFLOW VALVE AFT

►►**Go to the Smoke, Fire or Fumes checklist on page 8.6 and do the remaining steps.**

■ ■ ■ ■

11 FWD OUTFLOW VALVE switch. . . . . MAN

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

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

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

OUTFLOW VALVE FWD

►►Go to the Smoke, Fire or Fumes checklist on page 8.6 and do the remaining steps.

■ ■ ■ ■

[ ] SMOKE REST UPR DR 1

A7-BAA - A7-BBH

Condition: Smoke is detected in the crew rest area.

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

1 Establish cabin communications.

2 Choose one:

◆Smoke is **persistent**:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

◆Smoke has **cleared**:

■ ■ ■ ■

[ ] SMOKE REST UPR DR 4

A7-BBA - A7-BBH

Condition: Smoke is detected in the crew rest area.

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

1 Establish cabin communications.

2 Choose one:

◆Smoke is **persistent**:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

◆Smoke has **cleared**:

■ ■ ■ ■

[ ] SMOKE REST UPR DR 5

A7-BAA - A7-BAO

Condition: Smoke is detected in the crew rest area.

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

1 Establish cabin communications.

2 Choose one:

◆Smoke is **persistent**:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

◆Smoke has **cleared**:

■ ■ ■ ■

SMOKE LAVATORY

A7-BAA - A7-BBH

Condition: Smoke is detected in one or more lavatories.

■ ■ ■ ■

SMOKE LAVATORY

A7-BFA, A7-BFB

Condition: Smoke is detected in the lavatory.

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

[ ] STABILIZER

Condition: One of these occurs:
- Stabilizer movement without a signal to trim
- The stabilizer is failed

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

2 Do not exceed the current airspeed.

- -

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

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

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

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

FLIGHT CONTROLS

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ STABILIZER continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . VREF 30 + 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

[ ] AUTO SPEEDBRAKE

Condition: An automatic speedbrake fault occurs.

Note: Do not arm the speedbrake lever. This prevents inadvertent inflight extension.

Manually extend the speedbrakes after landing.

1 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[] FLAPS DRIVE

Condition: The flap drive mechanism is failed.

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

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

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

3 Choose one:

◆Flap position is **5 or less**

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

►►Go to step 4

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

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

►►Go to step 4

◆Flap position is **20 or greater**

Note: Use current flaps and VREF 20 for landing.

►►Go to step 4

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

FLAPS PRIMARY FAIL

■ ■ ■ ■

[ ] FLAPS PRIMARY FAIL

Condition: The flaps primary mode is failed.

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

Note: Plan additional time for slower flap operation.

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

2 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps**. 20**

■ ■ ■ ■

[ ] FLAP / SLAT CONTROL

Condition: The flap/slat electronics units are failed.

1 **If** flap retraction is required:

FLAP lever . . . . . UP

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

ALTN FLAPS ARM switch . . . . . ALTN

Alternate flaps selector . . . . . RET

Monitor airspeed during retraction.

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

Note: Plan additional time for alternate slat and flap extension.

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

3 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

▼ Continued on next page ▼

▼ FLAP / SLAT CONTROL continued ▼

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Alternate flaps extension

ALTN FLAPS ARM switch. . . . . ALTN

Alternate flaps selector . . . . . EXT

Monitor airspeed during extension.

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps. **20**

■ ■ ■ ■

[ ] FLIGHT CONTROL MODE

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

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

2 Choose one:

◆FLIGHT CONTROL MODE message **blanks**:

■ ■ ■ ■

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

►►**Go to step 3**

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

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

Note: Inoperative Items

Autopilot inop

Envelope protection functions inop

▼ Continued on next page ▼

▼ FLIGHT CONTROL MODE continued ▼

Note: The yaw damper is degraded.

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

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

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

Manually extend the speedbrakes after landing.

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

AUTO SPEEDBRAKE

THRUST ASYM COMP

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FLIGHT CONTROL MODE continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake **. . . . . DOWN**

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

Intentionally
Blank

[ ] FLIGHT CONTROLS

Condition: One or more of these occur:
- Two or more flight control surfaces are inoperative
- Other faults in the flight control system are detected

1 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.

2 Plan to land at the nearest suitable airport.

3 GND PROX FLAP OVRD switch . . . . . OVRD

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

Crosswind limit for landing is 20 knots.

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

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

SPOILERS

5 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . VREF 30 + 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps**. 20**

■ ■ ■ ■

FLT CONTROL VALVE

Condition: One or more of these occur:

- One or more flight control shutoff valves are failed closed
- One or more flight control shutoff switches are in shutoff

■ ■ ■ ■

[ ] PITCH DOWN AUTHORITY

Condition: Pitch down authority is restricted.

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

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

■ ■ ■ ■

Intentionally
Blank

[ ] PITCH UP AUTHORITY

Condition: Pitch up and flare authority are restricted.

1 Do not extend the flaps any further until on approach. The airplane is approaching its nose up pitch control limit.

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

Note: Do not use autoland.

3 Choose one:

◆Flap position is **15 or less**

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

►►Go to step 4

◆Flap position is **20 or greater**

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

►►Go to step 4

4 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ PITCH UP AUTHORITY continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 30 + 40 or VREF 30 + 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . **5 or 20**

■ ■ ■ ■

[ ] PRI FLIGHT COMPUTERS

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

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

2 Choose one:

◆PRI FLIGHT COMPUTERS message **blanks**:

■ ■ ■ ■

◆PRI FLIGHT COMPUTERS message **stays shown**:

▶▶Go to step 3

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

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

Note: Inoperative Items

Autopilot inop

Envelope protection functions inop

Yaw damping inop

Rudder manual trim cancel switch inop

▼ Continued on next page ▼

▼ PRI FLIGHT COMPUTERS continued ▼

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

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

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

Manually extend the speedbrakes after landing.

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

AUTO SPEEDBRAKE

THRUST ASYM COMP

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ PRI FLIGHT COMPUTERS continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake **. . . . . DOWN**

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

Intentionally
Blank

[] SLATS DRIVE

Condition: The slat drive mechanism is failed.

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

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

Note: Do not use FMC fuel predictions with slats extended.

Do not use autoland.

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

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

SLATS PRIMARY FAIL

4 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ SLATS DRIVE continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . VREF 30 + 30, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps**. 20**

■ ■ ■ ■

[ ] SLATS PRIMARY FAIL

Condition: The slats primary mode is failed.

Note: Plan additional time for slower slat operation.

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

■ ■ ■ ■

SPEEDBRAKE EXTENDED

Condition: The speedbrakes are extended and one or more of these occur:

- The radio altitude is between 15 and 800 feet
- The flap lever is in a landing setting
- A thrust lever is not at idle

■ ■ ■ ■

[ ] SPOILERS

Condition: One or more spoiler pairs are failed.

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

■ ■ ■ ■

[ ] STAB GREENBAND

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

1 Check FMC weight and CG entries.

■ ■ ■ ■

[ ] STABILIZER C

Condition: The center stabilizer control path is failed.

1 C STAB cutout switch . . . . . CUTOUT

Note: The left control wheel pitch trim switches may be inoperative.

■ ■ ■ ■

STABILIZER CUTOUT

Condition: Both stabilizer cutout switches are in CUTOUT.

■ ■ ■ ■

[ ] STABILIZER R

Condition: The right stabilizer control path is failed.

1 R STAB cutout switch . . . . . CUTOUT

Note: The right control wheel pitch trim switches may be inoperative.

■ ■ ■ ■

[ ] THRUST ASYM COMP

Condition: Thrust asymmetry compensation is failed or OFF.

1 THRUST ASYM COMP switch. . . . . Off, then AUTO

2 Choose one:

◆THRUST ASYM COMP message **blanks**:

■ ■ ■ ■

◆THRUST ASYM COMP message **stays shown**:

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

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

Airspeed Unreliable

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

1 Check the pitch attitude and thrust for the phase of flight.

2 **If** the pitch attitude or thrust are **not** normal for the phase of flight:

Autopilot disconnect switch . . . . . .Push

Autothrottle disconnect switch . . . . . .Push

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

Adjust the pitch attitude and thrust.

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

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

▼ Continued on next page ▼

▼ Airspeed Unreliable continued ▼

3 Compare the pitch attitude, thrust setting, and airspeed with the ground speed and the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

4 Choose one:

- Reliable airspeed data source **can** be determined:

  Use the reliable airspeed display.

  ■ ■ ■ ■

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

  ▶▶**Go to step 5**

5 Adjust the pitch attitude and thrust for the phase of flight.

6 Maintain a normal pitch attitude and thrust setting for the phase of flight. Refer to the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

7 **When** starting the Descent Procedure:

Additional approach briefing items:

Maintain visual conditions if possible.

Establish landing configuration early.

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

▼ Continued on next page ▼

▼ Airspeed Unreliable continued ▼

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

■ ■ ■ ■

Additional Information

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

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

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

One or more of the following EICAS messages may show:

▼ Continued on next page ▼

AIRSPEED LOW

GND PROX SYS

HEAT PITOT C

HEAT PITOT L

HEAT PITOT R

HEAT PITOT L+C+R

NAV AIR DATA SYS

OVERSPEED

SGL SOURCE AIR DATA

SGL SOURCE DISPLAYS

WINDSHEAR SYS

[] ALTN ATTITUDE

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

Note: Both PFDs show the SAARU attitude information.

■ ■ ■ ■

BARO SET DISAGREE

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

■ ■ ■ ■

DISPLAY SELECT PNL

Condition: Left, center, or right CDU control of the display select panel is used.

■ ■ ■ ■

[] EFIS CONTROL PNL L, R

Condition: One of these occurs:

- The EFIS control panel is failed
- CDU control of the EFIS is used

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

■ ■ ■ ■

SGL SOURCE AIR DATA

Condition: Both PFDs use the same air data source.

■ ■ ■ ■

[] SGL SOURCE DISPLAYS

Condition: Some or all display units use a single source of display data.

Note: Both PFDs and NDs or just both NDs show information generated from a single source. The lower center display unit may be blank or may not be capable of showing all normal formats. The left EFIS control panel controls either the right PFD and ND or the right ND only.

■ ■ ■ ■

SGL SOURCE RAD ALT

Condition: Both PFDs use the same radio altimeter source.

■ ■ ■ ■

SINGLE SOURCE F/D

Condition: Both PFDs use the same flight director source.

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

[ ] FMC

Condition: One of these occurs:

- The FMC selector is in L and the left FMC is failed
- The FMC selector is in R and the right FMC is failed
- Both FMCs are failed

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

Note: LNAV can be re–engaged. Plan to enter new waypoints by latitude and longitude into any CDU.

Manually tune navigation radios through the CDUs.

Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

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

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

LANDING ALTITUDE

■ ■ ■ ■

FMC L, R

Condition: An FMC is failed.

■ ■ ■ ■

FMC MESSAGE

Condition: An alerting message is in the FMC scratchpad.

■ ■ ■ ■

FMC RUNWAY DISAGREE

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

■ ■ ■ ■

GPS

Condition: Both GPS receivers are failed.

■ ■ ■ ■

[] ILS ANTENNA

Condition: Two or more ILS receivers do not use the correct antenna.

Note: AFDS may have difficulty capturing or tracking localizer or glideslope. The airplane path may be lower than indicated by the glideslope pointer.

■ ■ ■ ■

[] NAV ADIRU INERTIAL

Condition: The ADIRU cannot supply correct attitude, position, heading, track, and groundspeed data.

1 Heading information shows for 3 minutes after the NAV ADIRU INERTIAL message shows. If the airplane is in the polar region, heading information is removed immediately.

2 GPS continues to provide position and track information.

3 Transponder ALT SOURCE selector . . . . . ALTN

Note: Inoperative Items

FMC VNAV pages inop

FMC performance predictions inop

ND wind direction/speed and wind arrow inop

Autobrake inop

PFD flap maneuvering speeds inop

Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

▼ Continued on next page ▼

▼ NAV ADIRU INERTIAL continued ▼

Note: Inoperative AFDS Modes

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

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

Enter the heading.

Re-engage the autopilot.

Note: Crosscheck heading periodically for drift with the magnetic compass and update heading as necessary. If magnetic compass information is unreliable or unavailable, track information may be used.

VOR course deviation is available in the ND VOR mode. ILS localizer and glideslope deviation raw data is available on both the PFD and the ND.

▼ Continued on next page ▼

▼ NAV ADIRU INERTIAL continued ▼

Note: **If** GPS is not available, the following additional items are inoperative:

- ND map mode
- active leg course and distance
- direct to waypoint function
- alternate page DIVERT NOW function
- navigation radio autotuning

■ ■ ■ ■

[] NAV AIR DATA SYS

Condition: The three air data sources disagree.

1 Avoid abrupt control inputs. Airplane response is changed by simplified elevator feel and rudder ratio systems.

2 Crosscheck airspeed and altitude on the PFDs and standby flight instruments for accuracy. Each display is receiving data from an independent source.

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

Select alternate air data/attitude source if airspeed or altitude on respective PFD is determined to be in error and airspeed or altitude on opposite side PFD is verified to be correct.

3 GND PROX FLAP OVRD switch . . . . . OVRD

Note: Inoperative Items

Envelope protection functions inop

Autopilot inop

Flight directors inop

Autothrottles inop

PFD flap maneuvering speeds inop

Refer to the Flap Maneuver Speed table below:

▼ Continued on next page ▼

▼ NAV AIR DATA SYS continued ▼

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

Note: Yaw damper is degraded.

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

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

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

Manually extend speedbrakes after landing.

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

AUTO SPEEDBRAKE

FLIGHT CONTROL MODE

THRUST ASYM COMP

5 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ NAV AIR DATA SYS continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake **. . . . . DOWN**

Landing gear . . . . . DOWN

Flaps **. 20**

■ ■ ■ ■

[ ] NAV UNABLE RNP

Condition: The actual navigational performance is not sufficient.

1 Choose one:

◆On the **ground**:

Message may show with GPS disabled.

■ ■ ■ ■

◆In **flight**

►►**Go to step 2**

2 Choose one:

◆On procedure or airway **with RNP alerting requirement**:

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

■ ■ ■ ■

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

Verify position.

■ ■ ■ ■

SINGLE SOURCE ILS

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

■ ■ ■ ■

TRANSPONDER L, R

Condition: A transponder fault occurs.

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally Blank

[ ] FUEL AUTO JETTISON

Condition: One of these occurs:
- The total fuel quantity is less than the fuel to remain and a jettison nozzle valve is open
- The fuel jettison automatic shutoff is failed

Objective: To manually close the fuel jettison nozzle valves when fuel jettison is complete.

1 Choose one:

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

Determine jettison time using the following rates:

Fuel in center tank: 2500 kgs/minute

Center tank empty: 1400 kgs/minute

►►**Go to step 2**

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

►►**Go to step 2**

2 FUEL JETTISON NOZZLE
valve switches (both) . . . . . ON

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

FUEL JETTISON

▼ Continued on next page ▼

▼ FUEL AUTO JETTISON continued ▼

4 **When** fuel jettison is complete:

FUEL JETTISON NOZZLE
valve switches (both) . . . . . Off

FUEL JETTISON ARM switch . . . . . Off

5 Choose one:

◆FUEL line on PERF INIT page is **blank**:

Wait 5 minutes. Manual entry of fuel quantity is not possible until 5 minutes after jettison is complete.

Enter the current estimated total fuel in the FUEL line box prompts on the PERF INIT page. This provides gross weight data for FMC performance calculations and allows VNAV to be re–engaged.

■ ■ ■ ■

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

■ ■ ■ ■

[ ] FUEL CROSSFEED AFT

Condition: The fuel crossfeed valve is not in the commanded position.

1 Choose one:

◆AFT FUEL CROSSFEED switch is **on**:

FWD FUEL CROSSFEED switch. . . . . On

■ ■ ■ ■

◆AFT FUEL CROSSFEED switch is **off**:

■ ■ ■ ■

[ ] FUEL CROSSFEED FWD

Condition: The fuel crossfeed valve is not in the commanded position.

1 Choose one:

◆FWD FUEL CROSSFEED switch is **on**:

AFT FUEL CROSSFEED switch . . . . . On

■ ■ ■ ■

◆FWD FUEL CROSSFEED switch is **off**:

■ ■ ■ ■

[ ] FUEL DISAGREE

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

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

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

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

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

The individual tank quantities.

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

▼ Continued on next page ▼

▼ FUEL DISAGREE continued ▼

2 Choose one:

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

▶▶**Go to the Fuel Leak checklist on page 12.11**

■ ■ ■ ■

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

▶▶**Go to step 3**

3 Select PROGRESS page 2.

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

■ ■ ■ ■

[ ] FUEL IMBALANCE

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

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

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

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

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

The individual tank quantities.

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

▼ Continued on next page ▼

▼ FUEL IMBALANCE continued ▼

2 Choose one:

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

▶▶**Go to the Fuel Leak checklist on page 12.11**

■ ■ ■ ■

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

▶▶**Go to step 3**

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

4 Choose one:

◆**Left** main tank quantity is low:

L fuel PUMPS FWD and AFT switches (both) . . . . . Off

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

Do **not** accomplish the following checklists:

FUEL PUMP L AFT

FUEL PUMP L FWD

▶▶**Go to step 7**

◆**Right** main tank quantity is low:

▶▶**Go to step 5**

▼ Continued on next page ▼

▼ FUEL IMBALANCE continued ▼

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

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

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

FUEL PUMP R AFT

FUEL PUMP R FWD

7 **When** fuel balancing is complete:

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

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

■ ■ ■ ■

FUEL IN CENTER

Condition: The center tank fuel quantity is at the level where the pump switches must be ON.

■ ■ ■ ■

FUEL JETT NOZZLE L, R

Condition: A jettison nozzle valve is not in the commanded position.

■ ■ ■ ■

Fuel Jettison

Condition: Fuel jettison is needed.

1 FUEL JETTISON ARM switch . . . . . ARMED

2 Choose one:

◆FUEL TO REMAIN is **acceptable**:

►►**Go to step 4**

◆FUEL TO REMAIN must be **changed**:

►►**Go to step 3**

3 FUEL TO REMAIN selector . . . . . PULL ON and set manually

4 FUEL JETTISON NOZZLE valve switches (both) . . . . . ON

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

FUEL PUMP CENTER L

FUEL PUMP CENTER R

6 **When** fuel jettison is complete:

FUEL JETTISON NOZZLE valve switches (both) . . . . . Off

FUEL JETTISON ARM switch . . . . . Off

■ ■ ■ ■

[ ] FUEL JETTISON MAIN

Condition: The main tank fuel jettison system is failed.

1 Fuel jettison can occur only from the center tank.

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

FUEL JETTISON

3 **When** the center fuel tank is empty or the FUEL TO REMAIN quantity is reached:

FUEL JETTISON NOZZLE
valve switches (both) . . . . . Off

FUEL JETTISON ARM switch . . . . . Off

■ ■ ■ ■

[ ] FUEL JETTISON SYS

Condition: The fuel jettison system is failed.

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

1 FUEL JETTISON NOZZLE
valve switches (both) . . . . . Off

2 FUEL JETTISON ARM switch . . . . . Off

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

FUEL JETTISON

■ ■ ■ ■

Fuel Leak

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

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

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

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

3 Identify an engine fuel leak by verifying that a left or right main fuel tank quantity is decreasing faster than the other.

4 An increase in a fuel imbalance of approximately 500 kgs or more in 30 minutes should be considered a fuel leak.

5 **If** conditions allow, visually check for an engine fuel leak.

6 Choose one:

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

  ▶▶**Go to step 11**

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

  ▶▶**Go to step 7**

7 Resume normal fuel management procedures.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

8 Choose one:

◆FUEL DISAGREE message is **blank**:

▶▶**Go to step 11**

◆FUEL DISAGREE message **shows**:

▶▶**Go to step 9**

9 Select PROGRESS page 2.

10 TOTALIZER OR CALCULATED . . . . . Select USE

Select the most accurate value.

11 Choose one:

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

▶▶**Go to step 22**

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

▶▶**Go to step 12**

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

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

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

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

16 Transponder mode selector . . . . . TA ONLY

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

17 Choose one:

◆FUEL DISAGREE message is **blank**:

▶▶**Go to step 20**

◆FUEL DISAGREE message **shows**:

▶▶**Go to step 18**

18 Select PROGRESS page 2.

19 TOTALIZER . . . . . Select USE

Use TOTALIZER to determine fuel remaining.

20 Plan to land at the nearest suitable airport.

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

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

21 Choose one:

- Landing using flaps **20**:

  GND PROX FLAP OVRD switch . . . . . OVRD

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

  ▶▶**Go to step 22**

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

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

  ▶▶**Go to step 22**

22 Choose one:

- FUEL QTY LOW message is **blank**:

  ▶▶**Go to step 28**

- FUEL QTY LOW message **shows**:

  ▶▶**Go to step 23**

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

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

24 Fuel PUMPS switches (all) . . . . . ON

This ensures that all fuel is available for use.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

25 Plan to land at the nearest suitable airport.

26 GND PROX FLAP OVRD switch . . . . . OVRD

Note: Use flaps 20 and VREF 20 for landing. Increased speed at flaps 20 provides improved elevator control for landing flare in the event of dual engine flameout.

Avoid high nose up attitude and excessive acceleration or deceleration. This prevents forward pumps from uncovering.

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

FUEL QTY LOW

28 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . **VREF 20 or VREF 30, Minimums**___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

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

■ ■ ■ ■

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

Additional Information

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

- A visual observation of fuel spray from a strut or an engine
- An excessive engine fuel flow
- The total fuel quantity decreasing at an abnormal rate
- The FUEL DISAGREE message shows on EICAS
- The FUEL IMBALANCE message shows on EICAS
- The FUEL QTY LOW message shows on EICAS
- The INSUFFICIENT FUEL message shows on a CDU scratchpad

FUEL LOW CENTER

Condition: The center tank fuel quantity is at the level where the pump switches must be off.

■ ■ ■ ■

[ ] FUEL PRESS ENG L, R

Condition: The engine is on suction feed.

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

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

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

FUEL IMBALANCE

FUEL PUMP AFT

FUEL PUMP FWD

3 Choose one:

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

■ ■ ■ ■

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

▶▶**Go to step 4**

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

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

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

▼ Continued on next page ▼

▼ FUEL PRESS ENG L, R continued ▼

5 Do not balance fuel.

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

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

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

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

■ ■ ■ ■

FUEL PRESS ENG L+R

Condition: Both engines are on suction feed.

■ ■ ■ ■

[ ] FUEL PUMP CENTER L, R

Condition: The pump pressure is low.

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

2 Fuel CENTER PUMP switch (affected pump) . . . Off

3 Choose one:

◆**At least one** center fuel pump output pressure is **normal**:

■ ■ ■ ■

◆**Both** center fuel pump output pressures are **low**:

►►**Go to step 4**

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

5 Check that available left and right main tank quantity is sufficient for the planned flight. The center tank fuel is not available.

■ ■ ■ ■

[ ] FUEL PUMP L AFT, FWD

Condition: The pump pressure is low.

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

■ ■ ■ ■

[ ] FUEL PUMP R AFT, FWD

Condition: The pump pressure is low.

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

■ ■ ■ ■

[ ] FUEL QTY LOW

Condition: The fuel quantity is low in a main tank.

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

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

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

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

The individual tank quantities.

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

2 Choose one:

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

▶▶**Go to the Fuel Leak checklist on page 12.11**

■ ■ ■ ■

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

▶▶**Go to step 3**

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

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

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

4 Fuel PUMPS switches (all) . . . . . ON

This ensures that all fuel is available for use.

5 Plan to land at the nearest suitable airport.

6 GND PROX FLAP OVRD switch . . . . . OVRD

Note: Use flaps 20 and VREF 20 for landing. Increased speed provides improved elevator control for landing flare in the event of a dual engine flameout.

Avoid high nose up attitude and excessive acceleration or deceleration. This prevents forward pumps from uncovering.

7 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps 20

■ ■ ■ ■

[ ] FUEL SCAVENGE SYS

A7-BAE - A7-BAH, A7-BAJ, A7-BAK, A7-BBC - A7-BFB

Condition: The fuel scavenge system is failed.

1 Select the PERF INIT page.

2 Add 1,300 kgs to the required RESERVES.

3 Select the PROGRESS page.

4 Check the DESTINATION FUEL ESTIMATE. Verify that adequate fuel is available in the left and right main tanks to complete the flight.

Note: Remaining center tank fuel is unusable.

■ ■ ■ ■

[ ] FUEL TEMP LOW

Condition: Fuel temperature is near the minimum.

1 Increase airspeed, change altitude or deviate to a warmer air mass to achieve a TAT equal to or higher than the fuel temperature limit (3 degrees C above the fuel freeze point).

2 TAT increases approximately 0.5 to 0.7 degrees C for each .01 Mach increase in airspeed. In extreme conditions it may be necessary to descend as low as FL250.

■ ■ ■ ■

[ ] FUEL VALVE APU

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

1 Do not start the APU. This prevents a potential fire hazard.

Note: The APU is not available for the rest of the flight.

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

APU SHUTDOWN

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

[ ] HYD AUTO CONTROL C

Condition: Both of the following occur:
- Automatic control of both center demand pumps fails
- System indications fail

1 C1 AIR DEMAND pump selector . . . . . ON

■ ■ ■ ■

[ ] HYD AUTO CONTROL L, R

Condition: Both of the following occur:
- Automatic control of demand pump fails
- System indications fail

1 ELEC DEMAND pump selector (affected system) . . . . . ON

■ ■ ■ ■

[ ] HYD OVERHEAT DEM C1, C2, L, R

Condition: The pump temperature is high.

1 DEMAND pump selector . . . . . OFF

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

HYD PRESS DEM

■ ■ ■ ■

[] HYD OVERHEAT PRI C1, C2

Condition: The pump temperature is high.

1 ELEC PRIMARY pump switch. . . . . Off

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

HYD PRESS PRI

■ ■ ■ ■

[] HYD OVERHEAT PRI L, R

Condition: The pump temperature is high.

1 ENG PRIMARY pump switch . . . . . Off

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

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

HYD PRESS PRI

■ ■ ■ ■

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

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

1 DEMAND pump selector . . . . . ON

2 Choose one:

◆HYD PRESS DEM message **blanks**:

■ ■ ■ ■

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

DEMAND pump selector . . . . . OFF

■ ■ ■ ■

[ ] HYD PRESS PRI C1, C2

Condition: The pump pressure is low.

1 ELEC PRIMARY pump switch . . . . . Off

■ ■ ■ ■

[ ] HYD PRESS PRI L, R

Condition: The pump pressure is low.

1 ENG PRIMARY pump switch . . . . . Off

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

■ ■ ■ ■

[] HYD PRESS SYS C

Condition: The hydraulic system pressure is low.

Objective: To attempt to restore system pressure and configure for landing using alternate systems, if needed.

1 C1 or C2 AIR DEMAND pump selector . . . . . .ON

2 Choose one:

- HYD PRESS SYS C message **blanks**:

  ■ ■ ■ ■

- HYD PRESS SYS C message **stays shown**:

  ▶▶**Go to step 3**

3 C2 ELEC PRIMARY pump switch . . . . . .Off

4 C1 and C2 AIR DEMAND pump selectors . . . . OFF

5 GND PROX FLAP OVRD switch . . . . . .OVRD

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

AUTO SPEEDBRAKE

SPOILERS

Note: Inoperative Items

Primary flap and slat operation inop
Plan additional time for slower flap and slat operation.

Main landing gear hydraulic operation inop
Alternate gear extension is needed.

Main gear steering inop
Tires may scrub during turns.

▼ Continued on next page ▼

▼ HYD PRESS SYS C continued ▼

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

Note: Use flaps 20 and VREF 20 for landing. This ensures adequate go–around performance due to slower slat/flap operation in secondary mode.

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

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

Manually extend the speedbrakes after landing.

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

7 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 20, Minimums** ___

Approach briefing . . . . . Completed

▼ Continued on next page ▼

▼ HYD PRESS SYS C continued ▼

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Flap extension

Initiate flap extension as required.

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

Alternate gear extension

Landing gear lever . . . . . DN

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

A reduction of airspeed to below 240 knots may be necessary for the landing gear to lock down.

Do **not** accomplish the following checklist:

GEAR DOOR

Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

▼ Continued on next page ▼

▼ HYD PRESS SYS C continued ▼

Flaps. 20

■ ■ ■ ■

[ ] HYD PRESS SYS L

Condition: The hydraulic system pressure is low.

1 L ELEC DEMAND pump selector . . . . . .ON

2 Choose one:

◆HYD PRESS SYS L message **blanks**:

■ ■ ■ ■

◆HYD PRESS SYS L message **stays shown**:

►►**Go to step 3**

3 L ENG PRIMARY pump switch. . . . . .Off

4 L ELEC DEMAND pump selector . . . . . OFF

Note: The left thrust reverser is inoperative.

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

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

SPOILERS

■ ■ ■ ■

[ ] HYD PRESS SYS L+C

Condition: Two hydraulic system pressures are low.

Objective: To attempt to restore system pressure and configure for landing using alternate systems, if needed.

1 L ELEC DEMAND pump selector . . . . . .ON

2 C1 or C2 AIR DEMAND pump selector . . . . . .ON

3 Choose one:

◆HYD PRESS SYS L+C message **blanks**:

■ ■ ■ ■

◆HYD PRESS SYS L+C message **stays shown**:

►►**Go to step 4**

4 L ENG PRIMARY pump switch . . . . . .Off

5 C2 ELEC PRIMARY pump switch . . . . . .Off

6 L ELEC DEMAND pump selector . . . . . OFF

7 C1 and C2 AIR DEMAND pump selectors . . . . OFF

8 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.

9 Plan to land at the nearest suitable airport.

10 GND PROX FLAP OVRD switch . . . . . .OVRD

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

AUTO SPEEDBRAKE

FLIGHT CONTROLS

▼ Continued on next page ▼

▼ HYD PRESS SYS L+C continued ▼

SPOILERS

Note: Inoperative Items

Multiple flight control surfaces inop
Handling qualities are degraded.

Primary flap and slat operation inop
Plan additional time for slower flap and slat operation.

Main landing gear hydraulic operation inop
Alternate gear extension is needed.

Left thrust reverser inop
Right thrust reverser is available.

Main gear steering inop
Tires may scrub during turns.

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

▼ Continued on next page ▼

▼ HYD PRESS SYS L+C continued ▼

Note: Use flaps 20 and VREF 30 + 20 for landing. This allows higher approach speeds to improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

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

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

Manually extend the speedbrakes after landing.

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

12 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . VREF 30 + 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

▼ Continued on next page ▼

▼ HYD PRESS SYS L+C continued ▼

Approach Checklist

Altimeters . . . . . ___

Flap extension

Initiate flap extension as required.

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

Alternate gear extension

Landing gear lever . . . . . DN

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

Reduction of airspeed to below 240 knots may be necessary for landing gear to lock down.

Do **not** accomplish the following checklist:

GEAR DOOR

Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

HYD PRESS SYS L+C+R

Condition: All hydraulic system pressures are low.

■ ■ ■ ■

[ ] HYD PRESS SYS L+R

Condition: Two hydraulic system pressures are low.

Objective: To attempt to restore system pressure and configure for landing using alternate systems, if needed.

A7-BAA - A7-BAO

1 Do not exceed .87 Mach. This ensures sufficient roll control.

2 L ELEC DEMAND pump selector . . . . . ON

3 R ELEC DEMAND pump selector . . . . . ON

4 Choose one:

◆HYD PRESS SYS L+R message **blanks**:

■ ■ ■ ■

◆HYD PRESS SYS L+R message **stays shown**:

▶▶**Go to step 5**

5 L ENG PRIMARY pump switch. . . . . Off

6 R ENG PRIMARY pump switch . . . . . Off

7 L ELEC DEMAND pump selector . . . . . OFF

8 R ELEC DEMAND pump selector . . . . . OFF

9 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.

10 Plan to land at the nearest suitable airport.

11 GND PROX FLAP OVRD switch . . . . . OVRD

▼ Continued on next page ▼

▼ HYD PRESS SYS L+R continued ▼

Note: Inoperative Items

Multiple flight control surfaces inop
Handling qualities are degraded.

Left and right thrust reversers inop
Manual braking is available.

Autobrake inop
Manual braking is available.

Normal brakes inop
Alternate brakes are available.

Note: Use flaps 20 and VREF 30 + 20 for landing. This allows higher approach speeds to improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

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

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

FLIGHT CONTROLS

SPOILERS

13 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake **. . . . . .OFF**

▼ Continued on next page ▼

▼ HYD PRESS SYS L+R continued ▼

Landing data . . . . **VREF 30 + 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps. **20**

■ ■ ■ ■

[ ] HYD PRESS SYS R

Condition: The hydraulic system pressure is low.

1 R ELEC DEMAND pump selector . . . . . .ON

2 Choose one:

◆HYD PRESS SYS R message **blanks**:

■ ■ ■ ■

◆HYD PRESS SYS R message **stays shown**:

▶▶**Go to step 3**

3 R ENG PRIMARY pump switch. . . . . .Off

4 R ELEC DEMAND pump selector . . . . . OFF

Note: Inoperative Items

Right thrust reverser inop
Left thrust reverser is available.

Autobrake inop
Manual braking is available.

Normal brakes inop
Alternate brakes is available.

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

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

SPOILERS

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ HYD PRESS SYS R continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . **OFF**

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

■ ■ ■ ■

[ ] HYD PRESS SYS R+C

Condition: Two hydraulic system pressures are low.

Objective: To attempt to restore system pressure and configure for landing using alternate systems, if needed.

A7-BAA - A7-BAO

1 Do not exceed .87 Mach. This ensures sufficient roll control.

2 C1 or C2 AIR DEMAND pump selector . . . . . .ON

3 R ELEC DEMAND pump selector . . . . . .ON

4 Choose one:

◆HYD PRESS SYS R+C message **blanks**:

■ ■ ■ ■

◆HYD PRESS SYS R+C message **stays shown**:

►►**Go to step 5**

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

This keeps the STABILIZER message blank.

6 Do not exceed current airspeed. Nose down elevator authority is limited.

7 C2 ELEC PRIMARY pump switch . . . . . .Off

8 R ENG PRIMARY pump switch. . . . . .Off

9 C1 and C2 AIR DEMAND pump selectors . . . . OFF

10 R ELEC DEMAND pump selector . . . . . OFF

▼ Continued on next page ▼

▼ HYD PRESS SYS R+C continued ▼

11 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.

12 Plan to land at the nearest suitable airport.

13 GND PROX FLAP OVRD switch . . . . . OVRD

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

AUTO SPEEDBRAKE

FLIGHT CONTROLS

SPOILERS

STABILIZER

▼ Continued on next page ▼

▼ HYD PRESS SYS R+C continued ▼

Note: Inoperative Items

Multiple flight control surfaces inop
Handling qualities are degraded.

Stabilizer inop
Pitch trim is available in the normal flight control mode.

Primary flap and slat operation inop
Plan additional time for slower flap and slat operation.

Main landing gear hydraulic operation inop
Alternate gear extension is needed.

Right thrust reverser inop
Left thrust reverser is available.

Autobrake inop
Manual braking is available.

Normal and alternate brakes inop
Reserve brakes are available.

Main gear steering inop
Tires may scrub during turns.

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

▼ Continued on next page ▼

▼ HYD PRESS SYS R+C continued ▼

Note: Use flaps 20 and VREF 30 + 20 for landing. This allows higher approach speeds to improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

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

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

Manually extend speedbrakes after landing.

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

15 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake **. . . . . .OFF**

Landing data **. . . . VREF 30 + 20, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

▼ Continued on next page ▼

▼ HYD PRESS SYS R+C continued ▼

Approach Checklist

Altimeters . . . . . ___

Flap extension

Initiate flap extension as required.

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

Alternate gear extension

Landing gear lever . . . . . .DN

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

Reduction of airspeed to below 240 knots may be necessary for landing gear to lock down.

Do **not** accomplish the following checklist:

GEAR DOOR

Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps **20**

■ ■ ■ ■

[ ] HYD QTY LOW C

Condition: The hydraulic quantity is low.

Note: Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

■ ■ ■ ■

HYD QTY LOW L, R

Condition: The hydraulic quantity is low.

■ ■ ■ ■

[ ] HYD QTY LOW L+C

Condition: Two hydraulic quantities are low.

1 Plan to land at the nearest suitable airport.

Note: Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

■ ■ ■ ■

[ ] HYD QTY LOW L+C+R

Condition: All three hydraulic quantities are low.

1 Plan to land at the nearest suitable airport.

Note: Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

■ ■ ■ ■

[ ] HYD QTY LOW L+R

Condition: Two hydraulic quantities are low.

1 Plan to land at the nearest suitable airport.

■ ■ ■ ■

Intentionally
Blank

[ ] HYD QTY LOW R+C

Condition: Two hydraulic quantities are low.

Objective: To prevent fluid loss through the brake system.

1 C1 ELEC PRIMARY pump switch . . . . . Off

2 Plan to land at the nearest suitable airport.

Note: Nose wheel steering may be slow to react. Excessive force on the nose wheel steering tiller may cause abrupt tiller movement in the opposite direction.

Do not taxi with loss of steering.

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

BRAKE SOURCE

RESERVE BRAKES/STRG

4 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ HYD QTY LOW R+C continued ▼

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

Landing Checklist

Speedbrake . . . . . ARMED

Landing gear . . . . . DOWN

Flaps . . . . . ___

Before landing

C1 ELEC PRIMARY pump switch . . . . . ON

This restores reserve brakes and may restore steering.

■ ■ ■ ■

RAT UNLOCKED

Condition: The ram air turbine is not stowed and locked.

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

[] ANTISKID

Condition: An antiskid system fault occurs.

Note: The autobrake system is inoperative. Use minimum braking consistent with the runway conditions to reduce the possibility of a tire blowout.

■ ■ ■ ■

AUTOBRAKE

Condition: One of these occurs:
- the autobrake system is disarmed
- the autobrake system is failed

■ ■ ■ ■

[] BRAKE SOURCE

Condition: Normal, alternate, and reserve brake system pressures are low.

Note: Only accumulator pressure is available for braking. During landing rollout, apply steady, increasing brake pressure and hold to a full stop. Do not taxi.

■ ■ ■ ■

[ ] BRAKE TEMP

Condition: One or more brake temperatures are high.

1 Choose one:

◆In **flight**:

Do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

Landing gear lever . . . . . DN

When the BRAKE TEMP message blanks:

Wait 8 minutes.

Landing gear lever. . . . . UP

■ ■ ■ ■

◆On the **ground**:

Refer to the Recommended Brake Cooling Schedule table in the Performance Inflight chapter for the required cooling time.

■ ■ ■ ■

Intentionally
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[] GEAR DISAGREE

Condition: The gear position disagrees with the landing gear lever position.

Objective: To extend the gear using alternate gear extension, or land on the available gear.

Note: Do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

1 Choose one:

◆Landing gear lever **UP**:

Note: Flight with the gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down tables in the Performance Inflight chapter for flight planning.

Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

GEAR DOOR

■ ■ ■ ■

◆Landing gear lever **DN**:

▶▶**Go to step 2**

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

3 Reduction of airspeed to below 240 knots may be necessary for the gear to lock down.

▼ Continued on next page ▼

▼ GEAR DISAGREE continued ▼

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

GEAR DOOR

5 **Wait** 30 seconds.

6 Choose one:

- **All** gear indicate **DN**:

  ■ ■ ■ ■

- **Any** gear indicate **UP or in-transit**:

  ▶▶**Go to step 7**

7 Plan to land on the available gear.

8 GND PROX GEAR OVRD switch . . . . . OVRD

Note: Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

When stopping distance is critical, extend the speedbrakes after all gear, or the nose, or the engine nacelle have contacted the runway.

Do not use the thrust reversers unless stopping distance is critical.

9 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes . . . . . Checked

▼ Continued on next page ▼

▼ GEAR DISAGREE continued ▼

Autobrake . . . . . ___

Landing data **. . . . . VREF 30, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . _____

At pattern altitude

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

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

Fuel PUMPS switches (all) . . . . . Off

Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

FUEL PRESS ENG L

FUEL PRESS ENG R

Landing Checklist

Speedbrake **. . . . . DOWN**

Landing gear . . . . . DOWN

▼ Continued on next page ▼

▼ GEAR DISAGREE continued ▼

Flaps. 30

■ ■ ■ ■

[ ] GEAR DOOR

Condition: One or more gear doors are not closed.

Note: Do not exceed the gear EXTEND limit speed (270 knots/.82 Mach).

■ ■ ■ ■

Gear Lever Locked Down

Condition: The landing gear lever cannot move to UP.

1 Landing gear lever
LOCK OVRD switch . . . . . Push and hold

2 Landing gear lever . . . . . UP

■ ■ ■ ■

[ ] MAIN GEAR BRACE L, R

Condition: The main gear is down with one brace unlocked.

1 GND PROX GEAR OVRD switch . . . . . OVRD

Note: Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

Manually extend the speedbrakes after landing.

2 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall . . . . . Checked

Notes. . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 30, Minimums** ___

Approach briefing . . . . . Completed

Seat belts . . . . . ___

Approach Checklist

Altimeters . . . . . ___

At pattern altitude

Fuel PUMPS switches (all) . . . . . Off

▼ Continued on next page ▼

▼ MAIN GEAR BRACE L, R continued ▼

Do **not** accomplish the following checklists:

FUEL PRESS ENG L

FUEL PRESS ENG R

Landing Checklist

Speedbrake . . . . . **DOWN**

Landing gear . . . . . DOWN

Flaps **30**

■ ■ ■ ■

MAIN GEAR STEERING

Condition: Main gear steering does not lock.

■ ■ ■ ■

[ ] RESERVE BRAKES / STRG

Condition: One or more of these are possibly not available:

- Reserve brakes
- Normal nose gear extension
- Nose wheel steering

Note: Plan for possible alternate gear extension. Do not taxi with loss of steering.

■ ■ ■ ■

TAIL SKID

A7-BAA - A7-BAO

Condition: The tailskid is not in the commanded position.

■ ■ ■ ■

TIRE PRESS

Condition: One or more tire pressures are not normal.

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

AIRSPEED LOW

Condition: Airspeed is less than minimum maneuvering speed.

■ ■ ■ ■

ALTITUDE ALERT

Condition: A deviation from the MCP set altitude occurs.

■ ■ ■ ■

ALTITUDE CALLOUTS

Condition: Altitude and minimums voice annunciations during approach are not supplied.

■ ■ ■ ■

CONFIG DOORS

Condition: An entry, forward cargo, or aft cargo door is not closed and latched and locked during takeoff.

■ ■ ■ ■

CONFIG FLAPS

Condition: The flaps are not in a takeoff position during takeoff.

■ ■ ■ ■

CONFIG GEAR

Condition: A landing gear is not down and locked and one of these occurs:

- A thrust lever is at idle below 800 feet radio altitude
- The flaps are in a landing position

■ ■ ■ ■

CONFIG GEAR STEERING

Condition: Main gear steering is not locked during takeoff.

■ ■ ■ ■

CONFIG PARKING BRAKE

Condition: The parking brake is set during takeoff.

■ ■ ■ ■

CONFIG RUDDER

Condition: Rudder trim is not centered during takeoff.

■ ■ ■ ■

CONFIG SPOILERS

Condition: One of these occurs:
- The speedbrake lever is not down during takeoff
- The speedbrake lever is extended beyond ARMED in flight with climb thrust or greater

■ ■ ■ ■

CONFIG STABILIZER

Condition: The stabilizer is not in the greenband during takeoff.

■ ■ ■ ■

[] CONFIG WARNING SYS

Condition: A configuration warning system fault occurs.

Note: Radio altitude voice callouts and other aural alerts may not be available.

■ ■ ■ ■

[] GND PROX SYS

Condition: A ground proximity warning system fault occurs.

Note: Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

■ ■ ■ ■

OVERSPEED

Condition: Airspeed is more than Vmo/Mmo.

■ ■ ■ ■

[ ] TAIL STRIKE

Condition: The tail hits the runway.

Caution! Do not pressurize the airplane. Pressurizing the airplane may cause further structural damage.

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

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

3 Plan to land at the nearest suitable airport.

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

CABIN ALTITUDE AUTO

■ ■ ■ ■

TCAS

Condition: TCAS is failed.

■ ■ ■ ■

TCAS OFF

Condition: TCAS modes TA or TA/RA are not selected.

■ ■ ■ ■

TCAS RA CAPTAIN, F/O

Condition: TCAS cannot show RA guidance on the PFD.

■ ■ ■ ■

TERR OVRD

Condition: The ground proximity terrain override switch is in OVRD.

■ ■ ■ ■

[] TERR POS

Condition: Terrain position data is lost.

Note: Position data for the ND terrain map and look-ahead terrain alerts are lost. Ground proximity alerts that occur are valid.

■ ■ ■ ■

[ ] WINDSHEAR SYS

Condition: A windshear system fault occurs.

Note: Some or all windshear alerts are not available. Windshear alerts that occur are valid.

■ ■ ■ ■

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Introduction

This Section Reserved For Operator-Developed Information

Intentionally
Blank

Performance Inflight - QRH Chapter PI-QRH

Table of Contents

Intentionally
Blank

777-200LR GE90-115BL KG FAA

Performance Inflight - QRH 777-200LR Chapter PI-QRH

Flight With Unreliable Airspeed / TurbulentPerformance Inflight - QRH 777-200LRnetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	**PITCH ATT** V/S (FT/MIN)	**5.0** 2500	**4.5** 1500			
30000 (280 KIAS)	**PITCH ATT** V/S (FT/MIN)	**6.5** 3700	**5.5** 2600	**5.5** 1800	**5.0** 1300	**4.5** 900
20000 (270 KIAS)	**PITCH ATT** V/S (FT/MIN)	**9.5** 5000	**8.5** 3600	**8.0** 2700	**7.5** 2000	**7.5** 1400
10000 (270 KIAS)	**PITCH ATT** V/S (FT/MIN)	**14.0** 6700	11.5 4900	**10.0** 3700	**9.5** 2900	**9.5** 2200
SEA LEVEL (270 KIAS)	**PITCH ATT** V/S (FT/MIN)	**17.5** 7800	**14.5** 5700	**12.5** 4400	**11.5** 3500	**11.0** 2800

Cruise

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	**PITCH ATT** %N1	**2.0** 78.6	**3.0** 83.2			
35000 (.82M)	**PITCH ATT** %N1	**1.5** 76.5	**2.0** 78.9	**3.0** 82.8	**3.5** 88.0	
30000 (280 KIAS)	**PITCH ATT** %N1	**1.5** 72.6	**2.5** 74.7	**3.0** 78.1	**3.5** 82.4	**3.5** 87.3
25000 (280 KIAS)	**PITCH ATT** %N1	**1.5** 68.6	**2.5** 70.7	**3.5** 73.8	**4.0** 77.7	**4.0** 82.3
20000 (270 KIAS)	**PITCH ATT** %N1	**2.0** 63.4	**2.5** 65.8	**3.5** 69.0	**4.5** 72.8	**5.5** 77.4
15000 (270 KIAS)	**PITCH ATT** %N1	**1.5** 59.6	**2.5** 61.8	**3.5** 65.0	**4.5** 68.2	**5.5** 72.5

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	**PITCH ATT** V/S (FT/MIN)	**-1.5** -2900	**0.0** -2600			
30000 (280 KIAS)	**PITCH ATT** V/S (FT/MIN)	**-1.5** -2500	**-0.5** -2000	**0.5** -1900	**1.0** -1900	**0.5** -2400
20000 (270 KIAS)	**PITCH ATT** V/S (FT/MIN)	**-1.0** -1900	**0.5** -1600	**1.5** -1500	**2.5** -1400	**3.0** -1400
10000 (270 KIAS)	**PITCH ATT** V/S (FT/MIN)	**-1.5** -1700	**0.0** -1400	**1.0** -1300	**2.0** -1300	**3.0** -1300
SEA LEVEL (270 KIAS)	**PITCH ATT** V/S (FT/MIN)	**-2.0** -1500	**-0.5** -1300	**1.0** -1200	**2.0** -1200	**3.0** -1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	**PITCH ATT**	**3.0**	**4.5**	**5.5**	**6.0**	**6.0**
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	**PITCH ATT**	**3.0**	**4.5**	**5.5**	**6.0**	**6.0**
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP	PITCH ATT	3.5	5.0	6.0	6.0	6.5
GEAR UP	%N1	47.7	52.4	57.2	62.0	66.4
(VREF 30 + 80)	KIAS	220	220	227	244	262
FLAPS 1	PITCH ATT	4.5	6.5	7.5	8.0	8.0
GEAR UP	%N1	48.5	53.4	58.8	63.9	68.2
(VREF 30 + 60)	KIAS	200	200	207	224	242
FLAPS 5	PITCH ATT	3.5	5.5	6.5	6.5	6.5
GEAR UP	%N1	48.9	54.0	59.7	64.7	69.0
(VREF 30 + 40)	KIAS	180	180	187	204	222
FLAPS 15	PITCH ATT	3.5	6.0	7.5	7.0	7.0
GEAR UP	%N1	49.0	55.2	61.9	66.8	71.2
(VREF 30 + 20)	KIAS	160	160	167	184	202
FLAPS 20	PITCH ATT	2.0	4.5	6.0	5.5	5.5
GEAR DOWN	%N1	56.3	61.4	67.3	73.1	78.1
(VREF 30 + 20)	KIAS	160	160	167	184	202

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	PITCH ATT	0.0	1.5	2.0	2.0	2.5
	%N1	36.9	40.7	45.1	59.3	52.6
	KIAS	150	157	174	189	201
FLAPS 25 (VREF 25 + 10)	PITCH ATT	0.5	1.5	2.0	2.0	2.5
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	150	150	165	180	191
FLAPS 30 (VREF 30 + 10)	PITCH ATT	0.0	0.5	1.5	1.5	
	%N1	56.9	55.6	60.2	65.4	
	KIAS	150	150	157	174	

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

***Packs on or packs off with 2 bleed sources.**
****Packs off with 1 bleed source.**

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
360	186	184	198
340	180	181	192
320	173	176	186
300	165	170	180
280	158	164	174
260	150	158	167
240	144	152	161
220	140	146	154
200	140	140	147
180	140	140	140
160	140	140	140

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 30
Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	190000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 190000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	890	+20/0	10	-35	125	10	-10	20	-20	65	20	45
MAX AUTO	1210	+25/0	10	-50	180	0	0	30	-30	125	0	0
AUTOBRAKE 4	1565	+30/0	15	-75	255	5	-5	40	-40	170	10	10
AUTOBRAKE 3	1845	+40/-20	25	-90	310	15	-35	50	-50	140	45	50
AUTOBRAKE 2	2025	+45/-25	35	-100	350	45	-50	50	-55	135	165	175
AUTOBRAKE 1	2180	+55/-30	45	-115	400	65	-60	55	-55	135	290	440

Good Reported Braking Action

MAX MANUAL	1220	+25/-10	20	-60	215	30	-25	30	-30	90	85	205
MAX AUTO	1330	+25/0	15	-60	215	15	-10	30	-30	125	80	210
AUTOBRAKE 4	1570	+30/0	15	-75	260	10	-5	40	-40	170	15	45
AUTOBRAKE 3	1845	+40/-20	25	-90	310	15	-35	50	-50	140	45	50
AUTOBRAKE 2	2025	+45/-25	35	-100	350	45	-50	50	-55	135	165	175
AUTOBRAKE 1	2180	+55/-30	45	-115	400	65	-60	55	-55	135	290	440

Medium Reported Braking Action

MAX MANUAL	1585	+40/-15	30	-90	340	65	-55	40	-40	110	215	590
MAX AUTO	1665	+40/-15	30	-90	335	65	-45	40	-40	125	210	585
AUTOBRAKE 4	1730	+40/-5	25	-95	350	40	-30	45	-45	170	155	550
AUTOBRAKE 3	1905	+45/-20	25	-100	375	45	-50	50	-50	140	115	410
AUTOBRAKE 2	2055	+50/-25	40	-105	390	70	-60	55	-55	135	210	410
AUTOBRAKE 1	2185	+55/-30	45	-115	410	80	-65	55	-55	135	315	550

Poor Reported Braking Action

MAX MANUAL	1955	+50/-25	45	-130	515	140	-95	55	-55	125	435	1410
MAX AUTO	2060	+50/-25	45	-130	510	140	-95	55	-55	125	435	1415
AUTOBRAKE 4	2060	+55/-20	45	-130	510	135	-80	55	-55	160	440	1415
AUTOBRAKE 3	2140	+55/-30	40	-135	520	120	-95	60	-60	140	360	1350
AUTOBRAKE 2	2225	+55/-30	50	-135	530	140	-100	60	-60	135	405	1310
AUTOBRAKE 1	2300	+60/-35	55	-140	540	150	-105	60	-60	135	460	1320

***Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	190000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 190000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	890	+20/0	15	-35	125	10	-10	20	-20	65	20	45
MAX AUTO	1210	+20/0	25	-50	180	0	0	30	-30	125	0	0
AUTOBRAKE 4	1565	+30/0	35	-75	255	5	-5	40	-40	170	5	5
AUTOBRAKE 3	1845	+35/-15	45	-90	310	15	-25	50	-50	160	35	40
AUTOBRAKE 2	2040	+45/-25	55	-100	350	40	-50	55	-55	140	155	165
AUTOBRAKE 1	2205	+50/-30	65	-115	405	70	-65	60	-60	140	310	430

Medium Reported Braking Action

MAX MANUAL	1600	+35/-15	45	-90	340	65	-55	40	-45	115	220	620
MAX AUTO	1680	+35/-15	45	-90	335	65	-45	40	-40	125	220	615
AUTOBRAKE 4	1735	+35/-5	45	-95	350	40	-30	45	-45	170	165	575
AUTOBRAKE 3	1915	+40/-20	50	-105	375	45	-45	50	-50	160	110	420
AUTOBRAKE 2	2070	+45/-25	60	-110	390	65	-65	55	-55	140	200	410
AUTOBRAKE 1	2205	+55/-30	70	-115	415	85	-65	60	-60	140	335	550

Good Reported Braking Action

MAX MANUAL	1225	+25/-10	30	-60	215	30	-25	30	-30	90	85	210
MAX AUTO	1330	+25/0	30	-60	215	15	-10	30	-30	125	80	215
AUTOBRAKE 4	1570	+30/0	35	-75	260	10	-5	40	-40	170	15	45
AUTOBRAKE 3	1845	+35/-15	45	-90	310	15	-25	50	-50	160	35	40
AUTOBRAKE 2	2040	+45/-25	55	-100	350	40	-50	55	-55	140	155	165
AUTOBRAKE 1	2205	+50/-30	65	-115	405	70	-65	60	-60	140	310	430

Poor Reported Braking Action

MAX MANUAL	1980	+50/-25	65	-130	515	145	-100	55	-55	130	455	1505
MAX AUTO	2090	+50/-25	65	-130	510	145	-95	55	-55	130	460	1515
AUTOBRAKE 4	2090	+50/-20	65	-130	515	145	-85	55	-55	155	460	1505
AUTOBRAKE 3	2155	+50/-25	65	-135	525	120	-85	60	-60	160	375	1440
AUTOBRAKE 2	2250	+55/-30	70	-140	535	135	-105	60	-60	140	405	1405
AUTOBRAKE 1	2325	+60/-35	75	-140	545	150	-105	65	-65	140	485	1390

***Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.**

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	190000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 190000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	925	+25/-5	20	-35	125	10	-10	20	-20	65	20	50
MAX AUTO	1255	+25/-10	30	-55	185	0	0	30	-30	130	0	0
AUTOBRAKE 4	1630	+35/-15	45	-75	260	0	-5	45	-45	175	5	5
AUTOBRAKE 3	1895	+45/-25	55	-95	320	10	-25	55	-55	180	30	30
AUTOBRAKE 2	2045	+50/-35	70	-105	365	40	-50	55	-60	160	145	155
AUTOBRAKE 1	2185	+60/-40	80	-120	420	70	-70	60	-60	150	350	450

Good Reported Braking Action

MAX MANUAL	1290	+25/-15	35	-60	220	30	-25	30	-30	95	95	235
MAX AUTO	1320	+25/-10	35	-65	220	20	-10	35	-35	130	90	240
AUTOBRAKE 4	1630	+35/-15	45	-75	265	5	-5	45	-45	175	10	45
AUTOBRAKE 3	1895	+45/-25	55	-95	320	10	-25	55	-55	180	30	30
AUTOBRAKE 2	2045	+50/-35	70	-105	365	40	-50	55	-60	160	145	155
AUTOBRAKE 1	2185	+60/-40	80	-120	420	70	-70	60	-60	150	350	450

Medium Reported Braking Action

MAX MANUAL	1710	+40/-25	55	-95	350	70	-55	45	-45	120	250	705
MAX AUTO	1710	+40/-25	55	-95	345	70	-55	45	-45	120	245	705
AUTOBRAKE 4	1770	+40/-15	55	-95	360	45	-30	50	-50	175	190	660
AUTOBRAKE 3	1970	+45/-25	60	-105	385	45	-40	55	-55	180	110	485
AUTOBRAKE 2	2085	+55/-35	70	-115	405	65	-65	60	-60	160	195	445
AUTOBRAKE 1	2190	+60/-40	80	-120	430	85	-75	60	-65	150	375	585

Poor Reported Braking Action

MAX MANUAL	2145	+60/-35	80	-135	530	155	-105	60	-60	140	515	1735
MAX AUTO	2145	+60/-35	75	-135	525	155	-105	60	-60	140	520	1750
AUTOBRAKE 4	2145	+60/-35	80	-135	525	155	-100	60	-60	150	515	1740
AUTOBRAKE 3	2200	+60/-35	75	-140	540	135	-85	65	-65	180	435	1665
AUTOBRAKE 2	2275	+60/-40	80	-145	550	140	-105	65	-65	160	430	1615
AUTOBRAKE 1	2335	+65/-45	90	-145	560	155	-115	70	-70	150	540	1585

***Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.**

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 65 meters.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1625	35/-15	45	-90/340	65/-55	40/-45	115	220	620
ANTISKID (FLAPS 30)	VREF30	1615	35/-15	30	-90/340	65/-55	40/-40	110	215	590
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	930	25/-5	20	-35/130	10/-10	20/-20	70	-	45
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	905	20/0	10	-35/125	10/-10	20/-20	70	-	40
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1125	40/-5	15	-40/140	10/-10	25/-25	65	35	80
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1035	30/-5	15	-40/135	10/-10	25/-25	70	30	70
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	925	25/-5	20	-35/125	10/-10	20/-20	70	20	50
FLAPS PRIMARY FAIL	VREF20	1055	25/-5	25	-40/140	15/-10	20/-25	90	30	65
FLAP/SLAT CONTROL	VREF20	925	25/-5	20	-35/125	10/-10	20/-20	70	20	50
FLIGHT CONTROL MODE	VREF20	1065	25/-5	25	-40/140	15/-10	25/-25	90	30	70
HYD PRESS SYS C	VREF20	1055	25/-5	25	-40/140	15/-10	20/-25	90	30	65
HYD PRESS SYS L+C	VREF30+20	1320	25/0	15	-50/165	20/-20	30/-30	125	-	65
HYD PRESS SYS L+R	VREF30+20	1425	25/5	15	-60/195	35/-30	35/-35	140	-	-
HYD PRESS SYS R+C	VREF30+20	1610	25/0	20	-65/225	40/-35	40/-40	155	-	150
HYD PRESS SYS L (FLAPS 25)	VREF25	965	20/0	20	-40/135	15/-10	20/-20	85	-	30
HYD PRESS SYS L (FLAPS 30)	VREF30	975	20/0	10	-40/135	15/-10	20/-20	85	-	35
HYD PRESS SYS R (FLAPS 25)	VREF25	1055	15/0	20	-45/155	20/-15	25/-25	95	-	50
HYD PRESS SYS R (FLAPS 30)	VREF30	1060	15/0	10	-45/155	20/-15	25/-25	95	-	50
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1165	35/-5	15	-40/145	15/-10	25/-25	70	40	90
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1040	25/-5	15	-40/135	10/-10	25/-25	70	30	70
PRI FLIGHT COMPUTERS	VREF20	1065	25/-5	25	-40/140	15/-10	25/-25	90	30	70
SLATS DRIVE	VREF30+30	1115	30/-5	15	-40/140	15/-10	25/-25	75	35	80
STABILIZER	VREF30+20	1040	25/-5	15	-40/135	10/-10	25/-25	70	30	70

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1625	35/-15	45	-90/340	65/-55	40/-45	115	220	620
ANTISKID (FLAPS 30)	VREF30	1615	35/-15	30	-90/340	65/-55	40/-40	110	215	590
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1345	25/-10	35	-65/230	35/-30	35/-35	105	-	180
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1280	25/-5	15	-65/225	35/-30	30/-30	100	-	160
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1610	30/-10	30	-70/240	35/-30	40/-40	95	145	375
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1455	25/-10	25	-65/230	35/-30	35/-35	100	120	310
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1290	25/-10	35	-60/220	30/-25	30/-30	95	95	235
FLAPS PRIMARY FAIL	VREF20	1440	25/-10	40	-65/235	35/-30	35/-35	120	115	295
FLAP/SLAT CONTROL	VREF20	1290	25/-10	35	-60/220	30/-25	30/-30	95	95	235
FLIGHT CONTROL MODE	VREF20	1465	25/-10	40	-70/240	35/-30	35/-35	125	120	315
HYD PRESS SYS C	VREF20	1440	25/-10	40	-65/235	35/-30	35/-35	120	115	295
HYD PRESS SYS L+C	VREF30+20	1905	35/-5	30	-85/295	65/-55	50/-50	170	-	280
HYD PRESS SYS L+R	VREF30+20	2060	35/0	30	-95/330	90/-75	60/-60	195	-	-
HYD PRESS SYS R+C	VREF30+20	1935	35/-5	30	-85/295	65/-55	50/-50	180	-	300
HYD PRESS SYS L (FLAPS 25)	VREF25	1405	25/-5	35	-70/245	40/-35	35/-35	120	-	155
HYD PRESS SYS L (FLAPS 30)	VREF30	1415	25/-5	20	-70/245	45/-35	35/-35	125	-	155
HYD PRESS SYS R (FLAPS 25)	VREF25	1405	25/-5	35	-70/245	40/-35	35/-35	120	-	155
HYD PRESS SYS R (FLAPS 30)	VREF30	1400	25/-5	20	-70/245	40/-35	35/-35	120	-	150
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1640	30/-10	30	-70/245	35/-30	40/-45	100	145	370
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1455	25/-10	25	-65/230	35/-30	35/-35	100	115	285
PRI FLIGHT COMPUTERS	VREF20	1465	25/-10	40	-70/240	35/-30	35/-35	125	120	315
SLATS DRIVE	VREF30+30	1560	25/-10	30	-70/240	35/-30	40/-40	100	130	325
STABILIZER	VREF30+20	1455	25/-10	25	-65/230	35/-30	35/-35	100	115	285

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2035	45/-25	65	-130/515	145/-100	55/-55	130	455	1505
ANTISKID (FLAPS 30)	VREF30	2010	50/-25	45	-130/515	140/-95	55/-55	125	435	1410
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1875	40/-25	60	-105/385	95/-75	50/-50	140	-	540
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1750	40/-15	30	-100/370	85/-65	50/-50	130	-	455
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2155	45/-25	55	-105/380	80/-65	60/-60	120	380	1140
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1930	40/-20	45	-100/370	75/-60	50/-50	125	315	915
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1710	35/-20	55	-95/350	70/-55	45/-45	120	250	705
FLAPS PRIMARY FAIL	VREF20	1875	40/-20	60	-100/370	80/-65	50/-50	145	295	860
FLAP/SLAT CONTROL	VREF20	1710	35/-20	55	-95/350	70/-55	45/-45	120	250	705
FLIGHT CONTROL MODE	VREF20	1910	40/-20	65	-105/375	85/-65	50/-50	150	310	925
HYD PRESS SYS C	VREF20	1875	40/-20	60	-100/370	80/-65	50/-50	145	295	860
HYD PRESS SYS L+C	VREF30+20	2615	55/-20	55	-135/485	155/-120	75/-75	205	-	815
HYD PRESS SYS L+R	VREF30+20	3275	55/-10	60	-175/620	305/-215	100/-100	260	-	-
HYD PRESS SYS R+C	VREF30+20	2650	55/-20	55	-135/490	160/-120	75/-75	210	-	850
HYD PRESS SYS L (FLAPS 25)	VREF25	1975	40/-15	55	-115/420	110/-85	55/-55	155	-	485
HYD PRESS SYS L (FLAPS 30)	VREF30	1975	40/-15	35	-115/420	110/-85	55/-55	155	-	475
HYD PRESS SYS R (FLAPS 25)	VREF25	1960	40/-15	55	-115/415	110/-85	55/-55	155	-	480
HYD PRESS SYS R (FLAPS 30)	VREF30	1925	40/-15	35	-110/410	105/-80	55/-55	145	-	445
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2155	45/-25	55	-105/385	80/-65	60/-60	120	355	1025
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1905	40/-20	40	-100/365	75/-60	50/-50	120	285	805
PRI FLIGHT COMPUTERS	VREF20	1910	40/-20	65	-105/375	85/-65	50/-50	150	310	925
SLATS DRIVE	VREF30+30	2045	40/-20	45	-105/375	80/-65	55/-55	120	315	895
STABILIZER	VREF30+20	1905	40/-20	40	-100/365	75/-60	50/-50	120	285	805

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	190000 KG LDG WT	PER 5000 KG ABV/BLW 190000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2665	70/-45	100	-210/935	665/-215	80/-80	140	1280	5000
ANTISKID (FLAPS 30)	VREF30	2615	70/-45	75	-210/925	645/-210	75/-75	135	1215	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2480	60/-40	90	-160/610	230/-150	75/-75	170	-	1400
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2280	55/-30	50	-150/585	205/-135	65/-65	150	-	1135
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2710	65/-35	80	-150/575	170/-120	80/-80	140	760	2825
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2415	60/-30	65	-145/555	165/-115	70/-70	140	630	2225
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2150	55/-30	80	-135/530	155/-105	60/-60	140	515	1735
FLAPS PRIMARY FAIL	VREF20	2320	55/-35	85	-145/555	170/-115	65/-65	160	590	2085
FLAP/SLAT CONTROL	VREF20	2150	55/-30	80	-135/530	155/-105	60/-60	140	515	1735
FLIGHT CONTROL MODE	VREF20	2370	60/-35	90	-145/560	175/-120	65/-65	165	625	2265
HYD PRESS SYS C	VREF20	2320	55/-35	85	-145/555	170/-115	65/-65	160	590	2085
HYD PRESS SYS L+C	VREF30+20	3435	75/-35	90	-210/790	390/-235	105/-105	225	-	1980
HYD PRESS SYS L+R	VREF30+20	5210	85/-20	115	-335/1260	1405/-580	165/-165	320	-	-
HYD PRESS SYS R+C	VREF30+20	3470	80/-40	95	-210/795	395/-240	105/-105	230	-	2045
HYD PRESS SYS L (FLAPS 25)	VREF25	2660	60/-30	90	-180/705	305/-180	80/-80	180	-	1275
HYD PRESS SYS L (FLAPS 30)	VREF30	2645	60/-30	65	-180/705	305/-180	80/-80	180	-	1225
HYD PRESS SYS R (FLAPS 25)	VREF25	2630	55/-30	85	-180/700	300/-180	75/-80	175	-	1230
HYD PRESS SYS R (FLAPS 30)	VREF30	2550	60/-30	60	-175/690	285/-170	75/-75	165	-	1105
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2665	60/-35	75	-150/570	170/-120	75/-80	135	685	2360
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2365	55/-30	65	-140/550	160/-110	65/-70	135	565	1875
PRI FLIGHT COMPUTERS	VREF20	2370	60/-35	90	-145/560	175/-120	65/-65	165	625	2265
SLATS DRIVE	VREF30+30	2525	60/-35	70	-145/560	165/-115	75/-75	135	610	2040
STABILIZER	VREF30+20	2365	55/-30	65	-140/550	160/-110	65/-70	135	565	1875

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9
	40	25.7	28.4	31.4	37.7	42.0	46.8	51.5	57.8	64.8	67.1	75.5	84.9	83.7	94.2	105.8	100.7	113.0	126.4
340	0	22.2	24.5	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4
	10	22.9	25.2	27.8	33.2	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6
	15	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4
	20	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3
	30	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4
	40	24.6	27.1	30.0	35.9	40.0	44.6	49.0	55.0	61.6	63.8	71.8	80.7	79.7	89.7	100.8	96.0	107.9	120.9
320	0	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0
	10	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1
	15	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9
	20	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7
	30	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7
	40	23.4	25.8	28.5	34.2	38.0	42.3	46.6	52.2	58.4	60.5	68.0	76.5	75.6	85.1	95.7	91.2	102.6	115.1
300	0	20.2	22.2	24.5	29.2	32.4	36.0	39.5	44.1	49.3	51.1	57.3	64.3	63.7	71.6	80.6	76.8	86.6	97.5
	10	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4
	15	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1
	20	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8
	30	22.1	24.3	26.8	32.0	35.5	39.4	43.4	48.5	54.2	56.1	63.0	70.7	70.0	78.8	88.5	84.4	95.0	106.7
	40	22.3	24.6	27.1	32.4	36.0	40.1	44.1	49.3	55.2	57.2	64.3	72.2	71.4	80.4	90.5	86.3	97.1	109.0
260	0	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8
	10	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5
	15	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0
	20	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6
	30	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2
	40	20.1	22.1	24.2	28.9	32.1	35.6	39.1	43.7	48.7	50.5	56.6	63.5	62.9	70.8	79.6	76.0	85.6	96.2
220	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8
	15	17.1	18.7	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8
	40	17.9	19.6	21.5	25.5	28.2	31.1	34.1	38.0	42.3	43.7	48.9	54.7	54.1	60.8	68.2	65.2	73.4	82.5
180	0	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6
	10	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5
	15	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6
	20	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8
	30	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6
	40	15.8	17.2	18.8	22.1	24.3	26.8	29.1	32.3	35.8	36.8	41.0	45.7	45.1	50.5	56.5	53.9	60.5	68.0

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND	REQUIRED	11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	303.3	283.2				
52	126	311.7	290.0				
50	122	320.1	297.1	273.2			
48	118	328.2	305.9	279.6			
46	115	336.9	314.7	286.5	261.4		
44	111	349.2	322.9	294.1	270.3		
42	108	356.2	331.4	302.9	277.2	251.7	
40	104	363.4	340.2	311.6	284.0	257.4	
38	100	370.8	352.8	319.7	290.5	263.8	233.8
36	97	377.4	360.1	326.9	296.6	270.2	238.4
34	93	378.7	367.2	334.9	303.0	275.0	243.0
32	90	378.7	374.6	342.5	309.1	278.9	247.2
30	86	378.7	378.7	351.0	315.8	283.1	250.9
28	82	378.7	378.7	355.6	321.0	287.7	254.6
26	79	378.7	378.7	361.2	324.9	292.3	258.2
24	75	378.7	378.7	361.3	328.1	296.9	262.7
22	72	378.7	378.7	361.4	331.5	300.4	268.3
20	68	378.7	378.7	361.4	331.5	302.5	272.8
18	64	378.7	378.7	361.5	331.6	304.7	275.3
16	61	378.7	378.7	361.6	331.7	304.7	277.0
14	57	378.7	378.7	361.7	331.8	304.8	278.6
12	54	378.7	378.7	361.7	331.8	304.9	278.6
10	50	378.7	378.7	361.8	331.9	304.9	278.7
8	46	378.7	378.7	361.9	332.0	304.9	278.7
6	43	378.7	378.7	359.6	332.1	304.9	272.8
4	40	378.7	378.7	350.0	316.7	286.7	255.0
2	36	378.7	378.7	350.0	316.8	286.8	255.0
0	32	378.7	378.7	350.0	316.8	286.8	255.0
-40	-40	378.7	378.7	350.0	316.8	286.8	255.0

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1250 kg.
With engine anti-ice on, decrease weight by 150 kg.
With engine and wing anti-ice on, decrease weight by 2250 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26600 kg.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	307.3	288.4				
52	126	314.5	295.3				
50	122	321.8	302.2	278.3			
48	118	329.5	309.5	284.8			
46	115	337.5	317.0	291.7	268.7		
44	111	347.9	324.5	299.3	275.5		
42	108	355.1	332.4	307.0	282.2	259.0	
40	104	362.3	340.5	314.3	289.1	265.0	
38	100	369.6	351.7	321.6	296.1	270.9	241.1
36	97	376.1	358.9	328.4	302.1	276.1	245.9
34	93	378.7	366.0	335.7	307.6	280.5	250.6
32	90	378.7	373.1	342.5	312.6	284.8	255.2
30	86	378.7	378.7	349.8	318.3	288.9	259.0
28	82	378.7	378.7	354.3	322.9	293.7	262.9
26	79	378.7	378.7	359.7	326.5	298.3	266.5
24	75	378.7	378.7	359.8	329.6	302.7	270.5
22	72	378.7	378.7	359.9	332.7	305.6	274.8
20	68	378.7	378.7	359.9	332.7	307.3	278.5
18	64	378.7	378.7	360.0	332.8	309.0	281.0
16	61	378.7	378.7	360.1	332.9	309.1	282.8
14	57	378.7	378.7	360.2	332.9	309.1	284.4
12	54	378.7	378.7	360.2	333.0	309.2	284.5
10	50	378.7	378.7	360.3	333.1	309.2	284.5
8	46	378.7	378.7	360.4	333.1	309.3	284.5
6	43	378.7	378.7	360.4	333.2	309.3	284.5
4	40	378.7	378.7	360.5	333.3	309.3	278.4
2	36	378.7	378.7	360.5	333.3	309.4	278.4
0	32	378.7	378.7	360.5	333.3	309.4	278.4
-40	-40	378.7	378.7	360.6	333.4	309.5	278.5

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1400 kg.
With engine anti-ice on, decrease weight by 100 kg.
With engine and wing anti-ice on, decrease weight by 1950 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24500 kg.

Intentionally
Blank

ENGINE INOP

Initial Max Continuous %N1
Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
134	125	118	111	105	100	95	90	86	82	79
268	251	236	222	210	200	190	181	173	166	159
402	376	354	333	316	300	285	272	260	249	239
535	501	471	445	421	400	380	363	347	332	319
668	626	588	555	526	500	476	454	434	416	399
800	750	706	666	631	600	571	545	521	499	479
932	874	823	777	736	700	666	636	608	583	560
1064	998	940	888	841	800	762	727	696	667	640
1196	1122	1057	998	946	900	857	818	783	751	721
1327	1246	1173	1109	1051	1000	952	910	870	835	801
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG) WEIGHT AT START OF DRIFTDOWN (1000 KG)											TIME (HR:MIN)
	160	180	200	220	240	260	280	300	320	340	360	
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24

Includes APU fuel burn.

Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	15600	14200	12700
350	16000	14700	13200
340	16900	15200	13700
330	17800	16300	14600
320	18800	17300	15600
310	19800	18300	16600
300	20500	19300	17700
290	21100	20200	18700
280	21800	20800	19800
270	22700	21500	20600
260	23600	22300	21200
250	24600	23400	21900
240	25800	24600	23100
230	27100	25900	24300
220	28500	27300	25600
210	29900	28600	27100
200	30900	30000	28500
190	31900	31200	30100
180	32900	32500	31400
170	34000	33700	32800
160	35200	35100	34300

With engine anti-ice on, no altitude capability adjustment is required.
With engine and wing anti-ice on, decrease altitude capability by 300 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
284	263	244	227	213	200	190	181	173	166	159
565	523	485	453	425	400	381	364	348	334	321
847	784	728	680	638	600	572	546	522	501	482
1129	1045	970	906	850	800	763	729	698	669	643
1413	1308	1214	1133	1063	1000	954	911	872	836	804
1697	1570	1457	1361	1276	1200	1145	1094	1047	1004	965
1982	1834	1701	1588	1489	1400	1336	1276	1221	1171	1125
2268	2097	1945	1815	1702	1600	1526	1458	1395	1338	1286
2554	2362	2190	2043	1915	1800	1717	1640	1569	1505	1446
2842	2626	2434	2270	2128	2000	1908	1822	1743	1671	1606

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.8	0:39	3.3	0:38	3.0	0:36	2.7	0:36	2.5	0:35
400	8.0	1:13	7.3	1:10	6.8	1:08	6.4	1:05	6.1	1:03
600	12.1	1:48	11.2	1:44	10.6	1:39	10.0	1:35	9.7	1:32
800	16.2	2:23	15.1	2:17	14.3	2:11	13.6	2:06	13.2	2:01
1000	20.2	2:59	18.9	2:50	18.0	2:43	17.1	2:36	16.7	2:30
1200	24.2	3:34	22.7	3:24	21.7	3:15	20.7	3:06	20.2	2:59
1400	28.2	4:10	26.5	3:58	25.3	3:47	24.1	3:37	23.6	3:29
1600	32.1	4:46	30.2	4:33	28.9	4:19	27.6	4:08	26.9	3:58
1800	36.0	5:22	33.8	5:07	32.4	4:52	31.0	4:39	30.2	4:28
2000	39.8	5:59	37.5	5:42	36.0	5:25	34.4	5:10	33.5	4:58

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
5	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.1	1.7	2.4
10	-2.1	-1.7	-1.3	-0.9	-0.4	0.0	0.7	1.5	2.5	3.7	5.0
15	-3.3	-2.6	-2.0	-1.3	-0.7	0.0	1.0	2.3	3.8	5.6	7.6
20	-4.4	-3.5	-2.7	-1.8	-0.9	0.0	1.4	3.1	5.1	7.4	9.9
25	-5.5	-4.4	-3.4	-2.2	-1.1	0.0	1.8	3.9	6.3	9.1	12.2
30	-6.7	-5.4	-4.0	-2.7	-1.3	0.0	2.1	4.6	7.5	10.7	14.3
35	-7.8	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.3	8.6	12.2	16.2
40	-8.9	-7.2	-5.4	-3.6	-1.8	0.0	2.8	6.0	9.7	13.7	18.1

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	80.5	83.9	88.6	93.4			
	KIAS	264	264	265	269			
	FF/ENG	9070	9130	9370	9670			
340	%N1	78.7	81.9	86.7	91.4	100.4		
	KIAS	260	260	260	260	299		
	FF/ENG	8520	8560	8730	8950	10320		
320	%N1	76.7	79.7	84.6	89.2	96.4		
	KIAS	253	253	253	253	289		
	FF/ENG	7930	7940	8050	8210	9240		
300	%N1	74.7	77.7	82.3	87.1	92.4		
	KIAS	244	244	244	244	259		
	FF/ENG	7380	7360	7430	7550	8120		
280	%N1	72.8	75.7	80.1	85.0	90.1		
	KIAS	238	238	238	238	238		
	FF/ENG	6880	6850	6880	6950	7350		
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1	
	KIAS	229	229	229	229	229	262	
	FF/ENG	6380	6340	6330	6380	6690	7470	
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5	
	KIAS	223	223	223	223	223	228	
	FF/ENG	5910	5870	5820	5850	6110	6420	
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7	96.7
	KIAS	217	217	217	217	217	217	242
	FF/ENG	5440	5400	5330	5350	5530	5760	6550
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0	91.2
	KIAS	217	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200	5550
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5	87.2
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730	4880
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0	84.7
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340	4450

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	760	640				
50	810	700	540			
48	860	760	590			
46	920	810	650	490		
44	970	870	710	550		
42	1020	930	760	590	420	
40	1070	980	810	640	450	
38	1110	1040	860	680	490	270
36	1110	1080	900	720	520	300
34	1120	1120	940	760	550	330
32	1120	1150	980	800	590	360
30	1130	1150	1010	830	630	390
20	1150	1170	1040	890	730	530
10	1180	1200	1030	880	510	320
0	1200	1220	980	740	500	250
-20	1250	1260	1020	770	520	260
-40	1300	1320	1060	800	540	270

Rate of climb capability shown is valid for 190000 kg, gear down at VREF20 + 5.
Decrease rate of climb 50 ft/min per 5000 kg greater than 190000 kg.
Increase rate of climb 60 ft/min per 5000 kg less than 190000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	80	-50				
50	130	0	-80			
48	180	60	-30			
46	230	110	20	-100		
44	270	170	80	-50		
42	330	220	120	-10	-160	
40	370	270	170	30	-130	
38	400	320	210	70	-100	-310
36	410	360	260	100	-70	-280
34	410	400	290	140	-50	-260
32	410	420	320	170	-10	-230
30	420	430	350	200	20	-200
20	430	440	370	260	110	-80
10	440	440	330	170	10	-150
0	450	450	300	100	-120	-360
-20	470	470	310	100	-120	-370
-40	490	490	320	100	-130	-390

Rate of climb capability shown is valid for 190000 kg, gear down at VREF30 + 5.
Decrease rate of climb 30 ft/min per 5000 kg greater than 190000 kg.
Increase rate of climb 40 ft/min per 5000 kg less than 190000 kg.

Intentionally
Blank

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

Anti-ice Adjustment

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

*** Packs on or off with 2 bleed sources.**
**** Packs off with 1 bleed source.**

GEAR DOWN

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7524	7653	7775	7993						
340	%N1	83.5	87.8	89.7	91.8						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7296	7405	7486	7646						
320	%N1	82.6	86.7	88.3	90.0	92.1					
	MACH	.488	.534	.550	.568	.588					
	KIAS	270	269	267	265	264					
	FF/ENG	7058	7105	7101	7142	7267					
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1				
	MACH	.481	.520	.537	.554	.572	.594				
	KIAS	266	262	260	258	257	256				
	FF/ENG	6725	6632	6624	6623	6679	6806				
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3			
	MACH	.468	.507	.523	.540	.557	.576	.598			
	KIAS	259	255	253	252	250	248	248			
	FF/ENG	6283	6189	6167	6168	6164	6230	6361			
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7	
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628	
	KIAS	251	248	246	244	243	241	239	239	239	
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239	
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0	
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605	
	KIAS	242	240	238	237	235	233	231	230	230	
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450	
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4	91.5
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582	.606
	KIAS	232	231	230	228	227	225	224	222	221	220
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859	4983
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3	88.5
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571	.596
	KIAS	223	221	220	219	218	217	217	216	217	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481	4565
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1	87.0
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283	4335
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1	85.9
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125	4159

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

Reference Fuel and Time Required at Check Point

AIR DIST(NM)	PRESSURE ALTITUDE (1000 FT) 10		14		20		24		28	
	FUEL (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	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1						
	KIAS	264						
	FF/ENG	7750						
340	%N1	74.6	77.7					
	KIAS	260	260					
	FF/ENG	7360	7350					
320	%N1	72.8	75.8					
	KIAS	253	253					
	FF/ENG	6890	6870					
300	%N1	70.6	73.7	78.1				
	KIAS	244	244	244				
	FF/ENG	6380	6370	6340				
280	%N1	68.8	72.0	76.3				
	KIAS	238	238	238				
	FF/ENG	5970	5960	5920				
260	%N1	66.7	69.7	74.1	78.6			
	KIAS	229	229	229	229			
	FF/ENG	5520	5510	5470	5490			
240	%N1	64.9	67.7	72.2	76.7			
	KIAS	223	223	223	223			
	FF/ENG	5150	5130	5100	5100			
220	%N1	63.1	65.8	70.1	74.6	79.4		
	KIAS	217	217	217	217	217		
	FF/ENG	4800	4770	4730	4730	4770		
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7	
	KIAS	217	217	217	217	217	217	
	FF/ENG	4610	4570	4520	4520	4550	4610	
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5	86.0
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420	4520
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5	84.9
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260	4350

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3	94.3
	KIAS	244	244	244	244	244
	FF/ENG	7660	7700	7690	7810	8200
340	%N1	74.3	77.4	82.1	86.8	91.8
	KIAS	240	240	240	240	240
	FF/ENG	7240	7260	7250	7350	7630
320	%N1	72.5	75.5	80.0	84.9	89.7
	KIAS	233	233	233	233	233
	FF/ENG	6770	6780	6770	6830	7040
300	%N1	70.3	73.4	77.8	82.9	87.6
	KIAS	224	224	224	224	224
	FF/ENG	6270	6270	6270	6320	6450
280	%N1	68.3	71.5	75.8	80.6	85.6
	KIAS	218	218	218	218	218
	FF/ENG	5840	5840	5820	5870	5980
260	%N1	66.0	69.1	73.5	78.1	83.3
	KIAS	209	209	209	209	209
	FF/ENG	5380	5370	5340	5400	5460
240	%N1	64.1	66.9	71.4	75.9	81.0
	KIAS	203	203	203	203	203
	FF/ENG	4980	4960	4930	4970	5020
220	%N1	62.0	64.7	69.0	73.6	78.4
	KIAS	197	197	197	197	197
	FF/ENG	4600	4570	4530	4550	4610
200	%N1	60.5	63.2	67.3	71.8	76.5
	KIAS	197	197	197	197	197
	FF/ENG	4350	4310	4260	4270	4310
180	%N1	59.1	61.8	65.8	70.3	74.9
	KIAS	197	197	197	197	197
	FF/ENG	4140	4100	4040	4050	4070
160	%N1	57.9	60.7	64.6	69.0	73.5
	KIAS	197	197	197	197	197
	FF/ENG	3970	3920	3860	3860	3860

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	307	254	5600	4400	2200
300	288	246	7700	6800	5300
280	269	238	9800	9100	8100
260	250	230	12100	11400	10300
240	230	223	14000	13500	12400
220	210	217	15900	15400	14400
200	191	216	17300	16700	15700
180	172	216	18500	18100	16900
160	153	216	19700	19400	18200

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
340	1800		
330	3300	1000	
320	4500	2700	
310	5700	4400	1900
300	6800	5700	3800
290	7800	7000	5300
280	8800	8100	6700
270	9800	9100	8100
260	11100	10400	9300
250	12100	11400	10300
240	13100	12500	11300
230	14000	13600	12400
220	15100	14600	13600
210	15900	15400	14400
200	16700	16100	15100
190	17400	16700	15800
180	18000	17500	16400
170	18700	18200	16900
160	19300	18900	17700

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		5	7	9	11	13	15	17	19
300	%N1	94.3	96.8						
	MACH	.403	.418						
	KIAS	244	244						
	FF/ENG	12328	12507						
280	%N1	92.3	94.1	96.8					
	MACH	.393	.407	.422					
	KIAS	238	238	238					
	FF/ENG	11514	11566	11807					
260	%N1	90.5	91.6	93.6	96.4				
	MACH	.385	.393	.408	.423				
	KIAS	233	229	229	229				
	FF/ENG	10870	10626	10714	10945				
240	%N1	88.9	89.8	91.3	93.4	96.5			
	MACH	.379	.385	.397	.412	.428			
	KIAS	229	225	223	223	223			
	FF/ENG	10228	9966	9915	10023	10245			
220	%N1	86.6	88.0	89.1	90.9	93.1	96.4		
	MACH	.368	.377	.387	.401	.417	.433		
	KIAS	223	220	217	217	217	217		
	FF/ENG	9452	9309	9167	9222	9323	9542		
200	%N1	84.2	86.0	87.8	89.5	91.4	94.0	98.1	
	MACH	.358	.371	.385	.400	.415	.431	.448	
	KIAS	217	217	217	217	217	217	217	
	FF/ENG	8693	8698	8718	8773	8844	8956	9300	
180	%N1	82.9	84.7	86.7	88.4	90.2	92.3	95.5	100.2
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8330	8328	8342	8399	8458	8533	8740	9239
160	%N1	81.7	83.6	85.4	87.3	89.0	90.9	93.5	97.7
	MACH	.358	.371	.385	.400	.415	.431	.448	.466
	KIAS	217	217	217	217	217	217	217	217
	FF/ENG	8019	8011	8010	8058	8115	8168	8310	8670

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
165	145	129	118	108	100	95	90	84	78	73
332	295	263	238	218	200	187	175	165	155	147
500	444	396	358	327	300	280	262	246	233	221
669	593	528	477	436	400	374	350	329	310	294
837	742	661	597	545	500	467	437	410	387	367
1007	893	795	718	655	600	560	524	492	464	440
1177	1043	928	838	764	700	653	611	574	541	513
1347	1193	1061	958	873	800	746	698	655	618	586
1519	1344	1195	1078	983	900	839	785	737	695	659
1691	1496	1329	1198	1092	1000	933	873	819	772	731

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	4.0	0:27	3.8	0:26	3.5	0:26	3.4	0:25	3.3	0:25
200	8.2	0:51	7.8	0:50	7.5	0:49	7.3	0:48	7.2	0:47
300	12.3	1:15	11.8	1:14	11.4	1:12	11.1	1:10	11.1	1:09
400	16.4	1:40	15.8	1:38	15.3	1:36	14.9	1:33	14.9	1:30
500	20.5	2:04	19.7	2:02	19.1	1:59	18.7	1:56	18.7	1:53
600	24.5	2:29	23.6	2:27	22.9	2:23	22.5	2:19	22.4	2:15
700	28.5	2:53	27.5	2:51	26.7	2:46	26.1	2:42	26.0	2:37
800	32.5	3:18	31.3	3:16	30.4	3:10	29.8	3:05	29.6	2:59
900	36.4	3:43	35.1	3:40	34.1	3:34	33.4	3:28	33.2	3:22
1000	40.3	4:08	38.8	4:05	37.8	3:58	37.0	3:51	36.7	3:44

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.8	-0.5	0.0	1.6	2.6
10	-1.8	-1.1	0.0	3.0	5.6
15	-2.8	-1.6	0.0	4.4	8.6
20	-3.7	-2.2	0.0	5.6	11.6
25	-4.5	-2.7	0.0	6.8	14.4
30	-5.4	-3.2	0.0	7.8	17.3
35	-6.2	-3.7	0.0	8.7	20.0
40	-7.0	-4.2	0.0	9.5	22.7
45	-7.7	-4.7	0.0	10.2	25.3

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
340	%N1	95.5			
	KIAS	260			
	FF/ENG	14970			
320	%N1	93.4	97.2		
	KIAS	253	253		
	FF/ENG	13980	14120		
300	%N1	91.1	94.3		
	KIAS	244	244		
	FF/ENG	12970	12940		
280	%N1	89.3	92.3	98.8	
	KIAS	238	238	238	
	FF/ENG	12100	12090	12660	
260	%N1	86.8	90.0	94.8	
	KIAS	229	229	229	
	FF/ENG	11100	11180	11340	
240	%N1	84.6	88.0	92.2	
	KIAS	223	223	223	
	FF/ENG	10310	10380	10460	
220	%N1	82.3	85.7	90.0	96.4
	KIAS	217	217	217	217
	FF/ENG	9540	9590	9650	10020
200	%N1	80.8	84.2	88.6	94.0
	KIAS	217	217	217	217
	FF/ENG	9080	9130	9180	9400
180	%N1	79.6	82.9	87.5	92.3
	KIAS	217	217	217	217
	FF/ENG	8700	8750	8780	8960
160	%N1	78.6	81.7	86.4	90.9
	KIAS	217	217	217	217
	FF/ENG	8380	8420	8430	8580

This table includes 5% additional fuel for holding in a racetrack pattern.

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .84/310/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

777F GE90-115BL KG FAA

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	**PITCH ATT**	**5.0**	**4.5**			
	V/S (FT/MIN)	2500	1500			
30000 (280 KIAS)	**PITCH ATT**	**6.5**	**5.5**	**5.5**	**5.0**	**4.5**
	V/S (FT/MIN)	3700	2600	1800	1300	900
20000 (270 KIAS)	**PITCH ATT**	**9.5**	**8.5**	**8.0**	**7.5**	**7.5**
	V/S (FT/MIN)	5000	3600	2700	2000	1400
10000 (270 KIAS)	**PITCH ATT**	**14.0**	11.5	**10.0**	**9.5**	**9.5**
	V/S (FT/MIN)	6700	4900	3700	2900	2200
SEA LEVEL (270 KIAS)	**PITCH ATT**	**17.5**	**14.5**	**12.5**	**11.5**	**11.0**
	V/S (FT/MIN)	7800	5700	4400	3500	2800

Cruise

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	**PITCH ATT**	**2.0**	**3.0**			
	%N1	78.6	83.2			
35000 (.82M)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.5**	
	%N1	76.5	78.9	82.8	88.0	
30000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**3.5**	**3.5**
	%N1	72.6	74.7	78.1	82.4	87.3
25000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.0**	**4.0**
	%N1	68.6	70.7	73.8	77.7	82.3
20000 (270 KIAS)	**PITCH ATT**	**2.0**	**2.5**	**3.5**	**4.5**	**5.5**
	%N1	63.4	65.8	69.0	72.8	77.4
15000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.5**	**5.5**
	%N1	59.6	61.8	65.0	68.2	72.5

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	**PITCH ATT**	**-1.5**	**0.0**			
	V/S (FT/MIN)	-2900	-2600			
30000 (280 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.0**	**0.5**
	V/S (FT/MIN)	-2500	-2000	-1900	-1900	-2400
20000 (270 KIAS)	**PITCH ATT**	**-1.0**	**0.5**	**1.5**	**2.5**	**3.0**
	V/S (FT/MIN)	-1900	-1600	-1500	-1400	-1400
10000 (270 KIAS)	**PITCH ATT**	**-1.5**	**0.0**	**1.0**	**2.0**	**3.0**
	V/S (FT/MIN)	-1700	-1400	-1300	-1300	-1300
SEA LEVEL (270 KIAS)	**PITCH ATT**	**-2.0**	**-0.5**	**1.0**	**2.0**	**3.0**
	V/S (FT/MIN)	-1500	-1300	-1200	-1200	-1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	**PITCH ATT**	**3.0**	**4.5**	**5.5**	**6.0**	**6.0**
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	**PITCH ATT**	**3.0**	**4.5**	**5.5**	**6.0**	**6.0**
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP	PITCH ATT	3.5	5.0	6.0	6.0	6.5
GEAR UP	%N1	47.7	52.4	57.2	62.0	66.4
(VREF 30 + 80)	KIAS	220	220	227	244	262
FLAPS 1	PITCH ATT	4.5	6.5	7.5	8.0	8.0
GEAR UP	%N1	48.5	53.4	58.8	63.9	68.2
(VREF 30 + 60)	KIAS	200	200	207	224	242
FLAPS 5	PITCH ATT	3.5	5.5	6.5	6.5	6.5
GEAR UP	%N1	48.9	54.0	59.7	64.7	69.0
(VREF 30 + 40)	KIAS	180	180	187	204	222
FLAPS 15	PITCH ATT	3.5	6.0	7.5	7.0	7.0
GEAR UP	%N1	49.0	55.2	61.9	66.8	71.2
(VREF 30 + 20)	KIAS	160	160	167	184	202
FLAPS 20	PITCH ATT	2.0	4.5	6.0	5.5	5.5
GEAR DOWN	%N1	56.3	61.4	67.3	73.1	78.1
(VREF 30 + 20)	KIAS	160	160	167	184	202

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	PITCH ATT	0.0	1.5	2.0	2.0	2.5
	%N1	36.9	40.7	45.1	59.3	52.6
	KIAS	150	157	174	189	201
FLAPS 25 (VREF 25 + 10)	PITCH ATT	0.5	1.5	2.0	2.0	2.5
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	150	150	165	180	191
FLAPS 30 (VREF 30 + 10)	PITCH ATT	0.0	0.5	1.5	1.5	
	%N1	56.9	55.6	60.2	65.4	
	KIAS	150	150	157	174	

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

***Packs on or packs off with 2 bleed sources.**
****Packs off with 1 bleed source.**

VREF
Flaps 30

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	186	186	186	186	187	187
340	180	180	180	180	180	180
320	173	173	173	173	173	173
300	164	164	164	164	164	165
280	158	158	158	158	158	158
260	149	149	149	150	150	150
240	143	144	144	144	144	144
220	140	137	138	138	138	138
200	140	136	131	131	131	131
180	140	136	131	126	124	124
160	140	136	131	126	121	117

Flaps 25

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	185	185	185	185	185	185
340	180	180	180	180	181	181
320	175	175	175	175	175	176
300	169	170	170	170	170	170
280	164	164	164	164	164	164
260	158	158	158	158	158	158
240	152	152	152	152	152	152
220	145	145	146	146	146	146
200	140	139	139	139	139	139
180	140	136	131	131	131	132
160	140	136	131	126	124	124

Flaps 20

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	195	195	195	196	196	198
340	190	190	190	191	191	192
320	185	185	185	185	185	186
300	179	179	179	179	180	180
280	173	173	173	173	174	174
260	167	167	167	167	167	167
240	160	160	161	161	161	161
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	140	139	139	139	139	139
160	140	136	131	131	131	131

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV
Dry Runway									
MAX MANUAL	990	+25/-5	20	-40/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 4	1740	+40/-5	45	-80/+270	0/0	+45/-50	95	0	0
AUTOBRAKE 3	2065	+45/-15	60	-100/+335	0/-5	+60/-60	115	0	0
AUTOBRAKE 2	2315	+50/-25	70	-115/+390	+20/-50	+65/-65	90	45	45
AUTOBRAKE 1	2530	+60/-30	85	-130/+455	+75/-80	+75/-75	90	245	285
Good Reported Braking Action									
MAX MANUAL	1410	+30/-10	40	-65/+230	+35/-30	+35/-35	55	85	200
AUTOBRAKE MAX	1460	+30/-10	40	-70/+235	+30/-25	+35/-35	60	90	215
AUTOBRAKE 4	1750	+40/-5	50	-80/+275	+10/-5	+50/-50	95	5	35
AUTOBRAKE 3	2065	+45/-15	60	-100/+335	0/-5	+60/-60	115	0	0
AUTOBRAKE 2	2315	+50/-25	70	-115/+390	+20/-50	+65/-65	90	45	45
AUTOBRAKE 1	2530	+60/-30	85	-130/+455	+75/-80	+75/-75	90	245	285
Medium Reported Braking Action									
MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX	1915	+40/-20	60	-105/+375	+90/-70	+50/-50	70	230	600
AUTOBRAKE 4	1965	+45/-10	60	-105/+380	+75/-45	+55/-55	95	220	600
AUTOBRAKE 3	2180	+50/-15	65	-115/+410	+45/-35	+65/-65	115	100	415
AUTOBRAKE 2	2375	+50/-25	75	-125/+435	+60/-70	+65/-70	90	100	305
AUTOBRAKE 1	2540	+60/-30	85	-135/+465	+100/-85	+75/-75	90	265	395
Poor Reported Braking Action									
MAX MANUAL	2455	+55/-30	85	-155/+580	+200/-135	+70/-70	80	480	1435
AUTOBRAKE MAX	2465	+55/-30	90	-155/+580	+200/-135	+70/-70	80	485	1440
AUTOBRAKE 4	2465	+55/-25	90	-155/+580	+200/-130	+70/-70	85	485	1440
AUTOBRAKE 3	2520	+60/-25	85	-155/+590	+175/-105	+75/-75	110	450	1410
AUTOBRAKE 2	2645	+60/-30	90	-160/+600	+170/-130	+75/-75	90	370	1310
AUTOBRAKE 1	2740	+65/-35	95	-165/+620	+195/-140	+80/-80	90	455	1245

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.
For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.
For autobrake and manual speedbrakes, increase reference landing distance by 50 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1045	+25/-10	25	-40/+135	+15/-10	+25/-25	35	25	50
AUTOBRAKE MAX	1445	+20/-10	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 4	1900	+30/-15	50	-85/+285	0/0	+55/-55	100	0	0
AUTOBRAKE 3	2265	+35/-25	65	-105/+350	0/-15	+65/-65	110	0	0
AUTOBRAKE 2	2510	+40/-35	80	-120/+405	+30/-60	+70/-70	90	80	80
AUTOBRAKE 1	2735	+50/-40	95	-140/+470	+85/-90	+80/-80	90	295	370
Good Reported Braking Action									
MAX MANUAL	1500	+20/-15	40	-70/+240	+40/-35	+40/-40	55	95	230
AUTOBRAKE MAX	1565	+25/-15	45	-70/+245	+35/-25	+40/-40	65	100	245
AUTOBRAKE 4	1910	+30/-15	55	-85/+290	+10/-5	+55/-55	100	5	40
AUTOBRAKE 3	2265	+35/-25	65	-105/+350	0/-15	+65/-65	110	0	0
AUTOBRAKE 2	2510	+40/-35	80	-120/+405	+30/-60	+70/-70	90	80	80
AUTOBRAKE 1	2735	+50/-40	95	-140/+470	+85/-90	+80/-80	90	295	370
Medium Reported Braking Action									
MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX	2045	+35/-25	65	-110/+390	+95/-70	+55/-55	75	255	675
AUTOBRAKE 4	2130	+35/-20	65	-110/+395	+70/-45	+60/-60	100	225	655
AUTOBRAKE 3	2380	+35/-25	70	-120/+425	+45/-45	+70/-70	110	100	435
AUTOBRAKE 2	2570	+45/-35	80	-130/+450	+70/-80	+75/-75	90	135	355
AUTOBRAKE 1	2745	+50/-40	95	-140/+485	+110/-95	+80/-80	90	315	485
Poor Reported Braking Action									
MAX MANUAL	2625	+50/-35	95	-160/+595	+205/-140	+75/-75	80	535	1615
AUTOBRAKE MAX	2635	+50/-35	95	-160/+595	+210/-145	+75/-75	80	535	1620
AUTOBRAKE 4	2635	+50/-35	95	-160/+595	+210/-135	+75/-75	90	540	1620
AUTOBRAKE 3	2730	+50/-35	95	-160/+605	+175/-115	+80/-80	110	470	1560
AUTOBRAKE 2	2850	+50/-40	100	-165/+620	+185/-140	+85/-85	90	425	1460
AUTOBRAKE 1	2950	+55/-45	105	-170/+635	+210/-150	+85/-85	90	515	1410

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.
For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.
For autobrake and manual speedbrakes, increase reference landing distance by 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 4	2080	+30/-25	60	-90/+295	0/0	+60/-60	105	0	0
AUTOBRAKE 3	2480	+40/-35	70	-110/+370	0/-15	+75/-75	120	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
AUTOBRAKE 1	3010	+55/-50	105	-145/+495	+90/-100	+90/-90	100	350	425
Good Reported Braking Action									
MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 4	2085	+30/-25	60	-90/+305	+10/0	+60/-60	105	10	45
AUTOBRAKE 3	2480	+40/-35	70	-110/+370	0/-15	+75/-75	120	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
AUTOBRAKE 1	3010	+55/-50	105	-145/+495	+90/-100	+90/-90	100	350	425
Medium Reported Braking Action									
MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 4	2315	+40/-30	75	-115/+415	+75/-50	+65/-65	105	260	770
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515
AUTOBRAKE 2	2820	+50/-45	90	-135/+475	+75/-85	+85/-85	100	155	415
AUTOBRAKE 1	3020	+55/-50	105	-150/+510	+115/-105	+90/-90	100	375	555
Poor Reported Braking Action									
MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 4	2875	+55/-45	105	-165/+620	+230/-145	+85/-85	90	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845
AUTOBRAKE 2	3115	+55/-50	110	-175/+645	+195/-150	+95/-95	100	490	1735
AUTOBRAKE 1	3235	+60/-55	120	-180/+665	+225/-165	+95/-95	95	600	1660

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.
For Max Manual braking and manual speedbrakes, increase reference landing distance by 75 m.
For autobrake and manual speedbrakes, increase reference landing distance by 60 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
ANTISKID - Flaps 25
VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Good Reported Braking Action

MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Medium Reported Braking Action

MAX MANUAL	2625	+50/-35	95	-160/+595	+205/-140	+75/-75	80	535	1615
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Poor Reported Braking Action

MAX MANUAL	3565	+75/-60	140	-265/+1110	+1265/-315	+110/-110	90	1435	5000
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
ANTISKID - Flaps 30
VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Good Reported Braking Action

MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Medium Reported Braking Action

MAX MANUAL	2455	+55/-30	85	-155/+580	+200/-135	+70/-70	80	480	1435
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Poor Reported Braking Action

MAX MANUAL	3345	+80/-45	130	-255/+1090	+1220/-305	+100/-100	90	1320	5000
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
ENG SHUTDOWN L, R - Flaps 20
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1130	+35/-10	25	-45/+145	+15/-15	+25/-25	40	0	30
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2840	+45/-40	85	-130/+435	+5/-20	+85/-85	140	0	0

Good Reported Braking Action

MAX MANUAL	1700	+25/-20	50	-75/+265	+50/-45	+45/-45	60	0	150
AUTOBRAKE MAX	1775	+25/-25	50	-80/+270	+45/-40	+50/-50	70	0	160
AUTOBRAKE 2	2840	+45/-40	85	-130/+435	+5/-20	+85/-85	140	0	0

Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-125/+445	+135/-105	+70/-70	85	0	460
AUTOBRAKE MAX	2450	+40/-35	80	-125/+445	+135/-95	+70/-70	95	0	455
AUTOBRAKE 3	2675	+45/-35	85	-135/+465	+90/-60	+80/-80	125	0	345

Poor Reported Braking Action

MAX MANUAL	3325	+60/-55	115	-195/+710	+330/-215	+100/-100	105	0	1125
AUTOBRAKE MAX	3330	+60/-55	120	-195/+710	+335/-215	+100/-100	105	0	1130
AUTOBRAKE 3	3365	+65/-55	120	-195/+715	+320/-205	+100/-105	110	0	1140

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
ENG SHUTDOWN L, R - Flaps 30
VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	995	+30/-5	20	-40/+135	+15/-10	+20/-20	40	0	25
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 2	2345	+55/-15	70	-115/+390	+10/-15	+70/-70	125	0	0
Good Reported Braking Action									
MAX MANUAL	1460	+30/-10	40	-70/+245	+40/-35	+40/-40	60	0	110
AUTOBRAKE MAX	1525	+30/-10	40	-70/+250	+40/-35	+40/-40	65	0	120
AUTOBRAKE 2	2345	+55/-15	70	-115/+390	+10/-15	+70/-70	125	0	0
Medium Reported Braking Action									
MAX MANUAL	2070	+45/-20	65	-115/+410	+110/-85	+60/-60	80	0	340
AUTOBRAKE MAX	2070	+45/-15	65	-115/+410	+115/-80	+60/-60	85	0	340
AUTOBRAKE 3	2235	+50/-15	70	-120/+425	+80/-55	+65/-65	110	0	270
Poor Reported Braking Action									
MAX MANUAL	2790	+65/-30	95	-175/+655	+280/-180	+85/-85	95	0	825
AUTOBRAKE MAX	2795	+65/-30	95	-175/+655	+285/-180	+85/-85	95	0	830
AUTOBRAKE 3	2830	+65/-30	95	-175/+660	+270/-180	+85/-85	95	0	840

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLAP / SLAT CONTROL - Flaps 20
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
Good Reported Braking Action									
MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
Medium Reported Braking Action									
MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515
Poor Reported Braking Action									
MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLAPS DRIVE - (Flaps ≤ 5)
VREF30+40

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1300	+55/-10	45	-45/+205	+20/-15	+40/-35	55	55	130
AUTOBRAKE MAX	1910	+35/-5	50	-70/+230	0/0	+50/-50	80	0	0
AUTOBRAKE 2	3345	+70/-40	115	-140/+470	+60/-75	+100/-100	115	225	225
Good Reported Braking Action									
MAX MANUAL	1850	+30/-15	55	-75/+265	+45/-40	+50/-50	55	155	375
AUTOBRAKE MAX	1995	+35/-5	55	-80/+275	+20/-15	+55/-55	80	95	330
AUTOBRAKE 2	3345	+70/-40	115	-140/+470	+60/-75	+100/-100	115	225	225
Medium Reported Braking Action									
MAX MANUAL	2570	+50/-25	90	-120/+425	+110/-90	+75/-75	75	415	1170
AUTOBRAKE MAX	2570	+50/-25	90	-120/+425	+110/-80	+75/-75	80	410	1160
AUTOBRAKE 3	3160	+60/-30	100	-140/+485	+60/-60	+95/-95	120	150	690
Poor Reported Braking Action									
MAX MANUAL	3335	+70/-40	130	-175/+655	+245/-170	+100/-100	90	870	2925
AUTOBRAKE MAX	3335	+70/-40	130	-175/+655	+245/-170	+100/-100	90	870	2925
AUTOBRAKE 3	3530	+75/-40	130	-185/+670	+215/-140	+105/-110	120	690	2750

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLAPS DRIVE - (5 < Flaps < 20)
VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1135	+40/-5	25	-40/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+60/-30	90	-130/+435	+35/-50	+85/-85	115	85	85

Good Reported Braking Action

MAX MANUAL	1660	+30/-10	50	-75/+250	+40/-35	+45/-45	60	125	305
AUTOBRAKE MAX	1715	+35/-5	50	-75/+255	+35/-25	+45/-45	70	125	315
AUTOBRAKE 2	2845	+60/-30	90	-130/+435	+35/-50	+85/-85	115	85	85

Medium Reported Braking Action

MAX MANUAL	2290	+50/-20	75	-115/+410	+105/-85	+65/-65	75	340	930
AUTOBRAKE MAX	2290	+50/-20	75	-115/+410	+105/-85	+65/-65	75	335	925
AUTOBRAKE 3	2665	+55/-20	80	-130/+450	+50/-45	+80/-80	125	120	625

Poor Reported Braking Action

MAX MANUAL	2965	+65/-35	110	-170/+630	+230/-160	+85/-85	90	710	2280
AUTOBRAKE MAX	2970	+65/-35	110	-170/+630	+235/-160	+90/-90	90	710	2285
AUTOBRAKE 3	3055	+70/-30	110	-170/+640	+210/-125	+90/-90	120	630	2205

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLAPS DRIVE - (Flaps ≥ 20)
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
Good Reported Braking Action									
MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
Medium Reported Braking Action									
MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515
Poor Reported Braking Action									
MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLAPS PRIMARY FAIL - Flaps 20
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1280	+30/-15	30	-45/+155	+15/-15	+30/-30	50	35	80
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Good Reported Braking Action

MAX MANUAL	1820	+25/-25	50	-80/+270	+50/-45	+45/-45	70	140	340
AUTOBRAKE MAX	1820	+25/-25	55	-80/+270	+50/-40	+50/-50	75	140	335
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-120/+430	+115/-90	+70/-70	85	360	985
AUTOBRAKE MAX	2445	+40/-35	80	-120/+425	+120/-95	+70/-70	85	360	975
AUTOBRAKE 3	2640	+40/-35	80	-130/+450	+70/-45	+80/-80	130	180	795

Poor Reported Braking Action

MAX MANUAL	3110	+60/-50	115	-175/+650	+250/-170	+90/-90	100	725	2315
AUTOBRAKE MAX	3110	+60/-50	115	-175/+650	+255/-175	+90/-90	100	725	2315
AUTOBRAKE 3	3135	+60/-50	115	-175/+650	+245/-150	+95/-95	115	700	2285

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLIGHT CONTROL MODE - Flaps 20
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1295	+30/-15	30	-50/+160	+20/-15	+30/-30	50	35	85
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10
Good Reported Braking Action									
MAX MANUAL	1850	+30/-25	55	-80/+275	+50/-45	+50/-50	75	150	365
AUTOBRAKE MAX	1850	+30/-25	55	-80/+270	+50/-45	+50/-50	75	145	355
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10
Medium Reported Braking Action									
MAX MANUAL	2495	+45/-35	85	-125/+435	+120/-95	+70/-70	90	385	1060
AUTOBRAKE MAX	2495	+45/-35	85	-120/+435	+125/-100	+70/-70	90	380	1050
AUTOBRAKE 3	2650	+40/-35	80	-130/+450	+80/-45	+80/-80	130	225	895
Poor Reported Braking Action									
MAX MANUAL	3180	+60/-50	120	-180/+655	+260/-175	+95/-95	105	775	2515
AUTOBRAKE MAX	3180	+60/-50	120	-180/+655	+265/-185	+95/-95	105	775	2515
AUTOBRAKE 3	3195	+60/-50	120	-180/+660	+260/-160	+95/-95	115	760	2500

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS C - Flaps 20
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1280	+30/-15	30	-45/+155	+15/-15	+30/-30	50	35	80
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Good Reported Braking Action

MAX MANUAL	1820	+25/-25	50	-80/+270	+50/-45	+45/-45	70	140	340
AUTOBRAKE MAX	1820	+25/-25	55	-80/+270	+50/-40	+50/-50	75	140	335
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-120/+430	+115/-90	+70/-70	85	360	985
AUTOBRAKE MAX	2445	+40/-35	80	-120/+425	+120/-95	+70/-70	85	360	975
AUTOBRAKE 3	2640	+40/-35	80	-130/+450	+70/-45	+80/-80	130	180	795

Poor Reported Braking Action

MAX MANUAL	3110	+60/-50	115	-175/+650	+250/-170	+90/-90	100	725	2315
AUTOBRAKE MAX	3110	+60/-50	115	-175/+650	+255/-175	+90/-90	100	725	2315
AUTOBRAKE 3	3135	+60/-50	115	-175/+650	+245/-150	+95/-95	115	700	2285

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS L - Flaps 25
VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1125	+25/-10	25	-45/+150	+15/-15	+25/-25	45	0	35
AUTOBRAKE MAX	1445	+20/-10	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2595	+40/-25	75	-125/+415	0/0	+75/-75	145	0	0
Good Reported Braking Action									
MAX MANUAL	1700	+25/-15	50	-80/+270	+55/-45	+45/-45	70	0	160
AUTOBRAKE MAX	1740	+25/-15	50	-80/+275	+50/-40	+45/-45	75	0	165
AUTOBRAKE 2	2595	+40/-25	75	-125/+415	0/0	+75/-75	145	0	0
Medium Reported Braking Action									
MAX MANUAL	2460	+40/-30	80	-130/+465	+150/-115	+70/-70	90	0	510
AUTOBRAKE MAX	2465	+40/-30	80	-130/+465	+155/-115	+70/-70	95	0	510
AUTOBRAKE 3	2530	+40/-25	80	-135/+470	+130/-70	+75/-75	125	0	500
Poor Reported Braking Action									
MAX MANUAL	3395	+60/-45	120	-210/+780	+400/-245	+105/-105	110	0	1310
AUTOBRAKE MAX	3405	+60/-45	125	-210/+780	+405/-245	+105/-105	110	0	1310
AUTOBRAKE 3	3405	+60/-45	125	-210/+780	+405/-235	+105/-105	120	0	1310

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS L - Flaps 30
VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1060	+30/-5	25	-40/+145	+15/-15	+25/-25	45	0	30
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 2	2360	+55/-10	70	-115/+395	0/0	+70/-70	140	0	0

Good Reported Braking Action

MAX MANUAL	1595	+30/-10	45	-75/+265	+50/-45	+40/-40	70	0	145
AUTOBRAKE MAX	1620	+35/-10	45	-75/+265	+45/-40	+45/-45	75	0	145
AUTOBRAKE 2	2360	+55/-10	70	-115/+395	0/0	+70/-70	140	0	0

Medium Reported Braking Action

MAX MANUAL	2305	+50/-20	75	-125/+455	+145/-110	+65/-65	90	0	460
AUTOBRAKE MAX	2305	+50/-20	75	-125/+455	+145/-110	+65/-65	95	0	460
AUTOBRAKE 3	2345	+55/-15	75	-130/+455	+135/-75	+70/-70	110	0	465

Poor Reported Braking Action

MAX MANUAL	3185	+70/-35	115	-200/+760	+385/-230	+95/-95	110	0	1190
AUTOBRAKE MAX	3195	+70/-35	115	-200/+760	+390/-235	+95/-95	110	0	1195
AUTOBRAKE 3	3195	+70/-35	115	-200/+760	+390/-230	+95/-95	110	0	1195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS L+C - Flaps 20
VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1420	+40/-5	35	-50/+175	+25/-20	+35/-35	65	0	55
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2930	+60/-10	85	-130/+440	0/0	+90/-90	155	0	0
Good Reported Braking Action									
MAX MANUAL	2125	+40/-10	60	-90/+310	+75/-65	+60/-60	90	0	255
AUTOBRAKE MAX	2125	+40/-10	60	-90/+305	+80/-60	+60/-60	95	0	245
AUTOBRAKE 2	2930	+60/-10	85	-130/+440	0/0	+90/-90	155	0	0
Medium Reported Braking Action									
MAX MANUAL	3040	+65/-25	100	-150/+525	+195/-150	+90/-90	120	0	770
AUTOBRAKE MAX	3040	+65/-25	100	-150/+520	+205/-155	+90/-90	120	0	760
AUTOBRAKE 3	3040	+65/-20	100	-150/+520	+205/-140	+90/-90	125	0	765
Poor Reported Braking Action									
MAX MANUAL	4140	+90/-45	155	-235/+860	+500/-305	+125/-125	140	0	1920
AUTOBRAKE MAX	4140	+90/-45	155	-235/+860	+515/-315	+130/-130	140	0	1915
AUTOBRAKE 3	4140	+90/-45	155	-235/+860	+515/-315	+130/-130	140	0	1915

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS L+R - Flaps 20
VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1530	+40/-5	40	-60/+205	+35/-30	+40/-40	70	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Good Reported Braking Action

MAX MANUAL	2545	+50/-10	75	-120/+400	+135/-110	+75/-75	115	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Medium Reported Braking Action

MAX MANUAL	4095	+75/-20	125	-215/+745	+470/-305	+130/-130	160	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Poor Reported Braking Action

MAX MANUAL	6545	+110/-35	210	-400/+1475	+2250/-810	+210/-210	200	0	0
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS R - Flaps 25
VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1245	+20/-10	30	-50/+170	+25/-20	+30/-30	50	0	50
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Good Reported Braking Action

MAX MANUAL	1870	+30/-20	55	-90/+310	+70/-60	+50/-50	75	0	220
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Medium Reported Braking Action

MAX MANUAL	2660	+45/-30	90	-145/+525	+185/-135	+80/-80	95	0	640
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Poor Reported Braking Action

MAX MANUAL	3595	+65/-50	130	-230/+875	+515/-280	+110/-110	110	0	1565
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS R - Flaps 30
VREF30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1165	+20/-5	30	-50/+165	+20/-20	+30/-30	50	0	45
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Good Reported Braking Action

MAX MANUAL	1730	+35/-10	50	-85/+300	+65/-55	+45/-45	75	0	190
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Medium Reported Braking Action

MAX MANUAL	2440	+55/-20	80	-140/+505	+170/-125	+70/-70	90	0	545
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Poor Reported Braking Action

MAX MANUAL	3295	+70/-35	120	-220/+845	+480/-260	+100/-100	105	0	1330
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
HYD PRESS SYS R+C - Flaps 20
VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1755	+30/-5	50	-70/+235	+45/-40	+45/-45	80	0	130
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Good Reported Braking Action

MAX MANUAL	2605	+55/-15	80	-120/+410	+130/-105	+75/-75	110	0	480
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 2	Autobrake inoperative								

Medium Reported Braking Action

MAX MANUAL	3625	+80/-35	130	-190/+680	+325/-225	+110/-110	135	0	1295
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Poor Reported Braking Action

MAX MANUAL	4795	+105/-55	185	-295/+1110	+915/-430	+150/-150	150	0	3035
AUTOBRAKE MAX	Autobrake inoperative								
AUTOBRAKE 3	Autobrake inoperative								

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
PITCH UP AUTHORITY - (Flaps ≤ 15)
VREF30+40

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1290	+50/-5	35	-45/+175	+15/-15	+30/-30	40	40	85
AUTOBRAKE MAX	1910	+35/-5	50	-70/+230	0/0	+50/-50	80	0	0
AUTOBRAKE 2	3265	+65/-40	110	-140/+460	+70/-85	+95/-95	100	280	290

Good Reported Braking Action

MAX MANUAL	1880	+35/-15	55	-80/+265	+45/-40	+50/-50	60	150	365
AUTOBRAKE MAX	2010	+35/-10	55	-80/+280	+25/-20	+55/-55	80	110	335
AUTOBRAKE 2	3265	+65/-40	110	-140/+460	+70/-85	+95/-95	100	280	290

Medium Reported Braking Action

MAX MANUAL	2570	+50/-25	85	-120/+430	+110/-90	+75/-75	75	385	1050
AUTOBRAKE MAX	2580	+50/-25	90	-120/+430	+105/-85	+75/-75	80	385	1050
AUTOBRAKE 3	3135	+60/-30	100	-140/+485	+75/-75	+95/-95	105	185	640

Poor Reported Braking Action

MAX MANUAL	3285	+70/-40	125	-175/+650	+240/-165	+100/-100	85	775	2450
AUTOBRAKE MAX	3290	+70/-40	125	-175/+650	+240/-170	+100/-100	85	775	2450
AUTOBRAKE 3	3505	+75/-40	125	-180/+670	+210/-155	+105/-105	105	620	2295

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
PITCH UP AUTHORITY - (Flaps ≥ 20)
VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1145	+40/-5	25	-45/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120
Good Reported Braking Action									
MAX MANUAL	1660	+30/-10	45	-75/+250	+45/-35	+45/-45	55	115	280
AUTOBRAKE MAX	1725	+35/-5	50	-75/+260	+40/-25	+45/-45	75	120	295
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120
Medium Reported Braking Action									
MAX MANUAL	2265	+45/-20	75	-115/+405	+100/-80	+65/-65	75	310	815
AUTOBRAKE MAX	2265	+50/-20	75	-115/+405	+105/-75	+65/-65	80	305	815
AUTOBRAKE 3	2660	+55/-25	80	-130/+450	+55/-55	+80/-80	115	120	520
Poor Reported Braking Action									
MAX MANUAL	2905	+65/-35	105	-165/+620	+225/-155	+85/-85	85	630	1925
AUTOBRAKE MAX	2910	+65/-35	105	-165/+625	+230/-155	+85/-85	85	630	1930
AUTOBRAKE 3	3035	+65/-35	105	-170/+635	+190/-130	+90/-90	110	540	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
PRIMARY FLIGHT COMPUTERS - Flaps 20
VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1295	+30/-15	30	-50/+160	+20/-15	+30/-30	50	35	85
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

Good Reported Braking Action

MAX MANUAL	1850	+30/-25	55	-80/+275	+50/-45	+50/-50	75	150	365
AUTOBRAKE MAX	1850	+30/-25	55	-80/+270	+50/-45	+50/-50	75	145	355
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

Medium Reported Braking Action

MAX MANUAL	2495	+45/-35	85	-125/+435	+120/-95	+70/-70	90	385	1060
AUTOBRAKE MAX	2495	+45/-35	85	-120/+435	+125/-100	+70/-70	90	380	1050
AUTOBRAKE 3	2650	+40/-35	80	-130/+450	+80/-45	+80/-80	130	225	895

Poor Reported Braking Action

MAX MANUAL	3180	+60/-50	120	-180/+655	+260/-175	+95/-95	105	775	2515
AUTOBRAKE MAX	3180	+60/-50	120	-180/+655	+265/-185	+95/-95	105	775	2515
AUTOBRAKE 3	3195	+60/-50	120	-180/+660	+260/-160	+95/-95	115	760	2500

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
SLATS DRIVE - Flaps 20
VREF30+30

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1230	+45/-5	30	-45/+150	+15/-15	+30/-30	40	35	75
AUTOBRAKE MAX	1750	+30/-5	45	-65/+220	0/0	+45/-45	80	0	0
AUTOBRAKE 2	3030	+60/-35	100	-135/+445	+60/-75	+90/-90	95	190	190
Good Reported Braking Action									
MAX MANUAL	1785	+30/-15	50	-75/+260	+45/-40	+50/-50	60	135	320
AUTOBRAKE MAX	1875	+35/-5	55	-80/+270	+35/-20	+50/-50	80	130	325
AUTOBRAKE 2	3030	+60/-35	100	-135/+445	+60/-75	+90/-90	95	190	190
Medium Reported Braking Action									
MAX MANUAL	2430	+50/-25	80	-120/+420	+110/-85	+70/-70	75	340	905
AUTOBRAKE MAX	2440	+50/-25	80	-120/+420	+110/-80	+70/-70	80	340	905
AUTOBRAKE 3	2905	+55/-30	90	-135/+470	+65/-70	+85/-85	105	150	565
Poor Reported Braking Action									
MAX MANUAL	3110	+65/-40	115	-170/+640	+235/-160	+90/-90	85	685	2100
AUTOBRAKE MAX	3115	+65/-40	115	-170/+640	+240/-165	+95/-95	85	690	2100
AUTOBRAKE 3	3280	+70/-40	115	-175/+655	+200/-150	+100/-100	105	565	1990

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
STABILIZER - Flaps 20
VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1145	+40/-5	25	-45/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120
Good Reported Braking Action									
MAX MANUAL	1660	+30/-10	45	-75/+250	+45/-35	+45/-45	55	115	280
AUTOBRAKE MAX	1725	+35/-5	50	-75/+260	+40/-25	+45/-45	75	120	295
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120
Medium Reported Braking Action									
MAX MANUAL	2265	+45/-20	75	-115/+405	+100/-80	+65/-65	75	310	815
AUTOBRAKE MAX	2265	+50/-20	75	-115/+405	+105/-75	+65/-65	80	305	815
AUTOBRAKE 3	2660	+55/-25	80	-130/+450	+55/-55	+80/-80	115	120	520
Poor Reported Braking Action									
MAX MANUAL	2905	+65/-35	105	-165/+620	+225/-155	+85/-85	85	630	1925
AUTOBRAKE MAX	2910	+65/-35	105	-165/+625	+230/-155	+85/-85	85	630	1930
AUTOBRAKE 3	3035	+65/-35	105	-170/+635	+190/-130	+90/-90	110	540	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.
Max Manual assumes maximum achievable manual braking.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT	OAT	PRESSURE ALTITUDE (1000 FT)																	
(1000 KG)	(°C)	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9
	40	25.7	28.4	31.4	37.7	42.0	46.8	51.5	57.8	64.8	67.1	75.5	84.9	83.7	94.2	105.8	100.7	113.0	126.4
340	0	22.2	24.5	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4
	10	22.9	25.2	27.8	33.2	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6
	15	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4
	20	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3
	30	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4
	40	24.6	27.1	30.0	35.9	40.0	44.6	49.0	55.0	61.6	63.8	71.8	80.7	79.7	89.7	100.8	96.0	107.9	120.9
320	0	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0
	10	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1
	15	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9
	20	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7
	30	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7
	40	23.4	25.8	28.5	34.2	38.0	42.3	46.6	52.2	58.4	60.5	68.0	76.5	75.6	85.1	95.7	91.2	102.6	115.1
300	0	20.2	22.2	24.5	29.2	32.4	36.0	39.5	44.1	49.3	51.1	57.3	64.3	63.7	71.6	80.6	76.8	86.6	97.5
	10	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4
	15	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1
	20	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8
	30	22.1	24.3	26.8	32.0	35.5	39.4	43.4	48.5	54.2	56.1	63.0	70.7	70.0	78.8	88.5	84.4	95.0	106.7
	40	22.3	24.6	27.1	32.4	36.0	40.1	44.1	49.3	55.2	57.2	64.3	72.2	71.4	80.4	90.5	86.3	97.1	109.0
260	0	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8
	10	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5
	15	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0
	20	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6
	30	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2
	40	20.1	22.1	24.2	28.9	32.1	35.6	39.1	43.7	48.7	50.5	56.6	63.5	62.9	70.8	79.6	76.0	85.6	96.2
220	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8
	15	17.1	18.7	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8
	40	17.9	19.6	21.5	25.5	28.2	31.1	34.1	38.0	42.3	43.7	48.9	54.7	54.1	60.8	68.2	65.2	73.4	82.5
180	0	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6
	10	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5
	15	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6
	20	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8
	30	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6
	40	15.8	17.2	18.8	22.1	24.3	26.8	29.1	32.3	35.8	36.8	41.0	45.7	45.1	50.5	56.5	53.9	60.5	68.0

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	303.3	283.2				
52	126	311.7	290.0				
50	122	320.1	297.1	273.2			
48	118	328.2	305.9	279.6			
46	115	336.9	314.7	286.5	261.4		
44	111	346.3	322.9	294.1	270.3		
42	108	353.8	331.4	302.9	277.2	251.7	
40	104	361.0	340.2	311.6	284.0	257.4	
38	100	368.3	350.4	319.7	290.5	263.8	233.8
36	97	374.9	357.7	326.9	296.6	270.2	238.4
34	93	378.7	364.7	334.9	303.0	275.0	243.0
32	90	378.7	372.1	341.6	309.1	278.9	247.2
30	86	378.7	378.4	348.6	315.8	283.1	250.9
28	82	378.7	378.5	353.2	321.0	287.7	254.6
26	79	378.7	378.6	358.9	324.9	292.3	258.2
24	75	378.7	378.7	358.9	328.1	296.8	262.7
22	72	378.7	378.7	359.0	331.4	300.4	268.3
20	68	378.7	378.7	359.1	331.5	302.6	272.8
18	64	378.7	378.7	359.1	331.6	304.7	275.3
16	61	378.7	378.7	359.2	331.7	304.7	277.0
14	57	378.7	378.7	359.3	331.8	304.8	278.5
12	54	378.7	378.7	359.4	331.8	304.9	278.6
10	50	378.7	378.7	359.4	331.9	304.9	278.7
8	46	378.7	378.7	359.5	332.0	304.9	278.7
6	43	378.7	378.7	358.9	332.1	304.9	272.8
4	40	378.7	378.7	348.8	316.7	286.7	255.0
2	36	378.7	378.7	348.9	316.8	286.8	255.0
0	32	378.7	378.7	348.9	316.8	286.8	255.0
-40	-40	378.7	378.7	348.9	316.8	286.8	255.0

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1200 kg.
With engine anti-ice on, decrease weight by 150 kg.
With engine and wing anti-ice on, decrease weight by 2150 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24250 kg.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	307.3	288.4				
52	126	314.5	295.3				
50	122	321.8	302.2	278.3			
48	118	329.5	309.5	284.8			
46	115	337.5	317.0	291.7	268.7		
44	111	345.5	324.5	299.3	275.5		
42	108	352.9	332.4	307.0	282.2	259.0	
40	104	360.0	340.6	314.3	289.1	265.0	
38	100	367.2	349.5	321.6	296.1	270.9	241.1
36	97	373.8	356.6	328.4	302.1	276.1	245.9
34	93	378.7	363.6	335.7	307.6	280.5	250.6
32	90	378.7	370.8	341.8	312.6	284.8	255.2
30	86	378.7	377.0	347.5	318.3	288.9	259.0
28	82	378.7	377.1	352.1	322.9	293.7	262.9
26	79	378.7	377.2	357.6	326.5	298.3	266.5
24	75	378.7	377.3	357.6	329.6	302.6	270.5
22	72	378.7	377.4	357.7	332.6	305.6	274.8
20	68	378.7	377.5	357.8	332.7	307.3	278.4
18	64	378.7	377.5	357.8	332.8	309.0	281.0
16	61	378.7	377.6	357.9	332.9	309.1	282.9
14	57	378.7	377.7	358.0	332.9	309.1	284.4
12	54	378.7	377.7	358.1	333.0	309.2	284.5
10	50	378.7	377.8	358.1	333.1	309.2	284.5
8	46	378.7	377.8	358.2	333.1	309.3	284.6
6	43	378.7	377.9	358.2	333.2	309.3	284.5
4	40	378.7	377.9	358.3	333.3	309.3	278.4
2	36	378.7	377.9	358.3	333.3	309.4	278.4
0	32	378.7	377.9	358.4	333.3	309.4	278.4
-40	-40	378.7	378.0	358.5	333.4	309.6	278.5

Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1350 kg.
With engine anti-ice on, decrease weight by 100 kg.
With engine and wing anti-ice on, decrease weight by 1950 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 22350 kg.

ENGINE INOP

Initial Max Continuous %N1
Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
134	125	118	111	105	100	95	90	86	82	79
268	251	236	222	210	200	190	181	173	166	159
402	376	354	333	316	300	285	272	260	249	239
535	501	471	445	421	400	380	363	347	332	319
668	626	588	555	526	500	476	454	434	416	399
800	750	706	666	631	600	571	545	521	499	479
932	874	823	777	736	700	666	636	608	583	560
1064	998	940	888	841	800	762	727	696	667	640
1196	1122	1057	998	946	900	857	818	783	751	721
1327	1246	1173	1109	1051	1000	952	910	870	835	801
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG) WEIGHT AT START OF DRIFTDOWN (1000 KG)											TIME (HR:MIN)
	160	180	200	220	240	260	280	300	320	340	360	
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	15600	14200	12700
350	16000	14700	13200
340	16900	15200	13700
330	17800	16300	14600
320	18800	17300	15600
310	19800	18300	16600
300	20500	19300	17700
290	21100	20200	18700
280	21800	20800	19800
270	22700	21500	20600
260	23600	22300	21200
250	24600	23400	21900
240	25800	24600	23100
230	27100	25900	24300
220	28500	27300	25600
210	29900	28600	27100
200	30900	30000	28500
190	31900	31200	30100
180	32900	32500	31400
170	34000	33700	32800
160	35200	35100	34300

With engine anti-ice on, no altitude capability adjustment is required.
With engine and wing anti-ice on, decrease altitude capability by 300 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
284	263	244	227	213	200	190	181	173	166	159
565	523	485	453	425	400	381	364	348	334	321
847	784	728	680	638	600	572	546	522	501	482
1129	1045	970	906	850	800	763	729	698	669	643
1413	1308	1214	1133	1063	1000	954	911	872	836	804
1697	1570	1457	1361	1276	1200	1145	1094	1047	1004	965
1982	1834	1701	1588	1489	1400	1336	1276	1221	1171	1125
2268	2097	1945	1815	1702	1600	1526	1458	1395	1338	1286
2554	2362	2190	2043	1915	1800	1717	1640	1569	1505	1446
2842	2626	2434	2270	2128	2000	1908	1822	1743	1671	1606

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	3.8	0:39	3.3	0:38	3.0	0:36	2.7	0:36	2.5	0:35
400	8.0	1:13	7.3	1:10	6.8	1:08	6.4	1:05	6.1	1:03
600	12.1	1:48	11.2	1:44	10.6	1:39	10.0	1:35	9.7	1:32
800	16.2	2:23	15.1	2:17	14.3	2:11	13.6	2:06	13.2	2:01
1000	20.2	2:59	18.9	2:50	18.0	2:43	17.1	2:36	16.7	2:30
1200	24.2	3:34	22.7	3:24	21.7	3:15	20.7	3:06	20.2	2:59
1400	28.2	4:10	26.5	3:58	25.3	3:47	24.1	3:37	23.6	3:29
1600	32.1	4:46	30.2	4:33	28.9	4:19	27.6	4:08	26.9	3:58
1800	36.0	5:22	33.8	5:07	32.4	4:52	31.0	4:39	30.2	4:28
2000	39.8	5:59	37.5	5:42	36.0	5:25	34.4	5:10	33.5	4:58

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
5	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.1	1.7	2.4
10	-2.1	-1.7	-1.3	-0.9	-0.4	0.0	0.7	1.5	2.5	3.7	5.0
15	-3.3	-2.6	-2.0	-1.3	-0.7	0.0	1.0	2.3	3.8	5.6	7.6
20	-4.4	-3.5	-2.7	-1.8	-0.9	0.0	1.4	3.1	5.1	7.4	9.9
25	-5.5	-4.4	-3.4	-2.2	-1.1	0.0	1.8	3.9	6.3	9.1	12.2
30	-6.7	-5.4	-4.0	-2.7	-1.3	0.0	2.1	4.6	7.5	10.7	14.3
35	-7.8	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.3	8.6	12.2	16.2
40	-8.9	-7.2	-5.4	-3.6	-1.8	0.0	2.8	6.0	9.7	13.7	18.1

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	80.5	83.9	88.6	93.4			
	KIAS	264	264	265	269			
	FF/ENG	9070	9130	9370	9670			
340	%N1	78.7	81.9	86.7	91.4	100.4		
	KIAS	260	260	260	260	299		
	FF/ENG	8520	8560	8730	8950	10320		
320	%N1	76.7	79.7	84.6	89.2	96.4		
	KIAS	253	253	253	253	289		
	FF/ENG	7930	7940	8050	8210	9240		
300	%N1	74.7	77.7	82.3	87.1	92.4		
	KIAS	244	244	244	244	259		
	FF/ENG	7380	7360	7430	7550	8120		
280	%N1	72.8	75.7	80.1	85.0	90.1		
	KIAS	238	238	238	238	238		
	FF/ENG	6880	6850	6880	6950	7350		
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1	
	KIAS	229	229	229	229	229	262	
	FF/ENG	6380	6340	6330	6380	6690	7470	
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5	
	KIAS	223	223	223	223	223	228	
	FF/ENG	5910	5870	5820	5850	6110	6420	
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7	96.7
	KIAS	217	217	217	217	217	217	242
	FF/ENG	5440	5400	5330	5350	5530	5760	6550
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0	91.2
	KIAS	217	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200	5550
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5	87.2
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730	4880
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0	84.7
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340	4450

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available
Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN) PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	200	100				
50	250	140	0			
48	290	190	40			
46	330	230	90	-60		
44	370	280	130	-10		
42	410	330	180	30	-130	
40	450	370	220	60	-100	
38	470	410	260	90	-70	-260
36	470	450	290	130	-50	-230
34	480	490	320	160	-20	-210
32	480	490	350	190	10	-180
30	480	490	370	210	40	-160
20	500	500	380	240	100	-70
10	510	510	340	190	60	-310
0	520	520	320	110	-110	-320
-20	540	540	330	110	-110	-330
-40	570	570	350	120	-110	-350

Rate of climb capability shown is valid for 260000 kg, gear down at VREF20 + 5.
Decrease rate of climb 30 ft/min per 5000 kg greater than 260000 kg.
Increase rate of climb 40 ft/min per 5000 kg less than 260000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN) PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-370	-480				
50	-330	-440	-580			
48	-300	-400	-540			
46	-260	-360	-500	-640		
44	-220	-310	-460	-600		
42	-180	-280	-420	-570	-720	
40	-150	-240	-390	-540	-700	
38	-130	-200	-360	-510	-680	-860
36	-130	-170	-320	-490	-660	-840
34	-130	-140	-300	-460	-630	-820
32	-130	-130	-270	-430	-610	-800
30	-130	-130	-250	-410	-580	-780
20	-120	-130	-250	-390	-530	-700
10	-120	-130	-260	-510	-690	-840
0	-120	-130	-330	-530	-740	-960
-20	-120	-130	-340	-550	-770	-990
-40	-130	-140	-360	-580	-800	-1030

Rate of climb capability shown is valid for 260000 kg, gear down at VREF30 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 260000 kg.
Increase rate of climb 40 ft/min per 5000 kg less than 260000 kg.

Intentionally
Blank

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

Anti-ice Adjustment

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

*** Packs on or off with 2 bleed sources.**
**** Packs off with 1 bleed source.**

GEAR DOWN

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7524	7653	7775	7993						
340	%N1	83.5	87.8	89.7	91.8						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7296	7405	7486	7646						
320	%N1	82.6	86.7	88.3	90.0	92.1					
	MACH	.488	.534	.550	.568	.588					
	KIAS	270	269	267	265	264					
	FF/ENG	7058	7105	7101	7142	7267					
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1				
	MACH	.481	.520	.537	.554	.572	.594				
	KIAS	266	262	260	258	257	256				
	FF/ENG	6725	6632	6624	6623	6679	6806				
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3			
	MACH	.468	.507	.523	.540	.557	.576	.598			
	KIAS	259	255	253	252	250	248	248			
	FF/ENG	6283	6189	6167	6168	6164	6230	6361			
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7	
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628	
	KIAS	251	248	246	244	243	241	239	239	239	
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239	
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0	
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605	
	KIAS	242	240	238	237	235	233	231	230	230	
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450	
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4	91.5
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582	.606
	KIAS	232	231	230	228	227	225	224	222	221	220
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859	4983
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3	88.5
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571	.596
	KIAS	223	221	220	219	218	217	217	216	217	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481	4565
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1	87.0
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283	4335
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1	85.9
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571	.596
	KIAS	217	217	217	217	217	217	217	216	217	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125	4159

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

Reference Fuel and Time Required at Check Point

AIR DIST(NM)	PRESSURE ALTITUDE (1000 FT) 10		14		20		24		28	
	FUEL (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	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1						
	KIAS	264						
	FF/ENG	7750						
340	%N1	74.6	77.7					
	KIAS	260	260					
	FF/ENG	7360	7350					
320	%N1	72.8	75.8					
	KIAS	253	253					
	FF/ENG	6890	6870					
300	%N1	70.6	73.7	78.1				
	KIAS	244	244	244				
	FF/ENG	6380	6370	6340				
280	%N1	68.8	72.0	76.3				
	KIAS	238	238	238				
	FF/ENG	5970	5960	5920				
260	%N1	66.7	69.7	74.1	78.6			
	KIAS	229	229	229	229			
	FF/ENG	5520	5510	5470	5490			
240	%N1	64.9	67.7	72.2	76.7			
	KIAS	223	223	223	223			
	FF/ENG	5150	5130	5100	5100			
220	%N1	63.1	65.8	70.1	74.6	79.4		
	KIAS	217	217	217	217	217		
	FF/ENG	4800	4770	4730	4730	4770		
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7	
	KIAS	217	217	217	217	217	217	
	FF/ENG	4610	4570	4520	4520	4550	4610	
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5	86.0
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420	4520
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5	84.9
	KIAS	217	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260	4350

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3	94.3
	KIAS	244	244	244	244	244
	FF/ENG	7660	7700	7690	7810	8200
340	%N1	74.3	77.4	82.1	86.8	91.8
	KIAS	240	240	240	240	240
	FF/ENG	7240	7260	7250	7350	7630
320	%N1	72.5	75.5	80.0	84.9	89.7
	KIAS	233	233	233	233	233
	FF/ENG	6770	6780	6770	6830	7040
300	%N1	70.3	73.4	77.8	82.9	87.6
	KIAS	224	224	224	224	224
	FF/ENG	6270	6270	6270	6320	6450
280	%N1	68.3	71.5	75.8	80.6	85.6
	KIAS	218	218	218	218	218
	FF/ENG	5840	5840	5820	5870	5980
260	%N1	66.0	69.1	73.5	78.1	83.3
	KIAS	209	209	209	209	209
	FF/ENG	5380	5370	5340	5400	5460
240	%N1	64.1	66.9	71.4	75.9	81.0
	KIAS	203	203	203	203	203
	FF/ENG	4980	4960	4930	4970	5020
220	%N1	62.0	64.7	69.0	73.6	78.4
	KIAS	197	197	197	197	197
	FF/ENG	4600	4570	4530	4550	4610
200	%N1	60.5	63.2	67.3	71.8	76.5
	KIAS	197	197	197	197	197
	FF/ENG	4350	4310	4260	4270	4310
180	%N1	59.1	61.8	65.8	70.3	74.9
	KIAS	197	197	197	197	197
	FF/ENG	4140	4100	4040	4050	4070
160	%N1	57.9	60.7	64.6	69.0	73.5
	KIAS	197	197	197	197	197
	FF/ENG	3970	3920	3860	3860	3860

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .84/310/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

777-300ER GE90-115BL KG FAA

Performance Inflight - QRH 777-300ER Chapter PI-QRH

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		160	210	260	310	360
40000 (.82M)	**PITCH ATT**	**4.5**	**4.0**			
	V/S (FT/MIN)	2200	800			
30000 (280 KIAS)	**PITCH ATT**	**6.0**	**5.0**	**5.0**	**4.5**	**4.0**
	V/S (FT/MIN)	3300	2300	1600	1200	800
20000 (270 KIAS)	**PITCH ATT**	**9.0**	**8.0**	**7.5**	**7.5**	**7.0**
	V/S (FT/MIN)	4700	3400	2500	1900	1300
10000 (270 KIAS)	**PITCH ATT**	**13.0**	**10.5**	**10.0**	**9.5**	**9.0**
	V/S (FT/MIN)	6200	4500	3500	2700	2100
SEA LEVEL (270 KIAS)	**PITCH ATT**	**16.5**	**13.5**	**12.0**	**11.5**	**11.0**
	V/S (FT/MIN)	7200	5300	4100	3300	2700

Cruise

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		160	210	260	310	360
40000 (.82M)	**PITCH ATT**	**2.0**	**3.0**			
	%N1	80.2	84.8			
35000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.5**	
	%N1	77.7	80.4	84.1	90.4	
30000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.0**	**3.0**	**3.0**	**3.0**
	%N1	73.5	76.0	79.8	84.2	88.5
25000 (280 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**3.5**	**3.5**
	%N1	69.6	72.1	75.2	79.3	83.4
20000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.0**	**4.0**
	%N1	64.7	67.3	70.5	74.6	78.7
15000 (270 KIAS)	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.5**	**4.5**
	%N1	60.9	63.3	66.4	69.7	74.1

Descent

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		160	210	260	310	360
40000 (.82M)	**PITCH ATT**	**-1.5**	**-0.5**			
	V/S (FT/MIN)	-2900	-2600			
30000 (280 KIAS)	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**0.5**	**0.5**
	V/S (FT/MIN)	-2400	-2000	-1900	-2100	-2500
20000 (270 KIAS)	**PITCH ATT**	**-1.5**	**0.0**	**1.0**	**2.0**	**1.5**
	V/S (FT/MIN)	-1900	-1700	-1600	-1500	-1600
10000 (270 KIAS)	**PITCH ATT**	**-1.5**	**0.0**	**1.0**	**2.0**	**2.5**
	V/S (FT/MIN)	-1700	-1500	-1400	-1400	-1400
SEA LEVEL (270 KIAS)	**PITCH ATT**	**-2.0**	**-0.5**	**1.0**	**2.0**	**2.5**
	V/S (FT/MIN)	-1600	-1300	-1200	-1200	-1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		160	210	260	310	360
10000	**PITCH ATT**	**4.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	50.4	55.8	60.8	65.5	69.5
	KIAS	199	217	233	255	275
5000	**PITCH ATT**	**4.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	46.7	52.3	56.9	61.3	65.4
	KIAS	199	217	232	253	273

Terminal Area (5000 FT)

Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		160	210	260	310	360
FLAPS UP	**PITCH ATT**	**4.5**	**5.5**	**6.0**	**6.0**	**6.5**
GEAR UP	%N1	47.6	53.5	58.5	62.9	67.4
VREF30+80	KIAS	200	218	233	250	265
FLAPS 1	**PITCH ATT**	**6.5**	**7.0**	**7.5**	**7.5**	**8.0**
GEAR UP	%N1	48.6	54.6	59.7	64.7	68.8
VREF30+60	KIAS	180	198	213	230	245
FLAPS 5	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**6.5**
GEAR UP	%N1	48.9	55.1	60.8	65.8	70.0
VREF30+40	KIAS	160	178	194	210	225
FLAPS 15	**PITCH ATT**	**6.5**	**6.5**	**7.0**	**7.0**	**7.0**
GEAR UP	%N1	50.1	56.6	62.7	67.4	72.2
VREF30+20	KIAS	140	158	173	190	205
FLAPS 20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
GEAR DOWN	%N1	55.7	62.7	69.1	74.4	79.3
VREF30+20	KIAS	140	158	173	190	205

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		160	210	260	310	360
FLAPS 20 VREF20+10	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**2.0**
	%N1	37.0	41.6	46.0	49.8	52.9
	KIAS	145	165	182	197	209
FLAPS 25 VREF25+10	**PITCH ATT**	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**
	%N1	46.8	52.0	56.5	60.5	63.5
	KIAS	136	155	171	185	196
FLAPS 30 VREF30+10	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.0**	
	%N1	50.9	56.5	61.6	66.9	
	KIAS	130	148	163	180	

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

***Packs on or off with 2 bleed sources.**
****Packs off with 1 bleed source.**

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
360	184	186	199
340	180	183	196
320	173	177	190
300	164	172	184
280	158	166	178
260	152	160	172
240	146	154	165
220	140	148	158
200	134	141	151
180	126	133	143
160	119	125	134

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 30
Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	225000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 225000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	915	+25/-15	20	-40	140	10	-10	20	-20	75	20	45
MAX AUTO	1235	+20/-15	30	-55	190	0	0	30	-30	125	0	0
AUTOBRAKE 4	1600	+30/-20	45	-75	270	0	-5	45	-45	175	5	5
AUTOBRAKE 3	1885	+40/-30	55	-95	335	5	-20	55	-55	180	10	15
AUTOBRAKE 2	2125	+45/-35	65	-105	380	30	-50	55	-60	155	90	100
AUTOBRAKE 1	2345	+50/-40	75	-120	445	70	-70	65	-65	155	250	335

Good Reported Braking Action

MAX MANUAL	1275	+25/-20	35	-65	235	30	-25	35	-35	105	85	195
MAX AUTO	1370	+25/-20	35	-60	235	25	-15	35	-35	120	90	215
AUTOBRAKE 4	1595	+30/-30	45	-75	275	5	-5	45	-45	175	10	45
AUTOBRAKE 3	1880	+40/-35	55	-95	335	5	-20	55	-55	180	10	15

Medium Reported Braking Action

MAX MANUAL	1695	+35/-30	55	-95	375	75	-55	50	-50	130	225	590
MAX AUTO	1760	+35/-30	50	-90	365	75	-50	45	-45	135	225	595
AUTOBRAKE 4	1805	+40/-35	50	-95	375	55	-35	50	-50	175	205	585
AUTOBRAKE 3	1955	+40/-35	55	-105	400	40	-40	55	-55	180	115	425

Poor Reported Braking Action

MAX MANUAL	2125	+50/-45	75	-135	570	160	-105	65	-65	145	475	1435
MAX AUTO	2225	+50/-45	70	-130	560	160	-105	65	-65	145	485	1460
AUTOBRAKE 4	2225	+50/-45	75	-130	560	160	-95	65	-65	155	480	1450
AUTOBRAKE 3	2255	+50/-45	70	-135	570	135	-90	70	-65	180	425	1410

***Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	225000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 225000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	960	+25/-15	20	-40	140	10	-10	20	-20	75	20	50
MAX AUTO	1325	+20/-15	35	-55	195	0	0	35	-35	130	0	0
AUTOBRAKE 4	1725	+30/-20	45	-80	280	5	-5	50	-50	185	5	5
AUTOBRAKE 3	2045	+35/-30	60	-100	350	5	-30	60	-60	180	20	25
AUTOBRAKE 2	2290	+40/-40	70	-110	395	35	-55	65	-65	160	125	135
AUTOBRAKE 1	2510	+50/-45	80	-125	460	75	-75	70	-70	160	295	410

Good Reported Braking Action

MAX MANUAL	1350	+20/-25	35	-65	240	35	-30	35	-35	105	95	220
MAX AUTO	1455	+25/-25	35	-65	240	25	-15	35	-35	130	95	235
AUTOBRAKE 4	1725	+30/-30	45	-80	285	5	-5	50	-50	185	15	45
AUTOBRAKE 3	2035	+35/-40	60	-100	350	5	-30	60	-60	180	20	25

Medium Reported Braking Action

MAX MANUAL	1795	+35/-35	55	-100	385	80	-60	50	-50	130	250	660
MAX AUTO	1865	+35/-35	55	-95	375	75	-50	50	-50	140	250	665
AUTOBRAKE 4	1920	+35/-35	55	-100	390	55	-35	55	-55	185	210	635
AUTOBRAKE 3	2110	+40/-40	65	-110	415	40	-45	60	-60	180	130	455

Poor Reported Braking Action

MAX MANUAL	2255	+50/-45	80	-140	585	165	-110	70	-70	150	520	1595
MAX AUTO	2360	+50/-45	80	-135	575	170	-105	70	-70	145	530	1620
AUTOBRAKE 4	2360	+50/-45	80	-135	575	170	-100	70	-70	165	530	1615
AUTOBRAKE 3	2410	+50/-50	80	-140	585	135	-95	70	-70	180	450	1555

***Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine reverse thrust.**
Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 60 meters.
Autobrake data valid for both auto and manual speedbrakes.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (M)											
	REF DIST*	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	225000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 225000 KG	PER 1000 FT ABOVE S.L.	HEAD WIND	TAIL WIND	DN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF20	ONE REV	NO REV
MAX MANUAL	1050	+30/-15	25	-40	135	15	-10	25	-25	75	30	60
MAX AUTO	1465	+20/-25	35	-60	200	0	0	40	-40	140	0	0
AUTOBRAKE 4	1925	+30/-35	55	-85	285	5	-5	55	-55	195	5	5
AUTOBRAKE 3	2265	+40/-45	70	-105	355	15	-30	65	-65	195	30	35
AUTOBRAKE 2	2445	+50/-50	80	-120	400	45	-60	70	-70	175	165	175
AUTOBRAKE 1	2635	+55/-60	95	-135	465	90	-95	80	-80	170	380	515

Good Reported Braking Action

MAX MANUAL	1490	+25/-25	40	-65	235	35	-30	35	-40	105	115	275
MAX AUTO	1540	+25/-25	40	-70	240	20	-15	40	-40	140	110	280
AUTOBRAKE 4	1930	+30/-35	55	-85	295	10	-5	55	-55	195	15	50
AUTOBRAKE 3	2265	+40/-45	70	-105	355	15	-30	65	-65	195	30	35

Medium Reported Braking Action

MAX MANUAL	1995	+40/-40	65	-105	380	85	-70	55	-55	135	300	800
MAX AUTO	1995	+40/-40	65	-100	375	80	-60	55	-55	145	300	795
AUTOBRAKE 4	2080	+40/-40	65	-105	385	55	-35	60	-60	195	230	750
AUTOBRAKE 3	2335	+45/-45	70	-115	420	45	-50	65	-65	195	140	530

Poor Reported Braking Action

MAX MANUAL	2515	+55/-55	90	-150	570	180	-125	70	-70	155	615	1910
MAX AUTO	2515	+55/-50	90	-145	565	180	-120	70	-70	155	620	1925
AUTOBRAKE 4	2515	+55/-50	90	-145	565	180	-110	70	-70	180	620	1915
AUTOBRAKE 3	2595	+55/-55	90	-150	580	145	-105	75	-75	195	520	1835

***Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed and 2 engine reverse thrust.**

Max Manual braking data valid for auto speedbrakes. For manual speedbrakes, increase reference landing distance by 70 meters.

Autobrake data valid for both auto and manual speedbrakes.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1810	35/-35	60	-100/370	80/-60	25/-25	125	255	670
ANTISKID (FLAPS 30)	VREF30	1710	35/-25	55	-95/360	75/-60	25/-25	125	230	605
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1060	35/-15	25	-40/150	15/-10	10/-10	80	-	50
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	930	25/-10	20	-35/130	10/-10	10/-10	75	-	40
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1170	50/-15	35	-45/175	20/-15	20/-20	85	50	115
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1065	35/-10	25	-40/150	10/-10	10/-10	80	30	65
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1050	30/-15	25	-40/145	10/-10	10/-10	75	25	60
FLAPS PRIMARY FAIL	VREF20	1200	25/-15	25	-45/150	15/-15	15/-15	100	35	80
FLAP/SLAT CONTROL	VREF20	1050	30/-15	25	-40/145	10/-10	10/-10	75	25	60
FLIGHT CONTROL MODE	VREF20	1215	25/-15	30	-45/155	15/-15	15/-15	100	40	85
HYD PRESS SYS C	VREF20	1200	25/-15	25	-45/150	15/-15	15/-15	100	35	80
HYD PRESS SYS L+C	VREF30+20	1330	35/-15	35	-50/170	20/-20	20/-20	125	-	60
HYD PRESS SYS L+R	VREF30+20	1440	30/-15	35	-60/200	35/-30	20/-20	140	-	-
HYD PRESS SYS R+C	VREF30+20	1635	25/-15	45	-65/230	45/-35	25/-25	160	-	135
HYD PRESS SYS L (FLAPS 25)	VREF25	1045	25/-15	25	-45/145	15/-15	10/-10	90	-	35
HYD PRESS SYS L (FLAPS 30)	VREF30	995	25/-10	20	-40/140	15/-10	10/-10	90	-	30
HYD PRESS SYS R (FLAPS 25)	VREF25	1150	15/-15	25	-50/170	20/-20	15/-15	100	-	50
HYD PRESS SYS R (FLAPS 30)	VREF30	1085	20/-15	25	-45/160	20/-20	15/-15	100	-	45
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1205	45/-15	35	-45/170	20/-15	20/-20	85	45	105
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1070	35/-10	25	-40/140	10/-10	10/-10	75	30	65
PRI FLIGHT COMPUTERS	VREF20	1215	25/-15	30	-45/155	15/-15	15/-15	100	40	85
SLATS DRIVE	VREF30+30	1155	35/-15	30	-45/160	15/-10	10/-10	80	35	75
STABILIZER	VREF30+20	1070	35/-10	25	-40/140	10/-10	10/-10	75	30	65

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	1810	35/-35	60	-100/370	80/-60	25/-25	125	255	670
ANTISKID (FLAPS 30)	VREF30	1710	35/-25	55	-95/360	75/-60	25/-25	125	230	605
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	1565	25/-25	45	-75/255	45/-35	25/-25	115	-	195
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1345	25/-20	35	-65/240	40/-30	20/-20	110	-	150
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	1690	30/-25	50	-70/255	40/-35	25/-25	105	155	380
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	1525	25/-20	45	-65/245	35/-35	20/-20	105	130	305
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1490	25/-25	45	-65/240	35/-30	20/-20	105	115	270
FLAPS PRIMARY FAIL	VREF20	1665	25/-30	50	-75/260	45/-35	25/-25	130	145	345
FLAP/SLAT CONTROL	VREF20	1490	25/-25	45	-65/240	35/-30	20/-20	105	115	270
FLIGHT CONTROL MODE	VREF20	1695	25/-30	50	-75/260	45/-40	25/-25	135	150	365
HYD PRESS SYS C	VREF20	1665	25/-30	50	-75/260	45/-35	25/-25	130	145	345
HYD PRESS SYS L+C	VREF30+20	1960	35/-25	60	-90/305	70/-60	30/-30	175	-	255
HYD PRESS SYS L+R	VREF30+20	2100	35/-25	60	-100/340	100/-75	35/-35	200	-	-
HYD PRESS SYS R+C	VREF30+20	1990	35/-25	60	-90/310	75/-60	30/-30	185	-	270
HYD PRESS SYS L (FLAPS 25)	VREF25	1550	25/-25	45	-75/265	50/-45	20/-20	130	-	160
HYD PRESS SYS L (FLAPS 30)	VREF30	1470	30/-20	40	-70/260	50/-40	20/-20	130	-	145
HYD PRESS SYS R (FLAPS 25)	VREF25	1550	25/-25	45	-75/265	50/-45	20/-20	130	-	160
HYD PRESS SYS R (FLAPS 30)	VREF30	1455	25/-20	40	-70/255	45/-40	20/-20	130	-	140
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	1725	30/-25	50	-75/255	45/-35	25/-25	105	150	365
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	1525	25/-20	45	-65/245	35/-35	20/-20	105	120	285
PRI FLIGHT COMPUTERS	VREF20	1695	25/-30	50	-75/260	45/-40	25/-25	135	150	365
SLATS DRIVE	VREF30+30	1635	30/-25	50	-70/255	40/-35	20/-20	110	135	320
STABILIZER	VREF30+20	1525	25/-20	45	-65/245	35/-35	20/-20	105	120	285

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Medium Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2265	45/-45	80	-135/555	170/-110	35/-35	145	525	1620
ANTISKID (FLAPS 30)	VREF30	2135	50/-35	75	-135/545	160/-105	30/-30	140	480	1455
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2210	45/-45	70	-115/430	120/-90	35/-35	155	-	580
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	1865	40/-30	60	-105/395	105/-75	25/-25	145	-	445
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2295	45/-35	80	-110/400	90/-75	40/-40	135	410	1160
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2045	45/-35	65	-105/385	90/-70	30/-30	135	340	925
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	1990	40/-35	65	-105/385	90/-65	30/-30	130	300	800
FLAPS PRIMARY FAIL	VREF20	2190	45/-45	75	-110/405	100/-75	35/-35	160	360	985
FLAP/SLAT CONTROL	VREF20	1990	40/-35	65	-105/385	90/-65	30/-30	130	300	800
FLIGHT CONTROL MODE	VREF20	2235	45/-45	75	-115/410	105/-80	35/-35	165	380	1060
HYD PRESS SYS C	VREF20	2190	45/-45	75	-110/405	100/-75	35/-35	160	360	985
HYD PRESS SYS L+C	VREF30+20	2755	55/-40	90	-140/510	185/-130	45/-45	220	-	770
HYD PRESS SYS L+R	VREF30+20	3375	60/-40	105	-180/640	355/-225	60/-60	275	-	-
HYD PRESS SYS R+C	VREF30+20	2790	55/-40	95	-140/510	190/-135	45/-45	225	-	800
HYD PRESS SYS L (FLAPS 25)	VREF25	2210	40/-40	75	-120/455	140/-100	35/-35	170	-	505
HYD PRESS SYS L (FLAPS 30)	VREF30	2085	45/-30	65	-120/445	135/-95	35/-35	170	-	460
HYD PRESS SYS R (FLAPS 25)	VREF25	2190	40/-40	70	-120/455	135/-100	35/-35	170	-	495
HYD PRESS SYS R (FLAPS 30)	VREF30	2035	45/-30	65	-115/440	130/-90	30/-30	160	-	430
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2300	45/-35	80	-110/405	95/-75	35/-35	135	385	1045
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2025	45/-35	65	-105/385	90/-65	25/-25	130	310	815
PRI FLIGHT COMPUTERS	VREF20	2235	45/-45	75	-115/410	105/-80	35/-35	165	380	1060
SLATS DRIVE	VREF30+30	2180	45/-35	75	-105/400	95/-75	25/-25	135	340	905
STABILIZER	VREF30+20	2025	45/-35	65	-105/385	90/-65	25/-25	130	310	815

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (M)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	225000 KG LDG WT	PER 5000 KG ABV/BLW 225000 KG	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	2920	70/-65	115	-210/995	810/-220	45/-45	160	1325	5000
ANTISKID (FLAPS 30)	VREF30	2750	75/-55	105	-205/975	785/-210	45/-45	155	1220	5000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	2945	65/-60	105	-175/680	300/-180	50/-50	185	-	1480
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2465	55/-45	85	-160/630	255/-150	40/-40	170	-	1125
FLAPS DRIVE (FLAPS ≤ 5)	VREF30+40	2900	65/-50	115	-150/605	195/-130	50/-50	160	845	2910
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	2575	60/-45	100	-145/585	190/-125	40/-40	160	695	2285
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	2505	55/-50	90	-145/580	185/-120	40/-40	150	615	1925
FLAPS PRIMARY FAIL	VREF20	2705	60/-55	100	-150/605	205/-135	45/-45	175	710	2320
FLAP/SLAT CONTROL	VREF20	2505	55/-50	90	-145/580	185/-120	40/-40	150	615	1925
FLIGHT CONTROL MODE	VREF20	2770	60/-55	105	-155/610	215/-140	45/-45	185	755	2520
HYD PRESS SYS C	VREF20	2705	60/-55	100	-150/605	205/-135	45/-45	175	710	2320
HYD PRESS SYS L+C	VREF30+20	3680	80/-60	135	-215/830	475/-260	60/-60	250	-	1940
HYD PRESS SYS L+R	VREF30+20	5405	90/-55	180	-335/1285	1755/-605	100/-100	345	-	-
HYD PRESS SYS R+C	VREF30+20	3715	85/-65	140	-215/840	485/-265	60/-60	255	-	1995
HYD PRESS SYS L (FLAPS 25)	VREF25	3000	60/-55	110	-190/770	400/-210	50/-50	200	-	1310
HYD PRESS SYS L (FLAPS 30)	VREF30	2840	65/-45	100	-185/755	385/-200	45/-45	200	-	1205
HYD PRESS SYS R (FLAPS 25)	VREF25	2965	55/-55	105	-190/760	390/-205	50/-50	195	-	1265
HYD PRESS SYS R (FLAPS 30)	VREF30	2740	60/-45	100	-185/740	365/-190	45/-45	185	-	1090
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	2860	65/-50	110	-150/605	195/-130	45/-45	150	755	2440
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	2530	60/-45	90	-145/580	185/-120	35/-35	150	620	1930
PRI FLIGHT COMPUTERS	VREF20	2770	60/-55	105	-155/610	215/-140	45/-45	185	755	2520
SLATS DRIVE	VREF30+30	2715	65/-45	100	-150/595	190/-130	35/-35	150	675	2105
STABILIZER	VREF30+20	2530	60/-45	90	-145/580	185/-120	35/-35	150	620	1930

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (305 meters air distance).
Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
360	0	22.1	24.1	26.5	32.9	36.3	40.3	46.1	51.3	57.3	60.4	67.5	75.8	75.7	84.9	95.4	91.6	102.6	115.1
	10	22.7	24.8	27.2	33.9	37.4	41.5	47.5	52.9	59.1	62.3	69.7	78.2	78.1	87.6	98.4	94.4	105.7	118.4
	15	23.2	25.3	27.8	34.5	38.1	42.3	48.4	53.9	60.2	63.4	70.9	79.6	79.5	89.1	100.0	96.0	107.5	120.3
	20	23.6	25.7	28.2	35.1	38.8	43.0	49.3	54.8	61.2	64.5	72.1	80.9	80.8	90.6	101.7	97.6	109.2	122.2
	30	24.1	26.3	28.9	36.0	39.8	44.1	50.5	56.3	62.9	66.3	74.1	83.2	83.1	93.1	104.4	100.3	112.1	125.4
	40	24.3	26.5	29.2	36.4	40.3	44.7	51.3	57.2	64.0	67.4	75.5	84.8	84.7	94.9	106.5	102.3	114.3	127.7
340	0	21.2	23.1	25.3	31.4	34.7	38.4	43.9	48.8	54.5	57.5	64.2	72.0	72.1	80.8	90.8	87.3	97.9	109.9
	10	21.7	23.7	26.0	32.4	35.7	39.5	45.3	50.4	56.2	59.3	66.3	74.3	74.4	83.4	93.7	90.0	100.9	113.1
	15	22.1	24.1	26.5	33.0	36.3	40.3	46.1	51.3	57.3	60.4	67.5	75.7	75.7	84.8	95.3	91.6	102.6	115.0
	20	22.5	24.6	26.9	33.6	37.0	41.0	46.9	52.2	58.3	61.4	68.6	77.0	77.0	86.3	96.8	93.1	104.2	116.8
	30	23.1	25.1	27.6	34.4	37.9	42.0	48.2	53.6	59.8	63.1	70.5	79.1	79.1	88.7	99.5	95.7	107.1	119.9
	40	23.2	25.3	27.8	34.8	38.4	42.6	48.9	54.4	60.8	64.2	71.8	80.6	80.6	90.4	101.5	97.6	109.2	122.2
320	0	20.2	22.0	24.1	30.0	33.0	36.5	41.8	46.4	51.7	54.6	60.9	68.3	68.4	76.7	86.1	82.9	93.0	104.4
	10	20.8	22.6	24.8	30.8	33.9	37.6	43.1	47.8	53.3	56.3	62.9	70.4	70.6	79.1	88.9	85.5	95.9	107.6
	15	21.2	23.0	25.2	31.4	34.6	38.3	43.8	48.7	54.3	57.3	64.0	71.7	71.9	80.5	90.4	87.0	97.5	109.4
	20	21.5	23.4	25.7	32.0	35.2	38.9	44.6	49.5	55.3	58.3	65.1	72.9	73.1	81.9	91.9	88.5	99.1	111.1
	30	22.0	24.0	26.3	32.7	36.1	39.9	45.8	50.9	56.7	59.9	66.9	74.9	75.1	84.1	94.4	90.9	101.8	114.1
	40	22.1	24.1	26.5	33.1	36.5	40.4	46.4	51.6	57.7	60.9	68.1	76.3	76.5	85.8	96.3	92.7	103.9	116.3
300	0	19.3	20.9	22.9	28.5	31.3	34.6	39.6	43.9	48.9	51.6	57.6	64.5	64.7	72.5	81.4	78.4	88.0	98.8
	10	19.8	21.5	23.5	29.3	32.2	35.6	40.8	45.3	50.4	53.2	59.4	66.5	66.8	74.8	84.0	80.9	90.7	101.9
	15	20.2	21.9	24.0	29.8	32.8	36.3	41.6	46.1	51.4	54.2	60.5	67.7	68.0	76.1	85.4	82.3	92.3	103.6
	20	20.5	22.3	24.4	30.4	33.4	36.9	42.3	46.9	52.3	55.1	61.5	68.9	69.1	77.4	86.9	83.7	93.8	105.3
	30	21.0	22.8	25.0	31.1	34.2	37.8	43.4	48.1	53.6	56.6	63.2	70.8	71.0	79.5	89.3	86.1	96.4	108.1
	40	21.1	22.9	25.1	31.4	34.6	38.3	44.0	48.8	54.5	57.5	64.3	72.1	72.3	81.1	91.0	87.7	98.3	110.3
260	0	17.4	18.9	20.6	25.5	28.0	30.8	35.3	39.0	43.3	45.7	50.8	56.8	57.1	63.8	71.6	69.2	77.5	87.1
	10	17.9	19.4	21.2	26.3	28.8	31.7	36.3	40.1	44.6	47.1	52.4	58.6	58.9	65.8	73.8	71.4	80.0	89.8
	15	18.2	19.8	21.6	26.7	29.3	32.3	37.0	40.9	45.4	48.0	53.4	59.6	60.0	67.0	75.2	72.6	81.4	91.4
	20	18.6	20.1	21.9	27.2	29.8	32.9	37.6	41.6	46.2	48.8	54.3	60.7	61.0	68.2	76.4	73.9	82.7	92.9
	30	19.0	20.6	22.4	27.9	30.5	33.7	38.6	42.7	47.4	50.1	55.7	62.3	62.7	70.1	78.6	75.9	85.0	95.4
	40	19.0	20.7	22.6	28.1	30.8	34.0	39.0	43.2	48.1	50.8	56.6	63.4	63.7	71.3	80.0	77.3	86.7	97.3
220	0	15.7	16.9	18.4	22.6	24.7	27.1	30.9	34.0	37.6	39.7	44.0	49.0	49.3	54.9	61.4	59.4	66.5	74.6
	10	16.1	17.4	18.9	23.2	25.4	27.9	31.8	35.0	38.8	40.9	45.3	50.5	50.8	56.6	63.4	61.3	68.6	77.0
	15	16.4	17.7	19.2	23.7	25.8	28.4	32.4	35.6	39.5	41.6	46.2	51.4	51.7	57.6	64.5	62.4	69.8	78.3
	20	16.7	18.0	19.6	24.1	26.3	28.9	32.9	36.3	40.2	42.3	47.0	52.3	52.6	58.6	65.6	63.5	71.0	79.7
	30	17.0	18.4	20.0	24.6	26.9	29.6	33.7	37.2	41.2	43.4	48.2	53.7	54.0	60.2	67.4	65.2	73.0	81.9
	40	17.1	18.4	20.1	24.8	27.1	29.9	34.1	37.6	41.7	44.0	48.9	54.6	54.9	61.2	68.6	66.4	74.3	83.4
180	0	13.9	15.0	16.2	19.7	21.4	23.4	26.5	29.0	32.0	33.6	37.0	41.1	41.2	45.7	50.9	49.3	54.9	61.5
	10	14.3	15.4	16.6	20.2	22.0	24.1	27.2	29.9	32.9	34.5	38.1	42.3	42.4	47.1	52.5	50.8	56.7	63.4
	15	14.6	15.7	16.9	20.6	22.4	24.5	27.7	30.4	33.6	35.2	38.8	43.1	43.2	48.0	53.5	51.8	57.7	64.5
	20	14.8	15.9	17.2	21.0	22.8	25.0	28.2	30.9	34.1	35.8	39.5	43.9	44.0	48.8	54.4	52.7	58.7	65.7
	30	15.1	16.3	17.6	21.5	23.3	25.5	28.9	31.7	35.0	36.7	40.5	45.0	45.1	50.1	55.9	54.1	60.3	67.5
	40	15.1	16.3	17.7	21.6	23.5	25.7	29.1	32.0	35.4	37.1	41.1	45.6	45.7	50.9	56.8	54.9	61.3	68.7

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 with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	4.4	14.1	23.7	33.2	42.6	51.9	61.2	70.5	79.9	89.3	98.9	108.7
	MAX AUTO	4.4	13.1	21.7	30.2	38.7	47.3	56.0	65.0	74.3	83.9	94.0	104.6
	AUTOBRAKE 4	4.3	12.5	20.4	28.1	35.7	43.4	51.2	59.3	67.7	76.6	86.1	96.4
	AUTOBRAKE 3	4.2	11.9	19.2	26.3	33.3	40.3	47.4	54.8	62.6	70.8	79.7	89.3
	AUTOBRAKE 2	4.1	11.2	17.9	24.4	30.8	37.2	43.7	50.5	57.6	65.1	73.2	81.9
	AUTOBRAKE 1	4.0	10.3	16.3	22.1	27.8	33.4	39.1	45.1	51.3	58.0	65.1	72.9

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	MAX MAN	3.3	12.0	21.0	30.0	38.9	47.5	56.1	64.5	72.8	81.0	89.2	97.5
	MAX AUTO	2.0	8.7	15.5	22.3	29.3	36.4	43.8	51.5	59.6	68.3	77.5	87.4
	AUTOBRAKE 4	1.4	5.6	10.4	15.6	20.9	26.4	32.2	38.3	44.8	51.9	59.6	68.0
	AUTOBRAKE 3	0.9	3.2	6.4	10.3	14.3	18.5	23.0	27.9	33.2	39.0	45.4	52.4
	AUTOBRAKE 2	0.3	1.8	4.0	6.5	9.3	12.3	15.6	19.2	23.3	27.9	33.0	38.7
	AUTOBRAKE 1	0.2	1.2	2.6	4.3	6.1	8.1	10.3	12.8	15.6	18.8	22.3	26.4

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
	16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND	REQUIRED	11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on EICAS may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	304.9	284.8				
52	126	313.0	291.7				
50	122	321.0	299.0	274.7			
48	118	329.1	307.4	281.2			
46	115	337.3	315.9	288.2	265.3		
44	111	345.2	323.9	295.9	272.2		
42	108	352.5	332.1	304.6	278.8	255.6	
40	104	359.7	340.5	312.9	285.6	261.5	
38	100	366.9	349.0	320.7	292.2	267.2	237.5
36	97	373.4	356.3	327.9	298.5	272.1	242.3
34	93	378.7	363.3	335.4	304.7	276.5	247.0
32	90	378.7	370.4	341.7	310.6	280.5	251.3
30	86	378.7	376.6	347.1	317.1	284.8	255.1
28	82	378.7	376.7	351.7	322.0	289.4	258.9
26	79	378.7	376.8	357.1	325.9	294.0	262.5
24	75	378.7	376.9	357.2	329.0	298.9	266.5
22	72	378.7	377.0	357.3	332.2	302.2	270.7
20	68	378.7	377.1	357.3	332.3	304.3	274.3
18	64	378.7	377.2	357.4	332.4	306.4	276.8
16	61	378.7	377.3	357.5	332.4	306.4	278.6
14	57	378.7	377.3	357.6	332.5	306.5	280.1
12	54	378.7	377.4	357.7	332.6	306.5	280.2
10	50	378.7	377.4	357.7	332.7	306.6	280.3
8	46	378.7	377.5	357.8	332.7	306.6	280.3
6	43	378.7	377.5	357.8	332.8	306.6	280.2
4	40	378.7	377.5	354.6	320.5	293.0	258.9
2	36	378.7	377.6	354.6	320.5	293.0	258.9
0	32	378.7	377.6	354.7	320.6	293.0	259.0
-40	-40	378.7	377.7	354.6	320.6	293.0	259.0

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1350 kg.
With engine and wing anti-ice on, decrease weight by 2200 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 21950 kg.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	308.4	289.3				
52	126	315.6	296.4				
50	122	323.1	303.4	279.2			
48	118	330.8	310.6	285.8			
46	115	338.7	318.2	292.8	269.5		
44	111	346.3	325.7	300.4	276.4		
42	108	353.7	333.6	308.1	283.2	259.8	
40	104	360.8	341.6	315.5	290.1	265.8	
38	100	368.1	350.1	322.9	297.3	271.8	241.8
36	97	374.8	357.4	329.8	303.3	277.2	246.6
34	93	378.7	364.4	337.1	309.0	281.6	251.3
32	90	378.7	371.7	343.0	314.0	285.9	256.0
30	86	378.7	377.9	348.2	319.8	290.2	259.9
28	82	378.7	378.0	352.9	324.4	295.0	263.8
26	79	378.7	378.2	358.5	328.1	299.6	267.5
24	75	378.7	378.3	358.5	331.1	304.0	271.5
22	72	378.7	378.4	358.6	334.1	307.0	275.9
20	68	378.7	378.5	358.7	334.2	308.7	279.6
18	64	378.7	378.5	358.8	334.3	310.5	282.2
16	61	378.7	378.6	358.8	334.4	310.5	284.1
14	57	378.7	378.7	358.9	334.4	310.6	285.7
12	54	378.7	378.7	359.0	334.5	310.7	285.7
10	50	378.7	378.7	359.1	334.6	310.7	285.8
8	46	378.7	378.7	359.1	334.7	310.7	285.8
6	43	378.7	378.7	359.2	334.7	310.8	285.8
4	40	378.7	378.7	359.2	334.8	310.8	280.7
2	36	378.7	378.7	359.3	334.8	310.8	280.7
0	32	378.7	378.7	359.3	334.8	310.9	280.7
-40	-40	378.7	378.7	359.4	334.9	311.0	280.9

Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off.
With engine bleed for packs off, increase weight by 1450 kg.
With engine and wing anti-ice on, decrease weight by 1800 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 22250 kg.

Intentionally
Blank

ENGINE INOP

Initial Max Continuous %N1
Based on .84M, engine bleed for one pack on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	37	35	33	31	29	27
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100.0	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP

Max Continuous %N1

Based on engine bleed for packs on or off and anti-ice off

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.1	102.0	102.8	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	300	17500	16300	15100
340	330	292	19000	17800	16600
320	311	284	20400	19400	18300
300	292	275	21600	20800	19900
280	272	266	23300	22300	21300
260	252	257	25300	24400	23100
240	232	247	27500	26700	25300
220	214	237	29900	29200	27900
200	194	226	31700	31300	30500
180	175	215	33600	33400	33000
160	155	203	35800	35700	35600

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
134	126	118	111	105	100	95	90	86	82	79
269	251	236	222	210	200	190	181	173	165	159
403	377	354	334	316	300	285	272	260	248	238
536	502	472	445	421	400	380	362	346	332	318
670	627	589	556	526	500	475	453	433	415	398
803	752	707	667	632	600	571	544	520	498	478
936	877	824	778	737	700	666	635	607	582	558
1068	1001	942	889	842	800	761	726	695	665	639
1201	1126	1059	1000	947	900	856	817	782	749	719
1333	1250	1176	1111	1052	1000	952	908	869	833	799
1466	1374	1293	1222	1157	1100	1047	1000	956	916	880
1598	1499	1411	1332	1262	1200	1142	1091	1043	1000	960
1731	1623	1528	1443	1368	1300	1238	1182	1131	1084	1040
1863	1747	1645	1554	1473	1400	1333	1273	1218	1167	1121
1996	1872	1762	1665	1578	1500	1428	1364	1305	1251	1201
2129	1997	1880	1776	1683	1600	1524	1455	1392	1334	1281
2262	2121	1997	1887	1788	1700	1619	1546	1479	1418	1361
2395	2246	2115	1998	1894	1800	1714	1637	1566	1501	1441

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG) WEIGHT AT START OF DRIFTDOWN (1000 KG)											TIME (HR:MIN)
	160	180	200	220	240	260	280	300	320	340	360	
100	1.1	1.1	1.2	1.3	1.5	1.6	1.7	1.8	1.8	1.9	2.0	0:16
200	2.4	2.5	2.8	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.6	0:31
300	3.7	4.1	4.5	4.9	5.3	5.6	6.0	6.3	6.6	7.0	7.4	0:46
400	5.1	5.6	6.2	6.8	7.3	7.8	8.2	8.7	9.2	9.7	10.3	1:01
500	6.4	7.0	7.8	8.5	9.2	9.8	10.4	11.0	11.6	12.3	13.0	1:16
600	7.7	8.4	9.3	10.1	11.0	11.7	12.5	13.2	13.9	14.8	15.6	1:31
700	8.9	9.8	10.8	11.8	12.8	13.7	14.5	15.4	16.2	17.2	18.2	1:46
800	10.1	11.2	12.3	13.4	14.5	15.6	16.5	17.5	18.5	19.6	20.8	2:01
900	11.3	12.5	13.8	15.1	16.3	17.4	18.5	19.6	20.7	22.0	23.3	2:15
1000	12.6	13.9	15.3	16.7	18.0	19.3	20.5	21.8	23.0	24.4	25.9	2:30
1100	13.8	15.2	16.8	18.3	19.8	21.2	22.5	23.9	25.2	26.8	28.4	2:45
1200	14.9	16.6	18.2	19.9	21.5	23.0	24.5	26.0	27.4	29.2	30.9	2:59
1300	16.1	17.9	19.7	21.5	23.2	24.8	26.4	28.0	29.7	31.5	33.4	3:14
1400	17.3	19.2	21.1	23.0	24.9	26.6	28.4	30.1	31.8	33.8	35.8	3:29
1500	18.5	20.5	22.5	24.6	26.5	28.4	30.3	32.2	34.0	36.1	38.3	3:43
1600	19.6	21.7	23.9	26.1	28.2	30.2	32.2	34.2	36.2	38.4	40.7	3:58
1700	20.8	23.0	25.3	27.6	29.8	32.0	34.1	36.2	38.3	40.7	43.1	4:13
1800	21.9	24.3	26.7	29.1	31.5	33.8	36.0	38.2	40.5	43.0	45.5	4:28

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	15000	13600	12000
350	15500	14200	12600
340	16400	14900	13100
330	17200	15700	13900
320	18100	16600	14900
310	19000	17500	15800
300	19900	18400	16700
290	20600	19400	17800
280	21200	20200	18800
270	21900	20900	19900
260	22800	21600	20600
250	23800	22500	21400
240	24900	23700	22100
230	26200	24900	23400
220	27600	26300	24600
210	29100	27700	26000
200	30400	29100	27600
190	31400	30500	29100
180	32400	31700	30600
170	33400	33000	32000
160	34600	34400	33500

With engine anti-ice on, no altitude capability adjustment is required.
With engine and wing anti-ice on, decrease altitude capability by 300 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	91.6	97.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10335	11118								
340	%N1	90.6	95.5	98.6							
	MACH	.602	.662	.681							
	KIAS	334	337	333							
	FF/ENG	9977	10586	10771							
320	%N1	89.7	93.7	95.9	99.2						
	MACH	.602	.650	.667	.686						
	KIAS	334	330	326	323						
	FF/ENG	9633	9884	9949	10098						
300	%N1	87.7	92.0	93.7	96.1						
	MACH	.584	.637	.653	.671						
	KIAS	324	323	319	316						
	FF/ENG	8949	9222	9239	9287						
280	%N1	85.7	90.1	91.8	93.5	96.3					
	MACH	.566	.619	.640	.656	.674					
	KIAS	314	314	312	308	305					
	FF/ENG	8313	8533	8592	8583	8659					
260	%N1	83.8	88.1	89.8	91.5	93.2	96.3				
	MACH	.548	.599	.621	.642	.658	.677				
	KIAS	304	303	303	301	297	294				
	FF/ENG	7698	7830	7916	7948	7953	8065				
240	%N1	81.5	85.7	87.6	89.3	91.0	92.9	96.0			
	MACH	.529	.577	.599	.622	.643	.659	.678			
	KIAS	293	292	292	292	290	286	283			
	FF/ENG	7105	7147	7227	7288	7324	7345	7467			
220	%N1	79.3	83.3	85.1	86.9	88.7	90.4	92.3	95.4	99.4	
	MACH	.510	.555	.576	.598	.621	.642	.659	.679	.701	
	KIAS	282	280	280	280	280	278	274	271	269	
	FF/ENG	6519	6489	6557	6617	6672	6717	6737	6844	7112	
200	%N1	76.7	80.6	82.5	84.2	86.1	87.8	89.6	91.5	94.5	98.6
	MACH	.490	.532	.552	.572	.594	.618	.640	.658	.677	.700
	KIAS	271	269	268	267	267	267	266	262	259	257
	FF/ENG	5935	5852	5910	5967	6007	6064	6109	6120	6208	6468
180	%N1	74.1	77.8	79.6	81.5	83.1	85.0	86.7	88.5	90.3	93.3
	MACH	.470	.509	.527	.546	.567	.589	.613	.636	.654	.674
	KIAS	260	256	255	255	254	254	254	253	250	247
	FF/ENG	5363	5237	5285	5340	5374	5402	5453	5494	5502	5567
160	%N1	71.2	74.8	76.6	78.3	80.1	81.7	83.6	85.3	87.1	88.9
	MACH	.449	.485	.501	.519	.538	.559	.581	.605	.629	.649
	KIAS	248	244	243	242	241	241	240	240	240	237
	FF/ENG	4809	4648	4682	4735	4758	4774	4797	4837	4878	4892

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
286	264	244	227	213	200	190	181	173	166	159
569	525	487	454	425	400	381	364	348	333	320
853	788	730	681	638	600	572	546	522	501	482
1138	1051	974	908	851	800	763	729	698	669	643
1424	1316	1219	1136	1064	1000	954	911	872	836	803
1711	1580	1464	1364	1278	1200	1144	1093	1046	1003	964
1999	1846	1709	1592	1491	1400	1335	1275	1220	1170	1124
2288	2111	1954	1820	1704	1600	1526	1457	1394	1337	1285
2578	2378	2201	2049	1918	1800	1717	1639	1568	1504	1445
2869	2646	2447	2278	2132	2000	1907	1821	1742	1670	1605

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 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	4.0	0:39	3.5	0:38	3.2	0:36	2.8	0:36	2.6	0:35
400	8.4	1:15	7.6	1:11	7.1	1:08	6.7	1:06	6.4	1:03
600	12.7	1:50	11.7	1:45	11.1	1:40	10.4	1:36	10.2	1:32
800	16.9	2:26	15.7	2:19	14.9	2:11	14.2	2:06	13.9	2:02
1000	21.1	3:02	19.7	2:53	18.8	2:44	17.9	2:37	17.6	2:31
1200	25.3	3:38	23.7	3:27	22.6	3:16	21.5	3:07	21.2	3:00
1400	29.4	4:15	27.6	4:02	26.3	3:49	25.1	3:38	24.7	3:30
1600	33.5	4:52	31.4	4:37	30.1	4:21	28.7	4:09	28.2	4:00
1800	37.6	5:29	35.2	5:12	33.8	4:55	32.3	4:40	31.6	4:29
2000	41.6	6:07	39.0	5:47	37.4	5:28	35.8	5:11	35.0	5:00

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
5	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.2	1.7	2.3
10	-1.8	-1.3	-0.9	-0.4	0.0	0.8	1.6	2.6	3.7	4.9
15	-2.7	-2.0	-1.3	-0.7	0.0	1.2	2.5	4.0	5.6	7.4
20	-3.7	-2.7	-1.8	-0.9	0.0	1.6	3.3	5.3	7.5	9.8
25	-4.6	-3.4	-2.3	-1.1	0.0	2.0	4.2	6.6	9.3	12.2
30	-5.6	-4.2	-2.7	-1.4	0.0	2.3	4.9	7.8	11.0	14.4
35	-6.5	-4.9	-3.2	-1.6	0.0	2.7	5.7	9.0	12.6	16.6
40	-7.5	-5.6	-3.7	-1.8	0.0	3.1	6.4	10.2	14.2	18.6
45	-8.5	-6.3	-4.2	-2.1	0.0	3.4	7.1	11.3	15.8	20.6

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	81.1	84.5	89.2	94.5			
	KIAS	272	273	275	298			
	FF/ENG	9270	9350	9640	10310			
340	%N1	79.3	82.6	87.4	92.2			
	KIAS	264	266	267	282			
	FF/ENG	8720	8760	8990	9410			
320	%N1	77.6	80.6	85.4	90.1	98.4		
	KIAS	257	257	259	265	294		
	FF/ENG	8170	8190	8350	8590	9780		
300	%N1	75.6	78.6	83.4	88.1	94.5		
	KIAS	249	249	251	252	277		
	FF/ENG	7640	7640	7740	7890	8730		
280	%N1	73.7	76.6	81.1	86.0	91.3		
	KIAS	240	241	242	243	258		
	FF/ENG	7120	7090	7150	7250	7830		
260	%N1	71.6	74.5	78.8	83.7	88.8	97.3	
	KIAS	232	232	233	234	240	266	
	FF/ENG	6600	6570	6570	6640	7030	7980	
240	%N1	69.3	72.3	76.5	81.3	86.3	92.6	
	KIAS	226	226	226	226	226	248	
	FF/ENG	6090	6060	6040	6080	6360	6920	
220	%N1	67.0	69.9	74.1	78.6	83.8	88.8	99.1
	KIAS	220	220	220	220	220	226	246
	FF/ENG	5600	5570	5530	5540	5750	6060	7020
200	%N1	64.7	67.4	71.6	76.0	80.9	85.8	93.5
	KIAS	213	213	213	213	213	213	233
	FF/ENG	5130	5090	5030	5040	5180	5360	5950
180	%N1	62.2	64.8	68.9	73.2	77.9	83.0	88.0
	KIAS	206	206	206	206	206	206	208
	FF/ENG	4670	4620	4560	4560	4640	4780	5000
160	%N1	59.5	62.1	65.9	70.3	74.7	79.8	84.5
	KIAS	199	199	199	199	199	199	199
	FF/ENG	4230	4170	4110	4100	4150	4230	4360

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN) PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	450	340				
50	500	390	230			
48	550	440	290			
46	590	490	340	180		
44	640	550	390	230		
42	690	590	430	270	110	
40	730	640	480	310	140	
38	760	690	530	350	170	
36	760	730	560	390	200	-10
34	760	780	600	420	230	20
32	770	780	630	460	260	50
30	770	790	660	480	300	70
20	790	800	670	530	370	190
10	810	820	620	440	280	140
0	830	830	610	380	150	-90
-20	860	870	630	390	150	-90
-40	900	900	660	410	160	-100

Rate of climb capability shown is valid for 225000 kg, gear down at VREF20 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 225000 kg.
Increase rate of climb 50 ft/min per 5000 kg less than 225000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN) PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-120	-230				
50	-80	-190	-340			
48	-40	-140	-300			
46	10	-100	-250	-400		
44	50	-50	-200	-360		
42	90	-10	-160	-320	-480	
40	120	40	-130	-290	-450	
38	160	80	-90	-260	-430	
36	160	120	-50	-230	-400	-600
34	160	150	-20	-190	-380	-580
32	160	170	10	-160	-350	-560
30	160	170	30	-140	-320	-530
20	170	170	40	-100	-250	-440
10	180	180	20	-130	-280	-640
0	180	180	-30	-250	-480	-710
-20	190	190	-40	-260	-490	-730
-40	200	190	-40	-280	-510	-760

Rate of climb capability shown is valid for 225000 kg, gear down at VREF30 + 5.
Decrease rate of climb 40 ft/min per 5000 kg greater than 225000 kg.
Increase rate of climb 50 ft/min per 5000 kg less than 225000 kg.

Intentionally
Blank

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.6	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

***Packs on or off with 2 bleed sources.**
****Packs off with 1 bleed source.**

GEAR DOWN

Long Range Cruise Altitude Capability
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18200	16100	13700
350	18800	16900	14400
340	19400	17600	15100
330	20000	18200	15800
320	20700	19100	16800
310	21800	20300	18000
300	22800	21400	19300
290	24000	22500	20600
280	25100	23700	22000
270	26200	24800	23300
260	27300	26100	24600
250	28500	27500	26000
240	29700	28900	27400
230	30600	30200	28900
220	31400	31100	30300
210	32300	32000	31400
200	33200	33000	32500
190	34100	34000	33700
180	35000	34900	34800
170	36000	36000	35800
160	37000	37000	36800

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	84.7	89.1	91.1	93.6						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7616	7771	7912	8126						
340	%N1	83.8	88.1	90.0	92.2						
	MACH	.488	.535	.556	.578						
	KIAS	270	270	270	270						
	FF/ENG	7360	7485	7589	7762						
320	%N1	82.6	86.9	88.8	90.8	93.3					
	MACH	.483	.531	.552	.574	.597					
	KIAS	267	268	268	268	269					
	FF/ENG	7053	7156	7240	7378	7571					
300	%N1	80.5	84.9	87.0	88.8	90.8	93.8				
	MACH	.468	.514	.535	.556	.579	.603				
	KIAS	259	259	259	260	260	260				
	FF/ENG	6575	6634	6706	6789	6934	7132				
280	%N1	78.4	82.9	85.0	86.8	88.6	90.7	94.0			
	MACH	.453	.498	.517	.538	.560	.584	.609			
	KIAS	250	251	251	251	251	252	252			
	FF/ENG	6101	6136	6179	6258	6335	6478	6688			
260	%N1	76.2	80.7	82.7	84.7	86.4	88.3	90.4	94.0		
	MACH	.437	.481	.500	.520	.541	.563	.587	.613		
	KIAS	242	242	242	242	242	242	243	243		
	FF/ENG	5630	5659	5680	5728	5802	5878	6014	6228		
240	%N1	73.8	78.3	80.3	82.3	84.2	85.9	87.8	90.0	93.8	
	MACH	.421	.463	.481	.500	.520	.542	.565	.589	.615	
	KIAS	233	232	233	233	233	233	233	234	234	
	FF/ENG	5171	5184	5206	5227	5275	5340	5416	5541	5751	
220	%N1	71.4	75.8	77.7	79.7	81.6	83.5	85.3	87.1	89.4	93.4
	MACH	.404	.444	.461	.480	.499	.520	.542	.565	.590	.617
	KIAS	223	223	223	223	223	223	223	224	224	225
	FF/ENG	4720	4715	4736	4756	4775	4819	4878	4949	5062	5264
200	%N1	68.7	73.1	75.0	76.9	78.9	80.8	82.7	84.4	86.3	88.6
	MACH	.387	.425	.442	.460	.479	.498	.519	.541	.564	.589
	KIAS	213	213	213	213	213	213	213	213	213	214
	FF/ENG	4284	4281	4290	4310	4323	4339	4375	4426	4480	4578
180	%N1	66.3	70.8	72.6	74.5	76.5	78.5	80.2	82.2	83.9	85.7
	MACH	.374	.412	.428	.445	.463	.482	.503	.524	.546	.570
	KIAS	206	206	206	206	206	206	206	206	206	206
	FF/ENG	3937	3935	3933	3945	3959	3969	3984	4021	4066	4112
160	%N1	64.0	68.2	70.1	71.9	74.0	75.9	77.7	79.5	81.4	83.1
	MACH	.361	.397	.413	.429	.447	.465	.485	.505	.527	.550
	KIAS	199	199	199	199	199	199	199	199	199	199
	FF/ENG	3592	3585	3584	3585	3591	3602	3612	3628	3663	3702

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
316	284	257	235	216	200	189	180	171	162	155
634	570	515	470	433	400	379	359	341	326	312
956	859	774	706	650	600	568	539	512	489	468
1282	1149	1035	943	867	800	757	718	683	651	623
1610	1442	1297	1180	1084	1000	947	898	853	813	778
1942	1737	1560	1419	1302	1200	1136	1077	1024	976	933
2276	2034	1825	1658	1520	1400	1325	1256	1193	1137	1087
2614	2333	2091	1898	1739	1600	1514	1434	1362	1298	1241
2954	2634	2358	2138	1958	1800	1702	1613	1531	1459	1394
3297	2936	2626	2379	2176	2000	1891	1791	1701	1619	1547
3642	3240	2894	2620	2396	2200	2080	1969	1869	1780	1700
3991	3546	3164	2862	2615	2400	2268	2147	2037	1939	1852
4342	3853	3435	3104	2835	2600	2456	2324	2205	2098	2004
4697	4164	3707	3347	3055	2800	2644	2502	2373	2258	2156
5054	4476	3981	3591	3275	3000	2832	2679	2541	2416	2307
5414	4789	4255	3836	3495	3200	3020	2856	2708	2575	2458
5778	5105	4531	4081	3716	3400	3208	3033	2875	2734	2609
6146	5424	4808	4326	3937	3600	3396	3210	3041	2891	2759
6516	5744	5086	4572	4159	3800	3584	3386	3208	3049	2909
6889	6066	5365	4819	4380	4000	3772	3564	3375	3207	3059

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10		14		20		24		28	
	FUEL (1000 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	7.4	0:47	6.7	0:45	5.9	0:42	5.5	0:40	5.2	0:39
400	15.0	1:32	13.9	1:27	12.6	1:21	11.9	1:16	11.5	1:12
600	22.6	2:17	21.1	2:10	19.3	1:59	18.3	1:52	17.7	1:46
800	29.9	3:04	28.1	2:53	25.7	2:39	24.5	2:29	23.7	2:20
1000	37.3	3:50	35.0	3:37	32.1	3:18	30.6	3:06	29.7	2:55
1200	44.3	4:38	41.7	4:22	38.3	3:59	36.6	3:44	35.4	3:30
1400	51.4	5:27	48.4	5:07	44.5	4:40	42.5	4:22	41.2	4:06
1600	58.2	6:16	54.8	5:53	50.5	5:21	48.2	5:01	46.7	4:42
1800	65.0	7:05	61.3	6:39	56.5	6:03	53.9	5:40	52.2	5:19
2000	71.6	7:55	67.5	7:26	62.3	6:46	59.5	6:20	57.5	5:56
2200	78.1	8:46	73.8	8:14	68.1	7:28	65.0	7:00	62.8	6:33
2400	84.5	9:37	79.8	9:02	73.8	8:11	70.3	7:40	68.0	7:10
2600	90.8	10:29	85.9	9:50	79.4	8:55	75.7	8:20	73.1	7:48
2800	97.0	11:22	91.7	10:39	84.8	9:39	80.9	9:02	78.1	8:26
3000	103.1	12:15	97.5	11:28	90.2	10:23	86.1	9:43	83.0	9:05
3200	109.0	13:09	103.2	12:18	95.5	11:08	91.1	10:25	87.8	9:44
3400	114.9	14:03	108.8	13:09	100.8	11:53	96.1	11:07	92.7	10:23
3600	120.6	14:58	114.3	14:00	105.9	12:39	101.0	11:49	97.3	11:02
3800	126.4	15:53	119.7	14:51	111.0	13:25	105.8	12:32	102.0	11:42
4000	132.0	16:50	125.0	15:44	115.9	14:12	110.6	13:15	106.5	12:22

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
10	-1.7	-1.3	-0.9	-0.4	0.0	1.0	2.0	3.1	4.2	5.5
20	-3.6	-2.7	-1.8	-0.9	0.0	1.7	3.7	5.8	8.1	10.7
30	-5.5	-4.1	-2.8	-1.4	0.0	2.5	5.3	8.4	11.8	15.5
40	-7.3	-5.5	-3.7	-1.8	0.0	3.2	6.7	10.7	15.1	19.9
50	-9.1	-6.9	-4.6	-2.3	0.0	3.8	8.1	12.9	18.2	24.0
60	-10.8	-8.2	-5.5	-2.8	0.0	4.4	9.4	14.9	21.0	27.6
70	-12.5	-9.5	-6.4	-3.2	0.0	5.0	10.5	16.7	23.5	30.9
80	-14.2	-10.8	-7.3	-3.7	0.0	5.5	11.6	18.3	25.7	33.7
90	-15.9	-12.1	-8.1	-4.1	0.0	5.9	12.5	19.7	27.6	36.2
100	-17.5	-13.3	-9.0	-4.5	0.0	6.3	13.3	21.0	29.3	38.3
110	-19.1	-14.6	-9.8	-4.9	0.0	6.7	14.0	22.0	30.7	40.0
120	-20.6	-15.8	-10.7	-5.4	0.0	7.0	14.6	22.9	31.8	41.4
130	-22.1	-16.9	-11.5	-5.8	0.0	7.2	15.1	23.5	32.6	42.3
140	-23.5	-18.1	-12.3	-6.2	0.0	7.4	15.5	24.0	33.2	42.9

Descent at VREF30+80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	39	43	48	52	56	60	64	69	73
TIME (MINUTES)	11	12	12	13	14	15	15	16	17	17

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
360	%N1	76.2						
	KIAS	262						
	FF/ENG	7790						
340	%N1	75.0	78.1					
	KIAS	260	260					
	FF/ENG	7470	7470					
320	%N1	73.3	76.3					
	KIAS	253	253					
	FF/ENG	7010	7000					
300	%N1	71.2	74.3	78.7				
	KIAS	244	244	244				
	FF/ENG	6510	6490	6470				
280	%N1	69.2	72.5	76.8				
	KIAS	238	238	238				
	FF/ENG	6080	6070	6040				
260	%N1	67.4	70.5	74.9	79.5			
	KIAS	232	232	232	232			
	FF/ENG	5680	5680	5640	5670			
240	%N1	65.6	68.5	72.9	77.5	82.4		
	KIAS	226	226	226	226	226		
	FF/ENG	5300	5290	5250	5270	5320		
220	%N1	63.8	66.5	71.0	75.4	80.3		
	KIAS	220	220	220	220	220		
	FF/ENG	4940	4920	4880	4880	4930		
200	%N1	61.8	64.5	68.7	73.1	77.9	82.7	
	KIAS	213	213	213	213	213	213	
	FF/ENG	4580	4540	4500	4500	4530	4590	
180	%N1	59.6	62.4	66.3	70.8	75.4	80.2	84.8
	KIAS	206	206	206	206	206	206	206
	FF/ENG	4230	4190	4130	4130	4150	4180	4290
160	%N1	57.3	60.0	64.0	68.2	72.8	77.7	82.3
	KIAS	199	199	199	199	199	199	199
	FF/ENG	3880	3830	3770	3760	3770	3790	3870

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
360	%N1	75.9	78.9	83.8	88.3	94.3
	KIAS	242	242	242	242	242
	FF/ENG	7650	7690	7680	7800	8180
340	%N1	74.5	77.6	82.2	86.9	92.0
	KIAS	240	240	240	240	240
	FF/ENG	7290	7310	7300	7400	7690
320	%N1	72.7	75.7	80.2	85.1	89.9
	KIAS	233	233	233	233	233
	FF/ENG	6820	6820	6820	6880	7100
300	%N1	70.5	73.6	78.0	83.0	87.8
	KIAS	224	224	224	224	224
	FF/ENG	6310	6310	6300	6360	6490
280	%N1	68.4	71.6	76.0	80.8	85.7
	KIAS	218	218	218	218	218
	FF/ENG	5870	5870	5850	5910	6010
260	%N1	66.4	69.5	73.9	78.6	83.7
	KIAS	212	212	212	212	212
	FF/ENG	5470	5460	5430	5480	5550
240	%N1	64.5	67.3	71.8	76.3	81.4
	KIAS	206	206	206	206	206
	FF/ENG	5070	5050	5020	5060	5110
220	%N1	62.5	65.2	69.6	74.0	79.0
	KIAS	200	200	200	200	200
	FF/ENG	4690	4660	4620	4640	4690
200	%N1	60.2	62.9	67.0	71.5	76.2
	KIAS	193	193	193	193	193
	FF/ENG	4310	4260	4220	4230	4270
180	%N1	57.7	60.5	64.4	68.9	73.5
	KIAS	186	186	186	186	186
	FF/ENG	3940	3890	3830	3830	3860
160	%N1	55.2	57.8	61.8	65.9	70.5
	KIAS	179	179	179	179	179
	FF/ENG	3580	3520	3460	3430	3460

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb
Includes APU fuel burn

WEIGHT (1000 KG)		VREF30 + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	308	254	5000	3700	1300
300	288	246	7100	6100	4500
280	269	238	9200	8500	7400
260	249	231	11200	10500	9400
240	230	225	13200	12600	11500
220	211	219	15200	14800	13700
200	192	213	17500	16900	15900
180	173	206	19900	19700	18600
160	154	198	22300	21700	20900

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
340	200		
330	1700		
320	3200	600	
310	4500	2400	
300	5500	4200	1300
290	6600	5500	3200
280	7800	6800	5000
270	8900	8200	6700
260	10100	9400	8300
250	11200	10500	9400
240	12300	11600	10400
230	13200	12700	11500
220	14300	13800	12600
210	15400	14900	13800
200	16500	16000	15100
190	17800	17100	16200
180	19000	18700	17400
170	20300	20100	19000
160	21600	21100	20400

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		5	7	9	11	13	15	17	19
300	%N1	96.0	99.0						
	MACH	.413	.427						
	KIAS	250	249						
	FF/ENG	12977	13257						
280	%N1	93.5	95.6	98.8					
	MACH	.400	.414	.429					
	KIAS	242	242	241					
	FF/ENG	12015	12091	12444					
260	%N1	91.2	92.9	95.0	98.4				
	MACH	.387	.400	.414	.429				
	KIAS	234	234	233	233				
	FF/ENG	11137	11108	11216	11560				
240	%N1	88.9	90.6	92.3	94.7	98.4			
	MACH	.374	.388	.402	.418	.434			
	KIAS	226	226	226	226	226			
	FF/ENG	10249	10257	10303	10449	10806			
220	%N1	86.7	88.4	90.1	91.9	94.4	98.4		
	MACH	.364	.378	.392	.407	.422	.439		
	KIAS	220	220	220	220	220	220		
	FF/ENG	9466	9490	9517	9591	9723	10067		
200	%N1	84.1	86.0	87.7	89.5	91.4	93.9	98.1	
	MACH	.353	.366	.380	.394	.409	.425	.442	
	KIAS	213	213	213	213	213	213	213	
	FF/ENG	8676	8685	8711	8768	8843	8965	9313	
180	%N1	81.3	83.3	85.1	87.0	88.8	90.6	93.2	97.4
	MACH	.341	.354	.367	.381	.396	.412	.428	.445
	KIAS	206	206	206	206	206	206	206	206
	FF/ENG	7917	7917	7918	7967	8039	8106	8230	8570
160	%N1	78.4	80.3	82.2	84.1	86.1	87.8	89.7	92.2
	MACH	.329	.341	.354	.368	.382	.397	.413	.429
	KIAS	199	199	199	199	199	199	199	199
	FF/ENG	7154	7160	7151	7167	7230	7299	7359	7481

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
165	145	129	117	108	100	93	87	81	77	73
332	295	263	238	218	200	187	175	165	156	148
500	444	396	358	327	300	281	263	247	234	222
669	593	528	477	436	400	374	350	329	311	295
839	743	662	597	545	500	467	438	411	388	368
1009	894	795	718	655	600	561	525	494	466	442
1180	1044	928	838	764	700	654	612	575	543	515
1351	1196	1063	958	874	800	747	700	657	620	588
1523	1347	1197	1079	983	900	840	787	739	697	661
1696	1499	1331	1199	1093	1000	933	874	820	773	733

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	4.1	0:27	3.9	0:26	3.7	0:25	3.5	0:25	3.5	0:24
200	8.3	0:51	8.0	0:50	7.7	0:48	7.5	0:47	7.5	0:46
300	12.5	1:15	12.1	1:13	11.7	1:11	11.5	1:09	11.6	1:08
400	16.7	1:40	16.1	1:37	15.7	1:34	15.4	1:32	15.5	1:29
500	20.9	2:04	20.2	2:01	19.6	1:58	19.3	1:54	19.4	1:51
600	24.9	2:29	24.1	2:25	23.5	2:21	23.2	2:17	23.3	2:13
700	29.0	2:54	28.1	2:49	27.4	2:44	27.0	2:40	27.1	2:35
800	33.0	3:19	32.0	3:13	31.2	3:08	30.7	3:02	30.8	2:57
900	37.0	3:44	35.9	3:38	35.0	3:31	34.4	3:25	34.4	3:20
1000	40.9	4:09	39.7	4:02	38.7	3:55	38.1	3:48	38.0	3:42

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)									
	170	190	210	230	250	270	290	310	330	350
5	-0.9	-0.7	-0.4	-0.2	0.0	0.5	1.0	1.5	1.9	2.4
10	-1.9	-1.4	-0.9	-0.5	0.0	1.1	2.1	3.2	4.2	5.2
15	-2.9	-2.1	-1.4	-0.7	0.0	1.6	3.2	4.8	6.3	7.9
20	-3.8	-2.9	-1.9	-1.0	0.0	2.1	4.2	6.3	8.4	10.5
25	-4.8	-3.6	-2.4	-1.2	0.0	2.6	5.1	7.8	10.4	13.1
30	-5.8	-4.3	-2.9	-1.4	0.0	3.0	6.0	9.2	12.4	15.6
35	-6.8	-5.1	-3.4	-1.7	0.0	3.4	6.8	10.5	14.2	18.1
40	-7.8	-5.8	-3.9	-1.9	0.0	3.7	7.6	11.7	16.0	20.5
45	-8.8	-6.6	-4.4	-2.2	0.0	4.0	8.3	12.9	17.7	22.8

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
340	%N1	96.1			
	KIAS	260			
	FF/ENG	15250			
320	%N1	94.0	98.2		
	KIAS	253	253		
	FF/ENG	14280	14490		
300	%N1	91.8	95.1		
	KIAS	244	244		
	FF/ENG	13280	13280		
280	%N1	89.9	92.9		
	KIAS	238	238		
	FF/ENG	12380	12370		
260	%N1	87.9	90.9	96.3	
	KIAS	232	232	232	
	FF/ENG	11520	11580	11870	
240	%N1	85.6	88.9	93.4	
	KIAS	226	226	226	
	FF/ENG	10680	10760	10880	
220	%N1	83.3	86.7	91.0	98.4
	KIAS	220	220	220	220
	FF/ENG	9870	9940	10020	10570
200	%N1	80.8	84.1	88.6	93.9
	KIAS	213	213	213	213
	FF/ENG	9060	9110	9170	9410
180	%N1	78.2	81.3	86.1	90.6
	KIAS	206	206	206	206
	FF/ENG	8270	8310	8330	8510
160	%N1	75.5	78.4	83.1	87.8
	KIAS	199	199	199	199
	FF/ENG	7490	7510	7510	7660

This table includes 5% additional fuel for holding in a racetrack pattern.

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude,

wind, slope, and speed conditions. Each corrections is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 Table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .84/310/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

Maneuvers — Chapter MAN
Table of Contents — Section 0

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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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Approach to Stall Recovery

The following is immediately accomplished at the first indication of stall buffet or stick shaker.

Pilot Flying	Pilot Monitoring
• Advance the thrust levers to maximum thrust* • Smoothly adjust the pitch attitude** to avoid ground contact or obstacles • Level the wings (do not change flaps or landing gear configuration) • Retract the speedbrakes	• Verify maximum thrust • Monitor altitude and airspeed • Call out any trend toward terrain contact • Verify all required actions have been completed and call out any omissions
When ground contact is no longer a factor: • Adjust the pitch attitude to accelerate while minimizing altitude loss • Return to a speed appropriate for the configuration	

Note: *If an approach to stall is encountered with the autopilot engaged, apply maximum thrust and allow the airplane to return to the normal airspeed.

Note: **At high altitudes it may be necessary to descend to accelerate.

Note: If autopilot response is not acceptable, it should be disengaged.

Rejected Takeoff

The Captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the rejected takeoff maneuver by V1. If the decision is to reject the takeoff, the Captain must clearly announce “REJECT,” immediately start the rejected takeoff maneuver, and assume control of the airplane. If the First Officer is making the takeoff, the First Officer must maintain control of the airplane until the Captain makes a positive input to the controls.

Prior to 80 knots, the takeoff should be rejected for any of the following:

- activation of the master caution system
- system failure(s)
- unusual noise or vibration
- tire failure

- abnormally slow acceleration
- takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- if a side window opens
- if the airplane is unsafe or unable to fly

Above 80 knots and prior to V1, the takeoff should be rejected for any of the following:

- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly

During the takeoff, the crew member observing the non-normal situation will immediately call it out as clearly as possible.

Captain	First Officer
Without delay: Simultaneously close the thrust levers, disengage the autothrottles, and apply maximum manual wheel brakes or verify operation of RTO autobrakes. If RTO autobrakes is selected, monitor system performance and apply manual wheel brakes if the AUTOBRAKE message is displayed or deceleration is not adequate. Raise speedbrake lever. Apply the maximum amount of reverse thrust consistent with conditions. Continue maximum braking until certain the airplane will stop on the runway.	Verify actions as follows: Thrust levers closed. Autothrottles disengaged. Maximum brakes applied. Verify speedbrake lever UP and call “SPEEDBRAKES UP.” If speedbrake lever not UP call “SPEEDBRAKES NOT UP.” Reverse thrust applied. Call out any omitted action items.

Captain	First Officer
Field length permitting: Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.	Call out 60 knots. **A7-BAA - A7-BBH** Communicate the reject decision to the control tower and cabin as soon as practical. **A7-BFA, A7-BFB** Communicate the reject decision to the control tower as soon as practical.
When the airplane is stopped, perform procedures as required. Review Brake Cooling Schedule for brake cooling time and precautions (refer to the Performance Inflight chapter). Consider the following: • 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 the parking brake unless passenger evacuation is necessary • advising the ground crew of the hot brake hazard **A7-BAA - A7-BBH** • advising passengers of the need to remain seated or evacuate **A7-BFA, A7-BFB** • advising supernumeraries of the need to remain seated or evacuate • completion of Non-Normal checklist (if appropriate) for conditions which caused the RTO	

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 the flight path or the airplane configuration.	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer or backcourse approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope
- unreliable glideslope signal

Note: If a terrain caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.

Note: *As installed, some repeat.

Ground Proximity Warning

Accomplish the following maneuver for any of these conditions:

- activation of the “PULL UP”, “OBSTACLE OBSTACLE PULL UP”, or “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain

Pilot Flying	Pilot Monitoring
• Disconnect autopilot • Disconnect autothrottle(s) • 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 the 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 the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: * Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: If positive visual verification is made that no obstacle or terrain hazard exists when flying under daylight VMC conditions prior to a terrain or obstacle (as installed) warning, the alert may be regarded as cautionary and the approach may be continued.

Traffic Avoidance

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with RA if there is conflict between RA and air traffic control.

WARNING: Once an RA has been issued, safe separation could be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director 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 1000 feet AGL should not be followed.

Pilot Flying	Pilot Monitoring
If maneuvering is required, disengage the autopilot and autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

For a climb RA in landing configuration:

Pilot Flying	Pilot Monitoring
Disengage the autopilot and autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 20. Smoothly adjust pitch to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	Verify maximum thrust set. Position flap lever to 20 detent.
Verify a positive rate of climb on the altimeter and call "GEAR UP."	Verify a positive rate of climb on the altimeter and call "POSITIVE RATE." Set landing gear lever to UP.
Attempt to establish visual contact. Call out any conflicting traffic.	

Upset Recovery

An upset can generally be defined as unintentionally exceeding the following conditions:

- pitch attitude greater than 25 degrees nose up, or
- pitch attitude greater than 10 degrees nose down, or
- bank angle greater than 45 degrees, or
- within above parameters but flying at airspeeds inappropriate for the conditions

The following techniques represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all the actions may be necessary once recovery is underway. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume that the airplane is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stick shaker activation accompanied by one or more of the following:

- buffeting, which could be heavy at times
- lack of pitch authority and/or roll control
- inability to arrest descent rate

If the airplane is stalled, recovery from the stall must be accomplished first by applying and maintaining nose down elevator until stall recovery is complete and stick shaker activation ceases.

Nose High Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation.	•

• Disconnect autopilot and 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:
  • - when approaching the horizon, roll to wings level
  • - check airspeed and adjust thrust
  • - establish pitch attitude
	• 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.	•

• Disconnect autopilot and 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:
  • - apply nose up elevator
  • - *apply nose up trim, if required
  • - adjust thrust and drag as required
	• 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 the windshear	

Windshear Warning

Predictive windshear warning during takeoff roll: (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural)

- Prior to V1, reject takeoff
- After V1, perform the Windshear Escape Maneuver

Windshear encountered during takeoff roll:

- If windshear is 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 airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach: ("GO-AROUND, WINDSHEAR AHEAD" aural)

- perform Windshear Escape Maneuver or, at pilot's discretion, perform a normal go-around

Windshear encountered in flight:

- perform the Windshear Escape Maneuver

Note: The following are indications the airplane is in windshear:

- windshear warning (two-tone siren followed by "WINDSHEAR,WINDSHEAR,WINDSHEAR") or
- unacceptable flight path deviations

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 FPM vertical speed
- 5 degrees pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time

Windshear Escape Maneuver

Pilot Flying	Pilot Monitoring
MANUAL FLIGHT • Disconnect autopilot • Push either TO/GA switch • Aggressively apply maximum* thrust • Disconnect autothrottle(s) • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15° • Retract speedbrakes • Follow flight director TO/GA guidance (if available)	• Assure maximum* thrust • Verify all required actions have been completed and call out any omissions

Pilot Flying	Pilot Monitoring
AUTOMATIC FLIGHT • Press either TO/GA switch** • Verify TO/GA mode annunciation • Verify thrust advances to GA power • Retract speedbrakes • Monitor system performance***	• Assure maximum* thrust • Verify all required actions have been completed and call out any omissions
• 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	• Monitor vertical speed and altitude • Call out any trend toward terrain contact, descending flight path, or significant airspeed changes

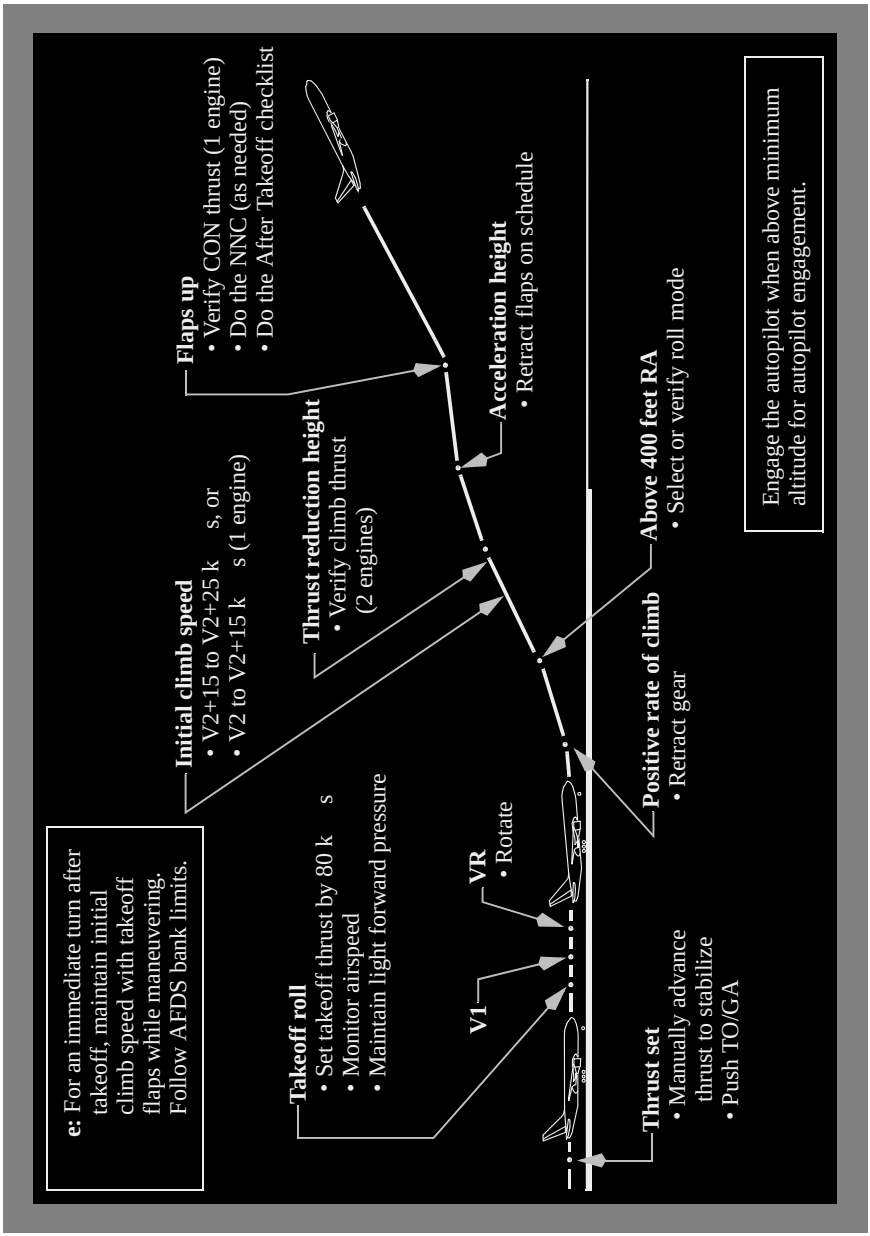
Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: * Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

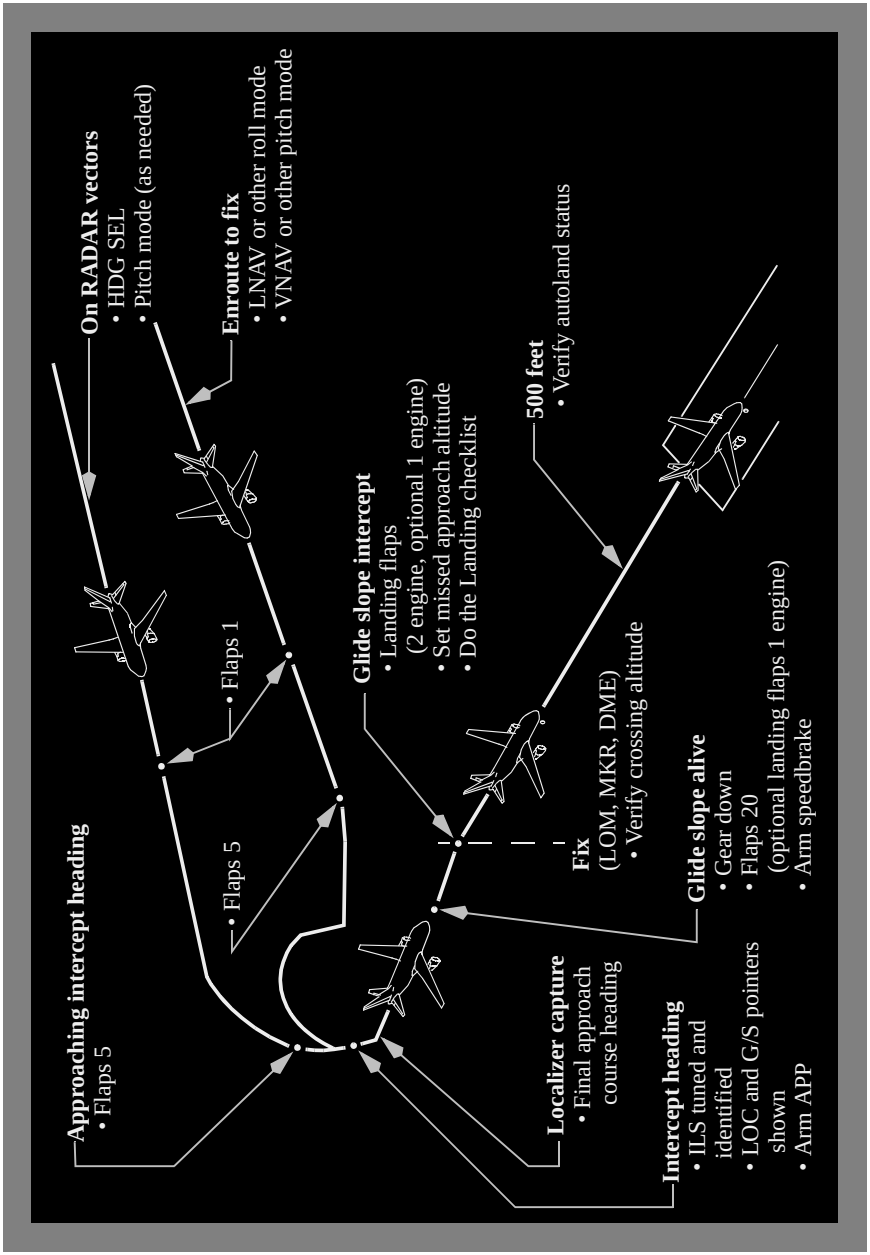
Note: ** If TO/GA is not available, disconnect autopilot and autothrottle(s) and fly manually.

WARNING: * Severe windshear may exceed the performance capability of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle(s) and fly manually.**

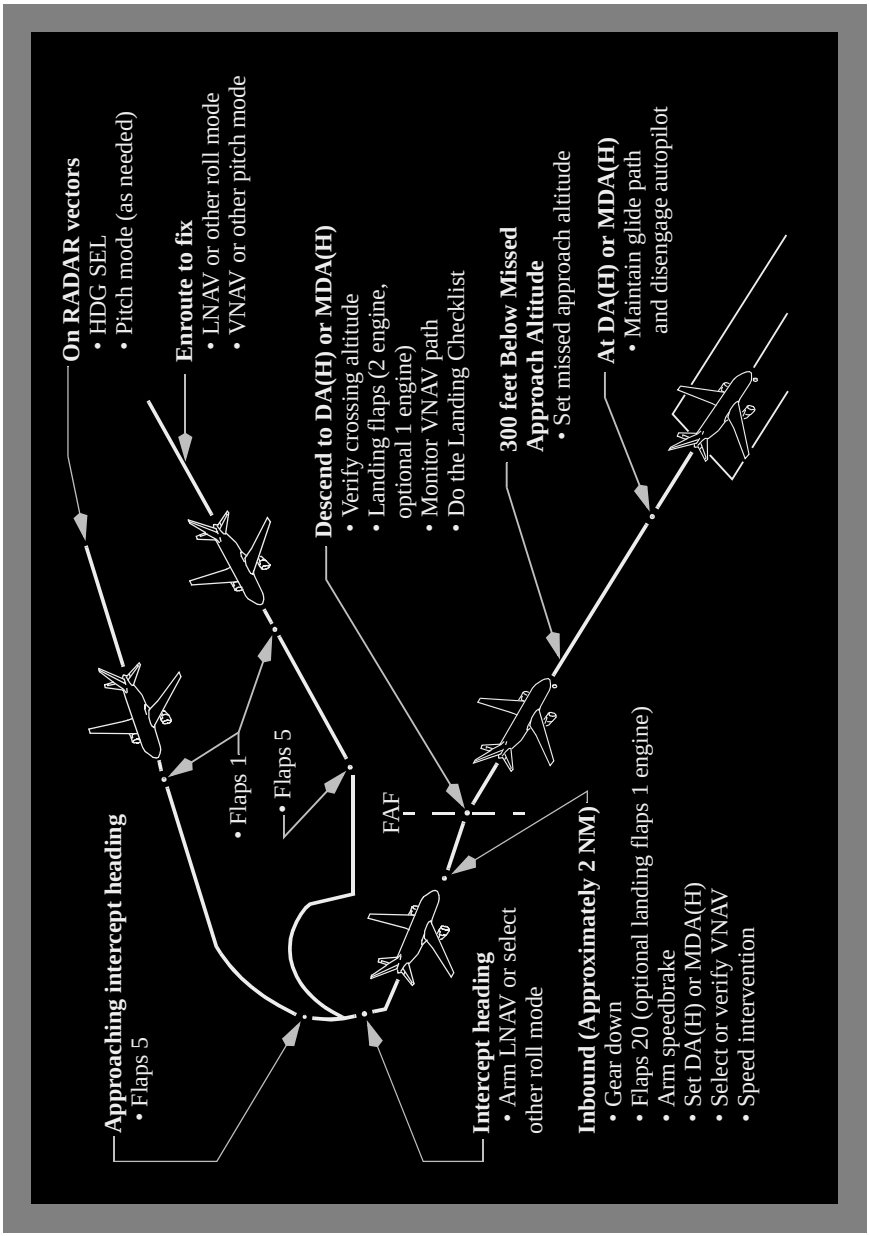
Takeoff



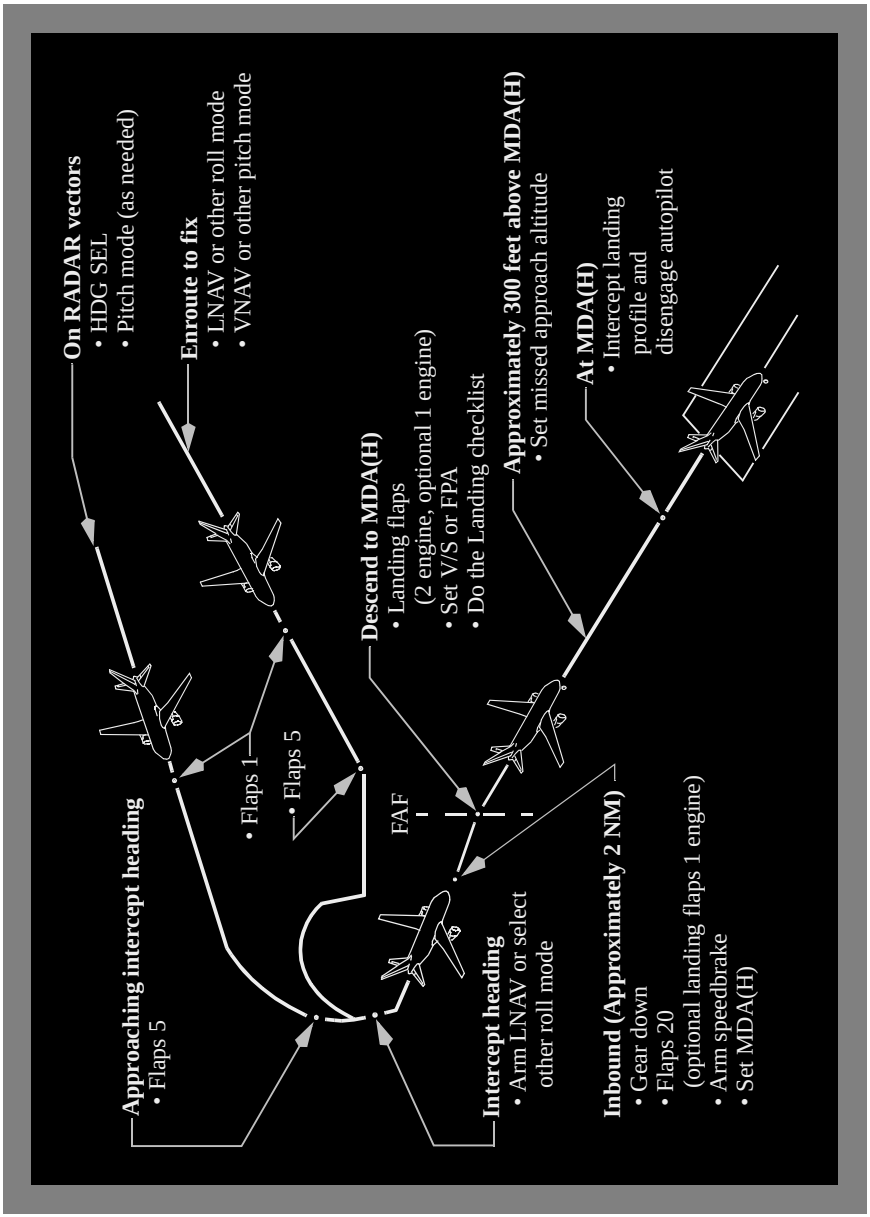
ILS Approach



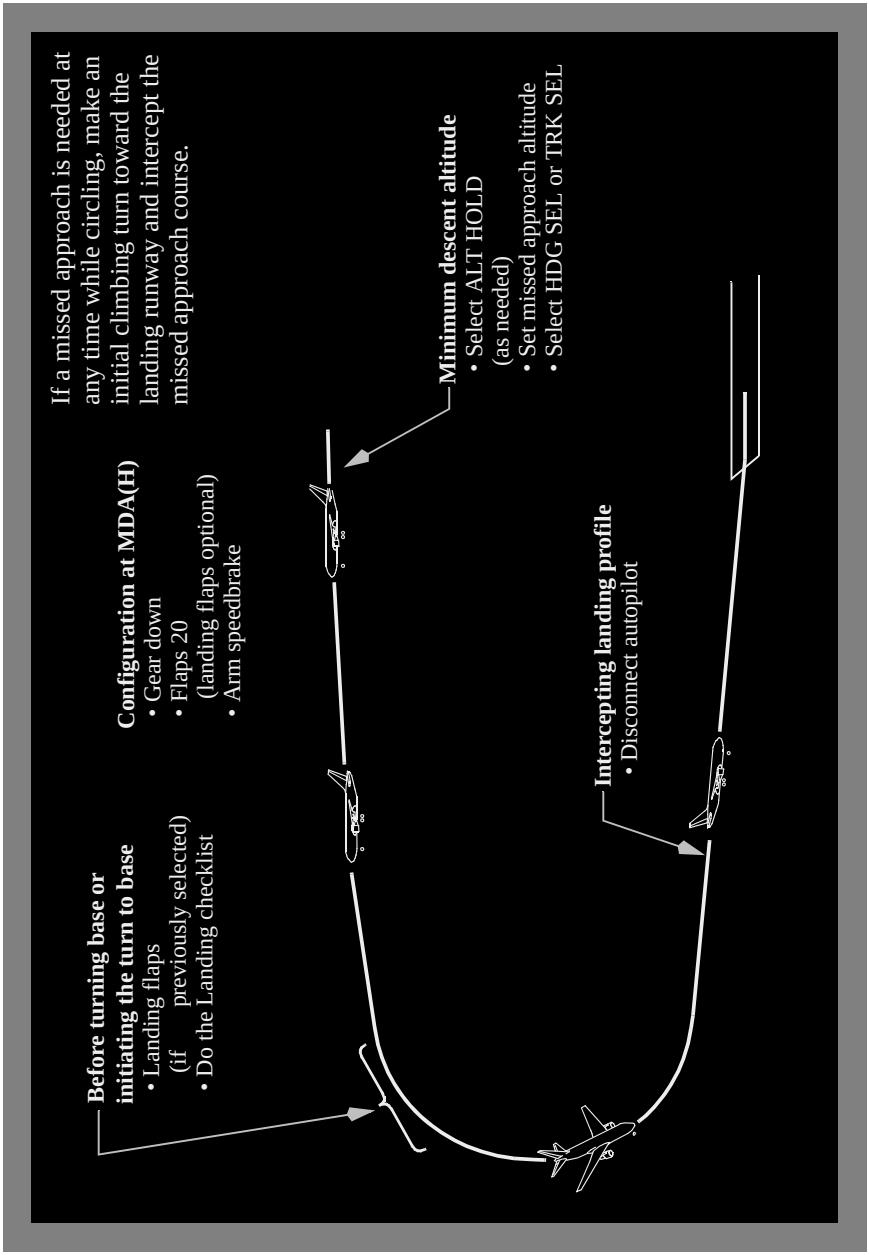
Instrument Approach Using VNAV



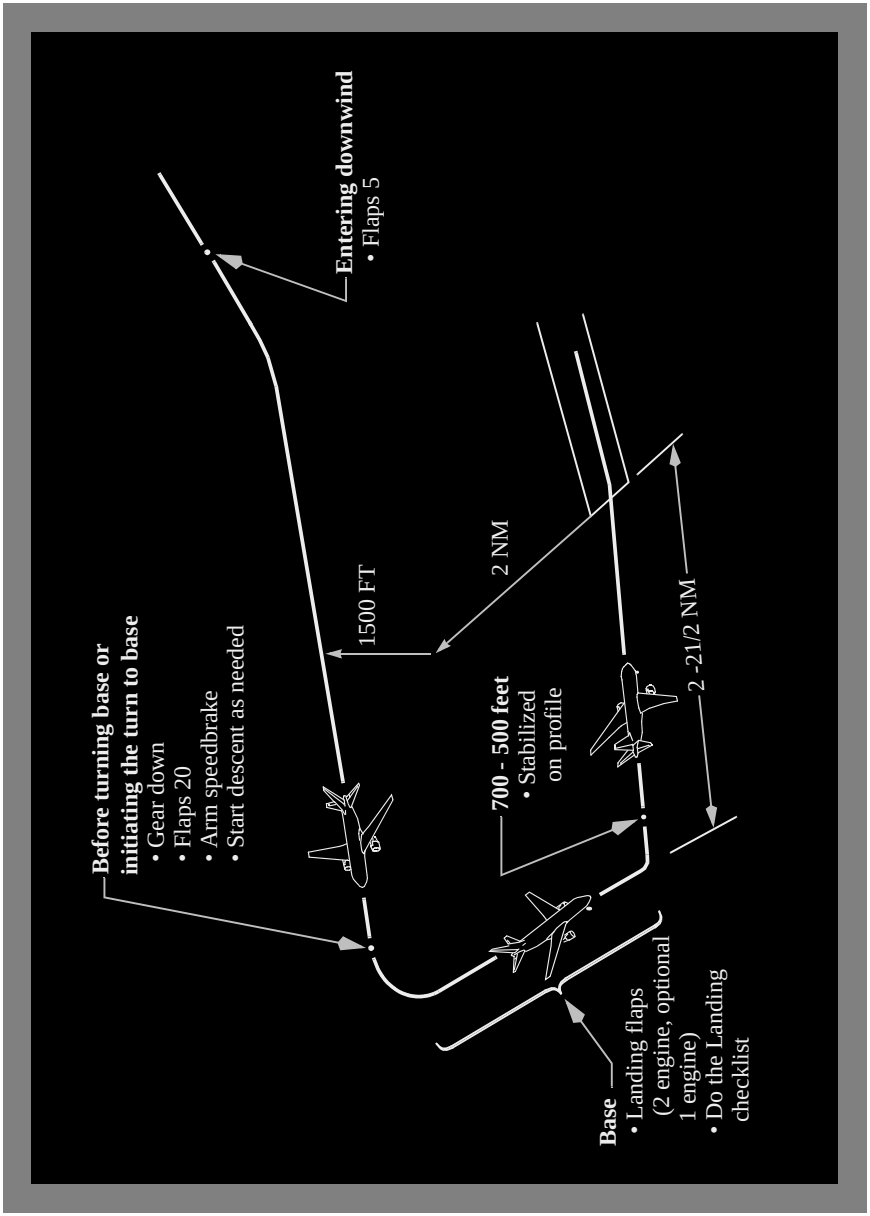
Instrument Approach Using V/S or FPA



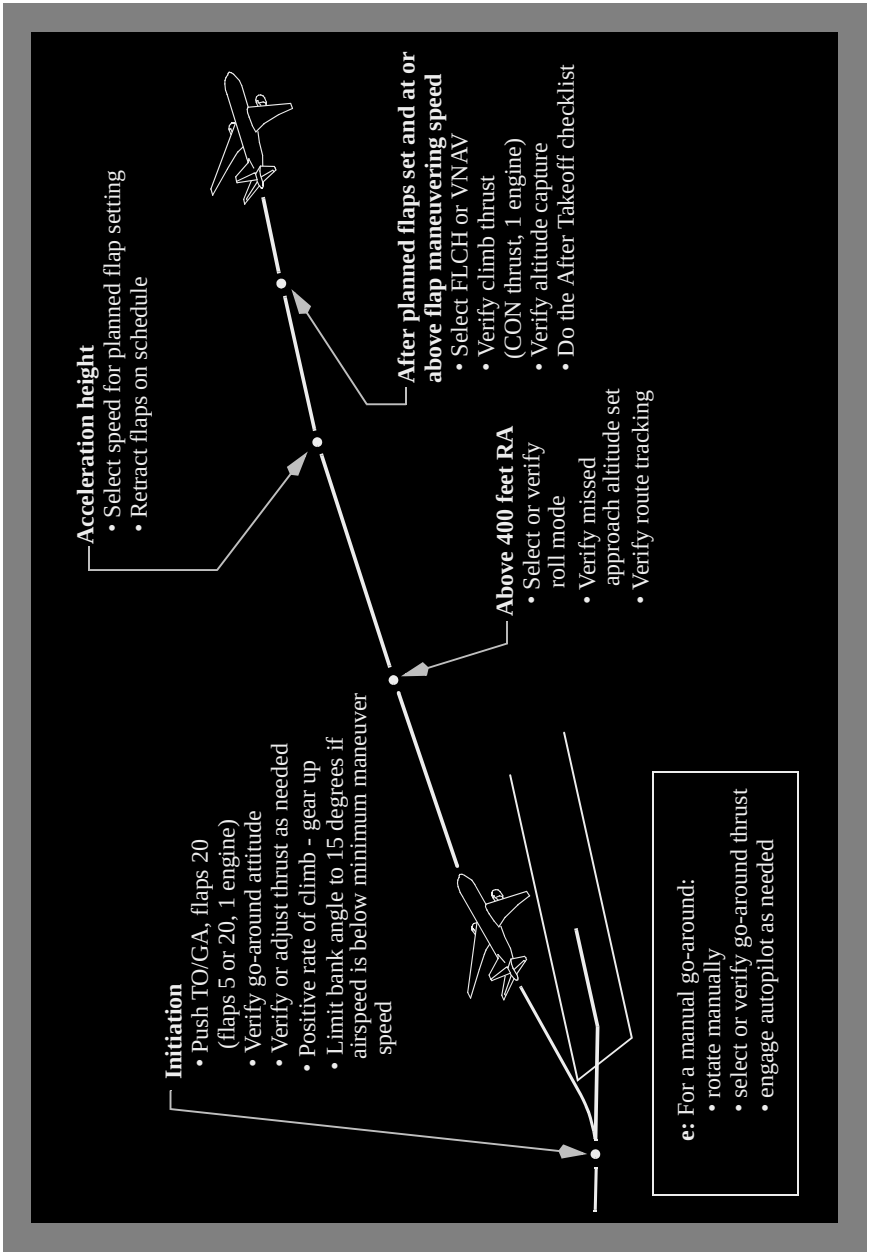
Circling Approach



Visual Traffic Pattern



Go–Around and Missed Approach



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Checklist Instructions — Chapter CI
Table of Contents — Section 0

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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	Serial Number	Tabulation Number
001	A7-BAA	36009	WD871
002	A7-BAB	36103	WD872
003	A7-BAC	36010	WD873
006	A7-BAE	36104	WD876
007	A7-BAF	37661	WD877
008	A7-BAG	36014	WD878
009	A7-BAH	37662	WD879
004	A7-BAI	36095	WD874
010	A7-BAJ	36096	WD880
011	A7-BAK	36097	WD881
005	A7-BAO	36011	WD875
101	A7-BBA	36012	WD081
102	A7-BBB	36013	WD082
103	A7-BBC	36015	WD083
104	A7-BBD	36016	WD084

Airplane Number	Registry Number	Serial Number	Tabulation Number
105	A7-BBE	36017	WD085
106	A7-BBF	36018	WD086
201	A7-BFA	36098	WF111
107	A7-BBG	36101	WD087
108	A7-BBH	36102	WD088
202	A7-BFB	36100	WF112

QRH Revision Transmittal Letter

To: All holders of Qatar Airways 777 Flight Crew Operations Manual, Boeing Document Number D632W001-QTR.

Subject: Quick Reference Handbook (QRH) Revision.

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
00	June 15, 2009	
1A	January 20, 2010	

No.	Revision Date	Date Filed
01	December 14, 2009	
1B	May 12, 2010	

General

The Boeing Company issues flight crew operations manual and QRH revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued flight crew operations manual bulletins.

The revision date is the approximate date the manual is mailed to the customer.

QRH revisions, part of the formal FCOM revisions, include a QRH Revision Transmittal Letter, a new QRH Revision Record, QRH Revision Highlights, and a current QRH List of Effective Pages. Use the information on the new QRH Revision Record and QRH List of Effective Pages to verify the QRH content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

The record above should be completed by the person incorporating the revision into the manual.

QRH Filing Instructions

Consult the QRH List of Effective Pages (CI.LEP). Pages identified with an asterisk (*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

QRH Revision Highlights

This section (CI.RR) replaces the existing section CI.RR in your manual.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the QRH List of Effective Pages (CI.LEP) can help determine the correct content of the QRH.

Throughout the QRH, airplane effectivity may be updated to reflect coverage as listed on the Model Identification page (CI.ModID), or to show service bulletin airplane effectivity. Highlights are not supplied for these types of changes.

This QRH is published from a database; the text and illustrations are marked with configuration information. Occasionally, because the editors rearrange the database markers, or mark items with configuration information due to the addition of new database content, some customers may receive revision bars on content that appears to be unchanged. Pages may also be republished without revision bars due to slight changes in the flow of the document.

Chapter PI-QRH - Performance Inflight - QRH

Section 20 - General

General

PI-QRH.20.1 - Incorporation of Freighter Performance Inflight data.

Checklist Instructions — Chapter CI
List of Effective Pages — Section LEP

Page	Date
Quick Reference Handbook	
Quick Action Index	
QA.Index.1-2	December 14, 2009
EICAS Messages (tab)	
EICAS.Index.1-12	January 20, 2010
Unannunciated Index (tab)	
Unann.Index.1-2	January 20, 2010
Alphabetical Index (tab)	
Alpha.Index.1-12	January 20, 2010
Normal Checklists (tab)	
NC.1-2	December 14, 2009
NC.3-4	June 15, 2009
0 Miscellaneous (tab)	
0.TOC.1-2	June 15, 2009
0.1-2	December 14, 2009
0.3	June 15, 2009
0.4-5	December 14, 2009
0.6	June 15, 2009
1 Airplane General, Emergency Equipment, Doors, Windows (tab)	
1.TOC.1-2	December 14, 2009
1.1	December 14, 2009
1.2	June 15, 2009
1.3-5	December 14, 2009
1.6	June 15, 2009
1.7-16	December 14, 2009
2 Air Systems (tab)	
2.TOC.1-2	December 14, 2009
2.1-28	December 14, 2009

Page	Date
3 Anti-Ice, Rain (tab)	
3.TOC.1-2	June 15, 2009
3.1	June 15, 2009
3.2	December 14, 2009
3.3	June 15, 2009
3.4-5	December 14, 2009
3.6-9	June 15, 2009
3.10-11	December 14, 2009
3.12-14	June 15, 2009
4 Automatic Flight (tab)	
4.TOC.1-2	June 15, 2009
4.1-2	June 15, 2009
5 Communications (tab)	
5.TOC.1-2	June 15, 2009
5.1	December 14, 2009
5.2-4	June 15, 2009
6 Electrical (tab)	
6.TOC.1-2	June 15, 2009
6.1	June 15, 2009
6.2	December 14, 2009
6.3-4	June 15, 2009
6.5	December 14, 2009
6.6	June 15, 2009

* = Revised, Added, or Deleted

Page	Date
7 Engines, APU (tab)	
7.TOC.1-2	January 20, 2010
7.1-2	June 15, 2009
7.3	December 14, 2009
7.4	June 15, 2009
7.5-7	December 14, 2009
7.8	June 15, 2009
7.9-10	December 14, 2009
7.11-12	June 15, 2009
7.13-42	January 20, 2010
8 Fire Protection (tab)	
8.TOC.1-2	December 14, 2009
8.1-2	June 15, 2009
8.3-4	December 14, 2009
8.5	June 15, 2009
8.6-34	December 14, 2009
9 Flight Controls (tab)	
9.TOC.1-2	December 14, 2009
9.1	June 15, 2009
9.2-3	December 14, 2009
9.4	June 15, 2009
9.5	December 14, 2009
9.6	June 15, 2009
9.7	December 14, 2009
9.8	June 15, 2009
9.9-10	December 14, 2009
9.11-12	June 15, 2009
9.13	December 14, 2009
9.14-16	June 15, 2009
9.17	December 14, 2009
9.18	June 15, 2009

Page	Date
9 Flight Controls (cont)	
9.19-20	December 14, 2009
9.21-22	June 15, 2009
9.23-25	December 14, 2009
9.26	June 15, 2009
10 Flight Instruments, Displays (tab)	
10.TOC.1-2	June 15, 2009
10.1	June 15, 2009
10.2-4	December 14, 2009
10.5-6	June 15, 2009
11 Flight Management, Navigation (tab)	
11.TOC.1-2	June 15, 2009
11.1-3	June 15, 2009
11.4-5	December 14, 2009
11.6	June 15, 2009
11.7-8	December 14, 2009
11.9-10	June 15, 2009
12 Fuel (tab)	
12.TOC.1-2	June 15, 2009
12.1	June 15, 2009
12.2	December 14, 2009
12.3-4	June 15, 2009
12.5	December 14, 2009
12.6	June 15, 2009
12.7-8	December 14, 2009
12.9-11	June 15, 2009
12.12-17	December 14, 2009
12.18	June 15, 2009
12.19	December 14, 2009
12.20-21	June 15, 2009
12.22-23	December 14, 2009

* = Revised, Added, or Deleted

Page	Date
12 Fuel (cont)	
12.24	June 15, 2009
13 Hydraulics (tab)	
13.TOC.1-2	June 15, 2009
13.1-4	June 15, 2009
13.5-7	December 14, 2009
13.8	June 15, 2009
13.9-11	December 14, 2009
13.12-13	June 15, 2009
13.14-15	December 14, 2009
13.16	June 15, 2009
13.17	December 14, 2009
13.18	June 15, 2009
13.19-22	December 14, 2009
13.23-26	June 15, 2009
13.27	December 14, 2009
13.28	June 15, 2009
14 Landing Gear (tab)	
14.TOC.1-2	December 14, 2009
14.1-2	June 15, 2009
14.3-10	December 14, 2009
15 Warning Systems (tab)	
15.TOC.1-2	December 14, 2009
15.1-3	June 15, 2009
15.4-6	December 14, 2009
Operations Information (tab)	
OI.TOC.0.1-2	December 14, 2009
OI.1.1-2	June 15, 2009

Page	Date
Performance - Inflight (tab)	
* PI-QRH.TOC.1-2	May 12, 2010
PI-QRH.TOC.10.1-2	June 15, 2009
PI-QRH.10.1-4	June 15, 2009
PI-QRH.11.1-12	June 15, 2009
PI-QRH.12.1-12	June 15, 2009
PI-QRH.13.1-8	June 15, 2009
PI-QRH.14.1-4	June 15, 2009
PI-QRH.15.1-6	June 15, 2009
* PI-QRH.TOC.20.1-2	May 12, 2010
* PI-QRH.20.1-6	May 12, 2010
* PI-QRH.21.1-30	May 12, 2010
* PI-QRH.22.1-12	May 12, 2010
* PI-QRH.23.1-8	May 12, 2010
* PI-QRH.24.1-6	May 12, 2010
PI-QRH.TOC.30.1-2	June 15, 2009
PI-QRH.30.1-4	June 15, 2009
PI-QRH.31.1-12	June 15, 2009
PI-QRH.32.1-12	June 15, 2009
PI-QRH.33.1-8	June 15, 2009
PI-QRH.34.1-4	June 15, 2009
PI-QRH.35.1-6	June 15, 2009
Maneuvers (tab)	
MAN.TOC.0.1-2	December 14, 2009
MAN.05.1-2	June 15, 2009
MAN.1.1	June 15, 2009
MAN.1.2-12	December 14, 2009
MAN.2.1-8	June 15, 2009
Checklist Instructions (tab)	
CI.TOC.0.1-2	June 15, 2009

* = Revised, Added, or Deleted

Page	Date
Model Identification	
* CI.ModID.1-2	May 12, 2010
Revision Record	
* CI.RR.1-2	May 12, 2010
List of Effective Pages	
* CI.LEP.1-4	May 12, 2010
Checklist Instructions	
CI.1.1-4	June 15, 2009
CI.2.1-4	June 15, 2009
CI.2.5	December 14, 2009
CI.2.6-8	June 15, 2009
Evacuation	
Back Cover.1	June 15, 2009
Back Cover.2	December 14, 2009

* = Revised, Added, or Deleted

Introduction

This introduction gives guidelines for use of the printed version of the Normal Checklist (NC) as well as the Electronic Checklist (ECL).

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation

Normal checklists are used after doing all respective procedural items.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Captain	First officer	Both	Area of responsibility
BEFORE START	Captain	First officer	Both	Area of responsibility
BEFORE TAXI	Captain	First officer	Both	Area of responsibility
BEFORE TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot flying
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring
DESCENT	Pilot flying	Pilot monitoring	Both	Area of responsibility
APPROACH	Pilot flying	Pilot monitoring	Both	Area of responsibility
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Area of responsibility
SECURE	Captain	First officer	Both	Area of responsibility

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that an entire procedure was not done:

- stop the checklist
- complete the entire procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, do the checklist from the start. If the checklist is stopped for a long time, also do the checklist from the start.

After completion of each checklist, the pilot reading the checklist calls, "_____ CHECKLIST COMPLETE."

Electronic Checklist Operation

Operation with the electronic normal checklist is the same as the printed normal checklist except that, there is no need to read aloud or visually confirm items that are complete (green). For the BEFORE TAKEOFF and LANDING checklists, the PM announces "___ CHECKLIST COMPLETE," the PF visually confirms that the CHECKLIST COMPLETE indication is shown, and announces "CHECKLIST COMPLETE."

Closed loop (sensed) checklist items change from white to green when the action is taken. The PM is responsible to check off any open loop (not sensed) item and to verify that all closed loop items are green. See Chapter 10, Flight Instruments, Displays, for a complete description of the electronic checklist system.

Checklist Content

The checklist has the minimum items needed to operate the airplane safely.

Normal checklists have items that meet any of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system, or
- items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- needed to meet regulatory requirements, or
- items needed to maintain fleet commonality between the 737, 747-400, 757, 767, 777, and 787, or
- items that enhance safety of flight and are not monitored by an alerting system (for example the autobrake), or
- during shutdown and secure, items that could result in injury to personnel or damage to equipment if not done

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.

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Introduction

The non-normal checklists chapter contains checklists used by the flight crew to manage non–normal situations. The checklists are grouped in sections which match the system description chapters in Volume 2.

Most checklists correspond to an EICAS alert message. The EICAS alert message indicates a non-normal condition and is the cue to select and do the associated checklist.

Checklists without an EICAS alert message (such as Ditching) are called unannunciated checklists. Most unannunciated checklists are in the associated system section. For example, Fuel Leak is in section 12, Fuel. Unannunciated checklists with no associated system are in section 0, Miscellaneous.

A rectangle icon [ ] precedes all EICAS alert messages that have procedural steps, notes, or other information of which the flight crew should be aware. The rectangle icon is removed from the EICAS message when the checklist has been completed. In the printed non–normal checklists, the titles also have the rectangle icon to agree with the EICAS alert message. EICAS alert messages without rectangle icons are informational, have no procedural steps or notes, or the action is obvious (such as OVERSPEED).

All checklists have condition statements. The condition statement briefly describes the situation that caused the EICAS alert message. Unannunciated checklists also have condition statements to help in understanding the reason for the checklist.

Some checklists have objective statements. The objective statement briefly describes the expected result of doing the checklist or briefly describes the reason for steps in the checklist.

Checklists can have both memory and reference items. Memory items are critical steps that must be done before reading the checklist. In the printed non-normal checklists, the last memory item is followed by a dashed horizontal line. In the electronic checklists, memory items are not identified. Reference items are actions to be done while reading the checklist.

Some checklists have additional information at the end of the checklist. The additional information provides data the crew may wish to consider. The additional information does not need to be read.

Checklists that need a quick response are listed in the Quick Action Index. In each system section, Quick Action Index checklists are listed first, followed by checklists that are not in the Quick Action Index. The titles of Quick Action Index checklists are printed in **bold** type. Checklist titles in upper case (such as AUTOBRAKE) are annunciated by an EICAS alert message or other indication. Checklist titles in upper and lower case (such as Window Damage L, R) are not annunciated.

Electronic Checklist Operation

A non–normal menu is given for the electronic checklist.

The primary purposes of the non–normal menu are to access unannunciated checklists and to access the condition statements for EICAS alert messages without rectangle icons.

The non-normal menu is also used to access checklists for EICAS alert messages with rectangle icons to allow review of the checklist. Operation of the electronic checklist is described in section 10; Flight Instruments, Displays.

Non–Normal Checklist Operation

Non–normal checklists start with steps to correct the situation. If needed, information for planning the rest of the flight is included. In the printed non-normal checklists, when special items are needed to configure the airplane for landing, the items are included in the Deferred Items section of the checklist. In the electronic checklists, deferred items are automatically added to the end of the applicable normal checklist. Flight patterns for some non–normal situations are located in the Maneuvers chapter and show the sequence of configuration changes.

While every attempt is made to supply needed non–normal checklists, it is not possible to develop checklists for all conceivable situations. In some smoke, fire, or fumes situations, the flight crew may need to move between the Smoke, Fire or Fumes checklist and the Smoke or Fumes Removal checklist. In some multiple failure situations, the flight crew may need to combine the elements of more than one checklist. In all situations, the captain must assess the situation and use good judgment to determine the safest course of action.

There are some situations where the flight crew must land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non–normal checklist includes the item “Plan to land at the nearest suitable airport.”
- fire or smoke continues

- only one AC power source remains (main engine generator, APU generator, or backup power system [both generators])
- any other situation determined by the flight crew to have a significant adverse effect on safety if the flight is continued.

It must be stressed that for smoke that continues or a fire that cannot be positively confirmed to be completely extinguished, the earliest possible descent, landing, and evacuation must be done.

If a smoke, fire or fumes situation becomes uncontrollable, the flight crew should consider an immediate landing. Immediate landing implies immediate diversion to a runway. However, in a severe situation, the flight crew should consider an overweight landing, a tailwind landing, an off-airport landing, or a ditching.

Checklists directing an engine shutdown must be evaluated by the captain to determine whether an actual shutdown or operation at reduced thrust is the safest course of action. Consideration must be given to the probable effects of running the engine at reduced thrust.

There are no non–normal checklists for the loss of an engine indication or automatic display of the secondary engine indications. Continue normal engine operation unless an EICAS alert message shows or a limit is exceeded.

Non–normal checklists also assume:

- During engine start and before takeoff, the associated non–normal checklist is done if an EICAS alert message is shown or a non-normal situation is identified. After completion of the checklist, the Dispatch Deviations Guide or operator equivalent is consulted to determine if Minimum Equipment List dispatch relief is available.
- System controls are in the normal configuration for the phase of flight before the start of the non–normal checklist.
- Aural alerts are silenced and the system is reset by the flight crew as soon as the cause of the alert is recognized.
- The EICAS message list is cancelled after all checklists are complete or on hold so that future messages are more noticeable.
- The EMERGENCY position of the oxygen regulator is used when needed to supply positive pressure in the masks and goggles to remove contaminants. The 100% position of the oxygen regulator is used when positive pressure is not needed but contamination of the flight deck air exists. The Normal position of the oxygen regulator is used if prolonged use is needed and the situation allows. Normal boom microphone operation is restored when oxygen is no longer in use.
- Indicator lights are tested to verify suspected faults.

- In flight, flight crew reset of a tripped circuit breaker is not recommended. However, a tripped circuit breaker may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. On the ground, flight crew reset of a tripped circuit breaker should only be done after maintenance has determined that it is safe to reset the circuit breaker.
- Flight crew cycling (pulling and resetting) of a circuit breaker to clear a non-normal condition is not recommended, unless directed by a non-normal checklist.

Non–Normal Checklist Use

If a checklist or a step in a checklist is not applicable to all airplanes, airplane effectivity information is included in the checklist. Airplane effectivity can be listed by airplane number, registry number, serial number or tabulation number. If a checklist is applicable to some but not all airplanes, airplane effectivity is centered below the checklist title. If a step in a checklist is applicable to some but not all airplanes, airplane effectivity is included above the step. If a checklist or a step in a checklist is applicable to all airplanes, airplane effectivity information is not included.

Non–normal checklist use starts when the airplane flight path and configuration are correctly established. Only a few situations need an immediate response (such as CABIN ALTITUDE). Usually, time is available to assess the situation before corrective action is started. All actions must then be coordinated under the captain's supervision and done in a deliberate, systematic manner. Flight path control must never be compromised.

When a non–normal situation occurs, at the direction of the pilot flying, both crewmembers do all memory items in their areas of responsibility without delay.

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical phase of flight (such as takeoff or landing)
- all memory items are complete.

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist. With the electronic checklist, items that are complete (green) do not need to be read or verified. The item numbers do not need to be read.

Non-memory items are called reference items. The pilot monitoring reads aloud the reference items, including:

- the precaution (if any)
- the response or action
- any amplifying information.

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood. The item numbers do not need to be read.

The word "Confirm" is added to checklist items when both crewmembers must verbally agree before action is taken. During an inflight non-normal situation, verbal confirmation is required for:

- an autothrottle arm switch
- an engine thrust lever
- a fuel control switch
- an engine or APU fire switch, or a cargo fire arm switch
- a generator drive disconnect switch.

This does not apply to the Dual Eng Fail/Stall checklist.

With the airplane stationary on the ground:

- the captain and first officer take action based on preflight and postflight Areas of Responsibility.

With the airplane in flight or in motion on the ground:

- the pilot flying and the pilot monitoring take action based on each crewmember’s areas of responsibility.

After moving the control, the crewmember taking the action also states the checklist response.

Closed loop (sensed) checklist items change from white to green when the action is taken. The pilot monitoring must “check off” any open loop (not sensed) items and verify that all closed loop items are green.

The pilot flying may also direct reference checklists to be done by memory if no hazard is created by such action, or if the situation does not allow reference to the checklist.

Checklists include an Inoperative Items table only when the condition of the items is needed for planning the rest of the flight and the condition is not shown on EICAS. The inoperative items, including the consequences (if any), are read aloud by the pilot monitoring. The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood.

Consequential EICAS alert messages can show as a result of a primary failure condition (such as AUTO SPEEDBRAKE as a result of HYD PRESS SYS C) or as a result of doing a non–normal checklist (such as PACK L or PACK R as a result of doing the Smoke, Fire or Fumes checklist). Consequential messages are shown for flight crew awareness, with the rectangle icons automatically removed. The flight crew does not do the checklists for consequential EICAS alert messages. In the printed primary checklist, the statement "Do not accomplish the following checklists:" is included to inform the flight crew of consequential checklists. In the electronic primary checklist, the statement “Inhibited checklists:” is included to inform the crew of consequential checklists. When doing the electronic primary checklist, the statement and the list of checklists do not need to be read. All consequential EICAS alert messages may not show while doing the primary checklist, depending on operational circumstances.

After completion of the non-normal checklist, normal procedures are used to configure the airplane for each phase of flight.

When there are no deferred items, the DESCENT, APPROACH, and LANDING normal checklists are used to verify that the configuration is correct for each phase of flight.

When there are deferred items, the non-normal checklist will include the item "**Checklist Complete Except Deferred Items.**" The pilot flying is to be made aware when there are deferred items. In the printed non-normal checklists, these items are included in the Deferred Items section of the checklist and may be delayed until the usual point during descent, approach or landing. In the electronic checklists, these items are automatically added to the end of the applicable normal checklist and may be delayed until the usual point during descent, approach, or landing.

The deferred items are read aloud by the pilot monitoring. The pilot flying or the pilot monitoring takes action based on each crewmember’s area of responsibility. After moving the control, the crewmember taking the action also states the response.

In the printed non-normal checklists, when there are deferred items, the Deferred Items section of the non-normal checklist will include the Descent, Approach, and Landing normal checklists. These checklists should be used instead of the usual DESCENT, APPROACH, and LANDING normal checklists. If a normal checklist item is changed as a result of the non-normal situation, the changed response is printed in **bold** type. In the electronic checklists, when there are deferred items, the items are automatically added to the end of the usual DESCENT, APPROACH, or LANDING normal checklist. The pilot flying or the pilot monitoring responds to the deferred normal checklist items based on each crewmember’s area of responsibility. However, during the deferred Landing normal checklist, the pilot flying responds to all deferred normal checklist items.

In the printed non-normal checklists, each checklist has a checklist complete symbol at the end. The following symbol indicates that the checklist is complete.

The checklist complete symbol can also be in the body of the checklist. This only occurs when a checklist divides into two or more paths. Each path can have a checklist complete symbol at the end. The flight crew does not need to continue reading the checklist after a checklist complete symbol in the body of the checklist. In the electronic checklists, each checklist has a "Checklist Complete" item at the end. There is only one checklist complete item.

After completion of each non–normal checklist, the pilot monitoring states "___ CHECKLIST COMPLETE."

Additional information at the end of the checklist is not required to be read.

The flight crew must be aware that the checklists cannot be created for all conceivable situations and are not intended to replace good judgement. In some situations, at the captain’s discretion, deviation from a checklist may be needed.

Non-Normal Checklist Legend

Redirection Symbol

The redirection symbol is used in a non-normal checklist, with the words "Go to", to direct the flight crew to a different checklist or to a different step in the current checklist.

Separator Symbol

The separator symbol is used in two ways:

- In the Table of Contents of a system section, to separate the Quick Action Index checklists from the checklists that are not in the Quick Action Index.
- In a non-normal checklist, to separate the memory items from the reference items.

Task Divider Symbol

The task divider symbol is used to indicate the end of one task and the beginning of another task.

Decision Symbol

Choose one:

The decision symbol is used to identify possible choices.

Precaution Symbol

The precaution symbol is used to identify information the flight crew must consider before taking the action.

Evacuation Checklist is on the reverse side of this page.

Evacuation

Condition: An evacuation is needed.

1	Parking brake . . . . . Set	C
2	OUTFLOW VALVE switches (both) . . . . . MAN	F/O
3	OUTFLOW VALVE MANUAL switches (both) . . . . . Push to OPEN and hold until the outflow valve displays show fully open to depressurize the airplane	F/O
4	FUEL CONTROL switches (both) . . . . . CUTOFF	C
5	Advise the cabin to evacuate.	C
6	Advise the tower.	F/O
7	Engine fire switches (both) . . . . . Pull	F/O
8	APU fire switch . . . . . Override and pull	F/O
9	**If** an engine or APU fire warning light is illuminated:	
	Illuminated fire switch . . . . . Rotate to the stop and hold for 1 second	F/O

■ ■ ■ ■