747
Quick Reference Handbook

Quick Action Index

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BRITISH AIRWAYS

B747
Quick Reference
Handbook

Rev. No.	Date Entered	Initials	Rev. No.	Date Entered	Initials
All to Rev 47 incorporated					
48	Dec 2009				
49	Sep 2010				
50	Mar 2011				
51	Oct 2011				
52	Jan 2012				
53	Feb 2013				
54	May 2013				
55	July 2013				
56	Nov 2013				
57	July 2014				
58	Jan 2015				
59	June 2015				
60	Feb 2016				
61	Aug 2016				
62	Jan 2017				
63	Nov 2017				

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Normal Checklists — Chapter NC

PREFLIGHT

Inspections & security .... Completed
Oxygen .... Tested, 100%
Flight instruments .... Heading___, Altimeter___
Parking brake .... Set
Fuel control switches .... CUTOFF
PFD .... V2___, LNAV/VNAV___, ALT___
Takeoff speeds .... V1___, VR___, V2___
CDU preflight .... Completed
Taxi and takeoff briefing .... Completed

BEFORE START

Flight deck door .... Closed and locked
Passenger signs .... ON
Beacon .... BOTH
Transponder .... XPDR

BEFORE TAXI

Flight controls .... Checked
Anti-ice .... ___
Recall .... Checked
Autobrake .... RTO
Flaps .... ___, Selected
Ground crew clearance .... Seen

BEFORE TAKEOFF

Final loadsheet .... Acknowledged
Flaps 20
Trim .... ___ Units, 0, 0
Takeoff briefing .... Updated
RWY/Speeds/EPR/VNAV .... Set
Cabin report .... Received
Transponder .... RA/TA

AFTER TAKEOFF

Landing gear .... UP and OFF
Flaps .... UP
Air con & pressurisation .... Checked
- - - - - - Standard Set - - - - - -
Altimeters .... STD

DESCENT

Recall .... Checked
Autobrake .... ___
Landing data .... VREF___, Minimums___
Approach briefing .... Completed

APPROACH

Altimeters .... ___

LANDING

Speedbrake .... Armed
Landing gear .... DOWN
Flaps .... ___
Cabin report .... Received

AFTER LANDING

Speedbrake .... Down
Exterior lights .... As required
Weather radars .... Off
Flaps .... UP
Transponder .... XPDR
Stab trim .... 6 Units

SHUTDOWN

Parking brake .... Set
Hydraulic demand pumps .... Off
Fuel pumps .... Off
Beacon .... Off
Doors .... Manual
Fuel control switches .... CUTOFF
Transponder .... STBY, 2000
Seatbelt signs .... OFF

Precautionary Rapid Disembarkation Announcement

"Attention, Attention, this is an important announcement. All passengers must leave the aircraft via nearest boarding door in a quick and orderly manner. Leave all personal items behind"

ELECTRICAL POWER UP

Battery switch..ON
Standby power ....AUTO
Hydraulic demand pumps...............................OFF
Windshield wiper selectors ....OFF
Alternate flaps selector...................................OFF
Landing gear lever ....DN
Flap position and Flap lever.........................Agree
Electrical power...................................... Establish

ELECTRICAL POWER DOWN

APU and / or External power ....OFF
Standby power ....OFF
Battery switch..OFF

SECURE

IRS mode selectors ....OFF
Emergency lights...OFF
Aft cargo heat ....OFF
Packs ....OFF
External power..ON
APU ....OFF
Standby power...OFF
Battery switch ....OFF
Flight deck access switch………………………OFF

Taxi and Takeoff Briefing

Threats / MEL / AIS / Weather / Takeoff alternate / Taxi Route / Flap / Runway / Performance Considerations / Terrain Awareness / MSA SSA / Transition altitude / SID / AFDS / Radio Aids / FMC / Emergencies / Review

Approach Briefing

Threats / Configuration / AIS / Weather / QNH / Transition Level / MSA SSA / Elevation / STAR / Approach / Go Around / Runway / Flaps / Stopping / Airport Considerations / Radio Aids / Navigation Accuracy / Alternate / Fuel Capability / Review

Crew Handover Briefing

Plane: FMAs / Fuel Plan / Technical Status (Recall, Notes, MEL)

Path: Current Position / Active Waypoint / Oceanic Clearance / MSA / MOA / Drift Down / Escape Routes / Destination and Alternate Strategy including Weather / Flight Strategy (RECMD FLs, Climb Points, Wind and Temp Uplinks) / Cost Index / ETA vs STA / Master CIRRUS

People: Acting Commander / Pilot Flying & Pilot Monitoring / ATC (CPDLC, Agency, Nearby Aircraft) / SCCM On-Duty & Location / Pilot Rest Location / Criteria for Recall of the Commander / Wake Up Time / Customer Issues / Non-Operational Items

Review: Relevant Emergency Procedures

Post Flight Review

What happened and why / Was the outcome positive or not / How do we repeat or avoid / Impact on safety / Commercial impact / Were SOPs followed / What are the learning points / Further action required

Flight Ops Safety Plan Threats

WEIGHT KG (000)	VREF (KTS) Flap 25	VREF (KTS) Flap 30
400	192	184
380	187	179
360	181	174
340	176	168
320	170	163
300	164	158
280	158	152
260	152	146
240	146	140
220	139	133
200	132	127

CROSSWINDS			
	WIND SPEED (KT)		
ANGLE	15	25	40
10	86	>100	>100
20	43	73	>100
30	30	50	80
40	23	38	62
50	19	32	52
60	17	28	46
70	16	26	42
80	15	25	40
90	15	25	40

NOTE VREF adjustment, +1KT per 4000ft altitude

Non-Normal Checklists — Chapter NNC
Miscellaneous — Section 0

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Ditching

Condition: Aircraft ditching and evacuation are needed.

1 Emergency . . . . .Declare

2 Transponder. . . . . .Maintain assigned code or set A7700 if none assigned

3 Plan to jettison fuel as needed to reduce the VREF speed.

4 Do **not** arm the autobrake.

5 Plan to ditch with the gear up.

6 Use flaps 30 and VREF 30.

7 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . .**OFF**

Landing data . . . . **VREF 30___, Minimums___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Below 5,000 feet:

GND PROX GEAR OVRD switch . . . . .OVRD

GND PROX TERR OVRD switch . . . . .OVRD

PACK control selectors (all) . . . . OFF

OUTFLOW VALVES MAN switches (both). . . . . .ON

OUTFLOW VALVES manual control . . . . .Hold in CLOSE until outflow valve indications show fully closed

Passenger signs . . . . .ON

▼ Continued on next page ▼

▼ Ditching continued ▼

Do **not** accomplish the following checklists:

CABIN ALT AUTO

OUTFLOW VLV L, R

On final approach:

Omit the landing checklist.

EMER LIGHTS switch . . . . .ON

Landing gear lever . . . . UP

FLAP lever 30

Maintain airspeed at VREF 30.

Rotate to a touchdown attitude of 10 to 12 degrees reducing v/s to less than 300 feet per minute.

Maintain approach power and then close thrust levers on contact with water.

When at 1,000 feet:

PA . . "Cabin crew take your seats for landing"

When at 200 feet:

PA . . . . "Brace Brace"

After impact:

FUEL CONTROL switches (all) . . . . CUTOFF

EVAC alarm . . . . .ON

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

Passenger evacuation . . . . .Direct

Captain(s) . . . . Supervise evacuation at Doors 1 and 2. Check aircraft clear

First Officer(s) . . . . Check upper deck clear. Assist at Door 2

Deploy the slide/rafts and evacuate the aircraft.

All crew members to command a slideraft and keep rafts together.

■ ■ ■ ■

Hijack

Condition: In Air or On Ground Hijack

Objective: Land aircraft safely and ensure the safe release of passengers and crew.

1 SEAT BELTS . . . . ON

2 Transponder. A7500

3 ATC . . . . .Inform if possible

4 Crew briefing . . . . Conduct

In the air:

Do not open the flight deck door.

Comply with demands without prejudicing safety.

Negotiate patiently – do not antagonise. Do not take independent action.

Recognise loss of command but considerable authority retained – do not surrender.

Make hijackers think for themselves – do not help.

Avoid actions or movements that might appear hostile.

Explain before moving controls etc.

Cabin crew to remain with passengers to ensure their comfort/safety and prevent panic.

Keep ground authorities informed if no risk to crew or passengers.

Be honest with hijackers as they may have technical knowledge.

Endeavour to build rapport with hijackers using first names/humanity.

Consider possible landing sites.

▼ Continued on next page ▼

▼ Hijack continued ▼

On the ground:

Ensure welfare of crew/pax and let authorities take control.

Taxy and park under ATC instructions if possible.

Do not take independent action.

Expect fixed communications link to be established quickly by authorities.

Establish endurance of water, food and sanitary supplies and ration if necessary.

Transfer to ground power as soon as possible.

Determine any medical problems amongst passengers/crew and assist.

Influence hijackers to restore/maintain services to passengers.

Always bear in mind the dangers of the Stockholm Syndrome (relationships with hijackers).

Establish a rest schedule amongst flight and cabin crew so as to maximise crew alertness in the event of a prolonged incident.

Maintain hygiene – keep all doors and aisles clear of obstructions.

For further guidance see OM A and OM B GEN procedures.

■ ■ ■ ■

Red Bomb Threat in Flight

Condition: Red Bomb Threat confirmed by BA Operations Control.

Information clearly identifies the flight and states that a bomb is on board.

Note: A threat of this type usually proves to be a hoax, but must be taken seriously. The aircraft should be flown as normally as possible, but in accordance with the following requirements.

1 Emergency . . . . .Declare

2 Plan to land at nearest suitable airfield.

3 Transponder. . . . . .Maintain assigned code or set A7700 if none assigned

4 PA . . . . “Will the senior cabin crew member report to the flight deck immediately”

5 LDG ALT switch . . . . .MAN

6 LDG ALT selector . . . . . Set current cabin altitude

Descend as soon as possible to current cabin altitude, or MSA if higher. DO NOT RAISE CABIN ALTITUDE. Minimise manoeuvres/avoid turbulence. Consider reducing airspeed and establishing landing configuration early. Keep Company advised.

7 SCCM . . . . .Brief

Bomb threat.

Organise search of cabin.

If bomb found, additional instructions contained in step 12.

Prepare to disembark using steps.

Only use slides if steps are not available.

Possible use of smoke hoods.

Further information is contained in OM B GEN procedures.

Continued on next page

▼ Red Bomb Threat in Flight continued ▼

8 Evacuation procedure . . . . .Establish

Location of parking area at landing airfield.

Whether steps are immediately available.

Disembarkation procedures with SCCM: doors auto or man.

9 Flightdeck search . . . . Conduct

10 Passengers briefing. . . . . Conduct

"Threat received against the airline. Threat most likely a hoax – must be treated seriously. Cabin crew to search cabin. Passengers to stay seated and co-operate fully. A landing is to be made at ______".

11 When aircraft altitude is less than, or equal to, cabin altitude:

PACK Control Selectors (all). . . . . OFF

OUTFLOW VALVES MAN switches (both) . . . .ON

OUTFLOW VALVES manual Control . .Fully open

12 **If** a Suspicious Article or Bomb found:

DO NOT MOVE, TOUCH OR OPEN.

Move passengers as far away as possible and instruct them to keep their heads below the top of the seat backs.

Obtain expert advice through Company communications, if possible.

Remove oxygen bottles and first aid kits from the vicinity of the device and make fire extinguishers readily available.

Secure device in place. Pack around with pillows, blankets, coats and absorbent materials. Wet surrounding material, but ensure device itself remains dry.

▼ Continued on next page ▼

▼ Red Bomb Threat in Flight continued ▼

Only consider moving device if its position poses an immediate threat and expert advice recommends this action. If moved, handle gently, keep in same attitude and place in the passenger cabin by Door 5R, supported on stacked pillows and cushions and centred in the door-opening about 50 cm/20 ins from the lower edge.

Further information is contained in OM B GEN procedures.

13 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF__, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin report . . . . Received

▼ Continued on next page ▼

▼ Red Bomb Threat in Flight continued ▼

After Landing Checklist

Speedbrake . . . . Down
Exterior lights . . . . As required
Weather radars . . . . Off
Flaps . . . . UP
Transponder . . . . XPDR
Stab trim . . . . 6 Units

Shutdown Checklist

Parking brake . . . . Set
Electrical power . . . . **APU On**
Hydraulic demand pumps . . . . Off
Fuel pumps . . . . Off
Beacon . . . . Off
Doors . . . . Manual
Fuel control switches . . . . CUTOFF
Transponder . . . . STBY, 2000
Seatbelt signs . . . . OFF

Carry out Precautionary Rapid Disembarkation Drill.

Refer to OM B GEN procedures for further information.

■ ■ ■ ■

Red Bomb Threat on Ground

Condition: Red Bomb Threat confirmed by BA Operations Control.

Information clearly identifies the flight and states that a bomb is on board.

1 ATC and Ground Engineer . . . . .ALERT

Confirm parking area and whether steps available.

2 PA . . . . "Will the senior cabin crew member report to the flight deck immediately"

3 SCCM . . . . BRIEF

Bomb threat.

Brief SCCM on disembarkation procedure.

Disembarkation to start on Captain's command over PA.

Brief for doors Automatic or Manual, as applicable.

Use steps/passenger jetty(s), if available, and escape slides, if not.

Do not touch suspicious articles.

Further information is contained in OM B GEN procedures.

4 Checklist Complete Except Deferred Items

Deferred Items

After Landing Checklist

Speedbrake . . . . Down

Exterior lights. . . . . As required

Weather radars. . . . . Off

Flaps . . . . UP

Transponder . . . . XPDR

Stab trim . . . . 6 Units

▼ Continued on next page ▼

▼ Red Bomb Threat on Ground continued ▼

Shutdown Checklist

Parking brake . . . . Set
Electrical power . . . . **APU On**
Hydraulic demand pumps . . . . Off
Fuel pumps . . . . Off
Beacon . . . . Off
Doors . . . . Manual
Fuel control switches . . . . CUTOFF
Transponder . . . . STBY, 2000
Seatbelt signs . . . . OFF

Carry out Precautionary Rapid Disembarkation Drill.

Refer to OM B GEN procedures for further information.

Non-Normal Checklists — Chapter NNC
Airplane Gen., Emer. Equip., Doors, Windows — Section 1

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Intentionally
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AUTO UNLK

AUTOMATIC UNLOCK

Condition: The correct emergency access code is entered.

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

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

■ ■ ■ ■

>CREW OXY LOW

Condition: Crew oxygen pressure is low.

■ ■ ■ ■

DOOR AFT CARGO

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

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

1 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

2 LDG ALT selector . . Set between 8,000 and 8,500

3 Choose one:

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

Level off at the lowest safe altitude.

►►**Go to step 4**

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

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

►►**Go to step 4**

4 **After** level off, allow sufficient time for cabin altitude to stabilise. This minimises discomfort when the aircraft is depressurised.

▼ **Continued on next page** ▼

▼ DOOR AFT CARGO continued ▼

5 Choose one:

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

▶▶**Go to step 9**

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

▶▶**Go to step 6**

6 Don the oxygen masks.

7 Establish crew communications.

8 Choose one:

◆Passenger oxygen is **needed**:

PASS OXYGEN switch . . . . .ON

Passenger signs. . . . . .ON

▶▶**Go to step 9**

◆Passenger oxygen is **not** needed:

▶▶**Go to step 9**

9 OUTFLOW VALVES MAN switches (both) . . . . .ON

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

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

11 After the aircraft is depressurised, the crew may change altitude as needed.

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

CABIN ALTITUDE

CABIN ALT AUTO

LANDING ALT

OUTFLOW VLV L, R

■ ■ ■ ■

DOOR BULK CARGO

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

1 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

▶▶**Go to step 2**

2 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

▶▶**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

DOOR ELEC MAIN, CTR

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

1 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

▶▶**Go to step 2**

2 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

▶▶**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

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

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

1 Instruct a cabin crew member to check the door handle.

2 Choose one:

◆Door handle is in **closed** position:

▶▶**Go to step 3**

◆Door handle is **not** in closed position:

Instruct the crew member to move the handle to the closed position.

▶▶**Go to step 3**

3 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

▶▶**Go to step 4**

4 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

▶▶**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

DOOR FWD CARGO

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

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

1 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

2 LDG ALT selector . . Set between 8,000 and 8,500

3 Choose one:

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

Level off at the lowest safe altitude.

►►**Go to step 4**

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

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

►►**Go to step 4**

4 **After** level off, allow sufficient time for cabin altitude to stabilise. This minimises discomfort when the aircraft is depressurised.

5 Choose one:

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

►►**Go to step 9**

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

►►**Go to step 6**

6 Don the oxygen masks.

7 Establish crew communications.

▼ **Continued on next page** ▼

▼ **DOOR FWD CARGO continued** ▼

8 Choose one:

◆Passenger oxygen is **needed**:

PASS OXYGEN switch . . . . ON

Passenger signs. . . . . ON

▶▶**Go to step 9**

◆Passenger oxygen is **not** needed:

▶▶**Go to step 9**

9 OUTFLOW VALVES MAN switches (both) . . . . . ON

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

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

11 After the aircraft is depressurised, the crew may change altitude as needed.

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

CABIN ALTITUDE

CABIN ALT AUTO

LANDING ALT

OUTFLOW VLV L, R

■ ■ ■ ■

DOOR L, R UPPER DK

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

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

2 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

►►**Go to step 3**

3 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

►►**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

DOOR U/D FLT LK

Condition: The upper deck door automatic lock failed to lock after takeoff.

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

■ ■ ■ ■

DOORS ELEC

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

1 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

▶▶**Go to step 2**

2 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

▶▶**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

DOORS ENTRY L, R

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

1 Instruct a cabin crew member to check the door handles.

2 Choose one:

◆Door handles are in **closed** position:

▶▶**Go to step 3**

◆Door handles are **not** in closed position:

Instruct the crew member to move the handles to the closed position.

▶▶**Go to step 3**

3 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

▶▶**Go to step 4**

4 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

▶▶**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

DOORS UPR DECK

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

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

2 Choose one:

◆Pressurisation is **normal**:

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

■ ■ ■ ■

◆Pressurisation is **not** normal:

Descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

►►**Go to step 3**

3 Choose one:

◆CABIN ALTITUDE message is **blank**:

■ ■ ■ ■

◆CABIN ALTITUDE message **shows**:

►►**Go to the CABIN ALTITUDE checklist on page 2.1**

■ ■ ■ ■

>EMER LIGHTS

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

■ ■ ■ ■

LOCK FAIL

LOCK FAIL

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

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

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

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

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

■ ■ ■ ■

>PASS OXY LOW

G-BNLK - G-BYGF, G-CIVA - G-CIVZ

Condition: Passenger oxygen pressure is low.

■ ■ ■ ■

PASS OXYGEN ON

Condition: Passenger oxygen system is on.

1 **When** passenger oxygen is no longer needed:

PASS OXYGEN
switch . . . . RESET, release to NORM

Note: Do not restow passenger oxygen masks.

■ ■ ■ ■

Window Damage

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

1 Don the seat belts and shoulder harnesses.

2 Choose one:

◆Window has an **arc**, a **crack** or is **shattered**:

▶▶**Go to step 3**

◆Window is **delaminated** only:

▶▶**Go to step 5**

3 Choose one:

◆Damage is on a **forward** window:

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

WSHLD AIR switch (affected side) . . . . ON

Do **not** accomplish the following checklist:

HEAT WINDOW

▶▶**Go to step 4**

◆Damage is on a **side** window:

▶▶**Go to step 4**

4 Choose one:

◆**Outer** glass pane is shattered or cracked and the inner glass pane is **not** shattered or cracked:

▶▶**Go to step 5**

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

▶▶**Go to step 7**

▼ **Continued on next page** ▼

▼ Window Damage continued ▼

5 Continue normal operation.

6 Shoulder harnesses may be removed.

■ ■ ■ ■

7 Don the oxygen masks.

8 Establish crew communications.

9 Passenger signs . . . . ON

10 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

11 LDG ALT selector . . . . Set 9,000

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

LANDING ALT

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

14 Plan to land at the nearest suitable airport.

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

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

▼ Continued on next page ▼

▼ **Window Damage continued** ▼

17 Choose one:

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

When below 13,000 feet:

LDG ALT switch. . . . . . Select AUTO

AUTO landing altitude mode shows on EICAS.

■ ■ ■ ■

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

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

LDG ALT selector . . . . Select AUTO

AUTO landing altitude mode shows on EICAS.

■ ■ ■ ■

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

►► **Go to step 18**

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

LDG ALT selector . . . . Set between 4,000 and 4,500

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

LDG ALT switch . . . . Select AUTO

AUTO landing altitude mode shows on EICAS.

■ ■ ■ ■

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CABIN ALTITUDE or Rapid Depressurisation

Condition: A cabin altitude exceedance occurs.

1 Don the oxygen masks.

2 Establish crew communications.

3 Check the cabin altitude and rate. Verify that the packs are on and the outflow valves are closed.

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

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

Note: Backs up automatic activation of the passenger oxygen system.

Without delay, descend to the lowest safe altitude or 14,000 feet (10,000 feet if fuel endurance is not critical), whichever is higher.

To descend:

Initiate a turn, if required, using HDG SEL.

Set a lower altitude in the altitude window.

Select FLCH.

Move the thrust levers to idle.

Extend the speedbrakes.

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

Descend at Vmo/Mmo.

---

5 Intermediate level off (above 14,000 feet if required):

PA . . . . "Passengers and crew keep masks on"

6 Full descent complete (at 14,000 feet or below):

PA . . . . "The descent is now complete. Will the Senior Cabin Crew Member report to the Flight Deck"

Continued on next page

CABIN ALTITUDE or Rapid Depressurisation continued

Note: To conserve oxygen set Flight Crew oxygen to NORM.

Note: If cabin altitude is 10,000 feet or below, crew oxygen no longer required.

Note: All passengers to remain on oxygen while cabin altitude is 15,000 feet or above. When cabin altitude below 15,000 feet, passenger oxygen will be as individually required. Do not restow passenger masks in flight.

Note: Refer to Performance Inflight for oxygen duration.

7 The following messages can be shown:

CABIN ALT AUTO

OUTFLOW VLV L

OUTFLOW VLV R

8 Choose one:

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

Do the applicable checklist or checklists:

■ ■ ■ ■

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

Do **not** accomplish the following checklists:

CABIN ALT AUTO

OUTFLOW VLV L

OUTFLOW VLV R

■ ■ ■ ■

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

■ ■ ■ ■

BLD DUCT LEAK C

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

Objective: To isolate the bleed duct leak.

1 ISLN valve switches (both) . . . . Off
2 PACK 2 control selector . . . . OFF
3 APU selector . . . . OFF
4 AFT CARGO HT switch . . . . Off
5 TRIM AIR switch . . . . Off
6 PASS TEMP selector . . . . .Set
7 Cargo smoke detection is no longer available.
8 Do not use ground pneumatic air.
9 Do **not** accomplish the following checklists:

CARGO DET AIR

TEMP ZONE

TRIM AIR OFF

■ ■ ■ ■

BLD DUCT LEAK L, R

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

Objective: To isolate the bleed duct leak.

1 ISLN valve switch (unaffected side) . . . . On
2 ISLN valve switch (affected side) . . . . Off
3 ENGINE BLEED air switches (affected side) . . . Off

This step isolates the air source and maintains pressure on the unaffected side.

4 PACK control selector (affected side) . . . . OFF
5 Hydraulic DEMAND PUMP 1 or 4 selector (affected side) . . . . OFF
6 WING ANTI-ICE switch . . . . Off

Do not use wing anti-ice.

▼ Continued on next page ▼

▼ BLD DUCT LEAK L, R continued ▼

Note: For nacelle anti-ice operation:

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

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

BLEED OFF

HYD PRESS DEM 1 or 4 (affected side)

8 Checklist Complete Except Deferred Items

Deferred Items

At Top of Descent:

PACK control selectors . . . . .One pack on, two packs OFF

This step maintains bleed air extraction within limits.

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . .VREF___, Minimums___

Approach briefing . . . . Completed

Flap Extension

LE flaps move in secondary mode. During approach, allow additional time for flap extension.

Do **not** accomplish the following checklist:

FLAPS PRIMARY

Note: When the LE flaps are extended or retracted, a temporary LE flap asymmetry occurs. This causes a mild rolling moment.

▼ Continued on next page ▼

▼ BLD DUCT LEAK L, R continued ▼

Approach Checklist

Altimeters . . . . ____

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

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ____

Cabin Report . . . . Received

After Landing

Speedbrake . . . . Down

Exterior lights . . . . As required

Weather radars . . . . Off

Flaps . . . . UP

Transponder . . . . XPDR

Stab trim . . . . 6 Units

■ ■ ■ ■

Additional Information

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

BLD FWSOV 1, 2, 3, 4 OFF

Condition: One or more of these occur:
- An engine bleed air overheat.
- An engine bleed air overpressure.
- A FWSOV is failed closed.

Objective: To attempt a rapid reset if three or more messages show, or to turn the engine bleed air switch off while at a high power setting if one or two messages show.

1 Choose one:

◆**One or two** BLD FWSOV OFF messages are shown:

►►**Go to step 2**

◆**Three or more** BLD FWSOV OFF messages are shown:

ENGINE BLEED air switches
(affected engines) . . . . Off, then ON

■ ■ ■ ■

2 ENGINE BLEED air switch
(affected engine) . . . . Off

3 **When** thrust is reduced in cruise:

ENGINE BLEED air switch
(affected engine) . . . . ON

4 Choose one:

◆BLD FWSOV OFF message **stays shown or shows again**:

Nacelle anti-ice is not available for the affected engine.

■ ■ ■ ■

◆BLD FWSOV OFF message **stays blank**:

Continue normal operation.

■ ■ ■ ■

SYS FAULT

BLEED 1, 2, 3, 4

Condition: One of these occurs:
- A high pressure bleed valve failed open.
- A FWSOV failed open.

Objective: To turn the engine bleed air switch off and then determine whether nacelle anti-ice is available.

1 ENGINE BLEED air switch (affected engine) . . . . Off

2 NACELLE ANTI-ICE switch (affected engine) . . . . ON

3 Choose one:

◆NAI VALVE message for the affected engine **is shown**:

Nacelle anti-ice for the affected engine is not available.

NACELLE ANTI-ICE switch (affected engine) . . . . OFF

▶▶**Go to step 5**

◆NAI VALVE message for the affected engine is **blank**:

ANTI-ICE NAC message can show.

▶▶**Go to step 4**

4 Use the nacelle anti-ice normally.

Note: For nacelle anti-ice operation:
- At or above 10,000 feet, maintain affected engine N1 at or above 60%.
- Below 10,000 feet, maintain affected engine N1 at or above 55%.
- Plan for a lower than normal descent rate.

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

BLEED OFF

■ ■ ■ ■

BLEED HP ENG 1, 2, 3, 4

Condition: The high pressure bleed valve is failed closed.

Note: For nacelle anti-ice operation:

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

■ ■ ■ ■

VALVE

BLEED ISLN L, R

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

1 Choose one:

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

■ ■ ■ ■

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

ISLN valve switch (unaffected side) . . . Off

PACK 2 control selector . . . . OFF

■ ■ ■ ■

VALVE

>BLEED ISLN APU

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

■ ■ ■ ■

OFF

>BLEED 1, 2, 3, 4 OFF

Condition: All of these occur:

- Engine bleed air switch is OFF.
- Engine is running.
- Engine bleed air valve is closed.

■ ■ ■ ■

CABIN ALT AUTO

Condition: One of these occurs:
- The automatic pressurisation control is failed.
- Both outflow valve manual switches are on.

Objective: To manually control the cabin altitude.

1 OUTFLOW VALVES MAN switches (both) . . . . . ON

2 PACK control selector . . . . Two packs on, one pack OFF

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

3 OUTFLOW VALVES manual control. . . . . Move to OPEN or CLOSE momentarily to check for correct outflow valve movement

4 Choose one:

◆ Outflow valves **move**:

▶▶**Go to step 5**

◆ Outflow valves **do not** move:

▶▶**Go to step 6**

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

5 ⚠ OUTFLOW VALVES manual control . . . . . . Move to OPEN or CLOSE as needed to control cabin rate and altitude

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

▼ **Continued on next page** ▼

▼ CABIN ALT AUTO continued ▼

Note: Recommended cabin altitude in cruise is:

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

►►**Go to step 14**

6 Pressurisation control is lost. Check cabin altitude, cabin rate, and cabin differential pressure regularly.

7 Do not climb to higher altitudes. Cabin altitude can only be maintained with packs and aircraft altitude.

8 Recalculate fuel requirements for destination.

9 Choose one:

◆Cabin altitude **exceeds 10,000 feet or** differential pressure **exceeds 9 psi**:

►►**Go to step 10**

◆Cabin altitude **stays at or below 10,000 feet and** differential pressure **stays at or below 9 psi**:

►►**Go to step 14**

10 Don the oxygen masks.

11 Establish crew communications.

12 PASS OXYGEN switch .ON

13 Descend to maintain cabin altitude at or below 10,000 feet and cabin differential pressure at or below 9 psi.

14 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . .VREF____, Minimums____

▼ Continued on next page ▼

▼ CABIN ALT AUTO continued ▼

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Choose one:

◆ Outflow valves operate **manually**:

When at pattern altitude:

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

OUTFLOW VALVES
manual control . . . . Move to OPEN until the outflow valve indications show fully open to depressurise the aeroplane

► ► **Go to Landing Checklist**

◆ Outflow valves do **not** operate manually:

► ► **Go to Passing 15,000 feet**

Passing 15,000 feet

PACK control selectors. . . . . .One pack on, two packs OFF

Passing 10,000 feet

PACK control selectors. . . . . .All packs OFF

Note: Depressurises aircraft before landing.

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

■ ■ ■ ■

>E/E CLNG CARD

Condition: A fault occurs in the equipment cooling system.

■ ■ ■ ■

EQUIP COOLING

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

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

2 Choose one:

◆On the **ground**:

EQUIP COOLING selector . . . . STBY

■ ■ ■ ■

◆In **flight**:

▶▶**Go to step 3**

3 EQUIP COOLING selector . . . . OVRD

4 Choose one:

◆EQUIP COOLING message **stays blank**:

■ ■ ■ ■

◆EQUIP COOLING message **stays shown or shows again**:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

>HUMID DOOR 5

G-BNLK - G-BNLY, G-CIVA - G-CIVP, G-CIVT, G-CIVU

Condition: A fault occurs in the door five crew rest humidifier.

■ ■ ■ ■

>HUMID FLT DK

Condition: A fault occurs in the flight deck humidifier.

■ ■ ■ ■

LANDING ALT

Condition: One of these occurs:
- The FMC does not supply a landing altitude.
- The landing altitude is selected to the manual mode.

1 Choose one:

◆ **Manual** landing altitude control is selected:

▶▶**Go to step 2**

◆ **Automatic** landing altitude control is selected:

LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

▶▶**Go to step 2**

2 LDG ALT selector . . . . Set the landing altitude

■ ■ ■ ■

OUTFLOW VLV L, R

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

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

1 OUTFLOW VALVES MAN switch (affected valve) . . . . ON

2 PACKS control selector . . . . Two packs on, one pack OFF

3 OUTFLOW VALVES manual control . . . . Hold in CLOSE until the outflow valve indication shows fully closed

■ ■ ■ ■

PACK 1, 2, 3

SYS FAULT — **May or may not be illuminated**

Condition: One or more of these occur:
- A pack controller fault.
- A pack operation fault.
- A pack overheat.
- A pack 2 shutdown and a cabin pressure relief valve is open.

Objective: To switch to a functioning controller, or turn off the pack.

1 TRIM AIR switch . . . . ON

2 PACK control selector (affected pack(s)) . . . . A

3 PACK RST switch . . . . .Push

4 Choose one:

◆ PACK message(s) **blanks**:

■ ■ ■ ■

◆ PACK message(s) **stays shown or shows again**:

▶▶ **Go to step 5**

5 PACK control selector (affected pack(s)) . . . . B

6 PACK RST switch . . . . .Push

7 Choose one:

◆ PACK message(s) **blanks**:

■ ■ ■ ■

◆ PACK message(s) **stays shown or shows again**:

PACK control selector (affected pack(s)) . . . . OFF

■ ■ ■ ■

PACK CONTROL

Condition: Automatic control of the outlet temperature of all packs is inoperative.

1 PACK RST switch . . . . Push

2 Choose one:

◆PACK CONTROL message **blanks**:

■ ■ ■ ■

◆PACK CONTROL message **stays shown or shows again:**

▶▶**Go to step 3**

3 TRIM AIR switch . . . . .ON

Note: The pack outlet temperature is not controlled, but the packs continue to run.

4 Packs may overheat and automatically shut down at lower altitudes during descent.

5 Choose one:

◆TEMP ZONE message is **shown**:

The cabin temperature can not be controlled.

■ ■ ■ ■

◆TEMP ZONE message is **blank**:

▶▶**Go to step 6**

6 Pack outlet temperature cannot be reduced to decrease cabin temperature.

Note: Passenger cabin temperatures may be controlled with passenger temperature selector and cabin temperature panel at SCCM station.

■ ■ ■ ■

PRESS RELIEF

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

1 PACK 2 control selector . . . . OFF

■ ■ ■ ■

TEMP CARGO HEAT

Condition: An aft cargo compartment overheat occurs.

1 Choose one:

◆Aft cargo heat is **needed**:

▶▶**Go to step 2**

◆Aft cargo heat is **not** needed:

AFT CARGO HEAT switch. . . . . Off

On extended flights, the aft cargo compartment temperature may decrease to below freezing.

■ ■ ■ ■

2 Cargo heat will intermittently:

Overheat,

Shutdown,

Show the TEMP CARGO HEAT message, and

Cool and restart.

3 The system cycles at a higher temperature than normal.

■ ■ ■ ■

SYS FAULT

TEMP ZONE

Condition: One or more of these occur:
- A zone duct overheat.
- The master trim air valve fails closed.
- The zone temperature controller fails.

1 ZONE RST switch . . . . Push

2 Choose one:

◆TEMP ZONE message **blanks**:

■ ■ ■ ■

◆TEMP ZONE message **stays shown or shows again within five minutes**:

▶▶**Go to step 3**

3 PASS TEMP selector . . . . Set

If the zone temperature controller is operative, passenger zone temperatures can be controlled with the PASS TEMP selector.

If the zone temperature controller is failed, passenger zone temperatures cannot be controlled with the PASS TEMP selector. All passenger zone temperatures are maintained at a moderate temperature.

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

TRIM AIR OFF

■ ■ ■ ■

>TRIM AIR OFF

Condition: The master trim air valve is closed. The backup mode controls flight deck and passenger cabin temperature.

■ ■ ■ ■

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>ANTI-ICE

G-BNLK - G-BNLY, G-CIVA - G-CIVP

Condition: All of these occur:
- Any nacelle or wing anti-ice system is on.
- TAT is above 12°C.
- Ice is not detected.

■ ■ ■ ■

>ANTI-ICE NAC

Condition: All of these occur:
- A nacelle anti-ice system is on.
- TAT is above 12°C.
- Ice is not detected.

■ ■ ■ ■

>ANTI-ICE WING

Condition: All of these occur:
- The wing anti-ice system is on.
- TAT is above 12°C.
- Ice is not detected.

■ ■ ■ ■

HEAT L, R AOA

Condition: An AOA probe heat is failed.

1 Flight in icing conditions may result in erroneous flight instrument indications.

■ ■ ■ ■

HEAT L, R TAT

Condition: One of these occurs:
- The TAT probe heat is failed.
- On the ground the TAT probe is heated due to an air/ground logic failure

1 Flight in icing conditions may result in unreliable performance calculations.

■ ■ ■ ■

HEAT P/S CAPT, F/O

Condition: A pitot static probe heat is failed.

Objective: To isolate the failed probe to prevent erroneous flight instrument indications.

1 Disengage the autopilot.

2 Choose one:

◆HEAT P/S **CAPT** message is shown:

AIR DATA SOURCE selector (Captain) . . . R

AIR DATA SOURCE selector (First Officer) C

Engage the R autopilot, if needed.

L and C autopilots are unreliable.

■ ■ ■ ■

◆HEAT P/S **F/O** message is shown:

▶▶**Go to step 3**

3 AIR DATA SOURCE selector (Captain) C

4 AIR DATA SOURCE selector (First Officer) L

5 Engage the L or C autopilot, if needed.

6 R autopilot is unreliable.

■ ■ ■ ■

HEAT P/S L, R AUX

Condition: A pitot static probe heat is failed.

Objective: To isolate the failed probe to prevent erroneous flight instrument indications.

1 Disengage the autopilot.

▼ Continued on next page ▼

▼ **HEAT P/S CAPT, F/O continued** ▼

2 Choose one:

◆ HEAT P/S **R** AUX message is shown:

AIR DATA SOURCE selector (Captain). . . R

AIR DATA SOURCE selector (First Officer) C

Engage the R autopilot, if needed.

L and C autopilots are unreliable.

■ ■ ■ ■

◆ HEAT P/S **L** AUX message is shown:

▶▶**Go to step 3**

3 AIR DATA SOURCE selector (Captain) C

4 AIR DATA SOURCE selector (First Officer) L

5 Engage the L or C autopilot, if needed.

6 R autopilot is unreliable.

■ ■ ■ ■

INOP

HEAT WINDOW L, R

Condition: The forward window heat is not operating.

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

1 Choose one:

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

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

▶▶**Go to the Window Damage checklist on page 1.13**

■ ■ ■ ■

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

▶▶**Go to step 2**

2 WINDOW HEAT switch
(affected window). . . . . . .Off 10 seconds, then ON

3 Choose one:

◆HEAT WINDOW message **stays shown**:

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

WSHLD AIR switch (affected side) . . . .ON

■ ■ ■ ■

◆HEAT WINDOW message **blanks**:

Continue normal operation.

■ ■ ■ ■

Ice Crystal Icing

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

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

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

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

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

- Maximum EPR lines (amber) or reference EPR indicators decrease while flying at constant altitude and airspeed
- EPR indications are not aligned
- Unable to achieve maximum continuous thrust or maximum climb thrust
- One or more engine vibration indications are greater than 2.5 units

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

2 Choose one:

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

▶▶**Go to step 12**

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

▶▶**Go to step 3**

3 A/T ARM switch . . . . OFF

▼ **Continued on next page** ▼

▼ Ice Crystal Icing continued ▼

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

5 Choose one:

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

▶▶**Go to step 12**

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

▶▶**Go to step 6**

6 For each operating engine, do these steps, one engine at a time:

Thrust lever . . . . Retard to mid position

ELEC ENG CONTROL switch . . . . ALTN

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

ENG EEC MODE

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

9 The autothrottle is not available.

10 The ENG LIM PROT message can show due to incorrect maximum EPR line. Set thrust to maintain the needed airspeed and airplane flight path. Maintain EGT below the amber band.

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

ENG LIM PROT

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

Reference EPR indicators and reference EPR

Maximum EPR lines (amber)

TAS, TAT, SAT, ECON SPD, and LRC

▼ Continued on next page ▼

▼ **Ice Crystal Icing continued** ▼

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

ELEC ENG CONTROL switches (all) . . . NORM

The autothrottle is available and can be re-engaged, if needed.

■ ■ ■ ■

Additional Information

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

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

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

>ICE DETECTORS

Condition: The ice detectors are failed.

■ ■ ■ ■

>ICING

G-BNLK - G-BNLY, G-CIVA - G-CIVP

Condition: Ice detector detects ice.

1 Message can be cancelled but cannot be recalled.

■ ■ ■ ■

>ICING NAC

Condition: Ice is detected and a nacelle anti-ice system is off.

■ ■ ■ ■

>ICING WING

Condition: Ice is detected and the wing anti-ice system is off.

■ ■ ■ ■

NAI VALVE 1, 2, 3, 4

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

1 Choose one:

◆NACELLE ANTI-ICE switch is **ON**:

Valve is failed closed.

Nacelle anti-ice is not available for the affected engine.

■ ■ ■ ■

◆NACELLE ANTI-ICE switch is **OFF**:

Valve is failed open.

If conditions allow, avoid high thrust settings when TAT is above 10° C.

■ ■ ■ ■

◆NACELLE ANTI-ICE switch is **AUTO**:

NACELLE ANTI-ICE switch (affected engine) . . . . .ON

►►**Go to step 2**

▼ **Continued on next page** ▼

▼ NAI VALVE 1, 2, 3, 4 continued ▼

2 Choose one:

◆NAI VALVE message **blanks**:

Valve is failed open.

If conditions allow, avoid high thrust settings when TAT is above 10° C.

■ ■ ■ ■

◆NAI VALVE message **stays shown**:

Valve is failed closed.

NACELLE ANTI-ICE switch
(affected engine) . . . . OFF

Nacelle anti-ice is not available for the affected engine.

■ ■ ■ ■

>NO ICING

G-BNLK - G-BNLY, G-CIVA - G-CIVP

Condition: Ice no longer detected.

1 Message can be cancelled but cannot be recalled. If ice detected, message no longer shown.

■ ■ ■ ■

VALVE

WAI VALVE LEFT, RIGHT

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

1 Choose one:

◆ WING ANTI-ICE switch is **ON**:

Valve is failed closed.

WING ANTI-ICE switch . . . . Off

Do not use wing anti-ice.

■ ■ ■ ■

◆ WING ANTI-ICE switch is **Off**:

Valve is failed open.

WING ANTI-ICE switch . . . . ON

► ► **Go to step 2**

2 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . .VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

▼ Continued on next page ▼

▼ **WAI VALVE LEFT, RIGHT continued** ▼

After Landing

ENGINE BLEED air switches
(affected side) . . . . Off

ISLN valve switch (affected side) . . . . Off

Note: Prevents structural damage due to overheat.

Note: If WAI VALVE message for non affected side shows on landing do not action above steps for this side. Only action above steps for side originally affected.

Speedbrake . . . . Down

Exterior lights. . . . . As required

Weather radars. . . . . Off

Flaps . . . . UP

Transponder . . . . XPDR

Stab trim . . . . 6 Units

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>AUTOPILOT

Condition: One or more of these occur:
- The autopilot operates in a degraded mode.
- The engaged roll mode is failed.
- The engaged pitch mode is failed.

■ ■ ■ ■

>AUTOPILOT DISC

Condition: All autopilots are disengaged.

■ ■ ■ ■

>AUTOTHROT DISC

Condition: The autothrottle is disconnected.

■ ■ ■ ■

>NO AUTOLAND

Condition: The autoland system is not available.

■ ■ ■ ■

>NO LAND 3

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

■ ■ ■ ■

Intentionally
Blank

Table of Contents

Intentionally
Blank

>DATALINK AVAIL

(G-BNLK, G-BNLD - G-CIVZ)

Condition: The ACARS datalink is available after a temporary loss.

■ ■ ■ ■

>DATALINK LOST

(G-BNLK, G-BNLD - G-CIVZ ; before SB, IDS 508 software not installed)

Condition: The ACARS datalink is temporarily lost.

■ ■ ■ ■

>DATALINK SYS L, R

Condition: Related ACARS system is failed and not available.

■ ■ ■ ■

RADIO TRANSMIT

Condition: A radio transmits continuously without crew input.

Objective: To identify and isolate the stuck microphone.

1 Transmitter select switches (all audio select panels) . . . . FLT Interphone

This deselects radios and stops radio transmissions.

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

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

■ ■ ■ ■

>SATCOM

Condition: Loss of both satellite voice and data capability due to SATCOM system failure.

■ ■ ■ ■

>SATCOM DATA

Condition: Loss of the satellite data communication due to an interface failure.

■ ■ ■ ■

>SATCOM VOICE

Condition: Total loss of voice capability due to equipment failure.

■ ■ ■ ■

>SATVOICE AVAIL

Condition: Re-establishment of voice capability after temporary loss.

■ ■ ■ ■

>SATVOICE LOST

Condition: Temporary loss of voice capability due to log-off, reversion to low gain, etc. Ground to air calls from ATC will not be received.

■ ■ ■ ■

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Intentionally
Blank

>BAT DISCH APU

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

■ ■ ■ ■

>BAT DISCH MAIN

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

■ ■ ■ ■

OFF

>BATTERY OFF

Condition: The battery switch is off.

■ ■ ■ ■

>DRIVE DISC 1, 2, 3, 4

Condition: The generator drive is disconnected.

■ ■ ■ ■

ISLN

ELEC AC BUS 1, 2, 3, 4

OFF

Condition: The AC bus is not powered.

Objective: To reset the generator and then the bus tie. Also, to reset the EEC if the bus is recovered.

Attempt only one reset per flight.

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

2 Choose one:

◆ELEC AC BUS message **stays shown**:

Do not attempt to close the bus tie.

▶▶**Go to step 3**

◆ELEC AC BUS message **blanks**:

▶▶**Go to step 7**

3 Choose one:

◆ELEC AC BUS **2** message stays shown:

Note: Left wing trailing edge flap indications are inoperative. Expect all flaps to move in the primary mode.

■ ■ ■ ■

◆ELEC AC BUS **3** message stays shown:

■ ■ ■ ■

◆ELEC AC BUS **1 or 4** message stays shown:

▶▶**Go to step 4**

▼ Continued on next page ▼

▼ ELEC AC BUS 1, 2, 3, 4 continued ▼

4 Choose one:

◆ELEC AC BUS **1** message is shown:

Avoid icing conditions. Flight in icing conditions may result in unreliable Captain's and standby flight instrument indications.

►►**Go to step 5**

◆ELEC AC BUS **4** message is shown:

Avoid icing conditions. Flight in icing conditions may result in unreliable First Officer's flight instrument indications.

►►**Go to step 5**

5 Note inoperative system items below.

Note: Inoperative Items

Both pitot probe heaters on one side of the aircraft inop
Avoid icing conditions.

Autothrottle inop
Use manual throttle.

LNAV and VNAV inop
Use HDG SEL or HDG HOLD and FLCH, V/S, or ALT HOLD

Reference EPR is blank
Use manual throttle.

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

HEAT P/S CAPT, F/O

HEAT P/S L, R AUX

■ ■ ■ ■

Attempt BUS TIE reset and EEC reset if needed

Attempt only one reset per flight.

7 ⚠ BUS TIE switch
(affected bus) . . . . Off, then AUTO

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

ELEC BUS ISLN

▼ Continued on next page ▼

9 Choose one:

◆ENG EEC MODE message is **blank**:

■ ■ ■ ■

◆ENG EEC MODE message is **shown**:

▶▶**Go to step 10**

10 For the affected engine, do these steps:

Thrust lever . . . . Retard to mid position

ELEC ENG CONTROL switch . . . . ALTN, then NORM

■ ■ ■ ■

ISLN

ELEC BUS ISLN 1, 2, 3, 4

Condition: The bus tie is open.

Objective: To reset the bus tie.

Attempt only one reset per flight.

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

■ ■ ■ ■

DRIVE

ELEC DRIVE 1, 2, 3, 4

Condition: One of these occurs:
- IDG oil pressure low.
- IDG oil temperature high.
- Generator control open due to uncorrectable generator frequency fault.

Objective: To prevent damage to the IDG.

Action is irreversible.

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

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

DRIVE DISC

ELEC GEN OFF

■ ■ ■ ■

OFF

ELEC GEN OFF 1, 2, 3, 4

Condition: The generator control is open.

Objective: To reset the generator.

Attempt only one reset per flight.

1 ⚠ GEN CONT switch (affected generator) . . . . OFF, then ON

■ ■ ■ ■

>ELEC SSB OPEN

Condition: The split system breaker is failed open.

■ ■ ■ ■

OFF

ELEC UTIL BUS L, R

Condition: One or more of these occur:
- A galley bus is not powered.
- A utility bus is not powered.
- The galley emergency power switch is off.

Objective: To reset power.

Attempt only one reset per flight.

1 UTILITY power switch
(affected side). . . . . Off, then ON

2 Multiple fuel pump messages show while the switch is off.

3 Leave the UTILITY power switch ON.

■ ■ ■ ■

>STBY BUS APU

Condition: The APU standby bus is not powered.

■ ■ ■ ■

>STBY BUS MAIN

Condition: The main standby bus is not powered.

■ ■ ■ ■

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Aborted Engine Start

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

Objective: To shut down the engine and motor it.

Note: Manual start abort criteria:

- The EGT does not increase by 30 seconds after the fuel control switch is moved to RUN.
- There is no N1 rotation by idle N3.
- The EGT quickly nears or exceeds the start limit.
- The N3 does not stabilise at idle.
- The oil pressure is not normal by the time the engine is stabilised at idle.

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

---

2 Engine START switch (affected engine) . . . . .Push

3 AUTOSTART switch . . . . Off

This allows engine motoring.

4 **When** N3 decreases below 20%

Engine START switch (affected engine) . . . Pull

Motor the engine for 30 seconds and until EGT below 100°C.

If restarting engine (engine and starter motor limits not exceeded):

AUTO IGNITION selector. . . . . BOTH

FUEL CONTROL switch . . . . RUN

If not restarting engine (engine or starter motor limits exceeded):

Engine START switch
(affected engine) . . . . .Push

■ ■ ■ ■

ENG 1, 2, 3, 4 AUTOSTART

Condition: During a ground start, any of the following conditions occur:
- Autostart did not start the engine.
- The fuel control switch is in RUN at low engine RPM with the autostart switch off.

Objective: To shut down the engine and motor it.

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

---

2 Engine START switch (affected engine) . . . . Push

3 AUTOSTART switch . . . . .Off

This allows engine motoring.

4 **When** N3 decreases below 20%

Engine START switch (affected engine) . . . . Pull

Motor the engine for 30 seconds and until EGT below 100°C.

Engine START switch (affected engine) . . . . Push

■ ■ ■ ■

Engine Limit or Surge or Stall

Condition: One or more of these occur:
- Engine indications are abnormal.
- Engine indications are rapidly approaching or exceeding limits.
- Abnormal engine noises are heard, possibly with airframe vibration.
- There is no response to thrust lever movement or the response is abnormal.
- Flames in the engine inlet or exhaust are reported.

Objective: To recover normal engine operation, or shut down the engine if recovery is not possible.

1 Thrust lever (affected engine) . . . . Confirm. . . . . Retard until engine indications stay within limits, or return to normal, or the thrust lever is at idle

---

2 CON IGNITION switch . . . . ON

This may prevent flameout.

3 Choose one:

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

▶▶**Go to step 4**

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

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

Transponder mode selector . . . . TA

Do **not** accomplish the following checklist:

>ENG SHUTDOWN

Note: If landing with engine shutdown refer to Non Normal Configuration Landing distance Table.

■ ■ ■ ■

▼ Continued on next page ▼

▼ Engine Limit or Surge or Stall continued ▼

Check that RPM and EGT follow thrust lever movement.

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

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

6 Choose one:

◆ Engine runs **normally**:

■ ■ ■ ■

◆ Engine runs at **reduced** thrust:

Transponder mode selector . . . . TA

■ ■ ■ ■

Multiple Engine Flameout or Stall

Condition: One of these occurs on two or more engines:
- Engine flameout.
- Engine indications are abnormal.
- Engine indications are more than limits.
- Abnormal engine noises are heard.
- There is no response to thrust lever movement.

Objective: To attempt a rapid relight.

1 CON IGNITION switch .ON

2 FUEL CONTROL switches
(affected engines) . . . . . Confirm . . . . . CUTOFF, then RUN

Note: This action attempts to clear stall condition.

3 **If** EGT increases rapidly approaching the EGT start limit:

Repeat the above step as needed.

- -

▼ Continued on next page ▼

▼ **Multiple Engine Flameout or Stall continued** ▼

4 Choose one:

◆Airspeed is **less than** 240 KIAS below FL200 (280 KIAS at or above FL200):

PACK control selectors . . . Set a maximum of one pack on

Engine START switch (affected engines) . . . . Pull

▶▶**Go to step 5**

◆Airspeed is **equal to or more than** 240 KIAS below FL200 (280 knots at or above FL200):

▶▶**Go to step 5**

5 Engines can accelerate to idle very slowly, especially at high altitudes. If N3 is steadily increasing, and EGT stays within limits, do not interrupt the start.

■ ■ ■ ■

APU

Condition: One of these occurs:
- An APU automatic shutdown.
- APU N1 RPM is more than 95% with the APU selector off.

Objective: To shut down or restart the APU.

1 Choose one:

◆APU selector is **OFF**:

APU fire switch . . . . Confirm . . . Override and pull

■ ■ ■ ■

◆APU selector is **ON**:

APU selector . . . . OFF

▶▶**Go to step 2**

▼ **Continued on next page** ▼

▼ **APU continued** ▼

2 Choose one:

◆ APU message **blanks**:

A restart may be attempted.

■ ■ ■ ■

◆ APU message **stays shown:**

Do **not** start the APU.

■ ■ ■ ■

APU DOOR

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

Objective: One of the following:
- In flight, to ensure accurate fuel burn calculations
- On the ground, to attempt an APU restart

1 Choose one:

◆In **flight**:

▶▶**Go to step 2**

◆On the **ground**:

▶▶**Go to step 3**

2 Choose one:

◆APU selector is **OFF**:

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

■ ■ ■ ■

◆APU selector is **ON**:

APU selector . . . . OFF

■ ■ ■ ■

3 Choose one:

◆APU selector is **OFF**:

■ ■ ■ ■

◆APU selector is **ON**:

▶▶**Go to step 4**

4 APU selector . . . . .OFF, then ON

▼ **Continued on next page** ▼

▼ APU DOOR continued ▼

5 Choose one:

◆APU DOOR message **blanks**:

A restart may be attempted.

■ ■ ■ ■

◆APU DOOR message **stays shown**:

APU selector . . . . OFF

Do **not** start the APU.

■ ■ ■ ■

APU FUEL

Condition: One of the following occurs:
- Low pump pressure is detected when the pump is activated.
- APU fuel valve is not in the commanded position.

1 APU selector . . . . OFF

2 Do **not** start the APU.

■ ■ ■ ■

>AUTOSTART OFF

Condition: The engine autostart switch is off.

■ ■ ■ ■

>ENG 1, 2, 3, 4 CH INHIBIT

Condition: EEC channel A inhibited.

■ ■ ■ ■

>ENG 1, 2, 3, 4 CONTROL

Condition: An EEC system fault occurs.

■ ■ ■ ■

ALTN

ENG 1, 2, 3, 4 EEC MODE

Condition: An EEC is in the alternate control mode.

Objective: To place all the EECs in alternate, ensuring all engines are controlled to the same parameter (N1).

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

Thrust lever. . . . . Retard to mid position

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

ELEC ENG CONTROL switch . . . . ALTN

2 Resume normal thrust management. Observe thrust limits.

3 Maximum thrust limiting is not available.

4 Autothrottle is not available.

■ ■ ■ ■

ENG 1, 2, 3, 4 FAIL

Condition: One of these occurs:
- An engine failure.
- An engine flameout.

1 Choose one:

◆**Only one** ENG FAIL message is shown:

▶▶**Go to step 2**

◆**More than one** ENG FAIL message is shown:

▶▶**Go to the Multiple Engine Flameout or Stall checklist on page 7.4**

■ ■ ■ ■

2 Choose one:

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

▶▶**Go to the FIRE ENG 1, 2, 3, 4 or Engine Severe Damage or Separation checklist on page 8.2**

◆An engine has **separated**:

▶▶**Go to the FIRE ENG 1, 2, 3, 4 or Engine Severe Damage or Separation checklist on page 8.2**

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

▶▶**Go to step 3**

3 Thrust lever
(affected engine) . . . . .Confirm . . . . . . Idle

4 FUEL CONTROL switch
(affected engine) . . . . .Confirm . . . CUTOFF

5 Transponder mode selector . . . . TA

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

>ENG SHUTDOWN

Note: If landing with engine shutdown refer to Non-Normal Configuration Landing Distance Table.

▼ **Continued on next page** ▼

▼ ENG 1, 2, 3, 4 FAIL continued ▼

7 A restart can be attempted if there is N1 rotation and no abnormal airframe vibration.

8 Choose one:

◆Restart **is** needed:

▶▶**Go to step 9**

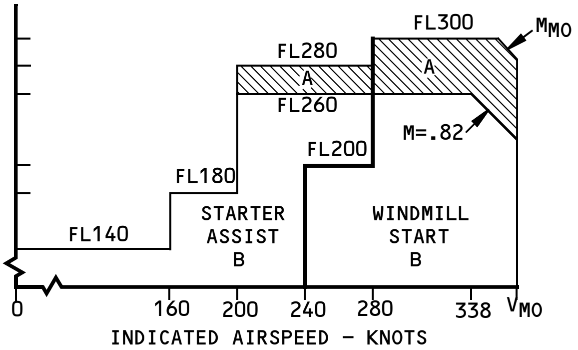
◆Restart **is not** needed:

■ ■ ■ ■

9 Monitor EGT during start.

10 Engines can accelerate to idle very slowly, especially at high altitudes. If N3 is steadily increasing, and EGT stays within limits, do not interrupt the start.

IN-FLIGHT START ENVELOPE



A. Light off in this area can be expected within approximately 80 (*30) seconds.
B. AFM envelope. Light off in this area can be expected within approximately 30 seconds.

* RB211-524G/H/G-T/H-T engines modified by RR SB RB211-72-C067; or, RR SB RB211-722-B999 but not RR SB RB 211-74-C108.

11 Choose one:

◆AUTOSTART switch is **ON**:

▶▶**Go to step 12**

◆AUTOSTART switch is **Off**:

▶▶**Go to step 13**

▼ Continued on next page ▼

▼ ENG 1, 2, 3, 4 FAIL continued ▼

12 Choose one:

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

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

▶▶**Go to step 14**

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

Engine START switch
(affected engine) . . . . Pull

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

▶▶**Go to step 15**

13 Choose one:

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

CON IGNITION switch . . . . ON

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

▶▶**Go to step 16**

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

Engine START switch
(affected engine) . . . . Pull

When at maximum motoring N3:

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

▶▶**Go to step 17**

▼ Continued on next page ▼

14 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . .RA/TA

■ ■ ■ ■

◆An **abort start condition** as listed in normal procedures occurs:

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

■ ■ ■ ■

15 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . .RA/TA

■ ■ ■ ■

◆An **abort start condition** as listed in normal procedures occurs:

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

Engine START switch
(affected engine) . . . . Push

■ ■ ■ ■

16 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . .RA/TA

■ ■ ■ ■

◆EGT does **not** increase within the time depicted on the IN-FLIGHT START ENVELOPE **or** an **abort start condition** as listed in normal procedures occurs:

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

Wait 30 seconds before attempting another start.

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ **ENG 1, 2, 3, 4 FAIL continued** ▼

17 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . . . RA/TA

■ ■ ■ ■

◆EGT does **not** increase within the time depicted on the IN-FLIGHT START ENVELOPE **or** an **abort start condition** as listed in normal procedures occurs:

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

Engine START switch (affected engine) . . . . Push

Wait 30 seconds before attempting another start.

■ ■ ■ ■

ENG 1, 2, 3, 4 FUEL FILT

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

1 Choose one:

◆Only **one** ENG FUEL FILTER message has shown during the flight:

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

■ ■ ■ ■

◆ENG FUEL FILTER messages for **more than one** engine show or have shown at any time during the flight (either separately or at the same time):

► ►**Go to step 2**

2 Plan to land at the nearest suitable airport.

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

■ ■ ■ ■

ENG 1, 2, 3, 4 FUEL VLV

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 Choose one:

◆FUEL CONTROL switch is in **RUN**:

■ ■ ■ ■

◆FUEL CONTROL switch is in **CUTOFF**:

The engine may continue to run for approximately 1 minute.

▶▶**Go to step 2**

2 Choose one:

◆In **flight**:

■ ■ ■ ■

◆On the **ground**:

Do not attempt an engine start.

■ ■ ■ ■

>ENG 1, 2, 3, 4 LIM PROT

Condition: The EEC is in the alternate control mode and thrust is approaching maximum rating.

■ ■ ■ ■

>ENG 1, 2, 3, 4 LOW IDLE

Condition: Engine idle not in approach setting when commanded.

■ ■ ■ ■

>ENG 1, 2, 3, 4 OIL FILT

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

■ ■ ■ ■

ENG 1, 2, 3, 4 OIL PRESS

Condition: The oil pressure is low.

1 Choose one:

◆Oil pressure is **above** the red line limit:

Run the engine normally.

■ ■ ■ ■

◆Oil pressure is **at or below** the red line limit:

▶▶**Go to step 2**

◆Oil pressure is **normal or** oil pressure is in the amber band with N3 **below** 70%:

Run the engine normally.

■ ■ ■ ■

◆Oil pressure is in the amber band with N3 **above** 70%:

▶▶**Go to step 6**

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

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

4 Transponder mode selector . . . . TA

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

>ENG SHUTDOWN

Note: If landing with engine shutdown refer to Non-Normal Configuration Landing Distance Table.

■ ■ ■ ■

6 Thrust lever
(affected engine) . . . Confirm . . . . Retard until N3 below 70%,

7 Transponder mode selector . . . . TA

■ ■ ■ ■

ENG 1, 2, 3, 4 OIL TEMP

Condition: The oil temperature is high.

1 Thrust lever
(affected engine) . . . . Confirm. . . . . Advance to mid position

2 Choose one:

◆Temperature **decreases** below the red line limit:

■ ■ ■ ■

◆Temperature does **not** adecrease below the red line limit:

▶▶**Go to step 3**

3 Thrust lever
(affected engine) . . . . Confirm . . . . Idle

4 FUEL CONTROL switch
(affected engine) . . . . Confirm . . . CUTOFF

5 Transponder mode selector . . . . TA

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

>ENG SHUTDOWN

Note: If landing with engine shutdown refer to Non-Normal Configuration Landing Distance Table.

■ ■ ■ ■

ENG 1, 2, 3, 4 REV LIMTD

Condition: A thrust reverser system fault occurs.

1 Reverse thrust on the affected engine will be limited to idle on landing.

■ ■ ■ ■

>ENG 1, 2, 3, 4 REVERSER

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

■ ■ ■ ■

>ENG 1, 2, 3, 4 RPM LIM

Condition: The N1 or N2 or N3 red line limit restricts engine thrust.

■ ■ ■ ■

>ENG 1, 2, 3, 4 SHUTDOWN

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

Note: Refer to Non-Normal Configuration Landing Distance Table.

■ ■ ■ ■

ENG 1, 2, 3, 4 START VLV

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

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

2 Choose one:

◆On the **ground**:

Accomplish manual override start.

■ ■ ■ ■

◆In **flight**:

Increase airspeed until Crossbleed indication (X-BLD or XB) is blank.

■ ■ ■ ■

>ENG CONTROLS

Condition: Three or four EEC systems operate in a degraded mode. The systems do not have full redundancy.

■ ■ ■ ■

ENG IGNITION

Condition: The continuous ignition system is failed.

1 STBY IGNITION selector . . . . .1 or 2

■ ■ ■ ■

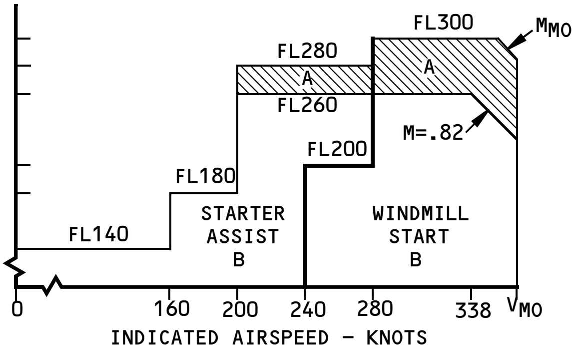
Engine In-Flight Start

Condition: An engine start is needed and all of the following is true:
- There was **no** engine fire.
- There is **N1** rotation.
- There is **no** abnormal airframe vibration.

1 Monitor EGT during start.

2 Engines can accelerate to idle very slowly, especially at high altitudes. If N3 is steadily increasing, and EGT stays within limits, do not interrupt the start.

IN-FLIGHT START ENVELOPE



A. Light off in this area can be expected within approximately 80 (*30) seconds.
B. AFM envelope. Light off in this area can be expected within approximately 30 seconds.

* RB211-524G/H/G-T/H-T engines modified by RR SB RB211-72-C067; or, RR SB RB211-722-B999 but not RR SB RB 211-74-C108.

3 Choose one:

◆AUTOSTART switch is **ON**:

▶▶**Go to step 4**

◆AUTOSTART switch is **Off**:

▶▶**Go to step 5**

▼ **Continued on next page** ▼

▼ Engine In-flight Start continued ▼

4 Choose one:

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

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

▶▶**Go to step 6**

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

Engine START switch
(affected engine) . . . . Pull

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

▶▶**Go to step 7**

5 Choose one:

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

CON IGNITION switch . . . . ON

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

▶▶**Go to step 8**

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

Engine START switch
(affected engine) . . . . Pull

When at maximum motoring N3:

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

▶▶**Go to step 9**

▼ Continued on next page ▼

▼ **Engine In-flight Start continued** ▼

6 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . .RA/TA

■ ■ ■ ■

◆An **abort start condition** as listed in normal procedures occurs:

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

■ ■ ■ ■

7 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . .RA/TA

■ ■ ■ ■

◆An **abort start condition** as listed in normal procedures occurs:

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

Engine START switch
(affected engine) . . . . Push

■ ■ ■ ■

8 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . .RA/TA

■ ■ ■ ■

◆EGT does **not** increase within the time depicted on the IN-FLIGHT START ENVELOPE **or** an **abort start condition** as listed in normal procedures occurs:

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

Wait 30 seconds before attempting another start.

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ **Engine In-flight Start continued** ▼

9 Choose one:

◆Engine **starts** and runs normally:

Transponder mode selector . . . . . . RA/TA

■ ■ ■ ■

◆EGT does **not** increase within the time depicted on the IN-FLIGHT START ENVELOPE **or** an **abort start condition** as listed in normal procedures occurs:

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

Engine START switch
(affected engine) . . . . Push

Wait 30 seconds before attempting another start.

■ ■ ■ ■

>IDLE DISAGREE

Condition: One or more engines are at approach idle and one or more engines are at minimum idle.

■ ■ ■ ■

Reverser Unlocked

Condition: The reverse annunciation shows with intentional reverse thrust not selected.

1 Choose one:

◆With **no** yaw, loss of airspeed, or buffet:

Run the engine normally.

■ ■ ■ ■

◆**With** yaw, loss of airspeed, or buffet:

▶▶**Go to step 2**

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

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

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

>ENG SHUTDOWN

5 Transponder mode selector . . . . TA

6 Buffet may be reduced by decreasing airspeed.

7 Plan to use flaps 25 and VREF 30+20 for landing.

Note: Refer to Non-Normal Configuration Landing Distance Table.

8 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . **VREF 30+20__, Minimums___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

▼ Continued on next page ▼

▼ **Reverser Unlocked continued** ▼

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps **25**

Cabin Report . . . . .Received

■ ■ ■ ■

STARTER CUTOUT 1, 2, 3, 4

Condition: Start valve does not close.

1 Engine START switch (affected engine) . . . . Push

2 Choose one:

◆ STARTER CUTOUT message **blanks**:

■ ■ ■ ■

◆ STARTER CUTOUT message **stays shown**:

▶▶ **Go to step 3**

3 ENGINE BLEED air switch (affected engine) . . . . Off

4 Nacelle anti-ice for the affected engine is not available.

■ ■ ■ ■

Two Engines Inoperative

Condition: A two engine landing is needed.

1 The autothrottle is inoperative.

2 Consider fuel jettison to improve performance.

3 Do not use Autoland.

Note: Refer to Non-Normal Configuration Landing Distance Table.

4 Checklist Complete Except Deferred Items

Deferred Items

Landing commit point is gear extension.

Note: The gear down commit point does not require visual contact with the runway in order to continue the approach.

This should be taken into consideration when assessing the cloud base and visibility at a suitable airfield.

Warning! Go-Around after passing the landing commit point is not recommended. Performance is not assured.
A descent may be required to achieve an acceleration to Vref 30+60 and flap 1.

Use Flaps 25 and VREF 25 for landing.

PACK control selectors . . . . .One pack on,
Two packs OFF

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . **VREF 25___, Minimums____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ Continued on next page ▼

▼ Two Engines Inoperative continued ▼

Go-Around Procedure Review

Note: If a go-around is absolutely required:

- Do not use TO/GA.
- Set flaps 20, at the same time increase thrust as airspeed increases while maintaining directional control.
- Control yaw with rudder and trim.
- Rudder pedal pressure may be required even with full rudder trim.
- Retract the landing gear without delay.
- Retract flaps to flaps 1 on schedule. Descent may be required to increase speed.
- Slowly increase pitch attitude to maintain Flaps 1 speed and transition from a descent to a climb.
- Climb at VREF 30+60.

Note: During an approach with two engines inoperative on the same side, it is possible to be at an airspeed below minimum control speed when the go-around is initiated. In this event thrust should be applied with rudder application and a slight bank into the operating engines while establishing a descent for faster acceleration. Stop the outboard thrust lever advance just before full rudder travel and then set the inboard engine to go-around thrust. As airspeed increases and the rudder becomes more effective, advance the thrust lever for the operable outboard engine to go-around thrust.

▼ Continued on next page ▼

▼ **Two Engines Inoperative continued** ▼

During acceleration with two engines inoperative on one side, with flaps retracted and airspeed above aileron lockout speed (approximately 240 kts), the autopilot may not have sufficient authority to maintain desired bank. If this occurs the aircraft must be manually flown.

Extend the landing gear and select flaps 20 at glideslope intercept, or at final descent point.

Approaching 1,000 ft AGL select flaps 25 and centre rudder trim.

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps **25**

Cabin Report . . . . .Received

■ ■ ■ ■

Volcanic Ash

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

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

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

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

1 Don the oxygen masks, if needed.

2 Establish crew communications, if needed.

3 Autothrottle disconnect switch . . . . Push

This step allows the thrust levers to stay where manually positioned.

If conditions allow, run the engines at idle

4 Thrust levers. . . . . Idle

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

5 CON IGNITION switch .ON

6 PACK control selectors (all) . . . . .NORM

7 HI FLOW switch . . . . .ON

8 NACELLE ANTI–ICE switches . . . . .ON

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

9 WING ANTI–ICE switch . . . . .ON

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

Continued on next page

▼ **Volcanic Ash continued** ▼

10 Choose one:

◆**All** engines run **normally**:

▶▶**Go to step 15**

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

▶▶**Go to step 11**

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

12 If N3 is steadily increasing, and EGT stays within limits, do not interrupt the start.

13 FUEL CONTROL switch (affected engines) . . . . . Confirm . . . . . CUTOFF, then when EGT starts to decrease RUN

14 Choose one:

◆Airspeed is **equal to or more than** 240 KIAS (280 KIAS at or above FL200):

▶▶**Go to step 15**

◆Airspeed is **less than** 240 KIAS (280 KIAS at or above FL200):

PACK control selectors . . . Set a maximum of one pack on

ENGINE START SWITCH (affected engines, maximum two engines at a time) . . PULL

▶▶**Go to step 15**

15 Volcanic ash can cause abnormal system operation such as:

Engine malfunctions, increasing EGT, unusually high EGT, compressor stall, or flameout.

Decreased or complete loss of airspeed indications.

Equipment cooling system malfunctions.

Cargo fire indications.

16 Plan to land at nearest suitable airport.

■ ■ ■ ■

Intentionally
Blank

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Intentionally
Blank

APU

FIRE APU

Condition: Fire is detected in the APU.

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

2 Choose one:

◆FIRE APU message **stays shown**:

Plan to land at the nearest suitable airport.

▶▶**Go to step 3**

◆FIRE APU message **blanks**:

▶▶**Go to step 3**

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

APU

■ ■ ■ ■

FIRE ENG 1, 2, 3, 4 or Engine Severe Damage or Separation

Condition: One or more of these occur:
- Engine fire warning.
- Airframe vibrations with abnormal engine indications.
- Engine separation.
- Turbine overheat detected.

1 Thrust lever
(affected engine) . . . . Confirm . . . . Idle

2 FUEL CONTROL switch
(affected engine) . . . . Confirm . . . . CUTOFF

3 Engine fire switch
(affected engine) . . . . Confirm . . . . Pull

4 **If** the FIRE ENG message is shown:

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

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

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

▼ Continued on next page ▼

▼ FIRE ENG 1, 2, 3, 4 or Engine Severe Damage or Separation continued ▼

5 Choose one:

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

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

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

►►Go to step 6

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

►►Go to step 6

6 Transponder mode selector . . . . TA

7 Choose one:

◆FIRE ENG message **stays shown**:

Plan to land at the nearest suitable airport.

►►Go to step 8

◆Severe engine damage or separation **occurs**:

Plan to land at the nearest suitable airport.

►►Go to step 8

◆FIRE ENG message is **blank** with **no indications** of severe engine damage or separation:

►►Go to step 8

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

>ENG SHUTDOWN

Note: If landing with engine shutdown refer to Non-Normal Configuration Landing Distance Table.

■ ■ ■ ■

Fire Engine Tailpipe

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

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

2 Advise the cabin.

3 Choose one:

◆Bleed air is **available**:

▶▶**Go to step 4**

◆Bleed air is **not** available:

Advise the tower.

■ ■ ■ ■

4 Engine START switch
(affected engine) . . . . Push

5 PACK control selectors (all) . . . . OFF

This allows maximum bleed air for engine motoring.

6 AUTOSTART switch . . . . .Off

7 Allow the affected N3 to decrease below 30%.

8 Engine START switch
(affected engine) . . . . Pull

This allows the EEC to engage the starter below the maximum starter engagement speed.

9 Advise the tower.

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

Engine START switch
(affected engine) . . . . Push

■ ■ ■ ■

Smoke, Fire or Fumes

Condition: Smoke, fire or fumes occur.

1 Diversion may be needed.

2 Don oxygen masks, if needed . . . . ON, 100%

Note: Occasional mask purging is achieved by pressing emergency selector, which provides oxygen at positive pressure. If continuous mask purging is required, turn emergency selector clockwise. Use this with caution to preserve oxygen supply.

3 Establish crew and cabin communications.

4 Instruct the cabin crew to turn off the following switches:

a. AVOD System
IFE POWER switch and both SEAT/PC ELECTRICS ISOLATION switches.

b. Panasonic System
All 9 switches on IFE panel.

5 Advise the cabin crew that the main cabin lighting will be turned off.

6 Instruct the cabin crew to turn on the cabin night lighting.

7 UTILITY power switches (both) . . . . Off

Note: Removes power from upper and lower recirculation fans, crew rest recirculation fan, galley/lavatory vent fans and chiller boost fans.

8 APU selector . . . . OFF

9 Passenger signs . . . . ON

10 **Anytime** the smoke or fumes become the greatest threat:

► ►**Go to the Smoke or Fumes Removal checklist on page 8.19**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

11 Choose one:

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

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

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

▶▶**Go to step 12**

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

▶▶**Go to step 13**

12 Choose one:

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

Continue the flight at the Captain's discretion.

Restore unpowered items at the Captain's discretion.

▶▶**Go to step 24**

■ ■ ■ ■

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

▶▶**Go to step 13**

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

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

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

16 ISLN valve switches (both) . . . . Off

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

17 PACK 2 control selector . . . . OFF

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

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

19 Choose one:

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

PACK 3 control selector . . . . OFF

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

▶▶**Go to step 20**

◆ Smoke or fumes are **decreasing**:

▶▶**Go to step 24**

20 Choose one:

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

PACK 3 control selector . . . . .NORM

PACK 1 control selector . . . . OFF

R ISLN valve switch . . . . On

▶▶**Go to step 21**

◆ Smoke or fumes are **decreasing**:

L ISLN valve switch . . . . On

▶▶**Go to step 21**

21 PACK 2 control selector . . . . .NORM

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

▼ Continued on next page ▼

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

23 Choose one:

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

ISLN valve switches (both) . . . . On

PACK 1 control selector . . . . NORM

Consider an immediate landing.

▶▶**Go to step 24**

◆Smoke or fumes are **decreasing**:

▶▶**Go to step 24**

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

CARGO DET AIR

ELEC UTIL BUS L, R

FUEL OVRD 2, 3 FWD

FUEL PRESS CTR L

FUEL PUMP 2, 3 FWD

HUMID FLT DK

TEMP ZONE

TRIM AIR OFF

FUEL OVRD CTR L

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.19, if needed**

■ ■ ■ ■

>BOTTLE LOW APU

Condition: The APU fire bottle pressure is low.

■ ■ ■ ■

>BTL LOW ENG 1A, 1B

Condition: Engine 1 fire extinguisher bottle A or bottle B pressure low.

■ ■ ■ ■

>BTL LOW ENG 2A, 2B

Condition: Engine 2 fire extinguisher bottle A or bottle B pressure low.

■ ■ ■ ■

>BTL LOW ENG 3A, 3B

Condition: Engine 3 fire extinguisher bottle A or bottle B pressure low.

■ ■ ■ ■

>BTL LOW ENG 4A, 4B

Condition: Engine 4 fire extinguisher bottle A or bottle B pressure low.

■ ■ ■ ■

>CARGO DET AIR

Condition: Cargo smoke detection airflow is not sufficient.

■ ■ ■ ■

>CGO BTL DISCH

Condition: One of these occurs:

- On the ground, a cargo fire bottle pressure is low.
- In flight, both cargo fire bottles A and B are discharged.

■ ■ ■ ■

>DET FIRE APU

Condition: APU fire detection is inoperative.

■ ■ ■ ■

>DET FIRE/OHT 1, 2, 3, 4

Condition: Engine fire or overheat detection is inoperative.

■ ■ ■ ■

AFT

FIRE CARGO AFT

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

Warning! Fire bottles should not be discharged in the under floor cargo holds while the aircraft is on the ground with the cargo doors open, unless the crew are independently advised of actual fire and all personnel are clear.

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

Pack 3 shuts down.

2 PACK 3 control selector . . . . OFF

3 PACK 1 and 2 control selectors. . . . . .One pack on, one pack OFF

Warning! Either pack 1 or 2 must be operating to prevent excessive smoke accumulation on the flight deck.

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

195 minutes of fire suppression are available.

▼ Continued on next page ▼

▼ **FIRE CARGO AFT continued** ▼

5 Choose one:

◆On the **ground**:

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

■ ■ ■ ■

◆**In flight**:

▶▶**Go to step 6**

6 Choose one:

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

▶▶**Go to step 9**

◆Airplane is **above** 8,000 feet:

▶▶**Go to step 7**

7 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

8 LDG ALT selector . . . . Set between 8,000 and 8,500

9 Plan to land at the nearest suitable airport

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

LDG ALT switch . . . . Select AUTO

AUTO landing altitude mode shows on EICAS.

11 Checklist Complete Except Deferred Items

▼ **Continued on next page** ▼

▼ FIRE CARGO AFT continued ▼

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

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

■ ■ ■ ■

FWD

FIRE CARGO FWD

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

Warning! Fire bottles should not be discharged in the under floor cargo holds while the aircraft is on the ground with the cargo doors open, unless the crew are independently advised of actual fire and all personnel are clear.

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

Pack 3 shuts down.

2 PACK 3 control selector . . . . OFF

3 PACK 1 and 2 control selectors. . . . .One pack on, one pack OFF

Warning! Either pack 1 or 2 must be operating to prevent excessive smoke accumulation on the flight deck.

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

195 minutes of fire suppression are available.

5 Choose one:

◆On the **ground**:

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

■ ■ ■ ■

◆**In flight**:

▶▶**Go to step 6**

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

6 Choose one:

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

►►**Go to step 9**

◆Airplane is **above** 8,000 feet:

►►**Go to step 7**

7 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

8 LDG ALT selector . . . . Set between 8,000 and 8,500

9 Plan to land at the nearest suitable airport

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

LDG ALT switch . . . . Select AUTO

AUTO landing altitude mode shows on EICAS.

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

LANDING ALT

12 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

Flaps . . . . ____

Cabin Report . . . . Received

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

■ ■ ■ ■

FIRE WHEEL WELL

Condition: Fire is detected in a main wheel well.

1 **When** extending or retracting the landing gear, do not exceed the gear EXTEND limit speed (270K/.82M).

2 Landing gear lever . . . . DN

This attempts to remove and extinguish the fire source.

3 Do not use FMC fuel predictions with gear extended.

4 Flight with 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 Plan to land at the nearest suitable airport.

6 Choose one:

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

►► **Go to step 7**

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

■ ■ ■ ■

▼ Continued on next page ▼

▼ FIRE WHEEL WELL continued ▼

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

Wait 20 minutes. This ensures the fire is extinguished.

Landing gear lever . . . . UP, then OFF

■ ■ ■ ■

OVHT ENG 1, 2, 3, 4 COWL

Condition: An overheat is detected in the engine cowl.

1 ENGINE BLEED air switch . . . . Off

This attempts to stop the flow of bleed air through the leak.

2 Choose one:

◆OVHT ENG COWL message **stays shown**:

Nacelle anti-ice is not available for the affected engine.

►►**Go to step 3**

◆OVHT ENG COWL message **blanks**:

Sufficient bleed air may not be available for nacelle anti-ice if N1 is less than 70% at or above 10,000 feet or less than 55% below 10,000 feet.

►►**Go to step 3**

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

>BLEED OFF

■ ■ ■ ■

OVHT ENG 1, 2, 3, 4 STRUT

Condition: An overheat is detected in the engine strut.

1 ENGINE BLEED air
switch (affected engine) . . . . Off

2 Nacelle anti-ice is not available for the affected engine.

3 Choose one:

◆OVHT ENG STRUT message **stays shown** after two minutes:

Thrust lever
(affected engine) . . . Confirm . . . . . . Idle

Transponder mode selector . . . . TA

▶▶**Go to step 4**

◆OVHT ENG STRUT message **blanks**:

Run the engine at reduced thrust to keep the OVHT ENG STRUT message from showing.

Transponder mode selector . . . . TA

▶▶**Go to step 4**

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

>BLEED OFF

■ ■ ■ ■

SMOKE DR 5 REST
SMOKE ZN F REST

Condition: Smoke is detected in the crew rest area.

1 Establish communications with the cabin crew.

2 Choose one:

◆Smoke is **persistent**:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

◆Smoke is **cleared** and the fire is confirmed **extinguished**:

▶▶**Go to step 3**

3 Instruct a cabin crew member to push the door 5 crew rest reset switch on the bottom of the door 5 crew rest TEMPERATURE CONTROL panel. This returns the packs to normal flow by resetting the recirculation fans.

4 **After** the door 5 crew rest reset switch is pushed:

PACK RST switch . . . . Push

This may be necessary to complete the reset.

■ ■ ■ ■

>SMOKE LAVATORY

Condition: Smoke detected in a lavatory or in IFE cooling duct (galley 4) on all aircraft.

■ ■ ■ ■

Smoke or Fumes Removal

Condition: Smoke or fumes removal is needed.

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

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

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

3 Close the flight deck door. This prevents smoke or fumes from penetrating onto the flight deck.

4 EQUIP COOLING selector. . . . . OVRD

5 Choose one:

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

▶▶ **Go to step 6**

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

Pull the smoke evacuation handle. Pulling the smoke evacuation handle when smoke or fumes source is not on the flight deck may bring the smoke or fumes into the flight deck.

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

■ ■ ■ ■

◆ Smoke or fumes does **not** continue and is **not** severe:

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

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ Smoke or Fumes Removal continued ▼

6 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

7 LDG ALT selector . . . . Set between 8,000 and 8,500

8 EQUIP COOLING selector . . . . .NORM

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

10 **When** at level off:

OUTFLOW VALVES MAN switches (both) . . .ON

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

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

CABIN ALT AUTO

LANDING ALT

OUTFLOW VLV L, R

12 Set airspeed at 200 KIAS or less.

13 Choose one:

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

▶▶**Go to step 14**

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

▶▶**Go to step 15**

14 Instruct the cabin crew to open two doors:

Door 1L or 1R

Door 5L or 5R

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

▶▶**Go to step 16**

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

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

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

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

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

Move the door mode select lever to AUTO.

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

■ ■ ■ ■

Intentionally
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Intentionally
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AILERON LOCKOUT

Condition: An aileron lockout actuator is not in the commanded position.

1 At high airspeed, avoid large or abrupt control wheel inputs.

2 Crosswind limit for landing is 20 knots.

3 CAT II and CAT III autoland not approved.

■ ■ ■ ■

>FLAP RELIEF

Condition: Flap load relief occurs.

■ ■ ■ ■

Flap Indication Disagree

Condition: The flap position indication does not reach the selected setting and none of these messages show:
- FLAPS CONTROL
- FLAPS DRIVE
- FLAPS PRIMARY

Objective: To move the flaps normally.

1 Flaps are operating normally.

2 Use the speeds for the selected flap setting.

3 Choose one:

◆During flap **extension**:

Continue normal flap extension.

■ ■ ■ ■

◆During flap **retraction**:

►►**Go to step 4**

4 Continue normal flap retraction.

5 The flap position indication may not reach the selected flap position.

6 The pitch limit indication and maximum speed may indicate previous flap setting.

▼ **Continued on next page** ▼

▼ Flap Indication Disagree continued ▼

7 Choose one:

◆ Maximum speed **stays** at 280 knots after normal retraction time with the flaps selected UP:

Plan to land at the nearest suitable airport.

Warning system functions and indications that use flap position data are unreliable.

■ ■ ■ ■

◆ Maximum speed does **not** stay at 280 knots after normal retraction time with the flaps selected UP.

Continue normal operation.

■ ■ ■ ■

FLAPS CONTROL

Condition: All flap control units are failed.

Objective: To use alternate flaps. Flaps still extend or retract normally with an inoperative flap position indication.

1 Choose one:

◆ During flap **retraction**:

Limit airspeed to the flaps 5 placard speed while the flaps are between 5 and UP.

▶▶**Go to step 2**

◆ During flap **extension**:

▶▶**Go to step 2**

2 Use flaps 25 and VREF 25 for landing.

3 Plan additional time for flap operation. Flaps UP to 5 takes approximately 4 minutes. Flaps 5 to 25 takes approximately 2 minutes.

4 ALTN FLAPS ARM switch . . . . ALTN

5 ALTN FLAPS selector . . . . Move to EXT or RET to extend or retract the flaps on schedule

▼ Continued on next page ▼

▼ FLAPS CONTROL continued ▼

6 Choose one:

◆ Expanded flap position indication is **operative**:

▶▶**Go to step 14**

◆ Expanded flap position indication is **inoperative**:

▶▶**Go to step 7**

7 Autopilots are inoperative.

8 Outboard ailerons are unlocked.

9 At high airspeed, avoid large or abrupt control wheel inputs.

10 Choose one:

◆ During flap **extension**:

Maintain flaps UP manoeuvring speed.

Slow to flaps 5 manoeuvring speed after 3 minutes and 45 seconds with the alternate flap selector in EXT.

Slow to flaps 25 approach speed after 5 minutes total.

Do not fly in stick shaker.

Extend the gear after the flaps are extended.

GND PROX FLAP OVRD switch . . . . . OVRD

▶▶**Go to step 14**

◆ During flap **retraction**:

▶▶**Go to step 11**

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

12 At gross weights above 308,443 kilograms, limit the angle of bank to 15 degrees until flaps are UP.

▼ Continued on next page ▼

▼ FLAPS CONTROL continued ▼

13 Choose one:

◆Flap retraction is **needed**:

Accelerate to flaps 5 manoeuvring speed.

After 90 seconds, accelerate to flaps 5 placard.

After 5 minutes total with alternate flap selector in RET, accelerate to climb speed.

Do not fly in stick shaker.

▶▶**Go to step 14**

◆Flap retraction is **not** needed:

▶▶**Go to step 14**

14 Checklist Complete Except Deferred Items

Note: Refer to Non-Normal Configuration Landing Distance Table.

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . . . **VREF 25___, Minimums____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps **25**

Cabin Report . . . . .Received

■ ■ ■ ■

FLAPS DRIVE

Condition: One or more of these occur:
- A flap group failed to move in secondary mode.
- An asymmetry is detected.

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

2 Choose one:

◆During flap **retraction**:

Do **not** exceed the flap placard speeds.

Do **not** exceed 20,000 feet.

Do **not** use FMC fuel predictions with the flaps extended.

►►**Go to step 3**

◆During flap **extension**:

►►**Go to step 3**

3 Do not use autoland.

4 Use flaps 25 and VREF 30+25 for landing. Use the flap lever to position the available flap groups in the primary or secondary mode.

Note: Refer Non-Normal Configuration Landing Distance Table.

5 **Checklist Complete Except Deferred Items**

Deferred Items

Review before Descent

If the amber minimum manoeuvring speed band is above the flap manoeuvring speed, do the following:

Set the A/T ARM switch OFF.

Use the shown flap manoeuvring speeds.

Do **not** accomplish the following checklist:

AIRSPEED LOW

▼ Continued on next page ▼

▼ FLAPS DRIVE continued ▼

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF 30+25___, Minimums___**

Approach briefing . . . . Completed

Approach Preparation

Choose one:

◆The inboard trailing edge flaps are **normal**:

▶▶**Go to Additional Deferred Items**

◆The inboard trailing edge flaps are **affected**:

Approach idle minimum thrust setting is inoperative.

Maintain a minimum thrust setting of 50% N1 at or above 10,000 feet and 40% N1 below 10,000.

CON IGNITION switch . . . . On

Automatic continuous ignition may be inoperative.

▶▶**Go to Additional Deferred Items**

Additional Deferred Items

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

Caution! The "CONFIG GEAR" message, master warning lights, and siren may not function when all of the following occurs:
- **The landing gear is not down and locked,**
- **Any thrust lever is at idle,**
- **Radio altitude (RA) is less than 800 feet with any inboard trailing edge flap at 20 or less.**

▼ Continued on next page ▼

▼ FLAPS DRIVE continued ▼

Approach Checklist

Altimeters . . . . ____

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps **25**

Cabin Report . . . . .Received

■ ■ ■ ■

FLAPS PRIMARY

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

1 Plan additional time for flap operation. Flaps UP to 5 takes approximately 4 minutes, Flaps 5 to 25 takes approximately 2 minutes.

■ ■ ■ ■

VALVE CLOSED

>FLT CONT VLVS

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

■ ■ ■ ■

Jammed or Restricted Flight Controls

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

1 Overpower the jammed or restricted flight control. Use maximum force, including a combined effort of both pilots, if needed.

2 Do not turn off any flight control hydraulic power switch.

3 Choose one:

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

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

►►**Go to step 4**

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

►►**Go to step 4**

4 Choose one:

◆Controls are **normal**:

■ ■ ■ ■

◆Controls stay **jammed or restricted**:

Use operative flight controls, trim (including alternate trim), and thrust as needed for aircraft control.

Do not use autoland.

■ ■ ■ ■

Jammed Stabiliser Landing

Condition: The stabiliser is jammed.

1 Do not use autoland.

2 Use flaps 25 and VREF 30+20 for landing.

Note: Maintain "in-trim" airspeed for as long as possible, to reduce workload.

Pitch attitude on landing is less than normal.

Refer Non-Normal Configuration Landing Distance Table.

3 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

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

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps. **25**

Cabin Report . . . . .Received

■ ■ ■ ■

RUD RATIO DUAL

Condition: Both rudder ratio changers are failed.

1 At high airspeed, avoid large or abrupt rudder inputs.

2 At low airspeed, rudder control may be reduced.

3 Manual landing crosswind limit is 10 knots.

4 Automatic landing crosswind limits are:

With all engines operating, 10 knots.

With an engine inoperative, 5 knots.

■ ■ ■ ■

RUD RATIO SNGL

Condition: One rudder ratio changer is failed.

1 At high airspeed, avoid large or abrupt rudder inputs.

2 At low airspeed, rudder control may be reduced.

3 Landing crosswind limit is 20 knots.

■ ■ ■ ■

SPEEDBRAKE AUTO

Condition: An automatic ground spoiler system fault occurs.

1 Do not arm the speedbrakes. This prevents inadvertent in flight extension.

2 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Additional deferred item

Extend the ground spoilers manually after landing.

Landing Checklist

Speedbrake . . . . **DN**

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

■ ■ ■ ■

>SPEEDBRAKES EXT

Condition: The speedbrakes are extended and one or more of these occur:
- The radio altitude is between 15 and 800 feet.
- The flap lever is in a landing setting.
- Two or more thrust levers are not at idle.

■ ■ ■ ■

>STAB GREENBAND

Condition: The nose gear pressure switch disagrees with the calculated stabilizer green band. One or more of the following may be incorrect:
- Aeroplane loading.
- Gross weight entry.
- CG entry.
- Takeoff thrust entry.

■ ■ ■ ■

>STAB TRIM 2, 3

Condition: One of these occurs:
- Automatic cutout of related hydraulic system power to stabiliser trim.
- A stabiliser trim cutout switch is in CUTOUT.
- Trim commanded and the respective actuator does not move.

Note: If the stabiliser fails to trim refer to Jammed Stabiliser Landing Checklist.

■ ■ ■ ■

STAB TRIM UNSCHD

Condition: One of these occurs:
- Stabiliser movement without a signal to trim and automatic cutout does not occur.
- The alternate stabiliser trim switches are used with an autopilot engaged.

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

2 Higher than normal control column force may be required to prevent unwanted pitch change.

3 Autopilot disengage switch . . . . .Push

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

4 STAB TRIM CUTOUT 2 switch . . . . .ON

5 Trim may be available after a brief delay.

6 Choose one:

◆Stabiliser movement is **normal**:

Continue normal operation.

Stabiliser trim moves at half rate.

Center and right autopilots are available.

■ ■ ■ ■

◆**Unscheduled stabiliser** movement occurs:

►►**Go to step 7**

7 STAB TRIM CUTOUT 2 switch . . . . CUTOUT

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

8 STAB TRIM CUTOUT 3 switch . . . . .ON

9 Trim may be available after a brief delay.

▼ Continued on next page ▼

▼ STAB TRIM UNSCHD continued ▼

10 Choose one:

◆Stabiliser movement is **normal**:

Continue normal operation.

Stabiliser trim moves at half rate.

Left and center autopilots are available.

■ ■ ■ ■

◆**Unscheduled stabiliser** movement occurs:

►►**Go to step 11**

11 STAB TRIM CUTOUT 3 switch . . . . CUTOUT

12 Stabilizer trim is inoperative.

13 Do not use autoland.

14 Use flaps 25 and VREF 30+20 for landing.

Note: Refer to Non-Normal Configuration Landing Distance Table.

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

Jammed Stabiliser Landing

16 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ____

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

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ Continued on next page ▼

▼ STAB TRIM UNSCHD continued ▼

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps **25**

Cabin Report . . . . .Received

■ ■ ■ ■

INOP

>YAW DAMPER LWR, UPR

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

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

■ ■ ■ ■

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IAS DISAGREE or Airspeed Unreliable

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

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

1 Autopilot disengage switch . . . . .Push

2 A/T ARM switch . . . . OFF

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

4 Set the following gear up pitch attitude and thrust:

Flaps extended . . . . 10° and 90% N1

Flaps up . . . . 4° and 80% N1

- -

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

5 The following are **reliable**:

Attitude

N1

Ground Speed

Radio Altimeter

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

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

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

▼ Continued on next page ▼

▼ IAS DISAGREE or Airspeed Unreliable continued ▼

7 When in trim and stabilized, cross check the PFD and standby airspeed indicators. An airspeed indication that differs by more than 30 knots or 0.03 Mach from the airspeed shown in the table should be considered **unreliable**.

8 Choose one:

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

▶▶**Go to step 9**

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

Autopilots, autothrottle, and flight directors are not reliable.

▶▶**Go to step 15**

9 Choose one:

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

AIR DATA SOURCE
selector (First Officer) C

Crosscheck PFD and standby airspeed indications.

▶▶**Go to step 10**

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

AIR DATA SOURCE selector (Captain) . . . C

Crosscheck PFD and standby airspeed indications.

▶▶**Go to step 11**

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

AIR DATA SOURCE selector (Captain) . . . C

Crosscheck PFD and standby airspeed indications.

▶▶**Go to step 12**

▼ Continued on next page ▼

▼ IAS DISAGREE or Airspeed Unreliable continued ▼

10 Choose one:

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

Autopilots, autothrottle, and flight director are available.

■ ■ ■ ■

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

AIR DATA SOURCE selector (First Officer) L

FLT DIR SOURCE selector (First Officer) L

FMC selector L

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

■ ■ ■ ■

11 Choose one:

◆Captain's airspeed is **reliable**:

Autopilots, autothrottle, and flight director are available.

■ ■ ■ ■

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

AIR DATA SOURCE selector (Captain) . . . R

FLT DIR SOURCE selector (Captain) . . . . R

FMC selector . . . . R

R autopilot, autothrottle, and flight directors are available.

■ ■ ■ ■

▼ Continued on next page ▼

▼ IAS DISAGREE or Airspeed Unreliable continued ▼

12 Choose one:

◆Captain's airspeed is **reliable**:

AIR DATA SOURCE selector (First Officer) L

FLT DIR SOURCE selector (First Officer) L

FMC selector L

C and L autopilots, autothrottle, and flight director are available. First officer's airspeed stays unreliable.

■ ■ ■ ■

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

▶▶**Go to step 13**

13 Continue flight using only the standby flight instruments.

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

Note: Plan more time for alternate flap extension.

Use flaps 25 and VREF 25 for landing.

▶▶**Go to step 17**

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

Note: Maintain visual conditions if possible.

Establish landing configuration early.

Radio altitude reference is available below 2,500 feet AGL.

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

Do not use TO/GA for a go-around or missed approach.

Note: Plan more time for alternate flap extension.

Use flaps 25 and VREF 25 for landing.

▼ Continued on next page ▼

▼ IAS DISAGREE or Airspeed Unreliable continued ▼

16 Transponder mode selector . . . . TA

17 Choose one:

◆ Altitude is **reliable**:

▶▶ **Go to step 18**

◆ Altitude is **unreliable**:

Altitude reporting selector . . . . OFF

▶▶ **Go to step 18**

18 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . . **VREF 25___, Minimums___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Flap Extension

Extend flaps normally until reaching flaps 20.

When flaps are at 20, continue extending flaps to 25 using alternate flaps:

ALTN FLAPS ARM switch. . . . . ALTN

Alternate flaps selector . . . . EXT

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

▼ Continued on next page ▼

▼ IAS DISAGREE or Airspeed Unreliable continued ▼

Flaps **25**

Cabin Report . . . . .Received

■ ■ ■ ■

Additional Information

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

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

    >ADC CENTER

    >ADC LEFT

    >ADC RIGHT

    AILERON LOCKOUT

    >AIRSPEED LOW

    >OVERSPEED

    RUD RATIO DUAL

    RUD RATIO SNGL

>ADC CENTRE, LEFT, RIGHT

Condition: Air data computer failure.

■ ■ ■ ■

ALT DISAGREE

Condition: The Captain's and First Officer's altitude indications disagree by more than 200 feet.

Objective: To attempt to select ADCs that do not disagree by more than 200 feet.

1 Autopilot disengage switch . . . . .Push

2 AIR DATA SOURCE selector (Captain) C

3 Choose one:

◆ ALT DISAGREE message **blanks**:

Engage the L, C or R autopilot, if needed.

Transponder altitude is now reliable.

■ ■ ■ ■

◆ ALT DISAGREE message **stays shown**:

▶▶**Go to step 4**

4 AIR DATA SOURCE selector (First Officer) L

5 Choose one:

◆ ALT DISAGREE message **blanks**:

Engage the L or C autopilot, if needed.

R autopilot is unreliable.

Transponder altitude is now reliable.

■ ■ ■ ■

◆ ALT DISAGREE message **stays shown**:

▶▶**Go to step 6**

6 AIR DATA SOURCE selector (Captain) . . . . R

7 AIR DATA SOURCE selector (First Officer) C

▼ **Continued on next page** ▼

▼ ALT DISAGREE continued ▼

8 Choose one:

◆ ALT DISAGREE message **blanks**:

Engage the R autopilot, if needed.

L and C autopilots are unreliable.

Transponder altitude is now reliable.

■ ■ ■ ■

◆ ALT DISAGREE message **stays shown**:

▶▶**Go to step 9**

9 AIR DATA SOURCE selector (Captain) L

10 Choose one:

◆ ALT DISAGREE message **blanks**:

Engage the L, C, or R autopilot, if needed.

Transponder altitude is now reliable.

■ ■ ■ ■

◆ ALT DISAGREE message **stays shown**:

▶▶**Go to step 11**

11 Aircraft does not meet RVSM airspace requirements.

12 Altitude reporting selector . . . . OFF

13 Do **not** use the flight path vector.

14 Maintain visual conditions if possible.

15 Checklist Complete Except Deferred Items

Deferred Items

Review before descent:

Establish landing configuration early.

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

Radio altitude reference is available below 2,500 feet AGL.

■ ■ ■ ■

>AOA RIGHT

Condition: The right angle of attack sensor is failed. AOA system redundancy is lost.

■ ■ ■ ■

>ATTITUDE

Condition: The Captain's and First Officer's attitude indications disagree.

■ ■ ■ ■

>BARO DISAGREE

Condition: The Captain’s and First Officer’s barometric reference settings disagree.

■ ■ ■ ■

>EFIS CONTROL L, R

Condition: One of these occurs:
- The EFIS control panel is failed.
- CDU control of the EFIS is used.

■ ■ ■ ■

>EFIS/EICAS C/P

Condition: One of these occurs:
- Both EFIS control panels and the EICAS display select panel are failed.
- CDU control of the EFIS and EICAS is used.

■ ■ ■ ■

>EIU LEFT

Condition: The left EFIS/EICAS interface unit is failed.

■ ■ ■ ■

>HEADING

Condition: The Captain's and First Officer's selected IRS heading output disagree by 4 degrees or more.

■ ■ ■ ■

>PVD SYS CAPT, F/O

Condition: A para-visual display is failed.

■ ■ ■ ■

>SNGL SOURCE RA

Condition: Both primary flight displays use the same radio altimeter source.

■ ■ ■ ■

>SOURCE SEL ADC

Condition: Both primary flight displays use the same air data source.

■ ■ ■ ■

>SOURCE SEL EIU

Condition: Both pilots' displays use the same EFIS/EICAS interface unit source.

■ ■ ■ ■

>SOURCE SEL F/D

Condition: Both primary flight displays use the same flight director source.

■ ■ ■ ■

>SOURCE SEL IRS

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

■ ■ ■ ■

>SOURCE SEL NAV

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

■ ■ ■ ■

>TRACK

Condition: Captain and First Officer selected track output disagree by 6 degrees or more.

■ ■ ■ ■

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FMC LEFT, RIGHT

Condition: An FMC is failed.

Note: Autothrottle may have disconnected without warning.
The FMC message may take up to 50 seconds to appear.

1 Choose one:

◆**A single** FMC is failed:

FMC selector . . . . .Select operable FMC

Reengage the autothrottle.

NAV SOURCE selector . . . . .Select operable FMC

■ ■ ■ ■

◆**Both** FMCs are failed:

▶▶**Go to step 2**

2 The autothrottle is inoperative.

3 Choose one:

◆Airplane position **is** north of 82° N latitude:

▶▶**Go to step 4**

◆Airplane position **is** north of 70° N latitude between 80° W and 130° W:

▶▶**Go to step 4**

◆Airplane position **is** south of 82° S latitude:

▶▶**Go to step 4**

◆Airplane position **is** south of 60° S latitude between 120° E and 160° E:

▶▶**Go to step 4**

◆Airplane position is **not** in the above regions:

▶▶**Go to step 5**

4 HDG reference switch . . . . TRUE

▼ **Continued on next page** ▼

▼ FMC LEFT, RIGHT continued ▼

5 Engage heading select or heading hold mode as needed.

6 NAV SOURCE selector (Captain). . . . . .CDU L or CDU C

7 NAV SOURCE selector (First Officer) . . . . CDU R or CDU C

Note: Select CDUs controlling two most accurate IRS sources (if known).

8 Route modifications must be entered into all three CDUs. Enter any new waypoints by latitude and longitude using only one decimal point for entry e.g. N6330.0W02050.0.

9 Manually tune navigation radios through CDUs. Use left CDU for left VOR, ADF and ILS. Use right CDU for right VOR, ADF and ILS. Use centre CDU for centre ILS.

10 Set Standby ASI to 1.3 g buffet margin. Refer to Cruise Altitude Limits table.

Note: Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP - Above 309,000 kgs	VREF 30 + 100
FLAPS UP - At or below 309,000 kgs	VREF 30 + 80
FLAPS 1	VREF 30 + 60
FLAPS 5	VREF 30 + 40
FLAPS 10	VREF 30 + 20
FLAPS 20	VREF 30 + 10
FLAPS 25	VREF 25
FLAPS 30	VREF 30

11 LDG ALT switch . . . . Select MAN

MAN landing altitude mode shows on EICAS.

12 LDG ALT selector . . . . Set the landing altitude

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

LANDING ALT

▼ Continued on next page ▼

▼ FMC LEFT, RIGHT continued ▼

14 Set Standby ASI bugs to VREF, VREF+20 kts, VREF+40 kts, VREF+60 kts and VREF+80 kts for approach and landing. Manoeuvring speeds are the bugged speeds.

■ ■ ■ ■

>FMC MESSAGE

Condition: An alert message is in the CDU scratchpad.

1 Check the FMC alert message in the CDU scratchpad.

2 Choose one:

◆ **VNAV STEP CLIMB** message is shown:

Condition: An FMC-predicted or manually-entered VNAV step climb point has sequenced and a climb has not started.

Objective: To update the VNAV profile so the FMC fuel and ETA predictions are accurate.

►► **Go to step 3**

◆ **INSUFFICIENT FUEL** message is shown:

Condition: FMC estimated fuel at the destination is less than the entered RESERVES fuel.

►► **Go to step 5**

◆ **Another** message is shown:

Corrective action may be needed.

■ ■ ■ ■

▼ Continued on next page ▼

▼ FMC MESSAGE continued ▼

3 Choose one:

◆ Step climb is already **completed**:

▶▶ **Go to step 4**

◆ Step climb is needed **now**:

Start a step climb.

■ ■ ■ ■

◆ Step climb is needed **later**:

Enter a planned step climb altitude on the RTE LEGS page.

▶▶ **Go to step 4**

◆ Step climb is **not** needed for the rest of the flight:

Enter a step size of 0 on the VNAV CRZ page.

▶▶ **Go to step 4**

4 Enter the current altitude as the cruise altitude on the VNAV CRZ page, even if it is already shown. This step updates the FMC predictions.

■ ■ ■ ■

5 The INSUFFICIENT FUEL message can be caused by a fuel leak.

6 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other tanks and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer fuel is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

▼ Continued on next page ▼

▼ **FMC MESSAGE continued** ▼

Fuel used is calculated using the engine fuel flow sensors.

7 Choose one:

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

▶▶ **Go to the Fuel Leak Engine checklist on page 12.9**

■ ■ ■ ■

◆ There is **no** indication of a fuel leak:

Verify sufficient fuel is available to complete the flight.

■ ■ ■ ■

>FMC RUNWAY DIS

Condition: Airplane is not on the FMC origin runway when takeoff is attempted.

■ ■ ■ ■

>GPS

Condition: Both GPS receivers are failed.

■ ■ ■ ■

>GPS LEFT, RIGHT

Condition: One GPS receiver is failed.

■ ■ ■ ■

ILS ANTENNA

Condition: An ILS receiver does not use the correct antenna.

Two or more localiser antennas failed to switch to tail or bulkhead antenna as selected by the FCC.

Two or more glide slope antennas failed to switch to bulkhead antenna with nose gear not down.

Two or more glide slope antennas failed to switch to track antenna with nose gear down.

Primary and alternate PSEU disagree with nose gear down.

1 Threshold clearance may be reduced.

■ ■ ■ ■

IRS CENTRE, LEFT, RIGHT

Condition: An IRU fault occurs.

1 IRS SOURCE
selector . . . . Select operable IRU source

Action is irreversible

2 IRS mode
selector (affected IRU) . . . Confirm . . . . ATT

Note: CAT IIIB autoland not available.

Body Gear Steering not available with IRS LEFT message.

3 **When** straight and level constant airspeed flight has been maintained for a minimum of 30 seconds:

►►**Go to step 4**

4 Choose one:

◆ IRS message **blanks**:

Maintain straight and level flight while entering the heading. Enter the current heading on the SET IRS HEADING line of the CDU position initialisation page.

The IRS heading may have to be updated periodically.

■ ■ ■ ■

◆ IRS message **stays shown**:

►►**Go to step 5**

Action is irreversible

5 IRS mode
selector (affected IRU) . . . Confirm . . . . OFF

■ ■ ■ ■

>IRS AC CENTRE, LEFT, RIGHT

Condition: IRU AC power is failed.

■ ■ ■ ■

>IRS DC CENTRE, LEFT, RIGHT

Condition: IRU backup DC power is failed.

■ ■ ■ ■

IRS MOTION

Condition: Aircraft motion is detected while the IRS aligns.

1 Stop aircraft motion until IRS alignment is complete.

2 Verify that the position is correct and re-enter if needed.

■ ■ ■ ■

>SNGL SOURCE ILS

Condition: Both primary flight displays use the same ILS source.

■ ■ ■ ■

>TRANSPONDER L, R

Condition: The transponder is failed.

■ ■ ■ ■

UNABLE RNP

Condition: The actual navigational performance is not sufficient.

1 Choose one:

◆ On the **ground**:

The message may show with GPS inhibited.

■ ■ ■ ■

◆ On procedure or airway that **has an RNP alerting requirement**:

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

■ ■ ■ ■

◆ On procedure or airway **without** an RNP alerting requirement:

Verify position.

■ ■ ■ ■

Intentionally
Blank

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Intentionally
Blank

FUEL DISAGREE

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

Objective: To decide if a fuel leak is suspected. To select the most accurate fuel value if a fuel leak is not suspected.

The FUEL DISAGREE message may be caused by a fuel leak.

1 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other tanks and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

▼ Continued on next page ▼

▼ FUEL DISAGREE continued ▼

2 Choose one:

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

►►**Go to the Fuel Leak Engine checklist on page 12.9, before completing this checklist.**

◆There is **no** indication of a fuel leak:

►►**Go to step 3**

3 Select PROGRESS page 2

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

■ ■ ■ ■

FUEL IMBAL 1-4

Condition:	There is a fuel imbalance of 1,360 kgs between main tanks 1 and 4.
Objective:	To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

Note: Fuel balancing should be accomplished, as necessary, on a time available basis.

Many factors may affect the need to balance fuel, including the nature of any abnormal condition: the amount of imbalance; the current flight situation and the configuration status of the aircraft, such as the number of engines operating.

1 If an engine has low fuel flow and unusual engine indications, a fuel imbalance may show due to engine damage instead of a fuel leak.

2 The FUEL IMBAL 1-4 message may be caused by an engine fuel leak or a fuel imbalance.

▼ Continued on next page ▼

▼ **FUEL IMBAL 1-4 continued** ▼

3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

4 Choose one:

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

► ► **Go to the Fuel Leak Engine checklist on page 12.9**

■ ■ ■ ■

◆ There is **no** indication of an engine fuel leak:

► ► **Go to step 5**

5 Configure the fuel pumps and crossfeed valves as needed to balance fuel.

6 **When** fuel balancing is complete:

Resume normal fuel management.

■ ■ ■ ■

FUEL IMBAL 2-3

Condition: There is a fuel imbalance of 2,720 kgs between main tanks 2 and 3.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

Note: Fuel balancing should be accomplished, as necessary, on a time available basis.

Many factors may affect the need to balance fuel, including the nature of any abnormal condition: the amount of imbalance; the current flight situation and the configuration status of the aeroplane, such as the number of engines operating.

1 If an engine has low fuel flow and unusual engine indications, a fuel imbalance may show due to engine damage instead of a fuel leak.

2 The FUEL IMBAL 2-3 message may be caused by an engine fuel leak or a fuel imbalance.

3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

▼ Continued on next page ▼

▼ **FUEL IMBAL 2-3 continued** ▼

4 Choose one:

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

▶▶ **Go to the Fuel Leak Engine checklist on page 12.9**

■ ■ ■ ■

◆ There is **no** indication of an engine fuel leak:

▶▶ **Go to step 5**

5 Configure the fuel pumps and crossfeed valves as needed to balance fuel.

6 **When** fuel balancing is complete:

Resume normal fuel management.

■ ■ ■ ■

FUEL IMBALANCE

Condition: After the FUEL TANK/ENG message shows, there is a longitudinal fuel imbalance of 2,720 kgs between the inboard and outboard main tanks.

Objective: To decide if a fuel leak is suspected. To balance fuel if a fuel leak is not suspected.

Note: Fuel balancing should be accomplished, as necessary, on a time available basis.

Many factors may affect the need to balance fuel, including the nature of any abnormal condition: the amount of imbalance; the current flight situation and the configuration status of the aeroplane, such as the number of engines operating.

1 If an engine has low fuel flow and unusual engine indications, a fuel imbalance may show due to engine damage instead of a fuel leak.

2 The FUEL IMBALANCE message may be caused by an engine fuel leak or a fuel imbalance.

▼ **Continued on next page** ▼

▼ FUEL IMBALANCE continued ▼

3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

4 Choose one:

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

►►**Go to the Fuel Leak Engine checklist on page 12.9**

■ ■ ■ ■

◆There is **no** indication of an engine fuel leak:

►►**Go to step 5**

5 Configure the fuel pumps and crossfeed valves as needed to balance fuel.

6 **When** fuel balancing is complete:

Resume normal fuel management.

■ ■ ■ ■

>FUEL JETT A, B

Condition: A fuel jettison system is failed.

■ ■ ■ ■

FUEL JETT SYS

Condition: One of these occurs:

- The total fuel quantity is less than the FUEL TO REMAIN and a jettison nozzle valve is open.
- Both fuel jettison systems are failed.

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

2 FUEL JETTISON selector . . . . OFF

■ ■ ■ ■

Fuel Jettison

Condition: Fuel jettison is needed.

Note: When fuel jettison is to be accomplished consider the following:

- Avoid areas of precipitation, static or lightning discharge.
- Except in emergency: minimum height above ground 6,000 feet to allow for fuel vapourisation.
- Downward drift of fuel may exceed one mile per 1,000 feet of drop.
- Avoid jettisoning fuel in a holding pattern with other aircraft below.

1 Do not extend or retract flaps between flaps 1 and 5 during fuel jettison.

2 FUEL JETTISON selector . . . . .A or B

3 FUEL TO REMAIN . . . . .Set

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

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

5 Fuel pump switches (all tanks that have fuel) . . . . ON

This turns on center wing tank and horizontal stabilizer tank pump switches if they are off with fuel remaining. This ensures override pumps 2 and 3 are on.

▼ Continued on next page ▼

▼ Fuel Jettison continued ▼

G-CIVF - G-CIVI

6 Fuel pump switches
(all tanks that have fuel) . . . . .ON

This turns on center wing tank pump switches if they are off with fuel remaining. This ensures override pumps 2 and 3 are on.

7 During fuel jettison:

Do **not** accomplish the following checklists:

FUEL OVRD 2, 3 AFT, FWD

Low back pressure and high flow rates can cause an erroneous low pressure indication. The override pumps are left on during jettison.

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

8 **When** the FUEL PRES STB message shows:

STAB pump switches (both). . . . . Off

9 **When** the FUEL PRESS CTR message shows:

CTR pump switches (both). . . . . Off

10 **When** jettison is complete:

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

FUEL JETTISON selector . . . . OFF

■ ■ ■ ■

Fuel Leak Engine

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

Objective: To verify that there is an engine fuel leak. To identify the leaking engine, and shut down the engine.

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

1 STAB pump switches (both) . . . . Off

2 CTR pump switches (both). . . . . Off

3 FUEL X FEED valve switches (all) . . . . Off

4 OVRD 2 pump switches (both) . . . . Off

5 OVRD 3 pump switches (both) . . . . Off

6 Identify an engine fuel leak by observing one main tank fuel quantity decreasing faster than other main tank fuel quantities.

7 An increase in fuel imbalance of approximately 500 kgs or more in 30 minutes should be considered an engine fuel leak.

8 If conditions allow, visually check for an engine fuel leak.

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

FUEL IMBAL 1-4

FUEL IMBAL 2-3

FUEL IMBALANCE

>X FEED CONFIG

FUEL DISAGREE

▼ **Continued on next page** ▼

▼ **Fuel Leak Engine continued** ▼

10 Choose one:

◆Engine fuel leak is **confirmed**:

▶▶**Go to step 12**

◆Engine fuel leak is **not** confirmed:

▶▶**Go to step 11**

11 Choose one:

◆FUEL DISAGREE message is **shown**:

Select PROGRESS PAGE 2.

TOTALIZER or
CALCULATED . . . . Select USE for the most accurate indication

▶▶**Go to step 18**

◆FUEL DISAGREE message is **not** shown:

▶▶**Go to step 18**

12 Thrust lever
(affected engine) . . . . . . Confirm . . . . Idle

If conditions allow, run the engine at idle for two minutes to allow the engine to cool and stabilize.

13 FUEL CONTROL switch
(affected engine) . . . . . . Confirm . . . . . CUTOFF

14 Transponder mode selector . . . . TA

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

>ENG SHUTDOWN

Note: If landing with engine shutdown refer to Non-Normal Configuration Landing Distance Table.

▼ **Continued on next page** ▼

▼ **Fuel Leak Engine continued** ▼

16 Choose one:

◆FUEL DISAGREE message is **shown**:

TOTALIZER . . . . Select USE

Use TOTALIZER to determine fuel remaining.

▶▶**Go to step 17**

◆FUEL DISAGREE message is **not** shown:

▶▶**Go to step 17**

17 After engine shutdown, all remaining fuel can be used for the operating engines. Resume normal fuel management.

18 Choose one:

◆FUEL QTY LOW message is **blank**:

■ ■ ■ ■

◆FUEL QTY LOW message is **shown**:

▶▶**Go to step 19**

19 FUEL X FEED valve switches (all) . . . . On

20 Fuel pump switches
(all tanks that have fuel) . . . . ON

21 Plan to land at nearest suitable airport.

22 Avoid high nose up attitude and excessive acceleration and deceleration.

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

FUEL QTY LOW

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ Fuel Leak Engine continued ▼

Additional Information

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

- Visual observation of fuel spray from strut or engine.
- Excessive engine fuel flow.
- Total fuel quantity decreasing at an abnormal rate.
- FUEL DISAGREE message on CDU scratchpad.
- INSUFFICIENT FUEL message on CDU scratchpad.
- FUEL QTY LOW EICAS message.
- FUEL IMBAL 1-4 EICAS message.
- FUEL IMBAL 2-3 EICAS message.
- FUEL IMBALANCE EICAS message.
- FUEL DISAGREE EICAS message

>FUEL LOW CTR L, R

Condition: One of these occurs:
- Before start, the centre wing tank quantity is less than 7,700 kg with the pump switches ON.
- In climb, the centre wing tank quantity is approximately 3,200 kg with the pump switches ON.
- In cruise, the centre wing tank quantity is approximately 1,300 kg with the pump switches ON.

■ ■ ■ ■

>FUEL OVD CTR L, R

Condition: The centre wing tank pump switch is off and one of these occurs:
- On the ground, the centre wing tank quantity is 7,700 kg or more.
- In cruise, the centre wing tank quantity is 1,800 kg or more.

■ ■ ■ ■

PRESS

FUEL OVRD 2, 3 AFT, FWD

Condition: The pump pressure is low.

1 OVRD pump switch (affected pump) . . . . Off

2 Choose one:

◆**A single** OVRD pump in tank 2 or 3 is inoperative:

■ ■ ■ ■

◆**Both** OVRD pumps in tank 2 **or both** OVRD pumps in tank 3 are inoperative:

▶▶**Go to step 3**

3 OVRD 2 pump switches (both) . . . . Off

4 OVRD 3 pump switches (both) . . . . Off

5 MAIN 1 pump switches (both) . . . . Off

6 MAIN 4 pump switches (both) . . . . Off

7 **When** the >FUEL TANK/ENG message shows:

MAIN 1 pump switches (both) . . . . ON

MAIN 4 pump switches (both) . . . . ON

FUEL X FEED valve 1 and 4 switches. . . . . . . Off

■ ■ ■ ■

>FUEL PMP STB L

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

Condition: One of these occurs:
- On the ground, the pump switch is ON.
- In cruise, the stabilizer tank quantity is 500 kg or more with the pump switch off.

■ ■ ■ ■

>FUEL PMP STB R

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

Condition: One of these occurs:

- On the ground, the pump switch is ON.
- In cruise, the stabilizer tank quantity is 500 kg or more with the pump switch off.

■ ■ ■ ■

PRESS

FUEL PRES STB L, R

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

Condition: The pump pressure is low

1 Choose one:

◆ Stabilizer tank fuel quantity is **less than or equal to** 900 kg:

■ ■ ■ ■

◆ Stabilizer tank fuel quantity is **greater than** 900 kg:

STAB pump switch
(affected pump) . . . . Off

▶▶**Go to step 2**

2 Choose one:

◆ **Both** pumps are inoperative:

The remaining stab fuel is unusable.

■ ■ ■ ■

◆ **A single** pump is inoperative:

Continue normal operation.

■ ■ ■ ■

FUEL PRESS CTR L, R

Condition: One of these occurs:
- The >FUEL LOW CTR L, R message is shown for 60 seconds.
- The pump pressure is low.

1 CTR pump switch (affected pump) . . . . Off

Override pumps 2 and 3 are commanded on by the centre wing tank pump failure. Override pumps 2 and 3 return to armed after approximately five minutes.

2 Choose one:

◆ **Both** centre wing tank override pumps are inoperative:

■ ■ ■ ■

◆ **A single** centre wing tank override pump is inoperative:

►► **Go to step 3**

3 Choose one:

◆ Center wing tank quantity is **less than or equal to** 1,300 kgs in **cruise**:

Resume normal fuel management.

■ ■ ■ ■

◆ Center wing tank quantity is **less than or equal to** 3,200 kgs in **climb**:

Resume normal fuel management.

■ ■ ■ ■

◆ Center wing tank quantity is **greater than** 1,300 kgs in **cruise or** 3,200 kgs in **climb**:

►► **Go to step 4**

4 MAIN 1 pump switches (both) . . . . Off

5 MAIN 4 pump switches (both) . . . . Off

6 **When** the FUEL LOW CTR message shows for the operable pump:

MAIN 1 pump switches (both) . . . . ON

▼ **Continued on next page** ▼

▼ FUEL PRESS CTR L, R continued ▼

MAIN 4 pump switches (both) . . . . ON

CTR pump switch (operable pump). . . . . Off

7 Choose one:

◆FUEL OVD CTR message is **blank** in cruise:

Resume normal fuel management.

■ ■ ■ ■

◆FUEL OVD CTR message **shows** in cruise:

►►**Go to step 8**

8 CTR pump switch (operable pump). . . . . ON

9 MAIN 1 pump switches (both) . . . . Off

10 MAIN 4 pump switches (both) . . . . Off

11 **When** the FUEL LOW CTR message shows:

MAIN 1 pump switches (both) . . . . ON

MAIN 4 pump switches (both) . . . . ON

CTR pump switch (operable pump). . . . . Off

12 Resume normal fuel management.

■ ■ ■ ■

FUEL PRESS ENG 1, 2, 3, 4

Condition: An engine is on suction feed.

Objective: To open the crossfeed valves to ensure fuel flow. To reconfigure if both pumps are failed in tank 1 or 4.

1 FUEL X FEED valve switches (all) . . . . On

2 MAIN pump switches (related tank) . . . . ON

3 Choose one:

◆ **Both** main pumps in **tank 2** are inoperative:

OVRD 2 pump switches (both). . . . . . . .ON

The last 3,200 kg of fuel in the affected tank are available only by suction feed.

■ ■ ■ ■

◆ **Both** main pumps in **tank 3** are inoperative:

OVRD 3 pump switches (both). . . . . . . .ON

The last 3,200 kg of fuel in the affected tank are available only by suction feed.

■ ■ ■ ■

◆ **Both** main pumps in **tank 1 or both** main pumps in **tank 4** are inoperative:

▶▶**Go to step 4**

4 OVRD 2 pump switches (both) . . . . .ON

5 OVRD 3 pump switches (both) . . . . .ON

6 The last 3,200 kg of fuel in the affected tank are available only by suction feed.

7 Do **not** accomplish the fuel tank-to-engine normal procedure.

8 **When** the >FUEL TANK/ENG message shows:

FUEL XFER MAIN 1 and 4 switch. . . . . .ON

This allows gravity transfer of fuel to main tanks 2 and 3.

▼ Continued on next page ▼

▼ FUEL PRESS ENG 1, 2, 3, 4 continued ▼

9 **When** the FUEL OVRD 2 and 3, AFT and FWD messages show:

OVRD 2 pump switches (both) . . . . Off

OVRD 3 pump switches (both) . . . . Off

FUEL X FEED 1 and 4 valve switches. . . . . . Off

Fuel in the affected tank (1 or 4) is available only by suction feed. The unaffected tanks operate normally.

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

FUEL XFER 1+4

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

FUEL PRESS ENG

■ ■ ■ ■

PRESS **FUEL PUMP 1, 4 AFT, FWD**

Condition: The pump pressure is low.

1 Choose one:

◆Tank quantity is **low and** the airplane is in a **high nose up** attitude:

When pitch attitude is reduced:

▶▶**Go to step 2**

◆Tank quantity is **not** low **or** the airplane is **not** in a high nose up attitude:

▶▶**Go to step 3**

2 Choose one:

◆FUEL PUMP message **blanks**:

■ ■ ■ ■

◆FUEL PUMP message **stays shown**:

▶▶**Go to step 3**

3 MAIN pump switch (affected pump) . . . . Off

▼ Continued on next page ▼

▼ **FUEL PUMP 1, 4 AFT, FWD continued** ▼

4 Choose one:

◆**At least one** main pump in tank 1 **and at least one** main pump in tank 4 are **operative**:

■ ■ ■ ■

◆**Both** main pumps in tank 1 **or both** main pumps in tank 4 are **inoperative**:

▶▶**Go to step 5**

5 The last 3,200 kg of fuel in the affected tank are available only by suction feed.

6 Do **not** accomplish the fuel tank-to-engine normal procedure.

7 **When** the >FUEL TANK/ENG message shows:

FUEL XFER MAIN 1 and 4 switch. . . . . .ON

This allows gravity transfer of fuel to main tanks 2 and 3.

8 **When** the FUEL OVRD 2 and 3, AFT and FWD messages show:

OVRD 2 pump switches (both) . . . . .Off

OVRD 3 pump switches (both) . . . . .Off

FUEL X FEED 1 and 4 valve switches. . . . . . .Off

Fuel in the affected tank (1 or 4) is available only by suction feed. The unaffected tank pumps operate normally.

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

FUEL PRESS ENG

>FUEL XFER 1+4

■ ■ ■ ■

PRESS

FUEL PUMP 2, 3 AFT, FWD

Condition: The pump pressure is low.

1 Choose one:

◆Tank quantity is **low and** the airplane is in a **high nose up** attitude:

When pitch attitude is reduced:

▶▶**Go to step 2**

◆Tank quantity is **not** low **or** the airplane is **not** in a high nose up attitude:

▶▶**Go to step 3**

2 Choose one:

◆FUEL PUMP message **blanks**:

■ ■ ■ ■

◆FUEL PUMP message **stays shown**:

▶▶**Go to step 3**

3 MAIN pump switch (affected pump) . . . . Off

4 Choose one:

◆**At least one** main pump in tank 2 **and at least one** main pump in tank 3 are **operative:**

■ ■ ■ ■

◆**Both** main pumps in tank 2 **or both** main pumps in tank 3 are **inoperative:**

▶▶**Go to step 5**

5 OVRD 2 pump switches (both) . . . . ON

6 OVRD 3 pump switches (both) . . . . ON

7 The last 3,200 kg of fuel in the affected tank are available only by suction feed.

8 Do **not** accomplish the fuel tank-to-engine normal procedure.

9 **When** the >FUEL TANK/ENG message shows:

FUEL X FEED 1 and 4 valve switches. . . . . . Off

▼ **Continued on next page** ▼

▼ FUEL PUMP 2, 3 AFT, FWD continued ▼

10 **When** the FUEL OVRD 2 and 3, AFT and FWD messages show:

OVRD 2 pump switches (both) . . . . .Off

OVRD 3 pump switches (both) . . . . .Off

FUEL X FEED valve switch
(affected tank). . . . . .Off

This prevents fuel imbalance and fuel starvation.

Fuel in main tanks 2 and 3 is at standpipe level, 3,200 kg.

Do **not** accomplish the following checklist:

FUEL PRESS ENG

■ ■ ■ ■

FUEL QTY LOW

Condition: Fuel quantity is 900 kg or less in one or more main tanks.

Objective: To decide if a fuel leak is suspected. To ensure that all fuel is available for use if a fuel leak is not suspected.

1 Avoid high nose up attitude. Make thrust changes slowly and smoothly. This reduces the possibility of uncovering fuel pumps.

2 The FUEL QTY LOW message may be caused by an engine fuel leak or low fuel.

3 A fuel leak should be suspected if one or more of the following are true:

The total fuel remaining on EICAS is less than the planned fuel remaining.

An engine has excessive fuel flow.

One main tank is abnormally low compared to the other main tanks and to the expected fuel remaining in the tanks.

On PROGRESS page 2, the totalizer is less than the calculated fuel.

▼ Continued on next page ▼

▼ **FUEL QTY LOW continued** ▼

The TOTALIZER fuel is the sum of the individual tank quantities.

The CALCULATED fuel is the totalizer value at engine start minus fuel used.

Fuel used is calculated using the engine fuel flow sensors.

4 Choose one:

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

▶▶**Go to the Fuel Leak Engine checklist on page 12.9**

■ ■ ■ ■

◆There is **no** indication of an engine fuel leak:

▶▶**Go to step 5**

5 FUEL X FEED valve switches (all) . . . . On

6 Fuel pump switches (all tanks that have fuel) . . . . ON

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

> FUEL TANK/ENG

G-BNLK – G-CIVE, G-CIVJ – G-CIVZ

8 Choose one:

◆FUEL STAB XFR message is **blank**:

▶▶**Go to step 9**

◆FUEL STAB XFR message is **shown**:

Do not turn on the centre or stabiliser tank pump switches.

OVRD 2 pump switches (both) . . . . ON

OVRD 3 pump switches (both) . . . . ON

Plan to land before tank 2 or 3 reaches 15,900 kgs to maintain CG within limits.

■ ■ ■ ■

9 Plan to land at the nearest suitable airport.

■ ■ ■ ■

FUEL RES XFR 2, 3

Condition: The reserve transfer valve is not in the commanded position.

1 Fuel in the affected tank is not available if the quantity does not decrease.

2 Choose one:

◆Reserve tank fuel **decreases**:

■ ■ ■ ■

◆Reserve tank fuel does **not** decrease:

Reduce maximum operating speed to 325 KIAS or 0.92 Mach.

■ ■ ■ ■

FUEL STAB XFR

G-BNLK - G-CIVE, G-CIVJ - G-CIVZ

Condition: The stabiliser tank fuel transfer function is failed.

1 STAB pump switches (both) . . . . ON

2 Choose one:

◆FUEL STAB XFR message **blanks**:

Continue normal operation.

■ ■ ■ ■

◆FUEL STAB XFR message **stays shown**:

►►**Go to step 3**

3 CTR pump switches (both). . . . . Off

4 FUEL X FEED 1 and 4 valve switches . . . . Off

5 OVRD 2 pump switches (both) . . . . Off

6 OVRD 3 pump switches (both) . . . . Off

7 STAB pump switches (both) . . . . Off

8 Stabiliser and centre wing fuel tanks are not available.

▼ Continued on next page ▼

▼ **FUEL STAB XFR continued** ▼

Warning! Do not jettison fuel.

9 Usable fuel is the total of:

All fuel in tanks 1 and 4, and

Fuel in tanks 2 and 3 down to 15,900 kgs remaining in each tank.

10 Plan to land before tank 2 or 3 reaches 15,900 kgs to maintain CG within limits.

11 **When** the FUEL QTY LOW message is shown:

FUEL X FEED 1 and 4 valve switches . . . . . On

OVRD 2 pump switches (both). . . . . ON

OVRD 3 pump switches (both). . . . . ON

Plan to land before tank 2 or 3 reaches 15,900 kgs to maintain CG within limits.

Do **not** accomplish the following checklist:

FUEL QTY LOW

■ ■ ■ ■

>FUEL TANK/ENG

Condition: One of these occurs with crossfeed valve 1 or 4 open:

- Main tank 2 quantity is equal to or less than main tank 1 quantity, or main tank 3 quantity is equal to or less than main tank 4 quantity.
- On the ground after refueling, after initial electrical power established, or after CMC ground test; main tank 2 quantity less than or equal to main tank 1 quantity plus 500 kg and main tank 3 quantity less than or equal to main tank 4 quantity plus 500 kg.

■ ■ ■ ■

FUEL TEMP LOW

Condition: Fuel temperature is near the minimum.

1 Choose one:

◆Fuel temperature is **approaching** the fuel temperature limit (3°C above the fuel freeze point):

▶▶**Go to step 2**

◆Fuel temperature is **not** approaching the fuel temperature limit (3°C above the fuel freeze point):

Check the fuel temperature regularly. Do this checklist if the fuel temperature approaches the fuel temperature limit (3°C above the fuel freeze point).

■ ■ ■ ■

2 Increase airspeed, or change altitude, or deviate to a warmer air mass, or all three, to achieve a TAT equal to or higher than the fuel temperature limit.

3 TAT will increase approximately 0.5 to 0.7 degrees C for each .01 Mach increase in speed.

4 In extreme conditions, it may be necessary to descend to as low as FL250.

■ ■ ■ ■

FUEL TEMP SYS

Condition: The fuel temperature indication is failed.

1 Use total air temperature as the indication of fuel temperature.

■ ■ ■ ■

>FUEL WING ISLN

G-BNLK - G-BNLY, G-CIVA - G-CIVP

Condition: Centre refueling isolation valve is closed.

■ ■ ■ ■

FUEL X FEED 1, 4

G-BNLK - G-BNLY, G-CIVA (Aircraft with electric fuel scavenge pump fitted)

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

1 Choose one:

◆>FUEL TANK/ENG message is **blank**:

■ ■ ■ ■

◆>FUEL TANK/ENG message is **shown**:

▶▶**Go to step 2**

2 FUEL X FEED valve switches (all) . . . . Off

This puts the fuel system into a tank-to-engine configuration.

3 OVRD 2 pump switches (both) . . . . Off

4 OVRD 3 pump switches (both) . . . . Off

5 The FUEL X FEED 1, 4 and >FUEL TANK/ENG messages stay shown.

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

FUEL TANK/ENG

>X FEED CONFIG

■ ■ ■ ■

FUEL X FEED 1, 4

G-BYGA - G-BYGG, G-CIVB - G-CIVZ (Aircraft with hydro-mechanical fuel scavenge pump fitted)

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

1 Choose one:

◆>FUEL TANK/ENG message is **blank**:

■ ■ ■ ■

◆>FUEL TANK/ENG message is **shown**:

▶▶**Go to step 2**

▼ **Continued on next page** ▼

▼ FUEL X FEED 1, 4 continued ▼

2 FUEL X FEED 2 and 3 valve switches . . . . Off

This puts tanks 2 and 3 into a tank-to-engine configuration.

3 FUEL X FEED 1 or 4 valve switch (affected side) . . . . Off

4 FUEL X FEED 1 or 4 valve switch (unaffected side) . . . . On

5 OVRD 2 pump switches (both) . . . . Off

6 OVRD 3 pump switches (both) . . . . Off

7 The FUEL X FEED 1, 4 and the >FUEL TANK/ENG messages stay shown.

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

FUEL TANK/ENG

>X FEED CONFIG

9 If the FUEL IMBALANCE message shows, do the Fuel Balancing Supplementary Procedure:

FUEL X FEED 2 and 3 valve switches. . . . . . On

MAIN 1 pump switches (both) . . . . Off

MAIN 4 pump switches (both) . . . . Off

Do **not** accomplish the following checklist:

FUEL PUMP 1, 4 AFT, FWD

When the FUEL IMBALANCE message blanks:

MAIN 1 pump switches (both) . . . . . . ON

MAIN 4 pump switches (both) . . . . . . ON

FUEL X FEED 2 and 3 valve switches . . . . Off

Repeat step 9 as needed.

■ ■ ■ ■

FUEL X FEED 2, 3

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

1 FUEL X FEED 2 and 3 valve switches. . . . . Off

This puts tanks 2 and 3 into a tank-to-engine configuration. This prevents a lateral imbalance.

The centre wing tank supplies fuel to engines 1 and 4 only.

2 Choose one:

◆Centre wing tank **contains** fuel:

The last 1,300 kgs of fuel in the center wing tank may not be available. Verify the remaining fuel is sufficient.

▶▶**Go to step 3**

◆Centre wing tank does **not** contain fuel:

▶▶**Go to step 4**

3 **When** the >FUEL TANK/ENG message is shown:

Wait until both of the following occur:

FUEL LOW CTR L or R message is shown.

Centre wing tank quantity is less than 1,300 kg.

Then do the tank-to-engine procedure.

▶▶**Go to step 4**

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

>X FEED CONFIG

■ ■ ■ ■

>FUEL XFER 1+4

Condition: The FUEL XFER MAIN 1 and 4 switch is on and one of these occurs:
- The aircraft is on the ground.
- In flight, the inboard main tank quantities are more than the outboard main tank quantities.

■ ■ ■ ■

>JETT NOZ ON

Condition: Both jettison nozzle valves are open.

■ ■ ■ ■

>JETT NOZ ON L, R

Condition: A jettison nozzle valve is open.

■ ■ ■ ■

>JETT NOZZLE L, R

VALVE

Condition: The fuel jettison nozzle valve position disagrees with the commanded position.

■ ■ ■ ■

>SCAV PUMP ON

G-BNLK - G-BNLY, G-CIVA

Condition: On the ground, the center wing tank scavenge pump operates.

■ ■ ■ ■

>X FEED CONFIG

Condition: A fuel crossfeed valve is not in the correct position.

■ ■ ■ ■

Table of Contents

Intentionally
Blank

HYD CONTROL 1, 4

Condition: The hydraulic control system is inoperative.

Objective: To ensure hydraulic system pressure during high demand.

1 DEMAND PUMP selector (affected system). . . . ON

2 Affected system indications may be inoperative.

■ ■ ■ ■

SYS FAULT

HYD OVHT SYS 1, 2, 3, 4

Condition: The system temperature is high.

Objective: To cool the system and, if the overheat persists, to configure for landing.

1 Choose one:

◆ HYD OVHT SYS **1** message is shown:

Use the L or R autopilot.

►►**Go to step 2**

◆ HYD OVHT SYS **2** message is shown:

Use the C or L autopilot.

►►**Go to step 2**

◆ HYD OVHT SYS **3** message is shown:

Use the R or C autopilot.

►►**Go to step 2**

◆ HYD OVHT SYS **4** message is shown:

►►**Go to step 2**

Cool down the system

2 ENGINE PUMP switch (affected system) . . . . . Off

3 DEMAND PUMP selector (affected system). . . OFF

▼ **Continued on next page** ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

4 **When** the HYD OVHT SYS message blanks:

DEMAND PUMP
selector (affected system) . . . . AUTO

Do **not** accomplish the following checklist:

HYD PRESS ENG

5 Choose one:

◆ HYD OVHT SYS message **stays blank**:

Continue normal operation.

■ ■ ■ ■

◆ HYD OVHT SYS message **shows again**:

►► **Go to step 6**

Depressurise the system

6 DEMAND PUMP selector (affected system) . . . OFF

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

HYD PRESS SYS

8 Note degraded or inoperative system items below.

▼ Continued on next page ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

System 1

Note: Inoperative Items

Centre autopilot inop
Left and right autopilots are available.

Left outboard elevator inop
Pitch control is reduced.

Inboard trailing edge flap hydraulic operation inop
Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Nose and body gear hydraulic extension and retraction inop
Alternate gear extension is needed.

Nose and body gear steering inop
A tow will be needed after landing.

System 1 alternate brake source inop
System 4 normal and system 2 alternate brake sources are available.

System 2

Note: Inoperative Items

Right autopilot inop
Left and centre autopilots are available.

Two outboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced.

System 2 hydraulic power to stabiliser trim inop
System 3 powers the trim at half rate.

System 2 alternate brake source inop
System 4 normal and system 1 alternate brake sources are available.

▼ Continued on next page ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

System 3

Note: Inoperative Items

Left autopilot inop
Centre and right autopilots are available.

System 3 hydraulic power to stabiliser trim inop
System 2 powers the trim at half rate.

Two outboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced.

System 4

Note: Inoperative Items

Right outboard elevator inop
Pitch control is reduced.

Outboard trailing edge flap hydraulic operation inop
Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Two inboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced.

Wing gear hydraulic extension and retraction inop
Alternate gear extension is needed.

System 4 normal brake source inop
System 1 and system 2 alternate brake sources are available.

Autobrake inop
Manual braking is needed.

9 Recall switch . . . . Push

▼ Continued on next page ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

10 Choose one:

◆ **Only one** HYD PRESS SYS message is shown:

▶▶ **Go to step 11**

◆ **More than one** HYD PRESS SYS message is shown:

Plan to land at the nearest suitable airport.

Consider reducing gross weight to lower the approach speed.

Use flaps 25 and VREF 30+20 for landing.

Cross wind limit is 20 knots.

▶▶ **Go to step 11**

11 Do not use autoland.

12 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ____ **or OFF with system 4 inoperative**

Landing data . . . . **VREF____ or VREF 30+20__ with more than one system inoperative, Minimums____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ Continued on next page ▼

▼ **HYD OVHT SYS 1, 2, 3, 4 continued** ▼

Inoperative System(s)

Choose one:

◆ Both Systems **1 and 4** are inoperative:

►► **Go to A) Both Systems 1 and 4 are inoperative**

◆ Both Systems **2 and 3** are inoperative:

►► **Go to B) Both Systems 2 and 3 are inoperative**

◆ Only System **2** is inoperative:

►► **Go to Landing Checklist**

◆ Only System **3** is inoperative:

►► **Go to Landing Checklist**

◆ All **other** system failure conditions:

►► **Go to C) All other system failure conditions**

A) Both Systems 1 and 4 are inoperative

Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Do **not** accomplish the following checklist:

FLAPS PRIMARY

▼ **Continued on next page** ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

Alternate Gear Extension

Landing gear lever . . . . OFF

Do not exceed the gear EXTEND limit speed (270K/.82M).

Action is irreversible

ALTN GEAR EXTEND
WING switch . . . . ALTN

Action is irreversible

ALTN GEAR EXTEND
NOSE/BODY switch . . . . ALTN

Reduction of speed to below .60 Mach may be needed for the wing gear to lock down.

When all gear are down:

Landing gear lever . . . . DN

Higher than normal column forces may be needed during flare.

The speedbrake lever does not extend past the flight detent until the nose gear is on the runway.

Extend the ground spoilers manually and slowly. Automatic extension of the outboard ground spoilers, without automatic extension of the inboard ground spoilers, causes the nose to pitch up.

Thrust reversers are only available after the nose gear is on the runway.

►►Go to Landing Checklist

B) Both Systems 2 and 3 are inoperative

Stabiliser trim and elevator feel are inoperative. Avoid abrupt elevator movement.

All autopilots are inoperative.

►►Go to Landing Checklist

▼ Continued on next page ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

C) All other system failure conditions

Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Do **not** accomplish the following checklist:

FLAPS PRIMARY

Alternate Gear Extension

Landing gear lever . . . . OFF

Do not exceed the gear EXTEND limit speed (270K/.82M).

⚠ Action is irreversible

ALTN GEAR EXTEND WING switch . . . . . ALTN

⚠ Action is irreversible

ALTN GEAR EXTEND NOSE/BODY switch . . . . ALTN

Reduction of speed to below .60 Mach may be needed for the wing gear to lock down.

When all gear are down:

Landing gear lever .DN

Choose one:

◆ **System 4** is operating **normally**:

▶▶ **Go to Landing Checklist**

◆ **System 4** is **inoperative**:

Extend the ground spoilers manually and slowly. Automatic extension of the outboard ground spoilers, without automatic extension of the inboard ground spoilers, causes the nose to pitch up.

▶▶ **Go to Landing Checklist**

▼ Continued on next page ▼

▼ HYD OVHT SYS 1, 2, 3, 4 continued ▼

Landing Checklist

Speedbrake . . . . **Armed or DN with system 4 inoperative**

Landing gear . . . . DOWN

Flaps . . . . ____ **or 25 with more than one system inoperative**

Cabin Report . . . . Received

■ ■ ■ ■

PRESS **HYD PRESS DEM 1, 2, 3, 4**

Condition: The pump pressure is low.

Objective: To restore pump operation, or avoid system contamination or pump damage.

1 DEMAND PUMP selector (affected system) . . . . ON

2 Choose one:

◆ HYD PRESS DEM message **blanks**:

Continue normal operation.

■ ■ ■ ■

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

▶▶ **Go to step 3**

3 DEMAND PUMP selector (affected system) . . . OFF

■ ■ ■ ■

PRESS **HYD PRESS ENG 1, 2, 3, 4**

Condition: The pump pressure is low.

Objective: To avoid system contamination or pump damage.

1 ENGINE PUMP switch (affected system) . . . . . Off

■ ■ ■ ■

HYD PRESS SYS 1, 2, 3, 4

PRESS	SYS FAULT

Condition: The hydraulic system pressure is low.

Objective: To restore system pressure, avoid further system damage, and configure for landing.

1 DEMAND PUMP selector (affected system) . . . . ON

2 ENGINE PUMP switch (affected system). . . . . . Off

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

HYD PRESS ENG

4 Choose one:

◆HYD PRESS SYS message **blanks**:

Continue normal operation.

■ ■ ■ ■

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

►►**Go to step 5**

5 DEMAND PUMP selector (affected system) . . . OFF

6 Note degraded or inoperative system items below.

▼ **Continued on next page** ▼

▼ HYD PRESS SYS 1, 2, 3, 4 continued ▼

System 1

Note: Inoperative Items

Centre autopilot inop
Left and right autopilots are available.

Left outboard elevator inop
Pitch control is reduced.

Inboard trailing edge flap hydraulic operation inop
Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Nose and body gear hydraulic extension and retraction inop
Alternate gear extension is needed.

Nose and body gear steering inop
A tow will be needed after landing.

System 1 alternate brake source inop
System 4 normal and system 2 alternate brake sources are available.

System 2

Note: Inoperative Items

Right autopilot inop
Left and centre autopilots are available.

Two outboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced.

System 2 hydraulic power to stabiliser trim inop
System 3 powers the trim at half rate.

System 2 alternate brake source inop
System 4 normal and system 1 alternate brake sources are available.

▼ Continued on next page ▼

▼ HYD PRESS SYS 1, 2, 3, 4 continued ▼

System 3

Note: Inoperative Items

Left autopilot inop
Centre and right autopilots are available.

System 3 hydraulic power to stabiliser trim inop
System 2 powers the trim at half rate.

Two outboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced.

System 4

Note: Inoperative Items

Right outboard elevator inop
Pitch control is reduced.

Outboard trailing edge flap hydraulic operation inop
Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Two inboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced.

Wing gear hydraulic extension and retraction inop
Alternate gear extension is needed.

System 4 normal brake source inop
System 1 and system 2 alternate brake sources are available.

Autobrake inop
Manual braking is needed.

▼ Continued on next page ▼

▼ **HYD PRESS SYS 1, 2, 3, 4 continued** ▼

7 Recall switch . . . . .Push

8 Choose one:

◆ **Only one** HYD PRESS SYS message is shown:

►► **Go to step 9**

◆ **More than one** HYD PRESS SYS message is shown:

Plan to land at the nearest suitable airport.

Consider reducing gross weight to lower the approach speed.

Use flaps 25 and VREF 30+20 for landing.

Cross wind limit is 20 knots.

►► **Go to step 9**

9 Do not use autoland.

Note: Refer to Non-Normal Configuration Landing Distance Table.

10 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ____ **or OFF with system 4 inoperative**

Landing data . . . . **VREF____ or VREF 30+20__ with more than one system inoperative, Minimums_____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS 1, 2, 3, 4 continued** ▼

Inoperative System(s)

Choose one:

- ◆ Both Systems **1 and 4** are inoperative:

  ►►**Go to A) Both Systems 1 and 4 are inoperative**

- ◆ Both Systems **2 and 3** are inoperative:

  ►►**Go to B) Both Systems 2 and 3 are inoperative**

- ◆ Only System **2** is inoperative:

  ►►**Go to Landing Checklist**

- ◆ Only System **3** is inoperative:

  ►►**Go to Landing Checklist**

- ◆ All **other** system failure conditions:

  ►►**Go to C) All other system failure conditions**

▼ **Continued on next page** ▼

▼ HYD PRESS SYS 1, 2, 3, 4 continued ▼

A) Both Systems 1 and 4 are inoperative

Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Do **not** accomplish the following checklist:

FLAPS PRIMARY

Alternate Gear Extension

Landing gear lever . . . . OFF

Do not exceed the gear EXTEND limit speed (270K/.82M).

Action is irreversible

ALTN GEAR EXTEND WING switch . . . . . ALTN

Action is irreversible

ALTN GEAR EXTEND NOSE/BODY switch . . . . ALTN

Reduction of speed to below .60 Mach may be needed for the wing gear to lock down.

When all gear are down:

Landing gear lever . . . . DN

Higher than normal column forces may be needed during flare.

The speedbrake lever does not extend past the flight detent until the nose gear is on the runway.

Extend the ground spoilers manually and slowly. Automatic extension of the outboard ground spoilers, without automatic extension of the inboard ground spoilers, causes the nose to pitch up.

Thrust reversers are only available after the nose gear is on the runway.

►►Go to Landing Checklist

▼ Continued on next page ▼

▼ HYD PRESS SYS 1, 2, 3, 4 continued ▼

B) Both Systems 2 and 3 are inoperative

Stabiliser trim and elevator feel are inoperative. Avoid abrupt elevator movement.

All autopilots are inoperative.

▶▶**Go to Landing Checklist**

C) All other system failure conditions

Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Do **not** accomplish the following checklist:

FLAPS PRIMARY

Alternate Gear Extension

Landing gear lever . . . . OFF

Do not exceed the gear EXTEND limit speed (270K/.82M).

⚠ Action is irreversible

ALTN GEAR EXTEND WING switch . . . . . . ALTN

⚠ Action is irreversible

ALTN GEAR EXTEND NOSE/BODY switch . . . . ALTN

Reduction of speed to below .60 Mach may be needed for the wing gear to lock down.

▼ Continued on next page ▼

▼ HYD PRESS SYS 1, 2, 3, 4 continued ▼

When all gear are down:

Landing gear lever . . . . DN

Choose one:

◆ **System 4** is operating **normally**:

▶▶ **Go to Landing Checklist**

◆ **System 4** is **inoperative**:

Extend the ground spoilers manually and slowly. Automatic extension of the outboard ground spoilers, without automatic extension of the inboard ground spoilers, causes the nose to pitch up.

▶▶ **Go to Landing Checklist**

Landing Checklist

Speedbrake . . . . **Armed or DN with system 4 inoperative**

Landing gear . . . . DOWN

Flaps . . . . ___ **or 25 with more than one system inoperative**

Cabin Report . . . . .Received

■ ■ ■ ■

SYS FAULT

HYD QTY LOW 1

Condition: The hydraulic quantity is low.

Objective: If needed, to reconfigure to preclude a progressive loss of systems.

1 Choose one:

◆ HYD PRESS SYS 4 message is **blank**:

Continue normal operation.

■ ■ ■ ■

◆ HYD PRESS SYS 4 message is **shown**:

▶▶ **Go to step 2**

▼ Continued on next page ▼

▼ HYD QTY LOW 1 continued ▼

2 Choose one:

◆C autopilot is **engaged**:

Autopilot disengage switch . . . . Push

L and R autopilots are available.

►►**Go to step 3**

◆C autopilot is **not** engaged:

►►**Go to step 3**

3 ENGINE PUMP 1 switch . . . . .Off

4 DEMAND PUMP 1 selector . . . . OFF

5 Plan to land at the nearest suitable airport.

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

HYD PRESS ENG 1

HYD PRESS SYS 1

Note: Inoperative Items

Left outboard elevator inop

Pitch control is reduced until hydraulic system 1 is repressurised just before extending flaps or landing gear.

7 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrakes **. . . . . .OFF**

Landing data . . . . .VREF____, Minimums____

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ Continued on next page ▼

▼ HYD QTY LOW 1 continued ▼

Just before extending the flaps or landing gear for approach:

ENGINE PUMP 1 switch . . . . ON

DEMAND PUMP 1 selector . . . . AUTO

If hydraulic fluid is lost from system 1 after hydraulic fluid is lost from system 4, the loss is likely through the brake system. Hydraulic fluid may subsequently be lost from system 2.

Landing Checklist

Speedbrake . . . . **DN**

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . Received

■ ■ ■ ■

SYS FAULT

HYD QTY LOW 2, 3

Condition: The hydraulic quantity is low.

■ ■ ■ ■

SYS FAULT

HYD QTY LOW 4

Condition: The hydraulic quantity is low.

Objective: If needed, reconfigure to preclude a progressive loss of systems.

1 Choose one:

◆HYD PRESS SYS 4 message is **shown**:

▶▶**Go to the HYD PRESS SYS 1, 2, 3, 4 checklist on page 13.10**

■ ■ ■ ■

◆HYD PRESS SYS 4 message is **blank** and **less than** one hour from landing:

Continue normal operation.

■ ■ ■ ■

◆HYD PRESS SYS 4 message is **blank** and **one hour or more** from landing:

▶▶**Go to step 2**

2 ENGINE PUMP 4 switch . . . . Off

3 DEMAND PUMP 4 selector . . . . OFF

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

HYD PRESS ENG 4

HYD PRESS SYS 4

Note: Inoperative Items

Two inboard spoiler panels on each wing inop
Roll rate and spoiler capability are reduced until hydraulic system 4 is repressurised before extending flaps or landing gear.

Right outboard elevator inop
Pitch control is reduced until hydraulic system 4 is repressurised before extending flaps or landing gear.

▼ **Continued on next page** ▼

▼ HYD QTY LOW 4 continued ▼

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Just before extending the flaps or landing gear for approach:

ENGINE PUMP 4 switch . . . . ON

DEMAND PUMP 4 selector . . . . AUTO

Autobrakes. . . . . _____

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . Received

■ ■ ■ ■

Intentionally
Blank

Table of Contents

Intentionally
Blank

AIR/GND SYSTEM

Condition: The air/ground system is failed in the air mode.

Objective: To provide information about the thrust reversers, autobrake and speedbrakes for landing.

1 The thrust reversers are inoperative.

2 Auto speedbrake deployment is inoperative.

3 When deployed manually, spoiler position is limited to FLIGHT DETENT.

4 The autobrake system is inoperative.

Note: Refer to Non-Normal Configuration Landing Distance Table.

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . VREF___, Minimums__________

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

Landing Checklist

Speedbrake . . . . **DN**

Landing gear . . . . DOWN

Flaps . . . . ____

Cabin Report . . . . .Received

■ ■ ■ ■

ANTISKID

Condition: An antiskid system fault occurs.

1 Braking effectiveness may be reduced.

Note: The autobrake system is inoperative. Use minimum braking consistent with the runway conditions to reduce the possibility of a tyre blowout. Minima below CAT IIIA not approved.
Refer Non-normal Configuration Landing Distance Table.

2 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . .VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

■ ■ ■ ■

ANTISKID OFF

Condition: One or more of these occur:
- The parking brake valve is not fully open.
- The antiskid system power is off.

1 Use brakes with caution. Braking effectiveness is reduced.

Note: The autobrake system is inoperative. Use minimum braking consistent with the runway conditions to reduce the possibility of a tire blowout.
Minima below CAT IIIA not approved.
Refer Non-Normal Configuration Landing Distance Table.

2 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . Received

■ ■ ■ ■

AUTOBRAKES

Condition: One of these occurs:
- The autobrake system is failed or disarmed.
- The autobrake selector is off but the autobrake system stays armed.
- RTO is initiated above 85 knots and the autobrake has not been applied.

1 AUTOBRAKES selector . . . . OFF, then as needed

2 Choose one:

◆AUTOBRAKES message **blanks**:

■ ■ ■ ■

◆AUTOBRAKES message **stays shown**:

AUTOBRAKES selector . . . . OFF

►►Go to step 3

3 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake **. . . . . .OFF**

Landing data . . . . .VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Landing Checklist

Speedbrake . . . . Armed

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

■ ■ ■ ■

>BODY GEAR STRG

Condition: One or more of these occur:
- Body gear steering does not lock
- Body gear steering pressure is on when commanded off

Note: Disregard message if it occurs because the aircraft has stopped in a turn with the body gear not centred, provided the message subsequently disappears.

■ ■ ■ ■

BRAKE LIMITER

Condition: One or more of these occur:
- More than one brake torque limiter is failed on a single gear
- The parking brake valve is not fully open.

1 Brake with caution. Heavy braking could exceed the brake torque limit.

■ ■ ■ ■

>BRAKE SOURCE

Condition: Normal and alternate brake system pressures are low.

■ ■ ■ ■

BRAKE TEMP

Condition: One or more brake temperatures are high.

Objective: To allow the brakes to cool.

1 Choose one:

◆In **flight**:

When extending or retracting the landing gear, do not exceed the gear EXTEND limit speed (270K/.82M).

Landing gear lever . . . . DN

This step allows cooling air to flow around the brakes.

When the BRAKE TEMP message blanks:

Wait 8 minutes. This step ensures sufficient cooling time.

Landing gear lever. . . . UP, then OFF

■ ■ ■ ■

◆On the **ground**:

▶▶**Go to step 2**

2 Refer to the Recomended Brake Cooling Schedule table in the Performance Inflight chapter for the needed cooling time.

■ ■ ■ ■

GEAR DISAGREE
or
Gear Lever Jammed In Off Position

Condition: One or more of these occur:
- The gear position disagrees with the landing gear lever position.
- The landing gear lever is jammed in the OFF position.

Objective: To extend the gear using alternate gear extension, or land on the available gear.

1 Choose one:

◆ Landing gear lever **UP**:

Do not exceed the gear EXTEND limit speed (270K/.82M).

Do not use FMC fuel predictions with gear extended. Refer to Gear Down performance tables in PI chapter for flight planning.

■ ■ ■ ■

◆ Landing gear lever **DN and all** gear **down**:

GND PROX GEAR OVRD switch . . . . OVRD

Do a normal landing.

■ ■ ■ ■

◆ Landing gear lever **DN and any** gear **not** down:

Do not exceed the gear EXTEND limit speed (270K/.82M).

Landing gear lever. . . . . UP

Wait 30 seconds.

▶▶**Go to step 4**

◆ Landing gear lever **will not move to UP**:

▶▶**Go to step 2**

◆ Landing gear lever **jammed in OFF**:

▶▶**Go to step 4**

▼ **Continued on next page** ▼

2 Choose one:

◆**Both** the GEAR TILT message **and** the BODY GEAR STRG message are **blank**:

Landing gear lever
LOCK OVRD switch. . . . . Push and hold

Landing gear lever . . . . UP, then OFF

▶▶**Go to step 3**

◆**Either** the GEAR TILT message **or** the BODY GEAR STRG message is **shown**:

Do not exceed the gear extended limit speed (320K/.82M).

Landing gear lever . . . . .DN

Do not retract the landing gear.

Do not use FMC fuel predictions with the gear extended. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.

▶▶**Go to step 3**

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

Gear Lever Will Not Move Up

■ ■ ■ ■

4 Landing gear lever . . . . OFF

5 Do not exceed the gear EXTEND limit speed (270K/.82M).

6 ALTN GEAR EXTEND WING switch. . . . . ALTN

7 ALTN GEAR EXTEND NOSE/BODY switch . . . ALTN

8 Reduction of speed to below .60 Mach may be needed for the wing gear to lock down.

9 **Wait** 90 seconds.

▼ **Continued on next page** ▼

▼ GEAR DISAGREE or Gear Lever Jammed In Off Position continued ▼

10 Choose one:

◆ All gear indicate **DN**:

Landing gear lever (if possible) . . . DN

▶▶Go to step 11

◆ Nose and both body gear indicate **UP**:

▶▶Go to the Nose and Body Gear Up checklist on page 14.16

■ ■ ■ ■

◆ All other combinations of **partial gear extension**:

▶▶Go to step 12

11 Choose one:

◆ Landing gear lever is **DN**:

Do a normal landing.

■ ■ ■ ■

◆ Landing gear lever is **OFF**:

GND PROX
GEAR OVRD switch . . . . OVRD

Nose and body gear steering are not available.

Do a normal landing.

■ ■ ■ ■

12 Landing gear lever (if possible) . . . . DN

13 GND PROX GEAR OVRD switch . . . . OVRD

14 Land on available gear.

15 Do not arm the speedbrakes.

Caution! If any wing or body gear is not extended, deployment of the thrust reversers may affect directional control.

▼ Continued on next page ▼

▼ GEAR DISAGREE or Gear Lever Jammed In Off Position continued ▼

Caution! If the nose gear is not extended, do not deploy the thrust reversers until the nose contacts the runway.

Caution! Delay extending the speedbrakes until the nose and both sides of the airplane have touched down.

Caution! If any wing gear is not extended, use aileron control to keep the wings level during the rollout until the aircraft comes to a complete stop.

Caution! If any wing or body gear is not extended, braking effectiveness is reduced.

Caution! If any wing or body gear is not extended, do not attempt to taxi the airplane or use the tiller.

Caution! If both body gear are not extended, the aircraft may tip tail down on the ground. Door 1 escape slides are then unusable.

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

CONFIG GEAR

Note: Refer to Non-Normal Configuration Landing Distance Table.

Deferred Items

Landing Checklist

Speedbrake . . . . **DN**

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . .Received

Note: At 1000 feet, PA: "Cabin Crew, take your seats for landing."

At 200 feet, PA: "Brace, Brace!"

■ ■ ■ ■

GEAR DOOR

Condition: One or more gear doors are not closed.

Objective: To attempt to close the gear door.

1 Do not exceed the gear EXTEND limit speed (270K/.82M).

2 Choose one:

◆ Landing gear lever is **DN**:

Reduction of speed to below .70 Mach may be necessary for the nose gear doors to close with the nose gear extended.

■ ■ ■ ■

◆ Landing gear lever is **OFF**:

Landing gear lever . . . . UP

■ ■ ■ ■

◆ Landing gear lever is **UP**:

■ ■ ■ ■

Gear Lever Jammed in Up Position

Condition: The landing gear lever is jammed in the UP position.

Objective: If there is enough time and fuel available, to depressurise hydraulic system 1 and allow the nose and body gear to extend.

1 Check the total fuel quantity.

Alternate nose and body gear extension may take up to 15 minutes.

Do not accomplish this checklist unless there is sufficient fuel to extend the gear and then complete an approach, with sufficient reserves.

Land with gear up or land with available gear if fuel is not sufficient.

▼ Continued on next page ▼

▼ Gear Lever Jammed in Up Position continued ▼

Note: Do not use FMC fuel predictions with gear extended. CAT II and CAT III autoland not approved.
Refer to Non-Normal Configuration Landing Distance Table.

2 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF___, Minimums___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Autopilot Availability

Choose one:

◆ C autopilot is **engaged**:

Autopilot disengage switch . . . . Push

L and R autopilots are available.

▶▶ **Go to Depressurise hydraulic system 1**

◆ C autopilot is **not** engaged:

▶▶ **Go to Depressurise hydraulic system 1**

▼ Continued on next page ▼

▼ Gear Lever Jammed in Up Position continued ▼

Depressurise hydraulic system 1

Hydraulic DEMAND PUMP 1 selector . . . . OFF

Hydraulic ENGINE PUMP 1 switch . . . . Off

Do **not** accomplish the following checklist:

HYD PRESS SYS 1

Note: Inoperative Items

Left outboard elevator inop
Pitch control is reduced.

Inboard trailing edge flap hydraulic operation inop
Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Nose and body gear hydraulic extension and retraction inop
Alternate gear extension is needed.

Nose and body gear steering inop
A tow will be needed after landing.

System 1 alternate brake source inop
System 4 normal and system 2 alternate brake sources are available.

Alternate Gear Extension

Do not exceed the gear EXTEND limit speed (270K/.82M).

ALTN NOSE/BODY GEAREXTEND switch . . . . . ALTN

Note: If fuel becomes critical while doing this checklist, vigorous cycling of the control wheel helps depressurise the landing gear hydraulic lines, significantly reducing the alternate extension time. (During flight test, 80 cycles of ±4 units of aileron reduced the depressurisation time to 90 seconds.)

▼ Continued on next page ▼

▼ Gear Lever Jammed in Up Position continued ▼

GND PROX GEAR OVRD switch . . . . .OVRD

Land on available gear.

Do **not** accomplish the following checklist:

CONFIG GEAR

Caution! Do not repressurise hydraulic system 1 in flight or on the ground as the gear will retract.

Caution! Deployment of the thrust reversers may affect directional control.

Caution! Delay extending the speedbrakes until the nose and both sides of the airplane have touched down.

Caution! Use aileron control to keep the wings level during the rollout until the aircraft comes to a complete stop.

Caution! Braking effectiveness will be reduced.

Caution! Do not attempt to taxi the airplane or use the tiller.

Caution! Pin the landing gear after stopping.

Do **not** accomplish the following checklists:

FLAPS PRIMARY

GEAR DISAGREE or Gear Lever Jammed In Off Position

Landing Checklist

Speedbrake . . . . **DN**

Landing gear . . . . **Nose and body down**

Flaps . . . . ___

Cabin Report . . . . .Received

■ ■ ■ ■

Gear Lever Will Not Move Up

Condition: The landing gear lever cannot move to UP.

1 Choose one:

◆**Both** the GEAR TILT message **and** the BODY GEAR STRG messages are **blank**:

▶▶**Go to step 2**

◆**Either** the GEAR TILT message **or** the BODY GEAR STRG message is **shown**:

Do not exceed the gear extended limit speed (320K/.82M).

Landing gear lever . . . . DN

Do not retract the landing gear.

Do not use FMC fuel predictions with the gear extended. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.

■ ■ ■ ■

2 Landing gear lever LOCK OVRD switch . . . . Push and hold

3 Landing gear lever . . . . UP, then OFF

■ ■ ■ ■

GEAR TILT

Condition: The main landing gear trucks are not in the fully tilted position.

1 Do not retract the landing gear.

2 Do not exceed the gear extended limit speed (320K/.82M).

3 Do not use FMC fuel predictions with the gear extended. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.

■ ■ ■ ■

Nose and Body Gear Up

Condition: The nose and body gear are failed in the up position.

Objective: If there is enough time and fuel available, to depressurise hydraulic system 1 to allow the nose and body gear to extend.

1 Do this checklist only when directed by the GEAR DISAGREE or Gear Lever Jammed in Off Position checklist.

2 Check the total fuel quantity.

Alternate nose and body gear extension may take up to 15 minutes.

Do not accomplish this checklist unless there is sufficient fuel to extend the gear and then complete an approach, with sufficient reserves.

Land with gear up or land with available gear if fuel is not sufficient.

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

3 Choose one:

◆C autopilot is **engaged**:

Autopilot disengage switch . . . . Push

L and R autopilots are available.

▶▶**Go to step 4**

◆C autopilot is **not** engaged:

▶▶**Go to step 4**

4 Hydraulic DEMAND PUMP 1 selector . . . . OFF

5 Hydraulic ENGINE PUMP 1 switch . . . . Off

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

HYD PRESS SYS 1

7 Do not exceed the gear EXTEND limit speed (270K/.82M).

▼ **Continued on next page** ▼

▼ Nose and Body Gear Up continued ▼

8 ALTN NOSE/BODY GEAR
EXTEND switch. . . . . Off, then ALTN

Note: If fuel becomes critical while doing this checklist, vigorous cycling of the control wheel helps depressurise the landing gear hydraulic lines, significantly reducing the alternate extension time. (During flight test, 80 cycles of ±4 units of aileron reduced the depressurisation time to 90 seconds.)

Note: Inoperative Items

Left outboard elevator inop
Pitch control is reduced.

Inboard trailing edge flap hydraulic operation inop
Trailing edge flaps move in secondary mode. Secondary extension from flaps 1 to 5 requires approximately 4 minutes. During approach, allow extra time for flap extension.

Nose and body gear hydraulic extension and retraction inop
Alternate gear extension is needed.

Nose and body gear steering inop
A tow will be needed after landing.

System 1 alternate brake source inop
System 4 normal and system 2 alternate brake sources are available.

9 GND PROX GEAR OVRD switch . . . . OVRD

10 Land on available gear.

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

CONFIG GEAR

Caution! Do not repressurise hydraulic system 1 in flight or on the ground as the gear will retract.

Caution! If any wing or body gear is not extended, deployment of the thrust reversers may affect directional control.

▼ Continued on next page ▼

▼ Nose and Body Gear Up continued ▼

Caution! **If the nose gear is not extended, do not deploy the thrust reversers until the nose contacts the runway.**

Caution! **If any gear is not extended, delay extending the speedbrakes until the nose and both sides of the aircraft have touched down.**

Caution! **If any wing gear is not extended, use aileron control to keep the wings level during the rollout until the airplane comes to a complete stop.**

Caution! **If any wing gear or body gear is not extended, braking effectiveness is reduced.**

Caution! **Do not attempt to taxi the airplane or use the tiller.**

Caution! **Pin the landing gear after stopping.**

Caution! **If both body gear not extended the aircraft may tip tail down on the ground. Door 1 escape slides are unusable.**

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

FLAPS PRIMARY

GEAR DISAGREE or Gear Lever Jammed in Off Position

Note: Refer to Non-Normal Configuration Landing Distance Table.

▼ Continued on next page ▼

▼ Nose and Body Gear Up continued ▼

13 Checklist Complete Except Deferred Items

Deferred Items

Landing Checklist

Speedbrake . . . . **DN**

Landing gear . . . . DOWN

Flaps . . . . ___

Cabin Report . . . . Received

Note: At 1000 feet, PA: "Cabin Crew, take your seats for landing."

At 200 feet, PA: "Brace, Brace!"

■ ■ ■ ■

>TIRE PRESSURE

Condition: One or more tyre pressures are not normal.

■ ■ ■ ■

Intentionally
Blank

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>AIRSPEED LOW

Condition: Airspeed is less than the minimum maneuvering speed.

■ ■ ■ ■

>ALT CALLOUTS

Condition: Altitude voice annunciations during approach are not supplied.

■ ■ ■ ■

>ALTITUDE ALERT

Condition: A deviation from the MCP set altitude occurs.

■ ■ ■ ■

>CONFIG FLAPS

Condition: The flaps are not in a takeoff position during takeoff.

■ ■ ■ ■

>CONFIG GEAR

Condition: A landing gear is not down and locked and one of these occurs:

- Below 800 feet radio altitude and a thrust lever is between idle and mid position.
- The flaps are in a landing position.

■ ■ ■ ■

>CONFIG GEAR CTR

Condition: Body gear steering is not centred during takeoff.

■ ■ ■ ■

>CONFIG PARK BRK

Condition: The parking brake is set during takeoff.

■ ■ ■ ■

>CONFIG SPOILERS

Condition: The speedbrake lever is not down during takeoff.

■ ■ ■ ■

>CONFIG STAB

Condition: The stabiliser is not in the greenband during takeoff.

■ ■ ■ ■

>CONFIG WARN SY

Condition: A configuration warning system fault occurs.

■ ■ ■ ■

GND PROX SYS

Condition: A ground proximity warning system fault occurs.

Note: Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

■ ■ ■ ■

>OVERSPEED

Condition: Airspeed is more than Vmo/Mmo.

■ ■ ■ ■

>PILOT RESPONSE

G-BNLK - G-BNLP, G-BYGA - G-BYGG, G-CIVF - G-CIVZ

Condition: Pilot action is not detected during a specified time.

■ ■ ■ ■

Tail Strike

Condition: A tail strike is suspected or confirmed.

Caution! Continued pressurization of the airplane can cause further structural damage.

1 OUTFLOW VALVES MAN switches (both) . . . . . ON

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

2 ⚠ OUTFLOW VALVES manual control . . . . Move to OPEN until the outflow valve indications show fully open to depressurise the aircraft

3 Plan to land at the nearest suitable airport.

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

CABIN ALT AUTO

OUTFLOW VLV L, R

■ ■ ■ ■

>TCAS OFF

Condition: TCAS modes TA or RA/TA are not selected.

■ ■ ■ ■

>TCAS RA CAPT, F/O

Condition: TCAS cannot show RA guidance on the PFD.

■ ■ ■ ■

>TCAS SYSTEM

Condition: TCAS is failed.

■ ■ ■ ■

>TERR OVRD

Condition: The ground proximity terrain override switch is in OVRD.

■ ■ ■ ■

TERR POS

Condition: Terrain position data is lost.

Note: Position data for look-ahead alerting and display are unavailable. Ground proximity alerts that occur are valid.

■ ■ ■ ■

WINDSHEAR SYS

Condition: A windshear system fault occurs.

Note: Some or all windshear alerts are not available. Windshear alerts that occur are valid.

■ ■ ■ ■

Operational Information — Chapter OI
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Non-ILS Database Final Approaches Using VNAV

Aide Memoire

Preparation

Check LEGS and ND in plan mode for:

- Waypoint Coding.
- Sequence.
- Track *(tolerance MAX 3 degree difference due variation)*.
- Distances.
- Speed/Altitude Constraints.
- Glidepath Angle on LEGS Page Must be Compatible with Charted Value.

For RNP (RNAV/GNSS/GPS) APCH amend RNP 0.3.

Execution

Consider amending speed in VNAV DES page to avoid unwanted thrust lever movement upon engagement of VNAV.

When cleared for Final Approach:

- Verify correct Active Waypoint is "ahead" of the aircraft.
- Check position relative to Vertical Path on VPP.
- Display FMC PROGRESS PAGE 2 (PM) and LEGS (PF).
- Engage VNAV and Speed Intervene.
- Set MDA in MCP altitude window.
- Check the FMA (see boxed text).

Passing FAF:

- Confirm FMAs are SPD | LNAV | VNAV PTH and MCP speed window open (Speed Intervene).
- Re-Set the G/A Alt in MCP (When > 300 ft below G/A Alt).
- Lateral and Vertical Deviation within limits.

Upon engaging VNAV one of the following will annunciate in the FMA:

VNAV SPD – If the aircraft is descending with Speed Intervene prior to 'on approach' logic active. **In this mode the PF controls the path with reference to the VPP (VNAV path pointer)**.

VNAV PTH – If the aircraft is:

(1) Flying level at an FMC altitude constraint.

(2) Descending on FMC profile.

(3) Descending with Speed Intervene, on the profile and "on-approach" logic is active.

VNAV ALT – If the aircraft is flying level at an altitude not in the LEGS page. For example, due to ATC radar vectoring. When cleared for final approach set MDA. If 'on approach' logic is active VNAV ALT will change to VNAV PTH automatically as it reaches the glidepath, otherwise press the ALT SEL button once as the aircraft meets the VPP path.

Note: NGFMC switches to the "on-approach" mode once the first approach waypoint is sequenced, or flaps are extended from the up position.

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Low Visibility Operations – Aide Memoire

If RVR <400 m, LVPs must be in force for take-off.
If RVR <550 m, LVPs must be in force for approach and landing.

Take-off Alternate

If required, alternate must be within 800 nm (alternate minima applies for USA, Canada, Saudi Arabia).

Using PVD

- Check takeoff minima below 125 m is published on Lido AOI pages.
- Check no unserviceability to LOC for take-off guidance.
- Tune and ident ILS.
- Switch on PVD during pre-flight and set brightness.
- Check PVD EICAS memo message.
- PVD will un-shutter within 45° of R/W QDM.

Runway C/L Lights for Take-off

Light Spacing	RVR	Lights Required
15 m	75 m	4
15 m	125 m	7

Take-off Ban

If any of following below minima:

- RVR assessed by Captain from flight deck before take-off can both increase and decrease reported RVR or Met visibility.
- TDZ RVR or met visibility.
- Mid point RVR, when reported.
- Stop End RVR, for operations below 200 m RVR.
- Cloud ceiling, if specified in AOM.
- OR the runway is indistinguishable from surroundings.

Refer to OM A 8.22.4 for USA/Canada/Australia differences.

Before Approach

- Aircraft – check serviceable for intended operation.
- Airfield – check for any downgraded facilities.
- QRH landing distance tables – check landing distance required for autoland.
- Flap 30 should normally be used for Cat IIIA or lower minima.
- LAND 3 – use lowest minima down to Cat IIIB No DH.
- LAND 2 or >NO LAND 3 – lowest minima Cat IIIA.

Approach

Shall be discontinued at 1000' or FAF if:

- TDZ RVR reported is below minimum specified.
- Mid-point RVR when reported is below 125 m or TDZ minimum if lower.
- Stop-end RVR if reported and relevant is below 75 m or TDZ minimum if lower.

Refer to OM A 8.22.13 for USA/Canada/Australia differences.

Before 1000R
Check RVR and confirm lowest operating minima and any reversion capability.

At 1000R
Captain assumes control and checks PFD annunciation for:
LAND 3 or LAND 2 or NO AUTOLAND

If no PFD Annunciation .... GO-AROUND

If RVR at 1000R below lowest operating minima .... GO-AROUND

Landing

If no landing clearance by 200R and not visual .... GO-AROUND

Visual Reference Requirements

Cat I	See OM A 8.22.6.b.
Cat II, LTS Cat I, OTS Cat II	3 consecutive lights (Approach, TDZ, C/L, edge) + lateral element.
Cat IIIA	3 consecutive lights (Approach, TDZ, C/L or edge).
Cat IIIB	1 C/L light (may continue if visual lost <DH if A/P remain engaged).
Cat IIIB No DH	No visual requirement.

Note: For Cat IIIA and Cat IIIB the visual reference must be maintained until touchdown.

Downgraded Lighting/facilities

- Take-off – OM A 8.22.3.g.
- Approach (prior to 1000 ft) – OM A 8.22.11,
  USA/Canada - OM A 8.22.13 and specific rules as per IAC.

Non Normals
>NO LAND 3 (Caution Message) with LAND 2 (PFD Annunciation).
Below 1000R do not re-bug DH, P2 must call out “Fifty above” and “Decide”.

With Reversion .... CONTINUE TO REVISED DH

Without Reversion .... GO-AROUND

ILS Deviation
ILS scales amber and pointer flashing.

If persistent above 200R or occurs below 200R .... GO-AROUND

Autopilot Disconnect

TDZ RVR below 300 m (even if below DH) .... GO-AROUND
May continue to landing at Commander’s discretion in exceptional circumstances if disconnect occurs during flare and sufficient visual reference to land.

Autothrottle Failure
Control manually, thrust levers to idle at 25R.

Engine Failure
Aircraft certified to operate to Cat IIIB No DH.
If failure below 1500R (multi-channel engagement):

The autopilot compensates for asymmetric thrust condition until autopilot disengaged or reversion to single autopilot. The rudder returns to trimmed position unless the pilot exerts a rudder pedal force required to maintain rudder position.

After Landing

Complete accurately the appropriate boxes in AML Pt 1 in accordance with the requirements of OM A.

Auto Approach/Autoland Limitations

<table>
<tr><th colspan="7">AUTO APPROACH/AUTOLAND LIMITATIONS</th></tr>
<tr><th>LIMITATION</th><th>Cat I Auto Approach</th><th>Cat I Autoland</th><th>Cat II Autoland</th><th>Cat IIIA Autoland</th><th>Cat IIIB Autoland</th><th>Cat IIIB Autoland (NO DH)</th></tr>
<tr><td colspan="7">AFDS & RADIO</td></tr>
<tr><td>Autopilot status annunciation (PFD)</td><td>No limitation</td><td colspan="2">Must be available</td><td colspan="3">Must be available on both PFDs</td></tr>
<tr><td>DH Display</td><td colspan="2">No limitation</td><td colspan="4">Must be available</td></tr>
<tr><td>IRU</td><td colspan="2">No limitation</td><td colspan="2">Two IRUs in Nav Mode</td><td colspan="2">Three IRUs in Nav Mode</td></tr>
<tr><td>ILS Deviation</td><td colspan="2">No limitation</td><td colspan="4">Serviceable</td></tr>
<tr><td>EIU, ILS, IRS & RA sources</td><td colspan="2">No limitation</td><td colspan="4">Independent sources on each PFD</td></tr>
<tr><td colspan="7">A/C EQUIPMENT</td></tr>
<tr><td>Main Engines</td><td colspan="6">3 or 4 operative</td></tr>
<tr><td>Flap</td><td>No limitation</td><td colspan="2">25 or 30</td><td colspan="3">Flap 25 or 30
(Flap 30 gives better visual acquisition of runway lights)</td></tr>
<tr><td>Hydraulic System</td><td>No limitation</td><td colspan="5">4 operative</td></tr>
<tr><td>Flight Controls</td><td>No limitation</td><td>Not approved for jammed stabiliser</td><td colspan="4">Normal flight controls</td></tr>
<tr><td>Antiskid braking system</td><td colspan="4">No limitation</td><td colspan="2">Must be serviceable</td></tr>
<tr><td colspan="7">OPERATIONAL</td></tr>
<tr><td>PFD Annunciation</td><td>No limitation</td><td colspan="3">LAND 2</td><td colspan="2">LAND 3</td></tr>
<tr><td>Decision Height/ Altitude</td><td colspan="2">Use Radio DH – If none listed use Decision Altitude</td><td colspan="3">Use Radio DH</td><td>N/A</td></tr>
<tr><td>Minimum A/P Engage Height</td><td>100R</td><td colspan="5">N/A</td></tr>
<tr><td>Min ILS Category</td><td>Uncategorised</td><td>Cat I</td><td>Cat II</td><td colspan="3">Cat III</td></tr>
<tr><td rowspan="2">Runway, approach lighting, transmissometers and OM</td><td rowspan="2">Uncategorised</td><td>Cat I</td><td>Cat II</td><td colspan="3">Cat III</td></tr>
<tr><td colspan="5">NOTE: For unserviceabilities, refer to OM A.</td></tr>
<tr><td>Min Operating Status</td><td colspan="2">No limitation</td><td>Cat II</td><td colspan="3">Cat III</td></tr>
</table>

Low Visibility Operations – Non-Normal

Rejected Takeoff

If it is necessary to reject the takeoff in low visibility, directional control with reference to the centreline lights may become less easy as the groundspeed reduces. If the PVD is being used it will give immediate demands to correct any swing.

If colour coded centreline lights (CLCD) are available, at 900 m (3,000 ft) to go, the all white centreline lights change to alternating red/white and at 300 m (1,000 ft) to go, change again to all red.

Reference to the ND and illumination of wing and landing lights may assist the emergency services in locating the aircraft.

Approach

Non-Normal conditions that could occur during a multi-channel approach and autoland and their impact on aircraft performance and crew procedures are listed below:

EICAS and PFD Annunciations

- If a >NO LAND 3 message is displayed and LAND 2 is annunciated during a Cat III No DH or Cat IIIB approach, the approach can be continued to Cat IIIA minima. The DH cannot be reset below 1,000 ft.
- The message indicates a single A/P system failure and a degradation of capability which may be accompanied by an A/P channel disengaging. A subsequent failure may cause complete A/P disengagement.
- A single failure in the autoflight system below 200R will not be evident until the ground speed is less than 40 kt and the A/P has been disengaged when a >NO LAND 3 EICAS message will be displayed.
- A >NO AUTOLAND EICAS message and/or PFD annunciation indicates a significant loss of A/P capability or lack of multi-channel engagement. During a Cat II or III approach an immediate go-around must be carried out.
- If there is no PFD annunciation by 1,000 ft R, there is a significant lack of A/P capability. Autoland must not be attempted and a go-around must be carried out.

ILS Deviation

Excess ILS deviation, below 500R, is indicated by the localiser or glideslope scales on the PFD changing colour to amber and the pointer flashing. If this warning occurs below 200R, or is persistent above 200R, a go-around must be carried out.

Autopilot Disconnect

If the A/P disconnects and the touchdown RVR is less than 300 m, a go-around must be carried out, even below DH. In exceptional circumstances the Captain may complete the landing manually provided the disconnect occurs during the flare and he is satisfied that he has sufficient visual reference to land.

Autothrottle Disconnect

A/T is not essential for autoland. Should the A/T be unserviceable, or disconnect during final approach, the thrust levers should be controlled manually to maintain approach speed. At approximately 25R, gradually reduce power to reach idle on touchdown.

In the event of a go around, thrust must be applied manually.

Generator Failure

The electrical system will automatically reconfigure to maintain bus isolation if a single generator fails above 200R. A subsequent failure will result in a >NO LAND 3 message and the disengagement of the associated A/P.

Below 200R, loss of a single generator may result in the loss of an A/P channel as the system will not reconfigure.

Engine Failure

The lowest permitted minima for one engine inoperative operations are normally Cat IIIB No DH with the aircraft operated in accordance with the one engine inoperative procedures detailed in this chapter.

If the engine fails above 1500R i.e. before multichannel engagement, the pilot must provide rudder inputs to counteract the asymmetric condition until multichannel engagement occurs.

With an engine failure below 1500R the A/P will contain any deviation from the localiser to acceptable limits and maintain the approach path. If the A/T fails, the thrust levers on the remaining engines should be smoothly advanced to achieve a power setting to maintain the normal approach speed. Power reduction during the flare should be performed slowly to permit the A/P sufficient time to counteract the yaw.

Aircraft Maintenance Log – Pilot Reporting

Pilots must report any A/P performance or integrity defects in the AML.

Integrity defects i.e. >NO LAND 3 message, should be reported as follows:

- PFD annunciation – LAND 2 or NO AUTOLAND.
- Height of occurrence.
- Associated flight deck effects (e.g. Left Radio Altimeter Failed).
- >NO LAND 3 recalls which occur below 40 kt on rollout.

Performance defects should be reported:

Defect	AML Log Entry
Performance unsatisfactory for autoland in less than 300 m.	Downgrade autopilot LAND 2 (Give reasons).
Performance unsatisfactory for autoland but satisfactory for auto-approach to 50R.	Downgrade autopilot NO AUTOLAND (Give reasons).

Autopilot Status ADDs

A/P status will be downgraded as a result of a “Performance” ADD being raised. This will originate from:

- A pilot report of poor A/P performance.
- Routine examination of Flight Data.
- A defect in any other system associated with autoland as detailed in the MEL.
- Irrespective of the PFD annunciation, the autoland status is limited to the ADD declared status.

Pilot reports of a degraded PFD annunciation (an integrity problem) may result in a “non-performance” ADD if it proves impossible to investigate the defect immediately. Such ADDs do not down-grade A/P status and are intended to indicate probable PFD annunciation for subsequent autoland attempts. This may be taken into account when planning to a destination where minima could be limiting.

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MNPS Aide Memoire

This section contains information related to flight in specific and scheduled airspace to comply with legislation for MNPS. Other requirements listed here are required to comply with British Airways' OM A, OM B and B747 FCOM.

Required Data

- CIRRUS (one paper copy minimum) including ATC Flight Plan.
- Sig Weather Chart.
- Surface Facilities (SFC) Chart.
- NAT Track Signal.
- Loreto Brief.

CIRRUS Plan

- Confirm Route with Flight Plan and NAT Track signal.
- Mark one CIRRUS plan as MASTER.
- If entering NAT airspace through New York OCA, update iPad FC Brief and confirm paper CIRRUS is the most recent version.

Loreto Brief and Planning

- Departure Alternate needed/suitable.
- Destination weather suitable.
- Destination Alternate weather suitable.
- Ensure that plan is not for an OTS track above FL340 for non-FANS equipped aircraft (CPDLC mandate track/levels).

Aircraft Requirements

- Confirm Daily Check complete.
- Initialize IRS with most accurate available position and crosscheck.

Departure Delays Greater than 60 Minutes

- Confirm weather is still acceptable for flight.

Before Entering MNPS Airspace

- Check filed level is optimal.
- Request clearance between 90min and 30min before entry point.
- Flights entering through New York OCA may be cleared 'as filed'. CIRRUS validity must be checked against the up-to-date iPad FC Brief, after which the master CIRRUS is used as the clearance.
- Confirm MNPS and RVSM status not downgraded.
- Review contingencies.

Route Checking & Reroute Procedure

- For full Procedure see FCOM SP.11 MNPS MNPS Route Checking and Waypoint Crossing Procedure, or flowchart below for pictorial representation.
- Accept and Load CPDLC ATC Route Uplinks.

- PM checks and modifies route (if required) working from clearance to FMC.
- If exit point has changed, leave discontinuity between new exit point and planned domestic routing until specific domestic clearance is obtained.
- PM checks unnamed waypoints using full lat/long against CIRRUS FMC page (if available), expansion in FMC NAV DATA, or typing into Lido Enroute search function as required.
- PF checks route, working from FMC to clearance.
- PF expands and checks unnamed waypoints in full lat/long using FMC scratchpad or NAV DATA.
- PF reads each MNPS waypoint sequentially from the CDU LEGS page, PM checks each waypoint directly against the clearance and annotates master CIRRUS as required to reflect cleared route.
- Request new winds and temperatures as needed.
- Following crew handover, the relieving pilot must carry out the PF checking tasks detailed above in full.
- For any discrepancy, at any stage, start procedure again.

Contingencies

- Contingency procedures – Lido Gen/Regional Supplementary Info/North Atlantic/RAR/2.17.
- Weather deviation procedures – Lido Gen/General Part/Navigation/2.3.5.3.
- MSA vs MOA.
- NAT MNPS FL285 – FL420.
- ETPs.
- MET/AIS/Charts/Perf for ERAs (normal minima applies).

Entering MNPS

- Confirm Mach No. in FMC.
- ANP vs RNP.
- VHF 121.5 and 123.45.
- Squawk A2000 after 30 mins.
- SLOP on OTS 0, R1 or R2.
- Consider use of RTE 2 for reciprocal oceanic route.

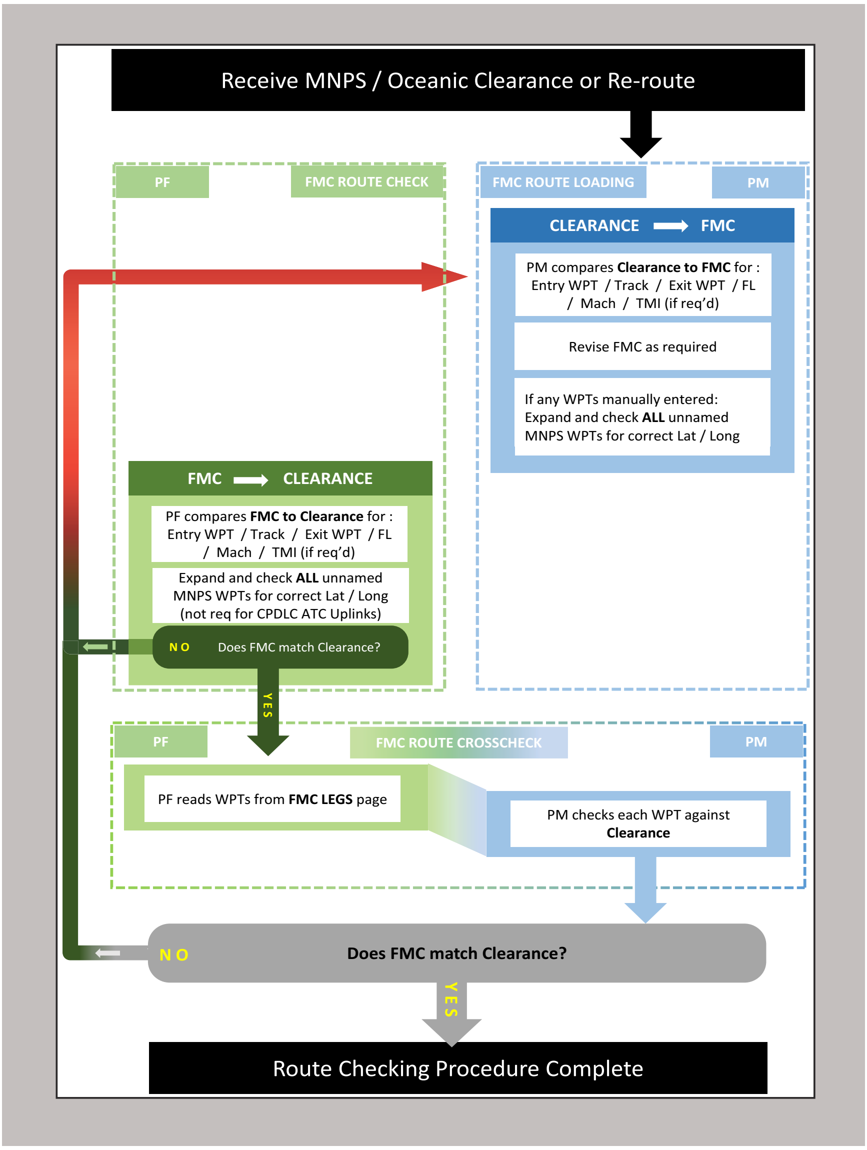
Waypoint Crossing Procedure

- ANP vs RNP.
- Active waypoint matches clearance.
- LNAV FMA.
- Aircraft turns towards next waypoint.
- Record ATA & Fuel on CIRRUS.
- Revise ETA and inform ATC if required.

Leaving MNPS

- Obtain domestic clearance.
- Remove any route discontinuity from exit point.
- Delete SLOP and fly by MNPS exit point with 0 XTK ERROR.
- Select ECON cruise and review optimum level.
- ANP vs RNP.

Route Checking Procedure Flowchart



Systems Failures in Flight

Any failures after dispatch or in flight will be handled in accordance with Non-Normal Procedures in the QRH or elsewhere.

RNAV/PBN Equipment Required to Guarantee Navigation Performance

The Performance Based Navigation (PBN) concept defines a level of navigation performance, rather than specific equipment requirements. Inbuilt redundancy in the aircraft's navigation equipment will often allow continued operations at the required RNP level with partial failures. The following tables are drawn directly from Boeing source information and are provided to allow crews to identify the impact on PBN performance when faced with equipment failures.

Note: Once airborne, ATC may allow aircraft to transit airspace despite reductions in Communications, Navigation and Surveillance (CNS) capability. Crews should advise ATC of such failures at the earliest opportunity to allow for clearance or re-routing as appropriate.

RNAV/RNP CAPABILITY

Before the aircraft enters RNAV/RNP airspace, RNAV/RNP capability is based on:

- The required RNAV/RNP equipment that is described below
- Actual Navigation Performance displayed on the POS REF page 2/4
- Any specific local requirements published in the Aeronautical Information Publication (AIP).

When the aircraft flies in RNAV/RNP airspace, RNAV/RNP capability is based on:

- Actual Navigation Performance displayed on the POS REF page 2/4
- Any specific local requirements published in the Aeronautical Information Publication (AIP).

For all specifications below the following equipment is required as well as equipment listed in the applicable section:

- Autopilot or Flight Director Computer
- Air Data Computer (ADC) System x 1
- Control Display Unit (CDUs) x 2
- Navigation Displays (NDs) x 2
- Primary Flight Displays (PFDs) x 2
- EICAS System
- Current Navigation Database.

RNAV 10 / RNP 10

GENERAL

RNAV 10 operations correspond to RNP 10 operations.

In RNAV 10 airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

Required Equipment

The minimum navigation equipment required to enter RNAV 10 airspace is:

- FMC 2
- GPS 2
- IRU 2

Note: If GPS inop aircraft may operate in RNP 10 airspace for a maximum of 6.2 hrs using the following equipment:

- FMC 1
- IRU 2

P-RNAV / B-RNAV / RNAV 5 / RNAV 2 / RNAV 1 (en-route and terminal area procedures)

GENERAL

RNAV 5 operations correspond to European BRNAV operations.

RNAV 1(2) operations correspond to P-RNAV TERMINAL RNAV operations.

The AIP may specify that GPS equipment is required.

Required Equipment

The minimum navigation equipment required to enter P-RNAV / B-RNAV / RNAV 5 / RNAV 2 / RNAV 1 airspace is:

- FMC 1(Check charts for dual FMC req)
- GPS 1 (Or DME x 1)
- IRU 2

RNP 4

GENERAL

In this airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

Required Equipment

The minimum navigation equipment required to enter RNP 4 airspace is:

- FMC 2
- GPS 2
- IRU 2
- SATCOM (VHF can be used where it is available)
- CPDLC
- ADS-C
- HF (Unless VHF available)

RNP 2 (remote areas)

GENERAL

In this airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

Required Equipment

The minimum navigation equipment required to enter RNP 2 airspace is:

- FMC 2
- GPS 2
- IRU 2
- CPDLC
- ADS-C
- HF (Unless VHF available)

RNP 1 / Terminal RNP 1 - Basic RNP 1

GENERAL

RNP 1 operations correspond to RNP 1 Terminal operations.

Required Equipment

The minimum navigation equipment required to enter RNP 1 airspace is:

- FMC 1
- GPS 1 (Or DME x 1)
- IRU 2

RNP APCH / RNAV (GNSS)

GENERAL

RNP APCH operations correspond to RNAV (GNSS) or RNAV (GPS) operations.

Required Equipment

The minimum equipment required to start RNP APCH operations is:

- FMC 2
- GPS 2
- IRU 2

Total Loss of Generated Electrical Power

The probability of this situation occurring and having to make an approach and landing with a total and unrecoverable AC power failure is extremely remote. There would only be enough battery capacity to supply standby power for a minimum of 30 minutes.

The Captain's standby attitude indicator, RMI and standby ASI, are available. Also available is, either the Captain's or Co-pilot's PFD and ND. The side selected is dependent on the Standby EFIS switch position. Only FMC (L) is available and will need to be selected as a NAV source for a usable ND.

Once in a standby power condition, it is recommended that the standby EFIS switch is not operated unless absolutely necessary, as the relevant screens will blank for about 30 seconds whilst they warm up.

Use Manual Pressurisation. Aim to decrease cabin altitude during descent, so that it matches the initial approach altitude, at which point the outflow valves can be opened fully to depressurise the aeroplane.

Fuel jettison is not available.

Approach

Complete the approach procedures. The left ADC, VOR, ILS, EIU, FMS-CDU, and FMC are all available. The right ADF is available. This will enable left VOR and right ADF needles to be pointed simultaneously. The left VHF communications and left transponder are available.

During the approach, the "FLAPS DRIVE" message is displayed after the flaps are selected to 1. The leading edge devices require AC control and cannot be extended on standby power.

Use FLAPS DRIVE checklist. Set VREF 30 + 25 kts for approach and use flaps 25 for landing.

The stabiliser can only be moved with the use of the alternate trim switches.

The right inboard and outboard trailing edge flaps indication is available, however, trailing edge flaps indication on the left side is not.

Landing

Anti-skid is not available.

Autobrake is not available.

Autospoilers are not available.

Thrust reversers are not available.

Avoid excess airspeed.

Polar FMS/IRS/CDU Failure Procedures

Introduction

These procedures are for use when operating with any IRS or CDU or FMS unserviceability when transiting or intending to transit the Magnetic Compass Erratic Area.

Definitions

- A Serviceable Inertial Reference System shall consist of an IRS serviceable in NAV mode.
- Magnetic Compass Erratic Area
  The area defined by the solid line on Lido Enroute Map.
- Decision Point
  The Decision Point for any particular route is the point at which the track crosses the line defining the Magnetic Compass Erratic Area.

Magnetic Headings

In the Magnetic Compass Erratic Area turns may be shown incorrectly or the card may remain fixed. For these reasons the only reliable heading is a stabilised heading reference such as is provided by an IRS. If operating in ATT, this is equivalent to a gyro heading reference.

FMC/CDU/IRS Serviceability Requirements

- At the Decision point there must be 2 serviceable IRSs and either 2 serviceable FMCs or 1 serviceable FMC and a serviceable CDU associated with each serviceable IRS in order to proceed through the Magnetic Compass Erratic Area. If this equipment is not available, diversion to the departure point or an alternate avoiding the Compass Useless Area must be carried out.
- If after the Decision Point there is a degradation of FMC/CDU/IRS serviceability the aircraft should normally continue on its routing. ATC must be advised and the procedures in the paragraph below ‘One Serviceable IRS within the Magnetic Compass Erratic Areas’ carried out.
- See OMA for MNPS airspace navigation system requirements.

One Serviceable IRS within the Magnetic Compass Erratic Areas

- Should the aircraft be reduced to one serviceable IRS within the Magnetic Compass Erratic Area, the aircraft must be routed so that the track lies within the reception range of radio facilities capable of providing an accurate check of the aircraft's position at intervals not exceeding one hour. North Canadian Tracks and Laterals meet this requirement.
- If paragraph 1 can be complied with, advise ATC of the unserviceability, cross-check the aircraft’s position at frequent intervals using all the available Nav aids, and proceed normally until clear of the Magnetic Compass Erratic Area. The aircraft should then continue to its destination.
- If paragraph 1 cannot be complied with, cross-check the aircraft position at frequent intervals using all available Nav aids, advise ATC of the unserviceability and obtain clearance to amend the aircraft's routing to the destination to comply with this requirement.

Emergency Assistance

The Canadian Armed Forces can provide assistance in an emergency to civil aircraft operating in the Air Defence Identification Zone (ADIZ). The assistance consists of:

(1) Track and groundspeed checks.

(2) Aircraft position.

(3) Position of heavy cloud in relation to aircraft.

Call “Radar Assistance” on 126.7.

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Performance Inflight-QRH — Chapter PI-QRH
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747-400 RB211-524G C KG FT JAA TO1%10 TO2%20 TALPA

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General

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Errata (NOE) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Serial and tabulation number are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
NLK	G-BNLK	24053	RT481
NLN	G-BNLN	24056	RT484
NLP	G-BNLP	24058	RT486
NLY	G-BNLY	27090	RT494
YGA	G-BYGA	28855	RM143
YGB	G-BYGB	28856	RM144
YGC	G-BYGC	25823	RM145
YGD	G-BYGD	28857	RM261
YGE	G-BYGE	28858	RM262
YGF	G-BYGF	25824	RM263
YGG	G-BYGG	28859	RM264
IVA	G-CIVA	27092	RT496
IVB	G-CIVB	25811	RT497
IVC	G-CIVC	25812	RT498
IVD	G-CIVD	27349	RT499
IVE	G-CIVE	27350	RU121
IVF	G-CIVF	25434	RU122
IVG	G-CIVG	25813	RU123
IVH	G-CIVH	25809	RU124

Airplane Number	Registry Number	Serial Number	Tabulation Number
IVI	G-CIVI	25814	RU125
IVJ	G-CIVJ	25817	RU126
IVK	G-CIVK	25818	RU127
IVL	G-CIVL	27478	RU128
IVM	G-CIVM	28700	RU129
IVN	G-CIVN	28848	RU130
IVO	G-CIVO	28849	RU131
IVP	G-CIVP	28850	RU132
IVR	G-CIVR	25820	RM136
IVS	G-CIVS	28851	RM137
IVT	G-CIVT	25821	RM096
IVU	G-CIVU	25810	RM097
IVV	G-CIVV	25819	RM138
IVW	G-CIVW	25822	RM139
IVX	G-CIVX	28852	RM140
IVY	G-CIVY	28853	RM141
IVZ	G-CIVZ	28854	RM142

Performance Inflight - QRH — Chapter PI-QRH
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Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb (290/.84)

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 200	250	300	350	390
40000	**PITCH ATT**	**3.5**	**3.5**			
	V/S (FT/MIN)	+1600	+800			
35000	**PITCH ATT**	**4.5**	**4.0**	**4.0**	**3.5**	
	V/S (FT/MIN)	+2800	+1900	+1100	+400	
30000	**PITCH ATT**	**4.5**	**4.5**	**4.5**	**4.5**	**5.0**
	V/S (FT/MIN)	+2700	+2000	+1400	+900	+500
20000	**PITCH ATT**	**7.5**	**7.0**	**6.5**	**6.5**	**7.0**
	V/S (FT/MIN)	+4200	+3100	+2400	+1900	+1500
10000	**PITCH ATT**	**10.5**	**9.5**	**9.0**	**8.5**	**8.5**
	V/S (FT/MIN)	+5400	+4200	+3300	+2600	+2200
SEA LEVEL	**PITCH ATT**	**14.0**	**12.5**	**11.5**	**11.0**	**10.5**
	V/S (FT/MIN)	+6500	+5100	+4100	+3400	+2900

Cruise (.84/290)

Flaps Up, Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 200	250	300	350	390
40000	**PITCH ATT**	**2.0**	**3.0**			
	EPR	1.48	1.59			
	(AltMode%N1)	(85.0)	(90.1)			
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	
	EPR	1.42	1.47	1.55	1.67	
	(AltMode%N1)	(82.2)	(84.9)	(88.4)	(94.6)	
30000	**PITCH ATT**	**1.0**	**2.0**	**3.0**	**3.5**	**4.0**
	EPR	1.33	1.38	1.44	1.51	1.60
	(AltMode%N1)	(78.6)	(81.0)	(83.9)	(87.5)	(91.6)
20000	**PITCH ATT**	**1.5**	**2.5**	**3.0**	**4.0**	**4.5**
	EPR	1.23	1.26	1.29	1.34	1.38
	(AltMode%N1)	(71.9)	(74.1)	(76.8)	(79.7)	(82.3)
10000	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.5**	**5.0**
	EPR	1.16	1.18	1.20	1.23	1.26
	(AltMode%N1)	(65.6)	(67.3)	(69.6)	(72.2)	(74.7)
SEA LEVEL	**PITCH ATT**	**1.5**	**2.5**	**3.5**	**4.5**	**5.0**
	EPR	1.12	1.13	1.14	1.16	1.18
	(AltMode%N1)	(58.7)	(60.5)	(62.8)	(65.3)	(67.6)

Descent (.84/290)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 200	250	300	350	390
40000	**PITCH ATT**	**-1.0**	**0.0**			
	V/S (FT/MIN)	-2600	-2500			
35000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	
	V/S (FT/MIN)	-3500	-3200	-3100	-3100	
30000	**PITCH ATT**	**-2.0**	**-0.5**	**0.5**	**1.0**	**1.5**
	V/S (FT/MIN)	-2300	-2100	-2000	-2000	-2000
20000	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.5**	**2.0**
	V/S (FT/MIN)	-2200	-2000	-1800	-1800	-1800
10000	**PITCH ATT**	**-2.0**	**-0.5**	**0.5**	**1.5**	**2.5**
	V/S (FT/MIN)	-2000	-1800	-1600	-1600	-1600
SEA LEVEL	**PITCH ATT**	**-2.0**	**-0.5**	**0.5**	**1.5**	**2.5**
	V/S (FT/MIN)	-1800	-1600	-1500	-1400	-1400

Holding (VREF30+80)

Flaps Up, Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 200	250	300	350	390
10000	**PITCH ATT**	**5.5**	**6.0**	**6.0**	**5.5**	**5.5**
	EPR	1.14	1.17	1.20	1.23	1.26
	(Alt Mode %N1)	(58.1)	(63.7)	(68.0)	(71.8)	(74.8)
	KIAS	207	224	242	266	283

Flight With Unreliable Airspeed / Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Terminal Area (5000 FT)

Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)					
		200	250	300	350	400	410
FLAPS UP (VREF30+80) (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	EPR	1.12	1.15	1.18	1.21	1.25	1.26
	(Alt Mode %N1)	(54.8)	(61.0)	(65.9)	(70.0)	(73.7)	(74.3)
	KIAS	208	224	239	253	266	269
FLAPS 1 (VREF30+60) (GEAR UP)	**PITCH ATT**	**6.5**	**7.0**	**7.0**	**7.5**	**7.5**	**7.5**
	EPR	1.14	1.17	1.21	1.24	1.28	1.29
	(Alt Mode %N1)	(57.3)	(63.3)	(67.9)	(72.0)	(75.9)	(76.5)
	KIAS	188	204	219	233	246	249
FLAPS 5 (VREF30+40) (GEAR UP)	**PITCH ATT**	**7.5**	**7.5**	**8.0**	**8.0**	**8.0**	**8.0**
	EPR	1.17	1.21	1.25	1.30	1.34	1.35
	(Alt Mode %N1)	(61.1)	(66.8)	(71.8)	(76.0)	(79.7)	(80.5)
	KIAS	168	184	199	213	226	229
FLAPS 10 (VREF30+20) (GEAR UP)	**PITCH ATT**	**8.5**	**8.5**	**8.5**	**9.0**	**9.0**	**9.0**
	EPR	1.17	1.21	1.25	1.29	1.34	1.34
	(Alt Mode %N1)	(60.2)	(66.0)	(71.2)	(75.3)	(78.9)	(79.6)
	KIAS	148	164	179	193	206	209
FLAPS 20 (VREF30+10) (GEAR DOWN)	**PITCH ATT**	**7.5**	**7.5**	**7.5**	**7.5**	**8.5**	**8.5**
	EPR	1.22	1.27	1.33	1.38	1.44	1.45
	(Alt Mode %N1)	(66.4)	(72.5)	(77.5)	(81.8)	(85.6)	(86.5)
	KIAS	138	154	169	183	196	199

Final Approach (1500 FT)

Gear Down, Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)					
		200	250	300	350	400	410
FLAPS 25 (VREF25+10)	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
	EPR	1.12	1.15	1.18	1.21	1.24	1.24
	(Alt Mode %N1)	(52.9)	(58.4)	(63.1)	(67.5)	(71.0)	(71.6)
	KIAS	143	159	175	189	203	205
FLAPS 30 (VREF30+10)	**PITCH ATT**	**0.5**	**1.0**	**1.0**	*	*	*
	EPR	1.16	1.20	1.24			
	(Alt Mode %N1)	(59.5)	(65.3)	(70.1)			
	KIAS	138	154	168			

***Exceeds flap placard speed**

Go-Around (1500 FT)

Flaps 20, Gear Up, Go-Around Thrust, Maneuver Speed

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)					
		200	250	300	350	400	410
10000	**PITCH ATT**	**17.5**	**14.0**	**11.5**	**10.0**	**9.0**	**9.0**
	VS (FT/MIN)	3500	2700	2100	1600	1200	1100
	KIAS	149	165	181	195	208	211
5000	**PITCH ATT**	**21.0**	**17.0**	**14.0**	**12.5**	**11.0**	**10.5**
	VS (FT/MIN)	4300	3400	2700	2200	1700	1700
	KIAS	148	164	179	193	206	209
SEA LEVEL	**PITCH ATT**	**24.0**	**19.0**	**16.0**	**14.0**	**12.0**	**12.0**
	VS (FT/MIN)	4700	3800	3100	2500	2100	2000
	KIAS	147	163	178	191	204	207

Max Climb EPR

Based on engine bleed for 3 packs on, engine and wing anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	45
	340	340	340	340	340	340	.84	.84	.84	.84
60	1.43	1.43								
50	1.48	1.48	1.47	1.47						
40	1.53	1.53	1.52	1.52	1.51	1.51				
30	1.53	1.57	1.58	1.57	1.57	1.56	1.54			
20	1.53	1.57	1.60	1.63	1.62	1.62	1.60	1.57		
10	1.53	1.57	1.60	1.63	1.66	1.68	1.66	1.63	1.61	1.58
0	1.53	1.57	1.60	1.63	1.66	1.69	1.72	1.69	1.67	1.65
-10	1.53	1.57	1.60	1.63	1.66	1.69	1.73	1.75	1.74	1.71
-20 & BELOW	1.53	1.57	1.60	1.63	1.66	1.69	1.73	1.76	1.76	1.74

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)	
	0	45
ENGINE ANTI-ICE ON	-0.01	-0.01
ENGINE & WING ANTI-ICE ON	-0.02	-0.02

Go-around EPR

Based on engine bleed for 3 packs on

REPORTED OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
°C	°F		-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	54	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57
47	117	50	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59
42	108	45	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
37	99	40	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.64	1.64	1.64
32	90	35	1.66	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.67	1.67	1.66	1.65
27	81	30	1.66	1.68	1.69	1.70	1.70	1.70	1.70	1.70	1.70	1.69	1.68	1.68	1.67
22	72	25	1.66	1.68	1.69	1.70	1.72	1.72	1.72	1.72	1.72	1.71	1.70	1.70	1.69
17	63	20	1.66	1.68	1.69	1.70	1.72	1.73	1.74	1.74	1.74	1.73	1.72	1.72	1.71
12	54	15	1.66	1.68	1.69	1.70	1.72	1.73	1.74	1.74	1.75	1.75	1.74	1.73	1.73
7	45	12	1.66	1.68	1.69	1.70	1.72	1.73	1.74	1.74	1.75	1.75	1.75	1.75	1.74
2 & BELOW	36 & BELOW	5 & BELOW	1.66	1.68	1.69	1.70	1.72	1.73	1.74	1.74	1.75	1.75	1.75	1.75	1.75

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)	
	-2000	10000
2 PACKS OFF	0.01	0.01
3 PACKS OFF	0.01	0.01

VREF (KIAS)

WEIGHT (1000 KG)	FLAPS	
	30	25
400	184	192
380	179	187
360	174	181
340	168	176
320	163	170
300	157	164
280	152	158
260	146	152
240	140	146
220	133	139
200	127	132

Increase VREF 1 knot/4000 ft above sea level.

Intentionally
Blank

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Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	45000
400	EPR	1.19	1.22	1.27	1.33	1.38	1.47	1.59			
	KIAS	286	286	286	286	307	311	316			
	FF/ENG	3340	3270	3230	3180	3230	3300	3530			
380	EPR	1.18	1.21	1.25	1.31	1.36	1.44	1.56			
	KIAS	280	280	280	280	300	303	307			
	FF/ENG	3180	3100	3050	3000	3050	3090	3250			
360	EPR	1.17	1.20	1.24	1.29	1.35	1.42	1.52			
	KIAS	271	271	271	271	291	294	298			
	FF/ENG	3010	2940	2880	2830	2860	2890	3010			
340	EPR	1.17	1.19	1.23	1.28	1.33	1.40	1.49	1.64		
	KIAS	261	261	261	261	282	285	289	292		
	FF/ENG	2850	2790	2720	2660	2690	2700	2780	3110		
320	EPR	1.16	1.18	1.21	1.26	1.31	1.38	1.47	1.59		
	KIAS	251	251	251	251	273	276	280	284		
	FF/ENG	2700	2640	2570	2520	2520	2520	2570	2780		
300	EPR	1.15	1.17	1.20	1.25	1.29	1.36	1.44	1.55		
	KIAS	242	242	242	242	264	267	270	275		
	FF/ENG	2540	2490	2430	2360	2350	2350	2380	2520		
280	EPR	1.14	1.16	1.19	1.23	1.27	1.34	1.41	1.52		
	KIAS	233	233	233	233	255	257	260	264		
	FF/ENG	2400	2340	2280	2210	2190	2180	2200	2290		
260	EPR	1.13	1.15	1.18	1.21	1.26	1.31	1.39	1.48	1.62	
	KIAS	228	228	228	228	246	248	250	254	259	
	FF/ENG	2250	2190	2140	2060	2050	2010	2020	2080	2370	
240	EPR	1.12	1.13	1.16	1.20	1.24	1.29	1.36	1.45	1.57	
	KIAS	221	221	221	221	236	237	239	243	247	
	FF/ENG	2110	2040	2000	1920	1880	1850	1850	1890	2060	
220	EPR	1.11	1.12	1.15	1.18	1.22	1.27	1.33	1.41	1.52	
	KIAS	215	215	215	215	225	226	229	231	235	
	FF/ENG	1960	1900	1860	1780	1730	1710	1680	1710	1820	
200	EPR	1.10	1.11	1.14	1.16	1.20	1.25	1.31	1.38	1.48	1.61
	KIAS	208	208	208	208	215	216	218	220	223	226
	FF/ENG	2030	1760	1720	1640	1590	1540	1520	1530	1610	1800

This table includes 5% additional fuel for holding in a racetrack pattern.

Holding
Flaps 1

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
400	EPR	1.24	1.28	1.34	1.41	1.51
	KIAS	245	246	248	251	251
	FF/ENG	3820	3770	3660	3640	3680
380	EPR	1.23	1.26	1.32	1.39	1.48
	KIAS	240	241	243	245	245
	FF/ENG	3620	3570	3470	3440	3460
360	EPR	1.22	1.25	1.30	1.37	1.45
	KIAS	234	236	238	240	240
	FF/ENG	3430	3380	3280	3240	3250
340	EPR	1.20	1.23	1.28	1.35	1.43
	KIAS	229	230	232	234	234
	FF/ENG	3250	3190	3140	3050	3050
320	EPR	1.19	1.22	1.27	1.33	1.40
	KIAS	223	224	226	228	228
	FF/ENG	3060	3010	2950	2860	2850
300	EPR	1.18	1.20	1.25	1.30	1.38
	KIAS	218	219	220	222	222
	FF/ENG	2880	2830	2760	2680	2660
280	EPR	1.17	1.19	1.23	1.28	1.35
	KIAS	212	213	215	216	216
	FF/ENG	2710	2650	2580	2540	2470
260	EPR	1.16	1.18	1.21	1.26	1.32
	KIAS	207	207	209	210	210
	FF/ENG	2530	2470	2410	2360	2290
240	EPR	1.14	1.16	1.20	1.24	1.30
	KIAS	200	201	202	203	203
	FF/ENG	2360	2300	2240	2180	2110
220	EPR	1.13	1.15	1.18	1.22	1.27
	KIAS	194	194	195	196	196
	FF/ENG	2190	2140	2080	2010	1970
200	EPR	1.12	1.14	1.17	1.20	1.25
	KIAS	187	188	189	190	190
	FF/ENG	2030	1970	1920	1840	1790

This table includes 5% additional fuel for holding in a racetrack pattern.
Holding at Flaps 1 in icing conditions is not recommended.

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ADVISORY INFORMATION

Runway Surface Condition Correlation

RUNWAY CONDITION CODE	RUNWAY SURFACE CONDITION DESCRIPTION	REPORTED BRAKING ACTION
6	Dry	Dry
5	Wet (Smooth, Grooved or PFC) or Frost 3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow	Good
4	Compacted Snow at or below -15°C OAT	Good to Medium
3	Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow Compacted Snow at OAT warmer than -15°C	Medium
2	Greater than 3 mm (0.12 inches) of: Water or Slush	Medium to Poor
1	Ice	Poor
0	Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice	Nil

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

BRAKING CONFIGURATION	REF DIST 290000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 290000 KG	ALT ADJ PER 1000 FT ABOVE SEA LEVEL	WIND ADJ PER 10 KTS HEAD/ TAIL WIND	SLOPE ADJ PER 1% DOWN/ UP HILL	TEMP ADJ PER 10°C ABV/ BLW ISA	APP SPD ADJ PER 5 KTS ABOVE VREF30	REVERSE THRUST ADJ TWO REV	REVERSE THRUST ADJ NO REV
Dry Runway									
MAX MANUAL	1520	40/-20	40	-65/220	25/-20	40/-35	70	40	90
AUTOBRAKE MAX	1820	35/-20	55	-75/260	0/0	50/-45	95	0	0
AUTOBRAKE 4	2200	40/-30	70	-100/345	0/0	65/-60	120	0	0
AUTOBRAKE 3	2580	45/-35	80	-120/415	10/-15	75/-70	135	5	5
AUTOBRAKE 2	2880	50/-45	95	-140/480	40/-50	90/-85	120	65	65
AUTOBRAKE 1	3160	55/-50	105	-160/560	80/-90	95/-90	120	215	325
Good Reported Braking Action									
MAX MANUAL	1940	35/-25	55	-90/325	55/-45	55/-50	90	110	250
AUTOBRAKE MAX	2040	35/-30	65	-95/330	50/-35	55/-50	95	110	250
AUTOBRAKE 4	2230	40/-35	70	-105/355	20/-5	65/-60	120	20	75
AUTOBRAKE 3	2580	45/-35	80	-120/415	10/-15	75/-70	135	5	5
AUTOBRAKE 2	2880	50/-45	95	-140/480	40/-50	90/-85	120	65	65
AUTOBRAKE 1	3160	55/-50	105	-160/560	80/-90	95/-90	120	215	325
Good To Medium Reported Braking Action									
MAX MANUAL	2250	40/-35	70	-115/415	90/-70	65/-60	95	190	445
AUTOBRAKE MAX	2320	40/-35	75	-115/420	80/-60	70/-60	105	180	435
AUTOBRAKE 4	2420	40/-35	75	-125/435	65/-45	75/-65	120	140	355
AUTOBRAKE 3	2680	45/-35	85	-130/475	55/-35	80/-75	135	80	255
AUTOBRAKE 2	2930	50/-45	95	-145/520	70/-65	90/-85	120	105	215
AUTOBRAKE 1	3180	55/-50	105	-165/580	105/-100	95/-90	120	230	380

Flaps 30

BRAKING CONFIGURATION	REF DIST 290000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 290000 KG	ALT ADJ PER 1000 FT ABOVE SEA LEVEL	WIND ADJ PER 10 KTS HEAD/ TAIL WIND	SLOPE ADJ PER 1% DOWN/ UP HILL	TEMP ADJ PER 10°C ABV/ BLW ISA	APP SPD ADJ PER 5 KTS ABOVE VREF30	REVERSE THRUST ADJ TWO REV	REVERSE THRUST ADJ NO REV
Medium Reported Braking Action									
MAX MANUAL	2560	45/-40	80	-140/510	125/-90	75/-70	105	265	640
AUTOBRAKE MAX	2600	50/-40	80	-140/510	120/-85	80/-70	115	255	625
AUTOBRAKE 4	2610	50/-40	80	-140/515	120/-75	80/-70	115	260	635
AUTOBRAKE 3	2770	50/-40	90	-145/535	95/-60	80/-75	135	160	500
AUTOBRAKE 2	2980	50/-45	95	-155/560	95/-85	90/-85	120	140	360
AUTOBRAKE 1	3190	55/-50	105	-165/595	120/-105	95/-90	120	240	440
Medium To Poor Reported Braking Action									
MAX MANUAL	2910	50/-45	90	-170/655	215/-140	90/-85	110	395	1015
AUTOBRAKE MAX	2930	55/-45	90	-170/660	215/-135	90/-85	115	395	1010
AUTOBRAKE 4	2940	55/-45	90	-175/660	210/-130	90/-85	115	395	1010
AUTOBRAKE 3	3040	55/-45	95	-175/670	200/-115	95/-85	135	340	945
AUTOBRAKE 2	3190	55/-50	100	-185/690	195/-130	100/-90	120	300	825
AUTOBRAKE 1	3350	60/-55	110	-190/715	205/-145	105/-100	120	360	845
Poor Reported Braking Action									
MAX MANUAL	3250	55/-50	100	-205/805	305/-185	100/-90	110	525	1390
AUTOBRAKE MAX	3270	65/-50	100	-205/805	305/-185	100/-95	120	530	1395
AUTOBRAKE 4	3280	65/-50	100	-205/805	305/-185	100/-95	120	520	1385
AUTOBRAKE 3	3310	65/-50	105	-210/810	300/-165	105/-95	135	515	1385
AUTOBRAKE 2	3410	65/-60	110	-215/840	290/-185	110/-105	120	465	1285
AUTOBRAKE 1	3510	65/-60	110	-215/840	290/-185	110/-105	120	480	1260

Reference distance is based on sea level, standard day, no wind or slope, VREF30 approach speed, four-engine maximum reverse thrust, and auto speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 80 m.
For autobrake and manual speedbrakes, increase reference landing distance by 65 m.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
All reference distances and adjustments shown have been increased by 15%.

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV	NO REV

Dry Runway

MAX MANUAL	1610	50/-20	50	-70/230	25/-20	45/-40	65	55	115
AUTOBRAKE MAX	1920	40/-25	55	-75/270	5/0	50/-45	95	0	0
AUTOBRAKE 4	2340	40/-35	75	-105/355	5/0	70/-65	125	0	0
AUTOBRAKE 3	2770	50/-40	90	-130/430	5/-15	80/-75	145	5	10
AUTOBRAKE 2	3110	55/-50	105	-145/500	35/-60	95/-90	135	55	55
AUTOBRAKE 1	3410	65/-60	115	-170/580	90/-100	110/-100	135	275	355

Good Reported Braking Action

MAX MANUAL	2040	35/-30	65	-90/330	55/-45	55/-50	90	135	300
AUTOBRAKE MAX	2130	40/-30	65	-95/340	50/-35	65/-50	95	135	300
AUTOBRAKE 4	2370	40/-35	75	-105/370	20/-5	70/-65	125	10	80
AUTOBRAKE 3	2770	50/-40	90	-130/430	10/-15	80/-75	145	5	10
AUTOBRAKE 2	3110	55/-50	105	-145/500	35/-60	95/-90	135	55	55
AUTOBRAKE 1	3410	65/-60	115	-170/580	90/-100	110/-100	135	275	355

Good To Medium Reported Braking Action

MAX MANUAL	2370	40/-35	75	-115/425	95/-70	70/-65	100	230	550
AUTOBRAKE MAX	2430	45/-35	75	-120/430	90/-60	75/-65	110	220	535
AUTOBRAKE 4	2560	45/-35	80	-125/450	70/-45	75/-70	125	165	430
AUTOBRAKE 3	2860	50/-40	90	-140/485	50/-35	90/-85	145	95	320
AUTOBRAKE 2	3160	55/-50	105	-155/540	65/-75	95/-90	135	95	245
AUTOBRAKE 1	3430	65/-60	115	-175/600	110/-105	110/-100	135	285	420

Flaps 25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF25	TWO REV	NO REV

Medium Reported Braking Action

MAX MANUAL	2710	50/-45	90	-140/520	135/-100	80/-75	110	325	800
AUTOBRAKE MAX	2730	50/-45	90	-140/525	125/-90	80/-75	120	305	775
AUTOBRAKE 4	2740	50/-45	90	-145/525	125/-75	80/-75	120	315	785
AUTOBRAKE 3	2960	50/-45	95	-155/545	90/-60	90/-85	145	180	630
AUTOBRAKE 2	3210	55/-50	105	-160/580	90/-90	95/-90	135	135	425
AUTOBRAKE 1	3450	65/-60	115	-175/620	125/-115	110/-100	135	300	490

Medium To Poor Reported Braking Action

MAX MANUAL	3090	55/-50	100	-175/675	225/-145	95/-85	110	485	1290
AUTOBRAKE MAX	3100	55/-50	100	-175/675	230/-140	95/-90	120	475	1275
AUTOBRAKE 4	3110	55/-50	100	-175/675	220/-135	95/-90	120	480	1280
AUTOBRAKE 3	3240	55/-50	105	-180/690	200/-115	100/-95	140	405	1200
AUTOBRAKE 2	3430	65/-50	110	-190/715	190/-140	105/-105	130	330	1035
AUTOBRAKE 1	3610	65/-60	120	-200/745	215/-155	110/-105	130	440	1025

Poor Reported Braking Action

MAX MANUAL	3470	65/-60	110	-210/825	320/-195	110/-100	120	645	1780
AUTOBRAKE MAX	3470	65/-60	110	-210/825	325/-195	110/-105	120	645	1780
AUTOBRAKE 4	3470	65/-60	110	-210/830	325/-195	110/-105	120	640	1775
AUTOBRAKE 3	3520	65/-60	110	-210/835	305/-175	110/-105	140	625	1770
AUTOBRAKE 2	3640	70/-65	115	-225/865	300/-200	120/-110	125	530	1645
AUTOBRAKE 1	3770	70/-65	120	-225/865	300/-200	120/-110	125	580	1565

Reference distance is based on sea level, standard day, no wind or slope, VREF25 approach speed, four-engine maximum reverse thrust, and auto speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 90 m.
For autobrake and manual speedbrakes, increase reference landing distance by 65 m.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
All reference distances and adjustments shown have been increased by 15%.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

AIR/GND SYSTEM (Flaps 25)

VREF25

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1660	50/-25	50	-75/230	35/-35	45/-50	95	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2360	40/-35	75	-110/365	105/-80	70/-70	125	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2970	50/-50	95	-150/500	215/-155	90/-90	150	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3580	55/-55	115	-190/640	330/-225	110/-110	170	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	4510	70/-70	145	-260/900	765/-400	145/-145	190	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	5440	80/-80	165	-325/1165	1200/-570	175/-175	205	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

AIR/GND SYSTEM (Flaps 30)

VREF30

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1570	35/-25	45	-70/225	35/-30	40/-40	90	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2160	35/-35	65	-105/350	90/-75	65/-65	120	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2670	40/-40	85	-140/475	180/-130	80/-80	135	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3170	50/-50	100	-175/595	270/-190	95/-95	150	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3900	60/-55	120	-235/830	605/-320	125/-125	160	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4630	70/-65	140	-295/1065	930/-450	150/-150	170	0	0
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Airspeed Unreliable (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1520	45/-25	45	-65/205	25/-25	40/-40	N/A	55	115
AUTOBRAKE MAX	1840	40/-25	55	-75/245	5/-5	50/-50	N/A	0	0
AUTOBRAKE 2	2930	50/-50	95	-135/450	55/-65	90/-90	N/A	120	120

Good Reported Braking Action

MAX MANUAL	1920	35/-30	60	-90/300	50/-45	55/-55	N/A	125	290
AUTOBRAKE MAX	2020	35/-35	65	-90/305	50/-40	55/-55	N/A	130	295
AUTOBRAKE 2	2930	50/-50	95	-135/450	55/-65	90/-90	N/A	120	120

Good To Medium Reported Braking Action

MAX MANUAL	2230	40/-35	75	-110/385	90/-70	65/-65	N/A	220	525
AUTOBRAKE MAX	2300	40/-40	75	-110/390	80/-65	70/-70	N/A	215	520
AUTOBRAKE 2	2970	50/-50	95	-145/485	80/-80	95/-90	N/A	155	280

Medium Reported Braking Action

MAX MANUAL	2540	45/-40	80	-135/465	120/-95	80/-75	N/A	305	760
AUTOBRAKE MAX	2580	45/-40	80	-135/470	110/-90	80/-80	N/A	300	735
AUTOBRAKE 3	2820	50/-45	90	-145/495	80/-65	90/-85	N/A	160	550

Medium To Poor Reported Braking Action

MAX MANUAL	2880	55/-50	95	-165/600	205/-135	90/-90	N/A	455	1205
AUTOBRAKE MAX	2900	55/-50	95	-165/605	200/-135	90/-90	N/A	445	1190
AUTOBRAKE 3	3060	55/-50	100	-170/620	175/-120	95/-95	N/A	355	1075

Poor Reported Braking Action

MAX MANUAL	3220	60/-55	105	-190/735	285/-180	105/-100	N/A	595	1645
AUTOBRAKE MAX	3230	60/-55	105	-195/735	285/-180	105/-100	N/A	590	1635
AUTOBRAKE 3	3300	60/-55	105	-195/740	270/-165	105/-105	N/A	545	1600

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
ANTISKID / ANTISKID OFF (Flaps 25)
VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	2580	45/-40	80	-135/470	105/-90	75/-75	100	275	685
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2580	45/-40	80	-135/470	105/-90	75/-75	100	275	685
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2900	55/-50	90	-165/605	170/-130	90/-85	105	415	1110
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3230	60/-55	100	-195/735	235/-175	95/-95	110	555	1530
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3780	70/-65	110	-270/1200	700/-300	120/-115	115	945	3120
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4330	80/-70	125	-340/1665	1160/-425	135/-135	120	1330	4705
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
ANTISKID / ANTISKID OFF (Flaps 30)
VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	2430	40/-40	75	-130/460	110/-85	70/-70	95	225	545
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good Reported Braking Action									
MAX MANUAL	2430	40/-40	75	-130/460	110/-85	70/-70	95	225	545
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good To Medium Reported Braking Action									
MAX MANUAL	2730	50/-45	80	-160/590	190/-125	80/-80	105	340	870
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Medium Reported Braking Action									
MAX MANUAL	3030	55/-50	90	-190/720	265/-165	90/-90	105	450	1190
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Medium To Poor Reported Braking Action									
MAX MANUAL	3540	65/-60	105	-255/1145	820/-285	110/-105	110	785	2430
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Poor Reported Braking Action									
MAX MANUAL	4040	75/-65	115	-325/1575	1375/-400	125/-125	110	1110	3675
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
BLD DUCT LEAK L, C, R (Flaps 25)
VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1430	40/-25	40	-65/205	25/-25	40/-40	60	35	80
AUTOBRAKE MAX	1670	35/-25	50	-75/235	5/0	45/-45	85	0	0
AUTOBRAKE 2	2730	50/-50	90	-135/440	20/-45	85/-85	125	25	25

Good Reported Braking Action

MAX MANUAL	1800	30/-30	55	-90/290	50/-40	50/-50	80	100	225
AUTOBRAKE MAX	1870	35/-30	55	-90/300	45/-40	55/-55	85	105	245
AUTOBRAKE 2	2730	50/-50	90	-135/440	20/-45	85/-85	125	25	25

Good To Medium Reported Braking Action

MAX MANUAL	2110	35/-35	65	-110/375	85/-65	65/-60	90	180	440
AUTOBRAKE MAX	2140	40/-35	65	-110/380	80/-65	65/-65	95	180	445
AUTOBRAKE 2	2780	50/-50	90	-140/470	45/-60	90/-85	125	60	185

Medium Reported Braking Action

MAX MANUAL	2400	40/-40	75	-130/460	115/-90	75/-70	95	260	650
AUTOBRAKE MAX	2400	45/-40	75	-130/460	120/-85	75/-75	100	260	645
AUTOBRAKE 3	2580	45/-40	80	-135/480	80/-55	80/-80	125	155	535

Medium To Poor Reported Braking Action

MAX MANUAL	2740	50/-50	90	-160/595	200/-135	85/-80	100	400	1070
AUTOBRAKE MAX	2740	50/-50	90	-160/595	205/-135	85/-85	105	400	1070
AUTOBRAKE 3	2840	50/-50	90	-165/605	175/-110	90/-90	120	345	1015

Poor Reported Braking Action

MAX MANUAL	3080	55/-55	95	-190/725	280/-175	95/-95	105	540	1490
AUTOBRAKE MAX	3080	55/-55	95	-190/725	285/-180	95/-95	105	540	1490
AUTOBRAKE 3	3110	55/-55	95	-190/730	275/-165	95/-95	115	535	1495

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

BLD DUCT LEAK L, C, R (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1340	35/-20	40	-60/195	25/-20	35/-35	65	30	55
AUTOBRAKE MAX	1580	30/-25	50	-70/230	0/0	40/-40	80	0	0
AUTOBRAKE 2	2540	45/-40	80	-125/420	25/-45	75/-75	110	25	25
Good Reported Braking Action									
MAX MANUAL	1720	30/-25	50	-85/285	50/-40	50/-50	80	85	185
AUTOBRAKE MAX	1790	30/-30	55	-90/290	40/-35	50/-50	85	90	200
AUTOBRAKE 2	2540	45/-40	80	-125/420	25/-45	75/-75	110	25	25
Good To Medium Reported Braking Action									
MAX MANUAL	1990	35/-35	60	-105/370	80/-65	55/-55	85	150	355
AUTOBRAKE MAX	2040	35/-35	65	-110/370	80/-55	60/-60	95	155	360
AUTOBRAKE 2	2580	45/-45	85	-135/455	50/-60	80/-80	110	55	155
Medium Reported Braking Action									
MAX MANUAL	2270	40/-40	70	-125/450	110/-90	65/-65	90	215	520
AUTOBRAKE MAX	2280	40/-40	75	-125/450	110/-80	70/-65	100	215	520
AUTOBRAKE 3	2410	40/-40	75	-130/465	90/-55	75/-75	120	135	430
Medium To Poor Reported Braking Action									
MAX MANUAL	2580	45/-45	80	-160/575	190/-125	80/-80	95	330	840
AUTOBRAKE MAX	2580	50/-45	80	-160/580	190/-125	80/-80	100	330	845
AUTOBRAKE 3	2660	50/-45	85	-160/585	180/-105	80/-80	115	290	800
Poor Reported Braking Action									
MAX MANUAL	2880	50/-50	90	-185/705	270/-165	90/-90	100	440	1160
AUTOBRAKE MAX	2890	55/-50	90	-185/705	270/-170	90/-90	100	440	1165
AUTOBRAKE 3	2910	55/-50	90	-185/705	270/-155	90/-90	110	440	1170

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG 1, 2, 3, 4 SHUTDOWN (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1450	45/-25	40	-65/210	25/-25	40/-40	60	0	55
AUTOBRAKE MAX	1670	40/-25	50	-75/235	5/0	45/-45	85	0	0
AUTOBRAKE 2	2750	50/-45	95	-135/440	10/-15	85/-85	150	0	0

Good Reported Braking Action

MAX MANUAL	1870	35/-30	55	-90/305	55/-50	55/-55	85	0	145
AUTOBRAKE MAX	1960	35/-35	60	-95/310	50/-45	55/-55	95	0	145
AUTOBRAKE 2	2750	50/-45	95	-135/440	10/-15	85/-85	150	0	0

Good To Medium Reported Braking Action

MAX MANUAL	2250	40/-40	75	-120/400	105/-85	70/-65	95	0	275
AUTOBRAKE MAX	2290	40/-40	75	-120/405	100/-75	70/-70	105	0	270
AUTOBRAKE 2	2820	50/-50	95	-145/485	55/-40	90/-90	150	0	120

Medium Reported Braking Action

MAX MANUAL	2610	45/-45	85	-145/495	150/-115	80/-80	105	0	410
AUTOBRAKE MAX	2620	50/-45	85	-145/495	150/-105	80/-80	115	0	395
AUTOBRAKE 3	2710	50/-45	90	-145/500	135/-90	85/-80	125	0	375

Medium To Poor Reported Braking Action

MAX MANUAL	3070	55/-55	100	-180/650	280/-180	95/-95	115	0	675
AUTOBRAKE MAX	3070	55/-55	100	-180/650	280/-175	95/-95	120	0	670
AUTOBRAKE 3	3130	55/-55	105	-180/660	270/-165	100/-95	125	0	665

Poor Reported Braking Action

MAX MANUAL	3510	65/-60	110	-220/805	405/-245	110/-110	120	0	940
AUTOBRAKE MAX	3520	65/-60	115	-220/805	410/-245	110/-110	120	0	945
AUTOBRAKE 3	3540	65/-60	115	-220/810	405/-245	110/-110	120	0	950

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG 1, 2, 3, 4 SHUTDOWN (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1390	40/-25	40	-65/205	25/-25	40/-40	60	0	45
AUTOBRAKE MAX	1580	35/-25	50	-70/230	5/0	40/-40	80	0	0
AUTOBRAKE 2	2580	45/-40	85	-125/425	5/-10	80/-80	145	0	0

Good Reported Braking Action

MAX MANUAL	1790	30/-30	55	-90/300	55/-50	50/-50	85	0	120
AUTOBRAKE MAX	1870	30/-30	55	-90/305	50/-40	55/-55	95	0	120
AUTOBRAKE 2	2580	45/-40	85	-125/425	5/-10	80/-80	145	0	0

Good To Medium Reported Braking Action

MAX MANUAL	2150	40/-35	65	-115/395	105/-80	65/-65	95	0	235
AUTOBRAKE MAX	2190	40/-35	70	-115/400	105/-75	65/-65	105	0	235
AUTOBRAKE 2	2660	50/-45	90	-140/470	55/-35	80/-80	145	0	115

Medium Reported Braking Action

MAX MANUAL	2510	45/-40	80	-140/485	150/-115	75/-75	105	0	355
AUTOBRAKE MAX	2520	45/-40	80	-140/490	155/-105	80/-75	115	0	350
AUTOBRAKE 3	2580	45/-45	85	-145/495	145/-95	80/-80	125	0	350

Medium To Poor Reported Braking Action

MAX MANUAL	2970	55/-50	95	-180/645	285/-180	95/-90	115	0	595
AUTOBRAKE MAX	2980	55/-50	95	-180/650	285/-180	95/-90	120	0	600
AUTOBRAKE 3	3020	55/-55	100	-180/650	275/-175	95/-95	125	0	600

Poor Reported Braking Action

MAX MANUAL	3420	60/-55	110	-215/800	410/-245	110/-105	125	0	840
AUTOBRAKE MAX	3430	65/-60	110	-215/805	415/-250	110/-105	125	0	845
AUTOBRAKE 3	3460	65/-60	110	-220/805	410/-250	110/-110	125	0	850

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
FLAPS CONTROL (Flaps 25)
VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1400	40/-25	40	-65/200	25/-20	40/-40	55	50	100
AUTOBRAKE MAX	1670	35/-25	50	-75/235	5/0	45/-45	85	0	0
AUTOBRAKE 2	2710	50/-50	90	-130/435	30/-55	80/-80	115	50	50
Good Reported Braking Action									
MAX MANUAL	1770	30/-30	55	-85/290	50/-40	50/-50	80	115	260
AUTOBRAKE MAX	1860	35/-30	55	-90/295	40/-35	55/-50	85	115	260
AUTOBRAKE 2	2710	50/-50	90	-130/435	30/-55	80/-80	115	50	50
Good To Medium Reported Braking Action									
MAX MANUAL	2070	35/-35	65	-105/370	80/-65	65/-60	90	200	480
AUTOBRAKE MAX	2120	40/-35	65	-110/375	80/-60	65/-60	95	190	465
AUTOBRAKE 2	2750	50/-50	90	-140/470	55/-70	85/-85	115	85	215
Medium Reported Braking Action									
MAX MANUAL	2360	40/-40	75	-125/455	115/-90	75/-70	95	280	695
AUTOBRAKE MAX	2380	45/-40	75	-125/455	110/-80	75/-70	105	270	675
AUTOBRAKE 3	2570	45/-40	80	-135/475	75/-55	80/-80	125	160	550
Medium To Poor Reported Braking Action									
MAX MANUAL	2690	50/-50	90	-160/590	200/-135	85/-80	100	420	1120
AUTOBRAKE MAX	2700	50/-50	90	-160/590	200/-125	85/-80	105	415	1110
AUTOBRAKE 3	2820	50/-50	90	-165/600	175/-105	90/-90	125	355	1045
Poor Reported Braking Action									
MAX MANUAL	3020	55/-55	95	-190/720	275/-175	95/-90	105	560	1550
AUTOBRAKE MAX	3020	55/-55	95	-190/720	285/-175	95/-95	105	560	1550
AUTOBRAKE 3	3060	55/-55	95	-190/725	270/-155	95/-95	120	545	1540

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS DRIVE (Flaps 25)

VREF30 + 25

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1610	45/-25	50	-65/215	25/-25	45/-45	70	65	135
AUTOBRAKE MAX	1980	35/-30	60	-80/255	10/-15	55/-55	85	15	20
AUTOBRAKE 2	3110	50/-50	105	-145/465	60/-70	95/-95	110	160	170
Good Reported Braking Action									
MAX MANUAL	2050	35/-35	65	-95/305	55/-50	60/-60	80	145	330
AUTOBRAKE MAX	2150	35/-35	65	-95/315	55/-50	65/-65	80	160	355
AUTOBRAKE 2	3110	50/-50	105	-145/465	65/-70	95/-95	115	160	170
Good To Medium Reported Braking Action									
MAX MANUAL	2370	40/-40	75	-115/395	90/-75	75/-75	90	245	590
AUTOBRAKE MAX	2440	40/-40	80	-120/400	90/-75	75/-75	95	245	590
AUTOBRAKE 2	3150	50/-55	105	-150/500	90/-85	100/-100	115	200	345
Medium Reported Braking Action									
MAX MANUAL	2690	45/-45	90	-135/480	125/-105	85/-80	95	340	850
AUTOBRAKE MAX	2730	45/-45	90	-140/485	120/-95	85/-85	105	330	830
AUTOBRAKE 3	2990	50/-50	95	-145/510	95/-80	95/-95	115	185	610
Medium To Poor Reported Braking Action									
MAX MANUAL	3040	55/-50	100	-165/620	215/-150	95/-95	105	495	1325
AUTOBRAKE MAX	3070	55/-50	100	-170/620	210/-145	95/-95	105	485	1305
AUTOBRAKE 3	3240	55/-55	105	-175/635	190/-130	105/-105	115	385	1175
Poor Reported Braking Action									
MAX MANUAL	3400	60/-55	110	-200/750	300/-190	110/-105	105	650	1790
AUTOBRAKE MAX	3410	60/-55	110	-200/750	295/-190	110/-105	105	635	1780
AUTOBRAKE 3	3490	60/-55	110	-200/760	280/-180	110/-110	115	580	1730

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Flaps Up Landing (Flaps Up)

VREF30 + 70

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	2340	125/-45	110	-100/400	45/-40	100/-90	110	140	315
AUTOBRAKE MAX	2810	110/-35	100	-100/355	10/-10	90/-90	115	25	110
AUTOBRAKE 2	4610	80/-75	160	-175/570	110/-120	150/-150	135	360	400
Good Reported Braking Action									
MAX MANUAL	2680	110/-40	90	-105/345	70/-60	85/-80	85	225	520
AUTOBRAKE MAX	2930	105/-40	95	-110/365	40/-35	90/-90	110	150	440
AUTOBRAKE 2	4610	80/-75	160	-175/570	110/-120	150/-150	135	360	400
Good To Medium Reported Braking Action									
MAX MANUAL	3180	90/-50	105	-135/450	120/-95	105/-100	95	390	970
AUTOBRAKE MAX	3340	90/-50	110	-135/460	95/-80	105/-105	110	345	915
AUTOBRAKE 2	4650	80/-75	160	-180/605	135/-130	155/-150	135	405	635
Medium Reported Braking Action									
MAX MANUAL	3690	75/-55	120	-160/550	165/-135	120/-115	105	555	1415
AUTOBRAKE MAX	3740	75/-55	125	-160/550	150/-125	120/-120	110	540	1385
AUTOBRAKE 3	4380	70/-65	145	-175/605	125/-110	145/-140	135	300	895
Medium To Poor Reported Braking Action									
MAX MANUAL	4230	80/-70	140	-195/700	275/-195	140/-135	115	825	2305
AUTOBRAKE MAX	4240	80/-70	145	-200/705	265/-185	140/-135	120	805	2260
AUTOBRAKE 3	4680	75/-75	160	-205/735	240/-175	155/-150	135	610	1940
Poor Reported Braking Action									
MAX MANUAL	4760	80/-80	160	-230/855	380/-250	160/-150	120	1095	3190
AUTOBRAKE MAX	4740	80/-80	160	-230/855	375/-245	160/-150	125	1065	3135
AUTOBRAKE 3	4980	80/-80	165	-235/870	355/-240	165/-160	135	925	2985

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1780	55/-35	50	-80/260	40/-35	50/-50	75	75	160
AUTOBRAKE MAX	1760	65/-30	50	-80/260	40/-25	50/-50	85	65	150
AUTOBRAKE 2	2750	50/-50	95	-135/440	10/-30	85/-85	140	10	10

Good Reported Braking Action

MAX MANUAL	1940	50/-30	55	-90/305	55/-50	55/-55	85	105	245
AUTOBRAKE MAX	1930	55/-30	55	-90/300	55/-50	55/-55	90	105	235
AUTOBRAKE 2	2760	50/-50	95	-135/440	10/-35	85/-85	140	15	15

Good To Medium Reported Braking Action

MAX MANUAL	2240	50/-35	70	-110/385	90/-75	65/-65	95	190	465
AUTOBRAKE MAX	2220	50/-35	70	-110/385	90/-75	65/-65	95	190	455
AUTOBRAKE 2	2830	50/-50	95	-145/480	45/-50	90/-90	140	50	180

Medium Reported Braking Action

MAX MANUAL	2540	45/-40	80	-135/470	125/-95	75/-75	100	275	680
AUTOBRAKE MAX	2520	45/-40	80	-135/470	125/-95	75/-75	105	270	670
AUTOBRAKE 3	2630	45/-40	85	-135/480	95/-60	80/-80	130	160	555

Medium To Poor Reported Braking Action

MAX MANUAL	2870	55/-50	90	-165/605	205/-145	90/-85	105	415	1115
AUTOBRAKE MAX	2860	55/-50	90	-165/605	215/-145	90/-85	110	410	1110
AUTOBRAKE 3	2920	55/-50	95	-165/610	195/-120	90/-90	125	355	1050

Poor Reported Braking Action

MAX MANUAL	3210	60/-55	100	-195/735	290/-185	100/-95	110	555	1550
AUTOBRAKE MAX	3200	60/-55	100	-195/735	295/-190	100/-95	110	555	1545
AUTOBRAKE 3	3210	60/-55	100	-195/735	290/-175	100/-95	120	550	1540

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - One Body or One Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1670	50/-35	50	-75/250	35/-35	45/-45	70	55	120
AUTOBRAKE MAX	1640	50/-25	50	-75/245	35/-20	45/-45	80	50	110
AUTOBRAKE 2	2580	45/-45	85	-125/425	10/-30	80/-80	125	15	15
Good Reported Braking Action									
MAX MANUAL	1860	40/-30	55	-90/300	55/-45	50/-50	85	90	200
AUTOBRAKE MAX	1840	45/-30	55	-90/295	50/-45	50/-50	90	90	200
AUTOBRAKE 2	2580	45/-45	85	-125/425	10/-35	80/-80	125	15	15
Good To Medium Reported Braking Action									
MAX MANUAL	2130	40/-35	65	-110/380	90/-70	60/-60	90	160	375
AUTOBRAKE MAX	2110	45/-35	65	-110/375	90/-70	60/-60	95	155	370
AUTOBRAKE 2	2640	45/-45	85	-135/465	45/-55	80/-80	125	50	150
Medium Reported Braking Action									
MAX MANUAL	2400	40/-40	75	-130/460	120/-95	70/-70	95	225	545
AUTOBRAKE MAX	2390	40/-40	75	-130/460	120/-90	70/-70	100	220	540
AUTOBRAKE 3	2480	40/-40	80	-135/470	95/-55	75/-75	125	145	450
Medium To Poor Reported Braking Action									
MAX MANUAL	2710	50/-45	80	-160/590	200/-135	80/-80	100	340	875
AUTOBRAKE MAX	2710	50/-45	80	-160/590	200/-135	80/-80	105	340	875
AUTOBRAKE 3	2750	50/-45	90	-160/595	190/-110	85/-85	125	300	830
Poor Reported Braking Action									
MAX MANUAL	3020	55/-50	90	-190/720	275/-175	90/-90	105	455	1210
AUTOBRAKE MAX	3020	55/-50	90	-190/720	280/-180	95/-90	105	455	1210
AUTOBRAKE 3	3020	55/-50	95	-190/720	280/-165	95/-90	120	450	1205

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	2120	110/-45	90	-100/465	75/-55	75/-60	110	145	330
AUTOBRAKE MAX	2140	125/-45	90	-110/485	70/-60	80/-75	125	145	345
AUTOBRAKE 2	2780	100/-50	95	-135/470	25/-30	85/-85	145	10	10

Good Reported Braking Action

MAX MANUAL	2120	110/-40	90	-100/465	75/-55	75/-60	110	145	330
AUTOBRAKE MAX	2140	125/-40	90	-110/485	70/-60	80/-75	125	145	345
AUTOBRAKE 2	2780	100/-50	95	-135/470	25/-30	85/-85	145	10	10

Good To Medium Reported Braking Action

MAX MANUAL	2340	105/-40	85	-120/470	100/-80	75/-65	105	210	510
AUTOBRAKE MAX	2330	120/-40	85	-120/480	100/-80	80/-75	115	210	515
AUTOBRAKE 2	2830	100/-50	95	-145/495	50/-50	90/-90	145	50	185

Medium Reported Braking Action

MAX MANUAL	2550	95/-40	80	-135/470	125/-100	75/-75	100	275	690
AUTOBRAKE MAX	2530	110/-40	80	-135/470	125/-100	75/-75	105	275	680
AUTOBRAKE 3	2640	105/-40	85	-135/480	95/-65	80/-80	130	170	575

Medium To Poor Reported Braking Action

MAX MANUAL	2890	80/-50	90	-165/605	210/-145	90/-85	105	425	1145
AUTOBRAKE MAX	2880	95/-50	90	-165/605	215/-145	90/-85	110	425	1135
AUTOBRAKE 3	2930	95/-50	95	-165/610	195/-120	90/-90	125	370	1080

Poor Reported Braking Action

MAX MANUAL	3230	65/-55	100	-195/740	295/-185	100/-95	110	570	1595
AUTOBRAKE MAX	3220	80/-55	100	-195/740	300/-190	100/-95	110	570	1590
AUTOBRAKE 3	3230	80/-55	100	-195/740	295/-175	100/-95	120	565	1585

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Two Body or Two Wing Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1960	90/-40	75	-95/395	60/-50	55/-55	85	110	245
AUTOBRAKE MAX	1940	95/-40	80	-95/430	60/-50	70/-55	110	105	235
AUTOBRAKE 2	2590	75/-45	90	-125/430	10/-35	80/-80	135	10	10

Good Reported Braking Action

MAX MANUAL	1960	90/-35	75	-95/395	60/-50	55/-55	85	110	245
AUTOBRAKE MAX	1940	95/-35	80	-95/430	60/-50	70/-55	110	105	235
AUTOBRAKE 2	2590	75/-45	90	-125/430	10/-35	80/-80	135	10	10

Good To Medium Reported Braking Action

MAX MANUAL	2190	80/-35	75	-115/425	90/-75	65/-65	90	170	400
AUTOBRAKE MAX	2170	90/-35	75	-110/445	90/-75	70/-65	105	165	395
AUTOBRAKE 2	2650	75/-45	90	-135/465	45/-50	80/-80	135	50	155

Medium Reported Braking Action

MAX MANUAL	2410	70/-40	75	-130/460	120/-95	70/-70	95	230	555
AUTOBRAKE MAX	2400	80/-40	75	-130/460	120/-95	70/-70	105	230	550
AUTOBRAKE 3	2480	75/-40	80	-135/470	95/-60	75/-75	125	145	465

Medium To Poor Reported Braking Action

MAX MANUAL	2730	65/-45	85	-160/590	200/-135	80/-80	105	345	900
AUTOBRAKE MAX	2720	65/-45	85	-160/590	205/-135	80/-80	105	345	895
AUTOBRAKE 3	2760	65/-45	90	-160/595	190/-115	85/-85	120	305	855

Poor Reported Braking Action

MAX MANUAL	3040	55/-50	95	-190/720	280/-175	95/-90	105	465	1240
AUTOBRAKE MAX	3040	55/-50	95	-190/720	285/-180	95/-90	105	465	1240
AUTOBRAKE 3	3040	55/-50	95	-190/720	285/-165	95/-90	115	465	1235

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Nose Gear Up (Flaps 25)

VREF25

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1400	40/-25	40	-65/200	25/-20	40/-40	55	50	100
AUTOBRAKE MAX	1670	35/-25	50	-75/235	5/0	45/-45	85	0	0
AUTOBRAKE 2	2710	50/-50	90	-130/435	30/-55	80/-80	115	50	50

Good Reported Braking Action

MAX MANUAL	1770	30/-30	55	-85/290	50/-40	50/-50	80	115	260
AUTOBRAKE MAX	1860	35/-30	55	-90/295	40/-35	55/-50	85	115	260
AUTOBRAKE 2	2710	50/-50	90	-130/435	30/-55	80/-80	115	50	50

Good To Medium Reported Braking Action

MAX MANUAL	2070	35/-35	65	-105/370	80/-65	65/-60	90	200	480
AUTOBRAKE MAX	2120	40/-35	65	-110/375	80/-60	65/-60	95	190	465
AUTOBRAKE 2	2750	50/-50	90	-140/470	55/-70	85/-85	115	85	215

Medium Reported Braking Action

MAX MANUAL	2360	40/-40	75	-125/455	115/-90	75/-70	95	280	695
AUTOBRAKE MAX	2380	45/-40	75	-125/455	110/-80	75/-70	105	270	675
AUTOBRAKE 3	2570	45/-40	80	-135/475	75/-55	80/-80	125	160	550

Medium To Poor Reported Braking Action

MAX MANUAL	2690	50/-50	90	-160/590	200/-135	85/-80	100	420	1120
AUTOBRAKE MAX	2700	50/-50	90	-160/590	200/-125	85/-80	105	415	1110
AUTOBRAKE 3	2820	50/-50	90	-165/600	175/-105	90/-90	125	355	1045

Poor Reported Braking Action

MAX MANUAL	3020	55/-55	95	-190/720	275/-175	95/-90	105	560	1550
AUTOBRAKE MAX	3020	55/-55	95	-190/720	285/-175	95/-95	105	560	1550
AUTOBRAKE 3	3060	55/-55	95	-190/725	270/-155	95/-95	120	545	1540

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

GEAR DISAGREE - Nose Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1320	35/-20	35	-60/190	20/-20	35/-35	60	35	80
AUTOBRAKE MAX	1580	30/-25	50	-70/230	0/0	40/-40	80	0	0
AUTOBRAKE 2	2500	45/-40	80	-125/415	35/-50	75/-75	105	55	55
Good Reported Braking Action									
MAX MANUAL	1690	30/-25	50	-85/285	50/-40	50/-50	75	95	215
AUTOBRAKE MAX	1770	30/-30	55	-90/290	40/-35	50/-50	85	95	215
AUTOBRAKE 2	2500	45/-40	80	-125/415	35/-50	75/-75	105	55	55
Good To Medium Reported Braking Action									
MAX MANUAL	1960	35/-35	60	-105/360	80/-65	55/-55	85	165	385
AUTOBRAKE MAX	2020	35/-35	65	-105/370	75/-55	60/-60	95	160	380
AUTOBRAKE 2	2550	45/-45	80	-135/455	60/-65	80/-80	105	90	190
Medium Reported Braking Action									
MAX MANUAL	2230	40/-40	70	-125/440	110/-85	65/-65	90	230	555
AUTOBRAKE MAX	2260	40/-40	75	-125/445	105/-80	70/-65	100	220	540
AUTOBRAKE 3	2410	40/-40	75	-130/465	80/-55	75/-75	115	140	440
Medium To Poor Reported Braking Action									
MAX MANUAL	2530	45/-45	80	-155/575	190/-125	80/-75	95	345	885
AUTOBRAKE MAX	2550	50/-45	80	-155/575	185/-120	80/-80	105	340	875
AUTOBRAKE 3	2640	50/-45	85	-160/585	175/-105	80/-80	115	295	825
Poor Reported Braking Action									
MAX MANUAL	2830	50/-50	90	-180/700	265/-165	90/-85	95	455	1210
AUTOBRAKE MAX	2840	55/-50	90	-180/700	270/-165	90/-90	105	460	1215
AUTOBRAKE 3	2880	55/-50	90	-185/705	260/-150	90/-90	115	450	1205

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Gear Lever Jammed In Up Position (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	2120	110/-45	90	-100/465	75/-55	75/-60	110	145	330
AUTOBRAKE MAX	2140	125/-45	90	-110/485	70/-60	80/-75	125	145	345
AUTOBRAKE 2	2780	100/-50	95	-135/470	25/-30	85/-85	145	10	10

Good Reported Braking Action

MAX MANUAL	2120	110/-40	90	-100/465	75/-55	75/-60	110	145	330
AUTOBRAKE MAX	2140	125/-40	90	-110/485	70/-60	80/-75	125	145	345
AUTOBRAKE 2	2780	100/-50	95	-135/470	25/-30	85/-85	145	10	10

Good To Medium Reported Braking Action

MAX MANUAL	2340	105/-40	85	-120/470	100/-80	75/-65	105	210	510
AUTOBRAKE MAX	2330	120/-40	85	-120/480	100/-80	80/-75	115	210	515
AUTOBRAKE 2	2830	100/-50	95	-145/495	50/-50	90/-90	145	50	185

Medium Reported Braking Action

MAX MANUAL	2550	95/-40	80	-135/470	125/-100	75/-75	100	275	690
AUTOBRAKE MAX	2530	110/-40	80	-135/470	125/-100	75/-75	105	275	680
AUTOBRAKE 3	2640	105/-40	85	-135/480	95/-65	80/-80	130	170	575

Medium To Poor Reported Braking Action

MAX MANUAL	2890	80/-50	90	-165/605	210/-145	90/-85	105	425	1145
AUTOBRAKE MAX	2880	95/-50	90	-165/605	215/-145	90/-85	110	425	1135
AUTOBRAKE 3	2930	95/-50	95	-165/610	195/-120	90/-90	125	370	1080

Poor Reported Braking Action

MAX MANUAL	3230	65/-55	100	-195/740	295/-185	100/-95	110	570	1595
AUTOBRAKE MAX	3220	80/-55	100	-195/740	300/-190	100/-95	110	570	1590
AUTOBRAKE 3	3230	80/-55	100	-195/740	295/-175	100/-95	120	565	1585

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Gear Lever Jammed In Up Position (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1960	90/-40	75	-95/395	60/-50	55/-55	85	110	245
AUTOBRAKE MAX	1940	95/-40	80	-95/430	60/-50	70/-55	110	105	235
AUTOBRAKE 2	2590	75/-45	90	-125/430	10/-35	80/-80	135	10	10

Good Reported Braking Action

MAX MANUAL	1960	90/-35	75	-95/395	60/-50	55/-55	85	110	245
AUTOBRAKE MAX	1940	95/-35	80	-95/430	60/-50	70/-55	110	105	235
AUTOBRAKE 2	2590	75/-45	90	-125/430	10/-35	80/-80	135	10	10

Good To Medium Reported Braking Action

MAX MANUAL	2190	80/-35	75	-115/425	90/-75	65/-65	90	170	400
AUTOBRAKE MAX	2170	90/-35	75	-110/445	90/-75	70/-65	105	165	395
AUTOBRAKE 2	2650	75/-45	90	-135/465	45/-50	80/-80	135	50	155

Medium Reported Braking Action

MAX MANUAL	2410	70/-40	75	-130/460	120/-95	70/-70	95	230	555
AUTOBRAKE MAX	2400	80/-40	75	-130/460	120/-95	70/-70	105	230	550
AUTOBRAKE 3	2480	75/-40	80	-135/470	95/-60	75/-75	125	145	465

Medium To Poor Reported Braking Action

MAX MANUAL	2730	65/-45	85	-160/590	200/-135	80/-80	105	345	900
AUTOBRAKE MAX	2720	65/-45	85	-160/590	205/-135	80/-80	105	345	895
AUTOBRAKE 3	2760	65/-45	90	-160/595	190/-115	85/-85	120	305	855

Poor Reported Braking Action

MAX MANUAL	3040	55/-50	95	-190/720	280/-175	95/-90	105	465	1240
AUTOBRAKE MAX	3040	55/-50	95	-190/720	285/-180	95/-90	105	465	1240
AUTOBRAKE 3	3040	55/-50	95	-190/720	285/-165	95/-90	115	465	1235

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - System 1 or System 2 or System 3 Inoperative (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1430	40/-25	40	-65/200	25/-25	40/-40	65	50	110
AUTOBRAKE MAX	1670	35/-25	50	-75/235	5/0	45/-45	85	0	0
AUTOBRAKE 2	2760	50/-50	95	-135/440	5/-30	85/-85	145	10	10
Good Reported Braking Action									
MAX MANUAL	1860	35/-30	55	-90/300	55/-50	55/-55	90	135	310
AUTOBRAKE MAX	1910	35/-35	60	-90/300	50/-40	55/-55	90	130	300
AUTOBRAKE 2	2760	50/-50	95	-135/440	5/-30	85/-85	145	10	10
Good To Medium Reported Braking Action									
MAX MANUAL	2180	40/-40	70	-110/385	95/-75	65/-65	95	235	580
AUTOBRAKE MAX	2200	40/-40	75	-110/385	90/-70	65/-65	100	230	565
AUTOBRAKE 2	2810	50/-50	95	-145/480	35/-45	90/-90	145	55	265
Medium Reported Braking Action									
MAX MANUAL	2490	50/-45	80	-135/470	130/-100	75/-75	105	330	845
AUTOBRAKE MAX	2490	50/-45	80	-135/470	130/-95	75/-75	110	325	835
AUTOBRAKE 3	2600	50/-40	85	-135/480	95/-50	80/-80	135	255	775
Medium To Poor Reported Braking Action									
MAX MANUAL	2850	55/-50	95	-165/610	220/-150	90/-90	110	500	1375
AUTOBRAKE MAX	2850	55/-50	95	-165/610	220/-150	90/-90	115	495	1370
AUTOBRAKE 3	2900	55/-50	95	-165/615	205/-115	90/-90	130	460	1340
Poor Reported Braking Action									
MAX MANUAL	3210	65/-55	105	-200/745	305/-195	105/-95	120	665	1910
AUTOBRAKE MAX	3200	65/-55	105	-200/745	315/-200	105/-100	120	665	1905
AUTOBRAKE 3	3210	65/-55	105	-200/745	310/-180	105/-100	125	665	1900

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - System 1 or System 2 or System 3 Inoperative (Flaps 30)

VREF30

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1360	35/-20	40	-60/200	25/-20	35/-35	70	40	90
AUTOBRAKE MAX	1580	30/-25	50	-70/230	0/0	40/-40	80	0	5
AUTOBRAKE 2	2580	45/-45	85	-125/425	10/-40	80/-80	125	10	10
Good Reported Braking Action									
MAX MANUAL	1780	30/-30	55	-90/290	55/-45	50/-50	85	115	260
AUTOBRAKE MAX	1830	30/-30	55	-90/300	45/-40	50/-50	90	110	250
AUTOBRAKE 2	2580	45/-45	85	-125/425	10/-40	80/-80	125	10	10
Good To Medium Reported Braking Action									
MAX MANUAL	2070	35/-35	65	-110/375	90/-75	65/-60	95	195	465
AUTOBRAKE MAX	2090	35/-35	65	-110/380	85/-65	65/-60	100	190	455
AUTOBRAKE 2	2620	45/-45	85	-135/465	40/-55	80/-80	125	55	210
Medium Reported Braking Action									
MAX MANUAL	2350	40/-40	75	-130/460	125/-95	75/-70	100	275	670
AUTOBRAKE MAX	2360	40/-40	75	-130/460	125/-95	75/-70	105	265	665
AUTOBRAKE 3	2460	40/-40	80	-135/470	95/-60	75/-75	125	215	620
Medium To Poor Reported Braking Action									
MAX MANUAL	2680	50/-50	85	-160/595	210/-140	85/-80	105	410	1065
AUTOBRAKE MAX	2680	50/-50	90	-160/595	215/-140	85/-80	110	400	1065
AUTOBRAKE 3	2740	50/-50	90	-165/595	195/-120	85/-85	120	375	1050
Poor Reported Braking Action									
MAX MANUAL	3000	55/-55	95	-190/725	295/-180	95/-90	110	540	1465
AUTOBRAKE MAX	3010	55/-55	95	-190/725	300/-185	95/-90	110	540	1465
AUTOBRAKE 3	3030	55/-55	95	-190/725	290/-175	95/-95	115	540	1475

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - System 4 Inoperative (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1710	35/-25	50	-75/250	40/-35	50/-50	85	90	190
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2190	40/-35	70	-105/365	80/-65	65/-65	100	205	495
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2500	50/-45	80	-135/465	125/-100	75/-75	105	325	835
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2820	55/-50	90	-160/565	175/-130	90/-85	110	440	1175
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3170	65/-55	100	-195/730	315/-185	100/-95	120	625	1805
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3520	70/-65	110	-230/895	455/-240	110/-105	120	805	2430
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - System 4 Inoperative (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1610	25/-25	50	-75/245	35/-35	45/-45	80	70	155
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2030	35/-35	65	-105/350	75/-60	55/-55	95	160	370
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2310	40/-40	75	-125/450	120/-90	70/-65	100	245	605
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2580	50/-45	80	-150/540	160/-120	80/-75	105	330	840
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	2890	55/-50	90	-180/700	290/-165	90/-90	105	470	1265
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3190	60/-55	95	-215/855	415/-215	100/-95	105	605	1685
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - Systems 1 and 2 Inoperative or Systems 1 and 3 Inoperative (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1570	50/-25	50	-65/215	30/-25	45/-45	75	65	135
AUTOBRAKE MAX	1870	40/-25	55	-80/250	5/-5	55/-55	95	0	0
AUTOBRAKE 2	3110	50/-50	105	-145/470	25/-60	95/-95	130	50	50
Good Reported Braking Action									
MAX MANUAL	2060	35/-35	65	-95/315	60/-55	60/-60	90	160	375
AUTOBRAKE MAX	2120	35/-35	65	-95/320	55/-50	65/-65	95	160	365
AUTOBRAKE 2	3110	50/-50	105	-145/470	30/-60	95/-95	130	50	50
Good To Medium Reported Braking Action									
MAX MANUAL	2400	40/-40	80	-120/400	100/-80	75/-75	100	270	675
AUTOBRAKE MAX	2440	40/-40	80	-120/405	95/-80	75/-75	105	260	660
AUTOBRAKE 2	3160	50/-55	105	-150/505	55/-75	100/-100	130	100	310
Medium Reported Braking Action									
MAX MANUAL	2740	50/-45	90	-140/490	140/-110	85/-85	105	380	970
AUTOBRAKE MAX	2750	50/-45	90	-140/490	135/-105	85/-85	110	365	950
AUTOBRAKE 3	2930	50/-45	95	-145/510	90/-60	90/-90	135	240	830
Medium To Poor Reported Braking Action									
MAX MANUAL	3120	55/-55	100	-175/630	230/-160	100/-95	110	555	1530
AUTOBRAKE MAX	3120	55/-55	105	-175/630	230/-160	100/-95	115	550	1520
AUTOBRAKE 3	3220	55/-55	105	-175/640	205/-125	105/-100	135	480	1455
Poor Reported Braking Action									
MAX MANUAL	3490	65/-60	110	-205/770	325/-205	110/-110	120	730	2090
AUTOBRAKE MAX	3490	65/-60	110	-205/770	325/-205	110/-110	120	730	2090
AUTOBRAKE 3	3520	65/-60	115	-205/770	315/-185	110/-110	130	720	2080

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - Systems 1 and 4 Inoperative (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1930	35/-30	55	-80/265	45/-40	55/-55	90	100	225
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2450	40/-40	75	-115/385	90/-75	75/-75	105	235	565
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2790	50/-45	90	-140/485	145/-110	85/-85	110	360	930
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3130	55/-50	100	-165/590	190/-145	95/-95	115	485	1295
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3490	65/-60	110	-200/755	335/-200	110/-105	120	675	1945
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3840	70/-65	120	-235/920	475/-250	120/-120	120	865	2590
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - Systems 2 and 3 Inoperative (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1660	50/-25	50	-70/220	35/-30	50/-50	85	75	165
AUTOBRAKE MAX	1870	40/-25	55	-80/250	10/-5	55/-55	95	10	60
AUTOBRAKE 2	3150	50/-50	105	-145/470	10/-40	100/-100	150	15	15
Good Reported Braking Action									
MAX MANUAL	2180	35/-35	70	-95/325	70/-60	65/-65	105	195	460
AUTOBRAKE MAX	2200	35/-35	70	-100/330	65/-50	65/-65	105	180	430
AUTOBRAKE 2	3150	50/-50	105	-145/470	10/-40	100/-100	150	15	15
Good To Medium Reported Braking Action									
MAX MANUAL	2540	45/-40	80	-120/415	110/-90	80/-75	110	320	810
AUTOBRAKE MAX	2540	45/-40	80	-125/415	115/-90	80/-80	110	315	790
AUTOBRAKE 2	3200	50/-50	105	-150/510	40/-55	105/-105	150	85	415
Medium Reported Braking Action									
MAX MANUAL	2890	50/-50	95	-145/505	155/-120	90/-90	120	445	1160
AUTOBRAKE MAX	2880	50/-50	95	-145/505	160/-120	90/-90	120	440	1155
AUTOBRAKE 3	2970	50/-45	95	-150/515	120/-65	95/-90	140	380	1095
Medium To Poor Reported Braking Action									
MAX MANUAL	3280	60/-55	105	-180/650	250/-175	105/-105	125	645	1820
AUTOBRAKE MAX	3270	60/-55	110	-180/650	260/-175	105/-105	125	640	1815
AUTOBRAKE 3	3320	60/-55	110	-180/650	240/-135	105/-105	135	610	1785
Poor Reported Braking Action									
MAX MANUAL	3670	70/-65	120	-210/790	350/-220	120/-115	125	840	2475
AUTOBRAKE MAX	3660	70/-65	120	-210/790	355/-230	120/-115	125	835	2470
AUTOBRAKE 3	3660	70/-65	120	-210/790	355/-210	120/-115	135	835	2465

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - Systems 2 and 4 Inoperative or Systems 3 and 4 Inoperative (Flaps 25)

VREF30 + 20

BRAKING CONFIGURATION	REF DIST 290000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 290000 KG	ALT ADJ PER 1000 FT ABOVE SEA LEVEL	WIND ADJ PER 10 KTS HEAD/ TAIL WIND	SLOPE ADJ PER 1% DOWN/ UP HILL	TEMP ADJ PER 10°C ABV/ BLW ISA	APP SPD ADJ PER 5 KTS ABOVE VREF	REVERSE THRUST ADJ TWO REV	REVERSE THRUST ADJ NO REV
Dry Runway									
MAX MANUAL	2030	35/-30	65	-85/275	50/-45	55/-55	105	135	315
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good Reported Braking Action									
MAX MANUAL	2580	40/-40	80	-120/400	105/-85	80/-75	120	295	735
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good To Medium Reported Braking Action									
MAX MANUAL	2940	50/-50	95	-145/505	160/-120	90/-90	125	450	1195
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Medium Reported Braking Action									
MAX MANUAL	3290	60/-55	105	-170/610	215/-160	105/-100	130	595	1650
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Medium To Poor Reported Braking Action									
MAX MANUAL	3670	70/-65	120	-205/780	370/-220	120/-110	135	820	2450
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Poor Reported Braking Action									
MAX MANUAL	4050	75/-70	130	-245/950	520/-275	130/-125	135	1040	3250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS 1, 2, 3, 4 - Systems 1 and 2 and 4 Inoperative (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	2370	40/-35	75	-105/345	80/-65	70/-70	115	205	500
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2710	45/-45	90	-125/425	115/-95	80/-80	120	320	800
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	3070	55/-50	100	-155/540	180/-135	95/-90	125	480	1290
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3430	60/-55	110	-180/650	240/-175	105/-105	130	635	1785
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3820	70/-65	125	-220/835	430/-235	120/-120	135	870	2650
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	4200	80/-75	135	-260/1020	620/-300	135/-130	135	1100	3515
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Jammed Stabilizer Landing (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1530	45/-25	45	-65/210	25/-25	40/-40	60	55	120
AUTOBRAKE MAX	1870	40/-25	55	-80/250	5/-5	55/-55	90	0	0
AUTOBRAKE 2	2980	50/-50	100	-140/455	55/-65	95/-90	110	145	150

Good Reported Braking Action

MAX MANUAL	1950	30/-30	60	-90/300	55/-45	55/-55	80	135	305
AUTOBRAKE MAX	2050	35/-35	65	-95/310	50/-40	60/-60	90	135	310
AUTOBRAKE 2	2980	50/-50	100	-140/455	60/-65	95/-90	110	145	150

Good To Medium Reported Braking Action

MAX MANUAL	2260	40/-35	75	-110/385	90/-75	70/-70	90	225	545
AUTOBRAKE MAX	2330	40/-40	75	-115/395	80/-65	75/-70	95	220	540
AUTOBRAKE 2	3020	50/-50	100	-145/495	85/-80	95/-95	110	180	310

Medium Reported Braking Action

MAX MANUAL	2580	45/-40	80	-135/470	120/-95	80/-80	95	315	785
AUTOBRAKE MAX	2620	45/-40	85	-135/475	115/-90	80/-80	105	305	765
AUTOBRAKE 3	2870	45/-45	90	-145/500	90/-75	90/-90	115	165	555

Medium To Poor Reported Braking Action

MAX MANUAL	2920	50/-50	95	-165/605	205/-140	90/-90	100	465	1230
AUTOBRAKE MAX	2950	55/-50	95	-165/610	200/-135	95/-90	105	455	1215
AUTOBRAKE 3	3110	50/-50	100	-170/625	180/-125	100/-95	115	360	1090

Poor Reported Braking Action

MAX MANUAL	3260	55/-55	105	-195/740	290/-180	105/-100	105	610	1675
AUTOBRAKE MAX	3280	60/-55	105	-195/740	285/-180	105/-105	105	600	1665
AUTOBRAKE 3	3350	55/-55	105	-200/745	270/-175	105/-105	115	550	1620

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Nose and Body Gear Up (Flaps 25)

VREF25

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	2120	110/-45	90	-100/465	75/-55	75/-60	110	145	330
AUTOBRAKE MAX	2140	125/-45	90	-110/485	70/-60	80/-75	125	145	345
AUTOBRAKE 2	2780	100/-50	95	-135/470	25/-30	85/-85	145	10	10
Good Reported Braking Action									
MAX MANUAL	2120	110/-40	90	-100/465	75/-55	75/-60	110	145	330
AUTOBRAKE MAX	2140	125/-40	90	-110/485	70/-60	80/-75	125	145	345
AUTOBRAKE 2	2780	100/-50	95	-135/470	25/-30	85/-85	145	10	10
Good To Medium Reported Braking Action									
MAX MANUAL	2340	105/-40	85	-120/470	100/-80	75/-65	105	210	510
AUTOBRAKE MAX	2330	120/-40	85	-120/480	100/-80	80/-75	115	210	515
AUTOBRAKE 2	2830	100/-50	95	-145/495	50/-50	90/-90	145	50	185
Medium Reported Braking Action									
MAX MANUAL	2550	95/-40	80	-135/470	125/-100	75/-75	100	275	690
AUTOBRAKE MAX	2530	110/-40	80	-135/470	125/-100	75/-75	105	275	680
AUTOBRAKE 3	2640	105/-40	85	-135/480	95/-65	80/-80	130	170	575
Medium To Poor Reported Braking Action									
MAX MANUAL	2890	80/-50	90	-165/605	210/-145	90/-85	105	425	1145
AUTOBRAKE MAX	2880	95/-50	90	-165/605	215/-145	90/-85	110	425	1135
AUTOBRAKE 3	2930	95/-50	95	-165/610	195/-120	90/-90	125	370	1080
Poor Reported Braking Action									
MAX MANUAL	3230	65/-55	100	-195/740	295/-185	100/-95	110	570	1595
AUTOBRAKE MAX	3220	80/-55	100	-195/740	300/-190	100/-95	110	570	1590
AUTOBRAKE 3	3230	80/-55	100	-195/740	295/-175	100/-95	120	565	1585

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Nose and Body Gear Up (Flaps 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1960	90/-40	75	-95/395	60/-50	55/-55	85	110	245
AUTOBRAKE MAX	1940	95/-40	80	-95/430	60/-50	70/-55	110	105	235
AUTOBRAKE 2	2590	75/-45	90	-125/430	10/-35	80/-80	135	10	10

Good Reported Braking Action

MAX MANUAL	1960	90/-35	75	-95/395	60/-50	55/-55	85	110	245
AUTOBRAKE MAX	1940	95/-35	80	-95/430	60/-50	70/-55	110	105	235
AUTOBRAKE 2	2590	75/-45	90	-125/430	10/-35	80/-80	135	10	10

Good To Medium Reported Braking Action

MAX MANUAL	2190	80/-35	75	-115/425	90/-75	65/-65	90	170	400
AUTOBRAKE MAX	2170	90/-35	75	-110/445	90/-75	70/-65	105	165	395
AUTOBRAKE 2	2650	75/-45	90	-135/465	45/-50	80/-80	135	50	155

Medium Reported Braking Action

MAX MANUAL	2410	70/-40	75	-130/460	120/-95	70/-70	95	230	555
AUTOBRAKE MAX	2400	80/-40	75	-130/460	120/-95	70/-70	105	230	550
AUTOBRAKE 3	2480	75/-40	80	-135/470	95/-60	75/-75	125	145	465

Medium To Poor Reported Braking Action

MAX MANUAL	2730	65/-45	85	-160/590	200/-135	80/-80	105	345	900
AUTOBRAKE MAX	2720	65/-45	85	-160/590	205/-135	80/-80	105	345	895
AUTOBRAKE 3	2760	65/-45	90	-160/595	190/-115	85/-85	120	305	855

Poor Reported Braking Action

MAX MANUAL	3040	55/-50	95	-190/720	280/-175	95/-90	105	465	1240
AUTOBRAKE MAX	3040	55/-50	95	-190/720	285/-180	95/-90	105	465	1240
AUTOBRAKE 3	3040	55/-50	95	-190/720	285/-165	95/-90	115	465	1235

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Reverser Unlocked (Flaps 25)

VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1580	50/-25	50	-65/215	30/-25	45/-45	65	0	65
AUTOBRAKE MAX	1870	45/-25	55	-80/250	5/-5	55/-55	95	0	0
AUTOBRAKE 2	3120	50/-50	105	-145/470	15/-45	95/-95	135	0	10
Good Reported Braking Action									
MAX MANUAL	2080	35/-35	65	-95/325	65/-55	65/-65	90	0	175
AUTOBRAKE MAX	2190	35/-35	65	-100/330	60/-50	65/-65	95	0	175
AUTOBRAKE 2	3120	50/-50	105	-145/470	20/-45	95/-95	135	0	10
Good To Medium Reported Braking Action									
MAX MANUAL	2490	40/-40	80	-125/425	120/-95	80/-80	95	0	325
AUTOBRAKE MAX	2560	40/-40	80	-125/430	110/-85	80/-80	110	0	320
AUTOBRAKE 2	3200	50/-50	105	-155/520	65/-70	100/-100	135	0	135
Medium Reported Braking Action									
MAX MANUAL	2890	50/-45	95	-150/525	165/-125	90/-90	105	0	470
AUTOBRAKE MAX	2930	50/-45	95	-150/525	160/-120	90/-90	120	0	460
AUTOBRAKE 3	3040	50/-50	100	-155/535	145/-95	95/-95	135	0	395
Medium To Poor Reported Braking Action									
MAX MANUAL	3390	55/-55	110	-195/700	315/-200	110/-105	115	0	770
AUTOBRAKE MAX	3400	55/-55	110	-195/700	310/-195	110/-110	120	0	765
AUTOBRAKE 3	3470	55/-55	110	-195/705	305/-180	110/-110	130	0	735
Poor Reported Braking Action									
MAX MANUAL	3880	65/-65	120	-235/870	455/-270	125/-120	120	0	1070
AUTOBRAKE MAX	3880	65/-65	125	-235/870	465/-270	125/-125	120	0	1070
AUTOBRAKE 3	3900	65/-65	125	-235/870	465/-260	125/-125	125	0	1075

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
STAB TRIM UNSCHD (Flaps 25)
VREF30 + 20

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV

Dry Runway

MAX MANUAL	1530	45/-25	45	-65/210	25/-25	40/-40	60	55	120
AUTOBRAKE MAX	1870	40/-25	55	-80/250	5/-5	55/-55	90	0	0
AUTOBRAKE 2	2980	50/-50	100	-140/455	55/-65	95/-90	110	145	150

Good Reported Braking Action

MAX MANUAL	1950	30/-30	60	-90/300	55/-45	55/-55	80	135	305
AUTOBRAKE MAX	2050	35/-35	65	-95/310	50/-40	60/-60	90	135	310
AUTOBRAKE 2	2980	50/-50	100	-140/455	60/-65	95/-90	110	145	150

Good To Medium Reported Braking Action

MAX MANUAL	2260	40/-35	75	-110/385	90/-75	70/-70	90	225	545
AUTOBRAKE MAX	2330	40/-40	75	-115/395	80/-65	75/-70	95	220	540
AUTOBRAKE 2	3020	50/-50	100	-145/495	85/-80	95/-95	110	180	310

Medium Reported Braking Action

MAX MANUAL	2580	45/-40	80	-135/470	120/-95	80/-80	95	315	785
AUTOBRAKE MAX	2620	45/-40	85	-135/475	115/-90	80/-80	105	305	765
AUTOBRAKE 3	2870	45/-45	90	-145/500	90/-75	90/-90	115	165	555

Medium To Poor Reported Braking Action

MAX MANUAL	2920	50/-50	95	-165/605	205/-140	90/-90	100	465	1230
AUTOBRAKE MAX	2950	55/-50	95	-165/610	200/-135	95/-90	105	455	1215
AUTOBRAKE 3	3110	50/-50	100	-170/625	180/-125	100/-95	115	360	1090

Poor Reported Braking Action

MAX MANUAL	3260	55/-55	105	-195/740	290/-180	105/-100	105	610	1675
AUTOBRAKE MAX	3280	60/-55	105	-195/740	285/-180	105/-105	105	600	1665
AUTOBRAKE 3	3350	55/-55	105	-200/745	270/-175	105/-105	115	550	1620

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Two Engines Inoperative (Flaps 25)

VREF25

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	290000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 290000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	TWO REV	NO REV
Dry Runway									
MAX MANUAL	1500	50/-25	45	-65/215	30/-25	40/-40	65	0	0
AUTOBRAKE MAX	1670	45/-25	50	-75/235	10/0	45/-45	85	0	0
AUTOBRAKE 2	2750	50/-50	95	-135/440	10/-10	85/-85	150	0	0
Good Reported Braking Action									
MAX MANUAL	2010	35/-35	65	-95/325	75/-60	60/-60	95	0	0
AUTOBRAKE MAX	2090	35/-35	65	-100/330	65/-55	60/-65	105	0	0
AUTOBRAKE 2	2750	50/-50	95	-135/440	10/-10	85/-85	150	0	0
Good To Medium Reported Braking Action									
MAX MANUAL	2500	40/-40	80	-130/440	150/-110	80/-80	110	0	0
AUTOBRAKE MAX	2540	40/-40	85	-130/445	145/-105	80/-80	120	0	0
AUTOBRAKE 2	2930	50/-50	100	-150/500	105/-65	90/-90	150	0	0
Medium Reported Braking Action									
MAX MANUAL	2990	50/-50	95	-160/555	220/-160	95/-95	125	0	0
AUTOBRAKE MAX	2980	50/-50	100	-160/555	225/-150	95/-95	135	0	0
AUTOBRAKE 3	3050	50/-50	100	-165/560	220/-160	95/-95	125	0	0
Medium To Poor Reported Braking Action									
MAX MANUAL	3670	60/-60	120	-215/755	465/-270	120/-120	140	0	0
AUTOBRAKE MAX	3670	65/-60	120	-215/755	470/-270	120/-120	145	0	0
AUTOBRAKE 3	3720	65/-60	120	-215/760	465/-275	120/-120	140	0	0
Poor Reported Braking Action									
MAX MANUAL	4360	75/-70	145	-270/955	705/-380	140/-140	150	0	0
AUTOBRAKE MAX	4360	75/-70	145	-270/955	710/-385	140/-140	150	0	0
AUTOBRAKE 3	4400	75/-70	145	-270/955	705/-390	145/-145	150	0	0

Reference distance is based on sea level, standard day, no wind or slope, and maximum available symmetrical reverse thrust.
MAX MANUAL assumes maximum achievable manual braking.
Reference Distance includes an air distance allowance of 460 m from threshold to touchdown.
Actual (unfactored) distances are shown.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy per Brake (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT		
		0	2	4	0	2	4	0	2	4	0	2	4	0	2	4	0	2	4
400	0	19.1	20.1	21.1	28.2	29.7	31.3	38.0	40.5	43.1	49.1	52.3	55.3	61.2	65.3	69.3	73.6	78.1	
	15	19.9	20.9	21.9	29.2	30.8	32.5	39.6	42.1	44.8	51.1	54.3	57.5	63.7	67.9	71.9	76.5	81.4	
	20	20.1	21.1	22.1	29.5	31.2	32.9	40.1	42.6	45.3	51.7	55.0	58.4	64.5	68.7	72.8	77.5	82.5	
	40	21.2	22.2	23.2	30.8	32.6	34.5	42.2	44.7	47.4	54.2	57.8	61.4	67.8	72.2	76.5	81.4	87.0	
	60	22.3	23.3	24.2	32.1	33.0	36.1	44.3	46.8	49.6	56.8	60.5	64.4	71.1	75.6	80.1	85.3	91.5	
350	0	17.2	18.0	18.9	25.2	26.7	27.4	33.8	36.0	38.2	43.6	46.4	49.3	54.1	57.6	61.1	65.0	69.4	74.0
	15	17.9	18.8	19.7	26.0	27.6	28.3	35.2	37.4	39.7	45.3	48.2	51.3	56.3	59.9	63.6	68.5	73.1	77.5
	20	18.1	19.1	20.0	26.3	27.9	28.6	35.7	37.9	40.2	45.8	48.8	51.9	57.0	60.6	64.4	69.5	74.2	78.6
	40	19.1	20.2	21.1	27.4	29.1	29.8	37.5	39.9	42.3	47.9	51.2	54.4	59.9	61.8	67.7	73.3	78.1	82.8
	60	20.0	21.3	22.2	28.4	30.3	31.0	39.3	41.8	44.4	50.1	53.6	57.0	62.8	67.1	71.0	75.3	80.6	85.3
300	0	15.4	16.2	16.9	22.0	23.4	24.7	29.7	31.4	33.1	37.8	40.3	42.9	47.1	50.1	53.1	56.3	60.0	63.6
	15	15.9	16.7	17.6	22.8	24.2	25.5	30.8	32.6	34.5	39.4	41.9	44.5	48.9	52.1	55.2	58.6	62.4	66.2
	20	16.1	16.9	17.8	23.1	24.4	25.8	31.2	33.0	34.9	39.9	42.4	45.0	49.5	52.7	55.9	59.4	63.2	67.0
	40	16.7	17.7	18.7	24.1	25.4	26.8	32.6	34.6	36.6	41.9	44.5	47.1	52.0	55.3	58.7	62.5	66.4	70.4
	60	17.4	18.5	19.6	25.1	26.4	27.9	34.0	36.2	38.4	44.0	46.6	49.3	54.4	57.9	61.5	65.6	69.7	73.7
250	0	13.7	14.3	15.0	18.8	19.8	20.8	25.6	27.2	28.7	32.2	34.2	36.2	40.0	42.6	45.3	47.9	50.9	53.9
	15	14.0	14.7	15.4	19.6	20.6	21.6	26.4	28.1	29.7	33.5	35.6	37.7	41.6	44.3	47.0	49.8	52.9	56.1
	20	14.1	14.8	15.5	19.9	20.9	21.8	26.7	28.4	30.0	33.9	36.1	38.2	42.1	44.8	47.6	50.4	53.6	56.8
	40	14.5	15.3	16.1	21.0	21.9	22.9	27.8	29.6	31.3	35.6	37.9	40.2	44.1	46.9	49.9	52.8	56.2	59.7
	60	14.9	15.7	16.7	22.0	23.0	23.9	28.9	30.8	32.7	37.4	39.7	42.1	46.2	49.0	52.2	55.3	58.9	62.6
200	0	11.8	12.3	12.9	15.9	16.6	17.4	21.2	22.5	23.7	26.8	29.3	29.9	32.8	34.9	36.9	39.2	41.9	44.5
	15	12.0	12.5	13.1	16.4	17.3	18.2	22.0	23.3	24.5	27.7	29.5	31.0	34.5	36.3	38.4	40.8	43.6	46.2
	20	12.0	12.6	13.2	16.6	17.5	18.4	22.3	23.5	24.7	28.0	29.6	31.4	34.6	36.7	38.9	41.3	44.0	46.7
	40	12.2	12.9	13.5	17.3	18.3	19.3	23.3	24.5	25.7	29.2	30.9	32.8	36.3	38.7	40.9	43.4	46.1	49.0
	60	12.4	13.1	13.8	18.1	19.1	20.3	24.4	25.6	26.7	30.4	32.1	34.3	38.1	40.5	43.0	45.5	48.2	51.2

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.
If ground speed is used for brakes on speed, ignore wind, altitude, and OAT effects and enter table with SL + 15°.

Adjusted Brake Energy per Brake (Millions of Foot Pounds)

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.0	13.5	22.3	30.6	39.4	48.1	57.2	66.5	75.5
	MAX AUTO	5.0	12.5	20.4	28.5	36.8	45.5	54.1	63.0	72.4
	AUTOBRAKE 4	4.8	12.0	19.3	26.6	34.3	42.3	50.7	60.0	69.3
	AUTOBRAKE 3	4.5	11.0	18.2	25.0	32.1	40.0	47.5	56.2	65.0
	AUTOBRAKE 2	4.4	10.5	17.1	23.4	30.0	36.8	43.7	51.7	60.0
	AUTOBRAKE 1	4.3	10.0	15.4	20.5	26.5	32.5	38.5	45.5	52.0

Cooling Time (Minutes)

	ADJUSTED BRAKE ENERGY PER BRAKE (MILLION OF FOOT POUNDS)								
	15 & BELOW	16	20	24	28	32	34	35 TO 45	45 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1.8	3.0	4.2	5.1	6.0	6.0	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	28	40	55	65	70		
BTMS	UP TO 2	2	2	3	4	4	4	5 TO 6	7 & ABOVE

Observe maximum quick turnaround limit.
Table does not consider the benefit of reverse thrust.
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 7 percent.
For two brakes deactivated, increase brake energy by 15 percent.
When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 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.

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH
One Engine Inoperative — Section 13

1 ENGINE INOP

Max Continuous EPR
45000 FT to 25000 FT Pressure Altitudes
Based on engine bleed for 3 packs on

PRESSURE ALTITUDE (FT)		KIAS					MACH NUMBER				
		150	200	250	300	350	.70	.75	.80	.85	.90
45000	EPR		1.76	1.71			1.77	1.76	1.75	1.73	1.71
	MAX TAT		-21	-9			-24	-21	-17	-14	-10
	EPR CORR		0.06	0.07			0.06	0.06	0.06	0.06	0.07
43000	EPR		1.77	1.73	1.67		1.77	1.76	1.75	1.74	1.72
	MAX TAT		-23	-12	1		-24	-21	-17	-14	-10
	EPR CORR		0.06	0.06	0.06		0.06	0.06	0.06	0.06	0.06
41000	EPR		1.78	1.74	1.69		1.78	1.77	1.76	1.74	1.72
	MAX TAT		-25	-15	-3		-24	-21	-17	-14	-10
	EPR CORR		0.06	0.06	0.06		0.06	0.06	0.06	0.06	0.06
39000	EPR		1.79	1.76	1.71		1.79	1.78	1.77	1.75	1.73
	MAX TAT		-27	-17	-6		-24	-21	-17	-14	-10
	EPR CORR		0.05	0.06	0.06		0.05	0.06	0.06	0.06	0.06
37000	EPR		1.79	1.78	1.73		1.79	1.78	1.77	1.75	1.74
	MAX TAT		-29	-19	-9		-24	-21	-17	-14	-10
	EPR CORR		0.05	0.05	0.06		0.05	0.05	0.06	0.06	0.06
35000	EPR		1.80	1.78	1.74		1.79	1.78	1.77	1.75	1.73
	MAX TAT		-28	-19	-9		-22	-19	-15	-11	-7
	EPR CORR		0.06	0.06	0.06		0.06	0.06	0.06	0.06	0.06
33000	EPR		1.79	1.78	1.74		1.78	1.77	1.76	1.74	1.72
	MAX TAT		-25	-17	-8		-18	-14	-11	-7	-3
	EPR CORR		0.06	0.06	0.06		0.06	0.06	0.06	0.06	0.06
31000	EPR		1.79	1.78	1.75	1.70	1.78	1.76	1.75	1.73	1.71
	MAX TAT		-22	-14	-6	4	-13	-10	-6	-2	2
	EPR CORR		0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
29000	EPR		1.78	1.76	1.74	1.69	1.76	1.75	1.73	1.71	1.68
	MAX TAT		-19	-12	-4	6	-9	-5	-2	2	7
	EPR CORR		0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
27000	EPR	1.79	1.76	1.75	1.73	1.68	1.75	1.73	1.71	1.69	1.66
	MAX TAT	-21	-16	-9	-1	8	-5	-1	3	7	11
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
25000	EPR	1.78	1.75	1.75	1.73	1.68	1.74	1.72	1.69	1.67	
	MAX TAT	-18	-13	-6	1	9	0	3	7	11	
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	

Decrease EPR by the EPR CORR for every 10°C above the MAX TAT shown.

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	40	45
2 PACKS OFF	0.01	0.01	0.01	0.01	0.02	0.02
3 PACKS OFF	0.01	0.01	0.01	0.01	0.02	0.02
ENGINE ANTI-ICE ON	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
ENGINE & WING ANTI-ICE ON	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02

1 ENGINE INOP

Max Continuous EPR

24000 FT to S.L. Pressure Altitudes

Based on engine bleed for 3 packs on

PRESSURE ALTITUDE (FT)		KIAS					MACH NUMBER				
		150	200	250	300	350	.70	.75	.80	.85	.90
24000	EPR	1.77	1.75	1.74	1.73	1.67	1.73	1.70	1.68	1.65	
	MAX TAT	-16	-11	-5	2	10	2	6	10	14	
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	
22000	EPR	1.76	1.74	1.74	1.71	1.66	1.70	1.68	1.65		
	MAX TAT	-12	-8	-2	5	13	6	10	14		
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06		
20000	EPR	1.74	1.73	1.73	1.70	1.65	1.68	1.65			
	MAX TAT	-9	-5	1	7	15	11	14			
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06	0.06			
18000	EPR	1.73	1.72	1.71	1.69	1.64	1.65	1.63			
	MAX TAT	-5	-1	4	10	17	15	19			
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06	0.06			
16000	EPR	1.71	1.71	1.71	1.67	1.63	1.63				
	MAX TAT	-2	2	7	13	19	19				
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06				
14000	EPR	1.69	1.70	1.69	1.66	1.62	1.60				
	MAX TAT	2	6	10	16	22	24				
	EPR CORR	0.06	0.06	0.06	0.06	0.06	0.06				
12000	EPR	1.67	1.68	1.67	1.64	1.60					
	MAX TAT	6	9	13	19	25					
	EPR CORR	0.06	0.06	0.06	0.06	0.05					
10000	EPR	1.65	1.67	1.66	1.63	1.59					
	MAX TAT	9	13	17	21	27					
	EPR CORR	0.05	0.06	0.06	0.05	0.05					
5000	EPR	1.61	1.60	1.61	1.59	1.56					
	MAX TAT	19	21	25	29	34					
	EPR CORR	0.05	0.05	0.05	0.05	0.05					
1500	EPR	1.57	1.56	1.58	1.56	1.53					
	MAX TAT	25	28	31	35	39					
	EPR CORR	0.05	0.05	0.05	0.05	0.05					
0	EPR	1.56	1.55	1.56	1.54	1.52					
	MAX TAT	28	30	34	37	42					
	EPR CORR	0.05	0.05	0.05	0.05	0.05					

Decrease EPR by the EPR CORR for every 10°C above the MAX TAT shown.

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	40	45
2 PACKS OFF	0.01	0.01	0.01	0.01	0.02	0.02
3 PACKS OFF	0.01	0.01	0.01	0.01	0.02	0.02
ENGINE ANTI-ICE ON	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
ENGINE & WING ANTI-ICE ON	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02

1 ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	391	306	26600	25500	24300
390	381	302	27300	26200	25000
380	372	298	28100	26900	25700
370	362	295	28800	27700	26500
360	352	290	29600	28400	27200
350	343	288	30300	29300	28000
340	333	283	31000	30000	28800
330	324	279	31700	30800	29700
320	314	276	32400	31500	30500
310	304	271	33100	32300	31200
300	294	268	33800	33100	32100
290	284	263	34700	33900	32900
280	275	259	35400	34900	33700
270	265	254	36100	35600	34800
260	255	249	36800	36300	35600
250	245	245	37500	37000	36300
240	235	240	38300	37800	37000
230	225	234	39100	38500	37800
220	215	229	39900	39300	38600
210	206	223	40800	40200	39400
200	196	218	41700	41000	40300

Altitude reduced by 1000 ft for additional margin.

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

Based on engine bleed for packs on or off

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	24700	22500	20100
390	25500	23600	21200
380	26400	24600	22400
370	27200	25600	23500
360	28100	26500	24500
350	28900	27500	25500
340	29800	28400	26500
330	30500	29300	27500
320	31300	30200	28500
310	32000	31000	29600
300	32800	31800	30500
290	33500	32600	31400
280	34400	33500	32300
270	35200	34500	33100
260	35900	35400	34100
250	36700	36100	35300
240	37400	36900	36000
230	38200	37600	36800
220	39000	38400	37500
210	39900	39200	38300
200	40800	40100	39200

Altitude reduced by 1000 ft for additional margin.
With engine anti-ice on, decrease altitude capability by 900 ft.
With engine and wing anti-ice on, decrease altitude capability by 1800 ft.

1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	14	20	25	27	29	31	33	35	37
400	EPR	1.38	1.44	1.55	1.67						
	MACH	.647	.694	.773	.807						
	KIAS	360	360	360	341						
	FF/ENG	4758	4779	4866	4890						
380	EPR	1.37	1.42	1.53	1.64	1.69					
	MACH	.632	.681	.762	.801	.815					
	KIAS	352	353	354	338	330					
	FF/ENG	4502	4525	4614	4591	4662					
360	EPR	1.35	1.40	1.51	1.61	1.66	1.71				
	MACH	.617	.664	.746	.794	.805	.824				
	KIAS	343	344	346	335	326	321				
	FF/ENG	4246	4252	4338	4323	4336	4454				
340	EPR	1.33	1.38	1.48	1.58	1.63	1.68				
	MACH	.601	.646	.726	.783	.798	.810				
	KIAS	334	334	336	330	323	315				
	FF/ENG	4000	3989	4050	4059	4063	4095				
320	EPR	1.31	1.36	1.46	1.55	1.60	1.64	1.70			
	MACH	.586	.628	.705	.772	.788	.802	.817			
	KIAS	325	325	326	325	319	311	304			
	FF/ENG	3763	3735	3776	3814	3801	3808	3878			
300	EPR	1.30	1.34	1.43	1.52	1.56	1.61	1.66	1.72		
	MACH	.570	.610	.684	.756	.776	.793	.805	.825		
	KIAS	316	315	316	318	313	307	299	294		
	FF/ENG	3533	3492	3507	3571	3552	3549	3563	3670		
280	EPR	1.28	1.32	1.41	1.49	1.54	1.58	1.62	1.67	1.74	
	MACH	.553	.592	.662	.733	.761	.780	.796	.808	.832	
	KIAS	307	305	305	307	307	302	296	288	284	
	FF/ENG	3306	3257	3245	3298	3318	3297	3305	3330	3458	
260	EPR	1.26	1.30	1.38	1.46	1.50	1.54	1.59	1.64	1.69	1.76
	MACH	.535	.573	.639	.707	.738	.765	.783	.799	.812	.839
	KIAS	297	295	294	296	297	296	290	284	276	274
	FF/ENG	3114	3029	2994	3029	3052	3066	3051	3064	3100	3262
240	EPR	1.24	1.28	1.35	1.43	1.47	1.51	1.55	1.60	1.65	1.70
	MACH	.517	.554	.616	.681	.710	.741	.768	.785	.801	.816
	KIAS	287	285	283	284	285	286	284	279	272	265
	FF/ENG	2886	2805	2750	2765	2782	2806	2816	2808	2822	2886
220	EPR	1.23	1.26	1.33	1.40	1.43	1.47	1.51	1.56	1.60	1.65
	MACH	.499	.533	.593	.654	.681	.711	.742	.769	.787	.802
	KIAS	276	274	272	272	272	273	274	272	267	260
	FF/ENG	2673	2610	2517	2508	2519	2535	2562	2570	2565	2594
200	EPR	1.21	1.24	1.30	1.37	1.40	1.43	1.47	1.51	1.56	1.60
	MACH	.480	.512	.569	.625	.651	.679	.709	.741	.769	.787
	KIAS	265	263	260	259	260	260	261	262	260	255
	FF/ENG	2471	2385	2295	2261	2264	2275	2294	2320	2328	2339

1 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
694	645	601	563	530	500	479	459	441	425	410
1391	1292	1203	1127	1060	1000	959	920	885	852	823
2096	1945	1810	1693	1592	1500	1438	1381	1328	1279	1235
2806	2601	2418	2261	2124	2000	1918	1842	1771	1706	1646
3524	3264	3031	2831	2657	2500	2398	2302	2214	2132	2058
4249	3930	3646	3403	3191	3000	2877	2762	2656	2558	2468
4982	4602	4264	3976	3725	3500	3356	3222	3098	2983	2878
5724	5281	4888	4552	4261	4000	3835	3682	3539	3408	3288
6475	5966	5514	5130	4798	4500	4314	4140	3979	3831	3696
7237	6659	6146	5712	5336	5000	4792	4598	4419	4254	4104

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		22		29		33	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
500	14.0	1:27	12.7	1:23	10.9	1:16	9.6	1:11	9.4	1:10
1000	28.2	2:52	26.0	2:44	22.7	2:27	20.6	2:16	20.3	2:14
1500	42.1	4:19	39.0	4:06	34.2	3:39	31.2	3:21	30.8	3:18
2000	55.7	5:48	51.6	5:30	45.5	4:53	41.5	4:27	40.9	4:22
2500	69.0	7:20	64.0	6:56	56.4	6:09	51.6	5:34	50.7	5:27
3000	82.0	8:53	76.0	8:24	67.0	7:26	61.4	6:42	60.1	6:33
3500	94.6	10:29	87.8	9:53	77.4	8:44	70.9	7:51	69.3	7:39
4000	107.0	12:07	99.4	11:25	87.5	10:05	80.2	9:02	78.1	8:45
4500	119.1	13:48	110.6	12:59	97.4	11:27	89.2	10:14	86.8	9:52
5000	130.9	15:32	121.6	14:36	107.0	12:50	97.9	11:27	95.2	11:01

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	200	250	300	350	400
10	-1.5	-0.7	0.0	1.9	4.5
20	-3.1	-1.5	0.0	3.9	8.9
30	-4.6	-2.4	0.0	5.7	13.0
40	-6.2	-3.2	0.0	7.5	16.9
50	-7.7	-4.0	0.0	9.1	20.5
60	-9.3	-4.8	0.0	10.7	23.8
70	-10.8	-5.6	0.0	12.1	26.9
80	-12.3	-6.3	0.0	13.4	29.8
90	-13.8	-7.1	0.0	14.7	32.4
100	-15.3	-7.8	0.0	15.8	34.7
110	-16.7	-8.6	0.0	16.9	36.8
120	-18.2	-9.3	0.0	17.8	38.7
130	-19.6	-10.0	0.0	18.6	40.3
140	-21.0	-10.7	0.0	19.4	41.7

1 ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
400	EPR	1.27	1.31	1.37	1.45	1.54	1.66			
	KIAS	286	286	286	286	307	311			
	FF/ENG	4370	4270	4250	4280	4450	4710			
380	EPR	1.25	1.29	1.35	1.43	1.51	1.63			
	KIAS	280	280	280	280	300	303			
	FF/ENG	4150	4050	4010	4020	4170	4360			
360	EPR	1.24	1.27	1.34	1.41	1.49	1.60	1.74		
	KIAS	271	271	271	271	291	294	298		
	FF/ENG	3920	3880	3780	3780	3900	4040	4470		
340	EPR	1.23	1.26	1.32	1.39	1.46	1.57	1.70		
	KIAS	261	261	261	261	282	285	289		
	FF/ENG	3710	3650	3550	3540	3640	3740	4050		
320	EPR	1.21	1.25	1.30	1.37	1.44	1.54	1.66		
	KIAS	251	251	251	251	273	276	280		
	FF/ENG	3490	3440	3340	3310	3390	3470	3680		
300	EPR	1.20	1.23	1.28	1.35	1.41	1.50	1.62		
	KIAS	242	242	242	242	264	267	270		
	FF/ENG	3280	3230	3170	3090	3150	3210	3350		
280	EPR	1.19	1.22	1.26	1.32	1.39	1.47	1.59	1.73	
	KIAS	233	233	233	233	255	257	260	264	
	FF/ENG	3070	3020	2960	2880	2920	2960	3060	3380	
260	EPR	1.18	1.20	1.24	1.30	1.36	1.44	1.55	1.68	
	KIAS	228	228	228	228	246	248	250	254	
	FF/ENG	2870	2810	2750	2670	2690	2710	2780	3000	
240	EPR	1.16	1.18	1.22	1.27	1.33	1.41	1.51	1.63	
	KIAS	221	221	221	221	236	237	239	243	
	FF/ENG	2670	2610	2540	2490	2470	2470	2520	2660	
220	EPR	1.15	1.17	1.20	1.25	1.31	1.38	1.47	1.59	1.74
	KIAS	215	215	215	215	225	226	229	231	235
	FF/ENG	2480	2420	2350	2290	2250	2240	2280	2360	2700
200	EPR	1.14	1.15	1.19	1.23	1.28	1.35	1.43	1.54	1.67
	KIAS	208	208	208	208	215	216	218	220	223
	FF/ENG	2290	2230	2170	2090	2070	2020	2040	2100	2310

This table includes 5% additional fuel for holding in a racetrack pattern.

1 ENGINE INOP

Go-Around Climb Gradient
Flaps 20, Gear Up
Based on engine bleed for 3 packs on, and anti-ice off

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	12.12	10.46	8.92	7.49	6.17	4.95
50	12.98	11.27	9.66	8.17	6.79	5.52
46	13.86	12.07	10.40	8.85	7.41	6.06
42	14.74	12.88	11.15	9.54	8.04	6.57
38	15.68	13.74	11.94	10.25	8.63	7.03
34	16.68	14.66	12.78	11.00	9.16	7.43
30	17.56	15.47	13.52	11.66	9.59	7.77
26	17.56	16.07	14.07	12.15	10.00	8.12
22	17.57	16.37	14.56	12.61	10.43	8.48
18	17.57	16.38	14.95	13.01	10.87	8.86
14	17.57	16.38	14.95	13.34	11.23	9.21
10	17.58	16.38	14.95	13.42	11.57	9.56

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)							
	4	6	8	10	12	14	16	18
400	-6.16	-7.18	-8.18	-9.18	-10.19	-11.17	-12.15	-13.12
380	-5.79	-6.73	-7.67	-8.62	-9.56	-10.49	-11.41	-12.31
360	-5.38	-6.24	-7.11	-7.99	-8.87	-9.72	-10.57	-11.42
340	-4.90	-5.68	-6.48	-7.28	-8.08	-8.86	-9.63	-10.41
320	-4.36	-5.05	-5.76	-6.48	-7.19	-7.87	-8.57	-9.26
300	-3.73	-4.33	-4.94	-5.55	-6.15	-6.75	-7.35	-7.94
280	-3.02	-3.50	-3.99	-4.48	-4.97	-5.45	-5.94	-6.40
260	-2.17	-2.53	-2.88	-3.24	-3.59	-3.93	-4.28	-4.62
240	-1.19	-1.38	-1.57	-1.77	-1.96	-2.15	-2.34	-2.51
220	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200	1.44	1.65	1.89	2.13	2.34	2.59	2.77	2.94

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)							
	4	6	8	10	12	14	16	18
VREF	-0.18	-0.21	-0.23	-0.23	-0.24	-0.27	-0.31	-0.34
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.06	0.08	0.10	0.08	0.07	0.07	0.06	0.00
VREF+20	0.09	0.10	0.10	0.08	0.04	0.02	0.02	0.00
VREF+30	-0.09	-0.09	-0.14	-0.18	-0.22	-0.27	-0.31	-0.33

With engine bleed for packs off, increase gradient by 0.4%.
Decrease gradient by 0.3% for ice accumulation when operating in icing conditions during any part of the flight with forecast landing temperature below 8°C.
With GoGo WiFi antenna installed, decrease gradient by 0.05%.
NOTES:
If required Missed Approach Climb Gradient is not achievable, check whether Missed Approach ETP published. If none published, adjust bleeds configuration, use higher minima/lower gradient or reduce weight.
The Boeing 747-400 with RB211-524G engines is able to achieve a Missed Approach Climb Gradient of at least 6.91% with up to 300t up to 30°C OAT and up to 4000ft pressure altitude.
(Data compiled using BCOP software and Boeing FPPM manual.)

Performance Inflight - QRH — Chapter PI-QRH

Two Engines Inoperative — Section 14

2 ENGINES INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	385	296	12600	10900	9100
390	376	293	13600	12000	10200
380	366	289	14600	13000	11300
370	357	286	15700	14000	12400
360	347	282	16700	15000	13400
350	339	279	17700	16000	14400
340	329	275	18600	17100	15400
330	319	271	19400	18100	16500
320	310	267	20200	19000	17500
310	300	263	21100	19900	18500
300	290	259	22000	20700	19400
290	280	255	22900	21700	20300
280	271	251	23800	22600	21200
270	261	246	24700	23500	22200
260	251	242	25700	24500	23200
250	242	237	26600	25500	24200
240	232	233	27700	26500	25300
230	223	228	28900	27500	26400
220	213	223	29900	28800	27500
210	203	219	31100	30100	28900
200	194	213	32200	31300	30200

Altitude reduced by 2000 ft for additional margin.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
672	628	591	557	527	500	476	454	434	415	398
1334	1251	1177	1111	1053	1000	952	909	869	833	800
1996	1872	1763	1666	1578	1500	1429	1364	1305	1251	1201
2658	2494	2349	2220	2104	2000	1906	1820	1741	1669	1603
3323	3118	2936	2775	2630	2500	2382	2275	2177	2087	2004
3991	3743	3525	3331	3157	3000	2858	2729	2611	2503	2403
4663	4372	4116	3888	3684	3500	3334	3183	3044	2918	2801
5341	5005	4710	4447	4211	4000	3809	3635	3476	3331	3197
6027	5644	5307	5007	4740	4500	4283	4086	3906	3742	3591
6721	6288	5908	5570	5270	5000	4756	4536	4334	4150	3981

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)											TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)											
	200	220	240	260	280	300	320	340	360	380	400	
500	9.0	9.9	10.5	11.4	12.2	13.0	13.9	14.6	15.4	16.0	16.9	1:17
1000	17.8	19.4	20.9	22.6	24.2	25.8	27.3	28.8	30.4	31.9	33.7	2:30
1500	26.1	28.5	30.8	33.3	35.7	38.0	40.4	42.6	45.0	47.3	50.0	3:44
2000	34.0	37.2	40.3	43.5	46.6	49.8	52.9	55.9	59.1	62.2	65.7	4:57
2500	41.6	45.5	49.3	53.3	57.2	61.0	64.9	68.7	72.6	76.6	80.9	6:11
3000	48.9	53.5	58.0	62.7	67.3	71.9	76.4	81.0	85.7	90.4	95.5	7:27
3500	55.9	61.2	66.4	71.7	77.0	82.3	87.6	92.8	98.3	103.8	109.7	8:44
4000	62.6	68.5	74.4	80.4	86.4	92.4	98.3	104.3	110.5	116.7	123.5	10:03
4500	69.1	75.7	82.2	88.9	95.5	102.1	108.7	115.4	122.4	129.3	136.8	11:24
5000	75.4	82.6	89.7	97.0	104.3	111.5	118.8	126.1	133.8	141.5	149.7	12:48

Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	5400	3500	1100
380	7900	5700	3600
360	10300	8200	6100
340	12800	10800	8700
320	15200	13300	11400
300	17700	15900	14100
280	20100	18500	16800
260	22800	21000	19300
240	24900	23600	22000
220	27200	25900	24500
200	29700	28500	27000

Altitude reduced by 2000 ft for additional margin.

2 ENGINES INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		10	14	17	20	23	25	27	29	31
380	EPR	1.59								
	MACH	.632								
	KIAS	352								
	FF/ENG	6975								
360	EPR	1.56								
	MACH	.617								
	KIAS	343								
	FF/ENG	6519								
340	EPR	1.53	1.62							
	MACH	.601	.646							
	KIAS	334	334							
	FF/ENG	6096	6242							
320	EPR	1.51	1.59	1.66						
	MACH	.586	.628	.665						
	KIAS	325	325	325						
	FF/ENG	5696	5776	5946						
300	EPR	1.48	1.55	1.62						
	MACH	.570	.610	.645						
	KIAS	316	315	315						
	FF/ENG	5310	5343	5457						
280	EPR	1.45	1.52	1.58	1.66					
	MACH	.553	.592	.625	.662					
	KIAS	307	305	305	305					
	FF/ENG	4942	4945	5003	5151					
260	EPR	1.42	1.49	1.55	1.61	1.69				
	MACH	.535	.573	.604	.639	.679				
	KIAS	297	295	294	294	295				
	FF/ENG	4583	4563	4583	4672	4852				
240	EPR	1.39	1.46	1.51	1.57	1.64	1.70	1.76		
	MACH	.517	.554	.583	.616	.654	.681	.710		
	KIAS	287	285	284	283	283	284	285		
	FF/ENG	4229	4194	4193	4230	4343	4469	4644		
220	EPR	1.37	1.42	1.47	1.53	1.60	1.65	1.70	1.76	
	MACH	.499	.533	.562	.593	.628	.654	.681	.711	
	KIAS	276	274	273	272	272	272	272	273	
	FF/ENG	3891	3837	3820	3827	3882	3960	4078	4243	
200	EPR	1.34	1.39	1.43	1.49	1.55	1.59	1.65	1.70	1.76
	MACH	.480	.512	.539	.569	.601	.625	.651	.679	.709
	KIAS	265	263	262	260	260	259	260	260	261
	FF/ENG	3561	3490	3462	3450	3465	3504	3572	3679	3836

Performance Inflight - QRH — Chapter PI-QRH

Gear Down — Section 15

GEAR DOWN

Takeoff Climb Limit

Based on engine bleed for 3 packs on and anti-ice off

Weight (1000 KG)

AIRPORT TEMP (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	SL	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	299	283	271	260									
50	318	301	288	275	263	241							
45	336	319	304	291	278	265	253	240	229				
40	354	335	320	307	293	280	267	254	242	229	218		
35	371	353	338	323	309	294	281	268	255	243	230	217	201
30	389	370	354	340	325	310	296	282	269	256	243	230	216
25	393	380	372	357	342	327	312	297	284	270	256	243	229
20	393	380	372	363	355	343	328	313	298	284	270	257	242
15	393	380	372	363	355	346	337	328	314	299	285	270	256
10	393	380	372	363	355	346	337	328	320	301	299	284	270
5 & BELOW	392	380	372	363	354	346	337	328	319	300	301	292	284

Applicable for flaps 10 or 20 takeoff.

Adjustments for Engine Bleed

BLEED CONFIGURATION	WEIGHT ADJUSTMENT (KG)	
	A/C PACKS OFF	A/C PACKS ON
A/I OFF	2250	0
NACELLE A/I ON	-5000	-7550
NACELLE & WING A/I ON	-12450	-14900

Boeing Converted Freighters are not certified for packs-off takeoff.

GEAR DOWN

Landing Climb Limit

Based on engine bleed for 3 packs on

Weight (1000 KG)

AIRPORT OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	340	328	317										
50	356	343	331	320	308								
45	372	359	346	334	322	310	299	288					
40	388	374	361	348	336	324	312	300	289	278			
35	405	391	377	363	350	337	325	314	302	289	277	265	254
30	406	399	392	378	364	351	338	326	313	299	285	272	259
25	406	399	392	385	374	361	348	335	322	306	292	278	266
20	406	399	392	385	377	367	355	342	329	314	299	285	272
15	406	399	392	385	377	367	358	349	335	321	306	292	278
10	406	399	392	385	377	367	358	349	338	326	314	298	284
5 & BELOW	406	399	392	385	377	367	358	349	338	326	314	302	291

Applicable for flaps 25 or 30 landing.
With engine bleed for 1 pack on, increase weight by 3950 kg.
With engine bleed for packs off, increase weight by 5850 kg.
Reduce landing climb limit weight by 38550 kg when operating in icing conditions during any part of the flight with forecast landing temperature below 8°C.

GEAR DOWN

Max Climb EPR

Based on engine bleed for 3 packs on, engine and wing anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)															
	0	5	10	12	14	16	18	20	22	24	26	28	30	31	33	35
	240	240	240	240	240	240	240	240	240	240	240	.60	.60	.60	.60	.60
55	1.45															
50	1.47	1.49														
45	1.49	1.51	1.51													
40	1.52	1.53	1.53	1.52												
35	1.54	1.56	1.56	1.55	1.55	1.54										
30	1.55	1.59	1.59	1.58	1.57	1.57	1.56	1.55								
25	1.55	1.62	1.61	1.61	1.60	1.60	1.59	1.58	1.57	1.56						
20	1.55	1.62	1.64	1.63	1.63	1.63	1.62	1.61	1.60	1.59	1.58					
15	1.55	1.62	1.67	1.67	1.66	1.66	1.65	1.64	1.63	1.62	1.61	1.59				
10	1.55	1.62	1.67	1.68	1.69	1.69	1.68	1.67	1.66	1.65	1.64	1.62	1.61	1.60	1.59	
5	1.55	1.62	1.67	1.68	1.70	1.71	1.71	1.70	1.69	1.68	1.67	1.65	1.64	1.63	1.63	1.62
0	1.55	1.62	1.67	1.68	1.70	1.71	1.72	1.73	1.72	1.71	1.70	1.68	1.67	1.67	1.66	1.65
-5	1.55	1.62	1.67	1.68	1.70	1.71	1.72	1.73	1.74	1.74	1.73	1.72	1.70	1.70	1.69	1.68
-10	1.55	1.62	1.67	1.68	1.70	1.71	1.72	1.73	1.74	1.75	1.76	1.75	1.73	1.73	1.72	1.71
-15	1.55	1.62	1.67	1.68	1.70	1.71	1.72	1.73	1.74	1.75	1.76	1.76	1.76	1.76	1.75	1.74
-20	1.55	1.62	1.67	1.68	1.70	1.71	1.72	1.73	1.74	1.75	1.76	1.76	1.77	1.78	1.78	1.77

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)	
	0	35
ENGINE ANTI-ICE ON	-0.01	-0.01
ENGINE & WING ANTI-ICE ON	-0.02	-0.02

GEAR DOWN

Long Range Cruise Altitude Capability

Max Climb Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	19400	17600	15900
390	20200	18300	16600
380	20800	19100	17300
370	21400	20000	18000
360	22000	20600	18700
350	22600	21200	19500
340	23200	21700	20200
330	23900	22400	20900
320	24900	23300	21800
310	25700	24200	22700
300	26600	25200	23600
290	27500	26100	24600
280	28400	27000	25500
270	29300	27900	26500
260	30300	28900	27500
250	31400	29900	28500
240	32400	31200	29500
230	33400	32300	30900
220	34500	33500	32100
210	35500	34700	33400
200	36500	36100	34700

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	14	17	20	23	25	27	29	31	33
400	EPR	1.48	1.56	1.64							
	MACH	.488	.525	.556							
	KIAS	270	270	270							
	FF/ENG	4951	5003	5113							
380	EPR	1.46	1.54	1.61	1.68						
	MACH	.488	.525	.556	.589						
	KIAS	270	270	270	270						
	FF/ENG	4776	4807	4883	5023						
360	EPR	1.45	1.52	1.59	1.66						
	MACH	.488	.525	.556	.589						
	KIAS	270	270	270	270						
	FF/ENG	4621	4635	4682	4786						
340	EPR	1.43	1.50	1.57	1.63						
	MACH	.488	.525	.556	.589						
	KIAS	270	270	270	270						
	FF/ENG	4482	4484	4514	4591						
320	EPR	1.41	1.48	1.54	1.60	1.68					
	MACH	.479	.513	.542	.575	.610					
	KIAS	265	263	263	263	264					
	FF/ENG	4250	4210	4224	4279	4384					
300	EPR	1.39	1.45	1.50	1.57	1.64	1.69				
	MACH	.467	.498	.526	.558	.592	.617				
	KIAS	258	256	255	255	255	256				
	FF/ENG	3995	3929	3925	3953	4029	4111				
280	EPR	1.37	1.42	1.47	1.53	1.60	1.65	1.70			
	MACH	.455	.484	.510	.540	.573	.597	.623			
	KIAS	252	248	247	247	247	247	248			
	FF/ENG	3758	3662	3638	3648	3694	3750	3836			
260	EPR	1.34	1.39	1.44	1.50	1.56	1.61	1.66	1.71		
	MACH	.444	.469	.493	.522	.554	.577	.601	.627		
	KIAS	245	241	239	238	238	238	238	239		
	FF/ENG	3537	3409	3365	3356	3377	3415	3467	3559		
240	EPR	1.32	1.37	1.41	1.46	1.52	1.56	1.61	1.67	1.72	
	MACH	.433	.456	.477	.503	.533	.555	.579	.604	.631	
	KIAS	239	233	231	229	229	229	229	229	230	
	FF/ENG	3329	3172	3105	3076	3078	3096	3132	3184	3278	
220	EPR	1.30	1.34	1.38	1.42	1.48	1.52	1.57	1.62	1.67	1.72
	MACH	.423	.442	.461	.484	.512	.533	.556	.580	.605	.632
	KIAS	234	226	223	221	220	220	220	220	220	220
	FF/ENG	3135	2954	2863	2812	2795	2799	2815	2849	2904	2992
200	EPR	1.29	1.32	1.35	1.39	1.44	1.48	1.52	1.56	1.61	1.67
	MACH	.413	.430	.446	.466	.491	.510	.531	.554	.578	.604
	KIAS	228	220	215	212	210	210	210	210	210	210
	FF/ENG	2956	2752	2641	2567	2527	2518	2520	2536	2569	2623

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
289	266	246	229	213	200	190	182	174	167	161
599	547	500	462	429	400	381	363	347	332	319
907	826	754	695	645	600	571	544	520	497	477
1216	1105	1008	928	860	800	761	725	692	663	636
1526	1386	1263	1161	1076	1000	951	906	865	828	794
1838	1667	1518	1395	1292	1200	1141	1087	1037	992	952
2152	1950	1774	1629	1508	1400	1331	1267	1209	1156	1109
2468	2235	2031	1864	1724	1600	1520	1447	1380	1319	1265
2786	2521	2289	2100	1941	1800	1710	1627	1551	1482	1421
3106	2808	2548	2336	2157	2000	1899	1806	1722	1645	1576
3428	3097	2808	2572	2374	2200	2088	1986	1892	1807	1731
3752	3387	3068	2809	2592	2400	2277	2165	2062	1969	1886
4078	3677	3329	3046	2809	2600	2466	2343	2231	2130	2040
4405	3969	3591	3283	3026	2800	2655	2522	2401	2291	2193
4734	4262	3853	3521	3244	3000	2844	2700	2569	2451	2346
5065	4557	4116	3759	3462	3200	3032	2877	2737	2611	2498
5396	4852	4380	3998	3680	3400	3220	3055	2905	2770	2650
5730	5148	4644	4236	3898	3600	3408	3232	3072	2929	2802
6065	5445	4909	4476	4116	3800	3596	3409	3239	3087	2952
6401	5743	5174	4715	4334	4000	3784	3586	3406	3245	3102

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		25	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	10.3	0:41	9.3	0:39	8.6	0:38	7.9	0:36	7.6	0:35
400	20.3	1:23	18.7	1:20	17.4	1:16	16.3	1:12	15.7	1:09
600	30.3	2:05	28.1	2:00	26.2	1:54	24.7	1:47	23.9	1:43
800	40.4	2:48	37.4	2:40	35.0	2:32	33.0	2:23	32.0	2:17
1000	50.4	3:30	46.8	3:21	43.8	3:10	41.4	2:59	40.1	2:51
1200	60.0	4:14	55.7	4:03	52.2	3:50	49.3	3:36	47.8	3:26
1400	69.7	4:57	64.6	4:44	60.5	4:29	57.3	4:13	55.5	4:01
1600	79.1	5:41	73.3	5:27	68.7	5:10	65.0	4:51	63.0	4:37
1800	88.3	6:26	81.9	6:10	76.7	5:51	72.5	5:29	70.2	5:14
2000	97.5	7:11	90.4	6:53	84.7	6:32	80.1	6:08	77.5	5:50
2200	106.4	7:57	98.5	7:38	92.2	7:14	87.2	6:48	84.4	6:28
2400	115.3	8:43	106.7	8:22	99.8	7:56	94.4	7:28	91.2	7:06
2600	124.1	9:29	114.7	9:07	107.3	8:39	101.4	8:08	97.9	7:45
2800	132.7	10:16	122.5	9:53	114.5	9:23	108.2	8:50	104.5	8:24
3000	141.3	11:03	130.3	10:39	121.8	10:07	115.0	9:31	111.0	9:03
3200	149.5	11:51	137.9	11:25	128.7	10:52	121.5	10:14	117.2	9:44
3400	157.8	12:39	145.5	12:12	135.7	11:37	127.9	10:57	123.4	10:25
3600	165.9	13:27	153.0	13:00	142.5	12:23	134.3	11:40	129.5	11:06
3800	173.8	14:16	160.3	13:47	149.1	13:10	140.5	12:25	135.4	11:49
4000	181.8	15:04	167.6	14:35	155.8	13:56	146.7	13:09	141.3	12:31

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	200	250	300	350	400
20	-2.8	-1.7	0.0	2.9	6.2
30	-4.4	-2.4	0.0	4.6	9.5
40	-5.9	-3.2	0.0	6.3	12.7
50	-7.4	-3.9	0.0	7.9	15.9
60	-8.9	-4.7	0.0	9.4	19.1
70	-10.3	-5.4	0.0	10.9	22.1
80	-11.7	-6.1	0.0	12.4	25.1
90	-13.1	-6.8	0.0	13.8	28.0
100	-14.5	-7.6	0.0	15.1	30.8
110	-15.9	-8.3	0.0	16.4	33.6
120	-17.2	-8.9	0.0	17.7	36.3
130	-18.5	-9.6	0.0	18.9	38.9
140	-19.8	-10.3	0.0	20.1	41.4
150	-21.1	-11.0	0.0	21.2	43.9
160	-22.3	-11.6	0.0	22.3	46.3

GEAR DOWN

Descent at .66/240

PRESSURE ALT (1000 FT)	5	10	15	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	18	28	37	41	45	49	53	57	61	65	70	73	76
TIME (MINUTES)	5	8	10	10	11	12	13	13	14	15	15	16	16

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
400	EPR	1.35	1.40	1.48	1.59			
	KIAS	270	270	270	270			
	FF/ENG	5240	5190	5200	5280			
380	EPR	1.34	1.38	1.46	1.56	1.68		
	KIAS	270	270	270	270	270		
	FF/ENG	5090	5030	5020	5070	5270		
360	EPR	1.33	1.37	1.45	1.54	1.66		
	KIAS	270	270	270	270	270		
	FF/ENG	4950	4880	4850	4880	5030		
340	EPR	1.31	1.35	1.42	1.51	1.63		
	KIAS	261	261	261	261	270		
	FF/ENG	4640	4570	4520	4530	4820		
320	EPR	1.29	1.33	1.39	1.48	1.61		
	KIAS	251	251	251	251	270		
	FF/ENG	4380	4270	4200	4190	4650		
300	EPR	1.27	1.30	1.37	1.45	1.58		
	KIAS	242	242	242	242	264		
	FF/ENG	4090	3980	3910	3880	4360		
280	EPR	1.25	1.28	1.34	1.42	1.55	1.67	
	KIAS	233	233	233	233	255	257	
	FF/ENG	3800	3740	3620	3580	4010	4170	
260	EPR	1.23	1.26	1.32	1.39	1.51	1.63	
	KIAS	228	228	228	228	246	248	
	FF/ENG	3580	3530	3410	3350	3670	3790	
240	EPR	1.22	1.25	1.30	1.36	1.47	1.58	1.71
	KIAS	221	221	221	221	236	237	239
	FF/ENG	3350	3290	3180	3110	3350	3410	3610
220	EPR	1.20	1.23	1.28	1.34	1.43	1.53	1.66
	KIAS	215	215	215	215	225	226	229
	FF/ENG	3130	3070	3000	2900	3040	3060	3200
200	EPR	1.19	1.21	1.26	1.31	1.39	1.49	1.61
	KIAS	208	208	208	208	215	216	218
	FF/ENG	2910	2850	2770	2680	2740	2750	2820

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
Based on engine bleed for 3 packs on

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	387	266	9400	7800	6100
390	378	264	10400	8800	7100
380	369	261	11300	9700	8000
370	358	259	12500	10800	9100
360	350	256	13400	11800	10100
350	341	254	14200	12800	11000
340	330	251	15200	13900	12200
330	321	248	15900	14700	13200
320	312	246	16700	15500	14100
310	301	243	17700	16400	15100
300	292	240	18600	17200	15900
290	282	237	19500	18200	16800
280	273	234	20300	19000	17700
270	262	231	21300	20000	18700
260	253	228	22100	20900	19600
250	243	225	23200	21900	20600
240	233	220	24300	23000	21700
230	223	215	25700	24300	22900
220	214	210	27000	25800	24300
210	204	204	28400	27300	26000
200	195	200	29700	28700	27700

Altitude reduced by 1000 ft for additional margin.

GEAR DOWN
1 ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

Based on engine bleed for 3 packs on

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	7900	6000	4000
390	8600	6800	4700
380	9400	7500	5500
370	10100	8200	6200
360	10800	8900	6900
350	11900	10000	8000
340	13100	11300	9300
330	14200	12600	10600
320	15200	13900	11900
310	16200	14800	13200
300	17200	15800	14500
290	18200	16800	15400
280	19300	17800	16500
270	20200	18900	17500
260	21200	19900	18600
250	22300	21000	19700
240	23300	22100	20800
230	24500	23200	21900
220	25800	24400	23100
210	27100	25900	24400
200	28400	27300	26000

Altitude reduced by 1000 ft for additional margin.
With engine bleed for 1 pack on, increase altitude capability by 300 ft.
With engine bleed for 2 packs on, increase altitude capability by 100 ft.
With engine anti-ice on, decrease altitude capability by 900 ft.
With engine and wing anti-ice on, decrease altitude capability by 1700 ft.

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 10	14	17	20	23	25	27	29
380	EPR	1.64							
	MACH	.488							
	KIAS	270							
	FF/ENG	6622							
360	EPR	1.61							
	MACH	.488							
	KIAS	270							
	FF/ENG	6356							
340	EPR	1.58	1.68						
	MACH	.476	.514						
	KIAS	264	264						
	FF/ENG	5941	6147						
320	EPR	1.55	1.64						
	MACH	.465	.498						
	KIAS	257	256						
	FF/ENG	5552	5650						
300	EPR	1.52	1.60	1.68					
	MACH	.453	.483	.513					
	KIAS	250	248	248					
	FF/ENG	5194	5194	5358					
280	EPR	1.49	1.56	1.63	1.72				
	MACH	.442	.469	.495	.528				
	KIAS	244	240	240	241				
	FF/ENG	4864	4796	4867	5090				
260	EPR	1.46	1.53	1.59	1.67				
	MACH	.433	.456	.479	.508				
	KIAS	239	233	231	232				
	FF/ENG	4559	4436	4433	4545				
240	EPR	1.43	1.49	1.55	1.62	1.70			
	MACH	.424	.443	.463	.488	.521			
	KIAS	234	227	224	222	223			
	FF/ENG	4280	4107	4054	4086	4235			
220	EPR	1.41	1.46	1.51	1.57	1.64	1.70		
	MACH	.416	.431	.448	.470	.498	.520		
	KIAS	229	221	216	214	213	214		
	FF/ENG	4031	3806	3714	3685	3751	3850		
200	EPR	1.39	1.43	1.47	1.52	1.59	1.64	1.70	1.76
	MACH	.409	.421	.435	.453	.476	.496	.518	.544
	KIAS	226	215	210	206	204	204	204	206
	FF/ENG	3814	3538	3407	3334	3323	3373	3462	3624

GEAR DOWN
1 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
302	275	251	231	215	200	191	182	174	167	160
610	554	505	464	430	400	381	363	347	333	320
921	835	759	698	646	600	572	545	521	499	479
1233	1117	1015	932	862	800	762	727	694	665	638
1548	1400	1271	1166	1078	1000	952	907	866	829	796
1864	1684	1528	1401	1294	1200	1141	1087	1038	993	953
2182	1971	1787	1637	1511	1400	1331	1268	1210	1157	1110
2502	2258	2045	1872	1728	1600	1520	1447	1380	1320	1266
2823	2546	2305	2109	1944	1800	1710	1627	1551	1482	1421
3146	2835	2565	2345	2161	2000	1899	1806	1722	1645	1576

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		25		29	
	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	9.7	0:43	8.9	0:42	8.4	0:40	8.1	0:38	7.7	0:36
400	20.3	1:26	18.9	1:22	18.1	1:18	17.8	1:13	17.3	1:09
600	30.6	2:09	28.6	2:03	27.5	1:56	27.2	1:49	26.6	1:43
800	40.6	2:52	38.1	2:45	36.6	2:36	36.2	2:25	35.7	2:17
1000	50.5	3:36	47.4	3:27	45.5	3:15	45.0	3:02	44.4	2:52
1200	60.2	4:20	56.5	4:09	54.2	3:56	53.5	3:40	52.9	3:27
1400	69.7	5:05	65.5	4:53	62.6	4:37	61.7	4:18	61.2	4:04
1600	79.1	5:50	74.2	5:36	70.9	5:19	69.6	4:58	69.1	4:41
1800	88.2	6:35	82.7	6:20	78.9	6:01	77.4	5:37	76.8	5:18
2000	97.2	7:21	91.1	7:05	86.8	6:44	84.9	6:18	84.2	5:57

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	200	250	300	350	400
10	-1.6	-0.9	0.0	1.1	2.7
20	-3.3	-1.8	0.0	2.6	5.5
30	-5.0	-2.7	0.0	4.1	8.3
40	-6.6	-3.6	0.0	5.6	11.2
50	-8.2	-4.5	0.0	7.2	14.2
60	-9.7	-5.3	0.0	8.8	17.3
70	-11.2	-6.1	0.0	10.5	20.4
80	-12.6	-6.9	0.0	12.1	23.6
90	-13.9	-7.6	0.0	13.8	26.9

GEAR DOWN
1 ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
400	EPR	1.48	1.54				
	KIAS	270	270				
	FF/ENG	6990	7030				
380	EPR	1.46	1.52	1.64			
	KIAS	270	270	270			
	FF/ENG	6760	6790	6950			
360	EPR	1.44	1.51	1.61			
	KIAS	270	270	270			
	FF/ENG	6550	6560	6670			
340	EPR	1.42	1.48	1.58			
	KIAS	261	261	261			
	FF/ENG	6110	6100	6160			
320	EPR	1.39	1.44	1.54	1.66		
	KIAS	251	251	251	251		
	FF/ENG	5680	5660	5680	5860		
300	EPR	1.36	1.42	1.50	1.61		
	KIAS	242	242	242	242		
	FF/ENG	5280	5240	5250	5340		
280	EPR	1.34	1.38	1.47	1.57		
	KIAS	233	233	233	233		
	FF/ENG	4890	4840	4820	4870		
260	EPR	1.32	1.36	1.44	1.54	1.70	
	KIAS	228	228	228	228	246	
	FF/ENG	4610	4560	4520	4530	5220	
240	EPR	1.29	1.34	1.41	1.50	1.65	
	KIAS	221	221	221	221	236	
	FF/ENG	4290	4240	4180	4180	4670	
220	EPR	1.27	1.31	1.38	1.46	1.60	1.73
	KIAS	215	215	215	215	225	226
	FF/ENG	4050	3950	3890	3860	4160	4420
200	EPR	1.25	1.29	1.35	1.43	1.54	1.67
	KIAS	208	208	208	208	215	216
	FF/ENG	3750	3690	3580	3530	3700	3850

This table includes 5% additional fuel for holding in a racetrack pattern.

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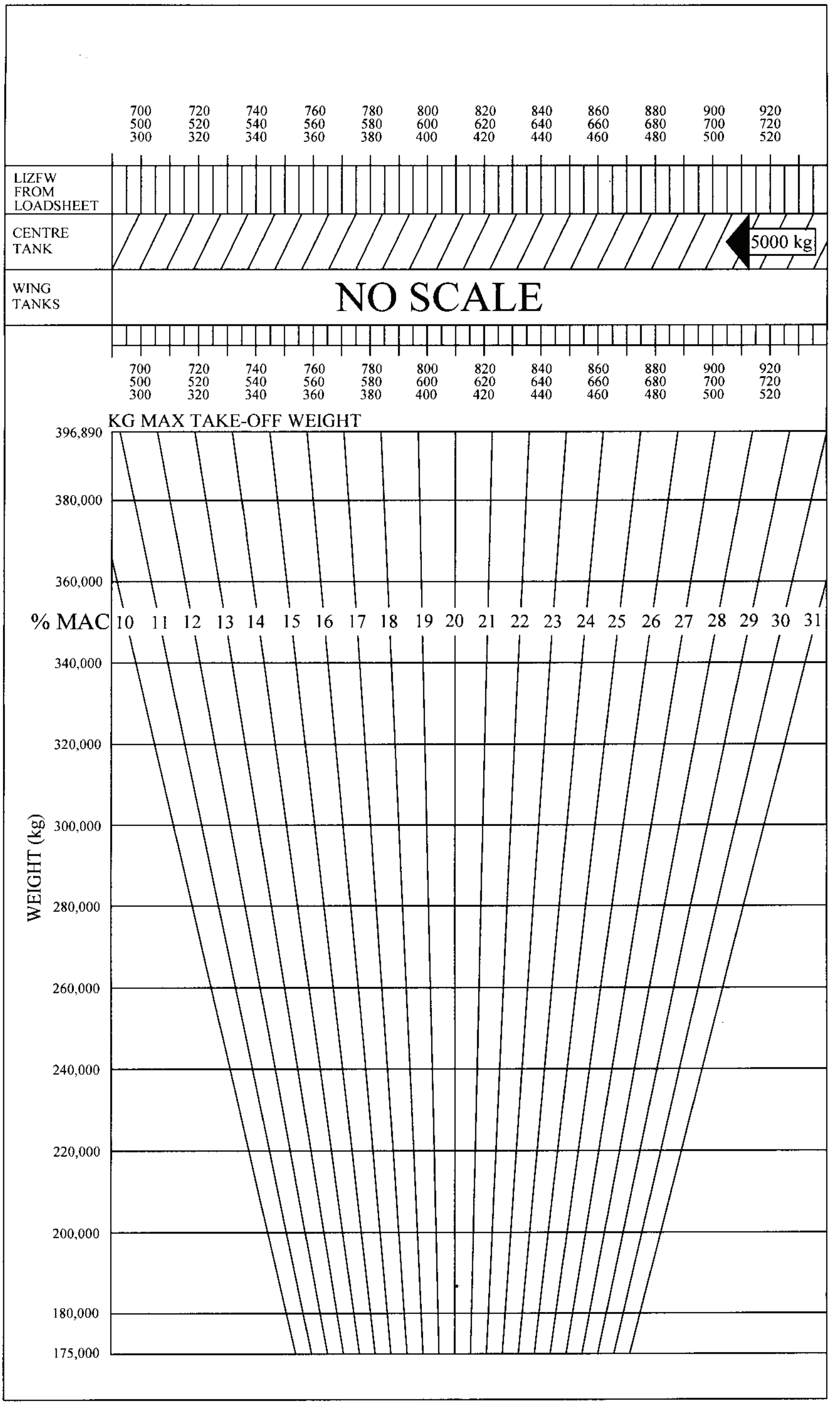
Performance Inflight - QRH — Chapter PI-QRH
Additional Advisory Information — Section 18

ADVISORY INFORMATION

Boeing 747-400 Cruise C of G



Enter chart with LIZFW, using the top line (700-920) for "Lite" aircraft, the middle line (500-720) for "Dusk" aircraft and the lower line (300-520) for "Heavy" aircraft.

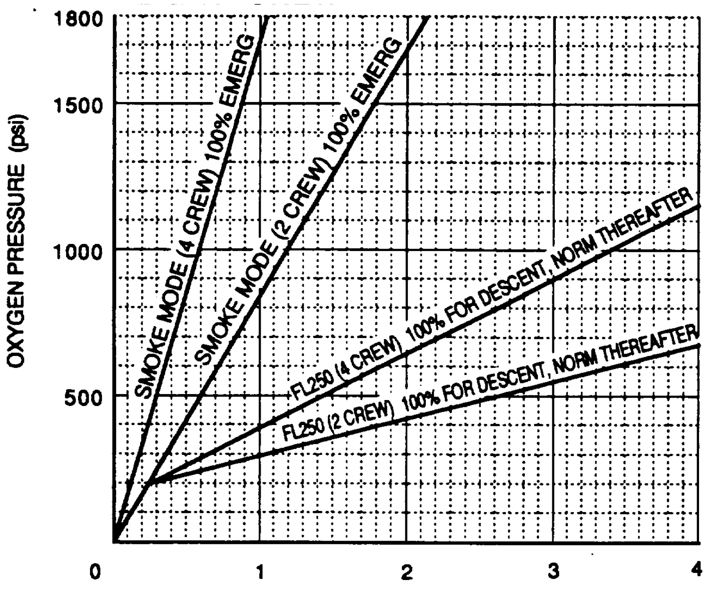
Drop down to the Centre Tank line and move left the required amount for the quantity of fuel in the tank. (It is not necessary to follow the slope of the grid, this indicates direction of movement).

Drop down to the intersection of the horizontal line from present weight, and read off the % MAC.

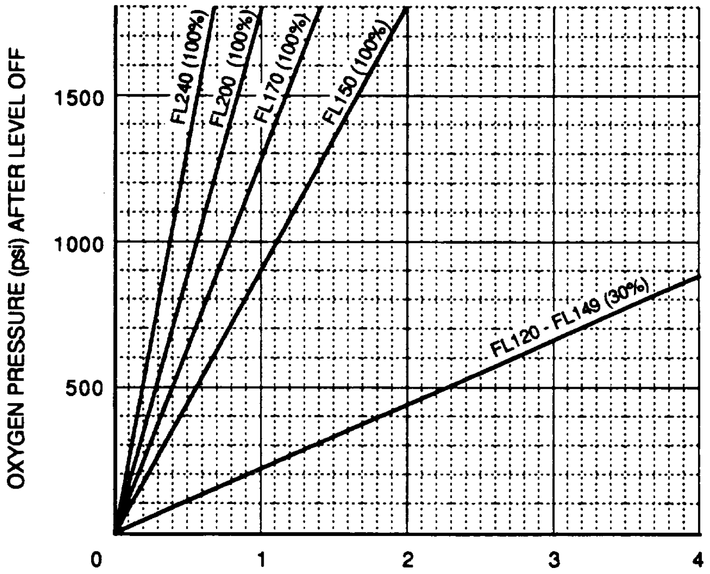
Oxygen Duration (Hours)

- Duration at FL of remaining oxygen contents.
- Values based on 300 pax + cabin crew - factor.

Flight Crew

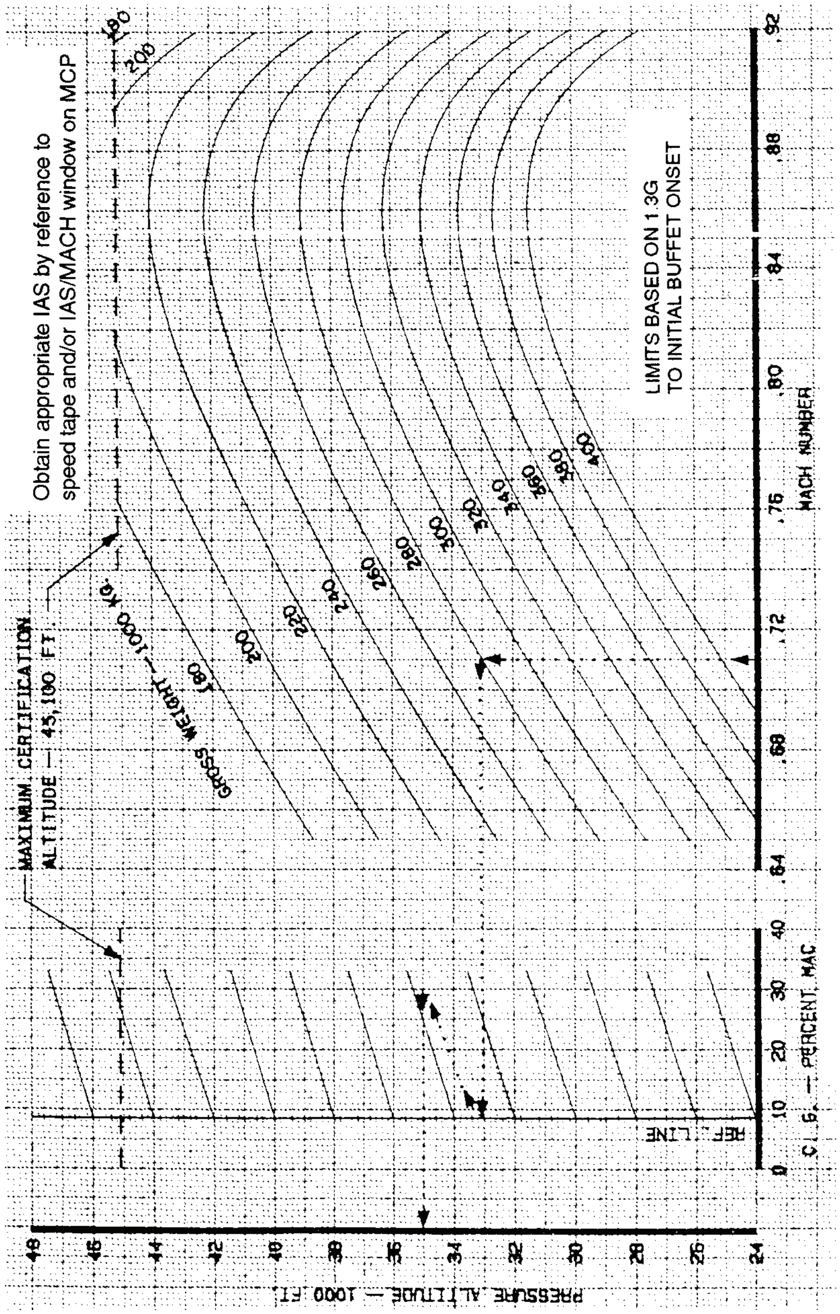


Passengers and Cabin Crew



- % relates to number assumed to be on oxygen.

Cruise Altitude Limits



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Performance Inflight - QRH
Chapter PI-QRH
Text
Section 19

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Pitch attitude and average EPR information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome or turbulent air may also cause unreliable airspeed/Mach indications. The cruise table in this section may also be used for turbulent air penetration.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed indications may also be unreliable.

Go-around EPR

To find Max Go-around EPR based on normal engine bleed for 3 packs on, enter the Go-around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. For packs off operation, apply the EPR adjustments provided below the table. No EPR adjustment is required for engine and wing anti-ice operations.

Max Climb EPR

This table shows Max Climb EPR for a 340/.84 climb speed schedule, normal engine bleed for 3 packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

VREF

The Reference Speed table contains flaps 30 and 25 landing speeds for a given weight. Apply adjustments shown as required.

All Engines

Holding

Target EPR, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Flaps 1 data is based on VREF30 + 60 speed. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read EPR, KIAS and fuel flow per engine.

Advisory Information

Runway Surface Condition Correlation

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. A table is provided that correlates runway condition code to runway surface condition description and reported braking action that can then be used to determine the appropriate Normal Configuration Landing Distance or Non-Normal Configuration Landing Distance.

Normal Configuration Landing Distance

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 landing distance.

Tables are provided as advisory information for normal configuration landing distances on dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are 115% of the actual landing distance. The Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance of 1500 ft (460 m) from threshold to touchdown. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, four-engine maximum reverse thrust, and auto speedbrakes.

To use these tables, determine the reference landing distance for the selected braking configuration and reported braking action. Adjust this reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is applied independently to the reference landing distance. A correction for use of manual speedbrakes is provided in the table notes.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" 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 conservative to add the effects of slope and inoperative reversers when using the autobrake system.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing. Landing distances and adjustments are provided for dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are representative of the actual landing distance, and are not factored. The Non-Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance of 1500 ft from threshold to touchdown. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, and maximum available symmetrical reverse thrust.

Tables for Non-Normal Configuration Landing Distance in this section are similar in format and used in the same manner as tables for the Normal Configuration Landing Distance previously described.

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 table with the reference brake energy per brake and the type of braking used during landing (Max Manual or Max Auto). 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 on the GEAR synoptic display and disappears as the hottest brake cools to an indication of 4. Note that even without an EICAS advisory message, brake cooling is recommended.

One Engine Inoperative

Max Continuous EPR

Power setting is based on one engine inoperative with 3 packs on and all anti-ice bleeds off. Enter the table with pressure altitude and KIAS or Mach to read EPR.

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.

The level off altitude is dependent on air temperature (ISA deviation). The level off altitude shown is 1000 ft below the maximum altitude. This reduction in altitude is consistent with the FMC logic.

Long Range Cruise Altitude Capability

The table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 1000 ft. This reduction in altitude is consistent with the FMC logic.

Long Range Cruise Control

The table provides target EPR, one engine inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect 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 three engine Long Range Cruise speed and .84/290/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table 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 Fuel Required Adjustment table with the fuel required for the reference weight and the actual weight at checkpoint.

Holding

EPR required, indicated airspeed and fuel flow are shown for one engine inoperative holding based on the recommended speeds. Fuel flow is based on a racetrack holding pattern and may be reduced by 5% for holding in straight and level flight.

Two Engines Inoperative

Driftdown Speed/Level Off Altitude

The 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.

The level off altitude is dependent on air temperature (ISA deviation). The level off altitude shown is 2000 ft below the maximum altitude. This reduction in altitude is consistent with the FMC.

Driftdown/LRC 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.

Long Range Cruise Altitude Capability

The table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed and Max Continuous thrust. Note that the maximum altitude shown has been reduced by 2000 ft. This reduction in altitude is consistent with the FMC logic.

Long Range Cruise Control

The table provides target EPR, two engines inoperative Long Range Cruise Mach number, KIAS, and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

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 the VNAV during descent under these circumstances is not recommended.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

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Manoeuvres — Chapter MAN
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General

Non-Normal Manoeuvres and Flight Patterns are included for training and review purposes.

Non-Normal Manoeuvres

Flight crews are expected to do Non-Normal Manoeuvres 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.

Flight Patterns are for information only. In the event of a conflict, procedures published in the FCOM take precedence.

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Approach to Stall or Stall Recovery

All recoveries from approach to stall should be done as if an actual stall has occurred.

Immediately do the following at the first indication of stall (buffet or stick shaker).

Note: Do not use flight director commands during recovery.

Pilot Flying	Pilot Monitoring

• Initiate the recovery:
  • Hold the control column firmly.
  • Disengage autopilot and disconnect autothrottle.
  • Smoothly apply nose down elevator to reduce the angle of attack until buffet or stick shaker stops. Nose down stabiliser trim may be needed.*
	• Monitor altitude and airspeed.
	• Verify all required actions have been done and call out any omissions.
	• Call out any trend toward terrain contact.

• Continue the recovery:
  • Roll in the shortest direction to wings level if needed.**
  • Advance thrust levers as needed.
  • Retract the speedbrakes.
  • Do not change gear or flap configuration, except
    • During liftoff, if flaps are up, call for flaps 1.
	• Monitor altitude and airspeed.
	• Verify all required actions have been done and call out any omissions.
	• Call out any trend toward terrain contact.
	• Set the FLAP lever as directed.

• Complete the recovery:
  • Check airspeed and adjust thrust as needed.
  • Establish pitch attitude.
  • Return to the desired flight path.
• Re-engage the autopilot and autothrottle if desired.
	• Monitor altitude and airspeed.
	• Verify all required actions have been done and call out any omissions.
	• Call out any trend toward terrain contact.

WARNING: *If the control column does not provide the needed response, stabiliser trim may be necessary. Excessive use of pitch trim may aggravate the condition, or may result in loss of control or in high structural loads.

WARNING: **Excessive use of pitch trim or rudder may aggravate the condition, or may result in loss of control or in high structural loads.

Rejected Takeoff

The decision to reject the takeoff must be made in time to start the maneuver by V1. The Captain shall call "STOP" if the takeoff is to be rejected, or "CONTINUE" if the takeoff is to be continued. If "STOP" is called, PF shall immediately start the rejected takeoff maneuver. The First Officer is authorized to call "STOP" for items marked with an asterisk.

Prior to 80 knots, the Captain (or First Officer where permitted) should call "STOP" 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 the airplane is unsafe or unable to fly

Above 80 knots and prior to V1, the Captain (or First Officer where permitted) shall call "STOP" for any of the following:

- fire or fire warning*
- engine failure*
- predictive windshear warning*
- if the airplane is unsafe or unable to fly

At all times when the First Officer is handling the takeoff he may, in addition, call "STOP" for a significant handling difficulty or a blocked runway.

During the takeoff, the crew member observing the non-normal situation will immediately call it out as clearly as possible.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Without delay:

Simultaneously close thrust levers, disconnect autothrottle, and apply maximum manual wheel brakes or verify operation of RTO autobrake.

If RTO autobrake selected, monitor system performance and apply manual wheel brakes if AUTOBRAKES message displayed or deceleration not adequate.

Verify speedbrake lever UP.

Continue maximum braking until certain the airplane will stop on the runway.</td><td>Verify actions as follows:

Thrust levers closed.

Autothrottles disengaged.

Maximum brakes applied.

Select reverse thrust to IDLE.

Verify the speedbrakes are extended, if not manually select speedbrake lever UP, and call "SPEEDBRAKES UP." If speedbrake lever cannot be selected UP call "SPEEDBRAKES NOT UP."

Apply the maximum amount of reverse thrust on all available engines consistent with conditions.

When all REV indications are green, call “REVERSERS NORMAL”.

If there is no REV indication(s) or the indication(s) stays amber, call “NO REVERSER ENGINE(S) NUMBER ____”, or “NO REVERSERS”.

Call out any omitted action items.</td></tr>
<tr><td>Stop on runway.

Set Park Brake.</td><td>Call out 80 knots.

Field length permitting:

Initiate movement of reverse thrust levers to reach reverse idle detent by taxi speed.

Note: If stopping from below 100 knots only reverse IDLE is required.</td></tr>
</table>

Pilot Flying	Pilot Monitoring

When the Park Brake is set, the Captain shall take control and assume the role of P1 by calling "I HAVE CONTROL".

When the airplane is stopped, perform procedures as required. The Captain's primary responsibility is to co-ordinate all subsequent activity to ensure a safe outcome; the First Officer may therefore conduct Non-Normal checklists unmonitored at the Captain's command. The Captain should communicate the reject decision to the control tower as soon as practical.

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
- releasing the parking brake unless passenger evacuation is necessary
- advising the ground crew of the hot brake hazard
- advising passengers of the need to remain seated or evacuate
- completion of Non-Normal checklist (if appropriate) for conditions which caused the RTO
- maintenance action is required before the next takeoff if RTO braking was activated.

Ground Proximity Warning System (GPWS) Response

GPWS Caution

Accomplish the following manoeuvre 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 flight path or aircraft configuration.	

The below glideslope deviation alert may be canceled or inhibited for:

- Localiser 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.

GPWS Warning

Accomplish the following manoeuvre for any of these conditions**:

- activation of “PULL UP” or “OBSTACLE OBSTACLE PULLUP” or “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain.

Pilot Flying	Pilot Monitoring
Call “PULL UP, GO AROUND”.	Assure maximum* thrust.
Disengage autopilot.	Verify all required actions have been completed and call out any omissions.
Disconnect autothrottle.	
Aggressively apply maximum* thrust.	
Simultaneously roll wings level and rotate to an initial pitch attitude of 20°.	
Retract speedbrakes.	
If terrain remains a threat, continue rotation up to the pitch limit indicator or stick shaker or initial buffet.	

Pilot Flying	Pilot Monitoring
Do not change gear or flap configuration until terrain separation is assured. Monitor radio altimeter for sustained or increasing terrain separation. When clear of terrain, slowly decrease pitch attitude and accelerate. Continue with normal takeoff or go-around procedures as required.	Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude). Call out any trend toward terrain contact.

Note: Aft control column force increases as airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: * Maximum thrust can be obtained by advancing the thrust levers full forward when the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: * Maximum thrust can be obtained by advancing the Thrust levers full forward when the EECs are in the normal mode. If terrain contact is imminent, advance Thrust levers full forward.

** as installed

Traffic Avoidance

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with the RA if there is a direct conflict between the RA and air traffic control.

WARNING: Once an RA has been issued, safe separation can be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA.

Note: If stick shaker or initial buffet occurs during the manoeuvre, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the manoeuvre, relax pitch force as necessary to reduce buffet, but continue the manoeuvre.

Note: Do not use flight director pitch commands until clear of conflict.

For TA:

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic.	
If traffic is sighted, maneuver if needed.	

Note: Maneuvers based solely on a TA may result in reduced separation and are not recommended.

For RA, except a climb in landing configuration:

WARNING: A DESCEND (fly down) RA issued below 1,000 feet AGL should not be followed.

Pilot Flying	Pilot Monitoring
If maneuvering is required, disengage autopilot and disconnect autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

For a climb RA in landing configuration:

Pilot Flying	Pilot Monitoring
Disengage autopilot and disconnect autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 20. Smoothly adjust pitch to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	Verify maximum thrust set. Position Flap lever to 20 detent.
Verify a positive rate of climb on the altimeter and call “GEAR UP”.	Verify a positive rate of climb on the altimeter and call “POSITIVE RATE”. Set the landing gear lever to UP.
Attempt to establish visual contact. Call out any conflicting traffic.	

Upset Recovery

An upset can generally be defined as unintentionally exceeding the following conditions:

- pitch attitude greater than 25 degrees nose up, or
- pitch attitude greater than 10 degrees nose down, or
- bank angle greater than 45 degrees, or
- within above parameters but flying at airspeeds inappropriate for the conditions

The following techniques represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all the actions may be necessary once recovery is underway. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume the airplane is not stalled. A stalled condition can exist at any 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	

• Disengage autopilot and disconnect autothrottle
• Apply as much as full nose-down elevator
• *Apply appropriate nose-down stabilizer trim
• Reduce thrust
• *Roll (adjust bank angle) to obtain a nose down pitch rate
• Complete the recovery:
  • 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	

• Disengage autopilot and disconnect autothrottle
• Recover from stall, if required
• *Roll in the shortest direction to wings level (unload and roll if bank angle is more than 90 degrees)
• Recover to level flight:
  - 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 (Predictive Windshear)

For predictive windshear caution alert (“MONITOR RADAR DISPLAY” aural):

Pilot Flying	Pilot Monitoring
Maneuver as required to avoid windshear.	

Windshear Warning

Predictive windshear warning during takeoff roll (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural):

- prior to V1, reject takeoff
- after V1, perform Windshear Escape Maneuver.

Windshear encountered during takeoff roll:

- if windshear encountered prior to V1, there may not be sufficient runway remaining to stop if an RTO is initiated at V1. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once in flight, perform Windshear Escape Maneuver
- if windshear encountered near normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 600 m before the end of the runway even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach (“GO-AROUND, WINDSHEAR AHEAD” aural):

- perform Windshear Escape Maneuver, or at pilot’s discretion, perform a normal go-around.

Windshear encountered in flight:

- perform Windshear Escape Maneuver.

Note: The following are indications the airplane is in windshear:

- windshear warning (two-tone siren followed by “WINDSHEAR, WINDSHEAR, WINDSHEAR”), or
- unacceptable flight path deviations.

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1,000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 FPM vertical speed
- 5 degrees pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time.

Windshear Escape Maneuver

Pilot Flying	Pilot Monitoring
MANUAL FLIGHT: • Call “WINDSHEAR GO-AROUND”. • Disengage autopilot. • Push either TO/GA switch. • Aggressively apply maximum* thrust. • Disconnect autothrottle. • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15°. • Retract speedbrakes. • Follow flight director TO/GA guidance (if available)**.	• Verify maximum* thrust. • Verify all required actions have been completed and call out any omissions.
AUTOMATIC FLIGHT: • Call “WINDSHEAR GO-AROUND”. • Press either TO/GA switch.*** • Verify TO/GA mode annunciation. • Verify GA thrust. • Retract speedbrakes. • Monitor system performance****.	• Verify GA* thrust. • Verify all required actions have been completed and call out any omissions.

Pilot Flying	Pilot Monitoring
MANUAL OR AUTOMATIC FLIGHT: • 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 when the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: ** Do not exceed the pitch limit indication.

Note: *** If TO/GA is not available, disengage autopilot and disconnect autothrottle and fly manually.

WARNING: ** Severe windshear may exceed the performance capability of the AFDS. The pilot flying must be prepared to disengage the autopilot and disconnect the autothrottle and fly manually.**

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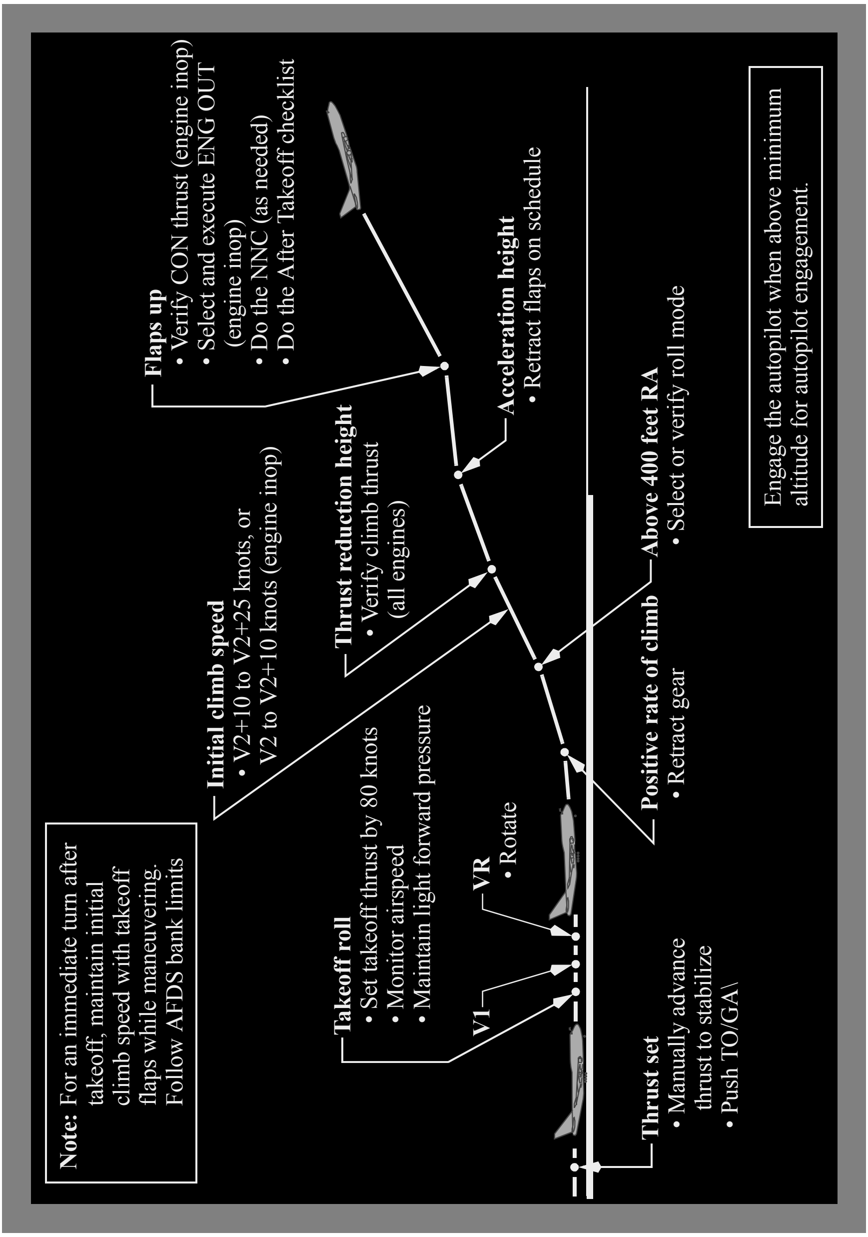
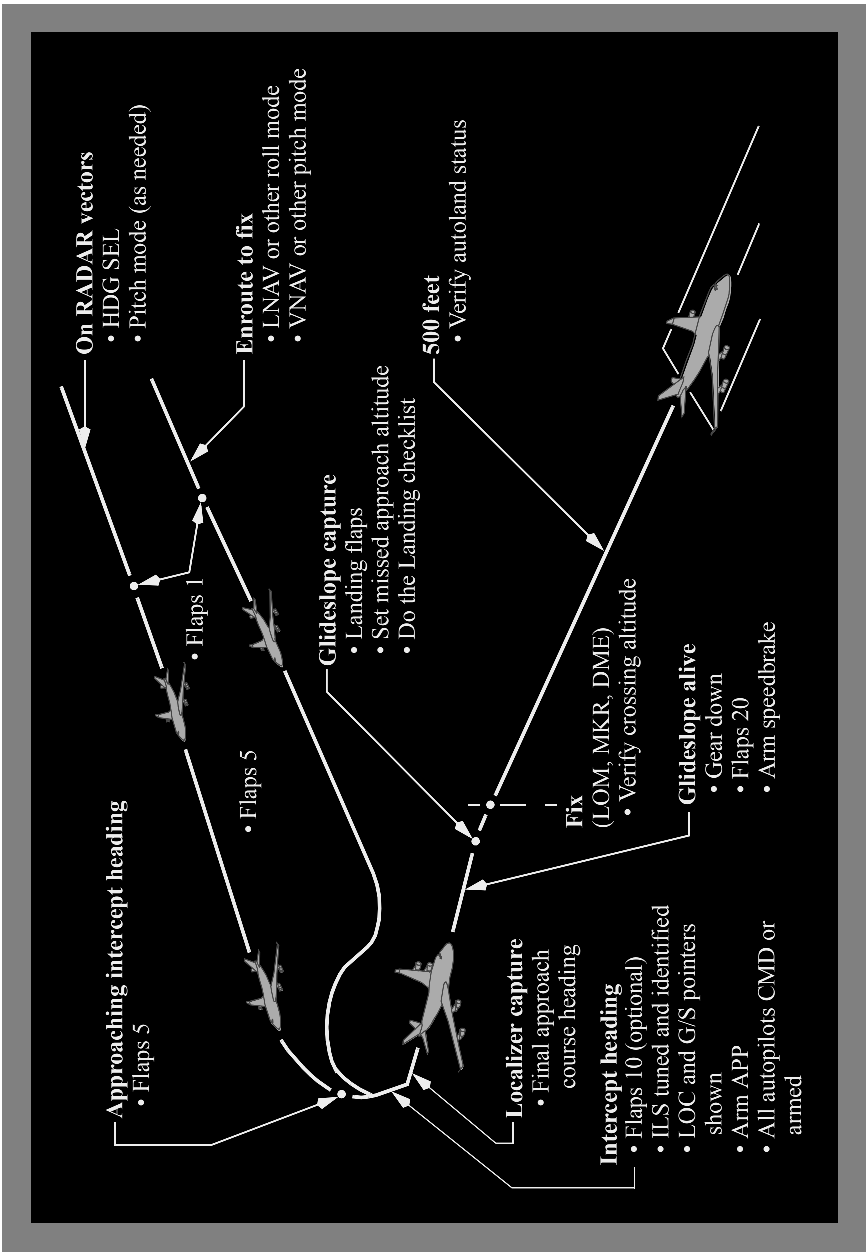
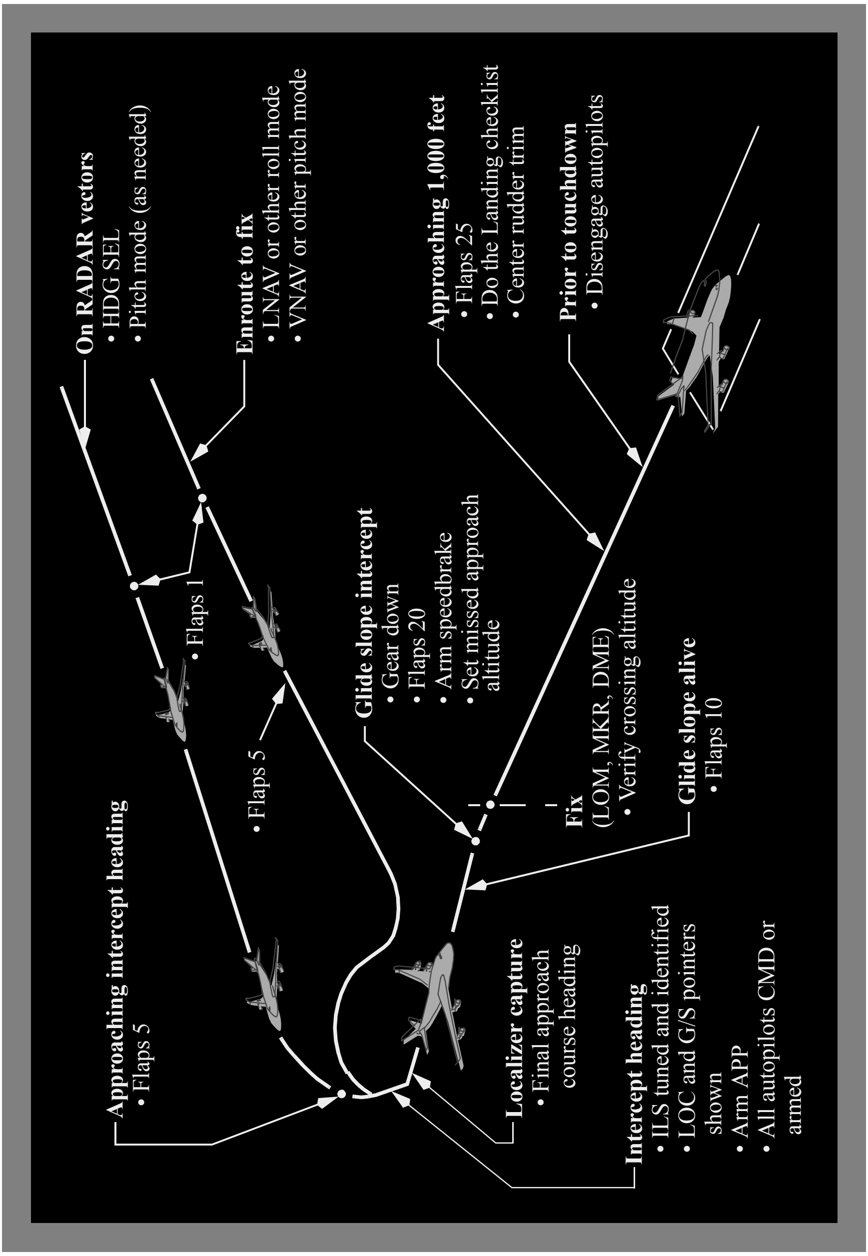
Takeoff


Note: For an immediate turn after takeoff, maintain initial climb speed with takeoff flaps while maneuvering. Follow AFDS bank limits
Initial climb speed
• V2+10 to V2+25 knots, or V2 to V2+10 knots (engine inop)
Flaps up
• Verify CON thrust (engine inop)
• Select and execute ENG OUT (engine inop)
• Do the NNC (as needed)
• Do the After Takeoff checklist
Thrust reduction height
• Verify climb thrust (all engines)
Takeoff roll
• Set takeoff thrust by 80 knots
• Monitor airspeed
• Maintain light forward pressure
V1
VR
• Rotate
Acceleration height
• Retract flaps on schedule
Thrust set
• Manually advance thrust to stabilize
• Push TO/GA\
Positive rate of climb
• Retract gear
Above 400 feet RA
• Select or verify roll mode
Engage the autopilot when above minimum altitude for autopilot engagement.

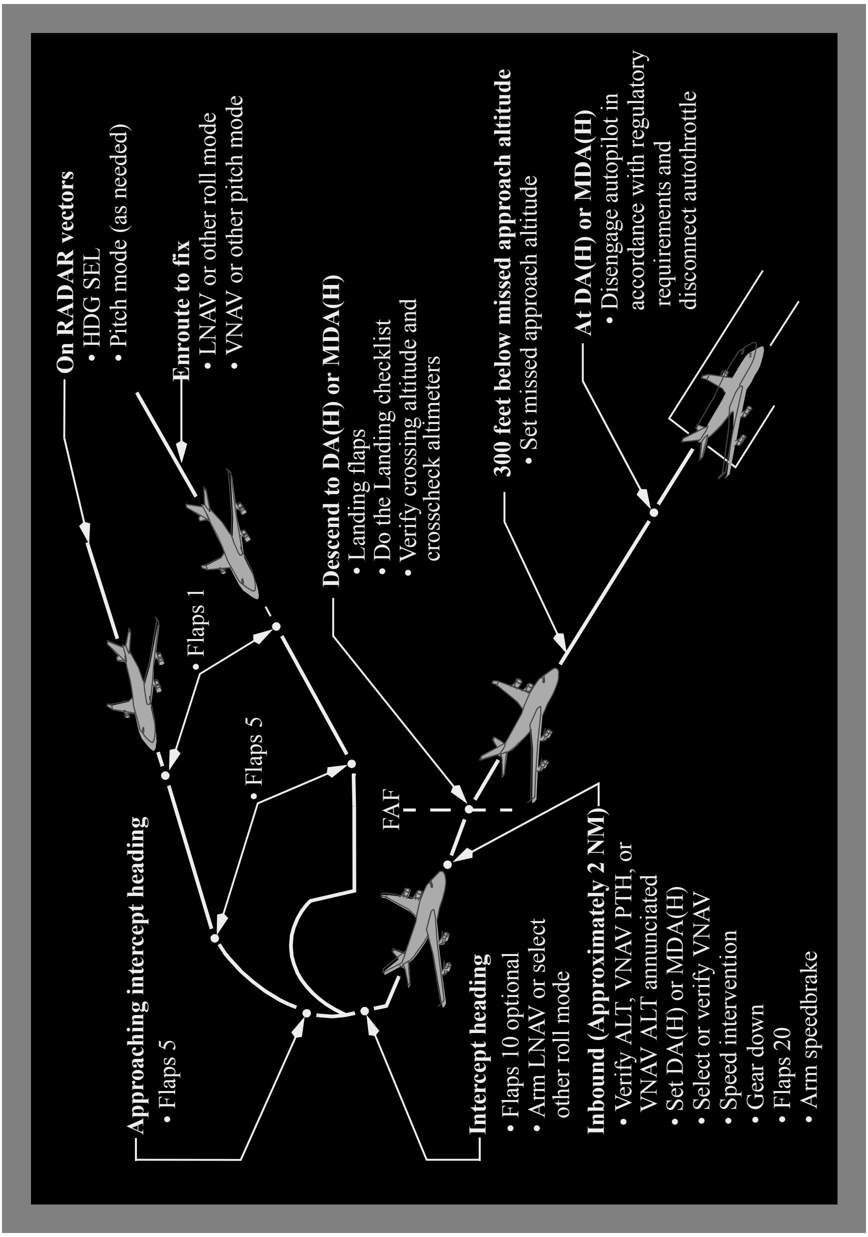
ILS Approach - Normal/One Engine Inoperative



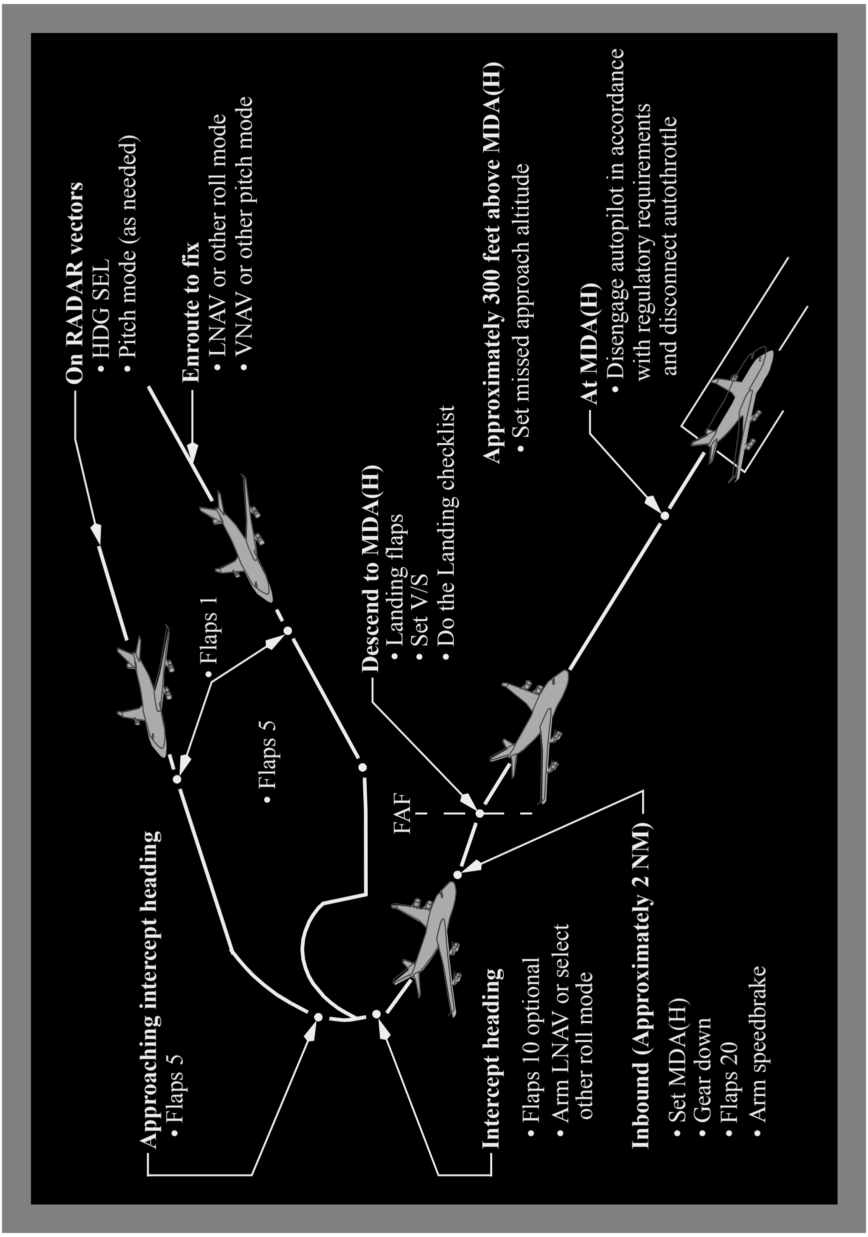
ILS Approach - Two Engines Inoperative



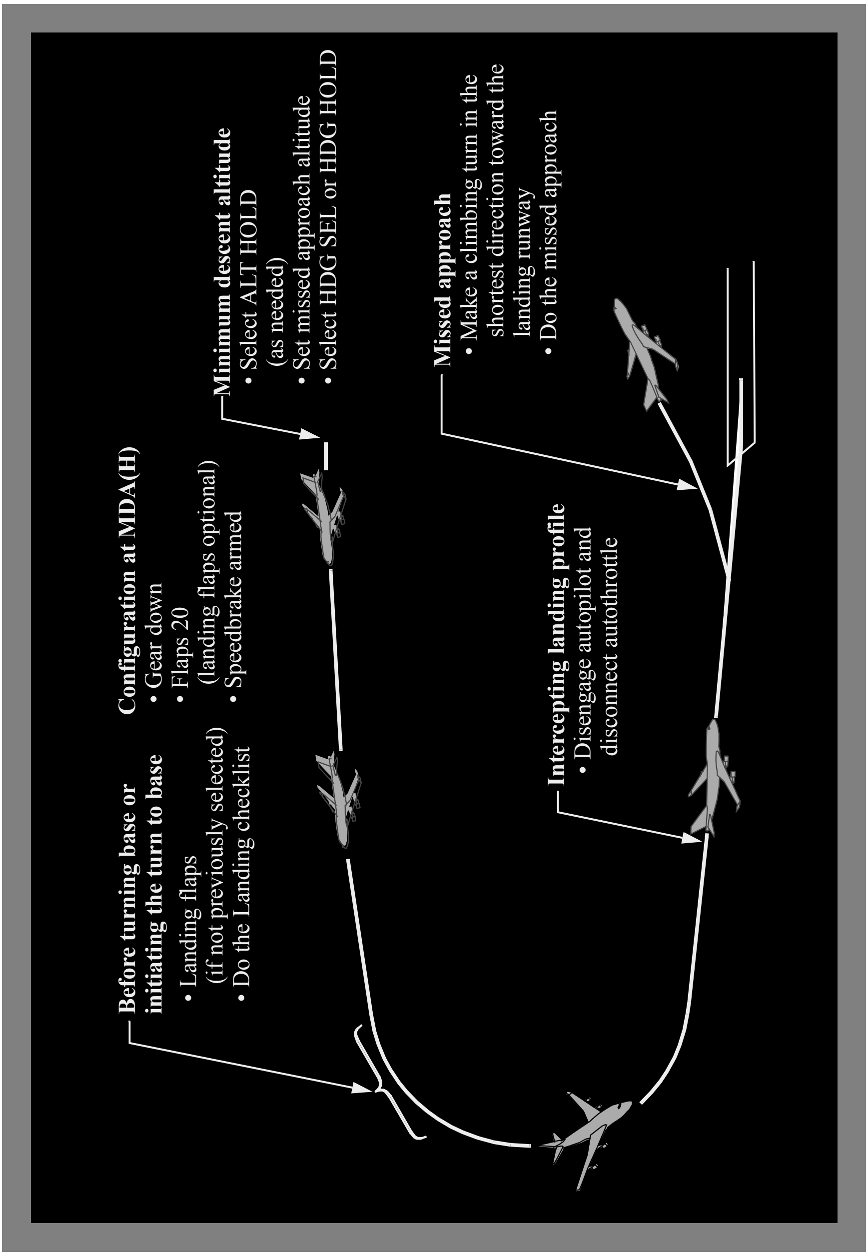
Instrument Approach Using VNAV



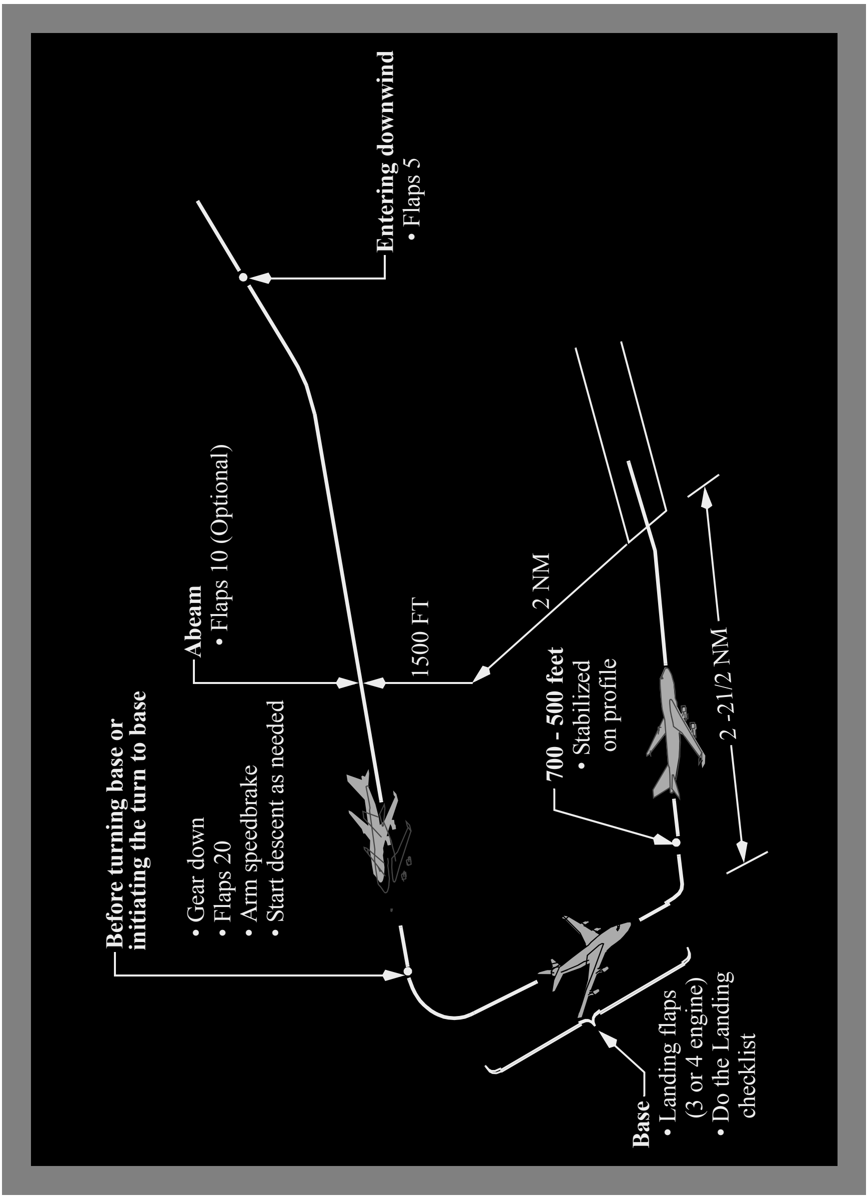
Instrument Approach Using V/S



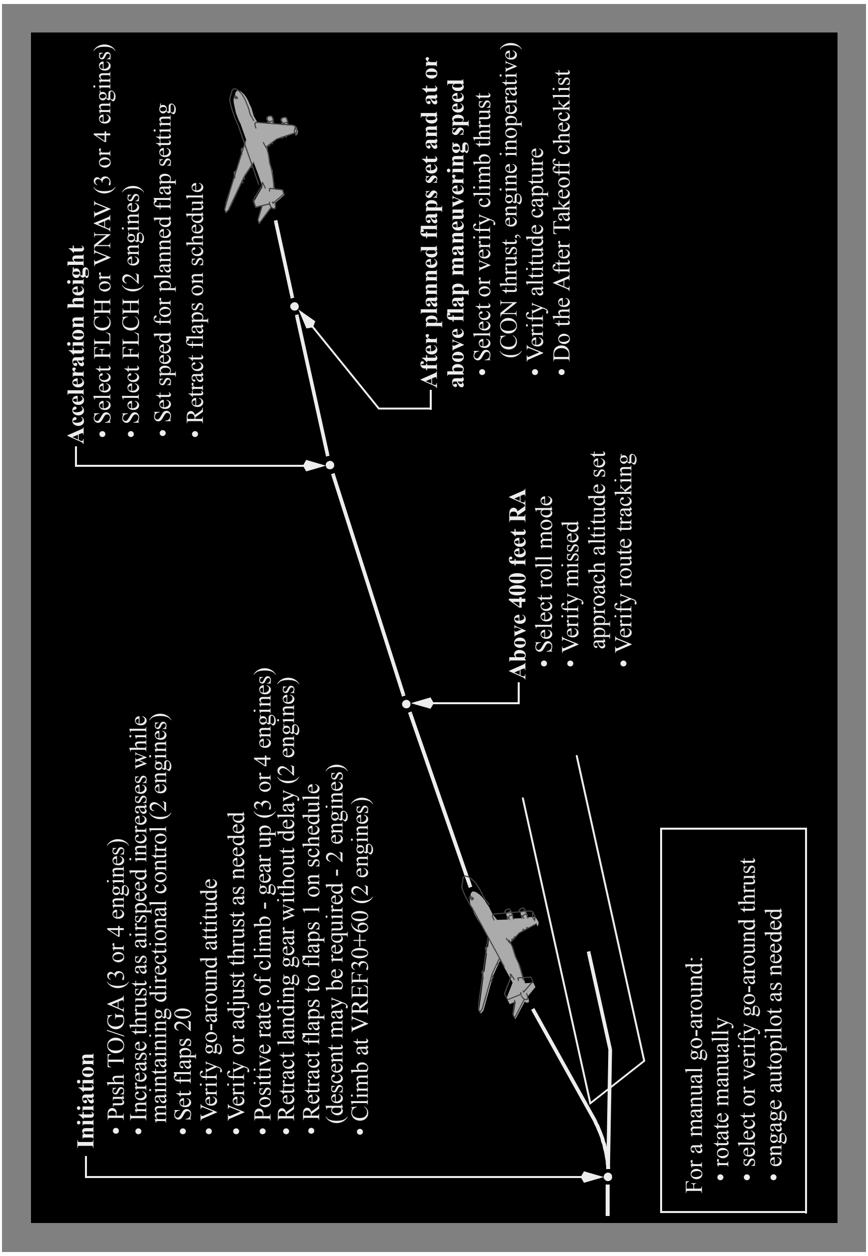
Circling Approach



Visual Traffic Pattern



Go-Around and Missed Approach - All Approaches



Checklist Instructions — Chapter CI
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Checklist Instructions — Chapter CI
Model Identification — Section ModID

General

The aircraft 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 aircraft. Where data applies to all aircraft listed, no reference is made to individual aircraft numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for aircraft covered in this handbook. Configuration data reflects the aircraft 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.

Aircraft number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Aircraft Number	Registry Number	Serial Number	Tabulation Number
NLK	G-BNLK	24053	RT481
NLN	G-BNLN	24056	RT484
NLP	G-BNLP	24058	RT486
NLY	G-BNLY	27090	RT494
YGA	G-BYGA	28855	RM143
YGB	G-BYGB	28856	RM144
YGC	G-BYGC	25823	RM145
YGD	G-BYGD	28857	RM261
YGE	G-BYGE	28858	RM262
YGF	G-BYGF	25824	RM263
YGG	G-BYGG	28859	RM264
IVA	G-CIVA	27092	RT496
IVB	G-CIVB	25811	RT497
IVC	G-CIVC	25812	RT498
IVD	G-CIVD	27349	RT499
IVE	G-CIVE	27350	RU121
IVF	G-CIVF	25434	RU122
IVG	G-CIVG	25813	RU123
IVH	G-CIVH	25809	RU124
IVI	G-CIVI	25814	RU125
IVJ	G-CIVJ	25817	RU126
IVK	G-CIVK	25818	RU127
IVL	G-CIVL	27478	RU128
IVM	G-CIVM	28700	RU129

Aircraft Number	Registry Number	Serial Number	Tabulation Number
IVN	G-CIVN	28848	RU130
IVO	G-CIVO	28849	RU131
IVP	G-CIVP	28850	RU132
IVR	G-CIVR	25820	RM136
IVS	G-CIVS	28851	RM137
IVT	G-CIVT	25821	RM096
IVU	G-CIVU	25810	RM097
IVV	G-CIVV	25819	RM138
IVW	G-CIVW	25822	RM139
IVX	G-CIVX	28852	RM140
IVY	G-CIVY	28853	RM141
IVZ	G-CIVZ	28854	RM142

QRH Revision Transmittal Letter

To: All holders of British Airways Plc 747 Flight Crew Operations Manual, Boeing Document Number D6-30151-406.

Subject: Quick Reference Handbook (QRH) Revision.

This revision reflects the most current information available to The Boeing Company 45 days before the subject revision date. The following revision highlights explain changes in this revision. General information below explains the use of revision bars to identify new or revised information.

Revision Record

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
26	October 1, 1998		27	April 1, 1999	
28	October 1, 1999		29	April 1, 2000	
30	October 1, 2000		31	April 1, 2001	
32	November 1, 2001		33	May 1, 2002	
34	November 1, 2002		35	May 1, 2003	
36	November 1, 2003		37	May 1, 2004	
38	October 1, 2004		39	April 1, 2005	
40	October 1, 2005		41	April 1, 2006	
42	October 1, 2006		43	April 1, 2007	
44	October 1, 2007		45	April 1, 2008	
46	October 1, 2008		47	April 1, 2009	
48	October1, 2009		49	April 1, 2010	
50	October 1, 2010		51	April 1, 2011	
52	October 1, 2011		53	April 1, 2012	
54	October 1, 2012		55	April 1, 2013	
56	October 1, 2013		57	July 1, 2014	
58	October 1, 2014		59	March 20, 2015	
60	October 1, 2015		61	April 1, 2016	
62	October 1, 2016		63	April 1, 2017	

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. This manual is effective upon receipt and supersedes any previous revision of this manual.

QRH revisions, part of the formal FCOM revisions, include a QRH Transmittal Letter, a new QRH Revision Record, QRH Revision Highlights, and a current QRH List of Effective Pages. Use the information on the new QRH Revision Record and QRH List of Effective Pages to verify the QRH content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

The record above should be completed by the person incorporating the revision into the manual.

QRH Filing Instructions

Consult the QRH List of Effective Pages (CI.LEP). Pages identified with an asterisk (*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

QRH Revision Highlights

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the QRH List of Effective Pages (CI.LEP) can help determine the correct content of the QRH.

Throughout the QRH, airplane effectivity may be updated to reflect coverage as listed on the Model Identification page (CI.ModID), or to show service bulletin airplane effectivity. Highlights are not supplied.

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.

Various Sections

Various

Effectivity updated to reflect current fleet.

Chapter NNC - Non-Normal Checklists

Section 2 - Air Systems

OUTFLOW VLV L, R

NNC.2.14 - Condition statement revised to more clearly indicate that a single valve is being addressed, and to change ‘on’ to ‘ON’ for correctness.

NNC.2.14 - Objective revised to change ‘operating’ to ‘operable’ for correctness and consistency with 747-8.

NNC.2.14 - ‘PACK’ changed to ‘PACKS’ to match the panel nomenclature; ‘selector’ changed to ‘selectors’ for correctness.

NNC.2.14 - In final step, ‘indications show’ changed to ‘indication shows’ for correctness.

Section 8 - Fire Protection

Smoke or Fumes Removal

NNC.8.20 - Changed "lever" to "door operating handle" to reflect fleet nonmenclature.

NNC.8.21 - Changed "lever" to "door operating handle" to reflect fleet nonmenclature.

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Checklist Instructions — Chapter CI
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Introduction

This introduction gives guidelines for use of the Normal Checklist (NC).

The NC is organised 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.

Checklist	Call	Read	Verify	Respond
ELEC POWER UP	NONE	P2	P2	REFERENCE
PREFLIGHT	P1	P2	Both	P1
BEFORE START	P1	P2	Both	P1
BEFORE TAXI	P1	P2	Both	P1
BEFORE TAKEOFF	PF	PM	Both	PF
AFTER TAKEOFF	PF	PM	Both	PF
DESCENT	PF	PM	Both	PF
APPROACH	PF	PM	Both	PF
LANDING	PF	PM	Both	PF
AFTER LANDING	NONE	PM	PM	PM
SHUTDOWN	P1	P2	Both	P1
SECURE	NONE	P2	P2	REFERENCE

If the aircraft 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".

Checklist Content

The checklist has the minimum items needed to operate the aircraft safely.

Normal checklists have items that meet any of the following criteria:

- Items essential to safety of flight that are not monitored by an alerting system, or
- Items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- Items needed to meet regulatory requirements, or
- Items needed to maintain fleet commonality between the 737, 747-400, 757, 767, 777, and 787, or
- Items that enhance safety of flight and are not monitored by an alerting system (for example the autobrake), or
- During shutdown and secure, items that could result in injury to personnel or damage to equipment if not done.

Checklist Construction

When a checklist challenge does not end with "switch or lever", then the challenge refers to system status. For example, "Landing Gear...Down", refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with "switch or lever", then the challenge refers to the position of the switch or lever. For example, "FUEL CONTROL switches … CUTOFF" refers to the position of the switches.

Because normal checklists are done routinely, some checklist items are simplified to be more conversational, such as: "Autobrake..RTO" instead of "AUTOBRAKES selector...RTO".

Introduction

The non-normal checklists chapter contains checklists used by the flight crew to cope with non–normal situations. The checklists are grouped in sections which match the system description chapters in Volume 2.

Most checklists correspond to an EICAS alert message. The EICAS alert message indicates a non-normal condition, and is the cue to select and do the associated checklist.

Checklists without an alert EICAS message (such as Ditching) are called unannunciated checklists. Most unannunciated checklists are in the associated system section. For example, Fuel Leak Engine is in section 12, Fuel. Unannunciated checklists with no associated system are in section 0, Miscellaneous.

A caret symbol > precedes all EICAS alert messages where the associated checklist is informational, has no procedural steps, or the action is obvious (such as Overspeed). The QRH should always be consulted for careted messages. The exception to this rule is where frequently seen careted messages appear and where the associated actions are well known by the crew e.g. >AUTOTHROT DISC, >FUEL TANK/ENG. The checklist titles also have the symbol to agree with the EICAS alert message.

All checklists have condition statements. The condition statement briefly describes the situation that caused the EICAS message. Unannunciated checklists also have condition statements to help in understanding the reason for the checklist.

Some checklists have objective statements. The objective statement briefly describes the expected result of doing the checklist or briefly describes the reason for steps in the checklist.

Checklists can have both memory and reference items. Memory items are critical steps that must be done before reading the checklist. The last memory item is followed by a dashed horizontal line. Reference items are to be done while reading the checklist.

Some checklists have additional information at the end of the checklist. The additional information provides data the crew may wish to consider. The additional information does not need to be read.

Checklists that need a quick response are listed in the Quick Action Index. In each system section, Quick Action Index checklists are listed first, followed by checklists that are not in the Quick Action Index. The titles in upper case (such as AUTOBRAKES) are annunciated by an EICAS alert message or other indication. Checklist titles in upper and lower case (such as Window Damage) are not annunicated.

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. When special items are needed to configure the airplane for landing, the items are included in the Deferred Items section of the checklist. Flight patterns for some engine(s) out situations are located in the Maneuvers chapter and show the sequence of configuration changes.

While every attempt is made to supply needed non-normal checklists, it is not possible to develop checklists for all conceivable situations. In some smoke, fire or fumes situations, the flight crew may need to move between the Smoke, Fire or Fumes checklist and the Smoke or Fumes Removal checklist. In some multiple failure situations, the flight crew may need to combine the elements of more than one checklist. In all situations, the captain must assess the situations and use good judgement to determine the safest course of action.

It should be noted that, in determining the safest course of action, troubleshooting, i.e. taking steps beyond published Non-Normal Checklist steps, may cause further loss of system function or system failure. Troubleshooting should only be considered when completion of the published Non-Normal Checklist results in an unacceptable situation.

There are some situations where the flight crew must land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- The non–normal checklist includes the item “Plan to land at the nearest suitable airport”.
- Fire or cabin smoke continues.
- Only one main power source remains.
- Any other situation determined by the flight crew to have a significant adverse effect on safety if the flight is continued.

It must be stressed that for smoke that continues or a fire that cannot be positively confirmed to be completely extinguished, the earliest possible descent, landing, and evacuation must be done.

If a smoke, fire or fumes situation becomes uncontrollable, the flight crew should consider an immediate landing. Immediate landing implies immediate diversion to a runway. However, in a severe situation, the flight crew should consider an overweight landing, a tailwind landing, an off-airport landing, or a ditching.

Checklists directing an engine shutdown must be evaluated by the captain to determine whether an actual shutdown or operation at reduced thrust is the safest course of action. Consideration must be given to the probable effects of running the engine at reduced thrust.

There are no non–normal checklists for the loss of an engine indication or automatic display of the secondary engine indications. Continue normal engine operation unless an EICAS alert message shows or a limit is exceeded.

Non–normal checklists also assume:

- During engine start and before dispatch, 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 MEL must be consulted to determine if dispatch relief is available.
- After dispatch and before takeoff the associated non-normal checklist must be done if an EICAS alert message is shown or a non-normal situation is identified. Although compliance with the MEL is not mandatory at this stage, this may be useful in determining whether it is appropriate to depart, taking into account factors such as facilities at the destination.
- 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 recognised.
- 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.
- Flight crew reset of a tripped fuel pump circuit breaker or refuel circuit breakers is prohibited. In flight, flight crew reset of any other tripped circuit breaker is not recommended. However, these other tripped breakers may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. On the ground, flight crew reset of any other tripped circuit breaker should only be done after maintenance has determined that it is safe to reset the circuit breaker.
- Flight crew cycling (pulling and resetting) of a circuit breaker to clear a non-normal condition is not recommended, unless directed by a non-normal checklist.
- When a non-normal checklist directs the flight crew to attempt only one reset of a switch per flight, a second reset of the switch should not be done until maintenance has cleared the malfunction.
- The following CBs have amber collars – Stick Shaker L & R, Aural Warning L & R and Gnd Prox Warning. In exceptional circumstances, with a continuous aural warning that is confirmed to be spurious, the Captain may elect to trip these CBs if the associated distraction is considered to compromise flight safety.

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 centred 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 or Rapid Depressurisation). 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 crew members do their respective memory items without delay.

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical phase of flight (such as takeoff or landing)
- all memory items are complete.

The pilot monitoring reads aloud:

- the checklist title
- as much of the condition statement as needed to verify that the correct checklist has been selected
- as much of the objective statement (if applicable) as needed to understand the expected result of doing the checklist.

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood.

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist. The item numbers do not need to be read.

Non-memory items are called reference items. The pilot monitoring reads aloud the reference items, including:

- the precaution (if any)
- the response or action
- any amplifying information.

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood. The item numbers do not need to be read.

The word “Confirm” is added to checklist items when both crewmembers must verbally agree before action is taken. During an in-flight non-normal situation, verbal confirmation is required for:

- an engine thrust lever
- a fuel control switch
- an engine or APU fire switch, or a cargo fire arm switch
- a generator drive disconnect switch
- an IRS mode selector

After moving the control, the crew member taking the action also states the checklist response.

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 FUEL IMBAL 1-4 as a result of FUEL LEAK ENGINE) or as a result of doing a non–normal checklist (such as HYD PRESS ENG as a result of doing the HYD OVHT SYS 1, 2, 3, 4 checklist). Do the checklists for consequential EICAS alert messages, unless the statement "Do not accomplish the following checklists:" is included. 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, LANDING, and AFTER 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. These items are included in the Deferred Items section of the checklist and may be delayed until the usual point during descent, approach, landing or after 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.

Use these checklists instead of the usual DESCENT, APPROACH, LANDING, and AFTER LANDING normal checklists. 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.

Each checklist has a checklist complete symbol at the end. The following symbol indicates that the checklist is complete:

■ ■ ■ ■

The checklist complete symbol can also be in the body of the checklist. This only occurs when a checklist divides into two or more paths. Each path can have a checklist complete symbol at the end. The flight crew does not need to continue reading the checklist after the checklist complete symbol.

After completion of each non–normal checklist, the pilot monitoring states "___ CHECKLIST COMPLETE".

Additional information at the end of the checklist is not required to be read.

The flight crew must be aware that checklists cannot be created for all conceivable situations and are not intended to replace good judgment. In some situations, at the captain's discretion, deviation from a checklist may be needed.

Engine Malfunction Checklist Handling

The PM will announce the nature of the failure without identifying the engine, e.g. "ENGINE FIRE", "ENGINE FAILURE". When the aircraft is climbing away with the gear selected up, the PF will ask the PM to 'RESTATE FAILURE'. The PM will restate the failure and identify the engine. The PF will confirm the engine and nature of the failure. When at or above 400 ft AAL, with an appropriate Roll Mode annunciated, the PF will call for the appropriate checklist.

Note: There are no memory items associated with an engine rundown.

The PM will complete the memory items of the appropriate checklist. The actioning of reference items should only be accomplished when the flaps have been retracted.

Emergency Evacuation Checklist Handling

The Commander will decide if an evacuation is necessary, and call for the evacuation checklist. All other checklists will be stopped. PF shall bring the aircraft to a halt and set the parking brake before the checklist is started.

Whenever an evacuation is required, the Evacuation Checklist from the QRH must be used. The checklist is a reference procedure like other non-normal checklists but actions are allocated to individual pilots. Therefore the checklist shall be placed on the center console, the First Officer shall read the procedural steps, and each pilot shall action the steps as specified in the checklist with the other monitoring.

Non–Normal Checklist Legend

Redirection Symbol

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The redirection symbol is used in a non-normal checklist with the word “Go to”, to direct the flight crew to a different checklist or to a different step in the current checklist.

Separator Symbol

The separator symbol is used in two ways:

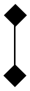
- In the Table of Contents of a system section, to separate the Quick Action Index checklists from the checklists that are not in the Quick Action Index.
- In a non-normal checklist, to separate the memory items from the reference items.

Task Divider Symbol

The task divider symbol is used to indicate the end of one task and the beginning of another task.

Decision Symbol

Choose one:



The decision symbol is used to identify possible choices.

Precaution Symbol

The precaution symbol is used to identify information the flight crew must consider before taking the action.

Intentionally
Blank

Evacuation Checklist is on the reverse side of this page.

Evacuation

Condition: Evacuation is needed.

1	Parking brake	Set	C
2	OUTFLOW VALVES MAN switches (both)	ON	F/O
3	OUTFLOW VALVES manual control	Hold in OPEN until the outflow valve indications show fully open to depressurize the airplane	F/O
4	FUEL CONTROL switches (all) . . .	CUTOFF	C
5	PA	"This is an Emergency. Evacuate Evacuate, (Hazard at __)"	C
6	Evacuation COMMAND switch	ON	C
7	Advise the tower.		F/O
8	Engine fire switches (all)	Pull	F/O
9	APU fire switch	Override and pull	F/O
10	**If** an engine or APU fire warning occurs:		
	Related fire switch	Rotate to the stop and hold for 1 second	F/O

■ ■ ■ ■