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PRELIMINARY PREFLIGHT PROCEDURE
(PF, read and do) < BRI >

IRS mode selectors . . . . OFF, then NAV PF

VOICE RECORDER switch . . . . ON PF

Do the remaining actions after a crew change or maintenance action:

Maintenance documents . . . . Check PF

FLIGHT DECK ACCESS SYSTEM switch . . . . . . OFF PF

Emergency equipment . . . . Check PF

PSEU light . . . . Verify extinguished PF

GPS light . . . . Verify extinguished PF

ILS light (G-FDZJ only) . . . . Verify extinguished PF

GLS light (G-FDZJ only) . . . . Verify extinguished PF

SERVICE INTERPHONE switch . . . . OFF PF

ENGINE panel . . . . Set PF

Oxygen panel . . . . Set PF

Landing gear indicator lights . . . . Verify illuminated PF

Flight recorder switch . . . . Guard closed PF

Circuit breakers (P6 panel) . . . . Check PF

Manual gear extension access door . . . . Closed PF

Circuit breakers
(control stand, P18 panel) . . . . Check PF

Parking brake . . . . Set PF

PREFLIGHT (PM) < BRI >

Oxygen . . . . Tested, 100% BOTH

Navigation transfer
and display switches . . . . NORMAL, AUTO PF

Window heat . . . . ON PF

Pressurization mode
selector . . . . AUTO PF

Flight instruments . . . . . Heading ___, Altimeter ___ BOTH

Parking brake . . . . Set PF

Engine start levers . . . . CUTOFF PF

Gear pins . . . . REMOVED PF

BEFORE START (F/O) < BRI >

Fuel	___ KGS, Pumps ON	C
Passenger signs	Set	C
Windows	Locked	BOTH
MCP	V2 ___, HEADING ___, ALTITUDE ___	C
Takeoff thrust	Selected ___°C/No assumed, ___K	C
Takeoff speeds	V1 ___, VR ___, V2 ___	BOTH
CDU preflight	Completed	C
Rudder and aileron trim	Free and 0	C
Taxi and takeoff briefing	Completed	C

– –

Flight deck door	Closed and locked	C
Anti collision light	ON	C

BEFORE TAXI (F/O) < BRI >

Generators	ON	C
Probe heat	ON	C
Anti-ice	ON / OFF	C
Isolation valve	AUTO/CLOSE	C
Engine start switches	CONT	C
Recall	Checked	C
Autobrake	RTO	C
Engine start levers	IDLE detent	C
Ground equipment	* Clear	BOTH

BEFORE TAKEOFF (F/O) < BRI >

Takeoff briefing	Reviewed	C
Engine bleeds	ON / OFF	C
Flaps	___, Green light	C
Stabilizer trim	___ Units	C
Flight controls	Checked	C
Cabin	* Secure	C

AFTER TAKEOFF (PM) < BRI >

Engine bleeds	ON	PM
Packs	AUTO	PM
Landing gear	UP and OFF	PM
Flaps	UP, No lights	PM
Altimeters	Set	BOTH

DESCENT (PM) < BRI >

Pressurization	LAND ALT ___	PM
Recall	Checked	PM
Autobrake	___	PM
Landing data	VREF___, Minimums ___	BOTH
Approach briefing	Completed	PM

APPROACH (PM) < BRI >

Altimeters	QNH___	BOTH
NAV aids	Set	PM

LANDING (PM) < BRI >

Cabin	Secure	PF
Engine start switches	CONT	PF
Speedbrake	ARMED	PF
Landing gear	Down	PF
Flaps	* ___, Green light	PF

SHUTDOWN (F/O) < BRI >

Fuel pumps	Set	C
Probe heat	OFF	C
Hydraulic panel	Set	C
Flaps	UP	C
Parking brake	Set	C
Engine start levers	CUTOFF	C
Weather radar	OFF	BOTH

SECURE (F/O) < BRI >

IRSs	OFF	C
Emergency exit lights	OFF	C
Window heat	OFF	C
Packs	OFF	C

If the aircraft is not handed over to a succeeding flight crew or maintenance personnel:

APU/GND PWR	OFF	C
Fuel pumps	OFF	C
Ground service switch	ON	C
Battery switch	OFF	C

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Emergency Descent < >

Condition: One or more of these occur:
- Cabin pressure cannot be controlled when the airplane is above 14,000 feet
- A rapid descent is needed.

1 Announce the emergency descent. PF will announce "CABIN CREW RAPID DESCENT, RAPID DESCENT" on the PA. The PM will set 7700 on the transponder, advise ATC and obtain the area altimeter setting.

2 Passenger signs . . . . ON

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

4 ENGINE START switches (both) . . . . CONT

5 Thrust levels (both) . . . . Reduce thrust to minimum or as needed for anti-ice

Autopilot and autothrottle should remain engaged.

6 Speedbrake . . . . .FLIGHT DETENT

> If structural integrity is in doubt, limit speed as much as possible and avoid high maneuvering loads.

7 Set target speed to Mmo/Vmo.

8 **When** approaching the level off altitude:

Smoothly lower the SPEED BRAKE lever to the DOWN detent and level off. Add thrust and stabilize on altitude and airspeed.

9 Crew oxygen regulators . . . . Normal

Flight crew must use oxygen when cabin altitude is above 10,000 feet. To conserve oxygen, move the regulator to Normal.

10 ENGINE START switches (both) . . . . . . .As needed

11 The new course of action is based on weather, oxygen, fuel remaining and available airports. Use of long range cruise may be needed.

■ ■ ■ ■

Bomb Threat <>

Condition: A suspicious article is found on the airplane, or a red or amber bomb threat has been made against the airplane and the flight crew has been advised.

1 Choose one:

◆If the airplane is **on the ground**:

PASSENGERS . . . . DISEMBARK

Disembark all passengers and crew with all hand baggage. Use stairs or jetways.

Use escape slides only in extreme emergencies.

■ ■ ■ ■

◆If the airplane is **in flight**:

Warning! Do not raise the cabin altitude.

▶▶**Go to step 2**

2 Maintain present flight and cabin altitude.

3 Fly at M0.76/280kts and avoid turbulence.

4 Avoid abrupt maneuvers and g-loads in order not to dislocate the explosive device.

5 Do not use speedbrakes.

6 Plan to land at the nearest suitable airport.

Airport elevation should not be higher than present cabin altitude to prevent triggering an altitude fuse.

Flight to selected airport should be performed at a flight altitude 2500 feet above present cabin altitude (which results in a cabin differential pressure of approximately 1psi) or MEA whichever is higher.

Check fuel required and reserves.

7 Cabin signs . . . . ON

8 Galley switch . . . . OFF

▼ Continued on next page ▼

▼ Bomb Threat <> continued ▼

9 CAB/UTIL switch . . . . OFF

10 IFE/PASS SEAT switch. . . . . OFF

Inform cabin crew of intentions.

If remaining flight time permits, a systematic bomb search may be performed. If a complete search cannot be carried out, inspect discretely the accessible areas.

If a suspicious device is discovered, it is preferred not to move it.

If needed, it is **recommended to relocate** a suspicious article according to the cabin crew bomb handling procedure (SEP Manual) **only after reaching differential pressure of 1psi.**

The least risk bomb location is door 4R.

11 Declare an emergency.

12 LAND ALT indicator . . . . Set present cabin altitude

13 **When** conditions permit:

Descend to 2500 feet above present cabin altitude or MEA, whichever is higher.

▼ Continued on next page ▼

▼ Bomb Threat <> continued ▼

14 Captain performs a PA announcement.

Example: "MAY I PLEASE HAVE YOUR ATTENTION. WE HAVE RECEIVED A WARNING THAT A DEVICE HAS BEEN PLACED ON BOARD THIS AIRCRAFT. WE CONSIDER THIS WARNING TO BE A HOAX, AS CALLS OF THIS NATURE HAVE BEEN RECEIVED BY AIRLINES MANY TIMES IN THE PAST. HOWEVER, AS YOUR SAFETY IS OF PARAMOUNT IMPORTANCE, WE MUST TAKE SUCH WARNINGS SERIOUSLY. I AM THEREFORE MAKING ARRANGEMENTS TO LAND AS SOON AS POSSIBLE, SO THAT A THOROUGH SEARCH OF THE AIRCRAFT CAN BE CARRIED OUT."

If applicable: "IN THE MEANTIME, THE CABIN CREW WILL BE CARRYING OUT A SEARCH AND I WOULD BE GRATEFUL FOR YOUR CO-OPERATION. I WOULD LIKE TO REPEAT THAT THIS WARNING IS ALMOST CERTAINLY A HOAX AND THERE IS NO CAUSE FOR ALARM. I WILL LET YOU KNOW AS SOON AS I HAVE ANY FURTHER INFORMATION."

15 **After** differential pressure zero is reached:

Cabin Crew . . . . Inform

Pressurization mode selector . . . . MAN

Outflow VALVE switch . . . . . Hold in OPEN until the outflow VALVE indicates fully open

16 Establish the landing configuration early.

The next two actions intend to establish an in-trim configuration which would avoid handling problems and allow a successful landing should an inflight explosion damage vital airplane systems.

Due consideration shall be given to the time/fuel/range situation.

▼ Continued on next page ▼

▼ Bomb Threat <> continued ▼

In a clearly defined situation or if the explosive device has been secured at door 4R, a high cruise speed may be more appropriate to minimize flight time.

17 Plan a flaps 15 landing.

18 Set VREF 15.

19 GROUND PROXIMITY
FLAP INHIBIT switch . . . . FLAP INHIBIT

20 Landing gear
(conditions and fuel permitting) . . . . Down

Extend landing gear except for flight over water.

21 Flaps (conditions and
fuel permitting) . . . . 15, Green light

22 Advise ATC of requirements for remote parking, passenger coaches and steps.

23 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Bomb Threat <> continued ▼

Deferred Items

Descent Checklist

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF 15, Minimums ___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

Landing Checklist

Cabin. . . . . Secure

ENGINE START switches. . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . **15, Green light**

After Landing Procedure Review

Follow ATC and security staff instructions.

Disembark passengers and crew with minimum delay with hand baggage when circumstances permit.

If bomb has been placed at door 4R, consider not using aft cabin doors.

■ ■ ■ ■

Ditching <>

Condition: Airplane ditching and evacuation are needed.

1 Send distress signals. Determine position, course, speed, altitude, situation, intention, time and position of intended touchdown and transmit mayday. Report type of aircraft and request intercept.

2 Alert the cabin crew to prepare for ditching and seat passengers as far forward as possible.

3 Burn off fuel to reduce touchdown speed and increase buoyancy.

4 Plan to touch down on the windward side and parallel to waves and swells.

5 Plan a flaps 40 landing unless another configuration is needed.

6 Set VREF 40.

7 Do **not** arm the autobrake.

8 Do **not** accomplish the normal landing checklist.

9 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ____

Recall . . . . Checked

Autobrake **. . . . . .OFF**

Landing data **. . . . . VREF 40**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ____

▼ Continued on next page ▼

▼ Ditching <> continued ▼

Below 5000 feet

LANDING GEAR AURAL WARN circuit breaker (P6-3:D18) . . . . Pull

This prevents the warning horn with gear retracted and landing flaps selected.

Passenger signs . . . . ON

Engine BLEED air switches (both) . . . . OFF

This allows the airplane to be depressurized with the outflow valve closed.

Pressurization mode selector . . . . MAN

Outflow VALVE switch . . . . Hold in CLOSE until outflow valve indicates fully closed

This prevents water from entering the airplane.

Note: The outflow valve takes up to 20 seconds to close.

APU switch . . . . OFF

GROUND PROXIMITY GEAR INHIBIT switch . . . . GEAR INHIBIT

GROUND PROXIMITY TERR INHIBIT switch . . . . TERR INHIBIT

Life vests, shoulder harnesses and seat belts . . . On

Confirm that passenger cabin preparations are complete.

Caution! Do not open aft entry or service doors as they may be partially submerged.

Transmit all pertinent information regarding final ditching position.

After Impact Procedure Review

Set both engine start levers to CUTOFF. This closes fuel shutoff valves to prevent discharge of fuel from ruptured fuel lines.

▼ Continued on next page ▼

▼ Ditching <> continued ▼

Open flight deck windows. This ensures no cabin differential pressure prevents the opening of the doors or emergency exits.

Start the evacuation.

Proceed to assigned ditching stations, launch rafts and evacuate the airplane as soon as practicable.

The airplane may stay afloat indefinitely if fuel load is minimal and no serious damage was sustained during landing.

Ditching Final

LANDING GEAR lever. . . . . UP and OFF

Flaps . . . . ___, Green light

At **500 feet**, the pilot monitoring will advise the cabin using the PA:

"CREW STATIONS, CREW STATIONS"

At **50 feet (or approximately 15 secs before impact)**, the pilot monitoring will advise the cabin using PA:

"BRACE, BRACE"

Maintain airspeed at VREF. Flare the airplane to achieve the minimum rate of descent at touchdown. Maintain 200-300 fpm rate of descent until the start of the flare.

At flare, rotate smoothly to a touchdown attitude of 10-12°. Maintain airspeed and rate of descent with thrust.

At touchdown, reduce thrust to idle.

■ ■ ■ ■

Hijack <>

Condition: Airplane has been hijacked.

1 Choose one:

◆**On the ground**:

Flight deck door. . . . . .Verify locked

ATC . . . . Inform

Use the phrase "Flight Deck Secure".

Do not takeoff.

Co-operate fully with the authorities.

▶▶**Go to step 2**

◆**In flight**:

Flight deck door. . . . . .Verify locked

ATC . . . . Inform

Declare an emergency and plan to land at the nearest suitable airport. Use the phrase "Flight Deck Secure".

Flight Deck door must remain locked.

Pass all relevant information to the authorities when possible.

Transponder code 7500.

Intercept Procedures are contained in the Jeppesen Flight Guide or Flight Deck Brief. Monitor 121.5 Mhz.

▶▶**Go to step 2**

2 On the ground 134.975 Mhz may be available for aircraft / ATC / Police use (UK only).

Note: Further information is contained in Ops Manual Part B SEP.

■ ■ ■ ■

Pilot Incapacitation <>

Condition: A pilot is considered to be incapacitated if they are unable to perform their proper duties. Indications may include:
- Lack of alertness and good humour
- Failure to respond to standard calls
- Abnormal behaviour.

1 Choose one:

◆Incapacitated pilot was operating as **PF**:

Call "I have control".

Autopilot. . . . . .Set

First Officer should engage autopilot B.

Captain should engage autopilot A.

▶▶**Go to step 2**

◆Incapacitated pilot was operating as **PM**:

▶▶**Go to step 2**

2 Call cabin crew for assistance. Ensure incapacitated pilot does not interfere with controls.

3 Ascertain whether there are medically qualified pax and type qualified flight crew available.

4 Declare an emergency and plan to land at the nearest airport. Consider the following factors:

Increased workload

Weather conditions

Familiarity with alternate airports.

5 Do **not** allow an incapacitated pilot to perform any further duties for the remainder of the flight.

6 Aim for being established earlier than normal.

7 Complete Normal Checklists.

8 Consider taxiing capability.

9 APU . . . . Start

10 Do **not** change seats until parking brake is set after landing.

■ ■ ■ ■

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AUTO UNLK

AUTOMATIC UNLOCK <>

Condition: The correct emergency code is entered.

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

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

---

2 Establish interphone communications with the cabin crew.

■ ■ ■ ■

CARGO DOOR

FWD CARGO	AFT CARGO

Condition: One or more cargo doors are not closed and secure.

1 Choose one:

◆Pressurization is **normal**:

Continue normal operation.

■ ■ ■ ■

◆Pressurization is **not** normal:

►►**Go to step 2**

2 Don oxygen masks.

3 Establish crew communications.

4 Passenger signs . . . . .ON

5 Choose one:

◆Airplane has **not** reached the planned cruise altitude:

Do **not** continue the climb.

Reset the FLT ALT indicator to the actual airplane altitude.

►►**Go to step 6**

◆Airplane **has** reached the planned cruise altitude:

►►**Go to step 6**

6 LAND ALT indicator . . . . .9,000 feet

▼ **Continued on next page** ▼

▼ CARGO DOOR continued ▼

7 Choose one:

◆ Minimum safe altitude is **at or below 9000 feet**:

▶▶**Go to step 8**

◆ Minimum safe altitude is **between 9000 feet and 13,000 feet**:

▶▶**Go to step 10**

◆ Minimum safe altitude is **at or above 13,000 feet**:

▶▶**Go to step 12**

8 Descend to 9000 feet.

9 Maintain a cabin differential pressure of 0 psi by limiting flight altitude to 9000 feet.

▶▶**Go to step 15**

10 Descend to the minimum safe altitude.

11 LAND ALT indicator . . . . . .Select a higher altitude (maximum 13,000 feet) to maintain a cabin differential pressure of 0 psi

Note: The intermittent cabin altitude/configuration warning horn will sound and the CABIN ALTITUDE lights (if installed and operative) will illuminate at a cabin altitude of approximately 10,000 feet.

▶▶**Go to step 15**

12 Descend to the minimum safe altitude.

13 Pressurization mode selector . . . . .MAN

14 Outflow VALVE switch . . . . Adjust to maintain a cabin differential pressure of 0 psi

Note: The intermittent cabin altitude/configuration warning horn will sound and the CABIN ALTITUDE lights (if installed and operative) will illuminate at a cabin altitude of approximately 10,000 feet.

15 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ CARGO DOOR continued ▼

16 **When** the cabin altitude is at or below 10,000 feet:

Oxygen masks may be removed.

■ ■ ■ ■

ELT

ELT

Condition: The emergency locator transmitter is on.

Objective: To reset the ELT.

1 **If** an uncommanded ELT activation occurs:

ELT switch . . . . ON, then ARM

■ ■ ■ ■

NOT ARMED

EMERGENCY EXIT LIGHTS NOT ARMED

Condition: The emergency exit lights switch is not ARMED.

1 Choose one:

◆EMER EXIT LIGHTS switch is **ON**:

Individual emergency exit light batteries supply a minimum of 10 minutes of lighting.

■ ■ ■ ■

◆EMER EXIT LIGHTS switch is **OFF**:

Emergency lighting is not available.

■ ■ ■ ■

ENTRY DOOR

FWD ENTRY **AFT ENTRY**

Condition: One or more entry doors are not closed and secure.

1 Instruct the cabin crew to verify that the door handle is in the closed position or to move the handle to the closed position if possible.

2 Choose one:

◆Handle is in the **closed** position:

►►**Go to step 3**

◆Handle is **not** in the closed position:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

3 Choose one:

◆Pressurization is **normal**:

Continue normal operation.

■ ■ ■ ■

◆Pressurization is **not** normal:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

EQUIP

EQUIPMENT DOOR

Condition: The equipment door is not closed and secure.

1 Choose one:

◆Pressurization is **normal**:

Continue normal operation.

■ ■ ■ ■

◆Pressurization is **not** normal:

►►**Go to step 2**

2 Don oxygen masks.

3 Establish crew communications.

4 Passenger signs . . . . .ON

5 Choose one:

◆Airplane has **not** reached the planned cruise altitude:

Do **not** continue the climb.

Reset the FLT ALT indicator to the actual airplane altitude.

►►**Go to step 6**

◆Airplane **has** reached the planned cruise altitude:

►►**Go to step 6**

6 LAND ALT indicator . . . . .9,000 feet

7 Choose one:

◆Minimum safe altitude is **at or below 9000 feet**:

►►**Go to step 8**

◆Minimum safe altitude is **between 9000 feet and 13,000 feet**:

►►**Go to step 10**

◆Minimum safe altitude is **at or above 13,000 feet**:

►►**Go to step 12**

▼ **Continued on next page** ▼

▼ **EQUIPMENT DOOR continued** ▼

8 Descend to 9000 feet.

9 Maintain a cabin differential pressure of 0 psi by limiting flight altitude to 9000 feet.

▶▶**Go to step 15**

10 Descend to the minimum safe altitude.

11 LAND ALT indicator . . . . . . Select a higher altitude (maximum 13,000 feet) to maintain a cabin differential pressure of 0 psi

Note: The intermittent cabin altitude/configuration warning horn will sound and the CABIN ALTITUDE lights (if installed and operative) will illuminate at a cabin altitude of approximately 10,000 feet.

▶▶**Go to step 15**

12 Descend to the minimum safe altitude.

13 Pressurization mode selector . . . . MAN

14 Outflow VALVE switch . . . . Adjust to maintain a cabin differential pressure of 0 psi

Note: The intermittent cabin altitude/configuration warning horn will sound and the CABIN ALTITUDE lights (if installed and operative) will illuminate at a cabin altitude of approximately 10,000 feet.

15 Plan to land at the nearest suitable airport.

16 **When** the cabin altitude is at or below 10,000 feet:

Oxygen masks may be removed.

■ ■ ■ ■

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.

1 **If** conditions allow:

FLIGHT DECK ACCESS SYSTEM switch . . . OFF

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

■ ■ ■ ■

OVERWING DOOR

LEFT FWD OVERWING	LEFT AFT OVERWING	RIGHT FWD OVERWING	RIGHT AFT OVERWING

Condition: One or more overwing doors are not closed and secure.

1 Choose one:

◆ Pressurization is **normal**:

Continue normal operation.

■ ■ ■ ■

◆ Pressurization is **not** normal:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

PASS OXY ON

PASSENGER OXYGEN ON

Condition: The passenger oxygen system is on.

■ ■ ■ ■

SERVICE DOOR

FWD SERVICE	AFT SERVICE

Condition: One or more service doors are not closed and secure.

1 Instruct the cabin crew to verify that the door handle is in the closed position or to move the handle to the closed position if possible.

2 Choose one:

◆Handle is in the **closed** position:

▶▶**Go to step 3**

◆Handle is **not** in the closed position:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

3 Choose one:

◆Pressurization is **normal**:

Continue normal operation.

■ ■ ■ ■

◆Pressurization is **not** normal:

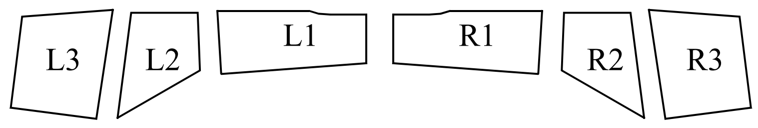
Plan to land at the nearest suitable airport.

■ ■ ■ ■

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 differential pressure and descend if a structural pane is shattered or cracked.



1 Choose one:

◆Window is **delaminated** only:

Continue normal operation.

■ ■ ■ ■

◆Window is **arcing**, **cracked** or **shattered**:

►►**Go to step 2**

2 Don seat belts and shoulder harnesses.

3 WINDOW HEAT switch (affected window). . . . . OFF

Limit airspeed to 250 knots maximum below 10,000 feet.

4 Pull both WINDSHIELD AIR controls. This vents conditioned air to the inside of the windshield for defogging.

5 **If** the **cracked or shattered** condition exists on:

Window 1 or 2 **outer** pane

Window 3 heated **outer** pane

►►**Go to step 7**

▼ Continued on next page ▼

▼ Window Damage continued ▼

6 **If** the **cracked or shattered** condition exists on:

Window 1 or 2 **inner** pane

Window 3 heated **inner** pane

►►**Go to step 9**

7 Continue normal operation.

8 Shoulder harnesses may be removed.

■ ■ ■ ■

9 Don oxygen masks.

10 Establish crew communications.

11 Passenger signs . . . . ON

12 Choose one:

◆Airplane has **not** reached the planned cruise altitude:

Do **not** continue the climb.

Reset the FLT ALT indicator to the actual airplane altitude.

►►**Go to step 13**

◆Airplane **has** reached the planned cruise altitude:

►►**Go to step 13**

13 LAND ALT indicator . . . . .9,000 feet

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

15 Plan to land at the nearest suitable airport.

16 **When** cabin differential pressure is 2 psi or less:

Oxygen masks and shoulder harnesses may be removed.

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

■ ■ ■ ■

Window Open

Condition: A side window opens during takeoff or in flight.

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

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

3 Close and lock the window.

4 Choose one:

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

Continue normal operation.

■ ■ ■ ■

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

Level off at the lowest safe altitude.

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

■ ■ ■ ■

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CABIN ALTITUDE WARNING or Rapid Depressurization

CABIN ALTITUDE **(If installed and operative)**

Condition: One or more of these occur:
- A cabin altitude exceedance
- In flight, the intermittent cabin altitude/configuration warning horn sounds and the CABIN ALTITUDE lights (if installed and operative) illuminate.

1 Don oxygen masks and set regulators to 100%.

2 Establish crew communications.

3 Pressurization mode selector . . . . MAN

4 Outflow VALVE switch . . . . Hold in CLOSE until outflow VALVE indicates fully closed

5 **If** cabin altitude is **not** controllable:

Passenger signs . . . . ON

If the cabin altitude exceeds or is expected to exceed 14,000 feet:

PASS OXYGEN switch . . . . ON

▶▶**Go to the Emergency Descent < > checklist on page 0.1**

■ ■ ■ ■

- -

6 **If** cabin altitude is **controllable**:

Continue manual operation to maintain correct cabin altitude.

When the cabin altitude is at or below 10,000 feet:

Oxygen masks may be removed.

■ ■ ■ ■

AUTO FAIL <> or Unscheduled Pressurization Change <>

AUTO FAIL — **May or may not be illuminated**

Condition: One or more of these occur:
- Automatic pressurization mode has failed
- The cabin altitude is not controllable.

Objective: To maintain control of cabin altitude.

1 Increasing thrust may ensure sufficient air supply to control cabin altitude.

One at a time.

2 Engine BLEED air switches (both). . . . Verify ON

One at a time. Allow cabin rate to stabilize before placing second switch to AUTO.

3 PACK switches (both) . . . . Verify AUTO

4 Choose one:

◆AUTO FAIL light is **extinguished and** cabin altitude is **controllable**:

■ ■ ■ ■

◆AUTO FAIL light is **illuminated or** cabin altitude is **not** controllable:

Pressurization mode selector. . . . . . ALTN

▶▶**Go to step 5**

5 Choose one:

◆AUTO FAIL light is **extinguished and** cabin altitude is **controllable**:

Continue normal operation.

■ ■ ■ ■

◆AUTO FAIL light is **illuminated or** cabin altitude is **not** controllable:

▶▶**Go to step 6**

6 Pressurization mode selector . . . . .MAN

▼ **Continued on next page** ▼

▼ AUTO FAIL or Unscheduled Pressurization Change <> continued ▼

7 Outflow VALVE switch . . . . Adjust as needed to maintain correct cabin altitude and cabin rate of change

8 Choose one:

◆Cabin altitude is **controllable**:

▶▶**Go to step 13**

◆Cabin altitude is **not** controllable:

▶▶**Go to step 9**

9 Don oxygen masks and set regulators to 100%.

10 Establish crew communications.

11 Passenger signs . . . . ON

12 **If** the cabin altitude exceeds or is expected to exceed 14,000 feet:

PASS OXYGEN switch . . . . ON

▶▶**Go to the Emergency Descent < > checklist on page 0.1**

■ ■ ■ ■

13 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ **AUTO FAIL or Unscheduled Pressurization Change <> continued** ▼

Deferred Items

Descent Checklist

Pressurization . . . **Adjust outflow VALVE switch as needed to maintain correct cabin altitude and cabin rate of change**

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

At Pattern Altitude

Outflow VALVE switch . . . . Hold in OPEN until outflow VALVE position indicates fully open

Landing Checklist

Cabin. . . . . Secure

ENGINE START switches. . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

BLEED TRIP OFF

BLEED TRIP OFF

Condition: One or more these occur:
- An engine bleed air overheat
- An engine bleed air overpressure.

1 WING ANTI-ICE switch . . . . OFF

2 TRIP RESET switch . . . . .Push

The BLEED TRIP OFF light extinguishes if the bleed air temperature has cooled below limits.

3 Choose one:

◆BLEED TRIP OFF light **stays illuminated**:

PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with flaps up.

Avoid icing conditions.

■ ■ ■ ■

◆BLEED TRIP OFF light **extinguishes**:

►►**Go to step 4**

4 WING ANTI-ICE switch . . . . .As needed

Caution! Use of wing anti-ice above approximately FL350 may cause bleed trip off and possible loss of cabin pressure.

■ ■ ■ ■

DUAL BLEED

DUAL BLEED

Condition: The APU bleed valve is open and one of these occurs:
- BLEED 1 air switch is on
- BLEED 2 air switch is on and the ISOLATION VALVE is open.

Objective: To prevent possible backpressure of the APU.

1 Limit engine thrust to idle while the light is illuminated.

2 **After** engine start:

APU BLEED air switch . . . . OFF

■ ■ ■ ■

OFF

EQUIPMENT COOLING OFF

Condition: The equipment cooling supply or exhaust fan is failed.

1 EQUIP COOLING SUPPLY or EXHAUST switch (affected side) . . . . ALTN

Note: Illumination of the EQUIP COOLING SUPPLY or EXHAUST OFF light may be an indication of a pressurization problem. Ensure the pressurization system is operating normally.

2 No further action is necessary in flight if the equipment cooling OFF light does not extinguish.

■ ■ ■ ■

OFF SCHED DESCENT

OFF SCHEDULE DESCENT

Condition: A descent is started before reaching the planned cruise altitude set in the FLT ALT indicator.

1 Choose one:

◆**Landing** at airport of departure:

Continue normal operation.

■ ■ ■ ■

◆**Not** landing at airport of departure:

FLT ALT indicator . . . . Reset to actual airplane altitude

■ ■ ■ ■

PACK

PACK

Condition: One or more of these occur:
- The primary and standby pack controls are failed
- A pack overheat.

1 Temperature selectors (all). . . . . . Select warmer temperature

This reduces the workload on the affected air conditioning pack.

2 TRIP RESET switch . . . . Push

If the PACK light illuminated as a result of the pack temperature exceeding limits, the light extinguishes if the pack temperature has cooled below limits.

3 Choose one:

◆**Both** PACK lights are **extinguished**:

Continue normal operation.

■ ■ ■ ■

◆**A single** PACK light **stays illuminated**:

ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side). . . . . OFF

■ ■ ■ ■

◆**Both** PACK lights **stay illuminated**:

Note: Both pack valves may have closed resulting in a gradual loss of cabin pressure and an eventual CABIN ALTITUDE warning.

►►**Go to step 4**

4 Descend to the lowest safe altitude, or 10,000 feet, whichever is higher. Monitor cabin altitude and rate.

5 **When** at level off:

Maintain 290 knots minimum. Flight deck and cabin temperatures may increase rapidly at speeds below 290 knots.

▼ Continued on next page ▼

▼ PACK continued ▼

6 Choose one:

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

▶▶**Go to step 7**

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

Don oxygen masks.

Establish crew communications.

▶▶**Go to step 7**

7 Pressurization mode selector . . . . MAN

8 Outflow VALVE switch . . . . Hold in OPEN until outflow VALVE position indicates fully open

This increases airplane ventilation.

9 R RECIRC FAN switch . . . . AUTO

10 L RECIRC FAN switch . . . . OFF

11 **If** flight deck and cabin temperatures are excessively warm:

Open the flight deck door. This improves flight deck ventilation.

Use flight deck window shades, as needed.

Instruct the cabin crew to:

Dim cabin lighting.

G-FDZA - G-FDZS
Turn off in-flight entertainment systems.

Close cabin window shades.

G-FDZA - G-FDZS
CAB/UTIL switch . . . . OFF

G-FDZA - G-FDZS
IFE/PASS SEAT switch. . . . . OFF

G-CDZH - G-CDZM
GALLEY switch . . . . OFF

■ ■ ■ ■

WING-BODY OVERHEAT

WING-BODY OVERHEAT

Condition: An overheat from a bleed duct leak occurs.

Objective: To isolate the bleed duct leak.

1 ISOLATION VALVE switch. . . . . CLOSE

2 Choose one:

◆**Right** WING-BODY OVERHEAT light illuminated:

►►**Go to step 3**

◆**Left** WING-BODY OVERHEAT light illuminated:

►►**Go to step 7**

3 R PACK switch . . . . OFF

This causes the operating pack to regulate to high flow in flight with the flaps up.

4 BLEED 2 air switch . . . . OFF

5 WING ANTI-ICE switch . . . . OFF

This prevents possible asymmetrical ice buildup on the wings.

6 Avoid icing conditions where wing anti-ice is needed.

■ ■ ■ ■

7 L PACK switch . . . . OFF

This causes the operating pack to regulate to high flow in flight with the flaps up.

8 BLEED 1 air switch . . . . OFF

9 WING ANTI-ICE switch . . . . OFF

This prevents possible asymmetrical ice buildup on the wings.

10 Avoid icing conditions where wing anti-ice is needed.

▼ Continued on next page ▼

▼ **WING-BODY OVERHEAT continued** ▼

11 Choose one:

◆WING-BODY OVERHEAT light **extinguishes**:

■ ■ ■ ■

◆WING-BODY OVERHEAT light **stays illuminated**:

►►**Go to step 12**

12 Choose one:

◆APU is **running**:

APU BLEED air switch (if needed) . . . OFF

This stops the flow of bleed air from the APU to the left side of the pneumatic ducting.

►►**Go to step 13**

◆APU is **not** running:

■ ■ ■ ■

13 Choose one:

◆WING-BODY OVERHEAT light **extinguishes**:

►►**Go to step 15**

◆WING-BODY OVERHEAT light **stays illuminated**:

APU switch . . . . OFF

Do **not** start the APU for the rest of the flight.

►►**Go to step 14**

14 Choose one:

◆WING-BODY OVERHEAT light **extinguishes**:

►►**Go to step 15**

◆WING-BODY OVERHEAT light **stays illuminated**:

■ ■ ■ ■

15 ISOLATION VALVE switch . . . . AUTO

▼ **Continued on next page** ▼

▼ **WING-BODY OVERHEAT continued** ▼

16 BLEED 1 air switch . . . . .ON

17 L PACK switch . . . . AUTO

18 WING ANTI-ICE switch . . . . .As needed

19 Choose one:

◆WING-BODY OVERHEAT light **stays extinguished**:

■ ■ ■ ■

◆WING-BODY OVERHEAT light **illuminates again**:

▶▶**Go to step 20**

20 ISOLATION VALVE switch. . . . . CLOSE

21 BLEED 1 air switch . . . . OFF

22 L PACK switch . . . . OFF

23 WING ANTI-ICE switch . . . . OFF

24 Avoid icing conditions where wing anti-ice is needed.

25 The APU can be used during the rest of the flight, if needed.

■ ■ ■ ■

ZONE TEMP

ZONE TEMP

Condition: One or more of these occur:
- A zone duct overheat
- Flight deck temperature control is failed.

1 Temperature selector (affected cabin) . . . . .Select a cooler temperature

This prevents the trim air modulating valve from returning to an overheat condition.

2 TRIP RESET switch . . . . .Push

The ZONE TEMP light extinguishes if the duct temperature has cooled below limits.

3 **If** duct temperature increases rapidly:

TRIM AIR switch. . . . . OFF

■ ■ ■ ■

Intentionally
Blank

Non-Normal Checklists — Chapter NNC

Anti-Ice, Rain — Section 3

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COWL ANTI-ICE

ENGINE COWL ANTI-ICE

Condition: An engine cowl anti-ice duct overpressure occurs.

Objective: To reduce cowl duct pressure by reducing thrust.

1 **If** flight conditions allow:

Autothrottle (if engaged). . . . . .Disengage

Thrust lever (affected engine) . . . . Retard until the COWL ANTI-ICE light extinguishes

■ ■ ■ ■

COWL VALVE OPEN

ENGINE COWL VALVE OPEN OR TAI INDICATION

Condition: An engine COWL VALVE OPEN light stays illuminated bright blue and an amber TAI indication is shown if the cowl anti-ice valve is not in the commanded position.

1 Choose one:

◆ENG ANTI-ICE switch is **ON**:

The cowl anti-ice valve is failed closed.

Avoid icing conditions.

■ ■ ■ ■

◆ENG ANTI-ICE switch is **OFF**:

The cowl anti-ice valve is failed open.

►►**Go to step 2**

2 **If** TAT is **above 10°C**:

Limit thrust on the affected engine to 80% N1 if possible.

■ ■ ■ ■

PROBE HEAT

CAPT PITOT	L ELEV PITOT	L ALPHA VANE	TEMP PROBE
F/O PITOT	R ELEV PITOT	R ALPHA VANE	AUX PITOT

Condition: One or more probe heats are failed.

1 Avoid icing conditions.

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

■ ■ ■ ■

OFF

WINDOW HEAT OFF

G-FDZA - G-FDZS

Condition: One of the following occurs:
- An overheat due to high ambient temperature
- A system failure.

1 Choose one:

◆On the **ground**:

WINDOW HEAT switches (all) . . . . .ON

WINDOW HEAT TEST switch . . . . .PWR

►►**Go to step 2**

◆**In flight**:

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

Limit airspeed to 250 knots maximum below 10,000 feet.

Pull both WINDSHIELD AIR controls. This vents conditioned air to the inside of the windshield for defogging.

■ ■ ■ ■

▼ Continued on next page ▼

▼ **WINDOW HEAT OFF continued** ▼

2 Choose one:

◆**All** WINDOW HEAT OFF lights are **extinguished**:

Continue normal operation. Power has been removed from the window for overheat protection.

■ ■ ■ ■

◆**Any** WINDOW HEAT OFF light **stays illuminated**:

The window heat system is inoperative.

■ ■ ■ ■

OVERHEAT

WINDOW OVERHEAT

Condition: A window overheat occurs.

1 WINDOW HEAT switch (affected window) . . . OFF

2 **Wait** 2 - 5 minutes.

3 WINDOW HEAT switch (affected window) . . . . ON

4 Choose one:

◆Window OVERHEAT light **stays extinguished**:

Continue normal operation.

■ ■ ■ ■

◆Window OVERHEAT light **illuminates again**:

▶▶**Go to step 5**

5 WINDOW HEAT switch (affected window) . . . OFF

Limit airspeed to 250 knots maximum below 10,000 feet.

6 Pull both WINDSHIELD AIR controls. This vents conditioned air to the inside of the windshield for defogging.

■ ■ ■ ■

WING ANTI-ICE VALVE OPEN

L VALVE OPEN	R VALVE OPEN

Condition: A wing anti-ice L VALVE OPEN or R VALVE OPEN light stays illuminated bright blue if the wing anti-ice valve is not in the commanded position.

1 Choose one:

◆WING ANTI-ICE switch is **ON**:

The wing anti-ice valve is failed closed.

WING ANTI-ICE switch . . . . OFF

Avoid icing conditions where wing anti-ice is needed.

■ ■ ■ ■

◆WING ANTI-ICE switch is **OFF**:

The wing anti-ice valve is failed open.

►►**Go to step 2**

2 **If** TAT is **above 10°C or** there is **no** visible moisture:

ISOLATION VALVE switch . . . . CLOSE

PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with the flaps up.

Engine BLEED air switch (affected side) . . OFF

Wing anti-ice is not available on the affected side with the ISOLATION VALVE switch closed.

■ ■ ■ ■

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AUTOPILOT DISENGAGE

A/P
P/RST

Condition:	All autopilots are disengaged. The red light flashes and the aural tone sounds.

1 Fly the airplane manually or re–engage an autopilot.

■ ■ ■ ■

AUTOTHROTTLE DISENGAGE

A/T
P/RST

Condition:	The autothrottle is disengaged. The red light flashes.

1 Control thrust manually or re–engage the autothrottle.

■ ■ ■ ■

NO AUTOLAND

G-FDZA - G-FDZG, G-FDZR, G-FDZS

Condition:	Autoland is not available.

■ ■ ■ ■

NO LAND 3

G-FDZA - G-FDZG, G-FDZR, G-FDZS

Condition:	The autoland system does not have the redundancy needed for LAND 3 operations.

■ ■ ■ ■

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ACARS Electrical Power Loss

G-FDZA - G-FDZS

Condition: ACARS AC power is lost.

Note: The ACARS automatically reverts to VOX MODE. The DATA MODE is inoperative.

■ ■ ■ ■

ACARS MU Fail or DU Fail

G-FDZA - G-FDZS

Condition: The ACARS system is failed.

1 Use normal voice procedures for reporting.

■ ■ ■ ■

Radio Transmit Continuous (Stuck Microphone Switch)

Condition: A radio transmits continuously without crew input.

1 MIC SELECTOR switches (all audio selector panels) . . . . .FLT INT

This deselects radios and stops radio transmissions.

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

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

■ ■ ■ ■

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BAT DISCHARGE

BATTERY DISCHARGE

Condition: A battery discharge exceedance occurs.

Note: Fully charged batteries supply a minimum of 60 minutes of standby power.

■ ■ ■ ■

DRIVE

DRIVE

Condition: A generator drive malfunction occurs.

Action is not reversible.

1 Generator drive DISCONNECT switch (affected side) . . . . . Confirm . . . . Hold in the DISCONNECT position momentarily

This prevents generator drive damage.

2 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch (affected side) . . . . ON

■ ■ ■ ■

◆APU is **not** available:

Plan to land at the nearest suitable airport. Only one main AC power source remains.

■ ■ ■ ■

ELEC

ELEC

Condition: A standby power or DC system fault occurs.

Note: The ELEC light illuminates on the ground only.

■ ■ ■ ■

LOSS OF BOTH ENGINE DRIVEN GENERATORS

GEN 1 & 2	GEN 1 & 2	GEN 1 & 2
TRANSFER BUS OFF	SOURCE OFF	GEN OFF BUS

Condition: Both engine driven generators are off.

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

1 Engine GEN switches (both). . . ON, one at a time

2 Choose one:

◆**A single** SOURCE OFF light **stays illuminated**:

▶▶**Go to step 3**

◆**Both** SOURCE OFF lights **stay illuminated**:

▶▶**Go to step 5**

◆**Both** SOURCE OFF lights **extinguish**:

YAW DAMPER switch . . . . .ON

▶▶**Go to step 15**

A single SOURCE OFF light stays illuminated

3 YAW DAMPER switch . . . . .ON

▼ Continued on next page ▼

▼ LOSS OF BOTH ENGINE DRIVEN GENERATORS continued ▼

4 Choose one:

◆APU is **available** for start:

Note: APU start attempts are not recommended above 25,000 feet.

APU . . . . START

When APU is running:

APU GEN switch (affected side) . . . . .ON

▶▶**Go to step 15**

◆APU is **not** available:

Plan to land at the nearest suitable airport. Only one main AC power source remains.

▶▶**Go to step 15**

Both SOURCE OFF lights stay illuminated

5 Choose one:

◆APU is **available** for start:

BUS TRANSFER switch . . . . OFF

ELEC HYD PUMP switches (both) . . . . OFF

Note: APU start attempts are not recommended above 25,000 feet. With both buses off, only one start attempt is recommended. Multiple start attempts reduce standby power capacity.

APU . . . . START

▶▶**Go to step 6**

◆APU is **not** available:

▶▶**Go to step 12**

6 **When** APU is running:

APU GEN switches (both) . . . . ON, one at a time

▼ Continued on next page ▼

▼ LOSS OF BOTH ENGINE DRIVEN GENERATORS continued ▼

7 **If** REMOTE CONTROL circuit breaker (RCCB REMOTE) (STBY power control unit, P6-5:A4) is tripped:

Reset circuit breaker.

8 Choose one:

◆**A single or both** SOURCE OFF lights **extinguish**:

►►**Go to step 9**

◆**Both** SOURCE OFF lights **stay illuminated**:

►►**Go to step 12**

9 BUS TRANSFER switch . . . . AUTO

This restores power to the remaining transfer bus if one BUS OFF light stays illuminated.

10 ELEC HYD PUMP switches (both) . . . . ON, one at a time

11 YAW DAMPER switch . . . . .ON

►►**Go to step 15**

Both SOURCE OFF lights stay illuminated

12 Avoid icing conditions.

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

13 Plan to land at the nearest suitable airport.

Note: Fully charged batteries supply a minimum of 60 minutes of standby power.

14 The right IRS will operate on DC power for 5 minutes.

▼ Continued on next page ▼

▼ LOSS OF BOTH ENGINE DRIVEN GENERATORS continued ▼

15 Choose one:

◆**Both** the captain's and first officer's primary attitude displays are **operative and** ATT flags are **not** shown:

■ ■ ■ ■

◆**Both** the captain's and first officer's primary attitude displays are **failed**:

►►**Go to step 16**

◆**Only** the **first officer's** primary attitude display is **failed**:

IRS TRANSFER switch . . . . BOTH ON L

Do **not** use either autopilot.

If both SOURCE OFF lights **stay illuminated**:

The left IRS will operate as long as battery power remains.

Plan to land at the nearest suitable airport.

■ ■ ■ ■

Action is not reversible. Do this step only if **both** the captain's and first officer's primary attitude displays are **failed**.

16 IRS MODE selectors (both) . . . . .ATT

Maintain straight and level, constant airspeed flight until attitude displays recover (approximately 30 seconds).

Note: The primary attitude displays will stay failed and the SET IRS HDG prompt will not appear on the POS INIT page until the attitude mode alignment is complete.

17 Enter magnetic heading on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

▼ Continued on next page ▼

18 The MAP display is not available.

19 Enter updated heading periodically on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

20 Do **not** use either autopilot.

■ ■ ■ ■

SOURCE OFF

SOURCE OFF

Condition: The transfer bus is not powered by the last selected source.

1 **If both** SOURCE OFF lights are illuminated:

▶▶**Go to the LOSS OF BOTH ENGINE DRIVEN GENERATORS checklist on page 6.2**

■ ■ ■ ■

2 Engine GEN switch (affected side) . . . . .ON

3 Choose one:

◆SOURCE OFF light **extinguishes**:

■ ■ ■ ■

◆SOURCE OFF light **stays illuminated**:

▶▶**Go to step 4**

4 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch (affected side) . . . . .ON

▶▶**Go to step 5**

◆APU is **not** available:

Plan to land at the nearest suitable airport. Only one main AC power source remains.

■ ■ ■ ■

▼ Continued on next page ▼

▼ SOURCE OFF continued ▼

5 Choose one:

◆SOURCE OFF light **extinguishes**:

■ ■ ■ ■

◆SOURCE OFF light **stays illuminated**:

Plan to land at the nearest suitable airport. Only one main AC power source remains.

■ ■ ■ ■

STANDBY PWR OFF

STANDBY POWER OFF

Condition: One or more of these buses are not energized:
- AC standby bus
- DC standby bus
- Battery bus.

1 STANDBY POWER switch . . . . BAT

■ ■ ■ ■

TR UNIT

TR UNIT

Condition: One or more transformer rectifiers are failed.

1 Do not use the AFDS approach mode.

Note: Autoland is not available.

■ ■ ■ ■

TRANSFER BUS OFF

TRANSFER BUS OFF

Condition: The transfer bus is not energized.

1 Engine GEN switch (affected side) . . . . .ON

2 Choose one:

◆TRANSFER BUS OFF light **extinguishes**:

■ ■ ■ ■

◆TRANSFER BUS OFF light **stays illuminated**:

▶▶**Go to step 3**

3 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . .ON

■ ■ ■ ■

◆APU is **not** available:

Plan to land at the nearest suitable airport.
Only one main AC power source remains.

■ ■ ■ ■

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Aborted Engine Start

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

Objective: To shut down the engine and motor it.

1 Engine start lever (affected engine) . . . . CUTOFF

- -

2 Choose one:

◆ENGINE START switch is in **GRD**:

Motor the engine for 60 seconds.

ENGINE START switch (affected engine) . . . . OFF

■ ■ ■ ■

◆ENGINE START switch is in **OFF**:

►►**Go to step 3**

3 **After** N2 decreases below 20%:

ENGINE START switch (affected engine) . . . . GRD

Motor the engine for 60 seconds.

ENGINE START switch (affected engine) . . . . OFF

■ ■ ■ ■

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
- There is no response to thrust lever movement.

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

1 Autothrottle (if engaged). . . . . .Disengage

2 Thrust lever
(affected engine) . . . . Confirm. . . . .Retard until indications stay within limits or the thrust lever is closed

- -

3 Choose one:

◆Engine indications are **stabilized** and EGT **decreases**:

▶▶**Go to step 4**

◆Engine indications are **not** normal or EGT continues to **increase**:

▶▶**Go to step 5**

4 Thrust lever
(affected engine) . . . . Advance slowly while checking RPM and EGT follow thrust lever movement

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

■ ■ ■ ■

5 Engine start lever
(affected engine) . . . . Confirm. . . . . CUTOFF

▼ Continued on next page ▼

▼ **Engine Limit or Surge or Stall continued** ▼

6 PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with flaps up.

7 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch (affected side) . . . . ON

▶▶**Go to step 8**

◆APU is **not** available:

▶▶**Go to step 8**

8 Balance fuel as needed.

G-FDZA - G-FDZS

9 Transponder mode selector . . . . TA

This prevents climb commands which can exceed single engine performance capability.

G-CDZH - G-CDZM

10 Transponder mode selector . . . . TA ONLY

This prevents climb commands which can exceed single engine performance capability.

11 **If** wing anti-ice is needed:

ISOLATION VALVE switch . . . . AUTO

12 Plan to land at the nearest suitable airport.

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

G-CDZH - G-CDZM, G-FDZJ

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.18**

G-FDZA - G-FDZG, G-FDZR, G-FDZS

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.20**

■ ■ ■ ■

Loss Of Thrust On Both Engines

Condition: Both of these occur:
- Both engines have a loss of thrust
- Both ENG FAIL alerts show.

Objective: To restart at least one engine.

1 ENGINE START switches (both) . . . . FLT

2 Engine start levers (both) . . . . CUTOFF

3 **When** EGT decreases:

Engine start levers (both) . . . . IDLE detent

4 **If** EGT reaches 950°C or there is no increase in EGT within 30 seconds:

Engine start lever (affected engine) . . . . Confirm . . . . . CUTOFF, then IDLE detent

If EGT again reaches 950°C or there is no increase in EGT within 30 seconds, repeat as needed.

Note: Engines may accelerate to idle very slowly, especially at high altitudes or in heavy precipitation. If N2 is steadily increasing and EGT stays within limits, do not interrupt the start.

5 At or above FL270, set airspeed to 275 knots. Below FL270, set airspeed to 300 knots.

6 Choose one:

◆APU is **available** for start:

▶▶**Go to step 7**

◆APU is **not** available:

▶▶**Go to step 9**

Do **not** wait for successful engine start(s) before starting the APU.

7 APU . . . . START

▼ Continued on next page ▼

▼ Loss Of Thrust On Both Engines continued ▼

8 **When** APU is running:

APU GEN switches (both) . . . . ON, one at a time

9 Choose one:

◆**One or both** engines **start**:

▶▶**Go to step 13**

◆**Neither** engine starts:

▶▶**Go to step 10**

10 Choose one:

◆**N2** is **above 11%**:

Attempt a windmill start.

▶▶**Go to step 11**

◆**N2** is **at or below 11%**:

Attempt a starter assisted start.

▶▶**Go to step 14**

11 Thrust levers (both) . . . . Close

12 Engine start lever (**either**) . . . . . . Confirm. . . . . . . CUTOFF, then IDLE detent

Note: The engine may accelerate to idle very slowly. If N2 is steadily increasing and EGT stays within limits, do not interrupt the start.

13 **When** engine parameters have stabilized:

ENGINE START switch (operating engine) . . . . .As needed

Thrust lever (operating engine) . . . . Advance slowly

Engine GEN switch (operating engine side). . . . . .ON

Note: The Engine In-Flight Start checklist will be used to start the other engine, if needed.

▶▶**Go to step 23**

▼ Continued on next page ▼

▼ Loss Of Thrust On Both Engines continued ▼

14 Thrust levers (both) . . . . Close

15 WING ANTI–ICE switch . . . . OFF

16 PACK switches (both) . . . . OFF

17 APU BLEED air switch . . . . .ON

18 Ignition select switch . . . . BOTH

19 Engine start
lever (**either**) . . . . . . Confirm. . . . . CUTOFF

20 ENGINE START switch . . . . .GRD

21 **When** N2 is at or above 11%:

Engine start lever . . . . IDLE detent

Note: The engine may accelerate to idle very slowly. If N2 is steadily increasing and EGT stays within limits, do not interrupt the start.

22 **When** engine parameters have stabilized:

APU BLEED air switch . . . . OFF

ENGINE START switch
(operating engine) . . . . .As needed

Thrust lever
(operating engine) . . . . Advance slowly

Engine GEN switch
(operating engine side) . . . . .ON

PACK switch
(operating engine side) . . . . AUTO

Note: The Engine In-Flight Start checklist will be used to start the other engine, if needed.

▼ Continued on next page ▼

▼ Loss Of Thrust On Both Engines continued ▼

23 Choose one:

◆**Both** the captain's and first officer's primary attitude displays are **operative and** ATT flags are **not** shown:

►►**Go to step 29**

◆**Both** the captain's and first officer's primary attitude displays are **failed**:

►►**Go to step 24**

◆**Only** the **first officer's** primary attitude display is **failed**:

IRS TRANSFER switch . . . . BOTH ON L

Do **not** use either autopilot.

►►**Go to step 29**

Action is not reversible. Do this step only if **both** the captain's and first officer's primary attitude displays are **failed**.

24 IRS MODE selectors (both) . . . . .ATT

Maintain straight and level, constant airspeed flight until attitude displays recover (approximately 30 seconds).

Note: The primary attitude displays will stay failed and the SET IRS HDG prompt will not appear on the POS INIT page until the attitude mode alignment is complete.

25 Enter magnetic heading on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

26 The MAP display is not available.

27 Enter updated heading periodically on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

28 Do **not** use either autopilot.

▼ **Continued on next page** ▼

▼ Loss Of Thrust On Both Engines continued ▼

29 Choose one:

◆**Both** engines are **running**:

Run the APU as needed.

■ ■ ■ ■

◆**One** engine stays **failed**:

►►**Go to the Engine In-Flight Start checklist on page 7.13**

■ ■ ■ ■

FAULT

APU FAULT

Condition: An APU malfunction occurs.

Note: The APU shuts down automatically.

1 APU switch. . . . . OFF

If the APU FAULT light extinguishes after 5 minutes, restarts may be attempted.

■ ■ ■ ■

LOW OIL PRESSURE

APU LOW OIL PRESSURE

Condition: The APU oil pressure is low.

Note: The APU shuts down automatically.

1 APU switch. . . . . OFF

The LOW OIL PRESSURE light extinguishes in 5 minutes.

■ ■ ■ ■

OVER SPEED

APU OVERSPEED

Condition: One of these occurs:
- An APU RPM limit exceedance causes automatic shutdown
- During a normal APU shutdown the overspeed shutdown protection logic fails a self-test.

1 APU switch . . . . OFF

The APU OVERSPEED light extinguishes in 5 minutes.

■ ■ ■ ■

ALTN

EEC ALTERNATE MODE

Condition: An EEC operates in the alternate control mode.

1 Autothrottle (if engaged). . . . . .Disengage

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

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

3 EEC mode switches (one at a time) . . . . . . ALTN

This ensures both engines operate in alternate mode.

4 Autothrottle (if needed) . . . . Engage

Note: Maximum thrust limiting is available with autothrottle engaged.

5 Do not exceed engine limits. Engine limit protection in alternate mode is not the same as in normal mode.

6 **If** the **DSPLY SOURCE** annunciation is shown and the DISPLAY SOURCE checklist has not been completed:

▶▶**Go to the DISPLAY SOURCE checklist on page 10.4**

■ ■ ■ ■

ENGINE CONTROL

ENGINE CONTROL

Condition: An engine control system fault occurs.

Note: An ENGINE CONTROL light illuminates on the ground only.

1 Do **not** takeoff.

■ ■ ■ ■

Engine Failure or Shutdown

Condition: One of these occurs:
- An engine failure
- An ENG FAIL alert shows
- An engine flameout
- Another checklist directs an engine shutdown.

1 Do an engine shutdown only when flight conditions allow.

2 Autothrottle (if engaged) . . . . .Disengage

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

4 **If** conditions allow:

Run the engine for three minutes at idle thrust.

5 Engine start lever (affected engine) . . . . Confirm . . . . . . CUTOFF

6 PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with flaps up.

▼ Continued on next page ▼

▼ Engine Failure or Shutdown continued ▼

7 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . .ON

►►Go to step 8

◆APU is **not** available:

►►Go to step 8

8 Balance fuel as needed.

G-FDZA - G-FDZS

9 Transponder mode selector . . . . TA

This prevents climb commands which can exceed single engine performance capability.

G-CDZH - G-CDZM

10 Transponder mode selector . . . . TA ONLY

This prevents climb commands which can exceed single engine performance capability.

11 **If** wing anti–ice is needed:

ISOLATION VALVE switch . . . . AUTO

12 Plan to land at the nearest suitable airport.

G-CDZH - G-CDZM, G-FDZJ

►►Go to the One Engine Inoperative Landing <> checklist on page 7.18

G-FDZA - G-FDZG, G-FDZR, G-FDZS

►►Go to the One Engine Inoperative Landing <> checklist on page 7.20

■ ■ ■ ■

Engine High Oil Temperature

Condition: The engine oil temperature is high.

1 Choose one:

◆Temperature is **at or above** the **redline**:

▶▶**Go to the Engine Failure or Shutdown checklist on page 7.10**

■ ■ ■ ■

◆Temperature is in the **amber band**:

▶▶**Go to step 2**

2 Autothrottle (if engaged) . . . . .Disengage

3 Thrust lever (affected engine) . . . . Confirm . . . Retard slowly until engine oil temperature is within normal operating range or thrust lever is closed

4 **If** temperature is in the **amber band** for more than **45 minutes**:

▶▶**Go to the Engine Failure or Shutdown checklist on page 7.10**

■ ■ ■ ■

Engine In-Flight Start

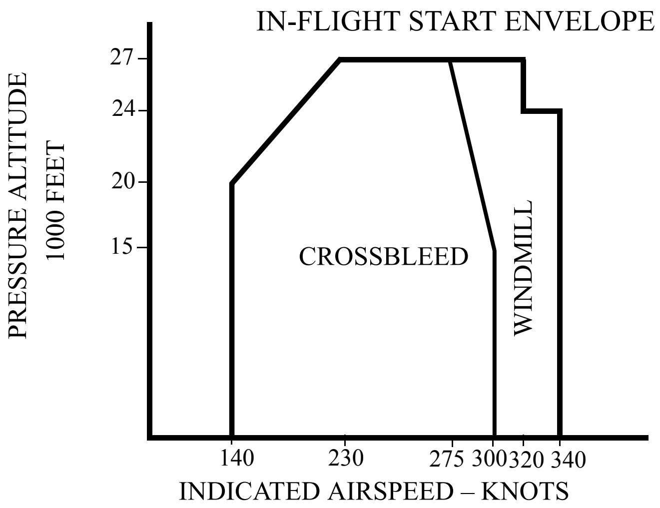
Condition: An engine start is needed after a shutdown and there is:
- N1 rotation
- No fire
- No abnormal airframe vibration.

Note: Oil quantity indication as low as zero is normal if windmilling N2 RPM is below approximately 8%.

1 Do this checklist **only** after completion of the Engine Failure or Shutdown checklist or as directed by the Loss of Thrust on Both Engines checklist.

2 Check the In-Flight Start Envelope. Starts are not assured outside of the in-flight start envelope.

Note: For engines shut down more than one hour, a crossbleed start is needed.



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

4 Engine start lever
(affected engine) . . . . Confirm. . . . . . . CUTOFF

Note: Engines may accelerate to idle very slowly, especially at high altitudes. Slow acceleration may be incorrectly interpreted as a hung start or an engine malfunction. If N2 is steadily increasing, and EGT stays within limits, the start is progressing normally.

▼ Continued on next page ▼

▼ Engine In-Flight Start continued ▼

5 Choose one:

◆**Windmill** start:

ENGINE START switch
(affected engine) . . . . FLT

▶▶**Go to step 6**

◆**Crossbleed** start:

PACK switch (affected side). . . . . OFF

DUCT PRESSURE . . . . . . Minimum 30 PSI

Advance the thrust lever to increase duct pressure if needed.

ENGINE START switch
(affected engine) . . . . .GRD

▶▶**Go to step 6**

6 **When** N2 is at or above 11%:

Engine start lever
(affected engine) . . . . IDLE detent

Monitor EGT to ensure it does not rise rapidly or exceed the start limit of 725° C during the start attempt.

7 **If** EGT does not increase in 30 seconds or another abort start condition as listed in the Normal Procedures occurs:

Engine start lever
(affected engine) . . . . Confirm . . . . . CUTOFF

ENGINE START switch
(affected engine) . . . . OFF

Note: If engine has been shutdown for more than 1 hour, multiple start attempts may be needed.

▼ Continued on next page ▼

▼ **Engine In-Flight Start continued** ▼

8 Choose one:

◆Engine **starts** and runs normally:

▶▶**Go to step 9**

◆Engine **fails** to start:

G-CDZH - G-CDZM, G-FDZJ

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.18**

■ ■ ■ ■

G-FDZA - G-FDZG, G-FDZR, G-FDZS

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.20**

■ ■ ■ ■

9 Engine GEN switch (affected side) . . . . .ON

10 PACK switch (affected side) . . . . AUTO

11 ENGINE START switch . . . . .As needed

12 APU . . . . .As needed

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

■ ■ ■ ■

ENGINE LOW OIL PRESSURE

Condition: The engine oil pressure is low. The LOW OIL PRESSURE alert may or may not be illuminated.

1 Choose one:

◆Engine oil pressure is in the **amber band** with **takeoff thrust** set:

Do **not** takeoff.

■ ■ ■ ■

◆Engine oil pressure is **at or below** the **redline**:

▶▶**Go to the Engine Failure or Shutdown checklist on page 7.10**

■ ■ ■ ■

ENGINE OIL FILTER BYPASS

Condition: The OIL FILTER BYPASS alert indicates oil filter contamination can cause oil to bypass the oil filter.

1 Autothrottle (if engaged). . . . . .Disengage

2 Thrust lever
(affected engine) . . .Confirm . . . Retard until the OIL FILTER BYPASS alert extinguishes or the thrust lever is closed

3 Choose one:

◆OIL FILTER BYPASS alert **extinguishes**:

Run the engine at reduced thrust to keep the alert extinguished.

■ ■ ■ ■

◆OIL FILTER BYPASS alert **stays illuminated**:

▶▶**Go to the Engine Failure or Shutdown checklist on page 7.10**

■ ■ ■ ■

High Engine Vibration

Condition: Both of these occur:
- The vibration level is more than 4.0 units
- Airframe vibrations.

1 Choose one:

◆In **icing** conditions:

▶▶**Go to step 2**

◆**Not** in icing conditions:

▶▶**Go to step 4**

2 **If** in moderate to severe icing conditions during descent or holding, do the following on one engine at a time at approximately 15 minute intervals:

ENGINE START switch
(affected engine) . . . . .FLT

Thrust (affected engine) . . . Adjust to 45% N1 for five seconds, then advance slowly to a minimum of 80% N1 for 1 second

3 Choose one:

◆Vibration **decreases**:

Continue normal operation.

■ ■ ■ ■

◆Vibration does **not** decrease:

▶▶**Go to step 4**

4 Autothrottle (if engaged). . . . . .Disengage

5 Thrust lever
(affected engine) . . . . Confirm. . . . . . Retard to maintain vibration levels below 4 units

Note: If the VIB indication does not decrease when the thrust lever is retarded, check other engine indications. If other engine indications are normal, no further action is needed.

■ ■ ■ ■

One Engine Inoperative Landing <>

G-CDZH - G-CDZM, G-FDZJ

Condition: Landing must be made with one engine inoperative.

1 Plan a flaps 15 landing.

2 Set VREF 15 or VREF ICE.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

3 Maintain VREF 15 + 5 knots or VREF ICE + 5 knots minimum on final approach to assure sufficient maneuver margin and speed for go-around.

4 Use engine anti-ice on the operating engine only.

5 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF 15 or VREF ICE, Minimums** ___

Approach briefing . . . . Completed

If additional go-around thrust is needed:

Configure the pressurization system for a no engine bleed landing when below 10,000 feet.

WING ANTI-ICE switch . . . . OFF

▼ **Continued on next page** ▼

One Engine Inoperative Landing <> continued

ISOLATION VALVE switch . . . . CLOSE

BLEED 1 air switch . . . . OFF

Do not open the APU bleed air valve if the engine fire switch is illuminated.

APU BLEED air switch . . . . ON

Left PACK switch . . . . AUTO

BLEED 2 air switch . . . . OFF

Go-around Procedure Review

Do the normal go–around procedure except:

Use flaps 1.

Maintain VREF 15 + 5 knots or VREF ICE + 5 knots until reaching flap retraction altitude.

Limit bank angle to 15° when airspeed is less than VREF 15 + 15 knots or VREF ICE + 5 knots or the minimum maneuver speed, whichever is lower.

Accelerate to flaps 1 maneuvering speed before flap retraction.

Approach Checklist

Altimeters . . . . QNH ____

NAV aids . . . . .Set

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin . . . . Secure

ENGINE START switch (operating engine). . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Continued on next page

▼ One Engine Inoperative Landing <> continued ▼

Flaps . . . . **15, Green light**

■ ■ ■ ■

One Engine Inoperative Landing <>

G-FDZA - G-FDZG, G-FDZR, G-FDZS

Condition: Landing must be made with one engine inoperative.

1 Choose one:

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

Use flaps 30 and VREF 30 for landing and flaps 15 for go-around.

▶▶**Go to step 4**

◆ Landing using **flaps 15**:

▶▶**Go to step 2**

Note: Company policy is that all One Engine Inoperative Landings should be made using flaps 15.

2 Use flaps 15 and VREF 15 or VREF ICE for landing and flaps 1 for go-around.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

3 Maintain VREF 15 + 5 knots or VREF ICE + 5 knots minimum on final approach to assure sufficient maneuver margin and speed for go-around.

Note: Autoland operations are not authorized when landing with flaps 15.

▼ Continued on next page ▼

▼ One Engine Inoperative Landing <> continued ▼

4 Use engine anti-ice on the operating engine only.

5 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ____

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . **VREF ____ as directed by checklist, Minimums ____**

Approach briefing . . . . Completed

Note: Check authorized autoland weather minima.

If additional go-around thrust is needed:

Configure the pressurization system for a no engine bleed landing when below 10,000 feet.

WING ANTI-ICE switch . . . . OFF

ISOLATION VALVE switch . . . . CLOSE

BLEED 1 air switch . . . . OFF

⚠ Do not open the APU bleed air valve if the engine fire switch is illuminated.

APU BLEED air switch . . . . ON

Left PACK switch . . . . AUTO

BLEED 2 air switch . . . . OFF

Go-around Procedure Review

Do the normal go-around procedure except:

▼ Continued on next page ▼

▼ One Engine Inoperative Landing <> continued ▼

Choose one:

◆Landing using **flaps 30**:

Use flaps 15.

Maintain VREF 30 + 5 knots and limit bank angle to 15° until initial maneuvering is complete and a safe altitude is reached.

►►**Go to Approach Checklist below**

◆Landing using **flaps 15**:

Use flaps 1.

Maintain VREF 15 + 5 knots or VREF ICE + 5 knots until reaching flap retraction altitude.

Limit bank angle to 15° when airspeed is less than VREF 15 + 15 knots or VREF ICE + 5 knots or the minimum maneuver speed, whichever is lower.

Accelerate to flaps 1 maneuvering speed before flap retraction.

►►**Go to Approach Checklist below**

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

Additional Deferred Item

Choose one:

◆Landing using **flaps 30**:

►►**Go to Landing Checklist below**

◆Landing using **flaps 15**:

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

►►**Go to Landing Checklist below**

▼ Continued on next page ▼

▼ One Engine Inoperative Landing <> continued ▼

Landing Checklist

Cabin . . . . Secure

ENGINE START switch (operating engine) . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps. . . . . ___, **Green light**

■ ■ ■ ■

REVERSER

REVERSER

Condition: A fault occurs in the thrust reverser system.

Note: Additional system failures may cause in-flight deployment.

1 Expect normal reverser operation after landing.

■ ■ ■ ■

REVERSER UNLOCKED (IN FLIGHT)

Condition: The amber REV indication shows with uncommanded reverse thrust.

Note: Only multiple failures could allow the engine to go into reverse thrust.

Unstowed reverser sleeves produce buffet, yaw, roll and increased airplane drag.

1 Check movement of the forward thrust lever on the affected engine.

The EECs prevent power above idle if the related thrust reverser has moved from the stowed position.

Warning! Do not actuate the reverse thrust lever.

2 Choose one:

◆Engine **responds** to forward thrust lever movement **and no** buffet or yaw exists:

Continue normal operation.

■ ■ ■ ■

◆Engine does **not** respond to forward thrust lever movement **or** buffet or yaw **exists**:

▶▶**Go to the Engine Failure or Shutdown checklist on page 7.10**

■ ■ ■ ■

START VALVE OPEN

Condition: The START VALVE OPEN alert indicates the start valve fails to close.

1 ENGINE START switch . . . . OFF

2 Choose one:

◆START VALVE OPEN alert **extinguishes**:

■ ■ ■ ■

◆START VALVE OPEN alert **stays illuminated**:

▶▶**Go to step 3**

3 ISOLATION VALVE switch . . . . CLOSE

4 PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with flaps up.

5 Engine BLEED air switch
(affected side) . . . . OFF

6 Choose one:

◆START VALVE OPEN alert stays illuminated for **engine 1**:

APU BLEED air switch . . . . OFF

▶▶**Go to step 7**

◆START VALVE OPEN alert stays illuminated for **engine 2**:

▶▶**Go to step 7**

7 Choose one:

◆**In flight**:

■ ■ ■ ■

◆On the **ground**:

Ground air source
(if in use) . . . . Disconnect

Engine start lever
(affected engine) . . . . CUTOFF

■ ■ ■ ■

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 volcanic ash as quickly as possible. Consider a 180° turn.

1 Don oxygen masks and smoke goggles, as needed.

2 Establish crew communications, as needed.

3 Autothrottle (if engaged) . . . . .Disengage

If conditions allow, run the engines at idle thrust.

4 Thrust levers (both) . . . . Close

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

5 ENGINE START switches (both) . . . . FLT

6 PACK switches . . . . HIGH

7 WING ANTI–ICE switch . . . . .ON

8 ENG ANTI–ICE switches (both). . . . . .ON

9 **If** the APU is available for start:

APU . . . . START

This supplies backup electrical and pneumatic sources, if needed.

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

- Engine malfunctions, increasing EGT, engine stall or flameout.
- Decrease or loss of airspeed indications.
- Equipment cooling OFF light.

Continued on next page

▼ Volcanic Ash continued ▼

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

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

12 Plan to land at the nearest suitable airport.

13 Choose one:

◆Engines run **normally**:

■ ■ ■ ■

◆Engines do **not** run normally:

►►**Go to the Loss Of Thrust On Both Engines checklist on page 7.4**

■ ■ ■ ■

Intentionally
Blank

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Table of Contents

Intentionally
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APU FIRE

Condition: Fire is detected in the APU.

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

2 APU switch . . . . OFF

- -

3 Choose one:

◆APU fire switch **extinguishes**:

■ ■ ■ ■

◆APU fire switch **stays illuminated**:

▶▶**Go to step 4**

4 Plan to land at the nearest suitable airport.

■ ■ ■ ■

ENGINE FIRE or Engine Severe Damage or Separation

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

1 Autothrottle (if engaged) . . . . .Disengage

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

3 Engine start lever (affected engine) . . . . .Confirm . . . CUTOFF

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

To manually unlock the engine fire switch, press the override and pull.

5 **If** the engine fire switch or ENG OVERHEAT light stays illuminated:

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

If after 30 seconds the engine fire switch or ENG OVERHEAT light stays illuminated:

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

---

6 **If** high airframe vibration occurs and continues after the engine is shut down:

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

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

7 ISOLATION VALVE switch. . . . . CLOSE

▼ Continued on next page ▼

▼ ENGINE FIRE or Engine Severe Damage or Separation continued ▼

8 PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with the flaps up.

9 APU BLEED air switch . . . . OFF

10 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . .ON

▶▶**Go to step 11**

◆APU is **not** available:

▶▶**Go to step 11**

11 Balance fuel as needed.

G-FDZA - G-FDZS

12 Transponder mode selector . . . . TA

This prevents climb commands which can exceed single engine performance capability.

G-CDZH - G-CDZM

13 Transponder mode selector . . . . TA ONLY

This prevents climb commands which can exceed single engine performance capability.

14 **If** wing anti–ice is needed:

ISOLATION VALVE switch
(after fire has been extinguished) . . . . . AUTO

15 Plan to land at the nearest suitable airport.

G-CDZH - G-CDZM, G-FDZJ

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.18**

G-FDZA - G-FDZG, G-FDZR, G-FDZS

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.20**

■ ■ ■ ■

ENGINE OVERHEAT

ENG 1 OVERHEAT	ENG 2 OVERHEAT

Condition: An overheat is detected in the engine.

1 Autothrottle (if engaged) . . . . .Disengage

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

3 **If** the ENG OVERHEAT light **stays illuminated**:

▶▶**Go to the ENGINE FIRE or Engine Severe Damage or Separation checklist on page 8.2**

■ ■ ■ ■

- -

4 **If** the ENG OVERHEAT light **extinguishes**:

Run the engine at reduced thrust to keep the light extinguished.

■ ■ ■ ■

Intentionally
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Engine Tailpipe Fire

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

1 Engine start lever (affected engine) . . . . CUTOFF

2 Advise the cabin.

3 Choose one:

◆Bleed air is **not** available:

Advise the tower.

■ ■ ■ ■

◆Bleed air is **available**:

▶▶**Go to step 4**

4 PACK switches (both) . . . . OFF

5 ISOLATION VALVE switch. . . . . AUTO

6 Engine BLEED air switches (both) . . . . .ON

7 Choose one:

◆APU is **running**:

APU BLEED air switch . . . . .ON

▶▶**Go to step 8**

◆APU is **not** running:

▶▶**Go to step 8**

8 Choose one:

◆Affected ENGINE START switch is in **GRD**:

▶▶**Go to step 9**

◆Affected ENGINE START switch is **not** in GRD:

Allow the affected N2 to decrease below 20%.

ENGINE START switch (affected engine) . . . . .GRD

▶▶**Go to step 9**

9 Advise the tower.

▼ Continued on next page ▼

▼ Engine Tailpipe Fire continued ▼

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

11 ENGINE START switch (affected engine) . . . . OFF

■ ■ ■ ■

Smoke, Fire or Fumes

Condition: Smoke, fire or fumes is identified.

1 Diversion may be needed.

2 Don oxygen masks and set regulators to 100%, as needed.

3 Don smoke goggles, as needed.

4 Establish crew and cabin communications.

5 BUS TRANSFER switch . . . . OFF

G-FDZA - G-FDZS
6 CAB/UTIL switch. . . . . OFF

G-FDZA - G-FDZS
7 IFE/PASS SEAT switch . . . . OFF

G-CDZH - G-CDZM
8 GALLEY switch . . . . OFF

9 RECIRC FAN switches (both) . . . . OFF

10 Instruct the cabin crew to turn off the IFE and PC power switches (as installed).

11 APU BLEED air switch . . . . OFF

12 **Anytime** the smoke or fumes becomes the greatest threat:

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.16**

13 Choose one:

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

Isolate and extinguish the source.

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

▶▶**Go to step 14**

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

▶▶**Go to step 15**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

14 Choose one:

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

Continue the flight at the captain's discretion.

Restore unpowered items at the captain's discretion.

►►**Go to the Smoke or Fumes Removal checklist on page 8.16, if needed**

■ ■ ■ ■

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

►►**Go to step 15**

15 EQUIP COOLING SUPPLY and EXHAUST switches (both) . . . . ALTN

16 Instruct the cabin crew to:

Turn on cabin reading lights.

Turn on galley attendants work lights.

Turn off cabin fluorescent light switches.

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

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

19 Do **not** delay landing in an attempt to complete all of the following steps.

20 ISOLATION VALVE switch . . . . CLOSE

21 R PACK switch . . . . OFF

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 are **decreasing**:

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.16, if needed**

■ ■ ■ ■

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

R PACK switch . . . . AUTO

L PACK switch . . . . OFF

▶▶**Go to step 24**

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

25 Choose one:

◆Smoke or fumes are **decreasing**:

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.16, if needed**

■ ■ ■ ■

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

L PACK switch . . . . AUTO

Consider an immediate landing.

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.16, if needed**

■ ■ ■ ■

APU DET INOP

APU DETECTION INOPERATIVE

Condition: APU fire detection is inoperative.

1 APU switch. . . . . OFF

Caution! Do not run the APU. An APU fire would not be detected and the APU would continue to run.

■ ■ ■ ■

Intentionally
Blank

CARGO FIRE < >

FWD	AFT

Condition: Fire is detected in the related cargo compartment.

1 CARGO FIRE ARM switch
(affected compartment) . . . Confirm . . . . . Push,
Verify ARMED

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

Note: DISCH light may need up to 30 seconds to illuminate.

3 RECIRC FAN switches (both) . . . . OFF

4 PACK switches (both) . . . . HIGH

5 Plan to land at the nearest suitable airport.

6 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ CARGO FIRE < > continued ▼

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . .Set

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

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

DETECTOR FAULT

CARGO FIRE DETECTOR FAULT

Condition: Fire detection is inoperative in one or both cargo compartments.

1 The fire detection system in one or both cargo compartments is inoperative.

■ ■ ■ ■

FAULT

ENGINE FIRE/OVERHEAT DETECTOR FAULT

Condition: Engine fire and overheat detection is inoperative.

1 The fire detection system in one or both engines is inoperative.

■ ■ ■ ■

Intentionally
Blank

Smoke or Fumes Removal

Condition: Smoke or fumes removal is needed.

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

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

3 Close the flight deck door.

4 Choose one:

◆ **Both** PACKS are **OFF**:

▶▶ **Go to step 5**

◆ **A single or both** PACKS are in **AUTO**:

▶▶ **Go to step 6**

5 Choose one:

◆ Smoke or fumes source is confirmed to be **outside** the flight deck:

■ ■ ■ ■

◆ Smoke or fumes source is confirmed to be **on** the flight deck:

Caution! Window should not be opened unless the source is confirmed to be on the flight deck.

Establish normal holding speed. High airspeed may prevent opening the window.

Open the first officer's sliding window.

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

■ ■ ■ ■

Do **not** turn on any PACK switch that was turned off by the Smoke, Fire or Fumes checklist.

6 Operating PACK switch(es) . . . . HIGH

7 LAND ALT indicator . . . . .10,000 feet

▼ Continued on next page ▼

▼ **Smoke or Fumes Removal continued** ▼

Note: The intermittent cabin altitude/configuration warning horn will sound and the CABIN ALTITUDE lights (if installed and operative) will illuminate at a cabin altitude of approximately 10,000 feet.

8 Engine BLEED air switches (both) . . . . . Verify ON

9 Set thrust to maximum practical N1 (minimum 45%).

10 Open flight deck air conditioning and gasper outlets.

Caution! Do not open any flight deck window. Keep the flight deck door closed.

11 Choose one:

◆Smoke or fumes are **controllable**:

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

■ ■ ■ ■

◆Smoke or fumes are **not** controllable:

▶▶**Go to step 12**

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

13 **When** at 14,000 feet or below:

Pressurization mode selector . . . . MAN

Outflow VALVE switch . . . . . Hold in OPEN until the outflow VALVE position indicates fully OPEN

This causes the cabin airflow to carry smoke or fumes aft.

Note: The outflow valve can take up to 20 seconds to open.

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

■ ■ ■ ■

WHEEL WELL

WHEEL WELL FIRE

Condition: Fire is detected in the main wheel well.

Do **not** exceed the gear EXTEND limit speed (270K/.82M)

1 LANDING GEAR lever . . . . .DN

Note: Do **not** use FMC fuel predictions with landing gear extended.

2 Choose one:

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

▶▶**Go to step 3**

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

Plan to land at the nearest suitable airport.

■ ■ ■ ■

3 **When** the WHEEL WELL light extinguishes:

Wait 20 minutes.

235K maximum

4 LANDING GEAR lever . . . . UP

5 **When** the landing gear indicator lights extinguish:

LANDING GEAR lever . . . . OFF

6 Plan to land at the nearest suitable airport.

■ ■ ■ ■

Table of Contents

Table of Contents

Intentionally
Blank

Runaway Stabilizer <>

Condition: Uncommanded stabilizer trim movement occurs continuously.

1 Control column. . . . . Hold firmly

2 Autopilot (if engaged) . . . . .Disengage

Do **not** re-engage the autopilot.

Control airplane pitch attitude manually with control column and main electric trim as needed.

3 **If** the runaway **stops**:

■ ■ ■ ■

4 **If** the runaway **continues**:

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

If the runaway **continues**:

Stabilizer
trim wheel . . . . Grasp and hold

- -

5 Stabilizer. . . . . Trim manually

6 Anticipate trim requirements.

7 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Runaway Stabilizer <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . Set

Airspeed and Trim

Establish correct airspeed and in-trim condition early on final approach.

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

All Flaps Up Landing <>

Condition:	The leading edge devices fail to extend and trailing edge flaps are less than 1.
Objective:	To configure for a landing with leading edge devices retracted and trailing edge flaps less than 1.

1 Do this checklist **only** when directed by the Trailing Edge Flaps Up Landing checklist.

2 Burn off fuel to reduce touchdown speed.

3 Set VREF 40 + 55 knots.

4 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

5 Maintain flaps up maneuvering speed until established on final approach.

6 Limit bank angle to 15° when airspeed is less than the flaps up maneuvering speed.

7 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ All Flaps Up Landing <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF 40 + 55 knots, Minimums ___**

Approach briefing . . . . Completed

Go-around Procedure Review

Do the normal go-around procedure except:

Limit bank angle to 15° when the airspeed is less than the flaps up maneuvering speed.

Accelerate to flaps up maneuvering speed.

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

Additional Deferred Items

FASTEN BELTS switch . . . . ON

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

G-FDZA - G-FDZS

Note: The SPEED BRAKE lever will not move beyond the FLIGHT DETENT on landing and the spoilers will not fully deploy.

Landing gear . . . . Down

▼ Continued on next page ▼

▼ **All Flaps Up Landing <> continued** ▼

Flaps. . . . . ____, **No lights**

■ ■ ■ ■

AUTO SLAT FAIL

AUTO SLAT FAIL

Condition: The auto slat system is failed.

1 Continue normal operation.

■ ■ ■ ■

FEEL DIFF PRESS

FEEL DIFFERENTIAL PRESSURE

Condition: High differential pressure is measured by the elevator feel computer.

1 Continue normal operation.

■ ■ ■ ■

FLAP LOAD RELIEF

FLAP LOAD RELIEF

G-FDZA - G-FDZS

Condition: Flap load relief occurs.

1 Check flap position and maintain the appropriate airspeed.

■ ■ ■ ■

LOW PRESSURE

FLIGHT CONTROL LOW PRESSURE

Condition: Hydraulic system pressure to the ailerons, elevators and rudder is low.

Objective: To activate the standby hydraulic system and standby rudder PCU.

1 FLT CONTROL switch
(affected side) . . . . Confirm. . . . . . STBY RUD

■ ■ ■ ■

Jammed or Restricted Flight Controls <>

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

1 Autopilot (if engaged) . . . . .Disengage

2 Autothrottle (if engaged) . . . . .Disengage

3 Verify that the thrust is symmetrical.

4 Overpower the jammed or restricted system. Use maximum force, including a combined effort of both pilots, if needed. A maximum two-pilot effort on the controls will not cause a cable or system failure.

5 Do **not** turn off any flight control switches.

6 **If** the failure could be due to freezing water and conditions allow:

Consider descent to a warmer temperature and attempt to overpower the jammed or restricted system again.

7 Choose one:

◆Controls are **normal**:

■ ■ ■ ■

◆Controls are **not** normal:

▶▶**Go to step 8**

8 Use stabilizer or rudder trim to offload control forces.

9 **If** electric stabilizer trim is needed:

Move the Stabilizer Trim Override switch to OVERRIDE.

10 Do not make abrupt thrust changes. Extend or retract speedbrake slowly and smoothly.

11 Limit bank angle to 15°.

12 Plan to land at the nearest suitable airport.

13 Plan a flaps 15 landing.

▼ **Continued on next page** ▼

▼ Jammed or Restricted Flight Controls <> continued ▼

14 Set VREF 15 or VREF ICE.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

15 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

16 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Jammed or Restricted Flight Controls <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF 15 or VREF ICE, Minimums ___**

Approach briefing . . . . Completed

Go-around Procedure Review

Do the normal go-around procedure.

Advance thrust to go-around smoothly and slowly to avoid excessive pitch-up.

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin. . . . . Secure

ENGINE START switches. . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps. . . . . **15, Green light**

■ ■ ■ ■

LE FLAPS TRANSIT

LEADING EDGE FLAPS TRANSIT <>

Condition: One or more of these occur:
- The leading edge devices are not in the commanded position
- A leading edge device asymmetry is detected
- A leading edge device skew is detected.

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

1 Choose one:

◆ **Trailing** edge flaps are **extended** and the trailing edge flap position indication **disagrees** with the flap handle position:

►► **Go to the Trailing Edge Flap Disagree <> checklist on page 9.21**

■ ■ ■ ■

◆ **Trailing** edge flaps are **extended** and the trailing edge flap position indication **agrees** with the flap handle position:

►► **Go to step 7**

◆ **Trailing** edge flaps are **up**:

Limit airspeed to 230 knots maximum.

►► **Go to step 2**

2 Choose one:

◆ Roll is **encountered**:

►► **Go to step 7**

◆ Roll is **not** encountered:

Note: Roll may be difficult to identify with the autopilot engaged.

►► **Go to step 3**

Maximum flap extension altitude 20,000 feet.

3 ⚠ Flaps . . . . .Extend to flaps 1, then retract to flaps up

▼ Continued on next page ▼

▼ LEADING EDGE FLAPS TRANSIT <> continued ▼

4 Choose one:

◆ LE FLAPS TRANSIT light **extinguishes** after the flaps are up:

Continue normal operation.

■ ■ ■ ■

◆ LE FLAPS TRANSIT light **stays illuminated** after the flaps are up:

▶▶**Go to step 5**

5 Check LE DEVICES annunciator panel.

6 Choose one:

◆ Light(s) for **only one** leading edge device is illuminated:

Limit airspeed to 300 knots (280 knots for turbulent air penetration) or .65 Mach, whichever is lower.

▶▶**Go to step 7**

◆ Light(s) for **more than one** leading edge device is illuminated:

Limit airspeed to 230 knots maximum.

▶▶**Go to step 7**

7 Plan a flaps 15 landing.

8 Set VREF 15 + 15 knots.

9 Limit bank angle to 15° when airspeed is less than the flaps up maneuvering speed.

10 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

11 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

▼ Continued on next page ▼

▼ LEADING EDGE FLAPS TRANSIT <> continued ▼

Landing data . . . . **VREF 15 + 15 knots, Minimums ____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ____

NAV aids . . . . .Set

Additional Deferred Item

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Note: The amber LE FLAPS TRANSIT light may be illuminated. Operation within the lower amber airspeed band for landing is normal for this condition.

G-CDZH - G-CDZM

Note: V/S and VNAV PTH modes may revert to LVL CHG mode.

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps. . . . . **15, Green or amber light**

Note: The light may be green or amber depending on the cause of the failure.

■ ■ ■ ■

MACH TRIM FAIL

MACH TRIM FAIL

Condition: The mach trim system is failed.

1 Limit airspeed to 280 knots/.82 Mach.

■ ■ ■ ■

SPEED BRAKE DO NOT ARM

SPEED BRAKE DO NOT ARM
<>

Condition: An automatic speedbrake fault occurs.

Note: Speedbrakes may be used in flight.

1 Do **not** arm the speedbrake for landing. Manually deploy the speedbrakes immediately upon landing.

2 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___
Recall . . . . Checked
Autobrake . . . . ___
Landing data . . . . VREF ___, Minimums ___
Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH___
NAV aids . . . . Set

Landing Checklist

Cabin. . . . . Secure
ENGINE START switches. . . . . CONT
Speedbrake . . . . **DOWN detent**
Landing gear . . . . Down
Flaps . . . . ___, Green light

■ ■ ■ ■

SPEED TRIM FAIL

SPEED TRIM FAIL

Condition: The speed trim system is failed.

1 Continue normal operation.

■ ■ ■ ■

SPEEDBRAKES EXTENDED

SPEEDBRAKES EXTENDED

Condition: In flight, the speedbrakes are extended beyond the ARMED position and one or more of these occur:

- The radio altitude is below 800 feet
- The flap lever setting is more than flaps 10.

On the ground, the SPEED BRAKE lever is down and the speedbrakes are extended.

1 SPEED BRAKE lever . . . . ARMED or DOWN detent

2 **If** the light is illuminated on the ground:

Do not takeoff.

■ ■ ■ ■

STABILIZER OUT OF TRIM

STAB OUT OF TRIM	Condition: The autopilot does not set the stabilizer trim correctly.

Note: Momentary illumination of the STAB OUT OF TRIM light during large changes in trim requirements is normal.

1 Choose one:

◆Stabilizer is **trimming**:

Continue normal operation.

■ ■ ■ ■

◆Stabilizer is **not** trimming:

►►**Go to step 2**

2 Control column. . . . . Hold firmly

3 Autopilot . . . . .Disengage

4 Stabilizer trim . . . . .As needed

5 Choose one:

◆Stabilizer **responds** to electric trim inputs:

■ ■ ■ ■

◆Stabilizer does **not** respond to electric trim inputs:

►►**Go to the Stabilizer Trim Inoperative <> checklist on page 9.15**

■ ■ ■ ■

Stabilizer Trim Inoperative <>

Condition: One or more of these occur:
- The main electric stabilizer trim is inoperative
- The autopilot stabilizer trim is inoperative.

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

The autopilot is not available.

2 Apply steady pressure on the manual trim handles until the needed trim is attained.

3 **If** needed:

Use force to cause the disconnect clutch to disengage. Approximately 1/2 turn of the stabilizer trim wheel may be needed.

Note: A maximum two-pilot effort on the trim wheels will not cause a cable or system failure.

The handle(s) should be folded inside the stabilizer trim wheel when manual trim is no longer needed.

If the failure could be due to ice accumulation, descend to a warmer temperature and attempt again.

4 Choose one:

◆ Stabilizer **can** be trimmed manually:

▶▶**Go to step 5**

◆ Stabilizer can **not** be trimmed manually:

▶▶**Go to step 9**

5 Maintain in-trim airspeed until the start of the approach.

6 Use an airspeed which results in an in-trim condition. This will reduce the force that is needed to move the stabilizer.

7 Continue to trim manually for the rest of the flight.

8 Establish the landing configuration early.

▼ Continued on next page ▼

▼ Stabilizer Trim Inoperative <> continued ▼

►►**Go to step 11**

9 Anticipate higher than normal elevator forces during approach and landing.

10 The thrust reduction at flare will cause a nose down pitch.

Note: Elevator control is sufficient to safely land the airplane regardless of stabilizer position.

11 Plan a flaps 15 landing.

12 Set VREF 15 or VREF ICE.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

13 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

14 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ____

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . **VREF 15 or VREF ICE, Minimums** ____

Approach briefing . . . . Completed

Go-around Procedure Review

Do the normal go-around procedure.

▼ Continued on next page ▼

▼ Stabilizer Trim Inoperative <> continued ▼

Advance thrust to go-around smoothly and slowly to avoid excessive pitch-up.

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . .Set

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps. . . . . **15, Green light**

■ ■ ■ ■

STBY RUD ON

STANDBY RUDDER ON

Condition: The standby rudder hydraulic system is commanded on.

1 Choose one:

◆ STBY RUD ON light is illuminated with **no other flight deck indications**:

Avoid large or abrupt rudder pedal inputs.

■ ■ ■ ■

◆ STBY RUD ON light is illuminated due to the **pilot moving** the FLT CONTROL A or B switch to STBY RUD:

■ ■ ■ ■

◆ STBY RUD ON light is illuminated in response to a hydraulic system **non-normal** situation:

■ ■ ■ ■

Trailing Edge Flap Asymmetry <>

Condition: One or more these occur:
- An uncommanded roll occurs when the flaps change position
- The left and right flap indications disagree.

Objective: To configure the airplane for landing.

1 Set the flap lever to the nearest detent that is equal to or less than the smallest indicated flap position.

Caution! Do not attempt to move the trailing edge flaps with the ALTERNATE FLAPS switch because there is no asymmetry protection.

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

2 Choose one:

◆ Flap **lever** is set to **30**

Set VREF 30.

Note: VREF + wind additive must not exceed the flap placard speed for the next larger flap setting.

►►**Go to step 4**

◆ Flap **lever** is set to **15 or 25**:

Set VREF 15 or VREF ICE.

►►**Go to step 3**

◆ Flap **lever** is set to **1 or greater** and **less than 15**:

Set VREF 40 + 30 knots.

►►**Go to step 4**

◆ Flap **lever** is set to **UP**:

►►**Go to the Trailing Edge Flaps Up Landing <> checklist on page 9.26**

■ ■ ■ ■

▼ Continued on next page ▼

▼ Trailing Edge Flap Asymmetry <> continued ▼

3 **If** any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

VREF + wind additive, or VREF ICE + wind additive if needed, must not exceed the flap placard speed for the next larger flap setting.

4 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

5 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Trailing Edge Flap Asymmetry <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF ___ as directed by checklist, Minimums ___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . Set

Additional Deferred Item

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . **___, Green or amber light**

Note: The light may be green or amber depending on the cause of the failure.

■ ■ ■ ■

Trailing Edge Flap Disagree <>

Condition: Both of these occur:
- The trailing edge flaps are not in the commanded position
- There is no trailing edge flap asymmetry.

Objective: To configure the airplane for landing.

1 **If** a trailing edge flap asymmetry exists:

▶▶**Go to the Trailing Edge Flap Asymmetry <> checklist on page 9.18**

■ ■ ■ ■

2 Choose one:

◆Indicated flap position is **30 or greater and less than 40**:

Land using existing flaps.

▶▶**Go to step 3**

◆Indicated flap position is **15 or greater and less than 30**:

Land using existing flaps.

▶▶**Go to step 5**

◆Indicated flap position is **less than 15**:

▶▶**Go to step 4**

3 Set VREF 30 for landing.

Note: VREF 30 + wind additive must not exceed the flap placard speed for flaps 40.

▶▶**Go to step 6**

4 Plan to extend flaps to 15 using alternate flap extension.

Note: Alternate flap extension time to flaps 15 is approximately 2 minutes.

The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

▼ **Continued on next page** ▼

▼ Trailing Edge Flap Disagree <> continued ▼

5 Set VREF 15 or VREF ICE for landing.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

VREF 15 + wind additive, or VREF ICE + wind additive if needed, must not exceed the flap placard speed for the next larger flap setting.

6 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

7 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . .**VREF ___ as directed by checklist, Minimums ___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

▼ Continued on next page ▼

▼ Trailing Edge Flap Disagree <> continued ▼

Additional Deferred Item

Choose one:

◆ Indicated flap position is **30 or greater**:

►►**Go to Landing Checklist below**

◆ Indicated flap position is **15 or greater and less than 30**:

GROUND PROXIMITY FLAP
INHIBIT switch . . . . .FLAP INHIBIT

►►**Go to Landing Checklist below**

◆ Indicated flap position is **less than 15**:

GROUND PROXIMITY FLAP
INHIBIT switch . . . . .FLAP INHIBIT

►►**Go to Alternate Flap Extension below**

▼ Continued on next page ▼

Alternate Flap Extension

During flap extension, set the flap lever to the desired flap position.

230K maximum during alternate flap extension.

ALTERNATE FLAPS master switch . . . . ARM

Note: The landing gear configuration warning may sound if the flaps are between 10 and 15 and the landing gear are retracted.

G-FDZA - G-FDZS

Note: The amber LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 15 position.

G-CDZH - G-CDZM

Note: The amber LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 10 position.

Note: Operation within the lower amber airspeed band may be needed until the LE FLAPS TRANSIT light extinguishes.

If flap asymmetry occurs, release the switch immediately. There is no asymmetry protection.

ALTERNATE FLAPS
position switch . . . . Hold DOWN
to extend flaps
to 15 on schedule

As flaps are extending, slow to respective maneuvering speed.

Continued on next page

▼ **Trailing Edge Flap Disagree <> continued** ▼

Choose one:

◆Trailing edge flaps asymmetry occurs:

▶▶**Go to the Trailing Edge Flap Asymmetry <> checklist on page 9.18**

■ ■ ■ ■

◆Trailing edge flaps extend to **15**:

▶▶**Go to Landing Checklist below**

◆Indicated flap position is **less than 1** after attempting alternate flap extension:

▶▶**Go to the Trailing Edge Flaps Up Landing <> checklist on page 9.26**

■ ■ ■ ■

◆Indicated flap position is **1 or greater and less than 15** after attempting alternate flap extension:

Land using existing flaps.

Set VREF 40 + 30 knots for landing.

Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

▶▶**Go to Landing Checklist below**

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps. . . . . ____, **Green or amber light**

Note: The light may be green or amber depending on the failure.

■ ■ ■ ■

Trailing Edge Flaps Up Landing <>

Condition: The trailing edge flaps are less than 1.

Objective: To configure for a landing with trailing edge flaps less than 1.

1 Choose one:

◆Trailing edge flap asymmetry does **not exist**:

Do this checklist **only** when directed by the Trailing Edge Flap Disagree checklist.

▶▶**Go to step 4**

◆Trailing edge flap asymmetry **exists**:

▶▶**Go to step 2**

230K maximum.

2 ⚠ALTERNATE FLAPS master switch . . . . ARM

Note: This procedure extends the leading edge devices only.

3 ALTERNATE FLAPS position switch . . . . Momentary DOWN

Verify that the LE DEVICES annunciator indicates FULL EXT for all leading edge slats and flaps.

Note: The LE FLAPS TRANSIT light may stay illuminated after the LE devices are fully extended.

4 Choose one:

◆LE DEVICES annunciator does **not** show FULL EXT:

▶▶**Go to the All Flaps Up Landing <> checklist on page 9.3**

■ ■ ■ ■

◆LE DEVICES annunciator **shows** FULL EXT:

▶▶**Go to step 5**

5 Burn off fuel to reduce touchdown speed.

6 Set VREF 40 + 40 knots.

▼ Continued on next page ▼

▼ Trailing Edge Flaps Up Landing <> continued ▼

7 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

8 Maintain flaps up maneuvering speed until on final.

9 Limit bank angle to 15° when airspeed is less than the flaps up maneuvering speed.

10 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Trailing Edge Flaps Up Landing <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . **VREF 40 + 40 knots, Minimums ___**

Approach briefing . . . . Completed

Go-around Procedure Review

Do the normal go-around procedure except:

Limit bank angle to 15° when the airspeed is less than the flaps up maneuvering speed.

Accelerate to flaps up maneuvering speed.

Do not exceed 230 knots with leading edge devices extended.

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

Additional Deferred Items

FASTEN BELTS switch . . . . .ON

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Note: A nuisance stick shaker may occur when slowing to VREF 40 + 40 knots at high gross weights and/or bank angles greater than 15°.

Operation within the lower amber airspeed band for landing is normal for this condition.

G-CDZH - G-CDZM

Note: V/S and VNAV PTH modes may revert to LVL CHG mode.

▼ Continued on next page ▼

▼ Trailing Edge Flaps Up Landing <> continued ▼

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

G-FDZA - G-FDZS

Note: The SPEED BRAKE lever will not move beyond the FLIGHT detent on landing and the spoilers will not fully deploy.

Landing gear . . . . Down

Flaps. . . . . ___, **Green or amber light**

Note: The light may be green or amber depending on the cause of the failure.

■ ■ ■ ■

YAW DAMPER

YAW DAMPER

Condition: The yaw damper is disengaged.

1 YAW DAMPER switch . . . . OFF then ON

2 Choose one:

◆ YAW DAMPER light **extinguishes**:

■ ■ ■ ■

◆ YAW DAMPER light **stays illuminated**:

YAW DAMPER switch . . . . OFF

▶▶**Go to step 3**

3 Avoid areas of predicted moderate or severe turbulence. If turbulence is encountered and passenger comfort becomes affected, reduce airspeed and/or descend to a lower altitude.

4 Do not exceed flaps 30 if the crosswind exceeds 30 knots.

■ ■ ■ ■

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Airspeed Unreliable

Condition: The pitch attitude is not consistent with the phase of flight, altitude, thrust and weight, or noise or low frequency buffeting is experienced.

Objective: To establish the normal pitch attitude and thrust setting for the phase of flight.

1 Adjust the airplane attitude and thrust. Maintain airplane control.

2 PROBE HEAT switches . . . . Check ON

3 Cross check the MACH/AIRSPEED indicators.

4 Cross check the IRS and FMC ground speed and winds to determine airspeed accuracy if indicated airspeed is questionable.

Note: Erroneous or unreliable airspeed indications may be caused by blocked or frozen pitot-static system(s), or a severely damaged or missing radome.

5 Attitude and thrust information is located in the Performance Inflight section.

■ ■ ■ ■

Additional Information

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

ALT DISAGREE

Condition: The ALT DISAGREE alert indicates the captain's and first officer's altitude indications disagree by more than 200 feet.

1 Check all altimeters are set to correct barometric setting for phase of flight.

2 Choose one:

◆ALT DISAGREE alert **extinguishes**:

Continue normal operation.

■ ■ ■ ■

◆ALT DISAGREE alert **stays illuminated**:

▶▶**Go to step 3**

3 Airplane does not meet RVSM airspace requirements.

4 Standby altimeter is available.

5 Transponder altitude received by ATC may be unreliable.

6 Maintain visual conditions if possible.

7 Establish landing configuration early.

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

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

■ ■ ■ ■

AOA DISAGREE

G-FDZA - G-FDZS

Condition: The AOA DISAGREE alert indicates the left and right angle of attack vanes disagree.

1 Airspeed errors and the IAS DISAGREE alert may occur.

2 Altimeter errors and the ALT DISAGREE alert may occur.

■ ■ ■ ■

CDS FAULT

Condition: The CDS FAULT annunciation indicates a CDS fault occurs.

Note: CDS FAULT annunciates on the ground only, before the second engine start.

1 Do not takeoff.

■ ■ ■ ■

Display Failure

Condition: A display in the common display system is failed.

1 Choose one:

◆A single display is not usable and **automatic switching** has occurred:

Continue normal operation.

■ ■ ■ ■

◆A single display is not usable and automatic switching has **not** occurred:

►►**Go to step 2**

2 MAIN PANEL DUs selector . . . . .As needed

3 LOWER DU selector . . . . .As needed

■ ■ ■ ■

DISPLAYS CONTROL PANEL

Condition: The DISPLAYS CONTROL PANEL annunciation indicates the EFIS control panel is failed.

Note: The altimeter blanks and an ALT flag illuminates on the side corresponding to the failed control panel.

1 CONTROL PANEL select switch . . . . .BOTH ON 1 or BOTH ON 2

Select the operating control panel.

2 Verify that the DISPLAYS CONTROL PANEL annunciation and ALT flag extinguish.

■ ■ ■ ■

DISPLAY SOURCE

Condition: The DSPLY SOURCE annunciation indicates only one DEU is supplying display information. Indications may include:

- No hydraulic pressure indication on the failed side
- Speed limit flag shown on the failed side
- Minimum maneuver speed and stick shaker band removed on the failed side
- Both EEC ALTN lights illuminated.

Note: Flight director indications may be removed and autoflight mode reversions may occur.

Dual autopilot approach is not available.

1 **If** the DEU fails on the same side as the engaged autopilot:

Select the opposite autopilot.

Verify that the correct flight director indications and flight mode annunciations are shown on the same side as the operating autopilot.

2 **If** the EEC ALTN lights are illuminated and the EEC ALTERNATE MODE checklist has not been completed:

▶▶**Go to the EEC ALTERNATE MODE checklist on page 7.9**

■ ■ ■ ■

OFF

FLIGHT RECORDER OFF

Condition: The flight recorder is off.

1 Continue normal operation.

■ ■ ■ ■

IAS DISAGREE

Condition: The IAS DISAGREE alert indicates the captain’s and first officer’s airspeed indications disagree.

▶▶Go to the Airspeed Unreliable checklist on page 10.1

■ ■ ■ ■

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MSG

FMC DISAGREE

FMC P/RST

Condition: Data needed for dual FMC operation disagree.

1 Choose one:

◆Flying an approach with an **RNP alerting requirement**:

Go-around unless suitable visual references can be established and maintained.

■ ■ ■ ■

◆Flying an approach **without** an RNP alerting requirement

Verify position.

■ ■ ■ ■

FMC P/RST

FMC FAIL

Condition: Dual FMC failure:
- Loss of FMC data on both CDUs
- Loss of FMC data on the captain’s and first officer’s navigation display MAP modes.

Left FMC failure:
- Loss of FMC data on both CDUs
- Loss of FMC data on the captain’s navigation display MAP mode.

Right FMC failure:
- Illumination of the FMC message light
- Loss of FMC data on the first officer’s navigation display MAP mode
- SINGLE FMC OPERATION scratchpad message.

Objective: To restore dual FMC operation, configure for single FMC operation or resume conventional navigation.

1 Choose one:

◆Only the **left or right** FMC has failed:

▶▶**Go to step 2**

◆**Dual** FMC failure has occurred:

▶▶**Go to step 4**

2 FMC source select switch . . . . .BOTH ON L or BOTH ON R

Select the operating FMC.

3 Choose one:

◆DUAL FMC OP RESTORED message **appears**:

FMC source select switch . . . . . . .NORMAL

■ ■ ■ ■

◆DUAL FMC OP RESTORED message does **not** appear:

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ **FMC FAIL continued** ▼

4 Resume conventional navigation. Without an operating FMC, LNAV and VNAV are not available.

G-FDZA - G-FDZS

5 Verify position relative to terrain using conventional navigation.

Note: EGPWS may use inaccurate GPS position data or an inappropriate value of RNP. This could result in a VSD terrain display that is incorrectly positioned relative to the airplane track.

6 **When** preparing for the approach:

Use the SPD REF selector to set the current gross weight.

Use the SPD REF selector to set the reference airspeed bugs.

Use the N1 SET selector to set the N1 bugs.

■ ■ ■ ■

MSG

FMC/CDU ALERTING MESSAGE

FMC P/RST

Condition: An alert message is in the FMC scratchpad.

1 Take action as needed by the message.

■ ■ ■ ■

GLS

GLS

G-FDZJ

Condition: A GLS failure occurs.

1 Do not fly a GLS approach.

2 ILS and non-ILS approaches may be flown.

■ ■ ■ ■

GPS

GPS

Condition: One or both GPS receivers are failed.

Note: The FMC uses only IRS or radio inputs.

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

1 Continue normal operation if ANP meets the requirements for the phase of flight.

■ ■ ■ ■

ILS

ILS

G-FDZJ

Condition: An ILS failure occurs.

1 Do not fly an ILS approach.

2 GLS and non-ILS approaches may be flown.

■ ■ ■ ■

DC FAIL

IRS DC FAIL

Condition: IRS backup DC power is failed.

1 **If** all other IRS lights are extinguished:

Continue normal operation.

Note: With both IRS DC FAIL lights illuminated, the switched hot battery bus is not powered or the battery is nearly discharged.

■ ■ ■ ■

Intentionally
Blank

FAULT

IRS FAULT

G-FDZA - G-FDZS

Condition: One or more of these occur:
- An IRS fault occurs
- On the ground, if the ALIGN light is also illuminated, the present position entry is possibly incorrect.

1 Choose one:

◆On the **ground**:

▶▶**Go to step 2**

◆**In flight**:

▶▶**Go to step 6**

On the ground

2 Choose one:

◆ALIGN light is **extinguished**:

Notify maintenance.

■ ■ ■ ■

◆ALIGN light is also **illuminated**:

IRS mode selector . . . . OFF

The FAULT light extinguishes immediately and the ALIGN light extinguishes after approximately 30 seconds.

▶▶**Go to step 3**

3 **After** the ALIGN light extinguishes:

IRS mode selector . . . . NAV

Enter present position.

▼ **Continued on next page** ▼

▼ **IRS FAULT continued** ▼

4 Choose one:

◆ALIGN light **is** flashing:

Re-enter present position.

▶▶**Go to step 5**

◆ALIGN light is **not** flashing:

▶▶**Go to step 5**

5 Choose one:

◆FAULT light **illuminates** again:

Notify maintenance.

■ ■ ■ ■

◆FAULT light does **not** illuminate again:

■ ■ ■ ■

In flight

6 The IRS ATT and/or NAV mode(s) may be inoperative.

7 Choose one:

◆Autopilot use is **not** desired:

▶▶**Go to step 8**

◆Autopilot use **is** desired:

▶▶**Go to step 13**

8 Partial capability may be restored by selecting attitude mode on the failed IRS. Straight and level, constant airspeed flight must be maintained for at least 30 seconds.

▼ **Continued on next page** ▼

▼ IRS FAULT continued ▼

9 Choose one:

◆Selecting attitude mode on the failed IRS **is** desired:

►►**Go to step 10**

◆Selecting attitude mode on the failed IRS is **not** desired:

►►**Go to step 13**

10 Do the next step **only** if the captain's **or** the first officer's primary attitude display is failed.

Action is not reversible.

11 IRS mode selector (**failed side**) . . . . . Confirm . . . . ATT

Maintain straight and level, constant airspeed flight until the attitude display recovers (approximately 30 seconds).

Note: The primary attitude display will stay failed and the SET IRS HDG prompt will not appear on the POS INIT page until the attitude mode alignment is complete.

12 Choose one:

◆FAULT light **extinguishes**:

Enter magnetic heading on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

Enter updated heading periodically on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

Do **not** use either autopilot.

■ ■ ■ ■

◆FAULT light **stays illuminated**:

►►**Go to step 13**

13 IRS transfer switch . . . .BOTH ON L or BOTH ON R

▼ Continued on next page ▼

▼ IRS FAULT continued ▼

14 The autopilot on the side with the operational IRS may be used **except** during approach. Autopilot use during approach is not authorized.

Note: If the autopilot is engaged, the yaw damper will disconnect after approximately 1 minute and cannot be reconnected until the autopilot is disengaged.

15 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . .Set

Prior to Start of the Approach

Autopilot . . . . .Disengage

YAW DAMPER switch . . . . ON

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

FAULT

IRS FAULT

G-CDZH - G-CDZM

Condition: One or more of these occur:
- An IRS fault occurs
- On the ground, if the ALIGN light is also illuminated, the present position entry is possibly incorrect.

1 Choose one:

◆On the **ground**:

▶▶**Go to step 2**

◆**In flight**:

▶▶**Go to step 6**

On the ground

2 Choose one:

◆ALIGN light is **extinguished**:

Notify maintenance.

■ ■ ■ ■

◆ALIGN light is also **illuminated**:

IRS mode selector . . . . OFF

The FAULT light extinguishes immediately and the ALIGN light extinguishes after approximately 30 seconds.

▶▶**Go to step 3**

3 **After** the ALIGN light extinguishes:

IRS mode selector . . . . NAV

Enter present position.

▼ **Continued on next page** ▼

▼ IRS FAULT continued ▼

4 Choose one:

◆ALIGN light **is** flashing:

Re-enter present position.

▶▶**Go to step 5**

◆ALIGN light is **not** flashing:

▶▶**Go to step 5**

5 Choose one:

◆FAULT light **illuminates** again:

Notify maintenance.

■ ■ ■ ■

◆FAULT light does **not** illuminate again:

■ ■ ■ ■

In flight

6 The IRS ATT and/or NAV mode(s) may be inoperative.

7 Partial capability may be restored by selecting attitude mode on the failed IRS. Straight and level, constant airspeed flight must be maintained for at least 30 seconds.

8 Choose one:

◆Selecting attitude mode on the failed IRS **is** desired:

▶▶**Go to step 9**

◆Selecting attitude mode on the failed IRS is **not** desired:

▶▶**Go to step 12**

9 Do the next step **only** if the captain's **or** first officer's primary attitude display is failed.

▼ Continued on next page ▼

▼ IRS FAULT continued ▼

Action is not reversible.

10 IRS mode selector (**failed side**) . . . . . Confirm . . . . ATT

Maintain straight and level, constant airspeed flight until the attitude display recovers (approximately 30 seconds).

Note: The primary attitude display will stay failed and the SET IRS HDG prompt will not appear on the POS INIT page until the attitude mode alignment is complete.

11 Choose one:

◆ FAULT light **extinguishes**:

Enter magnetic heading on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

Enter updated heading periodically on the POS INIT page or on the overhead IRS display unit by selecting HDG/STS.

Do **not** use either autopilot.

■ ■ ■ ■

◆ FAULT light **stays illuminated**:

► ► **Go to step 12**

12 IRS transfer switch . . . . BOTH ON L or BOTH ON R

Note: Autopilot(s) cannot be engaged.

■ ■ ■ ■

ON DC

IRS ON DC

Condition: IRS AC power is failed.

1 Power to the right IRS is removed after 5 minutes.

■ ■ ■ ■

UNABLE REQD NAV PERF - RNP

Condition: UNABLE REQD NAV PERF-RNP is shown. The actual navigation performance is not sufficient.

1 Choose one:

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

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

■ ■ ■ ■

◆On a procedure or airway **without** an RNP alerting requirement:

Verify position.

■ ■ ■ ■

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CONFIG < >
All aircraft (except G-CDZM with centre tank fuel pump restrictions in force)

Condition: All of these occur:
- Both center tank fuel pump switches are off
- There is more than 726 kgs of fuel in the center tank
- An engine is running.

1 Do not accomplish this procedure until established in a level flight attitude.

2 CTR FUEL PUMP switches (both). . . . . .ON

Verify that the LOW PRESSURE lights extinguish.

3 **When** both LOW PRESSURE lights illuminate:

CTR FUEL PUMP switches (both). . . . . OFF

■ ■ ■ ■

CONFIG < >
G-CDZM (with centre tank fuel pump restrictions in force)

Condition: All of these occur:
- Both center tank fuel pump pressures are low
- There is more than 726 kgs of fuel in the center tank
- An engine is running.

1 Do not accomplish this procedure until established in a level flight attitude.

2 CTR FUEL PUMP switches (both). . . . . .ON

Verify that the LOW PRESSURE lights extinguish.

3 **When** both LOW PRESSURE lights illuminate:

CTR FUEL PUMP switches (both). . . . . OFF

■ ■ ■ ■

VALVE OPEN

CROSSFEED SELECTOR INOPERATIVE

Condition: The crossfeed VALVE OPEN light stays illuminated bright blue if the fuel crossfeed valve is not in the commanded position.

1 Choose one:

◆CROSSFEED selector is **closed**:

Crossfeed **valve** is failed open.

Maintain fuel balance with selective use of fuel pumps.

■ ■ ■ ■

◆CROSSFEED selector is **open**:

Crossfeed **valve** is failed closed.

▶▶**Go to step 2**

2 **If** flight conditions allow:

Vary thrust to maintain fuel balance.

If unable to maintain acceptable balance:

Land at the nearest suitable airport.

■ ■ ■ ■

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Engine Fuel Leak

Condition: An inflight engine fuel leak is suspected or confirmed. (Items which may indicate an engine fuel leak are listed in the Additional Information section at the end of the checklist.)

Objective: To verify that there is an engine fuel leak and to take corrective action, if needed.

1 CTR FUEL PUMP switches (both) . . . . OFF

The fuel CONFIG alert may show with fuel in the center tank.

2 CROSSFEED selector . . . . Close

3 Identify an engine fuel leak by observing one main fuel tank quantity decreasing faster than the other.

4 An increase in fuel imbalance of approximately 230 kgs or more in 30 minutes should be considered an engine fuel leak.

5 **If** conditions allow:

Visually check for an engine fuel leak.

6 Choose one:

◆Both main tank quantities decrease at the **same** rate:

►►**Go to step 7**

◆Both main tank quantities decrease at **different** rates as described above **or an engine fuel leak is confirmed**:

►►**Go to step 15**

7 Resume normal fuel management procedures.

8 **If** the FMC message USING RSV FUEL, INSUFFICIENT FUEL, or CHECK FMC FUEL QUANTITY is shown on the CDU scratch pad:

Select PROGRESS page 1.

Check destination fuel estimate. Compare FMC fuel quantity with fuel gauges and flight plan fuel.

▼ Continued on next page ▼

▼ Engine Fuel Leak continued ▼

9 Choose one:

◆Fuel quantity indicator is **inoperative**:

Enter and periodically update the manually calculated FUEL weight on the FMC PERF INIT page, if needed.

►►**Go to step 10**

◆Fuel quantity indicator is **operative**:

►►**Go to step 10**

10 Choose one:

◆Fuel LOW alert is **shown**:

►►**Go to step 11**

◆Fuel LOW alert is **not** shown:

■ ■ ■ ■

11 Main tank FUEL PUMP switches (all) . . . . .ON

12 CROSSFEED selector. . . . . Open

13 Apply thrust changes slowly and smoothly.

14 **If** a climb is needed:

Maintain the minimum pitch attitude needed for safe flight. This minimizes the possibility of uncovering the fuel pumps.

■ ■ ■ ■

Engine fuel leak is confirmed

15 Autothrottle . . . . .Disengage

16 Thrust lever
(affected engine) . . . . . . Confirm . . . . Close

17 Engine start lever
(affected engine) . . . . . . Confirm . . . . . CUTOFF

18 PACK switch (affected side) . . . . OFF

This causes the operating pack to regulate to high flow in flight with the flaps up.

▼ Continued on next page ▼

▼ Engine Fuel Leak continued ▼

G-FDZA - G-FDZS

19 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . .ON

►►**Go to step 20**

◆APU is **not** available:

►►**Go to step 20**

G-FDZA - G-FDZS

20 Transponder mode selector . . . . TA

This prevents climb commands which can exceed single engine performance capability.

G-CDZH - G-CDZM

21 Choose one:

◆APU is **available** for start:

APU . . . . START

When APU is running:

APU GEN switch
(affected side) . . . . .ON

►►**Go to step 22**

◆APU is **not** available:

►►**Go to step 22**

G-CDZH - G-CDZM

22 Transponder mode selector . . . . TA ONLY

This prevents climb commands which can exceed single engine performance capability.

23 After engine shutdown, all remaining fuel can be used for the operating engine. Balance fuel as needed.

▼ Continued on next page ▼

▼ **Engine Fuel Leak continued** ▼

24 Plan to land at the nearest suitable airport.

G-CDZH - G-CDZM, G-FDZJ

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.18**

G-FDZA - G-FDZG, G-FDZR, G-FDZS

▶▶**Go to the One Engine Inoperative Landing <> checklist on page 7.20**

■ ■ ■ ■

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 fuel flow

Total fuel quantity decreasing at an abnormal rate

Fuel IMBAL alert

USING RSV FUEL message

INSUFFICIENT FUEL message

CHECK FMC FUEL QUANTITY message.

FILTER BYPASS

FUEL FILTER BYPASS

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

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

■ ■ ■ ■

LOW PRESSURE

FUEL PUMP LOW PRESSURE

Condition: The fuel pump pressure is low.

Note: Fuel pump LOW PRESSURE lights may flicker when tank quantity is low and the airplane is in turbulent air or during climb or descent.

1 Choose one:

◆**One main** tank fuel pump LOW PRESSURE light is illuminated:

Main tank FUEL PUMP switch (affected pump). . . . . OFF

Sufficient fuel pressure is available for normal operation.

■ ■ ■ ■

◆**Both main** tank fuel pump LOW PRESSURE lights are illuminated:

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

■ ■ ■ ■

◆**One CTR** tank fuel pump LOW PRESSURE light is illuminated:

▶▶**Go to step 2**

◆**Both CTR** tank fuel pump LOW PRESSURE lights are illuminated:

▶▶**Go to step 5**

2 CROSSFEED selector . . . . Open

This prevents fuel imbalance.

3 CTR FUEL PUMP switch (affected side) . . . . . OFF

4 **When** the other CTR tank fuel pump LOW PRESSURE light illuminates:

CROSSFEED selector. . . . . Close

▼ **Continued on next page** ▼

▼ **FUEL PUMP LOW PRESSURE continued** ▼

Remaining CTR FUEL PUMP switch . . . . . . OFF

■ ■ ■ ■

Both CTR tank fuel pump LOW PRESSURE lights are illuminated

5 CTR FUEL PUMP switches (both). . . . . OFF

6 Fuel CONFIG alert may show with fuel in the center tank.

7 Center tank fuel is unusable. Main tank fuel may not be sufficient for the planned flight.

■ ■ ■ ■

Fuel Quantity Indication Inoperative

Condition: The fuel quantity indication is blank.

1 Enter and periodically update the manually calculated FUEL weight on the FMC PERF INIT page.

■ ■ ■ ■

Fuel Temperature Low

Condition: Fuel temperature is near the minimum.

1 **When** fuel temperature is approaching the fuel temperature limit (3° C /5° F above the fuel freeze point or - 43° C /- 45° F whichever is higher):

Increase speed, change altitude and/or deviate to a warmer air mass to achieve a TAT equal to or higher than the fuel temperature limit.

TAT will increase approximately 0.5 to 0.7° C for each .01 Mach increase in speed. In extreme conditions, it may be necessary to descend as low as FL250.

■ ■ ■ ■

IMBAL

Condition: There is a fuel imbalance between the main fuel tanks of more than 453 kgs.

Objective: To balance fuel if there are no indications of an engine fuel leak.

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

Total fuel remaining compared to planned fuel remaining.

Fuel flow indications for an engine with excessive fuel flow.

Individual tank quantities.

2 Choose one:

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

▶▶ **Go to the Engine Fuel Leak checklist on page 12.4**

■ ■ ■ ■

◆ There is **no** indication of an engine fuel leak:

Balance fuel.

■ ■ ■ ■

LOW

Condition: The fuel quantity in a main tank is less than 907 kgs.

Objective: To check for indications of an engine fuel leak and ensure all remaining fuel is available to both engines.

1 The fuel LOW indication may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

Total fuel remaining compared to planned fuel remaining.

Fuel flow indications for an engine with excessive fuel flow.

Individual tank quantities.

2 Choose one:

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

▶▶**Go to the Engine Fuel Leak checklist on page 12.4**

■ ■ ■ ■

◆There is **no** indication of an engine fuel leak:

▶▶**Go to step 3**

3 Main tank FUEL PUMP switches (all) . . . . ON

4 CROSSFEED selector. . . . . Open

5 Apply thrust changes slowly and smoothly.

6 **If** a climb is needed:

Maintain the minimum pitch attitude needed for safe flight. This minimizes the possibility of uncovering the fuel pumps.

■ ■ ■ ■

Intentionally
Blank

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Intentionally
Blank

LOW PRESSURE

HYDRAULIC PUMP LOW PRESSURE

Condition: The hydraulic pump pressure is low.

1 HYD PUMP switch (affected side) . . . . OFF

Note: Loss of an engine-driven hydraulic pump and a high demand on the system may result in an intermittent illumination of the LOW PRESSURE light for the remaining electric motor-driven hydraulic pump.

■ ■ ■ ■

OVERHEAT

HYDRAULIC PUMP OVERHEAT

Condition: The hydraulic pump temperature is high.

1 ELEC HYD PUMP switch (affected side) . . . . . OFF

Note: One pump supplies sufficient pressure for normal system operation.

■ ■ ■ ■

LOSS OF SYSTEM A <>

FLT CONTROL	A HYD PUMPS	
A	ENG 1	ELEC 2
LOW PRESSURE	LOW PRESSURE	LOW PRESSURE

Condition: Hydraulic system A pressure is low.

1 System A
FLT CONTROL switch . . . . Confirm . . . .STBY RUD

2 System A
HYD PUMP switches (both). . . . . OFF

Inoperative Items

Autopilot A inop
Autopilot B is available.

Flight spoilers (two on each wing) inop
Roll rate and speedbrake effectiveness may be reduced in flight.

Normal landing gear extension and retraction inop
Manual gear extension is needed.

Ground spoilers inop
Landing distance will be increased.

Alternate brakes inop
Normal brakes are available.

Engine 1 thrust reverser normal hydraulic pressure inop
Thrust reverser will deploy and retract at a slower rate and some thrust asymmetry can be anticipated during thrust reverser deployment.

Normal nose wheel steering inop
Alternate nose wheel steering is available.

3 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

4 NOSE WHEEL STEERING switch . . . . ALT

5 Plan for manual gear extension.

Note: When the gear has been lowered manually, it cannot be retracted. The drag penalty with gear extended may make it impossible to reach an alternate field.

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ LOSS OF SYSTEM A <> continued ▼

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . .Set

Manual Gear Extension

LANDING GEAR lever. OFF

Manual gear extension handles. . . . . Pull

The uplock is released when the handle is pulled to its limit.

The related red landing gear indicator light illuminates, indicating uplock release.

Wait 15 seconds after the last manual gear extension handle is pulled:

LANDING GEAR lever . . . . .DN

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

LOSS OF SYSTEM B <>

FLT CONTROL	B HYD PUMPS	
B	ELEC 1	ENG 2
LOW PRESSURE	LOW PRESSURE	LOW PRESSURE

Condition: Hydraulic system B pressure is low.

1 System B
FLT CONTROL switch . . . . Confirm . . . .STBY RUD

2 System B
HYD PUMP switches (both). . . . . OFF

Inoperative Items

Autopilot B inop
Autopilot A is available.

Flight spoilers (two on each wing) inop
Roll rate and speedbrake effectiveness may be reduced in flight.

Yaw damper inop

Trailing edge flaps normal hydraulic system inop
The trailing edge flaps can be operated with the alternate electrical system. Alternate flap extension time to flaps 15 is approximately 2 minutes.

Leading edge flaps and slats normal hydraulic system inop
The leading edge flaps and slats can be extended with standby pressure. Once extended, they can not be retracted.

Autobrake inop
Use manual braking.

Normal brakes inop
Alternate brakes are available.

Engine 2 thrust reverser normal hydraulic pressure inop
Thrust reverser will deploy and retract at a slower rate and some thrust asymmetry can be anticipated during thrust reverser deployment.

Alternate nose wheel steering inop
Normal nose wheel steering is available.

3 Plan a flaps 15 landing.

▼ Continued on next page ▼

▼ LOSS OF SYSTEM B <> continued ▼

4 Set VREF 15 or VREF ICE.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

5 Plan to extend flaps to 15 using alternate flap extension.

Note: The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

6 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

7 Do **not** arm the autobrake for landing. Use manual braking.

8 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ____

Recall . . . . Checked

Autobrake **. . . . . .OFF**

Landing data **. . . . . .VREF 15 or VREF ICE, Minimums ____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ____

NAV aids . . . . .Set

▼ Continued on next page ▼

▼ LOSS OF SYSTEM B <> continued ▼

Alternate Flap Extension

During flap extension, set the flap lever to the desired flap position.

230K maximum during alternate flap extension.

ALTERNATE FLAPS master switch . . . . ARM

Note: The landing gear configuration warning may sound if the flaps are between 10 and 15 and the landing gear are retracted.

G-FDZA - G-FDZS

Note: The amber LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 15 position.

G-CDZH - G-CDZM

Note: The amber LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 10 position.

Note: Operation within the lower amber airspeed band may be needed until the LE FLAPS TRANSIT light extinguishes.

If flap asymmetry occurs, release the switch immediately. There is no asymmetry protection.

ALTERNATE FLAPS position switch . . . . Hold DOWN to extend flaps to 15 on schedule

As flaps are extending, slow to respective maneuvering speed.

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin. . . . . Secure

ENGINE START switches. . . . . CONT

Speedbrake . . . . ARMED

▼ Continued on next page ▼

▼ LOSS OF SYSTEM B <> continued ▼

Landing gear . . . . Down

Flaps. . . . . **15, Green light**

■ ■ ■ ■

MANUAL REVERSION <> or LOSS OF SYSTEM A AND SYSTEM B <>

FLT CONTROL		HYD PUMPS			
A	B	ENG 1	ELEC 2	ELEC 1	ENG 2
LOW PRESSURE	LOW PRESSURE	LOW PRESSURE		LOW PRESSURE	

Condition: Hydraulic system A and B pressures are low.

1 System A and B FLT CONTROL switches (both) . . . . . Confirm. . . . . . .STBY RUD

2 YAW DAMPER switch . . . . .ON

3 System A and B HYD PUMPS switches (all) . . . . OFF

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B <> continued ▼

Inoperative Items

Autopilots A and B inop

All flight spoilers inop
Roll rate will be reduced and speedbrakes will not be available in flight.

Trailing edge flaps normal hydraulic system inop
The trailing edge flaps can be operated with the alternate electrical system. Alternate flap extension time to flaps 15 is approximately 2 minutes.

Leading edge flaps and slats normal hydraulic system inop
The leading edge flaps and slats can be extended with standby hydraulic pressure. Once extended, they can not be retracted.

Normal landing gear extension and retraction inop
Manual gear extension is needed.

Autobrake inop

Ground spoilers inop
Landing distance will be increased.

Normal and alternate brakes inop
Inboard and outboard brakes have accumulator pressure only. On landing, apply steady brake pressure without modulating the brakes.

Both thrust reversers normal pressure inop
Thrust reversers will deploy and retract at a slower rate.

Nose wheel steering inop
Do not attempt to taxi the airplane after stopping.

4 Plan to land at the nearest suitable airport.

5 Plan a flaps 15 landing.

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B <> continued ▼

6 Set VREF 15 or VREF ICE.

If any of the following conditions apply, set VREF ICE = VREF 15 + 10 knots:

Engine anti–ice will be used during landing

Wing anti–ice has been used any time during the flight

Icing conditions were encountered during the flight and the landing temperature is below 10° C.

Note: When VREF ICE is needed, the wind additive should not exceed 10 knots.

7 Plan to extend flaps to 15 using alternate flap extension.

Note: The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

8 Plan for manual gear extension.

Note: When the gear has been lowered manually, it cannot be retracted. The drag penalty with gear extended may make it impossible to reach an alternate field.

9 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

Note: The crosswind capability of the airplane is greatly reduced.

10 Do **not** arm the autobrake for landing.

11 Do **not** arm the speedbrakes for landing.

12 On touchdown, apply steady brake pressure without modulating the brakes.

13 Do not attempt to taxi the airplane after stopping.

14 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B <> continued ▼

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . **VREF 15 or VREF ICE, Minimums ___**

Approach briefing . . . . Completed

Go-Around Procedure Review

Do the normal go-around procedure except:

Advance thrust to go-around smoothly and slowly to avoid excessive pitch-up.

Be prepared to trim.

Limit bank angle to 15° when airspeed is less than the minimum maneuver speed.

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . .Set

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B <> continued ▼

Alternate Flap Extension

During flap extension, set the flap lever to the desired flap position.

230K maximum during alternate flap extension.

ALTERNATE FLAPS master switch . . . . ARM

Note: The landing gear configuration warning may sound if the flaps are between 10 and 15 and the landing gear are retracted.

G-FDZA - G-FDZS

Note: The amber LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 15 position.

G-CDZH - G-CDZM

Note: The amber LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 10 position.

Note: Operation within the lower amber airspeed band may be needed until the LE FLAPS TRANSIT light extinguishes.

If flap asymmetry occurs, release the switch immediately. There is no asymmetry protection.

ALTERNATE FLAPS
position switch . . . . .Hold DOWN
to extend flaps
to 15 on schedule

As flaps are extending, slow to respective maneuvering speed.

Manual Gear Extension

LANDING GEAR lever. . . . . OFF

Manual gear extension handles. . . . . Pull

The uplock is released when the handle is pulled to its limit.

The related red landing gear indicator light illuminates, indicating uplock release.

▼ Continued on next page ▼

▼ **MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B <> continued** ▼

Wait 15 seconds after the last manual gear extension handle is pulled:

LANDING GEAR lever . . . . DN

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . Down

Flaps . . . . **15, Green light**

■ ■ ■ ■

LOW PRESSURE

STANDBY HYDRAULIC LOW PRESSURE

Condition: The standby hydraulic pump pressure is low.

Note: With a loss of hydraulic system A and B, the rudder is inoperative.

■ ■ ■ ■

LOW QUANTITY

STANDBY HYDRAULIC LOW QUANTITY

Condition: The standby hydraulic quantity is low.

1 Continue normal operation.

■ ■ ■ ■

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ANTISKID INOP

ANTISKID INOPERATIVE <>

Condition: An antiskid system fault occurs.

Note: Locked wheel protection is not available.

1 AUTO BRAKE select switch. . . . . OFF

2 Do **not** arm the speedbrakes for landing. Manually deploy the speedbrakes immediately upon landing.

Automatic speedbrake extension may be inoperative.

3 Do **not** apply brakes until after main gear touchdown. Use minimum braking consistent with runway conditions to reduce the possibility of a tire blowout.

4 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

5 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ ANTISKID INOPERATIVE <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . Set

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

Intentionally
Blank

AUTO BRAKE DISARM

AUTO BRAKE DISARM <>

Condition: The autobrake system disarms after being set.

1 Choose one:

◆On the **ground**:

AUTO BRAKE select switch . . . . OFF

►►**Go to step 2**

◆**In flight**:

►►**Go to step 3**

2 Choose one:

◆AUTO BRAKE DISARM light **extinguishes**:

■ ■ ■ ■

◆AUTO BRAKE DISARM light **stays illuminated**:

Do not takeoff.

■ ■ ■ ■

3 AUTO BRAKE select switch . . . . OFF, then reselect

4 Choose one:

◆AUTO BRAKE DISARM light **stays extinguished**:

■ ■ ■ ■

◆AUTO BRAKE DISARM light **illuminates again**:

AUTO BRAKE select switch . . . . OFF

Use manual brakes for landing.

►►**Go to step 5**

5 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ AUTO BRAKE DISARM <> continued ▼

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ___
Recall . . . . Checked
Autobrake . . . . **OFF**
Landing data . . . . VREF ___, Minimums ___
Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___
NAV aids . . . . .Set

Landing Checklist

Cabin . . . . Secure
ENGINE START switches . . . . CONT
Speedbrake . . . . ARMED
Landing gear . . . . Down
Flaps . . . . ___, Green light

■ ■ ■ ■

Brake Pressure Indicator Zero PSI

Condition: The brake accumulator has no nitrogen precharge.

1 Accumulator braking is not available.

Note: If hydraulic systems indications are normal, brake operation is unaffected.

■ ■ ■ ■

Landing Gear Lever Jammed in the Up Position <>

Condition: The LANDING GEAR lever will not move from the UP position.

Note: Start this checklist **only** when ready to extend the gear for landing.

Once the gear is extended, do **not** retract.

270K/.82M maximum.

1 ⚠ LANDING GEAR override trigger . . . . Pull

2 LANDING GEAR lever .DN

3 Choose one:

◆LANDING GEAR **lever** moves to the **DN** position:

►►**Go to step 4**

◆LANDING GEAR **lever** does **not** move to the DN position:

►►**Go to step 6**

4 Check landing gear indicator lights.

Note: If a green landing gear indicator light is illuminated on either the center main panel or the overhead panel, the related landing gear is down and locked.

5 Choose one:

◆**All** landing gear indicate down and locked:

Plan to land at the nearest suitable airport.

■ ■ ■ ■

◆**Only one or two** landing gear indicate down and locked:

►►**Go to the Manual Gear Extension checklist on page 14.12**

■ ■ ■ ■

6 NOSE WHEEL STEERING switch . . . . Verify NORM

Nose wheel steering is not available.

▼ Continued on next page ▼

▼ Landing Gear Lever Jammed in the Up Position <> continued ▼

Warning! Do not use alternate nose wheel steering because the landing gear may retract on the ground.

270K/.82M maximum.

7 Manual gear extension handles (all) . . . . Pull

Do not wait for an indication that a landing gear is down and locked before pulling the next handle.

Note: The uplock is released when the handle is pulled to its limit. The related red landing gear indicator light illuminates, indicating uplock released.

With the LANDING GEAR lever in the UP or OFF position, the red landing gear indicator lights will stay illuminated.

8 Check landing gear indicator lights.

9 Choose one:

◆**All** landing gear indicate down and locked:

►►**Go to step 10**

◆**Only one or two** landing gear indicate down and locked:

►►**Go to the Partial or All Gear Up Landing <> checklist on page 14.14**

■ ■ ■ ■

10 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Landing Gear Lever Jammed in the Up Position <> continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

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

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

Additional Deferred Item

GROUND PROXIMITY GEAR
INHIBIT switch . . . . GEAR INHIBIT

Landing Checklist

Cabin. . . . . Secure

ENGINE START switches. . . . . CONT

Speedbrake . . . . ARMED

Landing gear **. . . . . Down, Three green**

Flaps . . . . ___, Green light

Note: Nose wheel steering is not available.

Warning! Do not use alternate nose wheel steering because the landing gear may retract on the ground.

■ ■ ■ ■

Landing Gear Lever Will Not Move Up After Takeoff <>

Condition: The LANDING GEAR lever cannot be moved to the UP position due to one of the following:
- Failure of the landing gear lever lock solenoid
- Failure of the air/ground system
- Failure of the ground spoiler bypass valve to close.

Note: Do not use FMC fuel predictions.

1 LANDING GEAR lever . . . . DN

2 Retract the flaps on schedule.

3 Choose one:

◆Intermittent cabin altitude/configuration warning horn **stays silent** and the TAKEOFF CONFIG lights (if installed and operative) do **not illuminate** after the flaps are fully retracted and the thrust levers are advanced beyond the vertical position:

Note: This indicates a failure of the landing gear lever lock solenoid.

▶▶**Go to step 4**

◆Intermittent cabin altitude/configuration warning horn **sounds** or the TAKEOFF CONFIG lights (if installed and operative) **illuminate** when the flaps are fully retracted:

Note: This indicates either a failure of the air/ground system or a failure of the ground spoiler bypass to close.

Do **not** retract the gear.

▶▶**Go to step 8**

235K maximum.

4 ⚠ LANDING GEAR override trigger . . . . Pull

5 LANDING GEAR lever . . . . UP

▼ Continued on next page ▼

▼ Landing Gear Lever Will Not Move Up After Takeoff <> continued ▼

6 **When** the landing gear indicator lights extinguish:

LANDING GEAR lever . . . . OFF

7 Continue normal operation.

■ ■ ■ ■

8 LANDING GEAR
TAKEOFF WARNING CUTOFF
circuit breaker (P6–3:C18) . . . . Pull

Note: The intermittent cabin altitude/configuration warning horn may still sound and the TAKEOFF CONFIG lights (if installed and operative) may still illuminate depending on thrust lever and flap position.

Caution! Do not use the speedbrakes in flight.

9 Plan to land at the nearest suitable airport.

10 Do **not** arm the autobrake for landing. Use manual braking.

11 Do **not** arm the speedbrakes for landing. Manually deploy the speedbrakes immediately upon landing.

12 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake **. . . . . .OFF**

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH___

NAV aids . . . . Set

▼ Continued on next page ▼

▼ Landing Gear Lever Will Not Move Up After Takeoff <> continued ▼

Gear Down Verification

LANDING GEAR lever. . . . . Verify DN

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . **Down (previously verified)**

Flaps . . . . ___, Green light

Note: Manually deploy the speedbrakes immediately upon touchdown. Use manual braking.

■ ■ ■ ■

Manual Gear Extension

Condition: One of these occurs:
- Any landing gear is not down and locked when the LANDING GEAR lever is down
- The LANDING GEAR lever is jammed in the OFF position.

Note: If a green landing gear indicator light is illuminated on either the center main panel or the overhead panel, the related landing gear is down and locked.

1 LANDING GEAR lever . . . . OFF (if possible)

270K/.82M maximum.

2 Manual gear extension handles (affected gear) . . . . Pull

The uplock is released when the handle is pulled to its limit. The related red landing gear indicator light illuminates, indicating uplock released.

3 **Wait** 15 seconds after the last manual gear extension handle is pulled:

LANDING GEAR lever . . . . DN (if possible)

4 Check landing gear indicator lights.

Note: If the LANDING GEAR lever is in the OFF position, the red landing gear indicator lights will also be illuminated.

5 Choose one:

◆ **All** landing gear indicate down and locked:

►► **Go to step 6**

◆ **Only one or two** landing gear indicate down and locked:

►► **Go to the Partial or All Gear Up Landing <> checklist on page 14.14**

■ ■ ■ ■

▼ Continued on next page ▼

▼ **Manual Gear Extension continued** ▼

6 Choose one:

◆ LANDING GEAR **lever** is in the **DN** position:

Land normally.

■ ■ ■ ■

◆ LANDING GEAR **lever** is in the **OFF** position:

GROUND PROXIMITY GEAR
INHIBIT switch . . . . .GEAR INHIBIT

Land normally.

Note: Nose wheel steering is not available.

■ ■ ■ ■

Partial or All Gear Up Landing <>

Condition: All landing gear are not down and locked after attempting manual gear extension.

1 Choose one:

◆Manual gear extension **has** been attempted:

▶▶**Go to step 2**

◆Manual gear extension has **not** been attempted:

▶▶**Go to the Manual Gear Extension checklist on page 14.12**

■ ■ ■ ■

2 Brief the crew and passengers on emergency landing and evacuation procedures.

3 Burn off fuel to reduce touchdown speed.

4 Plan a flaps 40 landing.

5 Set VREF 40.

6 LANDING GEAR
AURAL WARN circuit breaker (P6-3:D18) . . . . Pull

This prevents the landing gear warning horn with gear retracted and landing flaps selected.

7 FLIGHT CONTROL
AUTO SPEED BRAKE
circuit breaker (P6-2:B9) . . . . Pull

This prevents inadvertent deployment of ground spoilers after landing.

8 Do **not** arm the autobrake for landing. Use manual braking.

9 Do **not** arm the speedbrakes for landing.

10 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . **OFF**

▼ Continued on next page ▼

▼ Partial or All Gear Up Landing <> continued ▼

Landing data . . . . **VREF 40, Minimums ___**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . QNH ___

NAV aids . . . . .Set

Landing Procedure Review

Do not extend the speedbrakes unless stopping distance is critical. When stopping distance is critical, extend the speedbrakes after all landing gear, the nose or the engine nacelle have contacted the runway.

Do not use the thrust reversers unless stopping distance is critical.

Turn all fuel pump switches OFF just before the flare.

After stopping, do the Evacuation checklist, if needed.

Additional Deferred Items

APU switch . . . . OFF

GROUND PROXIMITY GEAR
INHIBIT switch . . . . GEAR INHIBIT

When on approach:

Engine BLEED air switches . . . . OFF

This ensures the airplane is depressurized at touchdown.

▼ Continued on next page ▼

Landing Checklist

Cabin . . . . Secure

ENGINE START switches . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . ___ **Down**

Flaps . . . . **40, Green light**

At **500 feet**, the pilot monitoring will advise the cabin using the PA: "CREW STATIONS, CREW STATIONS."

At **50 feet (or approximately 15 secs before impact)**, the pilot monitoring will advise the cabin using the PA: "BRACE, BRACE."

■ ■ ■ ■

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LANDING CONFIGURATION

Condition: In flight, the steady warning horn sounds.

1 Assure correct airplane landing configuration.

Overspeed

Condition: Airspeed is more than Vmo/Mmo.

1 Reduce thrust and, if needed, adjust attitude to reduce airspeed to less than Vmo/Mmo.

TAKEOFF CONFIGURATION

TAKEOFF CONFIG **(If installed and operative)**

Condition: On the ground, the intermittent cabin altitude/configuration warning horn sounds and the TAKEOFF CONFIG lights (if installed and operative) illuminate when advancing the thrust levers to takeoff thrust.

1 Assure correct airplane takeoff configuration.

WARNING HORN (INTERMITTENT) or WARNING LIGHT - CABIN ALTITUDE OR TAKEOFF CONFIGURATION

(If installed and operative)

Left Forward Panel

TAKEOFF CONFIG	CABIN ALTITUDE

Right Forward Panel

CABIN ALTITUDE	TAKEOFF CONFIG

Condition: One of these occurs:

- In flight, at an airplane flight altitude above 10,000 feet MSL, the intermittent warning horn sounds or a CABIN ALTITUDE light (if installed and operative) illuminates, when the cabin altitude is at or above 10,000 feet
- On the ground, the intermittent warning horn sounds or a TAKEOFF CONFIG light (if installed and operative) illuminates, when the takeoff configuration is not correct during takeoff.

1 **If** the intermittent warning horn sounds or a CABIN ALTITUDE light (if installed and operative) illuminates **in flight** at an airplane flight altitude above 10,000 feet MSL:

Don the oxygen masks and set the regulators to 100%.

Establish crew communications.

▶▶**Go to the CABIN ALTITUDE WARNING or Rapid Depressurization checklist on page 2.1**

■ ■ ■ ■

2 **If** the intermittent warning horn sounds or a TAKEOFF CONFIG light (if installed and operative) illuminates **on the ground**:

Assure correct airplane takeoff configuration.

■ ■ ■ ■

ALTITUDE ALERT

Condition: The ALT ALERT indication shows that one of these occurs:
- The airplane is about to reach the MCP altitude
- A deviation from the MCP altitude.

1 Reset the selected altitude (if needed).

2 Maintain the correct altitude.

■ ■ ■ ■

INOP

GROUND PROXIMITY INOPERATIVE

Condition: A ground proximity warning system fault occurs.

Note: Some or all GPWS alerts are not available. GPWS alerts which occur are valid.

■ ■ ■ ■

PSEU

PSEU

Condition: A proximity switch electronics unit fault occurs.

Note: The PSEU light illuminates on the ground only.

G-CDZH - G-CDZM

1 Do not takeoff.

■ ■ ■ ■

G-FDZA - G-FDZS

2 Choose one:

◆PSEU light **stays** illuminated when either system annunciator panel is pushed and released:

►►**Go to step 3**

◆PSEU light **extinguishes** when either system annunciator panel is pushed and released:

■ ■ ■ ■

G-FDZA - G-FDZS

3 Choose one:

◆PSEU light **stays** illuminated when the parking brake is set or when both engines are shut down:

Do not takeoff.

■ ■ ■ ■

◆PSEU light **extinguishes** when the parking brake is set or when both engines are shut down:

■ ■ ■ ■

Tailstrike On Takeoff

Condition: The tail hits the runway on takeoff.

Caution! Do not pressurize the airplane due to possible structural damage.

1 Pressurization mode selector . . . . MAN

2 Outflow VALVE switch . . . . Hold in OPEN until the outflow VALVE position indicates fully open

3 Plan to land at the nearest suitable airport.

■ ■ ■ ■

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Operational Information — Chapter OI

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Introduction

This section of the QRH contains company Operational Procedures (OP).

On the ground, the following OP should be accomplished by reference:

- Electrical Power Up
- No Engine Bleed Takeoff and Landing
- Unpressurized Takeoff and Landing
- Starting with Ground Air Source
- Engine Crossbleed Start.

In-flight, the ’No Engine Bleed Takeoff and Landing’, and the ’Unpressurized Takeoff and Landing’ OP may be performed by memory, by reviewing the procedure prior to accomplishment, or by reference to the procedure during its accomplishment.

In-flight, fuel balancing may be performed by memory provided the centre tank contains no fuel and a fuel leak check has been accomplished.

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Autoland

Note: This Operational Procedure (OP) should be reviewed prior to any planned autoland. The procedure may be reviewed independently by each pilot, or read aloud by one pilot.

WARNING: In Category I conditions or better, Low Visibility Procedures may not be in force. Interference of ILS signals may occur. The flight path must be closely monitored and autopilots disengaged if excessive disturbances occur near the ground.

AUTOLAND SYSTEM AND WIND LIMITATIONS					
Aircraft	**Autoland System**	**Headwind**	**Crosswind**	**Tailwind (flaps 30)**	**Tailwind (flaps 40)**
G-CDZH-CDZV	Fail Passive	25 kts	20 kts	10 kts	10 kts
G-FDZA-FDZG G-FDZR-FDZS	Fail Operational	25 kts	25 kts	12 kts	15 kts
G-FDZJ	Fail Passive	25 kts	20 kts	12 kts	15 kts

----------------------------------- **Descent Procedure** -----------------------------------

Equipment requirements - Check

Crew Qualification - Check

- For CAT II/III both pilots must be LVO qualified.

Minima - Set

- For Cat II/III, set RADIO minima, and preset BARO Cat I minima.

Autobrake - Set

- Refer to C-LAND or P.I. Normal Configuration Landing Distances. For autoland increase P.I. reference distances by:
  - B737-800 - 400 ft (125 m)
  - B737-800WS - [Flap 40] 460 ft (140m), [Flap 30] 600 ft (185m)

Autoland Status Advisory Messages - Check

- On fail operational aircraft, verify that the autoland status advisory message NO AUTOLAND is not shown.

------------------------ **Fail Operational Landing Procedure** ------------------------

- Arm the second autopilot after selecting APP mode.
- Both autopilots must be engaged and LAND 3(2) displayed by 1000' RA.
- PM should call "LAND 3(2), ROLLOUT, FLARE ARMED" when annunciated.
- At 500' baro, PM should call "FIVE HUNDRED, LAND 3(2)"
- At 450' radio altitude, the alignment mode is enabled which provides rudder compensation.
- Approaching decision height PF should "look out". PM must continue to monitor flight instruments throughout approach and landing roll.
- The A/P flare maneuver starts at approx. 50' RA. PM shall call "FLARE GREEN" when FLARE mode engages. PM shall call "NO FLARE" if FLARE is not annunciated.
- The A/T begins retarding thrust at approx. 27' RA. PM shall call "NO RETARD" if RETARD is not annunciated.

- ROLLOUT engages at 2' RA. PM shall call "NO ROLLOUT" if ROLLOUT is not annunciated.
- On touchdown PF should apply reverse thrust and disconnect the autopilot when reaching taxi speed.

--------------------------- **Fail Passive Landing Procedure** -------------------------

- Arm the second autopilot after selecting APP mode.
- Both autopilots must be engaged and FLARE armed by 1000' RA.
- PM should call "FLARE ARMED" when annunciated.
- At 500' baro, PM should call "FIVE HUNDRED, FLARE ARMED"
- Approaching decision height PF should "look out". PM must continue to monitor flight instruments throughout approach and landing roll.
- The A/P flare maneuver starts at approx. 50' RA. PM shall call "FLARE GREEN" when FLARE mode engages. PM shall call "NO FLARE" if FLARE is not annunciated.
- The A/T begins retarding thrust at approx. 27' RA. PM shall call "NO RETARD" if RETARD is not annunciated.
- On touchdown PF should apply reverse thrust and disconnect the autopilot when the nose wheel touches down.

------------- **Contingencies below 1000' RA - Cat II/III Conditions -------**------

Above DH, a go-around should be made for:

- Engine malfunctions resulting in loss of thrust
- Failure of a required generator
- Failure of an attitude indicator or ADIRU
- Loss of hydraulic system pressure
- Failure of a required airport facility
- Continuous ILS deviation warning above 200' RA
- Any ILS deviation warning below 200' RA
- Flashing or steady red autopilot disengage warning light
- Autopilot wailer or failure
- No FLARE arm annunciation, including loss of FMA
- [Fail Operational Aircraft] Annunciation of NO AUTOLAND

In the event of any of the above conditions, PM should make an appropriate call e.g., "NO GLIDESLOPE" or "ENGINE FAILURE".

Below DH, a go-around should be flown; however, circumstances might dictate that a manual landing is the safest course of action. In the event of a manual landing be prepared for an out of trim condition.

---------------------- **Planning and Operational Information** ----------------------

Note: This section does not need to be read aloud.

Equipment requirements - Check

- The following aircraft equipment is required to be serviceable prior to commencing an approach to autoland:
  - 2 independent sources of electrical power. (The APU generator may be a substitute source of power for the left or right electrical system.)
  - Hydraulic Systems A & B - system pressures normal
  - Both engines operating
  - 2 autopilots engaged
  - 2 attitude indicators supplied by different display electronic units including attitude, radio altitude, ILS deviation, DA(H), and AFDS status
  - 2 Radio Altimeters and Indications
  - 2 ADIRUs in NAV mode
  - Both Flight Directors & F/D Command Bars
  - PM's A/P Disengage Lights

- A/P Disengage Aural Warning
- Thrust Mode Annunciation
- Both pilots' Flight Mode Annunciations
- Both ILS Receivers and pointers
- Radio DH displayed on both PFDs (for Cat II/IIIA only))
- EGPWS Automatic Height Callouts (for Cat IIIA only)
- Windshield Wipers (for Cat II/IIIA on Fail Passive aircraft only)

Landing Performance - Check

- Prior to dispatch to a destination predicated on Cat II/III conditions, check C-LAND (Autolanding), or make the following Autoland corrections to the PD Landing Field Length Limit:
  - B737-800 - subtract 400 ft (125m) from Field Length available.
  - B737-800WS - subtract [Flap 40] 460 ft (140m), [Flap 30] 600 ft (185m) from Field Length available.

Minima / ILS status - Refer to OMC Flight Guide

- For CAT I/II autoland, ILS Runway must be listed as suitable for autoland in Company Procedures pages. For Cat III, runway must be listed in Company Procedures pages. Refer to specific approach plate for minima.
- Training Captains are authorized to perform Verification Autolands at Cat I/II/III runways not listed in the Company Procedures pages.
- [Fail Operational] Autoland and rollout may be accomplished with either ASA LAND 3 or LAND 2 displayed. There is no change to minima with autoland status advisory message NO LAND 3, or ASA LAND 2 displayed.

Controlling RVR - Check

- Touchdown RVR (or Mid-point RVR if Touchdown not available) is required for Cat II and Cat IIIA and is controlling.
- "Controlling Runway Visual Range" is the value relevant to the approach ban requirements. The approach shall not be continued beyond the outer marker, or equivalent position, if the controlling RVR is below that required for the approach being flown.
- In the absence of an outer marker, or equivalent position, use 1000 aal.
- If reported and relevant a Mid-point RVR value of 125 m and a Stop-end RVR value of 75 m are also controlling.
- Relevant, in this context, means that part of the runway used during the high speed phase of landing down to a speed of approximately 60 kts.

Limitations - Check

- Instrument switching is not permitted.
- Autoland above Maximum Landing Mass is not certified.
- A planned Cat II/III approach with a manual landing is not authorized.
- Operations in conditions below Category IIIA are not approved.
- Autoland is only approved with flaps 30 or 40. Flaps 40 is recommended if weather conditions are below Category I.
- The maximum and minimum glideslope angles are 3.25° and 2.50° respectively. The localizer must not be offset.

FMA calls - Review

- After glideslope capture FMA calls should be made by PM.
- FMA calls are not required for "RETARD" or "ROLLOUT".

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Cold Weather Ground Operations

Note: This Operational Procedure (OP) should be accomplished when required in conjunction with the appropriate Normal Procedure. Review each OP section BEFORE performing the related NP. Refer to OMB Supplementary Procedures "Adverse Weather" for full details on all cold weather procedures.

---------------------------------- **Exterior Inspection** -----------------------------------

Do the normal Exterior Inspection with the following additional steps:

- Surfaces - Check
  - Cold-soaked fuel frost: refer to OMB Supplementary Procedures section 3. Thin hoarfrost on upper fuselage is acceptable, vents and ports must be clear. For full details refer to Supplementary Procedures "Adverse Weather".
- Control balance cavities - Check after snow removal
- Pitot probes and static ports - Check
- Air-cond inlets & exits, APU inlet, fuel tank vents, ldg gear doors - Check
- Engines inlet cowlings and fan blades - Free of snow and ice / Fan free to rotate
- Outflow valve- Check fully open

-------------------------------------- **Preflight** ---

Do the following step after completing the normal Preflight procedure:

- PITOT HEAT switches - ON

--------------------------------- **Takeoff performance** ----------------------------------

Review the following items after completing the takeoff briefing:

- Max crosswind - Review
- Takeoff thrust - Full, or derate if runway contaminated
  - Do not use ATM if runway is contaminated.
- Takeoff flap - Review
  - Use highest practicable setting if runway is contaminated.
- Takeoff bleed configuration - Review
  - If the aircraft has been de-iced and Bleeds OFF takeoff is required, use “Unpressurized T/O” Procedure.

---------------------------------- **On Stand De-icing** ------------------------------------

Perform the following procedure for on stand de-icing with engines shutdown:

- Cabin crew and passengers - Advise
- APU - OFF / if ON: advise ground personnel
  - Operate the APU during de-icing only if necessary. If the APU is running, ingestion of de-icing fluid causes objectionable fumes and odors to enter the airplane.
- Flaps - UP
- Stabilizer trim - Full APL NOSE DOWN (manual limit)
- APU bleed air switch - OFF
- Start time, fluid type, mixture - Note
- Holdover time - Check

After de-icing:

- Stabilizer trim - ___ units
- APU (if required) - Start
- APU bleed air switch - ON
  - Wait a minimum of 1 minute before switching APU bleed ON.

--------------------------------------- **Engine start** ---------------------------------------

Do the normal Engine Start procedure with the following modifications:

CAUTION: When OAT is below -35ºC, additional procedures apply.

- Pushback before engine start - Consider on slippery apron
- Oil pressure - Check
  - Any indication above zero after idle RPM is reached is acceptable. Up to three and one-half minutes may be allowed for oil pressure to reach the minimum operating pressure. During this period, the LOW OIL PRESSURE light may remain illuminated, pressure may go above the normal range and the FILTER BYPASS light may illuminate. Operate the engine at idle thrust until oil pressure returns to the normal range.
- DUs - May require additional warm-up time

--------------------------------------- **Before taxi** --

Do the normal Before Taxi procedure with the following modifications:

- Generator drives - Stabilized in maximum 5 min.
- Wing A/I - ON
  - Unless airplane is, or will be protected with Type II or Type IV fluid.

  Note: Delay “no bleed” setup until just prior T/O if wing AI is required.

  - Flaps - Check full travel (up --> Flaps 40 --> up)
    - Check full travel if temperature below 0°C or aircraft has been de-iced; then set as needed.

  CAUTION: In case of remote de-icing, do not move flaps until after de-icing is completed.

  - Flaps - UP if TWY is contaminated
    - If taxi route is through slush, or standing water in low temperatures, or if precipitation is falling with temperatures below freezing, taxi out with the flaps up.
  - Flight controls - Check

  CAUTION: In case of remote de-icing, do not move flight controls until after de-icing is completed.

  - Before Taxi checklist - Complete

-- **Taxi** --

Perform the normal Taxi procedure with the following modifications:

- Engine run-ups - 70% N1 minimum
  - Run-up for 30 sec. every 30 min. if engine A/I is required and OAT ≤ 3°C.
  - Run-up for 1 sec. every 10 min. in freezing rain, freezing drizzle, freezing fog or heavy snow.

------------------------- **Remote de-icing (engines running)** --------------------------

Perform the following procedure if de-icing with engines running:

- Cabin crew and passengers - Advise
- APU - OFF / if ON: advise ground personnel
- Flaps - UP
- Thrust levers - Idle
- Stabilizer trim - Full APL NOSE DOWN (manual limit)
- Engine and APU bleed air switches - OFF
- Wing A/I - OFF
  - If airplane will be de-iced with Type II or Type IV fluid.
- Start time, fluid type, mixture - Note
- Holdover time - Check

After de-icing:

- Stabilizer trim - ___ units
- Flaps - Check full travel (up --> Flaps 40 --> up)
  - Check full travel if temperature below 0°C; then set as needed. Monitor movement carefully.
- Flaps - UP if TWY is contaminated
  - If taxi route is through slush, or standing water in low temperatures, or if precipitation is falling with temperatures below freezing, taxi out with the flaps up.
- Flight controls - Check
- Engine bleed air switches - ON
  - Wait approximately one minute after de-icing is completed to turn engine BLEED air switches ON to ensure all de-icing fluid has been cleared from the engines.
- Before Taxi checklist - Complete
  - In the case of remote de-icing, the Before Taxi checklist will be completed twice.

------------------------------------- **Before takeoff** ---------------------------------------

Do the normal Before Takeoff procedure with the following modifications:

- Flaps - Takeoff position and monitor extension
- Before Takeoff checklist - Complete
- Holdover time - Review
  - If necessary, inspect wing visually just prior to takeoff.

--------------------------------------- **Takeoff** ---

Do the normal Takeoff procedure with the following modifications:

- Static engine run-up - 70% N1 minimum
  - Run-up to 70% N1 minimum and confirm stable engine operation if engine A/I is required and OAT ≤3°C

After Landing

Do the normal After Landing procedure with the following modifications:

- Flaps - 15
  - Do not retract the flaps to less than flaps 15 until the flap areas have been checked to be free of contaminates after prolonged operation in icing conditions with the flaps extended, or when an accumulation of airframe ice is observed, or when landing on a runway contaminated with ice, snow, or slush.
- Engine run-ups - 70% N1 minimum
  - Run-up for 30 sec. every 30 min. if engine A/I is required and OAT ≤ 3°C.
  - Run-up for 1 sec. every 10 min. in freezing rain, freezing drizzle, freezing fog or heavy snow.

Shutdown

Do the following step before starting the normal shutdown procedure:

- Stab trim - 0-2 UNITS
  - The Stab trim should be set to 0-2 UNITS when airframe icing conditions exist or are anticipated.

Secure

Refer to OMB Supplementary Procedures "Adverse Weather".

Cold Weather Altitude Corrections

Condition: Cold weather temperature altimeter corrections are required.

- No corrections are needed for reported temperatures above 0°C or if the airport temperature is at or above the minimum published temperature for the procedure being flown.
- Do not correct altimeter barometric reference settings.
- ATC assigned altitudes or flight levels should not be adjusted for temperature when under radar control.
- Corrections apply to QNH and QFE operations.
- Apply corrections to all published minimum departure, en route and approach altitudes, including missed approach altitudes, according to the table below. Advise ATC of the corrections.
- MDA/DA settings should be set at the corrected minimum altitudes for the approach.

-------------------------------------- **Procedure** --

- Subtract the elevation of the altimeter barometric reference setting source (normally the departure or destination airport elevation) from the published minimum altitude to be flown to determine "height above altimeter reference source".
- Enter the table with Airport Temperature and with "height above altimeter reference source". Read the correction where these two entries intersect. Add the correction to the published minimum altitude to be flown to determine the corrected indicated altitude to be flown. To correct an altitude above the altitude in the last column, use linear extrapolation (e.g., to correct 6000 feet, use twice the correction for 3000 feet.) The corrected altitude must always be greater than the published minimum altitude.
- If the corrected indicated altitude to be flown is between 100 foot increments, set the MCP altitude to the closest 100 foot increment above the corrected indicated altitude to be flown.

Altitude Correction Table (Heights and Altitudes in Feet)

Airport Temp °C	Height Above Altimeter Reference Source											
	200 feet	300 feet	400 feet	500 feet	600 feet	700 feet	800 feet	900 feet	1000 feet	1500 feet	2000 feet	3000 feet
0°	20	20	30	30	40	40	50	50	60	90	120	170
-10°	20	30	40	50	60	70	80	90	100	150	200	290
-20°	30	50	60	70	90	100	120	130	140	210	280	420
-30°	40	60	80	100	120	140	150	170	190	280	380	570
-40°	50	80	100	120	150	170	190	220	240	360	480	720
-50°	60	90	120	150	180	210	240	270	300	450	590	890

Altitude Correction Table (Heights and Altitudes in Meters)

Airport Temp °C	Height Above Altimeter Reference Source											
	60 m	90 m	120 m	150 m	180 m	210 m	240 m	270 m	300 m	450 m	600 m	900 m
0°	5	5	10	10	10	15	15	15	20	25	35	50
-10°	10	10	15	15	20	20	25	30	30	45	60	90
-20°	10	15	20	25	25	30	35	40	45	65	85	130
-30°	15	20	25	30	35	40	45	55	60	85	115	170
-40°	15	25	30	40	45	50	60	65	75	110	145	220
-50°	20	30	40	45	55	65	75	80	90	135	180	270

Electrical Power Up

The following procedure is accomplished to permit safe application of electrical power.

G-FDZA - G-FDZS

Note: Devices plugged into the flight deck auxiliary power outlets during Electrical Power Up will not be powered until the plugs are removed and re-inserted.

- BATTERY switch - **Guard closed**
- STANDBY POWER switch - **Guard closed**
- ALTERNATE FLAPS master switch - **Guard closed**
- Windshield WIPER selector(s) - **PARK**
- ELECTRIC HYDRAULIC PUMPS switches - **OFF**
- LANDING GEAR lever- **DN**
  - Verify that the green landing gear indicator lights are illuminated.
  - Verify that the red landing gear indicator lights are extinguished.

If external power is needed:

- Verify that the GRD POWER AVAILABLE light is illuminated.
- GRD POWER switch - ON
  - Verify that the SOURCE OFF lights are extinguished.
  - Verify that the TRANSFER BUS OFF lights are extinguished.
  - Verify that the STANDBY PWR OFF lights are extinguished.

If APU power is needed:

- Verify that the engine No. 1, APU and the engine No. 2 fire switches are in.
- Alert ground personnel before the following test is accomplished.
- OVERHEAT DETECTOR switches – NORMAL
- TEST switch – Hold to FAULT/INOP
  - Verify that the MASTER CAUTION lights are illuminated.
  - Verify that the OVHT/DET annunciator is illuminated.
  - Verify that the FAULT light is illuminated.
    - If the FAULT light fails to illuminate, the fault monitoring system is inoperative.
  - Verify that the APU DET INOP light is illuminated.
    - Do not operate the APU if the APU DET INOP light fails to illuminate.
- TEST switch – Hold to OVHT/FIRE
  - Verify that the fire warning bell sounds.
  - Verify that the master FIRE WARN lights are illuminated.
  - Verify that the MASTER CAUTION lights are illuminated.
  - Verify that the OVHT/DET annunciator is illuminated.
  - Master FIRE WARN light – Push
    - Verify that the master FIRE WARN lights are extinguished.
    - Verify that the fire warning bell cancels.
  - Verify that the engine No. 1, APU and the engine No. 2 fire switches stay illuminated.
  - Verify that the ENG 1 OVERHEAT and ENG 2 OVERHEAT lights stay illuminated.

- Extinguisher test switch – Check
  - TEST switch - Position to 1 and hold
    - Verify that the three green extinguisher test lights are illuminated.
  - TEST switch - Release
    - Verify that the three green extinguisher test lights are extinguished.
  - Repeat for test position 2.
- APU - Start and on bus

  Note: If extended APU operation is needed on the ground, position an AC operated fuel pump ON. If fuel is loaded in the center tank, position the left center tank fuel pump switch ON to prevent a fuel imbalance before takeoff.

  CAUTION: Center tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 453 kgs.

  CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.

  Note: Whenever the APU is operating and AC electrical power is on the airplane busses, operate at least one fuel boost pump to supply fuel under pressure to the APU to extend the service life of the APU fuel control unit.

  - When the APU GEN OFF BUS light is illuminated:
    - APU GENERATOR bus switches - ON
    - Verify that the SOURCE OFF lights are extinguished.
    - Verify that the TRANSFER BUS OFF lights are extinguished.
    - Verify that the STANDBY PWR OFF light is extinguished.
  - Verify that the APU MAINT light is extinguished.
  - Verify that the APU LOW OIL PRESSURE light is extinguished.
  - Verify that the APU FAULT light is extinguished.
  - Verify that the APU OVERSPEED light is extinguished.
- Wheel well fire warning system - **Test**
  - Test switch – Hold to OVHT/FIRE
    - Verify that the fire warning bell sounds.
    - Verify that the master FIRE WARN lights are illuminated.
    - Verify that the MASTER CAUTION lights are illuminated.
    - Verify that the OVHT/DET annunciator is illuminated.
  - Fire warning BELL CUTOUT switch – Push
    - Verify that the master FIRE WARN lights are extinguished.
    - Verify that the fire warning bell cancels.
    - Verify that the WHEEL WELL light stays illuminated.

Fuel Balancing

If an engine fuel leak is suspected:

- Accomplish the ENGINE FUEL LEAK Checklist.

Maintain main tank No. 1 and No. 2 fuel balance within limitations.

Note: Fuel pump pressure should be supplied to the engines at all times. At high altitude, without fuel pump pressure, thrust deterioration or engine flameout may occur.

If the center tank contains fuel:

- Center tank fuel pump switches - OFF

  Note: Fuel CONFIG indication may be displayed with fuel in the center tank.

- Crossfeed selector - Open
- Fuel pump switches (low tank) - OFF
- When quantities are balanced:
  - Fuel pump switches (main tank) - ON
  - Center tank fuel pump switches - ON
  - Crossfeed selector - Close

If the center tank contains no fuel:

- Crossfeed selector - Open
- Fuel pump switches (low tank) - OFF
- When quantities are balanced:
  - Fuel pump switches - ON
  - Crossfeed selector - Close

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No Engine Bleed Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU operating:

-- **Takeoff** --

Note: If anti–ice is required for taxi, configure for a “No Engine Bleed Takeoff” just prior to takeoff.

Note: If anti–ice is not required for taxi, configure for a “No Engine Bleed Takeoff” just after engine start.

- Right PACK switch - AUTO
- ISOLATION VALVE switch - CLOSE
- Left PACK switch - AUTO
- Engine No. 1 BLEED air switch - OFF
- APU BLEED air switch - ON
- Engine No. 2 BLEED air switch - OFF
- WING ANTI-ICE switch - OFF
  - The WING ANTI-ICE switch must remain OFF until the engine BLEED air switches are repositioned to ON and the ISOLATION VALVE switch is repositioned to AUTO.

------------------------------------ **After takeoff** ------------------------------------

Note: If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 feet or until obstacle clearance height has been attained.

- Engine No. 2 BLEED air switch - ON
- APU BLEED air switch - OFF
- When CABIN rate of CLIMB indicator stabilizes:
  - Engine No. 1 BLEED air switch - ON
  - ISOLATION VALVE switch - AUTO

-- **Landing** --

- If additional go-around thrust is desired configure for a “No Engine Bleed Landing.”
  - When below 10,000 feet:
    - WING ANTI-ICE switch - OFF
    - Right PACK switch - AUTO
    - ISOLATION VALVE switch - CLOSE
    - Left PACK switch - AUTO
    - Engine No. 1 BLEED air switch - OFF
    - APU BLEED air switch - ON
    - Engine No. 2 BLEED air switch - OFF

Unpressurized Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU inoperative:

-- **Takeoff** --

- PACK switches - AUTO
- ISOLATION VALVE switch - CLOSE
- Engine BLEED air switches - OFF

After takeoff

Note: If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 feet or until obstacle clearance height has been attained.

- At not less than 400 feet, and prior to 2000 feet above field elevation:
  - Engine No. 2 BLEED air switch - ON
- When CABIN rate of CLIMB indicator stabilizes:
  - Engine No. 1 BLEED air switch - ON
  - ISOLATION VALVE switch - AUTO

Landing

- When below 10,000 feet and starting the turn to final approach:
  - Engine BLEED air switches - OFF
  - Avoid high rates of descent for passenger comfort.

Starting with Ground Air Source (AC electrical power available)

Engine No.1 must be started first, unless ground crew instruct otherwise.

- When cleared to start:
  - APU BLEED air switch - OFF
  - Engine No. 1 start - Accomplish
    - Use normal start procedures.
    - After engine start, select generator switch ON, and GRD PWR OFF.

WARNING: To minimize the hazard to ground personnel, the external air should be disconnected, and the second engine started using the Engine Crossbleed Start procedure.

Engine Crossbleed Start

Prior to using this procedure, ensure that the area to the rear is clear.

- Engine BLEED air switches - ON
- APU BLEED air switch - OFF
- PACK switches - OFF
- ISOLATION VALVE switch - AUTO
  - Ensures bleed air supply for engine start.
- Engine thrust lever (operating engine) - Advance thrust lever until bleed duct pressure indicates 30 psi
- Non-operating engine - Start
  - Use normal start procedures with crossbleed air.
- After starter cutout, adjust thrust on both engines, as required.

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737-800 CFM56-7B27 KG JAA CATC/N

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH

General — Section 10

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb (280/.76)

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**4.0**	**4.0**			
	V/S (FT/MIN)	1700	1000			
30000	**PITCH ATT**	**4.0**	**3.5**	**3.5**	**3.5**	**4.0**
	V/S (FT/MIN)	2500	1900	1400	1100	800
20000	**PITCH ATT**	**7.0**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3200	2600	2100	1700
10000	**PITCH ATT**	**10.5**	**9.0**	**8.5**	**8.0**	**7.5**
	V/S (FT/MIN)	5600	4400	3600	3000	2500
SEA LEVEL	**PITCH ATT**	**14.0**	**12.0**	**11.0**	**10.0**	**9.5**
	V/S (FT/MIN)	6700	5300	4300	3600	3100

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	84	87	92		
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	82	83	86	89	94
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	85	87
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	80	81	83
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	74	74	76	77	79
15000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	70	71	72	73	75

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**-2.0**	**-1.0**	**-0.5**	**0.0**	**0.0**
	V/S (FT/MIN)	-2900	-2600	-2600	-2900	-3400
30000	**PITCH ATT**	**-2.0**	**-1.0**	**0.0**	**1.0**	**1.5**
	V/S (FT/MIN)	-2400	-2100	-1900	-1800	-1900
20000	**PITCH ATT**	**-2.0**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN)	-2200	-1900	-1700	-1700	-1700
10000	**PITCH ATT**	**-2.5**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN	-2000	-1700	-1500	-1500	-1500
SEA LEVEL	**PITCH ATT**	**-2.5**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN)	-1800	-1500	-1400	-1300	-1300

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	63	67	70
5000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	49	54	59	63	67

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 1 (GEAR UP)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**5.5**	**6.0**
(VREF40 + 50)	%N1	52	57	61	65	69
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF40 + 30)	%N1	52	58	63	67	70
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF40 + 20)	%N1	60	66	71	75	79

Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.
Final Approach (1500 FT)
Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 15	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.5**	**2.5**
(VREF15 + 10)	%N1	44	49	53	56	59
FLAPS 30	**PITCH ATT**	**0.5**	**0.5**	**1.0**	**1.0**	**1.0**
(VREF30 + 10)	%N1	48	53	58	61	65
FLAPS 40	**PITCH ATT**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**0.0**
(VREF40 + 10)	%N1	53	59	64	68	71

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)/SPEED (KIAS/MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	37000	41000
	280	280	280	280	280	280	280	.78	.78	.78
60	90.2	90.5	90.4	90.6	90.4	92.1	93.8	95.1	95.2	93.5
55	91.0	91.2	91.3	91.4	90.8	91.5	93.1	94.4	94.5	92.8
50	91.7	92.0	92.1	92.2	91.7	91.5	92.4	93.7	93.8	92.1
45	92.4	92.6	92.8	93.0	92.6	92.4	92.4	93.0	93.1	91.4
40	93.1	93.3	93.6	93.8	93.4	93.2	93.2	92.3	92.4	90.7
35	93.6	94.0	94.3	94.5	94.3	94.0	94.0	93.0	92.4	90.8
30	92.9	94.8	95.0	95.2	95.1	94.8	94.7	93.9	93.3	91.8
25	92.2	94.8	95.7	95.9	95.9	95.5	95.4	94.7	94.1	92.8
20	91.4	94.0	96.5	96.7	96.6	96.2	96.1	95.4	94.9	93.7
15	90.6	93.2	95.9	97.5	97.4	96.9	96.7	96.2	95.7	94.6
10	89.9	92.5	95.1	97.8	98.3	97.7	97.4	96.9	96.5	95.6
5	89.1	91.7	94.3	97.0	99.2	98.6	98.1	97.7	97.3	96.5
0	88.3	90.9	93.5	96.2	98.6	99.6	99.1	98.5	98.2	97.5
-5	87.6	90.1	92.7	95.4	97.8	99.6	100.0	99.2	99.0	98.4
-10	86.8	89.3	91.9	94.6	97.1	98.8	100.3	100.2	99.8	99.4
-15	86.0	88.5	91.0	93.8	96.3	98.0	99.6	101.1	100.8	100.4
-20	85.2	87.6	90.2	93.0	95.5	97.2	98.7	100.8	101.3	101.0
-25	84.3	86.8	89.4	92.2	94.7	96.4	97.9	100.0	100.5	100.1
-30	83.5	86.0	88.5	91.3	93.9	95.6	97.1	99.1	99.6	99.3
-35	82.7	85.1	87.7	90.5	93.1	94.8	96.3	98.3	98.8	98.4
-40	81.8	84.3	86.8	89.6	92.3	93.9	95.4	97.4	97.9	97.6

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	35	41
ENGINE ANTI-ICE	-0.6	-0.8	-0.9	-0.9	-0.8	-0.8
ENGINE & WING ANTI-ICE*	-1.8	-2.1	-2.5	-2.7	-3.0	-3.0

*Dual bleed sources

Go-around %N1

Based on engine bleed for packs on, engine and wing anti-ice on or off

AIRPORT OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
57	134	60	95.0	96.2	96.8									
52	125	55	95.9	96.7	96.6	96.8	97.5							
47	116	50	96.6	97.6	97.8	97.8	97.7	97.5	98.2	98.8				
42	108	45	97.4	98.4	98.5	98.6	98.7	98.8	98.7	98.5	98.5	99.0		
37	99	40	98.0	99.1	99.2	99.3	99.4	99.5	99.6	99.5	99.1	98.9	98.8	99.1
32	90	35	98.1	99.9	100.0	100.1	100.1	100.3	100.3	100.2	99.9	99.6	99.6	99.5
27	81	30	97.3	99.8	100.4	100.7	100.7	100.7	100.7	100.7	100.6	100.4	100.4	100.3
22	72	25	96.6	99.1	99.7	100.2	100.6	100.9	100.9	100.9	100.9	100.9	100.9	100.8
17	63	20	95.8	98.3	98.9	99.5	99.8	100.2	100.5	100.9	101.0	101.1	101.0	101.0
12	54	15	95.0	97.5	98.1	98.7	99.1	99.4	99.8	100.1	100.5	100.9	101.3	101.2
7	45	10	94.2	96.8	97.4	98.0	98.3	98.7	99.0	99.4	99.8	100.2	100.5	100.9
2	36	5	93.4	96.0	96.6	97.2	97.6	97.9	98.3	98.7	99.0	99.4	99.8	100.2
-3	27	0	92.6	95.2	95.8	96.4	96.8	97.2	97.5	97.9	98.3	98.7	99.0	99.4
-8	18	-5	91.8	94.4	95.0	95.6	96.0	96.4	96.8	97.2	97.5	97.9	98.3	98.6
-13	9	-10	91.0	93.6	94.2	94.8	95.2	95.6	96.0	96.4	96.8	97.1	97.5	97.9
-17	1	-15	90.2	92.8	93.4	94.0	94.4	94.8	95.2	95.6	96.0	96.4	96.7	97.1
-22	-8	-20	89.3	92.0	92.6	93.2	93.6	94.0	94.4	94.8	95.2	95.6	95.9	96.3
-27	-17	-25	88.5	91.1	91.8	92.4	92.8	93.2	93.6	94.0	94.4	94.8	95.1	95.5
-32	-26	-30	87.6	90.3	90.9	91.6	92.0	92.4	92.8	93.3	93.6	94.0	94.3	94.7
-37	-35	-35	86.8	89.4	90.1	90.7	91.1	91.6	92.0	92.4	92.8	93.2	93.5	93.9
-42	-44	-40	85.9	88.6	89.2	89.9	90.3	90.7	91.2	91.6	92.0	92.4	92.7	93.0
-47	-53	-45	85.0	87.7	88.4	89.0	89.4	89.9	90.3	90.8	91.2	91.5	91.9	92.2
-52	-62	-50	84.1	86.8	87.5	88.2	88.6	89.0	89.5	90.0	90.3	90.7	91.0	91.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
A/C HIGH	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
85	160	168	177
80	155	163	172
75	151	158	167
70	146	153	161
65	141	148	156
60	135	142	149
55	128	136	143
50	122	129	136
45	115	122	128
40	108	115	121

Performance Inflight - QRH — Chapter PI-QRH

Advisory Information — Section 11

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2955	200/-160	70/80	-115	365	35	-30	70	-65	215	50	115
MAX AUTO	3760	215/-195	85/100	-130	460	20	-15	85	-80	330	0	0
AUTOBRAKE 3	5285	345/-340	135/180	-230	775	20	-15	150	-145	545	0	0
AUTOBRAKE 2	6775	495/-490	200/260	-310	1070	100	-115	180	-180	560	215	215
AUTOBRAKE 1	7450	575/-570	230/310	-360	1265	200	-210	215	-210	525	660	920

Good Reported Braking Action

MAX MANUAL	4720	305/-280	115/150	-205	740	115	-90	115	-110	360	245	550
MAX AUTO	5170	305/-300	135/170	-205	755	115	-90	115	-110	380	265	605
AUTOBRAKE 3	6100	400/-395	155/210	-260	910	40	-35	170	-170	625	20	60
AUTOBRAKE 2	7795	570/-565	230/300	-355	1230	115	-130	210	-205	645	245	245

Medium Reported Braking Action

MAX MANUAL	6395	455/-450	190/240	-340	1210	285	-225	170	-170	455	660	1605
MAX AUTO	6680	475/-450	190/240	-340	1210	285	-225	170	-170	455	680	1645
AUTOBRAKE 3	6830	475/-450	190/260	-340	1245	230	-150	170	-185	625	490	1455
AUTOBRAKE 2	7980	585/-585	230/300	-395	1400	210	-205	210	-225	645	380	815

Poor Reported Braking Action

MAX MANUAL	8285	660/-620	265/360	-490	1905	680	-430	230	-225	530	1400	3755
MAX AUTO	8605	660/-620	265/360	-490	1905	680	-430	230	-225	530	1400	3775
AUTOBRAKE 3	8605	660/-620	265/360	-490	1905	680	-430	230	-225	570	1415	3775
AUTOBRAKE 2	8950	700/-660	285/380	-505	1965	605	-395	245	-245	645	1155	3320

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 180 ft.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

BRAKING CONFIGURATION	REF DIST 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/ HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	TEMP ADJ PER 10°C ABV ISA	TEMP ADJ PER 10°C BLW ISA	APP SPD ADJ PER 10 KTS ABOVE VREF40	REVERSE THRUST ADJ ONE REV	REVERSE THRUST ADJ NO REV
MAX MANUAL	2825	180/-145	50/80	-95	365	35	-30	50	-45	215	50	100
MAX AUTO	3510	200/-180	70/100	-130	445	20	-15	85	-80	315	0	0
AUTOBRAKE 3	4875	330/-310	115/160	-210	740	20	-15	135	-130	525	0	0
AUTOBRAKE 2	6270	460/-440	180/230	-295	1035	85	-95	165	-160	575	115	115
AUTOBRAKE 1	6940	545/-525	215/280	-340	1215	165	-195	200	-195	525	510	675

Good Reported Braking Action

MAX MANUAL	4510	285/-280	115/150	-205	720	115	-90	115	-110	355	230	510
MAX AUTO	4910	305/-280	115/150	-205	740	115	-90	115	-110	380	245	530
AUTOBRAKE 3	5625	380/-355	135/180	-245	870	40	-35	150	-150	605	20	60
AUTOBRAKE 2	7210	530/-505	210/260	-340	1190	95	-110	190	-185	660	135	135

Medium Reported Braking Action

MAX MANUAL	6075	435/-415	170/230	-320	1190	285	-205	155	-150	455	605	1455
MAX AUTO	6320	435/-430	170/240	-320	1190	285	-205	155	-150	455	605	1455
AUTOBRAKE 3	6415	455/-430	170/240	-340	1210	230	-150	170	-170	605	510	1380
AUTOBRAKE 2	7395	550/-525	210/290	-375	1340	190	-170	190	-205	660	285	700

Poor Reported Braking Action

MAX MANUAL	7850	625/-585	245/350	-490	1870	660	-430	210	-205	530	1265	3340
MAX AUTO	8170	625/-585	245/350	-490	1870	660	-430	210	-205	530	1265	3340
AUTOBRAKE 3	8170	625/-585	245/350	-490	1870	660	-430	210	-205	550	1265	3360
AUTOBRAKE 2	8360	645/-620	245/350	-505	1925	585	-375	230	-225	645	1020	3000

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 180 ft.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APP SPD ADJ PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	4020	560/-220	150/150	-140	680	70	-60	350
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4980	300/-310	140/190	-240	890	150	-130	380
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3370	230/-180	90/100	-110	420	50	-40	280
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3250	220/-180	70/100	-110	420	50	-30	300
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3120	200/-160	70/90	-110	400	50	-30	300
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3500	190/-190	90/100	-130	460	50	-40	250
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4680	270/-270	120/150	-170	610	120	-90	480
LEADING EDGE FLAPS TRANSIT	VREF15+15	3480	250/-190	90/100	-110	420	40	-30	230
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3140	230/-180	70/90	-110	400	40	-30	220
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2990	200/-160	70/90	-110	380	40	-30	220

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD ADJ
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	3110	230/-180	70/90	-110	400	40	-30	220
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	3110	230/-180	70/90	-110	400	40	-30	220
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2960	200/-160	70/90	-110	370	40	-30	220
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3110	230/-180	70/90	-110	400	40	-30	220
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3450	280/-190	90/100	-110	430	40	-30	230
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2960	200/-160	70/90	-110	370	40	-30	220
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3110	230/-180	70/90	-110	400	40	-30	220
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3450	280/-190	90/100	-110	430	40	-30	230
TRAILING EDGE FLAPS UP	VREF40+40	3650	370/-210	100/100	-130	550	50	-30	230

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD ADJ
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	5450	300/-310	150/200	-210	740	120	-90	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5530	370/-360	150/200	-270	1090	220	-180	420
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4880	320/-320	140/190	-190	740	140	-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4630	300/-290	140/170	-190	730	140	-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4400	280/-270	120/170	-190	710	140	-110	430
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4430	280/-270	120/150	-190	680	100	-80	330
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5780	350/-360	150/200	-240	830	190	-160	560
LEADING EDGE FLAPS TRANSIT	VREF15+15	4840	300/-290	140/190	-190	710	120	-90	320
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	4430	270/-270	120/150	-190	690	120	-90	330
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	4220	250/-260	100/150	-180	680	100	-95	330

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
LANDING CONFIGURATION	VREF	REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APP SPD ADJ PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	4250	270/-260	120/150	-180	660	100	-80	300
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4250	270/-260	120/150	-180	660	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4110	270/-240	100/140	-180	640	100	-80	320
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4250	270/-260	120/150	-180	660	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4710	270/-270	140/170	-190	690	100	-80	300
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4110	270/-240	100/140	-180	640	100	-80	320
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4250	270/-260	120/150	-180	660	100	-80	300
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4710	270/-270	140/170	-190	690	100	-80	300
TRAILING EDGE FLAPS UP	VREF40+40	4960	270/-270	140/190	-190	710	100	-90	280

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD ADJ
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	7680	500/-500	250/330	-320	1240	280	-240	400
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6990	510/-500	220/300	-420	1690	500	-340	480
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6670	510/-490	220/300	-320	1200	320	-260	550
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6260	460/-450	200/270	-310	1170	300	-240	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5890	430/-420	190/250	-310	1140	280	-220	530
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6060	450/-420	190/250	-290	1120	270	-210	430
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	7960	560/-550	230/330	-370	1300	400	-340	690
LEADING EDGE FLAPS TRANSIT	VREF15+15	6630	460/-450	200/280	-310	1170	270	-220	420
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	6340	450/-450	190/250	-320	1190	300	-240	450
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	5930	420/-420	170/230	-310	1150	280	-220	450

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT): REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS: HEAD WIND	WIND ADJ PER 10 KTS: TAIL WIND	SLOPE ADJ PER 1%: DOWN HILL	SLOPE ADJ PER 1%: UP HILL	APP SPD ADJ: PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	5810	420/-410	170/250	-290	1090	230	-190	400
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5810	420/-410	170/250	-290	1090	230	-190	400
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	5570	400/-390	170/220	-290	1050	250	-190	400
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5810	420/-410	170/250	-290	1090	230	-190	400
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6520	430/-440	200/270	-310	1150	270	-210	400
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5570	400/-390	170/220	-290	1050	250	-190	400
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5810	420/-410	170/250	-290	1090	230	-190	400
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	6520	430/-440	200/270	-310	1150	270	-210	400
TRAILING EDGE FLAPS UP	VREF40+40	6930	450/-450	220/280	-320	1190	270	-220	380

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APP SPD ADJ PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	10140	730/-730	370/500	-500	1940	660	-490	500
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	9240	740/-700	280/430	-680	3140	1690	-800	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8600	730/-680	300/430	-470	1880	680	-490	630
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	7990	640/-620	270/380	-450	1830	630	-450	600
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7500	600/-570	250/350	-440	1780	610	-440	580
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7850	630/-600	270/380	-440	1780	560	-420	510
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	10220	790/-770	350/480	-540	1990	790	-600	780
LEADING EDGE FLAPS TRANSIT	VREF15+15	8580	660/-650	300/420	-450	1830	600	-440	500
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	8650	680/-670	280/380	-500	1960	740	-520	560
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	7980	610/-600	250/350	-470	1890	690	-490	530

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT): REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS: HEAD WIND	WIND ADJ PER 10 KTS: TAIL WIND	SLOPE ADJ PER 1%: DOWN HILL	SLOPE ADJ PER 1%: UP HILL	APP SPD ADJ: PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	7530	600/-570	250/350	-440	1730	530	-390	460
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	7530	600/-570	250/350	-440	1730	530	-390	460
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	7210	580/-540	230/320	-420	1660	600	-370	460
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	7530	600/-570	250/350	-440	1730	530	-390	460
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	8520	630/-620	280/400	-450	1830	580	-420	480
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	7210	580/-540	230/320	-420	1660	600	-370	460
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	7530	600/-570	250/350	-440	1730	530	-390	460
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	8520	630/-620	280/400	-450	1830	580	-420	480
TRAILING EDGE FLAPS UP	VREF40+40	9130	660/-650	320/430	-470	1860	610	-450	480

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy Per Brake (Millions of Foot Pounds)

		WIND CORRECTED BRAKES ON SPEED (KIAS)*																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
	0	15.1	17.0	19.3	22.4	25.3	28.9	30.9	35.0	40.2	40.4	45.9	53.0	50.8	57.9	67.3	60.8	69.6	81.2
	10	15.6	17.6	20.0	23.1	26.1	29.8	31.9	36.2	41.5	41.8	47.5	54.8	52.5	59.9	69.5	62.8	71.9	83.9
	15	15.8	17.8	20.2	23.5	26.5	30.3	32.4	36.7	42.1	42.4	48.2	55.6	53.3	60.7	70.5	63.7	72.9	85.1
80	20	16.0	18.1	20.5	23.8	26.9	30.7	32.8	37.2	42.7	42.9	48.8	56.3	54.0	61.5	71.4	64.6	73.9	86.2
	30	16.4	18.5	21.1	24.4	27.6	31.5	33.7	38.2	43.8	44.0	50.0	57.7	55.3	63.1	73.2	66.2	75.7	88.4
	40	16.6	18.7	21.3	24.7	27.9	31.9	34.1	38.7	44.4	44.7	50.9	58.8	56.3	64.3	74.8	67.5	77.4	90.5
	50	16.6	18.7	21.3	24.8	28.0	32.1	34.3	39.0	44.9	45.2	51.5	59.7	57.1	65.4	76.3	68.7	79.0	92.9
	0	13.7	15.4	17.5	20.2	22.8	26.0	27.7	31.3	35.9	36.1	41.0	47.2	45.3	51.6	59.7	54.9	62.7	72.9
	10	14.2	15.9	18.1	20.8	23.5	26.8	28.6	32.4	37.1	37.3	42.3	48.7	46.8	53.3	61.6	56.7	64.8	75.4
	15	14.4	16.2	18.4	21.1	23.9	27.2	29.0	32.8	37.6	37.8	43.0	49.4	47.5	54.0	62.5	57.5	65.7	76.4
70	20	14.6	16.4	18.6	21.4	24.2	27.6	29.4	33.3	38.1	38.4	43.5	50.1	48.1	54.8	63.4	58.3	66.5	77.4
	30	14.9	16.8	19.1	22.0	24.8	28.3	30.2	34.1	39.1	39.3	44.6	51.4	49.3	56.1	64.9	59.8	68.2	79.4
	40	15.1	17.0	19.3	22.2	25.1	28.6	30.5	34.6	39.6	39.9	45.3	52.2	50.1	57.1	66.2	60.9	69.6	81.2
	50	15.1	17.0	19.3	22.3	25.2	28.8	30.7	34.8	40.0	40.2	45.8	52.9	50.7	58.0	67.4	61.8	70.9	83.0
	0	12.3	13.9	15.7	18.0	20.3	23.1	24.4	27.6	31.6	31.7	35.9	41.2	39.6	45.0	51.8	48.1	54.8	63.5
	10	12.7	14.3	16.3	18.5	20.9	23.8	25.2	28.5	32.6	32.7	37.1	42.6	40.9	46.5	53.6	49.7	56.6	65.6
	15	12.9	14.6	16.5	18.8	21.2	24.2	25.6	29.0	33.1	33.2	37.6	43.2	41.5	47.1	54.4	50.4	57.4	66.5
60	20	13.1	14.8	16.7	19.1	21.5	24.5	26.0	29.4	33.5	33.6	38.1	43.8	42.0	47.8	55.1	51.1	58.2	67.4
	30	13.4	15.1	17.2	19.6	22.1	25.1	26.6	30.1	34.4	34.5	39.1	44.9	43.1	49.0	56.5	52.3	59.6	69.1
	40	13.6	15.3	17.3	19.8	22.3	25.4	26.9	30.5	34.9	35.0	39.7	45.6	43.8	49.8	57.5	53.2	60.7	70.5
	50	13.5	15.3	17.3	19.8	22.4	25.5	27.0	30.6	35.1	35.2	40.0	46.0	44.2	50.4	58.3	53.9	61.7	71.9
	0	11.0	12.3	14.0	15.7	17.7	20.2	21.2	23.9	27.3	27.2	30.8	35.3	33.8	38.3	44.1	40.9	46.4	53.6
	10	11.3	12.7	14.4	16.3	18.3	20.8	21.9	24.7	28.2	28.1	31.8	36.5	34.9	39.6	45.5	42.2	48.0	55.4
	15	11.5	12.9	14.7	16.5	18.6	21.1	22.2	25.1	28.6	28.6	32.3	37.0	35.4	40.2	46.2	42.8	48.7	56.2
50	20	11.6	13.1	14.9	16.7	18.9	21.4	22.5	25.4	29.0	28.9	32.8	37.5	35.9	40.7	46.8	43.4	49.3	56.9
	30	11.9	13.4	15.2	17.2	19.3	22.0	23.1	26.1	29.7	29.7	33.6	38.4	36.8	41.8	48.0	44.5	50.6	58.4
	40	12.1	13.6	15.4	17.3	19.5	22.2	23.4	26.4	30.1	30.1	34.0	39.0	37.4	42.4	48.8	45.2	51.4	59.4
	50	12.0	13.6	15.4	17.3	19.6	22.3	23.4	26.5	30.3	30.2	34.2	39.3	37.6	42.8	49.3	45.7	52.1	60.3
	0	9.6	10.8	12.3	13.5	15.2	17.3	17.9	20.2	23.0	22.8	25.8	29.4	28.1	31.8	36.4	33.7	38.2	43.9
	10	10.0	11.2	12.7	14.0	15.8	17.9	18.5	20.9	23.8	23.6	26.6	30.4	29.0	32.8	37.6	34.8	39.5	45.4
	15	10.1	11.4	12.9	14.2	16.0	18.1	18.8	21.2	24.1	23.9	27.0	30.8	29.4	33.3	38.2	35.3	40.0	46.0
40	20	10.2	11.5	13.1	14.4	16.2	18.4	19.1	21.5	24.5	24.2	27.4	31.3	29.8	33.8	38.7	35.8	40.6	46.6
	30	10.5	11.8	13.4	14.8	16.6	18.9	19.6	22.1	25.1	24.9	28.1	32.1	30.6	34.6	39.7	36.7	41.6	47.8
	40	10.6	11.9	13.5	14.9	16.8	19.1	19.8	22.3	25.4	25.2	28.4	32.5	31.0	35.1	40.2	37.2	42.2	48.6
	50	10.6	11.9	13.5	14.9	16.8	19.1	19.8	22.3	25.5	25.2	28.6	32.7	31.1	35.3	40.6	37.5	42.6	49.1

***To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind. If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.**

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)
No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.8	16.3	25.3	34.7	44.7	55.0	65.7	76.6	87.9
	MAX AUTO	7.5	15.4	23.6	32.4	41.8	51.8	62.5	74.1	86.5
	AUTOBRAKE 3	7.3	14.7	22.3	30.2	38.6	47.6	57.4	68.1	80.0
	AUTOBRAKE 2	7.0	13.8	20.5	27.4	34.8	42.7	51.5	61.3	72.4
	AUTOBRAKE 1	6.7	13.1	19.2	25.3	31.8	38.8	46.6	55.4	65.5

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.0	14.6	22.8	31.4	40.5	49.9	59.7	69.8	80.0
	MAX AUTO	5.8	12.3	19.5	27.2	35.6	44.5	53.9	63.7	74.1
	AUTOBRAKE 3	4.3	9.2	14.7	20.7	27.2	34.4	42.0	50.2	59.0
	AUTOBRAKE 2	2.5	5.6	9.1	13.1	17.8	23.0	28.8	35.2	42.3
	AUTOBRAKE 1	1.8	3.8	6.1	8.8	11.9	15.5	19.6	24.4	29.8

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Cooling Time (Minutes) - Category C Steel Brakes

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	25	28	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	3.9	4.4	4.9	5.0 TO 7.5	7.5 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	20	30	40	50	60		

Cooling Time (Minutes) - Category N Carbon Brakes

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)							
	16 & BELOW	17	19	20.9	23.5	26.9	30 TO 41	41 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS							
	UP TO 2.5	2.6	3	3.3	3.8	4.5	5.0 TO 7.1	7.1 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	4	5	6	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		6.7	16.0	24.1	34.2	45.9		

Observe maximum quick turnaround limit.
Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.
Add 1.0 million foot pounds per brake for each taxi mile.

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 7 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on CDS systems page 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.

Performance Inflight - QRH — Chapter PI-QRH

Engine Inoperative — Section 12

ENGINE INOP

Initial Max Continuous %N1
Based on .79M, A/C high and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
20	96.8	96.6	96.3	96.1	95.9	95.4	95.0	94.7	93.9
15	97.4	97.2	96.9	96.8	96.6	96.2	95.7	95.5	94.8
10	98.0	97.8	97.5	97.4	97.4	96.9	96.5	96.3	95.7
5	98.3	98.6	98.3	98.1	98.1	97.7	97.3	97.1	96.6
0	97.5	98.7	99.2	99.0	98.9	98.5	98.2	98.0	97.5
-5	96.7	98.0	99.1	99.8	99.7	99.3	98.9	98.7	98.4
-10	96.0	97.2	98.4	99.6	100.5	100.2	99.8	99.6	99.4
-15	95.2	96.4	97.6	98.8	100.1	101.0	100.8	100.6	100.3
-20	94.4	95.6	96.8	98.0	99.3	100.5	101.1	100.8	100.6
-25	93.6	94.9	96.0	97.2	98.5	99.7	100.2	100.0	99.8
-30	92.8	94.1	95.2	96.4	97.7	98.8	99.4	99.2	99.0
-35	92.0	93.2	94.4	95.6	96.8	98.0	98.5	98.3	98.1
-40	91.2	92.4	93.5	94.7	96.0	97.1	97.6	97.4	97.2

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
ENGINE ANTI-ICE	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE	-4.2	-4.4	-4.5	-4.7	-5.0	-4.8	-4.8	-4.8	-4.8

ENGINE INOP

Max Continuous %N1
37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.51	96.6	97.6	98.5	99.4	100.2	99.6	98.8	97.6	96.3	94.7	93.2	91.8
200	.63	96.0	96.9	97.8	98.7	99.6	100.4	100.1	99.3	98.4	97.5	96.3	95.2
240	.74	95.1	96.0	96.8	97.7	98.6	99.4	100.3	100.7	100.0	99.2	98.4	97.5
280	.86	94.3	95.2	96.1	97.0	97.8	98.7	99.5	100.4	101.2	100.9	100.0	99.1

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	96.5	97.4	98.3	99.2	100.1	99.8	99.0	98.0	96.8	95.4	94.0	92.7
200	.60	96.1	97.0	97.9	98.8	99.7	100.6	100.5	99.6	98.6	97.6	96.5	95.4
240	.71	95.0	95.9	96.8	97.7	98.6	99.4	100.3	100.8	100.2	99.5	98.6	97.7
280	.82	93.8	94.6	95.5	96.4	97.3	98.1	98.9	99.8	100.6	100.3	99.5	98.8

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	97.4	98.3	99.2	100.0	100.8	100.0	99.1	97.9	96.7	95.3	93.9	92.6
200	.58	97.0	97.9	98.8	99.7	100.6	101.4	100.6	99.6	98.6	97.5	96.3	95.1
240	.68	95.9	96.8	97.7	98.5	99.4	100.2	101.1	100.9	100.2	99.4	98.4	97.4
280	.79	94.3	95.1	96.0	96.8	97.7	98.5	99.3	100.2	100.5	99.7	98.9	98.1
320	.89	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	100.3	101.1	100.7	99.8

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	97.3	98.2	99.1	100.0	100.9	101.1	100.2	99.2	98.0	96.6	95.2	93.9
200	.55	97.1	98.0	98.9	99.7	100.6	101.5	101.6	100.7	99.7	98.6	97.4	96.2
240	.66	95.6	96.5	97.4	98.3	99.1	100.0	100.8	101.3	100.5	99.8	98.8	97.8
280	.76	93.8	94.7	95.5	96.4	97.2	98.0	98.8	99.7	100.5	99.8	98.9	98.0
320	.85	92.4	93.2	94.1	94.9	95.7	96.5	97.4	98.2	98.9	99.7	99.9	99.1

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	98.1	99.0	99.9	100.8	101.6	101.2	100.2	99.1	97.9	96.4	95.1	93.8
200	.53	97.5	98.4	99.3	100.2	101.0	101.9	101.3	100.4	99.3	98.2	96.9	95.8
240	.63	96.3	97.1	98.0	98.9	99.7	100.5	101.4	101.1	100.2	99.2	98.3	97.2
280	.73	94.2	95.0	95.9	96.7	97.5	98.3	99.1	99.9	100.1	99.1	98.2	97.5
320	.82	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	98.5	97.6
360	.91	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	100.0	100.1

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	29	31	33	35	37
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-4.1	-4.3	-4.5	-4.7	-4.7

ENGINE INOP

Max Continuous %N1

27000 FT to 20000 FT Pressure Altitudes

27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	98.0	98.8	99.7	100.6	101.4	102.2	101.2	100.2	99.0	97.8	96.4	95.1
200	.51	96.9	97.8	98.7	99.6	100.4	101.2	101.8	100.8	99.9	98.8	97.6	96.4
240	.60	95.6	96.5	97.4	98.2	99.1	99.9	100.7	101.3	100.4	99.4	98.5	97.5
280	.70	93.6	94.4	95.3	96.1	96.9	97.7	98.5	99.3	100.1	99.4	98.4	97.6
320	.79	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.6	97.8
360	.88	91.0	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	98.1	98.8	99.4
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.8	99.7	100.5	101.4	102.2	102.4	101.4	100.3	99.1	97.7	96.5	95.2
200	.49	97.5	98.3	99.2	100.0	100.9	101.7	101.5	100.6	99.5	98.4	97.3	96.2
240	.58	95.7	96.5	97.4	98.2	99.0	99.9	100.7	100.5	99.5	98.6	97.6	96.7
280	.67	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.5	99.5	98.6	97.6	96.9
320	.76	91.7	92.6	93.4	94.2	95.0	95.8	96.5	97.3	98.0	98.6	97.8	97.2
360	.85	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.6	98.4	98.2
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	98.6	99.5	100.4	101.2	102.1	102.9	101.9	100.8	99.6	98.4	97.1	95.8
200	.48	97.5	98.4	99.2	100.1	100.9	101.8	102.2	101.1	100.1	99.0	97.8	96.7
240	.57	95.9	96.8	97.6	98.5	99.3	100.1	100.9	101.2	100.2	99.2	98.2	97.3
280	.66	94.2	95.1	95.9	96.7	97.5	98.3	99.1	99.9	100.4	99.4	98.3	97.5
320	.75	92.1	93.0	93.8	94.6	95.4	96.2	96.9	97.7	98.5	99.2	98.6	97.8
360	.83	90.6	91.4	92.2	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	99.1	100.0	100.9	101.7	102.5	102.8	101.8	100.7	99.5	98.2	97.0	95.8
200	.46	98.4	99.3	100.1	101.0	101.8	102.6	102.3	101.2	100.0	98.9	97.8	96.8
240	.55	97.2	98.1	98.9	99.7	100.5	101.3	102.1	101.6	100.5	99.4	98.5	97.5
280	.63	95.7	96.5	97.4	98.2	99.0	99.8	100.6	101.3	101.0	99.8	98.9	98.1
320	.72	93.9	94.7	95.5	96.3	97.1	97.9	98.6	99.4	100.1	100.2	99.3	98.6
360	.80	92.2	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	99.2	99.7	99.1
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	98.7	99.5	100.4	101.2	102.0	102.8	102.5	101.5	100.4	99.2	98.0	96.8
200	.44	98.3	99.2	100.0	100.9	101.7	102.5	103.3	102.3	101.1	100.0	98.9	97.8
240	.53	97.5	98.4	99.2	100.0	100.8	101.7	102.5	103.1	101.8	100.5	99.5	98.6
280	.61	96.2	97.0	97.8	98.7	99.5	100.3	101.1	101.8	102.5	101.3	100.1	99.3
320	.69	94.7	95.5	96.3	97.1	97.9	98.7	99.5	100.2	101.0	101.7	100.9	99.9
360	.77	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	100.0	100.7	100.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	20	22	24	25	27
ENGINE ANTI-ICE ON	-0.9	-0.9	-1.0	-1.0	-1.0
ENGINE & WING ANTI-ICE ON	-3.6	-3.8	-3.8	-3.9	-4.0

ENGINE INOP

Max Continuous %N1

18000 FT to 12000 FT Pressure Altitudes

18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.34	98.5	99.3	100.2	101.0	101.8	102.6	101.6	100.3	99.2	98.1	97.0	95.9
200	.42	98.7	99.6	100.4	101.2	102.0	102.8	103.1	101.7	100.4	99.3	98.3	97.3
240	.51	97.8	98.7	99.5	100.3	101.1	101.9	102.7	102.5	101.1	99.9	99.0	98.1
280	.59	96.3	97.1	97.9	98.7	99.5	100.3	101.0	101.8	101.6	100.5	99.6	98.8
320	.67	94.8	95.6	96.4	97.2	97.9	98.7	99.5	100.2	101.0	100.9	100.0	99.2
360	.75	93.0	93.8	94.6	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.2	99.6
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	97.1	98.0	98.8	99.6	100.4	101.2	101.6	100.3	99.1	98.1	97.1	96.1
200	.41	98.0	98.8	99.6	100.4	101.2	102.0	102.8	102.5	101.3	100.2	99.3	98.3
240	.49	97.1	97.9	98.7	99.5	100.3	101.1	101.9	102.7	101.8	100.5	99.6	98.7
280	.57	95.6	96.4	97.2	98.0	98.8	99.6	100.3	101.1	101.8	100.9	99.8	99.0
320	.64	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.2	99.4
360	.72	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.4	99.2	99.9	99.6
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	96.6	97.4	98.2	99.0	99.8	100.6	100.4	99.1	98.0	97.1	96.2	95.3
200	.39	97.1	97.9	98.7	99.5	100.3	101.1	101.8	101.5	101.0	100.1	99.3	98.4
240	.47	96.6	97.4	98.2	99.0	99.8	100.6	101.3	101.8	101.1	100.3	99.5	98.7
280	.54	95.5	96.3	97.1	97.8	98.6	99.4	100.1	100.9	101.0	100.1	99.2	98.5
320	.62	94.1	94.9	95.7	96.5	97.2	98.0	98.7	99.5	100.2	100.3	99.5	98.8
360	.69	92.2	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.6	99.0
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	96.3	97.0	97.8	98.6	99.4	100.1	99.3	98.1	97.1	96.3	95.4	94.5
200	.38	97.1	97.9	98.7	99.5	100.3	101.0	101.5	100.8	99.8	99.0	98.2	97.3
240	.45	96.5	97.3	98.0	98.8	99.6	100.3	101.1	101.0	100.1	99.4	98.6	97.9
280	.52	95.5	96.3	97.0	97.8	98.6	99.3	100.0	100.8	100.3	99.4	98.6	98.0
320	.60	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	99.7	98.9	98.2
360	.67	92.3	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	99.4	99.1	98.5

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	12	14	16	18
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9
ENGINE & WING ANTI-ICE ON	-3.2	-3.4	-3.4	-3.5

ENGINE INOP

Max Continuous %N1

10000 FT to 1000 FT Pressure Altitudes

10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.29	95.2	96.0	96.8	97.6	98.3	99.1	99.8	98.6	97.4	96.6	95.8	94.9
200	.36	96.0	96.7	97.5	98.3	99.0	99.8	100.5	100.5	99.4	98.5	97.8	97.0
240	.43	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.1	99.2	98.4	97.7
280	.51	94.5	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.4	99.5	98.7	98.0
320	.58	93.0	93.9	94.7	95.5	96.2	97.0	97.8	98.6	99.3	99.7	99.0	98.2
360	.65	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	99.1	98.5
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	94.9	95.7	96.4	97.2	98.0	98.8	99.2	98.3	97.4	96.6	95.9	95.1
200	.33	94.7	95.5	96.3	97.1	97.8	98.6	99.4	98.9	98.0	97.3	96.6	95.8
240	.40	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.5	98.7	97.9	97.2	96.5
280	.46	93.3	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	98.2	97.5	96.8
320	.53	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	98.7	98.4	97.7	97.1
360	.59	91.5	92.3	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.0	97.3
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.9	97.1	96.4	95.6	94.8
200	.32	94.5	95.3	96.1	96.9	97.6	98.4	99.2	98.3	97.5	96.8	96.1	95.3
240	.38	94.1	94.9	95.6	96.4	97.2	98.0	98.7	98.8	98.0	97.2	96.6	95.9
280	.45	93.2	94.0	94.8	95.6	96.4	97.2	97.9	98.7	98.3	97.5	96.9	96.2
320	.51	92.5	93.3	94.1	94.9	95.7	96.4	97.2	98.0	98.5	97.8	97.1	96.5
360	.57	91.6	92.4	93.2	94.0	94.7	95.5	96.3	97.1	97.8	98.1	97.4	96.8
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	93.9	94.7	95.4	96.2	97.0	97.8	98.5	98.2	97.4	96.7	96.0	95.2
200	.31	93.5	94.3	95.1	95.9	96.7	97.4	98.2	98.5	97.8	97.0	96.3	95.6
240	.37	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	98.1	97.3	96.6	95.9
280	.43	92.3	93.2	93.9	94.7	95.5	96.3	97.1	97.8	98.3	97.6	96.9	96.2
320	.49	91.6	92.4	93.2	94.0	94.8	95.6	96.3	97.1	97.9	97.9	97.2	96.5
360	.55	90.7	91.5	92.3	93.1	93.9	94.7	95.4	96.2	96.9	97.7	97.3	96.6

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	1	3	5	10
ENGINE ANTI-ICE ON	-0.6	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-2.9	-3.0	-3.1	-3.2

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
85	81	270	17500	16200	15000
80	77	262	19200	18000	16700
75	72	255	20800	19800	18500
70	67	246	22300	21300	20300
65	62	238	23900	23000	22000
60	57	228	25800	24800	23900
55	53	219	28100	27100	26000
50	48	209	30300	29500	28500
45	43	198	32500	31800	30900
40	38	187	34900	34100	33300

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
139	129	120	113	106	100	95	90	86	82	78
277	257	240	225	212	200	189	180	171	164	156
416	386	360	338	318	300	284	270	257	245	235
554	515	480	450	424	400	379	360	343	327	313
693	643	600	563	529	500	474	450	428	409	391
831	772	720	675	635	600	568	540	514	491	469
969	900	840	788	741	700	663	630	600	573	548
1108	1029	960	900	847	800	758	720	686	655	626
1246	1157	1080	1012	953	900	853	810	771	736	704
1385	1286	1200	1125	1059	1000	947	900	857	818	783
1523	1414	1320	1237	1165	1100	1042	990	943	900	861
1662	1543	1440	1350	1271	1200	1137	1080	1029	982	939
1800	1672	1560	1463	1376	1300	1232	1170	1114	1064	1017
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1095
2078	1929	1800	1688	1588	1500	1421	1350	1285	1227	1174
2217	2058	1921	1800	1694	1600	1516	1440	1371	1309	1252
2356	2187	2041	1913	1800	1700	1610	1530	1457	1390	1330
2496	2317	2161	2026	1906	1800	1705	1619	1542	1472	1408

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)										
	40	45	50	55	60	65	70	75	80	85	
100	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	0:17
200	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	0:34
300	1.3	1.3	1.4	1.6	1.7	1.7	1.9	2.0	2.1	2.2	0:50
400	1.7	1.8	2.0	2.2	2.3	2.4	2.6	2.8	2.9	3.1	1:07
500	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	1:24
600	2.5	2.8	3.0	3.3	3.5	3.7	4.0	4.2	4.5	4.7	1:40
700	2.9	3.2	3.5	3.8	4.1	4.3	4.6	4.9	5.2	5.5	1:57
800	3.4	3.7	4.0	4.3	4.7	5.0	5.3	5.6	6.0	6.3	2:14
900	3.8	4.1	4.5	4.9	5.3	5.6	6.0	6.4	6.7	7.1	2:30
1000	4.2	4.6	5.0	5.4	5.8	6.2	6.6	7.0	7.5	7.9	2:47
1100	4.6	5.0	5.5	5.9	6.4	6.8	7.3	7.7	8.2	8.7	3:04
1200	5.0	5.4	5.9	6.5	6.9	7.4	7.9	8.4	8.9	9.4	3:21
1300	5.3	5.9	6.4	7.0	7.5	8.0	8.6	9.1	9.7	10.2	3:37
1400	5.7	6.3	6.9	7.5	8.1	8.6	9.2	9.8	10.4	11.0	3:54
1500	6.1	6.7	7.3	8.0	8.6	9.2	9.8	10.4	11.1	11.7	4:11
1600	6.5	7.2	7.8	8.5	9.1	9.8	10.4	11.1	11.8	12.5	4:28
1700	6.9	7.6	8.3	9.0	9.7	10.3	11.1	11.8	12.5	13.2	4:45
1800	7.2	8.0	8.7	9.5	10.2	10.9	11.7	12.4	13.2	13.9	5:02

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
85	13800	11300	8900
80	16100	13700	11400
75	18100	16300	14000
70	20200	18500	16300
65	21800	20600	18600
60	23400	22300	20700
55	25300	24100	22700
50	28100	26700	24800
45	30700	29700	28100
40	33200	32300	31100

With engine anti-ice on, decrease altitude capability by 2100 ft.
With engine and wing anti-ice on, decrease altitude capability by 5700 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	14	18	22	25	27	29	31
85	%N1	92.5	95.7						
	MACH	.561	.593						
	KIAS	311	306						
	FF/ENG	3152	3144						
80	%N1	90.8	94.2	98.5					
	MACH	.545	.585	.612					
	KIAS	302	302	292					
	FF/ENG	2951	2983	2973					
75	%N1	89.0	92.4	96.2					
	MACH	.528	.569	.599					
	KIAS	293	293	286					
	FF/ENG	2751	2781	2756					
70	%N1	87.1	90.6	94.1					
	MACH	.510	.551	.589					
	KIAS	282	284	281					
	FF/ENG	2552	2581	2578					
65	%N1	85.1	88.5	92.0	96.3				
	MACH	.491	.532	.574	.604				
	KIAS	271	273	274	266				
	FF/ENG	2356	2381	2394	2388				
60	%N1	82.9	86.3	89.9	93.8				
	MACH	.471	.511	.553	.590				
	KIAS	261	262	263	260				
	FF/ENG	2168	2183	2196	2192				
55	%N1	80.7	83.9	87.5	91.2	94.5	97.7		
	MACH	.453	.488	.530	.574	.597	.614		
	KIAS	250	250	252	252	247	244		
	FF/ENG	1991	1987	1998	2009	2010	2060		
50	%N1	78.3	81.4	84.9	88.5	91.7	94.0	97.1	
	MACH	.434	.466	.505	.549	.583	.596	.613	
	KIAS	240	239	240	241	241	236	233	
	FF/ENG	1822	1803	1801	1811	1831	1829	1873	
45	%N1	75.9	78.8	82.0	85.7	88.4	90.6	93.2	96.2
	MACH	.415	.444	.478	.522	.556	.578	.593	.610
	KIAS	229	227	227	229	229	229	225	222
	FF/ENG	1661	1629	1608	1615	1627	1647	1649	1683
40	%N1	73.4	76.0	79.1	82.5	85.2	87.1	89.2	91.8
	MACH	.395	.422	.453	.491	.525	.548	.571	.589
	KIAS	218	216	215	215	216	216	216	214
	FF/ENG	1506	1466	1434	1422	1432	1445	1461	1470

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
309	279	253	233	215	200	190	180	172	164	157
625	564	511	467	432	400	379	360	342	326	312
943	850	769	703	648	600	568	540	513	489	468
1263	1137	1028	939	865	800	758	719	683	652	623
1586	1426	1287	1175	1082	1000	947	898	853	813	778
1912	1717	1548	1412	1299	1200	1136	1076	1023	975	932
2240	2009	1810	1649	1517	1400	1324	1255	1192	1136	1086
2570	2304	2074	1888	1735	1600	1513	1434	1362	1297	1240
2903	2600	2337	2127	1953	1800	1702	1613	1531	1458	1393

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.3	0:46	1.1	0:43	1.0	0:41	0.9	0:39	0.8	0:38
400	2.7	1:30	2.4	1:25	2.2	1:20	2.0	1:15	1.9	1:12
600	4.0	2:14	3.7	2:07	3.4	2:00	3.1	1:52	2.9	1:46
800	5.3	3:00	4.9	2:50	4.5	2:40	4.2	2:29	4.0	2:21
1000	6.7	3:45	6.1	3:33	5.7	3:20	5.3	3:07	5.0	2:56
1200	8.0	4:32	7.3	4:17	6.8	4:01	6.3	3:45	6.0	3:31
1400	9.3	5:18	8.6	5:01	7.9	4:42	7.4	4:23	7.0	4:07
1600	10.5	6:06	9.7	5:45	9.0	5:24	8.4	5:02	7.9	4:43
1800	11.8	6:54	10.9	6:31	10.1	6:07	9.4	5:42	8.9	5:20

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)								
	40	45	50	55	60	65	70	75	80
1	-0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5
2	-0.1	-0.1	0.0	0.1	0.3	0.5	0.7	0.9	1.2
3	-0.2	-0.1	0.0	0.2	0.4	0.7	1.0	1.4	1.8
4	-0.3	-0.2	0.0	0.3	0.6	1.0	1.4	1.9	2.4
5	-0.4	-0.2	0.0	0.3	0.7	1.2	1.8	2.4	3.0
6	-0.5	-0.2	0.0	0.4	0.9	1.4	2.1	2.8	3.6
7	-0.6	-0.3	0.0	0.4	1.0	1.6	2.4	3.2	4.2
8	-0.6	-0.3	0.0	0.5	1.1	1.9	2.7	3.6	4.7
9	-0.7	-0.4	0.0	0.6	1.2	2.0	3.0	4.0	5.2
10	-0.8	-0.4	0.0	0.6	1.4	2.2	3.2	4.4	5.6
11	-0.9	-0.4	0.0	0.7	1.5	2.4	3.5	4.7	6.1
12	-1.0	-0.5	0.0	0.7	1.6	2.6	3.7	5.0	6.5
13	-1.0	-0.5	0.0	0.8	1.7	2.7	3.9	5.3	6.9
14	-1.1	-0.6	0.0	0.8	1.8	2.8	4.1	5.6	7.2

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
85	%N1	82.0	84.9	89.2	94.1				
	KIAS	252	253	254	255				
	FF/ENG	2820	2830	2850	2920				
80	%N1	80.3	83.2	87.5	92.0				
	KIAS	244	245	246	247				
	FF/ENG	2650	2650	2660	2710				
75	%N1	78.6	81.4	85.6	90.1	96.9			
	KIAS	236	238	238	239	241			
	FF/ENG	2490	2480	2480	2520	2620			
70	%N1	76.7	79.4	83.7	88.1	93.6			
	KIAS	229	229	230	231	233			
	FF/ENG	2330	2310	2310	2330	2380			
65	%N1	74.7	77.5	81.6	85.9	90.7			
	KIAS	221	221	222	223	224			
	FF/ENG	2160	2150	2130	2150	2170			
60	%N1	72.5	75.4	79.4	83.7	88.3	95.6		
	KIAS	211	212	213	214	215	216		
	FF/ENG	2000	1980	1970	1970	1980	2080		
55	%N1	70.1	73.0	77.0	81.3	85.8	91.4		
	KIAS	202	203	203	204	205	207		
	FF/ENG	1850	1820	1800	1790	1790	1840		
50	%N1	67.7	70.4	74.5	78.7	83.2	87.9	96.7	
	KIAS	192	193	194	195	195	197	198	
	FF/ENG	1690	1660	1640	1630	1620	1630	1780	
45	%N1	64.9	67.6	71.7	75.8	80.3	84.9	91.2	
	KIAS	185	185	185	185	185	186	187	
	FF/ENG	1540	1510	1480	1470	1450	1450	1510	
40	%N1	61.8	64.6	68.5	72.8	77.0	81.6	86.5	96.3
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	1380	1360	1330	1310	1280	1280	1310	1440

This table includes 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

Long Range Cruise Altitude Capability

Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
85	14600	11500	8500
80	17400	14600	11700
75	20300	17600	14900
70	22800	20500	17800
65	25400	23500	20900
60	27800	26300	24400
55	30200	29000	27300
50	32300	31300	30100
45	34500	33500	32400
40	36900	36000	34900

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
80	%N1	84.8									
	MACH	.468									
	KIAS	259									
	FF/ENG	2313									
70	%N1	81.1	90.4	92.6							
	MACH	.440	.541	.557							
	KIAS	243	242	240							
	FF/ENG	2010	2004	2002							
60	%N1	76.9	86.2	88.0	89.8	92.3	95.7				
	MACH	.409	.504	.525	.544	.562	.580				
	KIAS	226	225	225	224	222	220				
	FF/ENG	1722	1694	1696	1697	1709	1756				
50	%N1	72.3	81.2	83.0	84.8	86.6	88.5	91.1	94.7		
	MACH	.376	.463	.482	.502	.523	.544	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	1443	1395	1392	1394	1403	1409	1418	1461		
40	%N1	66.6	75.3	77.0	78.8	80.5	82.3	84.2	86.1	88.6	92.5
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573
	KIAS	187	185	185	185	185	185	185	185	183	181
	FF/ENG	1184	1114	1102	1102	1108	1112	1115	1119	1125	1160

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
327	291	260	236	217	200	188	177	167	159	152
657	585	524	475	435	400	377	356	337	320	305
992	882	788	714	653	600	565	534	505	480	458
1331	1182	1055	954	872	800	754	712	674	640	610
1676	1486	1323	1195	1091	1000	942	889	842	799	762
2026	1792	1593	1436	1310	1200	1130	1066	1009	958	913
2382	2103	1865	1680	1530	1400	1318	1244	1176	1116	1064
2744	2418	2140	1924	1751	1600	1506	1420	1342	1274	1214
3112	2737	2418	2171	1972	1800	1694	1597	1510	1432	1364

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	2.4	0:49	2.2	0:47	1.9	0:44	1.8	0:42	1.6	0:41
400	5.0	1:36	4.6	1:31	4.1	1:24	3.8	1:20	3.6	1:17
600	7.5	2:25	7.0	2:17	6.2	2:06	5.8	1:59	5.5	1:54
800	9.9	3:14	9.2	3:03	8.3	2:48	7.7	2:38	7.4	2:31
1000	12.3	4:05	11.5	3:51	10.3	3:31	9.7	3:18	9.2	3:08
1200	14.6	4:56	13.7	4:39	12.3	4:14	11.5	3:59	11.0	3:46
1400	16.9	5:49	15.8	5:28	14.2	4:59	13.3	4:40	12.7	4:24
1600	19.1	6:43	17.9	6:19	16.1	5:44	15.1	5:22	14.4	5:04
1800	21.3	7:39	19.9	7:11	18.0	6:30	16.9	6:05	16.1	5:43

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
2	-0.3	-0.2	0.0	0.3	0.7
4	-0.7	-0.3	0.0	0.7	1.5
6	-1.0	-0.5	0.0	1.0	2.2
8	-1.4	-0.7	0.0	1.2	2.8
10	-1.7	-0.9	0.0	1.5	3.4
12	-2.0	-1.0	0.0	1.8	4.0
14	-2.4	-1.2	0.0	2.0	4.5
16	-2.7	-1.4	0.0	2.2	4.9
18	-3.1	-1.5	0.0	2.4	5.3
20	-3.4	-1.7	0.0	2.5	5.7
22	-3.8	-1.9	0.0	2.6	6.0

Descent

VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	20	270	88
39000	20	270	84
37000	19	260	79
35000	18	260	75
33000	18	250	71
31000	17	250	67
29000	16	240	63
27000	15	240	59
25000	15	230	55
23000	14	220	51
21000	13	220	47
19000	12	210	43
17000	11	200	39
15000	11	190	35
10000	8	170	25
5000	6	130	16
1500	4	110	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
80	%N1	74.8	77.5	81.8	86.1	90.8			
	KIAS	225	225	225	225	225			
	FF/ENG	2160	2150	2140	2160	2170			
75	%N1	73.1	76.0	80.0	84.4	89.0			
	KIAS	220	220	220	220	220			
	FF/ENG	2040	2030	2010	2020	2030			
70	%N1	71.3	74.3	78.2	82.5	87.1	93.1		
	KIAS	216	216	216	216	216	216		
	FF/ENG	1920	1900	1890	1890	1890	1940		
65	%N1	69.5	72.4	76.4	80.7	85.1	90.2		
	KIAS	211	211	211	211	211	211		
	FF/ENG	1800	1780	1770	1760	1750	1780		
60	%N1	67.5	70.3	74.5	78.6	83.1	87.7	95.7	
	KIAS	204	204	204	204	204	204	204	
	FF/ENG	1680	1660	1640	1630	1620	1630	1740	
55	%N1	65.5	68.2	72.4	76.4	80.9	85.5	91.6	
	KIAS	198	198	198	198	198	198	198	
	FF/ENG	1570	1540	1520	1500	1490	1490	1550	
50	%N1	63.3	66.0	70.0	74.2	78.5	83.0	87.9	
	KIAS	192	192	192	192	192	192	192	
	FF/ENG	1450	1430	1400	1380	1360	1360	1390	
45	%N1	60.8	63.7	67.6	71.8	76.0	80.5	85.1	92.6
	KIAS	185	185	185	185	185	185	185	185
	FF/ENG	1330	1310	1290	1270	1240	1230	1250	1320
40	%N1	58.2	61.0	65.0	69.1	73.4	77.7	82.2	87.7
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	1220	1200	1170	1150	1130	1110	1120	1140

This table includes 5% additional fuel for holding in a racetrack pattern.

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Performance Inflight - QRH — Chapter PI-QRH

Gear Down, Engine Inop — Section 14

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	76	224	3000	1300	
75	71	219	5400	4000	2000
70	67	215	7800	6400	4600
65	62	210	10200	9000	7300
60	57	204	12500	11600	10200
55	53	198	15000	14100	13200
50	48	192	17500	16700	15900
45	43	185	20100	19300	18400
40	38	178	22600	21800	21000

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
75	700		
70	3800	1600	
65	6800	5200	2600
60	10000	8400	6200
55	12700	11600	9800
50	15600	14800	13700
45	18700	17800	17000
40	21800	20900	20000

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	21
70	%N1	95.5								
	MACH	.389								
	KIAS	235								
	FF/ENG	3850								
65	%N1	93.1	95.0							
	MACH	.376	.389							
	KIAS	228	227							
	FF/ENG	3544	3556							
60	%N1	90.7	92.4	94.3	97.3					
	MACH	.364	.375	.388	.402					
	KIAS	220	219	218	218					
	FF/ENG	3250	3252	3263	3326					
55	%N1	88.2	89.8	91.6	93.5	96.4				
	MACH	.351	.362	.374	.387	.400				
	KIAS	212	211	210	209	209				
	FF/ENG	2973	2961	2961	2971	3027				
50	%N1	85.7	87.2	88.7	90.5	92.3	95.1	99.5		
	MACH	.338	.348	.359	.371	.384	.398	.412		
	KIAS	204	203	202	201	200	199	198		
	FF/ENG	2714	2691	2676	2674	2684	2722	2824		
45	%N1	83.1	84.4	85.9	87.4	89.1	90.9	93.5	97.7	
	MACH	.325	.334	.344	.355	.367	.380	.393	.408	
	KIAS	196	195	193	192	191	190	189	189	
	FF/ENG	2468	2437	2412	2396	2393	2396	2411	2489	
40	%N1	80.2	81.5	82.9	84.3	85.8	87.5	89.3	91.5	95.1
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2234	2196	2164	2139	2122	2113	2106	2107	2160

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
167	148	132	119	109	100	94	88	82	78	74
341	300	266	239	218	200	187	174	164	155	147
516	454	402	361	328	300	280	261	245	231	219
692	608	537	482	438	400	373	348	326	307	291
869	763	673	603	548	500	465	434	407	383	363
1048	919	809	725	658	600	558	521	488	459	434
1228	1076	947	847	768	700	651	607	568	535	506
1410	1234	1084	970	879	800	744	693	648	610	577
1593	1392	1222	1092	989	900	836	779	729	685	648
1778	1552	1361	1215	1100	1000	929	865	809	760	719

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	1.3	0:27	1.1	0:26	1.1	0:26
200	2.6	0:53	2.4	0:50	2.4	0:48
300	4.0	1:18	3.7	1:15	3.7	1:11
400	5.3	1:44	5.0	1:39	4.9	1:35
500	6.6	2:10	6.2	2:04	6.1	1:58
600	7.9	2:37	7.5	2:29	7.3	2:22
700	9.2	3:04	8.7	2:55	8.5	2:46
800	10.5	3:31	9.9	3:20	9.7	3:10
900	11.7	3:58	11.1	3:46	10.8	3:35
1000	13.0	4:25	12.2	4:12	11.9	4:00

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
1	-0.2	-0.1	0.0	0.1	0.3
2	-0.4	-0.2	0.0	0.3	0.6
3	-0.5	-0.3	0.0	0.5	1.0
4	-0.7	-0.4	0.0	0.7	1.3
5	-0.9	-0.5	0.0	0.9	1.7
6	-1.1	-0.6	0.0	1.1	2.0
7	-1.3	-0.7	0.0	1.2	2.4
8	-1.4	-0.7	0.0	1.4	2.7
9	-1.6	-0.8	0.0	1.6	3.1
10	-1.8	-0.9	0.0	1.8	3.4
11	-2.0	-1.0	0.0	1.9	3.8
12	-2.2	-1.1	0.0	2.1	4.1
13	-2.3	-1.2	0.0	2.2	4.5

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000
80	%N1	94.1			
	KIAS	225			
	FF/ENG	4240			
75	%N1	92.1	95.5		
	KIAS	220	220		
	FF/ENG	3960	4010		
70	%N1	90.0	93.3		
	KIAS	216	216		
	FF/ENG	3680	3730		
65	%N1	88.0	91.1	97.0	
	KIAS	211	211	211	
	FF/ENG	3430	3450	3560	
60	%N1	85.8	88.8	93.6	
	KIAS	204	204	204	
	FF/ENG	3170	3180	3230	
55	%N1	83.5	86.4	91.0	98.4
	KIAS	198	198	198	198
	FF/ENG	2920	2920	2940	3110
50	%N1	80.9	83.9	88.3	93.6
	KIAS	192	192	192	192
	FF/ENG	2670	2660	2670	2730
45	%N1	78.3	81.2	85.5	90.2
	KIAS	185	185	185	185
	FF/ENG	2440	2420	2420	2450
40	%N1	75.6	78.3	82.6	87.1
	KIAS	178	178	178	178
	FF/ENG	2210	2190	2170	2180

This table includes 5% additional fuel for holding in a racetrack pattern.

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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 Airplane Flight Manual, the Flight Manual shall always take precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

Pitch attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome 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.

Max Climb %N1

This table shows Max Climb %N1 for a 280/.78 climb speed schedule, normal engine bleed for packs on or off and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Go-around %N1

To find Max Go-around %N1 based on normal engine bleed for packs on (AUTO) and anti-ice on or off, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs OFF or HIGH operation, apply the %N1 adjustment shown below the table.

VREF

This table contains flaps 40, 30 and 15 reference speeds for a given weight.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Advisory Information

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 30 and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking actions, which are commonly referred to as slippery runway conditions. Landing distances for slippery runways are 115% of the actual landing distances.

If the surface is affected by water, snow or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding the 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 appropiate Recommended Brake Cooling Schedule table (Steel or Carbon Brakes) 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. Notes providing adjustments for wind are included below the table.

To determine the energy per brake absorbed during landing, enter the appropriate Adjusted Brake Energy Per Brake table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing.

The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, use the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted to determine recommended cooling schedule.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise speed of .79M to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with one A/C pack operating and all anti-ice bleeds off. Enter the table with pressure altitude, TAT, and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/LRC 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 adjust for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Enroute Fuel and Time table.

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, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .78/280/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel adjustments table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel required and time for the actual weight.

Holding

Target %N1, 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. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

Gear Down

This section contains performance for airplane operation with the landing gear extended. 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 may generate inappropriate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. An accurate estimated time of arrival (ETA) is available if current speed or Mach is entered into the VNAV cruise page.

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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General — Section 20

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Climb (280/.76)

Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1700	1100	600		
30000	**PITCH ATT**	**4.0**	**4.0**	**3.5**	**4.0**	**4.0**
	V/S (FT/MIN)	2500	1900	1500	1100	800
20000	**PITCH ATT**	**7.0**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3300	2600	2100	1700
10000	**PITCH ATT**	**11.0**	**9.5**	**8.5**	**8.0**	**8.0**
	V/S (FT/MIN)	5600	4400	3600	3000	2500
SEA LEVEL	**PITCH ATT**	**14.5**	**12.5**	**11.0**	**10.0**	**9.5**
	V/S (FT/MIN)	6700	5300	4400	3700	3100

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	83	85	90		
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	81	83	84	87	90
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	84	86
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	81	82
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	74	74	75	77	78
15000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**3.0**	**3.5**
	%N1	70	71	72	73	74

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.0**	**1.5**
	V/S (FT/MIN)	-2700	-2400	-2300	-2500	-2700
30000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3100	-2600	-2300	-2100	-2000
20000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2800	-2300	-2000	-1900	-1700
10000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN	-2500	-2100	-1800	-1700	-1500
SEA LEVEL	**PITCH ATT**	**-3.5**	**-2.5**	**-1.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-2300	-1900	-1700	-1500	-1400

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	62	66	69
5000	**PITCH ATT**	**5.0**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	49	54	58	62	66

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 1 (GEAR UP)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	6.0
(VREF40 + 50)	%N1	51	56	60	64	68
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
(VREF40 + 30)	%N1	51	57	61	65	69
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**5.0**	**5.5**	5.5	**6.0**	**6.5**
(VREF40 + 20)	%N1	58	63	68	73	76

Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.
Final Approach (1500 FT)
Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.5**	**2.5**
(VREF15 + 10)	%N1	40	44	48	51	54
FLAPS 30	**PITCH ATT**	**0.5**	**1.0**	**1.0**	**1.0**	**1.0**
(VREF30 + 10)	%N1	47	52	56	60	63
FLAPS 40	**PITCH ATT**	**-0.5**	**-0.5**	**-0.5**	**0.0**	**0.0**
(VREF40 + 10)	%N1	52	58	62	66	70

Max Climb %N1

Based on engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)/SPEED (KIAS/MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	37000	41000
	280	280	280	280	280	280	280	.78	.78	.78
60	90.2	90.5	90.4	90.6	90.4	92.1	93.8	95.1	95.2	93.5
55	91.0	91.2	91.3	91.4	90.8	91.5	93.1	94.4	94.5	92.8
50	91.7	92.0	92.1	92.2	91.7	91.5	92.4	93.7	93.8	92.1
45	92.4	92.6	92.8	93.0	92.6	92.4	92.4	93.0	93.1	91.4
40	93.1	93.3	93.6	93.8	93.4	93.2	93.2	92.3	92.4	90.7
35	93.6	94.0	94.3	94.5	94.3	94.0	94.0	93.0	92.4	90.8
30	92.9	94.8	95.0	95.2	95.1	94.8	94.7	93.9	93.3	91.8
25	92.2	94.8	95.7	95.9	95.9	95.5	95.4	94.7	94.1	92.8
20	91.4	94.0	96.5	96.7	96.6	96.2	96.1	95.4	94.9	93.7
15	90.6	93.2	95.9	97.5	97.4	96.9	96.7	96.2	95.7	94.6
10	89.9	92.5	95.1	97.8	98.3	97.7	97.4	96.9	96.5	95.6
5	89.1	91.7	94.3	97.0	99.2	98.6	98.1	97.7	97.3	96.5
0	88.3	90.9	93.5	96.2	98.6	99.6	99.1	98.5	98.2	97.5
-5	87.6	90.1	92.7	95.4	97.8	99.6	100.0	99.2	99.0	98.4
-10	86.8	89.3	91.9	94.6	97.1	98.8	100.3	100.2	99.8	99.4
-15	86.0	88.5	91.0	93.8	96.3	98.0	99.6	101.1	100.8	100.4
-20	85.2	87.6	90.2	93.0	95.5	97.2	98.7	100.8	101.3	101.0
-25	84.3	86.8	89.4	92.2	94.7	96.4	97.9	100.0	100.5	100.1
-30	83.5	86.0	88.5	91.3	93.9	95.6	97.1	99.1	99.6	99.3
-35	82.7	85.1	87.7	90.5	93.1	94.8	96.3	98.3	98.8	98.4
-40	81.8	84.3	86.8	89.6	92.3	93.9	95.4	97.4	97.9	97.6

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	35	41
ENGINE ANTI-ICE	-0.6	-0.8	-0.9	-0.9	-0.8	-0.8
ENGINE & WING ANTI-ICE*	-1.8	-2.1	-2.5	-2.7	-3.0	-3.0

*Dual bleed sources

Go-around %N1

Based on engine bleed for packs on, engine and wing anti-ice on or off

AIRPORT OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
57	134	60	95.0	96.2	96.8									
52	125	55	95.9	96.7	96.6	96.8	97.5							
47	116	50	96.6	97.6	97.8	97.8	97.7	97.5	98.2	98.8				
42	108	45	97.4	98.4	98.5	98.6	98.7	98.8	98.7	98.5	98.5	99.0		
37	99	40	98.0	99.1	99.2	99.3	99.4	99.5	99.6	99.5	99.1	98.9	98.8	99.1
32	90	35	98.1	99.9	100.0	100.1	100.1	100.3	100.3	100.2	99.9	99.6	99.6	99.5
27	81	30	97.3	99.8	100.4	100.7	100.7	100.7	100.7	100.7	100.6	100.4	100.4	100.3
22	72	25	96.6	99.1	99.7	100.2	100.6	100.9	100.9	100.9	100.9	100.9	100.9	100.8
17	63	20	95.8	98.3	98.9	99.5	99.8	100.2	100.5	100.9	101.0	101.1	101.0	101.0
12	54	15	95.0	97.5	98.1	98.7	99.1	99.4	99.8	100.1	100.5	100.9	101.3	101.2
7	45	10	94.2	96.8	97.4	98.0	98.3	98.7	99.0	99.4	99.8	100.2	100.5	100.9
2	36	5	93.4	96.0	96.6	97.2	97.6	97.9	98.3	98.7	99.0	99.4	99.8	100.2
-3	27	0	92.6	95.2	95.8	96.4	96.8	97.2	97.5	97.9	98.3	98.7	99.0	99.4
-8	18	-5	91.8	94.4	95.0	95.6	96.0	96.4	96.8	97.2	97.5	97.9	98.3	98.6
-13	9	-10	91.0	93.6	94.2	94.8	95.2	95.6	96.0	96.4	96.8	97.1	97.5	97.9
-17	1	-15	90.2	92.8	93.4	94.0	94.4	94.8	95.2	95.6	96.0	96.4	96.7	97.1
-22	-8	-20	89.3	92.0	92.6	93.2	93.6	94.0	94.4	94.8	95.2	95.6	95.9	96.3
-27	-17	-25	88.5	91.1	91.8	92.4	92.8	93.2	93.6	94.0	94.4	94.8	95.1	95.5
-32	-26	-30	87.6	90.3	90.9	91.6	92.0	92.4	92.8	93.3	93.6	94.0	94.3	94.7
-37	-35	-35	86.8	89.4	90.1	90.7	91.1	91.6	92.0	92.4	92.8	93.2	93.5	93.9
-42	-44	-40	85.9	88.6	89.2	89.9	90.3	90.7	91.2	91.6	92.0	92.4	92.7	93.0
-47	-53	-45	85.0	87.7	88.4	89.0	89.4	89.9	90.3	90.8	91.2	91.5	91.9	92.2
-52	-62	-50	84.1	86.8	87.5	88.2	88.6	89.0	89.5	90.0	90.3	90.7	91.0	91.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
A/C HIGH	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
85	159	167	174
80	154	162	169
75	148	156	163
70	143	151	157
65	139	147	153
60	133	141	147
55	127	134	140
50	121	128	133
45	114	121	126
40	107	114	119

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ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENT (FT) REF DIST 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/ HIGH*	WIND ADJ PER 10 KTS HEAD WIND	TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	UP HILL	TEMP ADJ PER 10°C ABV ISA	BLW ISA	APP SPD ADJ PER 10 KTS ABOVE VREF30	REVERSE THRUST ADJ ONE REV	NO REV
MAX MANUAL	2870	190/-160	60/80	-100	360	30	-30	60	-60	200	50	100
MAX AUTO	3720	200/-210	80/110	-140	460	0	0	80	-80	350	0	0
AUTOBRAKE 3	5220	320/-350	130/180	-230	760	10	-30	140	-140	510	10	20
AUTOBRAKE 2	6620	450/-470	190/250	-300	1030	120	-140	180	-180	490	300	320
AUTOBRAKE 1	7180	520/-540	220/300	-350	1210	200	-210	200	-200	480	610	1010

Good Reported Braking Action

MAX MANUAL	4520	260/-280	120/150	-200	710	100	-90	100	-100	320	210	470
MAX AUTO	5030	290/-300	130/160	-210	740	80	-70	120	-120	390	240	540
AUTOBRAKE 3	6010	370/-400	160/210	-260	900	20	-50	160	-160	590	30	70
AUTOBRAKE 2	7610	520/-540	220/290	-350	1180	140	-160	210	-210	560	350	370

Medium Reported Braking Action

MAX MANUAL	6130	410/-430	180/240	-320	1170	260	-210	160	-160	430	580	1400
MAX AUTO	6460	430/-440	180/250	-320	1170	230	-180	160	-170	490	600	1430
AUTOBRAKE 3	6620	440/-460	180/250	-330	1220	180	-150	170	-180	590	410	1200
AUTOBRAKE 2	7790	530/-550	230/300	-380	1350	240	-220	210	-220	560	470	840

Poor Reported Braking Action

MAX MANUAL	7930	600/-590	250/360	-480	1850	630	-410	220	-230	490	1250	3310
MAX AUTO	8250	600/-590	250/360	-480	1840	620	-380	220	-230	560	1230	3310
AUTOBRAKE 3	8250	600/-600	260/360	-480	1850	600	-390	220	-240	580	1270	3380
AUTOBRAKE 2	8650	600/-600	280/380	-490	1900	610	-400	230	-250	560	1150	2960

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speed-brakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 210 ft.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (1000 ft of air distance).

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2740	170/-150	50/70	-100	350	30	-30	50	-50	200	40	80
MAX AUTO	3470	180/-200	70/100	-130	440	0	0	70	-80	340	0	0
AUTOBRAKE 3	4800	290/-320	120/160	-210	730	10	-20	120	-120	510	10	10
AUTOBRAKE 2	6130	410/-430	170/230	-290	1000	90	-120	160	-160	490	180	180
AUTOBRAKE 1	6740	480/-500	200/270	-340	1170	180	-200	180	-180	480	490	770

Good Reported Braking Action

MAX MANUAL	4340	250/-260	100/150	-200	700	100	-90	100	-100	330	200	430
MAX AUTO	4760	260/-290	120/150	-210	720	80	-70	100	-100	390	220	480
AUTOBRAKE 3	5530	330/-370	140/180	-250	850	20	-30	140	-140	590	20	60
AUTOBRAKE 2	7050	470/-490	200/260	-330	1150	100	-140	180	-180	560	210	210

Medium Reported Braking Action

MAX MANUAL	5840	390/-400	170/230	-310	1150	250	-210	150	-160	430	530	1270
MAX AUTO	6120	400/-410	170/230	-310	1150	220	-170	150	-160	510	540	1280
AUTOBRAKE 3	6220	410/-430	170/240	-320	1180	180	-150	160	-170	590	430	1170
AUTOBRAKE 2	7230	480/-520	210/280	-370	1310	210	-200	200	-200	560	330	680

Poor Reported Braking Action

MAX MANUAL	7560	560/-560	240/330	-470	1820	620	-400	210	-220	510	1150	2990
MAX AUTO	7850	560/-550	240/330	-470	1810	620	-390	200	-220	540	1150	3010
AUTOBRAKE 3	7850	580/-580	240/350	-470	1820	600	-390	210	-220	550	1170	3050
AUTOBRAKE 2	8110	580/-580	250/360	-480	1860	590	-390	220	-240	560	1000	2680

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 200 ft.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (1000 ft of air distance).

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT): REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS: HEAD WIND	WIND ADJ PER 10 KTS: TAIL WIND	SLOPE ADJ PER 1%: DOWN HILL	SLOPE ADJ PER 1%: UP HILL	APP SPD: PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	3985	525/-245	80/195	-130	445	50	-35	260
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4805	280/-295	130/165	-230	855	130	-115	360
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3280	230/-180	80/100	-115	395	35	-35	260
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3165	215/-165	65/80	-115	375	35	-35	280
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3035	180/-165	65/80	-115	375	35	-35	295
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3365	180/-180	80/100	-130	445	50	-50	245
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4575	245/-260	115/150	-180	605	100	-100	475
LEADING EDGE FLAPS TRANSIT	VREF15+15	3345	245/-195	80/100	-115	395	35	-35	215
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3020	215/-180	65/80	-115	375	35	-35	215
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2885	180/-165	65/80	-100	360	35	-35	215

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APP SPD PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	2985	230/-180	65/80	-100	375	35	-35	195
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2985	230/-180	65/80	-100	375	35	-35	195
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2870	195/-165	65/80	-100	360	35	-35	195
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2985	230/-180	65/80	-100	375	35	-35	195
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3330	280/-195	80/100	-115	395	35	-35	195
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2870	195/-165	65/80	-100	360	35	-35	195
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2985	230/-180	65/80	-100	375	35	-35	195
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3330	280/-195	80/100	-115	395	35	-35	195
TRAILING EDGE FLAPS UP	VREF40+40	3560	345/-215	80/100	-115	410	35	-35	215

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	5300	280/-295	150/195	-195	705	100	-100	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5350	345/-360	150/195	-280	1015	195	-165	395
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4740	295/-310	130/180	-195	705	130	-115	410
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4495	280/-295	115/165	-195	690	115	-100	410
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4265	260/-280	115/150	-195	675	115	-100	410
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4250	260/-260	115/150	-180	655	100	-80	310
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5645	330/-360	150/195	-230	805	180	-165	575
LEADING EDGE FLAPS TRANSIT	VREF15+15	4575	260/-280	115/165	-195	675	100	-80	295
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	4230	245/-260	100/150	-180	655	100	-80	295
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	4035	230/-245	100/130	-180	640	100	-80	295

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	4070	245/-245	100/150	-180	625	80	-80	280
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4070	245/-245	100/150	-180	625	80	-80	280
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	3905	230/-230	100/130	-180	605	80	-80	280
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4070	245/-245	100/150	-180	625	80	-80	280
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4495	245/-260	115/150	-180	655	80	-80	260
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	3905	230/-230	100/130	-180	605	80	-80	280
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4070	245/-245	100/150	-180	625	80	-80	280
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4495	245/-260	115/150	-180	655	80	-80	260
TRAILING EDGE FLAPS UP	VREF40+40	4805	260/-280	130/165	-195	675	100	-80	260

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APP SPD PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	7465	475/-490	245/330	-330	1180	260	-230	375
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6740	475/-490	215/280	-410	1610	445	-330	460
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6480	475/-490	215/280	-330	1150	295	-245	525
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6085	445/-445	195/260	-310	1115	280	-230	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5725	410/-410	180/245	-295	1085	260	-230	510
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5805	410/-410	180/245	-295	1065	230	-195	410
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	7810	540/-540	245/330	-375	1295	395	-330	705
LEADING EDGE FLAPS TRANSIT	VREF15+15	6235	425/-425	195/260	-295	1100	230	-195	375
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	6020	410/-425	180/230	-310	1130	260	-230	425
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	5660	375/-395	165/215	-295	1085	260	-215	410

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	5545	375/-395	165/230	-280	1035	215	-180	375
JAMMED OR RESTRICTIVE FLIGHT CONTROLS	VREF15	5545	375/-395	165/230	-280	1035	215	-180	375
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	5250	360/-360	150/195	-280	1015	195	-180	360
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5545	375/-395	165/230	-280	1035	215	-180	375
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6185	395/-410	195/260	-295	1085	230	-195	360
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5250	360/-360	150/195	-280	1015	195	-180	360
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5545	375/-395	165/230	-280	1035	215	-180	375
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	6185	395/-410	195/260	-295	1085	230	-195	360
TRAILING EDGE FLAPS UP	VREF40+40	6695	425/-445	215/280	-310	1130	245	-215	375

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	9890	705/-720	360/475	-490	1870	625	-475	475
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8940	705/-690	295/445	-675	2955	1575	-770	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8385	690/-675	310/425	-475	1790	640	-475	625
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	7790	625/-605	280/375	-460	1740	590	-445	575
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7315	575/-575	245/345	-445	1705	575	-425	560
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7545	590/-575	260/360	-445	1690	525	-395	490
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	10025	770/-755	345/490	-540	1970	785	-605	785
LEADING EDGE FLAPS TRANSIT	VREF15+15	8040	605/-605	280/375	-445	1705	525	-395	445
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	8220	625/-625	260/360	-490	1835	675	-490	525
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	7610	560/-575	245/330	-460	1770	625	-460	490

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REF DIST FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABV/BLW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	7200	560/-540	245/330	-425	1640	490	-360	445
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	7200	560/-540	245/330	-425	1640	490	-360	445
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	6760	510/-510	215/310	-410	1590	460	-345	425
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	7200	560/-540	245/330	-425	1640	490	-360	445
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	8085	590/-590	280/375	-445	1705	525	-395	445
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	6760	510/-510	215/310	-410	1590	460	-345	425
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	7200	560/-540	245/330	-425	1640	490	-360	445
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	8085	590/-590	280/375	-445	1705	525	-395	445
TRAILING EDGE FLAPS UP	VREF40+40	8795	625/-640	310/425	-475	1770	560	-425	460

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy Per Brake (Millions of Foot Pounds)

		WIND CORRECTED BRAKES ON SPEED (KIAS)*																	
		80			100			120			140			160			180		
WEIGHT (1000 KG)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
80	0	15.1	17.0	19.3	22.4	25.3	28.9	30.9	35.0	40.2	40.4	45.9	53.0	50.8	57.9	67.3	60.8	69.6	81.2
	10	15.6	17.6	20.0	23.1	26.1	29.8	31.9	36.2	41.5	41.8	47.5	54.8	52.5	59.9	69.5	62.8	71.9	83.9
	15	15.8	17.8	20.2	23.5	26.5	30.3	32.4	36.7	42.1	42.4	48.2	55.6	53.3	60.7	70.5	63.7	72.9	85.1
	20	16.0	18.1	20.5	23.8	26.9	30.7	32.8	37.2	42.7	42.9	48.8	56.3	54.0	61.5	71.4	64.6	73.9	86.2
	30	16.4	18.5	21.1	24.4	27.6	31.5	33.7	38.2	43.8	44.0	50.0	57.7	55.3	63.1	73.2	66.2	75.7	88.4
	40	16.6	18.7	21.3	24.7	27.9	31.9	34.1	38.7	44.4	44.7	50.9	58.8	56.3	64.3	74.8	67.5	77.4	90.5
	50	16.6	18.7	21.3	24.8	28.0	32.1	34.3	39.0	44.9	45.2	51.5	59.7	57.1	65.4	76.3	68.7	79.0	92.9
70	0	13.7	15.4	17.5	20.2	22.8	26.0	27.7	31.3	35.9	36.1	41.0	47.2	45.3	51.6	59.7	54.9	62.7	72.9
	10	14.2	15.9	18.1	20.8	23.5	26.8	28.6	32.4	37.1	37.3	42.3	48.7	46.8	53.3	61.6	56.7	64.8	75.4
	15	14.4	16.2	18.4	21.1	23.9	27.2	29.0	32.8	37.6	37.8	43.0	49.4	47.5	54.0	62.5	57.5	65.7	76.4
	20	14.6	16.4	18.6	21.4	24.2	27.6	29.4	33.3	38.1	38.4	43.5	50.1	48.1	54.8	63.4	58.3	66.5	77.4
	30	14.9	16.8	19.1	22.0	24.8	28.3	30.2	34.1	39.1	39.3	44.6	51.4	49.3	56.1	64.9	59.8	68.2	79.4
	40	15.1	17.0	19.3	22.2	25.1	28.6	30.5	34.6	39.6	39.9	45.3	52.2	50.1	57.1	66.2	60.9	69.6	81.2
	50	15.1	17.0	19.3	22.3	25.2	28.8	30.7	34.8	40.0	40.2	45.8	52.9	50.7	58.0	67.4	61.8	70.9	83.0
60	0	12.3	13.9	15.7	18.0	20.3	23.1	24.4	27.6	31.6	31.7	35.9	41.2	39.6	45.0	51.8	48.1	54.8	63.5
	10	12.7	14.3	16.3	18.5	20.9	23.8	25.2	28.5	32.6	32.7	37.1	42.6	40.9	46.5	53.6	49.7	56.6	65.6
	15	12.9	14.6	16.5	18.8	21.2	24.2	25.6	29.0	33.1	33.2	37.6	43.2	41.5	47.1	54.4	50.4	57.4	66.5
	20	13.1	14.8	16.7	19.1	21.5	24.5	26.0	29.4	33.5	33.6	38.1	43.8	42.0	47.8	55.1	51.1	58.2	67.4
	30	13.4	15.1	17.2	19.6	22.1	25.1	26.6	30.1	34.4	34.5	39.1	44.9	43.1	49.0	56.5	52.3	59.6	69.1
	40	13.6	15.3	17.3	19.8	22.3	25.4	26.9	30.5	34.9	35.0	39.7	45.6	43.8	49.8	57.5	53.2	60.7	70.5
	50	13.5	15.3	17.3	19.8	22.4	25.5	27.0	30.6	35.1	35.2	40.0	46.0	44.2	50.4	58.3	53.9	61.7	71.9
50	0	11.0	12.3	14.0	15.7	17.7	20.2	21.2	23.9	27.3	27.2	30.8	35.3	33.8	38.3	44.1	40.9	46.4	53.6
	10	11.3	12.7	14.4	16.3	18.3	20.8	21.9	24.7	28.2	28.1	31.8	36.5	34.9	39.6	45.5	42.2	48.0	55.4
	15	11.5	12.9	14.7	16.5	18.6	21.1	22.2	25.1	28.6	28.6	32.3	37.0	35.4	40.2	46.2	42.8	48.7	56.2
	20	11.6	13.1	14.9	16.7	18.9	21.4	22.5	25.4	29.0	28.9	32.8	37.5	35.9	40.7	46.8	43.4	49.3	56.9
	30	11.9	13.4	15.2	17.2	19.3	22.0	23.1	26.1	29.7	29.7	33.6	38.4	36.8	41.8	48.0	44.5	50.6	58.4
	40	12.1	13.6	15.4	17.3	19.5	22.2	23.4	26.4	30.1	30.1	34.0	39.0	37.4	42.4	48.8	45.2	51.4	59.4
	50	12.0	13.6	15.4	17.3	19.6	22.3	23.4	26.5	30.3	30.2	34.2	39.3	37.6	42.8	49.3	45.7	52.1	60.3
40	0	9.6	10.8	12.3	13.5	15.2	17.3	17.9	20.2	23.0	22.8	25.8	29.4	28.1	31.8	36.4	33.7	38.2	43.9
	10	10.0	11.2	12.7	14.0	15.8	17.9	18.5	20.9	23.8	23.6	26.6	30.4	29.0	32.8	37.6	34.8	39.5	45.4
	15	10.1	11.4	12.9	14.2	16.0	18.1	18.8	21.2	24.1	23.9	27.0	30.8	29.4	33.3	38.2	35.3	40.0	46.0
	20	10.2	11.5	13.1	14.4	16.2	18.4	19.1	21.5	24.5	24.2	27.4	31.3	29.8	33.8	38.7	35.8	40.6	46.6
	30	10.5	11.8	13.4	14.8	16.6	18.9	19.6	22.1	25.1	24.9	28.1	32.1	30.6	34.6	39.7	36.7	41.6	47.8
	40	10.6	11.9	13.5	14.9	16.8	19.1	19.8	22.3	25.4	25.2	28.4	32.5	31.0	35.1	40.2	37.2	42.2	48.6
	50	10.6	11.9	13.5	14.9	16.8	19.1	19.8	22.3	25.5	25.2	28.6	32.7	31.1	35.3	40.6	37.5	42.6	49.1

***To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind. If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.**

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.8	16.3	25.3	34.7	44.7	55.0	65.7	76.6	87.9
	MAX AUTO	7.5	15.4	23.6	32.4	41.8	51.8	62.5	74.1	86.5
	AUTOBRAKE 3	7.3	14.7	22.3	30.2	38.6	47.6	57.4	68.1	80.0
	AUTOBRAKE 2	7.0	13.8	20.5	27.4	34.8	42.7	51.5	61.3	72.4
	AUTOBRAKE 1	6.7	13.1	19.2	25.3	31.8	38.8	46.6	55.4	65.5

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.0	14.6	22.8	31.4	40.5	49.9	59.7	69.8	80.0
	MAX AUTO	5.8	12.3	19.5	27.2	35.6	44.5	53.9	63.7	74.1
	AUTOBRAKE 3	4.3	9.2	14.7	20.7	27.2	34.4	42.0	50.2	59.0
	AUTOBRAKE 2	2.5	5.6	9.1	13.1	17.8	23.0	28.8	35.2	42.3
	AUTOBRAKE 1	1.8	3.8	6.1	8.8	11.9	15.5	19.6	24.4	29.8

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Cooling Time (Minutes) - Category C Steel Brakes

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	25	28	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	3.9	4.4	4.9	5.0 TO 7.5	7.5 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	20	30	40	50	60		

Cooling Time (Minutes) - Category N Carbon Brakes

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)							
	16 & BELOW	17	19	20.9	23.5	26.9	30 TO 41	41 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS							
	UP TO 2.5	2.6	3	3.3	3.8	4.5	5.0 TO 7.1	7.1 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	4	5	6	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		6.7	16.0	24.1	34.2	45.9		

Observe maximum quick turnaround limit.
Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.
Add 1.0 million foot pounds per brake for each taxi mile.

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 7 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt to taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature monitor system (BTMS) indication on CDS systems page 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.

Performance Inflight - QRH Chapter PI-QRH
General Section 22

ENGINE INOP

Initial Max Continuous %N1
Based on .79M, A/C high and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
20	96.8	96.6	96.3	96.1	95.9	95.4	95.0	94.7	93.9
15	97.4	97.2	96.9	96.8	96.6	96.2	95.7	95.5	94.8
10	98.0	97.8	97.5	97.4	97.4	96.9	96.5	96.3	95.7
5	98.3	98.6	98.3	98.1	98.1	97.7	97.3	97.1	96.6
0	97.5	98.7	99.2	99.0	98.9	98.5	98.2	98.0	97.5
-5	96.7	98.0	99.1	99.8	99.7	99.3	98.9	98.7	98.4
-10	96.0	97.2	98.4	99.6	100.5	100.2	99.8	99.6	99.4
-15	95.2	96.4	97.6	98.8	100.1	101.0	100.8	100.6	100.3
-20	94.4	95.6	96.8	98.0	99.3	100.5	101.1	100.8	100.6
-25	93.6	94.9	96.0	97.2	98.5	99.7	100.2	100.0	99.8
-30	92.8	94.1	95.2	96.4	97.7	98.8	99.4	99.2	99.0
-35	92.0	93.2	94.4	95.6	96.8	98.0	98.5	98.3	98.1
-40	91.2	92.4	93.5	94.7	96.0	97.1	97.6	97.4	97.2

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
ENGINE ANTI-ICE	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE	-4.2	-4.4	-4.5	-4.7	-5.0	-4.8	-4.8	-4.8	-4.8

ENGINE INOP

Max Continuous %N1

37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.51	96.6	97.6	98.5	99.4	100.2	99.6	98.8	97.6	96.3	94.7	93.2	91.8
200	.63	96.0	96.9	97.8	98.7	99.6	100.4	100.1	99.3	98.4	97.5	96.3	95.2
240	.74	95.1	96.0	96.8	97.7	98.6	99.4	100.3	100.7	100.0	99.2	98.4	97.5
280	.86	94.3	95.2	96.1	97.0	97.8	98.7	99.5	100.4	101.2	100.9	100.0	99.1

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	96.5	97.4	98.3	99.2	100.1	99.8	99.0	98.0	96.8	95.4	94.0	92.7
200	.60	96.1	97.0	97.9	98.8	99.7	100.6	100.5	99.6	98.6	97.6	96.5	95.4
240	.71	95.0	95.9	96.8	97.7	98.6	99.4	100.3	100.8	100.2	99.5	98.6	97.7
280	.82	93.8	94.6	95.5	96.4	97.3	98.1	98.9	99.8	100.6	100.3	99.5	98.8

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	97.4	98.3	99.2	100.0	100.8	100.0	99.1	97.9	96.7	95.3	93.9	92.6
200	.58	97.0	97.9	98.8	99.7	100.6	101.4	100.6	99.6	98.6	97.5	96.3	95.1
240	.68	95.9	96.8	97.7	98.5	99.4	100.2	101.1	100.9	100.2	99.4	98.4	97.4
280	.79	94.3	95.1	96.0	96.8	97.7	98.5	99.3	100.2	100.5	99.7	98.9	98.1
320	.89	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	100.3	101.1	100.7	99.8

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	97.3	98.2	99.1	100.0	100.9	101.1	100.2	99.2	98.0	96.6	95.2	93.9
200	.55	97.1	98.0	98.9	99.7	100.6	101.5	101.6	100.7	99.7	98.6	97.4	96.2
240	.66	95.6	96.5	97.4	98.3	99.1	100.0	100.8	101.3	100.5	99.8	98.8	97.8
280	.76	93.8	94.7	95.5	96.4	97.2	98.0	98.8	99.7	100.5	99.8	98.9	98.0
320	.85	92.4	93.2	94.1	94.9	95.7	96.5	97.4	98.2	98.9	99.7	99.9	99.1

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	98.1	99.0	99.9	100.8	101.6	101.2	100.2	99.1	97.9	96.4	95.1	93.8
200	.53	97.5	98.4	99.3	100.2	101.0	101.9	101.3	100.4	99.3	98.2	96.9	95.8
240	.63	96.3	97.1	98.0	98.9	99.7	100.5	101.4	101.1	100.2	99.2	98.3	97.2
280	.73	94.2	95.0	95.9	96.7	97.5	98.3	99.1	99.9	100.1	99.1	98.2	97.5
320	.82	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	98.5	97.6
360	.91	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	100.0	100.1

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	29	31	33	35	37
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-4.1	-4.3	-4.5	-4.7	-4.7

ENGINE INOP

Max Continuous %N1

27000 FT to 20000 FT Pressure Altitudes

27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	98.0	98.8	99.7	100.6	101.4	102.2	101.2	100.2	99.0	97.8	96.4	95.1
200	.51	96.9	97.8	98.7	99.6	100.4	101.2	101.8	100.8	99.9	98.8	97.6	96.4
240	.60	95.6	96.5	97.4	98.2	99.1	99.9	100.7	101.3	100.4	99.4	98.5	97.5
280	.70	93.6	94.4	95.3	96.1	96.9	97.7	98.5	99.3	100.1	99.4	98.4	97.6
320	.79	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.6	97.8
360	.88	91.0	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	98.1	98.8	99.4

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.8	99.7	100.5	101.4	102.2	102.4	101.4	100.3	99.1	97.7	96.5	95.2
200	.49	97.5	98.3	99.2	100.0	100.9	101.7	101.5	100.6	99.5	98.4	97.3	96.2
240	.58	95.7	96.5	97.4	98.2	99.0	99.9	100.7	100.5	99.5	98.6	97.6	96.7
280	.67	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.5	99.5	98.6	97.6	96.9
320	.76	91.7	92.6	93.4	94.2	95.0	95.8	96.5	97.3	98.0	98.6	97.8	97.2
360	.85	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.6	98.4	98.2

24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	98.6	99.5	100.4	101.2	102.1	102.9	101.9	100.8	99.6	98.4	97.1	95.8
200	.48	97.5	98.4	99.2	100.1	100.9	101.8	102.2	101.1	100.1	99.0	97.8	96.7
240	.57	95.9	96.8	97.6	98.5	99.3	100.1	100.9	101.2	100.2	99.2	98.2	97.3
280	.66	94.2	95.1	95.9	96.7	97.5	98.3	99.1	99.9	100.4	99.4	98.3	97.5
320	.75	92.1	93.0	93.8	94.6	95.4	96.2	96.9	97.7	98.5	99.2	98.6	97.8
360	.83	90.6	91.4	92.2	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.6

22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	99.1	100.0	100.9	101.7	102.5	102.8	101.8	100.7	99.5	98.2	97.0	95.8
200	.46	98.4	99.3	100.1	101.0	101.8	102.6	102.3	101.2	100.0	98.9	97.8	96.8
240	.55	97.2	98.1	98.9	99.7	100.5	101.3	102.1	101.6	100.5	99.4	98.5	97.5
280	.63	95.7	96.5	97.4	98.2	99.0	99.8	100.6	101.3	101.0	99.8	98.9	98.1
320	.72	93.9	94.7	95.5	96.3	97.1	97.9	98.6	99.4	100.1	100.2	99.3	98.6
360	.80	92.2	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	99.2	99.7	99.1

20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	98.7	99.5	100.4	101.2	102.0	102.8	102.5	101.5	100.4	99.2	98.0	96.8
200	.44	98.3	99.2	100.0	100.9	101.7	102.5	103.3	102.3	101.1	100.0	98.9	97.8
240	.53	97.5	98.4	99.2	100.0	100.8	101.7	102.5	103.1	101.8	100.5	99.5	98.6
280	.61	96.2	97.0	97.8	98.7	99.5	100.3	101.1	101.8	102.5	101.3	100.1	99.3
320	.69	94.7	95.5	96.3	97.1	97.9	98.7	99.5	100.2	101.0	101.7	100.9	99.9
360	.77	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	100.0	100.7	100.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	20	22	24	25	27
ENGINE ANTI-ICE ON	-0.9	-0.9	-1.0	-1.0	-1.0
ENGINE & WING ANTI-ICE ON	-3.6	-3.8	-3.8	-3.9	-4.0

ENGINE INOP

Max Continuous %N1

18000 FT to 12000 FT Pressure Altitudes

18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.34	98.5	99.3	100.2	101.0	101.8	102.6	101.6	100.3	99.2	98.1	97.0	95.9
200	.42	98.7	99.6	100.4	101.2	102.0	102.8	103.1	101.7	100.4	99.3	98.3	97.3
240	.51	97.8	98.7	99.5	100.3	101.1	101.9	102.7	102.5	101.1	99.9	99.0	98.1
280	.59	96.3	97.1	97.9	98.7	99.5	100.3	101.0	101.8	101.6	100.5	99.6	98.8
320	.67	94.8	95.6	96.4	97.2	97.9	98.7	99.5	100.2	101.0	100.9	100.0	99.2
360	.75	93.0	93.8	94.6	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.2	99.6

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	97.1	98.0	98.8	99.6	100.4	101.2	101.6	100.3	99.1	98.1	97.1	96.1
200	.41	98.0	98.8	99.6	100.4	101.2	102.0	102.8	102.5	101.3	100.2	99.3	98.3
240	.49	97.1	97.9	98.7	99.5	100.3	101.1	101.9	102.7	101.8	100.5	99.6	98.7
280	.57	95.6	96.4	97.2	98.0	98.8	99.6	100.3	101.1	101.8	100.9	99.8	99.0
320	.64	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.2	99.4
360	.72	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.4	99.2	99.9	99.6

14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	96.6	97.4	98.2	99.0	99.8	100.6	100.4	99.1	98.0	97.1	96.2	95.3
200	.39	97.1	97.9	98.7	99.5	100.3	101.1	101.8	101.5	101.0	100.1	99.3	98.4
240	.47	96.6	97.4	98.2	99.0	99.8	100.6	101.3	101.8	101.1	100.3	99.5	98.7
280	.54	95.5	96.3	97.1	97.8	98.6	99.4	100.1	100.9	101.0	100.1	99.2	98.5
320	.62	94.1	94.9	95.7	96.5	97.2	98.0	98.7	99.5	100.2	100.3	99.5	98.8
360	.69	92.2	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.6	99.0

12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	96.3	97.0	97.8	98.6	99.4	100.1	99.3	98.1	97.1	96.3	95.4	94.5
200	.38	97.1	97.9	98.7	99.5	100.3	101.0	101.5	100.8	99.8	99.0	98.2	97.3
240	.45	96.5	97.3	98.0	98.8	99.6	100.3	101.1	101.0	100.1	99.4	98.6	97.9
280	.52	95.5	96.3	97.0	97.8	98.6	99.3	100.0	100.8	100.3	99.4	98.6	98.0
320	.60	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	99.7	98.9	98.2
360	.67	92.3	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	99.4	99.1	98.5

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	12	14	16	18
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9
ENGINE & WING ANTI-ICE ON	-3.2	-3.4	-3.4	-3.5

ENGINE INOP

Max Continuous %N1

10000 FT to 1000 FT Pressure Altitudes

10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.29	95.2	96.0	96.8	97.6	98.3	99.1	99.8	98.6	97.4	96.6	95.8	94.9
200	.36	96.0	96.7	97.5	98.3	99.0	99.8	100.5	100.5	99.4	98.5	97.8	97.0
240	.43	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.1	99.2	98.4	97.7
280	.51	94.5	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.4	99.5	98.7	98.0
320	.58	93.0	93.9	94.7	95.5	96.2	97.0	97.8	98.6	99.3	99.7	99.0	98.2
360	.65	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	99.1	98.5

5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	94.9	95.7	96.4	97.2	98.0	98.8	99.2	98.3	97.4	96.6	95.9	95.1
200	.33	94.7	95.5	96.3	97.1	97.8	98.6	99.4	98.9	98.0	97.3	96.6	95.8
240	.40	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.5	98.7	97.9	97.2	96.5
280	.46	93.3	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	98.2	97.5	96.8
320	.53	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	98.7	98.4	97.7	97.1
360	.59	91.5	92.3	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.0	97.3

3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.9	97.1	96.4	95.6	94.8
200	.32	94.5	95.3	96.1	96.9	97.6	98.4	99.2	98.3	97.5	96.8	96.1	95.3
240	.38	94.1	94.9	95.6	96.4	97.2	98.0	98.7	98.8	98.0	97.2	96.6	95.9
280	.45	93.2	94.0	94.8	95.6	96.4	97.2	97.9	98.7	98.3	97.5	96.9	96.2
320	.51	92.5	93.3	94.1	94.9	95.7	96.4	97.2	98.0	98.5	97.8	97.1	96.5
360	.57	91.6	92.4	93.2	94.0	94.7	95.5	96.3	97.1	97.8	98.1	97.4	96.8

1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	93.9	94.7	95.4	96.2	97.0	97.8	98.5	98.2	97.4	96.7	96.0	95.2
200	.31	93.5	94.3	95.1	95.9	96.7	97.4	98.2	98.5	97.8	97.0	96.3	95.6
240	.37	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	98.1	97.3	96.6	95.9
280	.43	92.3	93.2	93.9	94.7	95.5	96.3	97.1	97.8	98.3	97.6	96.9	96.2
320	.49	91.6	92.4	93.2	94.0	94.8	95.6	96.3	97.1	97.9	97.9	97.2	96.5
360	.55	90.7	91.5	92.3	93.1	93.9	94.7	95.4	96.2	96.9	97.7	97.3	96.6

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	1	3	5	10
ENGINE ANTI-ICE ON	-0.6	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-2.9	-3.0	-2.7	-3.2

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELLOW	ISA + 15°C	ISA + 20°C
85	82	271	18500	17300	15900
80	77	263	20200	19000	17700
75	72	255	21600	20600	19400
70	67	247	23100	22200	21100
65	62	238	24700	23800	22800
60	57	229	26800	25800	24700
55	53	219	29100	28100	27000
50	48	209	31200	30400	29400
45	43	199	33300	32600	31700
40	38	187	35600	34900	34000

Includes APU fuel burn.

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
138	128	120	112	106	100	95	90	86	82	78
275	256	239	225	212	200	190	180	172	164	157
413	384	359	337	317	300	284	270	258	246	235
551	512	479	449	423	400	379	360	344	328	314
689	640	598	562	529	500	474	451	429	410	392
826	768	718	674	635	600	569	541	515	492	471
964	896	838	786	741	700	664	631	601	574	549
1102	1025	957	898	846	800	758	721	687	656	628
1240	1153	1077	1011	952	900	853	811	773	738	706
1377	1281	1197	1123	1058	1000	948	901	859	820	785
1515	1409	1317	1235	1164	1100	1043	991	945	902	863
1653	1537	1436	1348	1270	1200	1138	1081	1030	984	942
1792	1666	1556	1460	1375	1300	1232	1171	1116	1066	1020
1930	1794	1676	1573	1481	1400	1327	1261	1202	1148	1098
2068	1922	1796	1685	1587	1500	1422	1351	1288	1230	1177
2207	2051	1916	1798	1693	1600	1517	1441	1373	1312	1255
2345	2180	2036	1910	1799	1700	1611	1531	1459	1393	1333
2484	2309	2156	2023	1905	1800	1706	1621	1545	1475	1411

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)										
	40	45	50	55	60	65	70	75	80	85	
100	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0:16
200	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.3	0:33
300	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	0:49
400	1.6	1.8	1.9	2.0	2.2	2.3	2.5	2.6	2.8	2.9	1:06
500	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.3	3.5	3.7	1:22
600	2.4	2.7	2.9	3.1	3.3	3.6	3.8	4.0	4.3	4.5	1:39
700	2.8	3.1	3.4	3.6	3.9	4.2	4.5	4.7	5.0	5.3	1:55
800	3.2	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.1	2:11
900	3.6	4.0	4.3	4.7	5.0	5.4	5.7	6.1	6.4	6.8	2:28
1000	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.7	7.1	7.6	2:44
1100	4.4	4.8	5.3	5.7	6.1	6.6	7.0	7.4	7.9	8.3	3:01
1200	4.8	5.3	5.7	6.2	6.7	7.1	7.6	8.1	8.6	9.0	3:17
1300	5.2	5.7	6.2	6.7	7.2	7.7	8.2	8.7	9.2	9.8	3:34
1400	5.5	6.1	6.6	7.2	7.7	8.3	8.8	9.4	9.9	10.5	3:51
1500	5.9	6.5	7.1	7.7	8.3	8.9	9.4	10.0	10.6	11.2	4:07
1600	6.3	6.9	7.5	8.2	8.8	9.4	10.0	10.7	11.3	12.0	4:24
1700	6.6	7.3	8.0	8.6	9.3	10.0	10.6	11.3	12.0	12.7	4:41
1800	7.0	7.7	8.4	9.1	9.8	10.5	11.2	11.9	12.6	13.4	4:57

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at long range cruise speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
85	15200	12600	9900
80	17200	15300	12500
75	19200	17400	15000
70	20900	19700	17300
65	22500	21300	19800
60	24100	23000	21600
55	26300	24800	23500
50	29000	27700	25800
45	31400	30500	29200
40	33800	33000	31800

With engine anti-ice on, decrease altitude capability by 1200 ft.
With engine and wing anti-ice on, decrease altitude capability by 5500 ft .

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
85	%N1	91.8	95.5	97.9							
	MACH	.561	.600	.616							
	KIAS	311	303	300							
	FF/ENG	3067	3033	3052							
80	%N1	90.1	94.0	95.9	98.5						
	MACH	.545	.590	.603	.621						
	KIAS	302	299	294	291						
	FF/ENG	2875	2870	2846	2886						
75	%N1	88.4	92.5	94.0	96.1						
	MACH	.528	.579	.593	.607						
	KIAS	293	293	288	284						
	FF/ENG	2684	2709	2674	2662						
70	%N1	86.5	90.7	92.3	94.0	96.2					
	MACH	.510	.562	.582	.595	.610					
	KIAS	282	284	283	278	274					
	FF/ENG	2494	2518	2520	2481	2487					
65	%N1	84.5	88.7	90.4	92.2	93.9	96.4				
	MACH	.491	.542	.563	.584	.596	.612				
	KIAS	271	274	274	273	268	265				
	FF/ENG	2306	2327	2330	2330	2295	2317				
60	%N1	82.3	86.5	88.3	90.0	91.9	93.7	96.4			
	MACH	.471	.521	.543	.564	.585	.597	.614			
	KIAS	261	263	263	263	263	258	254			
	FF/ENG	2124	2137	2139	2140	2143	2114	2146			
55	%N1	80.2	84.2	85.9	87.7	89.5	91.4	93.3	96.2		
	MACH	.453	.498	.520	.541	.563	.585	.597	.614		
	KIAS	250	251	252	252	253	252	247	244		
	FF/ENG	1954	1948	1950	1950	1953	1958	1938	1971		
50	%N1	77.8	81.6	83.4	85.2	87.0	88.7	90.7	92.7	95.7	
	MACH	.434	.475	.495	.516	.538	.561	.583	.596	.613	
	KIAS	240	239	239	240	241	241	241	236	233	
	FF/ENG	1791	1764	1762	1762	1764	1767	1777	1765	1793	
45	%N1	75.5	79.1	80.6	82.3	84.1	85.9	87.7	89.7	91.8	94.8
	MACH	.415	.452	.469	.489	.511	.533	.556	.578	.593	.610
	KIAS	229	227	227	227	228	229	229	229	225	222
	FF/ENG	1636	1594	1582	1575	1577	1580	1586	1600	1593	1613
40	%N1	73.0	76.2	77.8	79.4	81.0	82.8	84.6	86.4	88.3	90.7
	MACH	.395	.429	.445	.462	.480	.502	.525	.548	.571	.589
	KIAS	218	215	215	214	214	215	216	216	216	214
	FF/ENG	1485	1434	1416	1402	1392	1394	1400	1410	1421	1424

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
298	272	249	230	214	200	190	180	172	164	158
600	547	501	462	429	400	379	361	344	328	315
903	823	753	694	644	600	570	542	517	494	473
1209	1100	1005	926	859	800	759	721	687	657	630
1516	1379	1259	1159	1075	1000	949	902	859	820	786
1825	1659	1513	1393	1290	1200	1139	1082	1031	984	943
2137	1940	1768	1626	1506	1400	1328	1262	1202	1147	1099
2450	2222	2024	1860	1722	1600	1518	1442	1373	1311	1256
2766	2507	2281	2095	1938	1800	1707	1622	1544	1474	1412
3083	2792	2539	2331	2155	2000	1896	1801	1715	1637	1568

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.4	0:43	1.2	0:41	1.1	0:39	1.0	0:38	0.9	0:37
400	2.8	1:23	2.6	1:19	2.4	1:14	2.2	1:11	2.1	1:09
600	4.3	2:04	3.9	1:57	3.6	1:50	3.4	1:45	3.2	1:42
800	5.7	2:46	5.2	2:36	4.9	2:26	4.5	2:19	4.4	2:14
1000	7.1	3:28	6.6	3:15	6.1	3:03	5.7	2:53	5.5	2:47
1200	8.5	4:10	7.9	3:55	7.3	3:40	6.8	3:28	6.6	3:21
1400	9.8	4:53	9.1	4:36	8.5	4:18	8.0	4:02	7.7	3:54
1600	11.2	5:36	10.4	5:16	9.7	4:55	9.1	4:38	8.7	4:28
1800	12.5	6:20	11.7	5:58	10.9	5:34	10.2	5:13	9.8	5:02
2000	13.9	7:05	12.9	6:39	12.0	6:13	11.3	5:49	10.8	5:36

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)								
	40	45	50	55	60	65	70	75	80
1	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.1	0.2	0.3
2	-0.3	-0.2	-0.1	-0.1	0.0	0.2	0.3	0.6	0.8
3	-0.4	-0.3	-0.2	-0.1	0.0	0.3	0.5	0.9	1.2
4	-0.6	-0.4	-0.3	-0.1	0.0	0.3	0.7	1.2	1.6
5	-0.7	-0.5	-0.4	-0.2	0.0	0.4	0.9	1.4	2.0
6	-0.8	-0.6	-0.4	-0.2	0.0	0.5	1.1	1.7	2.4
7	-1.0	-0.8	-0.5	-0.3	0.0	0.6	1.2	2.0	2.8
8	-1.1	-0.9	-0.6	-0.3	0.0	0.6	1.4	2.2	3.2
9	-1.3	-1.0	-0.7	-0.3	0.0	0.7	1.5	2.4	3.5
10	-1.4	-1.1	-0.7	-0.4	0.0	0.7	1.6	2.6	3.8
11	-1.6	-1.2	-0.8	-0.4	0.0	0.8	1.7	2.8	4.1
12	-1.7	-1.3	-0.9	-0.4	0.0	0.8	1.9	3.0	4.4
13	-1.9	-1.4	-0.9	-0.5	0.0	0.9	2.0	3.2	4.7
14	-2.0	-1.5	-1.0	-0.5	0.0	0.9	2.0	3.4	4.9

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
85	%N1	81.1	84.1	88.3	92.8				
	KIAS	250	251	252	253				
	FF/ENG	2740	2730	2750	2800				
80	%N1	79.5	82.4	86.5	91.0	98.3			
	KIAS	242	243	244	245	247			
	FF/ENG	2580	2570	2570	2610	2740			
75	%N1	77.8	80.5	84.7	89.1	95.0			
	KIAS	235	236	236	238	239			
	FF/ENG	2420	2400	2400	2420	2490			
70	%N1	76.0	78.6	82.8	87.1	92.1			
	KIAS	227	227	228	229	231			
	FF/ENG	2260	2240	2230	2250	2270			
65	%N1	74.0	76.7	80.8	85.0	89.7	97.7		
	KIAS	219	219	220	221	222	224		
	FF/ENG	2100	2090	2070	2070	2080	2230		
60	%N1	71.7	74.6	78.5	82.8	87.4	93.7		
	KIAS	210	210	211	212	213	214		
	FF/ENG	1950	1930	1910	1910	1910	1970		
55	%N1	69.4	72.3	76.3	80.5	84.9	90.0		
	KIAS	200	201	202	203	204	205		
	FF/ENG	1800	1770	1750	1740	1730	1760		
50	%N1	67.0	69.7	73.8	77.8	82.3	87.0	94.9	
	KIAS	191	191	192	193	194	195	196	
	FF/ENG	1650	1620	1600	1580	1570	1570	1680	
45	%N1	64.3	66.9	71.0	75.0	79.4	84.0	89.6	
	KIAS	184	184	184	184	184	185	186	
	FF/ENG	1500	1470	1440	1430	1400	1400	1450	
40	%N1	61.1	64.0	67.8	72.0	76.2	80.7	85.4	94.1
	KIAS	177	177	177	177	177	177	177	177
	FF/ENG	1350	1330	1300	1270	1250	1240	1260	1360

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-250	-310				
50	-220	-290	-390			
48	-190	-260	-370			
46	-170	-240	-340	-450		
44	-140	-210	-320	-420		
42	-110	-180	-290	-400	-520	
40	-90	-160	-270	-370	-490	
38	-60	-130	-240	-350	-470	-610
36	-50	-100	-210	-320	-450	-580
34	-40	-70	-190	-300	-430	-560
32	-40	-60	-170	-290	-410	-540
30	-40	-50	-150	-270	-400	-520
20	-30	-50	-140	-240	-360	-470
10	-30	-40	-130	-240	-360	-470
0	-20	-40	-130	-240	-360	-470
-20	-20	-30	-130	-250	-370	-490
-40	-10	-30	-130	-250	-380	-500

Rate of climb capability shown is valid for 60000 kg, gear down at VREF30+5.
Decrease rate of climb 130 ft/min per 5000 kg greater than 60000 kg.
Increase rate of climb 160 ft/min per 5000 kg less than 60000 kg.

GEAR DOWN

Long Range Cruise Altitude Capability
Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
85	15600	12500	9400
80	18400	15500	12600
75	21100	18500	15700
70	23600	21400	18600
65	26100	24400	21800
60	28600	27100	25300
55	30800	29600	28100
50	32900	31900	30700
45	35100	34100	33000
40	37500	36500	35400

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		10	21	23	25	27	29	31	33	35
85	%N1	85.9								
	MACH	.482								
	KIAS	267								
	FF/ENG	2421								
80	%N1	84.2								
	MACH	.468								
	KIAS	259								
	FF/ENG	2271								
75	%N1	82.5	91.7							
	MACH	.454	.554							
	KIAS	251	248							
	FF/ENG	2123	2101							
70	%N1	80.6	89.8	91.7						
	MACH	.440	.541	.557						
	KIAS	243	242	240						
	FF/ENG	1977	1960	1950						
65	%N1	78.6	87.9	89.5	91.6	94.5				
	MACH	.425	.524	.543	.560	.578				
	KIAS	235	234	233	231	229				
	FF/ENG	1835	1812	1806	1805	1836				
60	%N1	76.5	85.6	87.4	89.1	91.3	94.5			
	MACH	.409	.504	.525	.544	.562	.580			
	KIAS	226	225	225	224	222	220			
	FF/ENG	1696	1661	1661	1658	1664	1696			
55	%N1	74.4	83.3	85.0	86.8	88.5	90.9	94.1		
	MACH	.393	.484	.504	.525	.545	.562	.581		
	KIAS	217	216	216	216	215	213	211		
	FF/ENG	1559	1515	1512	1515	1517	1523	1555		
50	%N1	71.9	80.7	82.5	84.2	86.0	87.8	90.2	93.5	
	MACH	.376	.463	.482	.502	.523	.544	.561	.580	
	KIAS	207	206	206	206	206	205	203	201	
	FF/ENG	1424	1371	1367	1368	1374	1377	1381	1411	
45	%N1	69.1	78.0	79.7	81.4	83.1	85.0	86.8	89.1	92.5
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578
	KIAS	197	196	196	196	196	196	195	193	191
	FF/ENG	1294	1231	1224	1224	1230	1235	1237	1239	1265
40	%N1	66.2	74.9	76.6	78.3	80.0	81.8	83.6	85.5	87.7
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554
	KIAS	187	185	185	185	185	185	185	185	183
	FF/ENG	1170	1098	1085	1083	1089	1092	1094	1096	1097

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
324	290	260	236	217	200	188	178	168	160	153
654	583	523	474	435	400	377	357	338	321	307
989	880	787	713	653	600	566	535	507	483	461
1329	1181	1054	953	871	800	754	713	676	643	614
1674	1484	1322	1194	1090	1000	943	891	844	803	766
2024	1791	1593	1436	1310	1200	1131	1069	1013	962	918
2381	2103	1865	1680	1530	1400	1320	1247	1181	1122	1070
2743	2417	2140	1924	1751	1600	1508	1424	1348	1280	1221
3113	2737	2418	2171	1972	1800	1695	1600	1514	1438	1371

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	2.4	0:49	2.2	0:47	1.9	0:44	1.7	0:42	1.6	0:41
400	4.9	1:36	4.5	1:31	4.0	1:25	3.7	1:20	3.5	1:17
600	7.4	2:25	6.8	2:17	6.1	2:06	5.7	1:59	5.4	1:54
800	9.8	3:14	9.1	3:03	8.1	2:48	7.6	2:38	7.2	2:31
1000	12.1	4:04	11.3	3:50	10.1	3:30	9.5	3:18	9.0	3:08
1200	14.4	4:56	13.5	4:39	12.1	4:14	11.3	3:58	10.7	3:46
1400	16.7	5:49	15.6	5:28	14.0	4:58	13.1	4:40	12.4	4:24
1600	18.9	6:43	17.7	6:18	15.9	5:44	14.9	5:22	14.1	5:03
1800	21.1	7:38	19.7	7:10	17.7	6:30	16.6	6:05	15.7	5:43

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG) 40	50	60	70	80
2	-0.3	-0.2	0.0	0.3	0.7
4	-0.7	-0.3	0.0	0.6	1.3
6	-1.0	-0.5	0.0	0.9	2.0
8	-1.3	-0.7	0.0	1.2	2.6
10	-1.7	-0.8	0.0	1.4	3.2
12	-2.0	-1.0	0.0	1.6	3.7
14	-2.4	-1.2	0.0	1.8	4.2
16	-2.7	-1.3	0.0	2.0	4.6
18	-3.0	-1.5	0.0	2.2	5.0
20	-3.4	-1.7	0.0	2.4	5.3
22	-3.7	-1.8	0.0	2.5	5.6

Descent

VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	21	280	91
39000	20	270	86
37000	19	270	81
35000	19	260	77
33000	18	260	72
31000	17	250	68
29000	17	250	64
27000	16	240	60
25000	15	230	56
23000	14	230	52
21000	13	220	48
19000	13	210	44
17000	12	200	40
15000	11	190	36
10000	8	170	26
5000	6	140	16
1500	4	110	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
85	%N1	75.7	78.4	82.7	86.9	91.9			
	KIAS	229	229	229	229	229			
	FF/ENG	2240	2220	2220	2230	2250			
80	%N1	74.1	76.9	81.0	85.3	89.9			
	KIAS	224	224	224	224	224			
	FF/ENG	2110	2100	2090	2090	2100			
75	%N1	72.3	75.3	79.2	83.6	88.1			
	KIAS	218	218	218	218	218			
	FF/ENG	1990	1970	1960	1960	1960			
70	%N1	70.6	73.5	77.5	81.8	86.2	91.7		
	KIAS	213	213	213	213	213	213		
	FF/ENG	1870	1850	1840	1830	1830	1860		
65	%N1	68.8	71.7	75.8	80.0	84.4	89.1		
	KIAS	209	209	209	209	209	209		
	FF/ENG	1760	1740	1720	1710	1700	1720		
60	%N1	66.9	69.7	73.9	77.9	82.3	86.9	94.1	
	KIAS	203	203	203	203	203	203	203	
	FF/ENG	1650	1620	1600	1590	1580	1580	1660	
55	%N1	65.0	67.6	71.8	75.8	80.2	84.7	90.2	
	KIAS	197	197	197	197	197	197	197	
	FF/ENG	1530	1510	1490	1470	1450	1450	1490	
50	%N1	62.7	65.5	69.4	73.6	77.8	82.3	87.0	
	KIAS	191	191	191	191	191	191	191	
	FF/ENG	1420	1400	1370	1350	1330	1320	1350	
45	%N1	60.2	63.1	67.0	71.2	75.3	79.8	84.4	91.3
	KIAS	184	184	184	184	184	184	184	184
	FF/ENG	1310	1290	1260	1240	1210	1200	1220	1260
40	%N1	57.7	60.4	64.5	68.5	72.8	77.1	81.5	86.6
	KIAS	177	177	177	177	177	177	177	177
	FF/ENG	1200	1170	1150	1130	1100	1080	1090	1110

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
85	80	227	1700		
80	76	223	4000	2300	200
75	71	218	6300	4900	2800
70	66	213	8600	7300	5300
65	62	208	10900	9800	8000
60	57	202	13200	12300	10900
55	52	196	15600	14800	13900
50	47	190	18100	17300	16500
45	43	183	20600	19800	18900
40	38	176	23100	22300	21400

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
75	1500		
70	4500	2500	
65	7500	5900	3400
60	10600	9200	6900
55	13300	12300	10600
50	16200	15400	14500
45	19300	18300	17500
40	22200	21400	20500

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		5	7	9	11	13	15	17	19	21	23
70	%N1	94.8									
	MACH	.389									
	KIAS	235									
	FF/ENG	3774									
65	%N1	92.6	94.3	96.9							
	MACH	.376	.389	.402							
	KIAS	228	227	226							
	FF/ENG	3477	3485	3527							
60	%N1	90.2	91.9	93.7	96.3						
	MACH	.364	.375	.388	.402						
	KIAS	220	219	218	218						
	FF/ENG	3192	3191	3198	3240						
55	%N1	87.8	89.3	91.0	92.8	95.4					
	MACH	.351	.362	.374	.387	.400					
	KIAS	212	211	210	209	209					
	FF/ENG	2924	2909	2906	2913	2951					
50	%N1	85.3	86.7	88.2	89.9	91.7	94.2	98.2			
	MACH	.338	.348	.359	.371	.384	.398	.412			
	KIAS	204	203	202	201	200	199	198			
	FF/ENG	2672	2647	2630	2626	2633	2657	2737			
45	%N1	82.7	84.0	85.4	86.9	88.6	90.4	92.7	96.6		
	MACH	.325	.334	.344	.355	.367	.380	.393	.408		
	KIAS	196	195	193	192	191	190	189	189		
	FF/ENG	2432	2400	2374	2356	2351	2352	2359	2417		
40	%N1	79.8	81.1	82.5	83.9	85.4	87.0	88.8	90.8	94.1	98.4
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402	.418
	KIAS	188	186	184	183	182	181	180	179	179	178
	FF/ENG	2206	2166	2133	2107	2088	2076	2069	2065	2101	2201

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time
Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
172	151	134	120	109	100	93	88	83	78	75
352	308	270	242	219	200	187	175	165	156	148
533	465	408	364	330	300	280	262	246	232	220
716	623	545	486	440	400	373	349	328	309	293
900	783	684	609	551	500	466	436	409	385	365
1086	943	823	733	661	600	559	523	490	462	438
1273	1105	964	856	772	700	652	610	572	538	510
1462	1267	1103	980	883	800	745	696	652	614	581
1653	1431	1245	1104	994	900	838	782	733	690	653
1845	1595	1386	1228	1105	1000	931	868	813	765	724

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	1.3	0:27	1.1	0:26	1.0	0:26
200	2.6	0:53	2.4	0:50	2.3	0:48
300	3.9	1:18	3.7	1:15	3.6	1:11
400	5.2	1:44	4.9	1:39	4.8	1:35
500	6.5	2:10	6.1	2:04	6.0	1:58
600	7.8	2:37	7.3	2:29	7.1	2:22
700	9.1	3:03	8.5	2:55	8.3	2:46
800	10.3	3:30	9.7	3:20	9.4	3:10
900	11.6	3:58	10.9	3:46	10.5	3:35
1000	12.8	4:25	12.0	4:12	11.6	3:59

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
1	-0.2	-0.1	0.0	0.1	0.3
2	-0.3	-0.2	0.0	0.3	0.6
3	-0.5	-0.3	0.0	0.5	1.0
4	-0.6	-0.3	0.0	0.7	1.3
5	-0.8	-0.4	0.0	0.9	1.7
6	-1.0	-0.5	0.0	1.0	2.0
7	-1.1	-0.6	0.0	1.2	2.4
8	-1.3	-0.7	0.0	1.4	2.7
9	-1.5	-0.7	0.0	1.6	3.1
10	-1.6	-0.8	0.0	1.8	3.5
11	-1.8	-0.9	0.0	1.9	3.8
12	-1.9	-1.0	0.0	2.1	4.2
13	-2.1	-1.1	0.0	2.3	4.5
14	-2.3	-1.1	0.0	2.5	4.9

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
80	%N1	93.2			
	KIAS	224			
	FF/ENG	4120			
75	%N1	91.2	94.5		
	KIAS	218	218		
	FF/ENG	3840	3890		
70	%N1	89.2	92.4		
	KIAS	213	213		
	FF/ENG	3580	3610		
65	%N1	87.3	90.3	95.7	
	KIAS	209	209	209	
	FF/ENG	3340	3360	3430	
60	%N1	85.1	88.1	92.7	
	KIAS	203	203	203	
	FF/ENG	3090	3090	3130	
55	%N1	82.8	85.7	90.2	97.0
	KIAS	197	197	197	197
	FF/ENG	2850	2840	2860	2990
50	%N1	80.2	83.2	87.6	92.6
	KIAS	191	191	191	191
	FF/ENG	2610	2600	2610	2650
45	%N1	77.7	80.5	84.9	89.5
	KIAS	184	184	184	184
	FF/ENG	2390	2370	2360	2380
40	%N1	75.0	77.7	82.0	86.4
	KIAS	177	177	177	177
	FF/ENG	2170	2140	2120	2130

This table includes 5% additional fuel for holding in a racetrack pattern.

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Performance Inflight - QRH — Chapter PI-QRH
General — Section 25

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 Airplane Flight Manual, the Flight Manual shall always take precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

Pitch attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome 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.

Max Climb %N1

This table shows Max Climb %N1 for a 280/.78 climb speed schedule, normal engine bleed for packs on or off and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Go-around %N1

To find Max Go-around %N1 based on normal engine bleed for packs on (AUTO) and anti-ice on or off, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs OFF or HIGH operation, apply the %N1 adjustment shown below the table.

VREF

This table contains flaps 40, 30 and 15 reference speeds for a given weight.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Advisory Information

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 30 and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking actions, which are commonly referred to as slippery runway conditions. Landing distances for slippery runways are 115% of the actual landing distances.

If the surface is affected by water, snow or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding the 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 appropiate Recommended Brake Cooling Schedule table (Steel or Carbon Brakes) 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. Notes providing adjustments for wind are included below the table.

To determine the energy per brake absorbed during landing, enter the appropriate Adjusted Brake Energy Per Brake table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing.

The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, use the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted to determine recommended cooling schedule.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise speed of .79M to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Power setting is based on one engine operating with one A/C pack operating and all anti-ice bleeds off. Enter the table with pressure altitude, TAT, and IAS or Mach to read %N1.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/LRC 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 adjust for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Enroute Fuel and Time table.

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, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .78/280/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel adjustments table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel required and time for the actual weight.

Holding

Target %N1, 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. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative landing (manual or autoland) is planned. The tables show gear down rate of climb available for Flaps 15 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Gear Down

This section contains performance for airplane operation with the landing gear extended. 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 may generate inappropriate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. An accurate estimated time of arrival (ETA) is available if current speed or Mach is entered into the VNAV cruise page.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

Maneuvers — Chapter Man
Table of Contents — Section 0

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Maneuvers — Chapter MAN
Introduction — Section 05

General

Non-Normal Maneuvers and Flight Patterns are included for training and review purposes.

Non-Normal Maneuvers

Flight crews are expected to do non-normal maneuvers from memory.

Flight Patterns

Flight patterns show procedures for some all-engine and engine-inoperative situations.

Flight patterns do not include all procedural items but show required/recommended:

- configuration changes
- thrust changes
- Mode Control Panel (MCP) changes
- pitch mode and roll mode changes
- checklist calls.

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Approach to Stall Recovery

The following is immediately accomplished at the first indication of stall buffet or stick shaker.

Pilot Flying	Pilot Monitoring
• Advance thrust levers to maximum thrust*. • Smoothly adjust pitch attitude** to avoid ground contact or obstacles. • Level the wings (do not change flaps or landing gear configuration). • Retract the speedbrakes.	• Verify maximum thrust. • Monitor altitude and airspeed. • Call out any trend toward terrain contact. • Verify all required actions have been completed and call out any omissions.
When ground contact is no longer a factor: • Adjust pitch attitude to accelerate while minimizing altitude loss. • Return to speed appropriate for the configuration.	

Note: *If an approach to stall is encountered with the autopilot engaged, apply maximum thrust and allow the airplane to return to the normal airspeed.

Note: **At high altitude, it may be necessary to descend to accelerate.

Note: If autopilot response is not acceptable, it should be disengaged.

Rejected Takeoff < BRI >

The captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the rejected takeoff maneuver by V1. If the decision is to reject the takeoff, the captain must clearly announce “REJECT,” immediately start the rejected takeoff maneuver and assume control of the airplane. If the first officer is making the takeoff, the first officer must maintain control of the airplane until the captain makes a positive input to the controls.

Prior to 80 knots, the takeoff should be rejected for any of the following:

- activation of the master caution system
- system failure(s)
- unusual noise or vibration
- tire failure
- abnormally slow acceleration
- takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- if a side window opens
- if the airplane is unsafe or unable to fly.

Above 80 knots and prior to V1, the takeoff should be rejected for any of the following:

- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly.

During the takeoff, the crewmember observing the non-normal situation will immediately call it out as clearly as possible.

Captain	First Officer
Without delay: Simultaneously close the thrust levers, disengage the autothrottles and apply maximum manual wheel brakes or verify operation of RTO autobrake. If RTO autobrake is selected, monitor system performance and apply manual wheel brakes if the AUTO BRAKE DISARM light illuminates or deceleration is not adequate. Raise SPEED BRAKE lever. Apply maximum reverse thrust consistent with conditions. Continue maximum braking until certain the airplane will stop on the runway.	Verify actions as follows: Thrust levers closed. Autothrottles disengaged. Maximum brakes applied. Verify SPEED BRAKE lever UP and call “SPEEDBRAKES UP.” If SPEED BRAKE lever is not UP, call “NO SPEEDBRAKES.” Reverse thrust applied. Call out omitted action items.
Field length permitting: Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed. Communicate with the cabin crew as soon as practical.	Call out “SIXTY” at 60 knots. Select flaps 40. Communicate the reject decision to the control tower as soon as practical.
When the airplane is stopped, perform procedures as required. Review Brake Cooling Schedule for brake cooling time and precautions (refer to 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 (the aircraft should be stopped as close as possible to the runway centreline.) Alerting fire equipment Not setting 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.	

Terrain Avoidance

Ground Proximity Caution

Accomplish the following maneuver for any of these aural alerts:

- SINK RATE
- TERRAIN
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- GLIDESLOPE
- BANK ANGLE
- CAUTION TERRAIN

G-FDZA - G-FDZS

- CAUTION OBSTACLE

Pilot Flying	Pilot Monitoring
Correct the flight path or the airplane configuration.	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer or backcourse approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope
- unreliable glideslope signal.

Note: If a terrain caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.

Note: Some aural alerts repeat.

Ground Proximity Warning

Accomplish the following maneuver for any of these conditions:

- Activation of "PULL UP" or "TERRAIN TERRAIN PULL UP" warning.

G-FDZA - G-FDZS

- Activation of the "PULL UP" or "OBSTACLE OBSTACLE PULL UP" warning.
- Other situations resulting in unacceptable flight toward terrain.

Pilot Flying	Pilot Monitoring
Disconnect autopilot. Disconnect autothrottle. Aggressively apply maximum* thrust. Simultaneously roll wings level and rotate to an initial pitch attitude of 20°. Retract speedbrakes. If terrain remains a threat, continue rotation up to the pitch limit indicator (if available) or stick shaker or initial buffet.	Assure maximum* thrust. Verify all required actions have been completed and call out any omissions.
Do not change gear or flap configuration until terrain separation is assured. Monitor radio altimeter for sustained or increasing terrain separation. When clear of terrain, slowly decrease pitch attitude and accelerate.	Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude.) Call out any trend toward terrain contact.

Note: Aft control column force increases as 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 a positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: *Maximum thrust can be obtained by advancing the thrust levers full forward if the EEC's are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: If positive visual verification is made that no obstacle or terrain hazard exists when flying under daylight VMC conditions prior to a terrain or obstacle warning, the alert may be regarded as cautionary and the approach may be continued.

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 conflict between the RA and air traffic control.**

WARNING: **Once an RA has been issued, safe separation could be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the others aircraft's compliance with the RA.**

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director pitch commands until clear of conflict.

For TA:

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic.	
If traffic is sighted, maneuver if needed.	

Note: Maneuvers based solely on a TA may result in reduced separation and are not recommended.

For RA, except a climb in landing configuration:

WARNING: A DESCEND (fly down) RA issued below 1000 feet AGL should not be followed.

Pilot Flying	Pilot Monitoring
If maneuvering is required, disengage the autopilot and autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

For a climb RA in landing configuration:

Pilot Flying	Pilot Monitoring
Disengage the autopilot and autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 15. 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 15 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 actions may be necessary once recovery is under way. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume that the airplane is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stick shaker activation accompanied by one or more of the following:

- Buffeting which could be heavy at times
- Lack of pitch authority and/or roll control
- Inability to arrest descent rate.

If the airplane is stalled, recovery from the stall must be accomplished first by applying and maintaining nose down elevator until stall recovery is complete and stick shaker activation ceases.

Nose High Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
• Disconnect autopilot and autothrottle • Apply as much as full nose-down elevator • * Apply appropriate nose down stabilizer trim • Reduce thrust • * Roll (adjust bank angle) to obtain a nose down pitch rate • Complete the recovery: - When approaching the horizon, roll to wings level - Check airspeed and adjust thrust - Establish pitch attitude.	• Call out attitude, airspeed and altitude throughout the recovery • Verify all required actions have been completed and call out any omissions.

Nose Low Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
• Disconnect autopilot and autothrottle • Recover from stall, if required • * Roll in shortest direction to wings level (unload and roll if bank angle is more than 90 degrees) • Recover to level flight: - Apply nose up elevator - *Apply nose up trim, if required - Adjust thrust and drag as required.	• Call out attitude, airspeed and altitude throughout the recovery • Verify all required actions have been completed and call out any omissions.

WARNING: * Excessive use of pitch trim or rudder may aggravate an upset situation or may result in loss of control and/or high structural loads.

Windshear

Windshear Caution

For predictive windshear caution alert: ("MONITOR RADAR DISPLAY" aural).

Pilot Flying	Pilot Monitoring
Maneuver as required to avoid the windshear.	

Windshear Warning

Predictive windshear warning during takeoff roll: ("WINDSHEAR AHEAD, WINDSHEAR AHEAD" aural)

- prior to V1, reject takeoff
- after V1, perform the Windshear Escape Maneuver.

Windshear encountered during takeoff roll:

- If windshear is encountered prior to V1, there may not be sufficient runway remaining to stop if an RTO is initiated at V1. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway, even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach: ("GO–AROUND, WINDSHEAR AHEAD" aural)

- perform the Windshear Escape Maneuver, or, at pilot's discretion, perform a normal go–around.

Windshear encountered in flight:

- perform the Windshear Escape Maneuver.

Note: The following are indications the airplane is in windshear:

- windshear warning (two–tone siren followed by "WINDSHEAR, WINDSHEAR, WINDSHEAR") or
- unacceptable flight path deviations.

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 fpm vertical speed
- 5° pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time.

Windshear Escape Maneuver

Pilot Flying	Pilot Monitoring
MANUAL FLIGHT • Disconnect autopilot. • Press 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). AUTOMATIC FLIGHT • Press either TO/GA switch**. • Verify TO/GA mode annunciation. • Verify thrust advances to GA power. • Retract speedbrakes. • Monitor system performance***.	• Assure maximum* thrust. • Verify all required actions have been completed and call out any omissions.
• Do not change flap or gear 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 a positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: *Maximum thrust can be obtained by advancing the thrust levers full forward if the EEC's are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: ** If TO/GA is not available, disconnect autopilot and autothrottle and fly manually.

WARNING: * Severe windshear may exceed the performance of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle and fly manually.**

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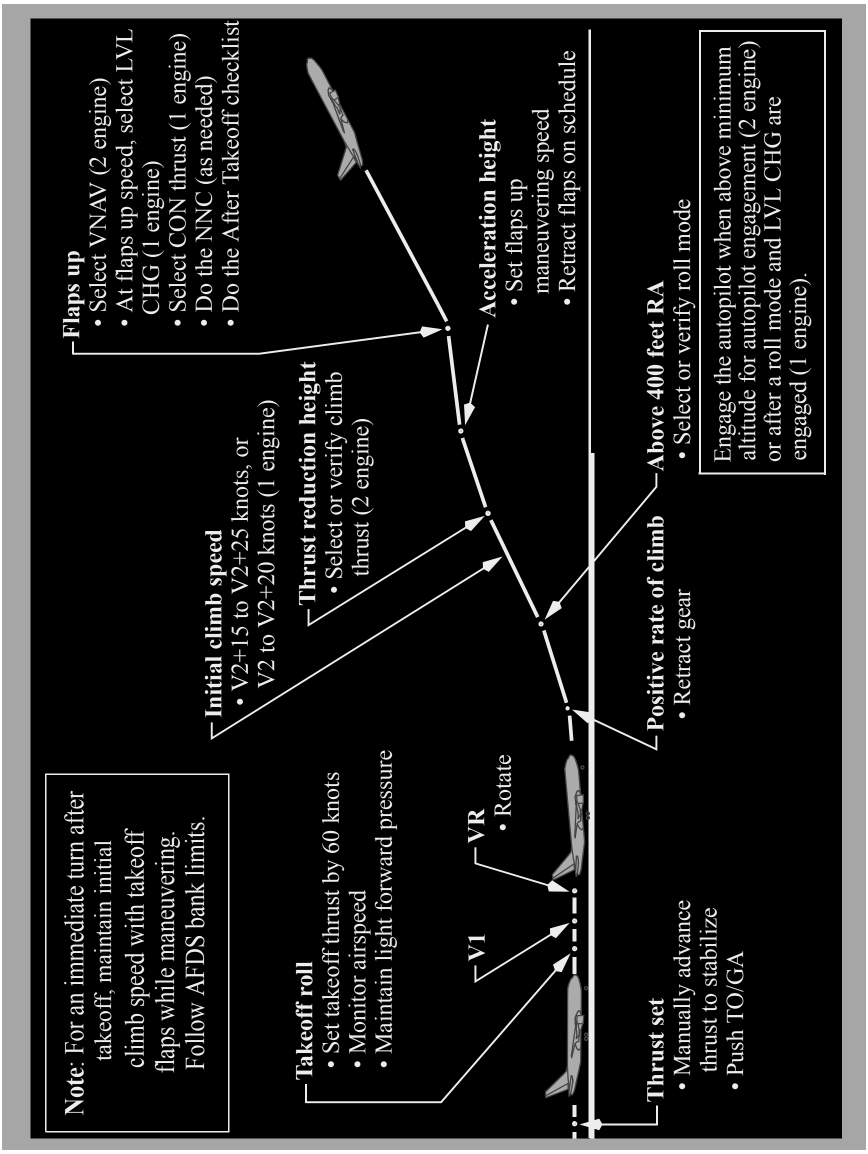
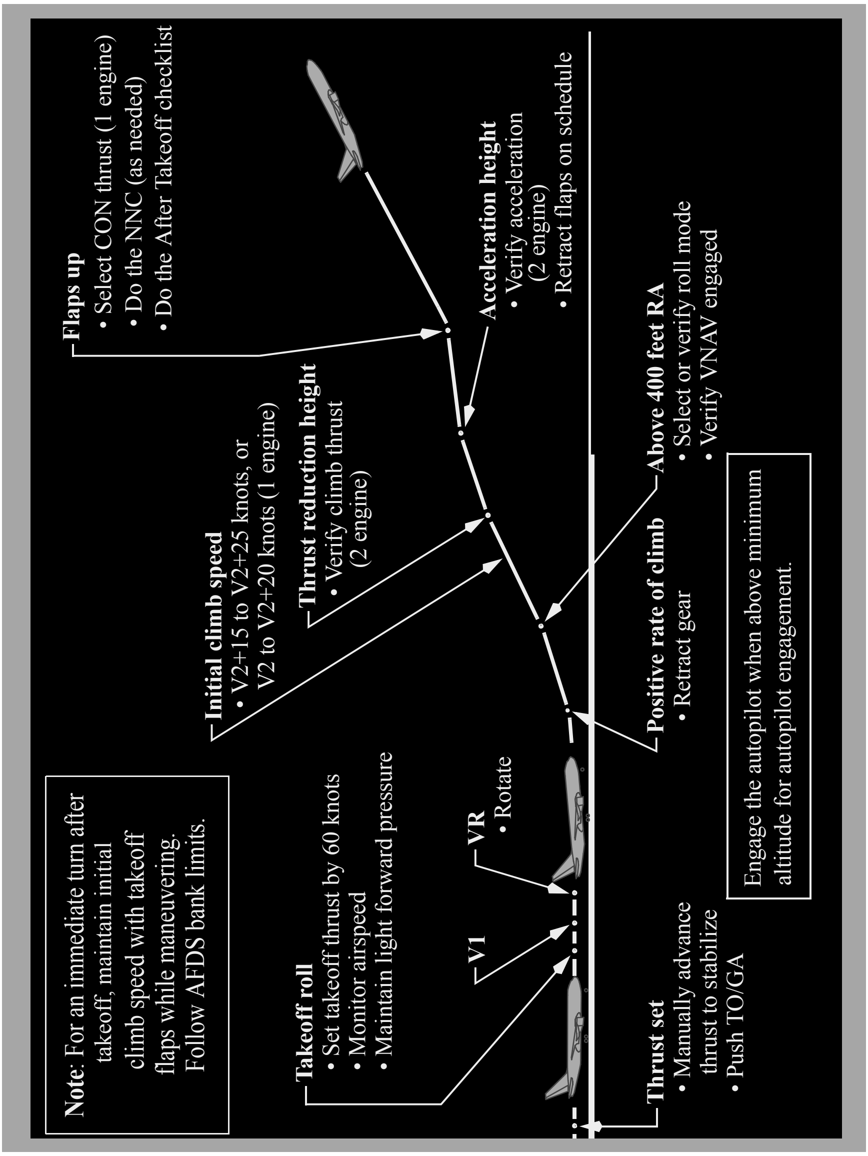
Takeoff

G-CDZH - G-FDZJ

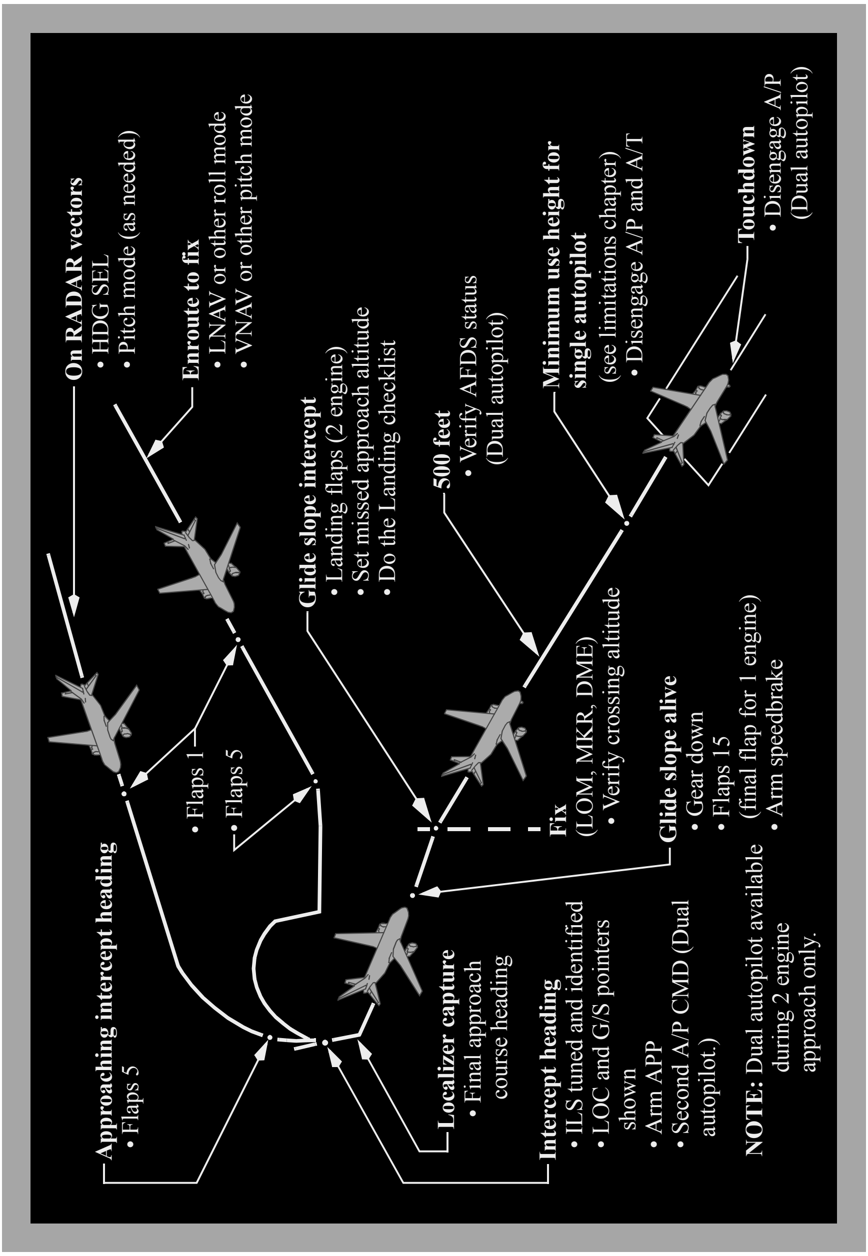


Takeoff

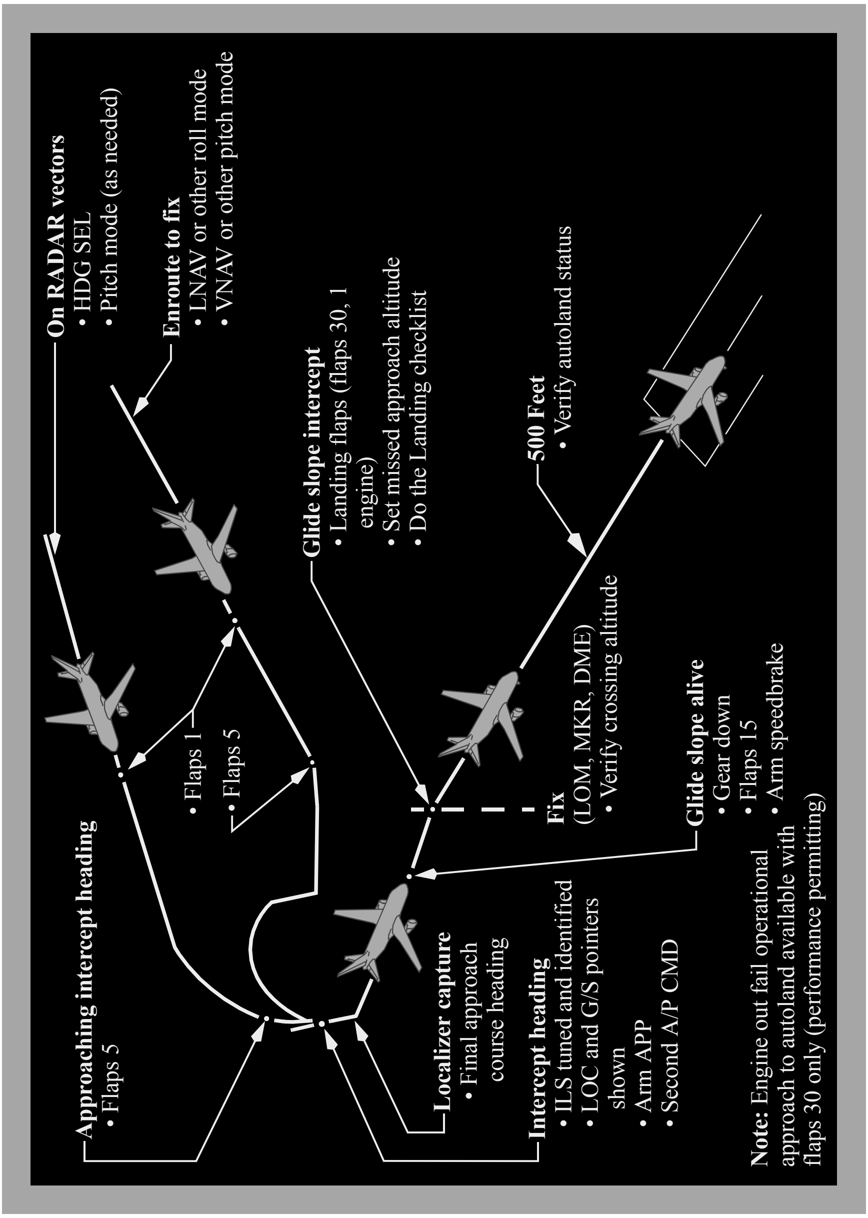
G-FDZR, G-FDZS



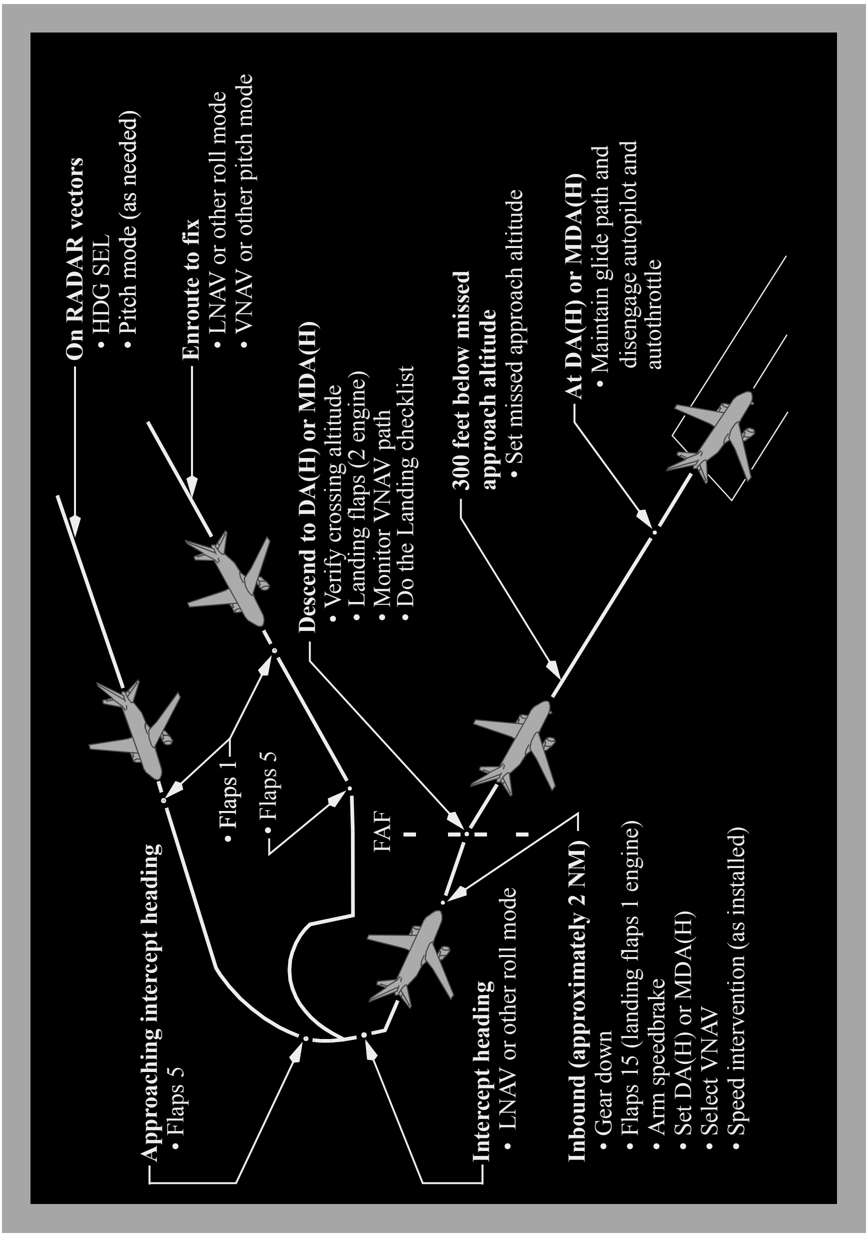
ILS Approach - Fail Passive



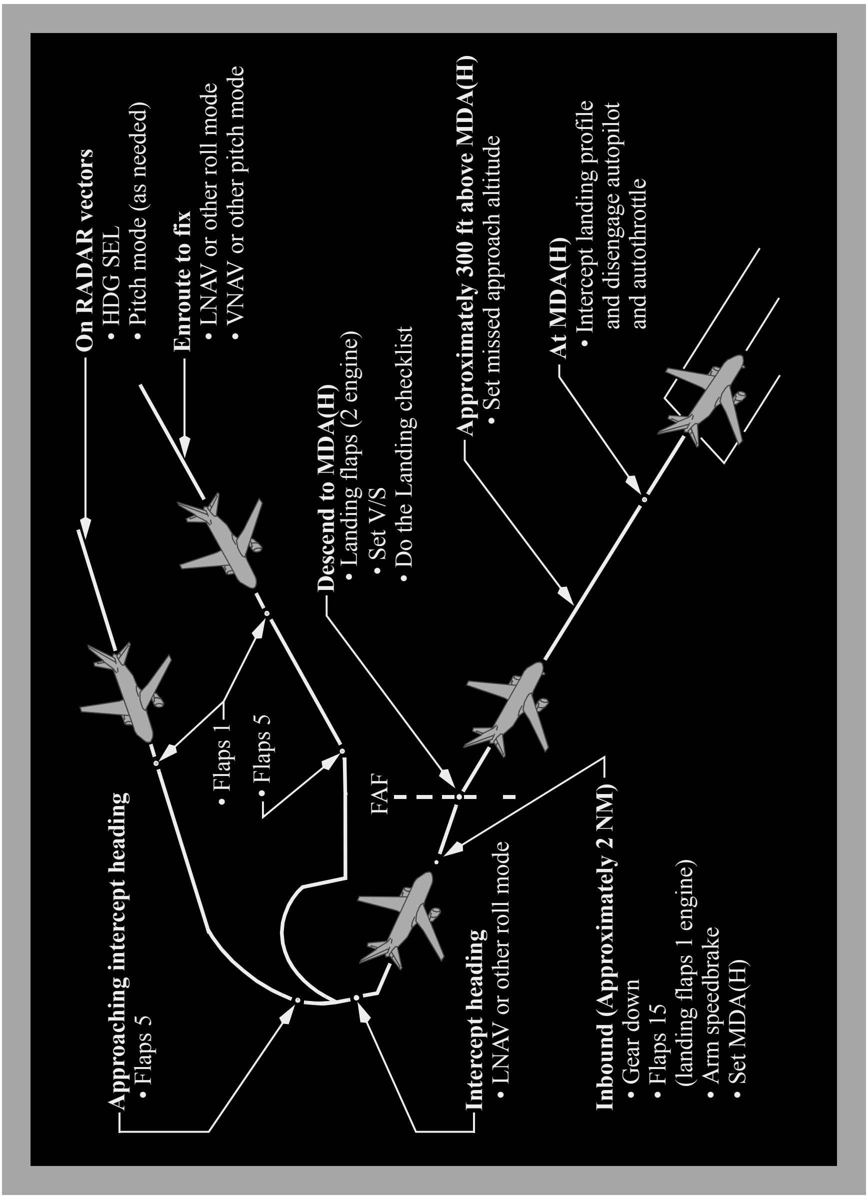
ILS Approach - Fail Operational



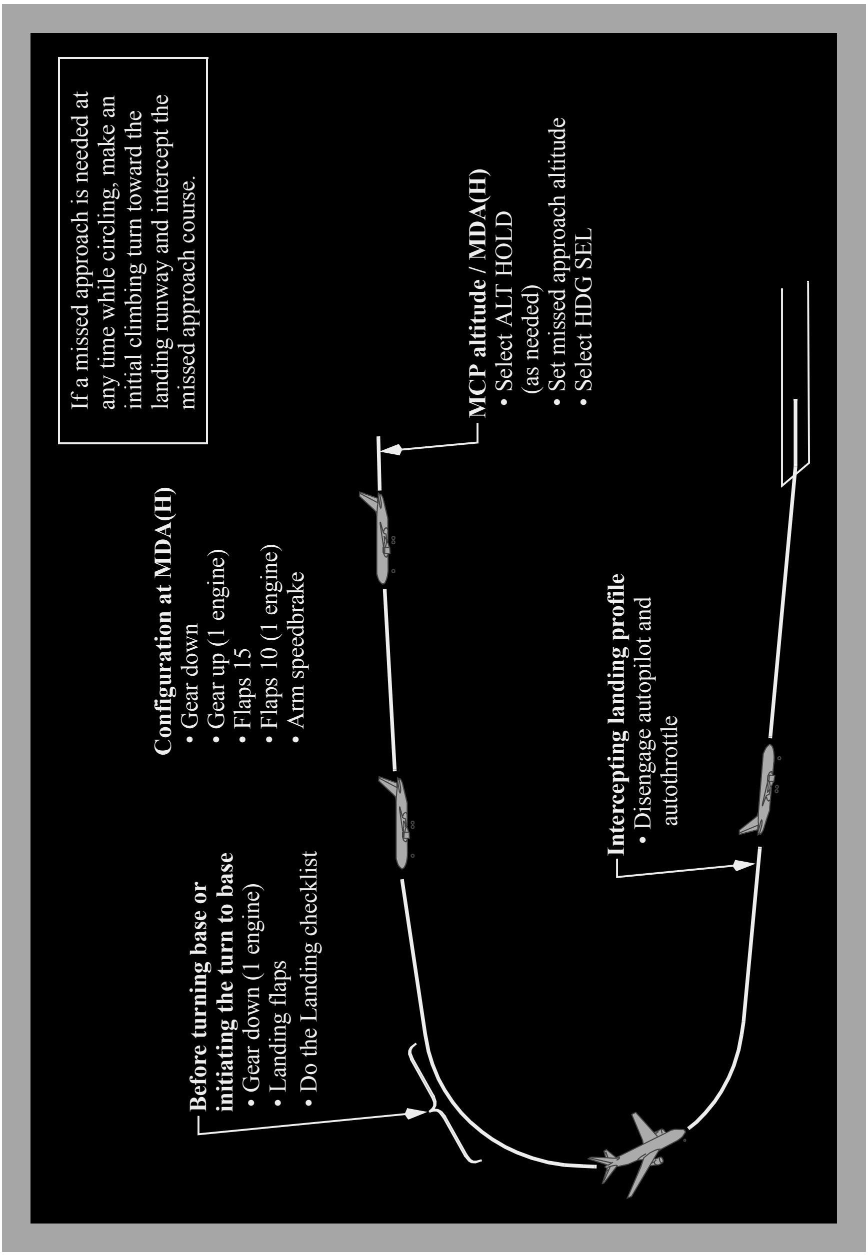
Instrument Approach Using VNAV



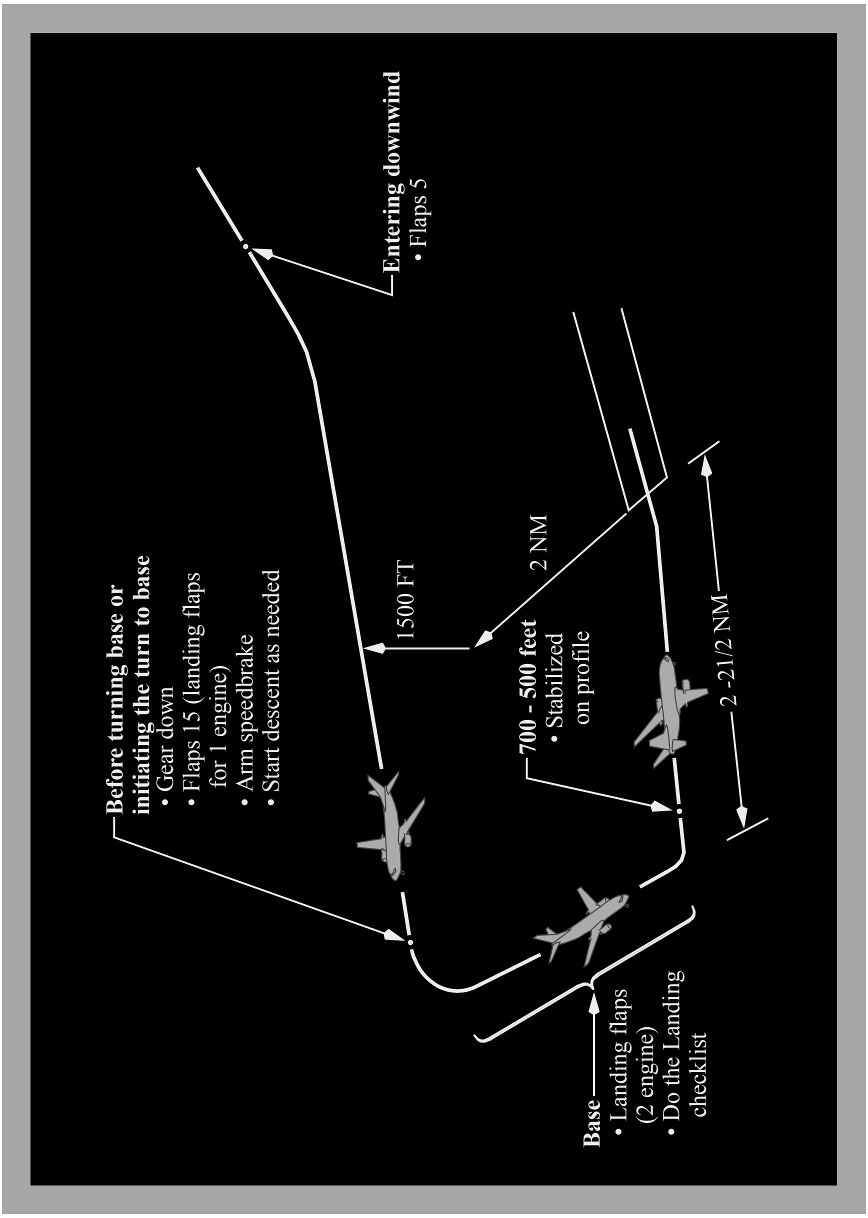
Instrument Approach Using V/S



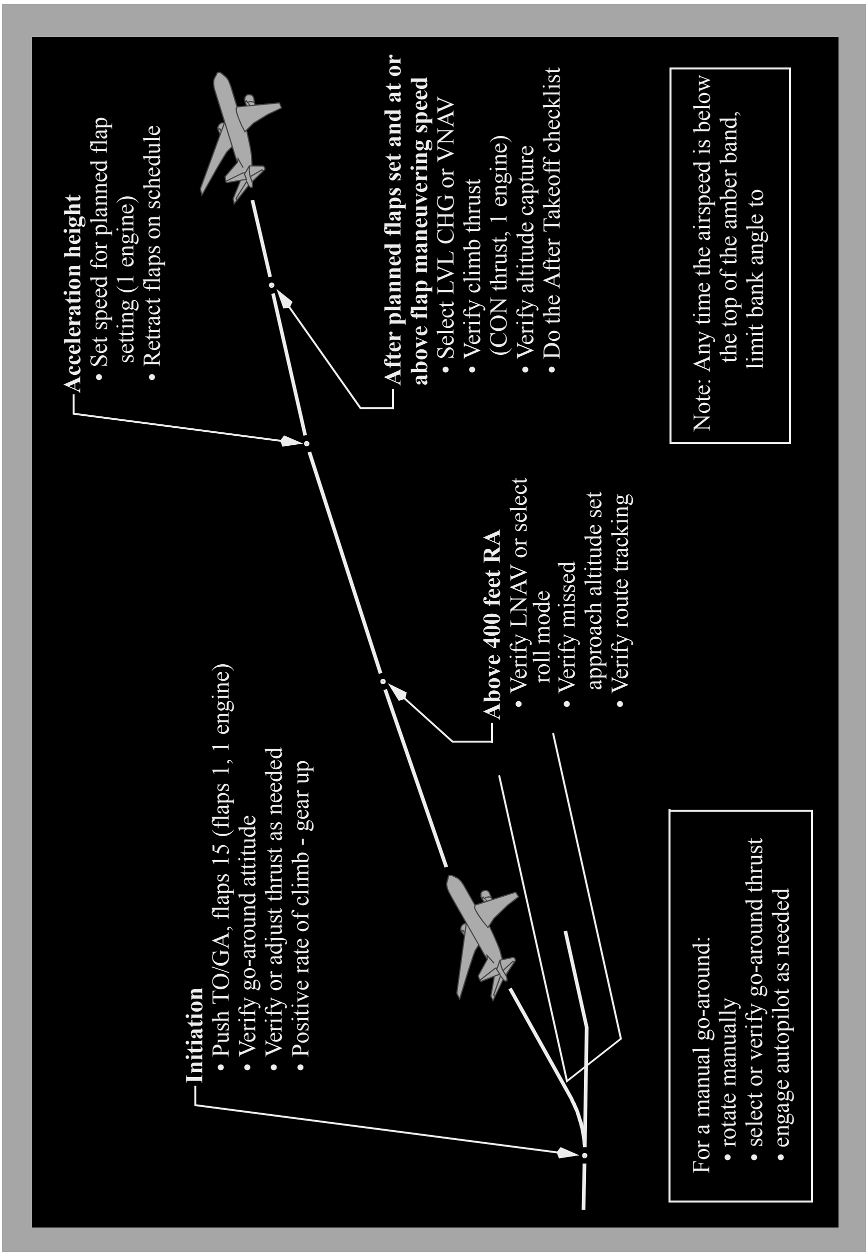
Circling Approach



Visual Traffic Pattern



Go–Around and Missed Approach



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Checklist Instructions — Chapter CI

Table of Contents — Section 0

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Checklist Instructions — Chapter CI
Model Identification — Section ModID

General

The airplanes listed in the table below are covered in the Quick Reference Handbook. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for airplanes covered in this manual. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
001	G-CDZH	28227	YD001
002	G-CDZI	28229	YD002
003	G-CDZL	30465	YD003
004	G-CDZM	30466	YD004
038	G-FDZA	35134	YL421
042	G-FDZB	35131	YL422
043	G-FDZD	35132	YL423
044	G-FDZE	35137	YL424
045	G-FDZF	35138	YL425
046	G-FDZG	35139	YL426
037	G-FDZJ	34690	YK907
051	G-FDZR	35145	YL427
052	G-FDZS	35147	YL428

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Revision Transmittal Letter

To: All holders of Thomson Airways 737 Flight Crew Operations Manual, Boeing Document Number D6-27370-804-BRI(P2).

Subject: Flight Crew Operations Manual 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
0	July 17, 2009				

General

The Boeing Company issues flight crew operations manual 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.

Formal revisions include a Transmittal Letter, a new Revision Record, Revision Highlights, and a current List of Effective Pages. Use the information on the new Revision Record and List of Effective Pages to verify the manual 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.

Filing Instructions

Consult the 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.

Revision Highlights

This section (CI.RR) replaces the existing section CI.RR in your manual.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the List of Effective Pages (CI.LEP) can help determine the correct content of the manual.

Throughout the manual, airplane effectivity may be updated to reflect coverage as listed on the Preface - Model Identification page, or to show service bulletin airplane effectivity. Highlights are not supplied.

This manual 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.

* = Revised, Added, or Deleted

* = Revised, Added, or Deleted

Introduction

This introduction gives guidelines for use of the Normal Checklist (NC).

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation < BRI >

Normal checklists are used after doing all respective procedural items that are not marked with an asterisk.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Pilot flying	Pilot monitoring	Both	Pilot flying*
BEFORE START	Captain	First officer	Both	Captain*
BEFORE TAXI	Captain	First officer	Both	Captain*
BEFORE TAKEOFF	Captain	First officer	Both	Captain
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring*
DESCENT	Pilot flying	Pilot monitoring	Both	Pilot monitoring*
APPROACH	Pilot flying	Pilot monitoring	Both	Pilot monitoring*
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Captain*
SECURE	Captain	First officer	Both	Captain

* Some items require response from both pilots.

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that an entire procedure was not done:

- stop the checklist
- complete the entire procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, do the checklist from the start. If the checklist is stopped for a long time, also do the checklist from the start.

Where a checklist item requires a response from both pilots the reader of the checklist will respond last.

The BEFORE START checklist may be initiated before the flight deck door is closed and anti-collision light is turned ON by calling "BEFORE START CHECKLIST ABOVE THE LINE". Once all remaining items have been accomplished the checklist should be completed by calling "BEFORE START CHECKLIST BELOW THE LINE". If the checklist is initiated after all items have been accomplished call "BEFORE START CHECKLIST".

Whilst it is acceptable for PF to call "GEAR DOWN, FLAPS___, LANDING CHECKLIST", PM should only begin the LANDING checklist once the gear is down.

Checklists that contain responses marked with an asterisk may be initiated prior to the final checklist item being accomplished. In these cases, when reaching the final checklist item, the reader should announce the final item and the response should be "TO COME", e.g. when accomplishing the landing checklist the PM announces "FLAPS" and the PF will respond "TO COME". The PM will then state "FLAPS ___ WILL COMPLETE THE LANDING CHECKLIST". When the flaps have reached the landing position the PM should announce "FLAPS" and the PF will respond accordingly.

Do not stow the checklist until all items are complete.

In the PREFLIGHT checklist the item "Flight instruments" is a prompt to check the ND heading indication and the primary altimeters sub setting and altitude indication for RVSM compliance. Example response:

"HEADING 232, ALTIMETER 1004, 280 FEET"

When the QNH has been set, the PF will request the APPROACH checklist. The item "NAV aids" is a prompt to check the radio aids and the courses are set appropriate to the stage of flight. It is not necessary for the NAV aids to be set for final approach to complete the checklist.

When the landing gear has been selected DOWN, PF will normally request the LANDING checklist, provided the cabin is secure and the speedbrake lever is armed. PM will set the ENGINE START SWITCHES to CONT, and read the LANDING checklist once the gear is down.

The "stick checklist" provided on the control column is not subject to revision and must not be used.

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 airplane safely.

Normal checklists have items that meet any of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system, or
- items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- items needed to meet regulatory requirements, or
- items needed to maintain fleet commonality between the 737, 747-400, 757, 767, 777, and 787, or
- items that enhance safety of flight and are not monitored by an alerting system (for example the autobrake), or
- during shutdown and secure, items that could result in injury to personnel or damage to equipment if not done.

Checklist Construction

When a checklist challenge does not end with “switch or lever”, then the challenge refers to system status. For example, “Landing Gear...Down”, refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with “switch or lever”, then the challenge refers to the position of the switch or lever. For example, “Engine start levers...CUTOFF” refers to the position of the levers.

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Checklist Instructions — Chapter CI
Non-Normal Checklists — Section 2

Introduction

The non-normal checklists chapter contains checklists used by the flight crew to manage non–normal situations. The checklists are grouped in sections which match the system description chapters in Volume 2.

Most checklists correspond to a light, alert or other indication. In most cases, the MASTER CAUTION and system annunciator lights also illuminate to indicate the non-normal condition. These lights, alerts and other indications are the cues to select and do the associated checklist.

Checklists without a light, alert or other indication (such as Ditching) are called unannunciated checklists. Most unannunciated checklists are in the associated system section. For example, Engine Fuel Leak is in section 12, Fuel. Unannunciated checklists with no associated system are in section 0, Miscellaneous.

All checklists have condition statements. The condition statement briefly describes the situation that caused the light, alert or other indication. 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 actions to be done while reading the checklist.

Some checklists have additional information at the end of the checklist. The additional information provides data the crew may wish to consider. The additional information does not need to be read.

Checklists that need a quick response are listed in the Quick Action Index. In each system section, Quick Action Index checklists are listed first, followed by checklists that are not in the Quick Action Index. The titles of Quick Action Index checklists are printed in **bold** type. Checklist titles in upper case (such as AUTO BRAKE DISARM) are annunciated by a light, alert, or other indication. Checklist titles in upper and lower case (such as Window Damage) are not annunciated.

Non–Normal Checklist Operation < BRI >

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 non–normal situations are located in the Maneuvers chapter and show the sequence of configuration changes.

While every attempt is made to supply needed non–normal checklists, it is not possible to develop checklists for all conceivable situations. In some smoke, fire or fumes situations, the flight crew may need to move between the Smoke, Fire or Fumes checklist and the Smoke or Fumes Removal checklist. In some multiple failure situations, the flight crew may need to combine the elements of more than one checklist. In all situations, the captain must assess the situation and use good judgment to determine the safest course of action.

There are some situations where the flight crew must land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non–normal checklist includes the item “Plan to land at the nearest suitable airport.”
- fire or smoke continues
- only one AC power source remains (engine or APU generator)
- only one hydraulic system remains (the standby system is considered a hydraulic system)
- 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 a limit is exceeded.

Non–normal checklists also assume:

- During engine start and before dispatch, the associated non–normal checklist is done if 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 is done if a non-normal situation is identified. After completion of the checklist the MEL is consulted to determine if dispatch relief is available for subsequent sectors.
- System controls are in the normal configuration for the phase of flight before the start of the non–normal checklist.
- If the MASTER CAUTION and system annunciator lights illuminate, all related amber lights are reviewed to assist in recognizing the cause(s) of the alert.
- Aural alerts are silenced and the master caution system is reset by the flight crew as soon as the cause of the alert is recognized.
- The EMERGENCY position of the oxygen regulator is used when needed to supply positive pressure in the masks and goggles to remove contaminants. The 100% position of the oxygen regulator is used when positive pressure is not needed but contamination of the flight deck air exists. The Normal position of the oxygen regulator is used if prolonged use is needed and the situation allows. Normal boom microphone operation is restored when oxygen is no longer in use.
- Indicator lights are tested to verify suspected faults.

- In flight, reset of a tripped circuit breaker is not recommended unless directed by a non-normal checklist. However, a tripped circuit breaker may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. On the ground, flight crew reset of a tripped circuit breaker should only be done after maintenance has determined that it is safe to reset the circuit breaker.
- Flight crew cycling (pulling and resetting) of a circuit breaker to clear a non-normal condition is not recommended, unless directed by a non-normal checklist.

After engine start and before takeoff, illumination of a red warning light, an amber caution light, an alert or other indication requires completion of the associated checklist. In certain cases, amber system monitor lights illuminate during MASTER CAUTION recall to inform the flight crew of the failure of one element in a system with redundant elements. If system operation is maintained by a second element, the amber system monitor light will extinguish when MASTER CAUTION is reset. In these situations, the amber light alerts the flight crew that normal system operation will be affected if another element fails. If an amber light illuminates during MASTER CAUTION recall, but extinguishes after MASTER CAUTION reset, completion of the associated checklist is not required.

Non–Normal Checklist Use < BRI >

If a checklist or a step in a checklist is not applicable to all airplanes, airplane effectivity information is included in the checklist. Airplane effectivity can be listed by airplane number, registry number, serial number or tabulation number. If a checklist is applicable to some but not all airplanes, airplane effectivity is centered below the checklist title. If a step in a checklist is applicable to some but not all airplanes, airplane effectivity is included above the step. If a checklist or a step in a checklist is applicable to all airplanes, airplane effectivity information is not included.

Non–normal checklist use starts when the airplane flight path and configuration are correctly established. Only a few situations need an immediate response (such as CABIN ALTITUDE WARNING or Rapid Depressurization). 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 in the air, at the direction of the pilot flying, both crewmembers do all memory items in their areas of responsibility without delay.

On the ground, the captain will act as pilot flying for all non-normal situations.

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 inflight non-normal situation, verbal confirmation is required for:

- an engine thrust lever
- an engine start lever
- an engine, APU or cargo fire switch
- a generator drive disconnect switch
- an IRS mode selector, when only one IRS is failed
- a flight control switch

This does not apply to the EMERGENCY DESCENT or LOSS OF THRUST ON BOTH ENGINES checklist.

With the airplane on the ground:

- the captain and the first officer take action based on preflight and postflight areas of responsibility
- during an evacuation, the first officer sets the flap lever to 40.

With the airplane in flight:

- the pilot flying and the pilot monitoring take action based on each crewmember's Areas of Responsibility.

The engine thrust levers are considered to be in the pilot flying's area of responsibility in the air, and the captain's area of responsibility on the ground. The engine start levers and all fire switches are considered to be in the pilot monitoring's area of responsibility in the air and the first officer's area of responsibility on the ground.

On the ground, the parking brake and speedbrake lever are in the captain's area of responsibility.

After moving the control, the crewmember 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. 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.

After completion of the non–normal checklist, normal procedures are used to configure the airplane for each phase of flight.

When there are no deferred items, the DESCENT, APPROACH and LANDING normal checklists are used to verify that the configuration is correct for each phase of flight.

When there are deferred items, the non-normal checklist will include the item "**Checklist Complete Except Deferred Items.**" The pilot flying is to be made aware when there are deferred items. These items are included in the Deferred Items section of the checklist and may be delayed until the usual point during descent, approach or landing.

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.

When there are deferred items, the Deferred Items section of the non-normal checklist will include the Descent, Approach and Landing normal checklists. These checklists should be used instead of the usual DESCENT, APPROACH and LANDING normal checklists. If a normal checklist item is changed as a result of the non-normal situation, the changed response is printed in **bold** type. 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.

Non–Normal Checklist Use - Amplified < BRI >

The first pilot to recognize any non-normal condition must call it out clearly and precisely. Review all caution and warning lights to positively identify the non-normal condition. The relevant checklist should be accomplished only after the non-normal condition has been positively identified.

On the ground, the captain will call for memory items, as appropriate, and the relevant checklist. The first officer will read the checklist.

In the air, the pilot flying will call for memory items, as appropriate, and the relevant checklist. The pilot monitoring will read the checklist.

In the event of an aborted engine start the first officer must complete the memory item without delay. Subsequently the captain will call for the relevant checklist which the first officer will read. In the event of an engine failing to start seek engineering advice and, if appropriate, consult the MEL prior to attempting a subsequent start.

Whenever an emergency exists on the ground that is considered life threatening to persons on board, the EVACUATION checklist should be performed without delay; this may require other checklists to be discontinued at any point. Captains should use all available sources of information when determining if an evacuation is necessary and be aware that it is likely that one or more persons may be injured in an evacuation. If an Evacuation is needed the captain will assume the role of pilot flying, stop the aircraft and set the Parking Brake. The captain will call "EVACUATION CHECKLIST".

In the event of an evacuation, the First Officer will select/confirm FLAP lever 40 and then read the EVACUATION checklist. The parking brake and speedbrake lever will be actioned by the captain. The captain will state the checklist response for these items.

Inflight, when a non-normal checklist requires the autothrottle to be disengaged, this should normally be accomplished by the pilot flying.

Inflight, when a non-normal checklist requires a thrust lever to be moved, either as a memory or reference item, this should normally be accomplished by the pilot flying. The pilot flying must verbally confirm the affected thrust lever with pilot monitoring prior to action being taken. When actioning the EMERGENCY DESCENT, or LOSS OF THRUST ON BOTH ENGINES checklists, it is not necessary to verbally confirm the affected thrust levers with pilot monitoring prior to action being taken. The pilot flying slowly retards the affected thrust lever. When the thrust lever item is complete, the pilot flying will state the checklist response.

Inflight, when an engine shutdown is required, pilot monitoring places a hand on and verbally identifies the start lever for the engine to be shutdown. The start lever must only be actioned after verbal confirmation from the pilot flying.

Inflight, when activation of any fire switch is required, pilot monitoring places a hand on and verbally identifies the affected fire switch. The fire switch must only be actioned after verbal confirmation from the pilot flying.

In the event of an engine malfunction at or above V1, the takeoff should be continued. Pilot monitoring will call the malfunction using the terms "Engine Failure" or "Engine Fire" as appropriate, without specifying which engine. If additional climb performance is required on a derated thrust and/or assumed temperature reduced thrust take-off, the thrust lever of the operating engine may be advanced to full rated thrust, provided the aircraft is airborne, the IAS is V2 or greater, and no directional control difficulties are encountered. This guidance will ensure protection against minimum control speed.

Confirmation of which engine has failed and the nature of the failure will be completed at a safe height (minimum 400’ AGL), followed by memory items as appropriate. When the flaps have been retracted the appropriate non-normal checklist will be completed, followed by the After Takeoff checklist.

An engine failure procedure is produced for all runways and requires either climbing straight ahead or an Emergency Turn. When an engine failure procedure involves a deviation from the SID, ATC must be informed.

When an emergency turn is required, the flaps should be retracted when:

- All close in and radius limited turns are completed, and
- At or above single engine minimum flap retraction altitude.

If the intermittent warning horn sounds inflight above 10,000 feet, both pilots will immediately don oxygen masks. Both pilots must verify on the overhead Cabin Altitude Panel that the cabin altitude is stabilized at or below 10,000 feet before removing oxygen masks.

Non–Normal Checklist Legend

Redirection Symbol

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The redirection symbol is used in two ways:

- In the Table of Contents of a system section, to direct the flight crew to a different system section.
- In a non-normal checklist, with the word “Go to”, to direct the flight crew to a different checklist or to a different step in the current checklist.

Separator Symbol

The separator symbol is used in two ways:

- In the Table of Contents of a system section, to separate the Quick Action Index checklists from the checklists that are not in the Quick Action Index.
- In a non-normal checklist, to separate the memory items from the reference items.

Task Divider Symbol

The task divider symbol is used to indicate the end of one task and the beginning of another task.

Decision Symbol

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.

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Evacuation Checklist is on the reverse side of this page.

Evacuation <>

Condition: Evacuation is needed.

1 FLAP lever 40

The First Officer selects Flaps 40 (IAS < 60 kts).

2 PARKING BRAKE. . . . . Set

3 Speedbrake lever . . . . DOWN

4 Pressurization mode selector . . . . .MAN

5 Outflow VALVE switch . . . . Hold in OPEN until the outflow VALVE position indicates fully open

6 **If** time allows:

Verify that the flaps are 40 before the engine start levers are moved to CUTOFF.

7 Engine start levers (both) . . . . CUTOFF

8 The captain will advise the cabin to evacuate using the PA:.

"EVACUATE, EVACUATE, UNDO SEAT BELTS AND GET OUT".

9 The first officer will advise ATC.

10 Engine and APU fire switches (all) . . . . .Override and pull

11 **If** an engine or APU fire warning occurs:

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

■ ■ ■ ■