737
Quick Reference Handbook

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Normal Checklists — Chapter NC

PREFLIGHT

Oxygen. . . . . Tested, 100%

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

Window heat . . . . ON

Pressurization mode
selector . . . . AUTO

Flight instruments . . . . Heading ___, Altimeter ___

Parking brake . . . . Set

Engine start levers . . . . CUTOFF

BEFORE START

Flight deck door . . . . Closed and locked

Fuel . . . . ___ LBS/KGS, Pumps ON

Passenger signs . . . . ___

Windows . . . . Locked

MCP . . . . V2 ___, HEADING ___, ALTITUDE ___

Takeoff speeds . . . . V1 ___, VR ___, V2 ___

CDU preflight. . . . . Completed

Rudder and aileron trim . . . . Free and 0

Taxi and takeoff briefing . . . . Completed

Anti collision light. . . . . ON

BEFORE TAXI

Generators . . . . On

Probe heat . . . . ON

Anti-ice . . . . ___

Isolation valve . . . . AUTO

[Without automatic ignition]
Engine start switches . . . . CONT

Recall . . . . Checked

Autobrake . . . . RTO

Engine start levers . . . . IDLE detent

Flight controls . . . . Checked

Ground equipment . . . . Clear

BEFORE TAKEOFF

Flaps . . . . ___ , Green light

Stabilizer trim . . . . ___ Units

AFTER TAKEOFF

Engine bleeds . . . . ON

Packs . . . . AUTO

Landing gear . . . . UP and OFF

Flaps . . . . UP, No lights

DESCENT

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . ___

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

APPROACH

Altimeters . . . . ___

LANDING

[Without automatic ignition]

Engine start switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

SHUTDOWN

Fuel pumps . . . . OFF

Probe heat . . . . OFF

Hydraulic panel . . . . Set

Flaps . . . . UP

Parking brake . . . . ___

Engine start levers . . . . CUTOFF

Weather radar . . . . Off

SECURE

IRSs . . . . OFF

Emergency exit lights . . . . OFF

Window heat . . . . OFF

Packs . . . . OFF

Non-Normal Checklists — Chapter NNC
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Emergency Descent

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

1 Announce the emergency descent. The pilot flying will advise the cabin crew, on the PA system, of impending rapid descent. The pilot monitoring will 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 levers (both) . . . . Reduce thrust to minimum or as needed for anti-ice

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.

Continued on next page

▼ Emergency Descent continued ▼

[737-700 with Winglets]

Caution! When gross weight is greater than 143,000 lbs / 64,864 kgs, speed brake will autostow to the 50% flight detent if airspeed exceeds 320 knots. Do not override autostow function unless airspeed is less than 320 knots.

[737-900ER with Winglets]

Caution! When gross weight is greater than 170,000 lbs / 77,112 kgs, speed brake will autostow to the 50% flight detent if airspeed exceeds 320 knots. Do not override autostow function unless airspeed is less than 320 knots.

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.

■ ■ ■ ■

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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**

▼ Continued on next page ▼

▼ Ditching continued ▼

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

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

[Option - Ground Proximity Gear Inhibit switch]
GROUND PROXIMITY GEAR
INHIBIT switch . . . . GEAR INHIBIT

▼ Continued on next page ▼

▼ Ditching continued ▼

[Option - Without Ground Proximity Gear Inhibit switch]
GND PROX WARN
circuit breaker (P18–1:B7) . . . . Pull

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.

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.

▼ Continued on next page ▼

▼ Ditching continued ▼

Ditching Final

LANDING GEAR lever. . . . . UP and OFF

Flaps . . . . ___, Green light

At **500 feet**, advise the cabin crew that ditching is imminent.

At **50 feet**, advise the cabin crew to brace for impact.

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.

■ ■ ■ ■

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AIR STAIR

AIRSTAIR

[Option - Forward airstairs]

Condition: The airstair is not 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** ▼

▼ **AIRSTAIR 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.

▼ **Continued on next page** ▼

▼ **AIRSTAIR continued** ▼

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.

■ ■ ■ ■

AUTO UNLK

AUTOMATIC UNLOCK

Condition: The correct emergency access code is entered.

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

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

■ ■ ■ ■

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.

▼ **Continued on next page** ▼

▼ **CARGO DOOR continued** ▼

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.

■ ■ ■ ■

ELT

ELT

[Option - Gables G7116-01 and Artex 453-0161]

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

▼ Continued on next page ▼

▼ EQUIPMENT 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.

▼ Continued on next page ▼

▼ **EQUIPMENT DOOR continued** ▼

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.

■ ■ ■ ■

MID EXIT DOOR

[Option - Mid-Exit doors]

LEFT MID EXIT	RIGHT MID EXIT

Condition: One or more mid exit 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.

■ ■ ■ ■

OVERWING DOOR

[737 - 600/700]

LEFT OVERWING	RIGHT 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.

■ ■ ■ ■

OVERWING DOOR

[737 - 800/900]

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.

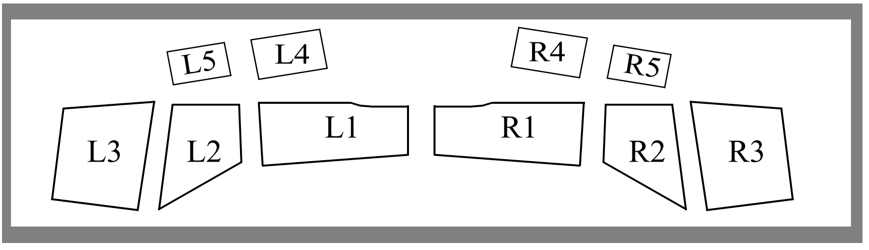
■■■■

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.

[Option - Windows 4 and 5 installed]



[Option - Window 3 not heated]

1 **If** the damage is on Window 3 not heated:

▶▶Go to the Window Damage (Window 3 Not Heated) checklist on page 1.20

■ ■ ■ ■

▼ Continued on next page ▼

▼ **Window Damage continued** ▼

2 Choose one:

◆Window is **delaminated** only:

Continue normal operation.

■ ■ ■ ■

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

►►**Go to step 3**

3 Don seat belts and shoulder harnesses.

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

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

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

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

Window 1 or 2 **outer** pane

[Option - Windows 4 and 5 installed]
Window 4 **inner** pane

Window 5 **outer** pane

►►**Go to step 8**

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

Window 1 or 2 **inner** pane

▼ **Continued on next page** ▼

▼ **Window Damage continued** ▼

[Option - Windows 4 and 5 installed]

Window 4 **middle or outer** pane

Window 5 **inner** pane

►►**Go to step 10**

8 Continue normal operation.

9 Shoulder harnesses may be removed.

■ ■ ■ ■

10 Don oxygen masks.

11 Establish crew communications.

12 Passenger signs . . . . ON

13 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 14**

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

►►**Go to step 14**

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

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

▼ **Continued on next page** ▼

▼ Window Damage continued ▼

16 Plan to land at the nearest suitable airport.

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

Oxygen masks and shoulder harnesses may be removed.

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

■ ■ ■ ■

Window Damage (Window 3 Not Heated)

[Option - Window 3 not heated]

Condition: The window 3 not heated has one or more of these:
- A delamination
- A crack
- Is shattered.

Objective: To reduce differential pressure to 0 psi if both panes are shattered or cracked.

1 Choose one:

◆Window is **delaminated** only:

Continue normal operation.

■ ■ ■ ■

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

►►**Go to step 2**

2 Don seat belts and shoulder harnesses.

3 Choose one:

◆Cracked or shattered condition exists on the inner **or** outer pane:

►►**Go to step 4**

◆Cracked or shattered condition exists on the inner **and** outer panes:

►►**Go to step 6**

▼ Continued on next page ▼

▼ Window Damage (Window 3 Not Heated) continued ▼

4 Continue normal operation.

5 Shoulder harnesses may be removed.

■ ■ ■ ■

6 Passenger signs . . . . ON

7 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 8**

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

► ► **Go to step 8**

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

▼ Continued on next page ▼

Window Damage (Window 3 Not Heated) continued

9 Choose one:

- Minimum safe altitude is **at or below 9,000 feet**:

  Go to step 10

- Minimum safe altitude is **between 9,000 feet and 13,000 feet**:

  Go to step 12

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

  Go to step 15

10 Descend to 9000 feet.

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

Go to step 20

12 Descend to the minimum safe altitude.

13 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.

14 **If** the cabin altitude is above 10,000 feet:

Don oxygen masks.

Continued on next page

▼ Window Damage (Window 3 Not Heated) continued ▼

Establish crew communications.

▶▶Go to step 19

15 Descend to the minimum safe altitude.

16 Pressurization mode selector . . . . MAN

17 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.

18 **When** the cabin altitude is above 10,000 feet:

Don oxygen masks.

Establish crew communications.

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

Oxygen masks may be removed.

20 Shoulder harnesses may be removed.

■ ■ ■ ■

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.

■ ■ ■ ■

Non-Normal Checklists — Chapter NNC
Air Systems — Section 2

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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**

■ ■ ■ ■

▼ Continued on next page ▼

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

Continued on next page

AUTO FAIL or Unscheduled Pressurization Change continued

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

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

Continued on next page

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

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**

Deferred Items

Descent Checklist

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

Recall . . . . Checked

Autobrake . . . . ___

▼ Continued on next page ▼

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

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

At Pattern Altitude

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

Landing Checklist

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

BLEED
TRIP OFF

BLEED TRIP OFF

Condition: One or more of 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

■ ■ ■ ■

DUCT OVERHEAT

DUCT OVERHEAT

[737-600/700]

Condition: A duct overheat occurs.

1 Temperature selector (affected side) . . . . Select cooler temperature

This prevents the air mix valves from returning to an overheat condition.

2 TRIP RESET switch . . . . Push

The DUCT OVERHEAT light extinguishes if the duct temperature has cooled below limits.

3 Monitor duct temperature.

4 **If** the duct temperature increases rapidly or the air mix valve indicator moves toward full hot:

Temperature selector . . . . MANUAL

Adjust the air mix valve position as needed.

■ ■ ■ ■

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.

■ ■ ■ ■

INOP

HIGH ALTITUDE LANDING INOPERATIVE

[Option]

Condition: The high altitude landing system is inoperative.

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.

■ ■ ■ ■

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

■ ■ ■ ■

Intentionally
Blank

PACK

PACK

[737-800/900]

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.

▼ Continued on next page ▼

▼ PACK continued ▼

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.

Close cabin window shades.

CAB/UTIL switch . . . . OFF

▼ Continued on next page ▼

▼ PACK continued ▼

IFE/PASS SEAT switch. . . . . OFF

■ ■ ■ ■

PACK TRIP OFF

PACK TRIP OFF

[737-600/700]

Condition: A pack overheat occurs.

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

This reduces the workload on the affected air conditioning pack.

2 TRIP RESET switch . . . . Push

The PACK TRIP OFF light extinguishes if the pack temperature has cooled below limits.

3 Choose one:

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

Continue normal operation.

■ ■ ■ ■

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

Continue normal operation.

■ ■ ■ ■

◆ **Both** PACK TRIP OFF 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**

▼ **Continued on next page** ▼

▼ **PACK TRIP OFF continued** ▼

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.

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.

▼ **Continued on next page** ▼

▼ PACK TRIP OFF continued ▼

9 **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.

Close cabin window shades.

CAB/UTIL switch . . . . OFF

IFE/PASS SEAT switch. . . . . OFF

■ ■ ■ ■

Intentionally
Blank

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.

▼ Continued on next page ▼

▼ **WING-BODY OVERHEAT continued** ▼

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.

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:

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ **WING-BODY OVERHEAT continued** ▼

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

16 BLEED 1 air switch . . . . .ON

17 L PACK switch . . . . AUTO

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

▼ **Continued on next page** ▼

▼ **WING-BODY OVERHEAT continued** ▼

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

[737-800/900]

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

■ ■ ■ ■

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Blank

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.

■ ■ ■ ■

ICE DETECTOR

ICE DETECTOR

[Option]

Condition: The ice detector system is failed.

1 Run engine anti–ice system as needed.

■ ■ ■ ■

ICING
P-CANCEL

ICING

[Option]

Condition: Ice is detected.

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

■ ■ ■ ■

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

[Option]

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.

■ ■ ■ ■

Intentionally
Blank

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

▼ Continued on next page ▼

▼ **WING ANTI-ICE VALVE OPEN continued** ▼

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

■ ■ ■ ■

Intentionally
Blank

Non-Normal Checklists — Chapter NNC

Automatic Flight — Section 4

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Blank

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

Condition: Autoland is not available.

■ ■ ■ ■

NO LAND 3

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

■ ■ ■ ■

Non-Normal Checklists — Chapter NNC

Communications — Section 5

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ACARS Electrical Power Loss

[Option - ACARS]

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

[Option - ACARS]

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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Blank

BAT DISCHARGE

BATTERY DISCHARGE

Condition: A battery discharge exceedance occurs.

[Option - Single battery]

Note: A fully charged battery supplies a minimum of 30 minutes of standby power.

[Option - Dual battery]

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

[Option - Dual battery]

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

Reset circuit breaker.

▼ Continued on next page ▼

▼ **LOSS OF BOTH ENGINE DRIVEN GENERATORS continued** ▼

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.

[Option - Single battery]

Note: A fully charged battery supplies a minimum of 30 minutes of standby power.

[Option - Dual battery]

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

▼ **Continued on next page** ▼

▼ **LOSS OF BOTH ENGINE DRIVEN GENERATORS continued** ▼

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

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.

■ ■ ■ ■

▼ **Continued on next page** ▼

▼ **LOSS OF BOTH ENGINE DRIVEN GENERATORS continued** ▼

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.

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 Choose one:

◆**Both** SOURCE OFF ights are illuminated:

▶▶**Go to the LOSS OF BOTH ENGINE DRIVEN GENERATORS checklist on page 6.4**

■ ■ ■ ■

◆**Only one** SOURCE OFF light is illuminated:

▶▶**Go to step 2**

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

3 Choose one:

◆SOURCE OFF light **extinguishes**:

■ ■ ■ ■

◆SOURCE OFF light **stays illuminated**:

▶▶**Go to step 4**

▼ Continued on next page ▼

▼ **SOURCE OFF continued** ▼

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.

■ ■ ■ ■

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.

[Airplanes with IAN]

1 Do not use the AFDS approach mode during an ILS approach.

[Airplanes without IAN]

2 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.

■ ■ ■ ■

Intentionally
Blank

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Aborted Engine Start

[Without Automatic Ignition]

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

■ ■ ■ ■

Aborted Engine Start

[With Automatic Ignition]

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) . . . . AUTO

■ ■ ■ ■

◆ENGINE START switch is in **AUTO**:

▶▶**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) . . . . AUTO

■ ■ ■ ■

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**

▼ **Continued on next page** ▼

▼ Engine Limit or Surge or Stall continued ▼

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

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.

▼ Continued on next page ▼

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

9 Transponder mode selector . . . . TA ONLY

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

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

ISOLATION VALVE switch . . . . AUTO

11 Plan to land at the nearest suitable airport.

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

[Airplanes without Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.26**

[Airplanes with Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.29**

■ ■ ■ ■

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.

▼ Continued on next page ▼

▼ **Loss Of Thrust On Both Engines continued** ▼

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

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**

▼ **Continued on next page** ▼

▼ Loss Of Thrust On Both Engines continued ▼

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**

14 Thrust levers (both) . . . . Close

▼ Continued on next page ▼

▼ **Loss Of Thrust On Both Engines continued** ▼

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.

Continued on next page

▼ **Loss Of Thrust On Both Engines continued** ▼

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.

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 7.18**

■ ■ ■ ■

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 10.6**

■ ■ ■ ■

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.

9 Transponder mode selector . . . . TA ONLY

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

10 **If** wing anti–ice is needed:

ISOLATION VALVE switch . . . . AUTO

11 Plan to land at the nearest suitable airport.

[Airplanes without Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.26**

[Airplanes with Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.29**

■ ■ ■ ■

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 7.14**

■ ■ ■ ■

◆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 7.14**

■ ■ ■ ■

Intentionally
Blank

Engine In-Flight Start

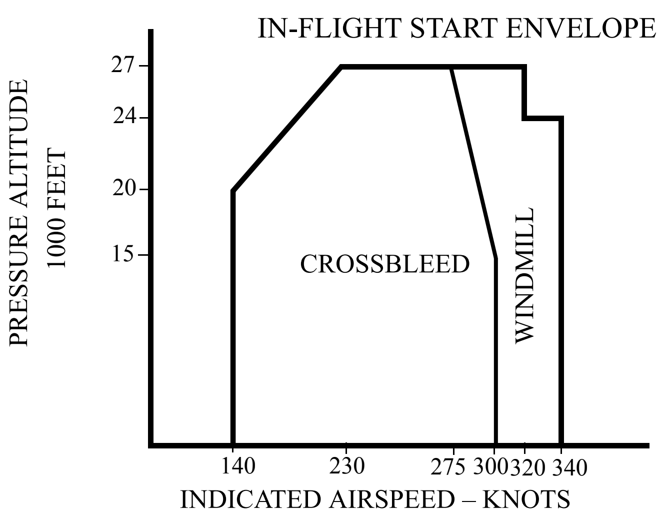
Condition: An engine start is needed after a shutdown and there is:
- N1 rotation
- No fire
- No abnormal airframe vibration.

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 Engine Limit or Surge or Stall checklist or 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.



▼ Continued on next page ▼

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

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.

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**

▼ **Continued on next page** ▼

▼ Engine In-Flight Start continued ▼

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

[Without automatic ignition]
ENGINE START switch
(affected engine) . . . . OFF

[With automatic ignition]
ENGINE START switch
(affected engine) . . . . AUTO

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:

[Airplanes without Fail Operational Autoland Capability]

►►**Go to the One Engine Inoperative Landing checklist on page 7.26**

■ ■ ■ ■

[Airplanes with Fail Operational Autoland Capability]

►►**Go to the One Engine Inoperative Landing checklist on page 7.29**

■ ■ ■ ■

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 7.14**

■ ■ ■ ■

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 7.14**

■ ■ ■ ■

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**

▼ Continued on next page ▼

▼ **High Engine Vibration continued** ▼

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

Condition: Landing must be made with one engine inoperative.

Airplanes without Fail Operational Autoland Capability

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

▼ Continued on next page ▼

▼ One Engine Inoperative Landing continued ▼

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

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.

▼ Continued on next page ▼

▼ **One Engine Inoperative Landing continued** ▼

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 . . . . ____

Additional Deferred Item

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

[Without automatic ignition]
ENGINE START switch
(operating engine) . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

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

■ ■ ■ ■

One Engine Inoperative Landing

Condition: Landing must be made with one engine inoperative.

Airplanes with Fail Operational Autoland Capability

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**

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.

▼ Continued on next page ▼

One Engine Inoperative Landing continued

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.

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

Continued on next page

One Engine Inoperative Landing continued

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 . . . . ___

▼ Continued on next page ▼

▼ One Engine Inoperative Landing continued ▼

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**

Landing Checklist

[Without automatic ignition]
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 7.14**

■ ■ ■ ■

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START VALVE OPEN

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

[Without automatic ignition]

1 ENGINE START switch . . . . OFF

[With automatic ignition]

2 ENGINE START switch . . . . AUTO

3 Choose one:

◆START VALVE OPEN alert **extinguishes**:

■ ■ ■ ■

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

►►**Go to step 4**

4 ISOLATION VALVE switch. . . . . CLOSE

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

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

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

▼ Continued on next page ▼

▼ START VALVE OPEN continued ▼

7 Choose one:

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

APU BLEED air switch . . . . OFF

▶▶**Go to step 8**

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

▶▶**Go to step 8**

8 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

▼ Continued on next page ▼

▼ **Volcanic Ash continued** ▼

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.

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 7.6**

■ ■ ■ ■

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Table of Contents

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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

Continued on next page

▼ **ENGINE FIRE or Engine Severe Damage or Separation continued** ▼

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

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.

▼ **Continued on next page** ▼

▼ **ENGINE FIRE or Engine Severe Damage or Separation continued** ▼

12 Transponder mode selector . . . . TA ONLY

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

13 **If** wing anti–ice is needed:

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

14 Plan to land at the nearest suitable airport.

[Airplanes without Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.26**

[Airplanes with Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.29**

■ ■ ■ ■

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.

■ ■ ■ ■

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**

▼ **Continued on next page** ▼

▼ Engine Tailpipe Fire continued ▼

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.

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

[Without automatic ignition]

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

[With automatic ignition]

12 ENGINE START switch (affected engine) . . . AUTO

■ ■ ■ ■

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

6 CAB/UTIL switch. . . . . OFF

7 IFE/PASS SEAT switch . . . . OFF

[737 - 600/700]

8 RECIRC FAN switch . . . . OFF

[737 - 800/900]

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

10 APU BLEED air switch . . . . OFF

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

►►**Go to the Smoke or Fumes Removal checklist on page 8.18**

▼ Continued on next page ▼

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

12 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 13**

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

►►**Go to step 14**

13 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 8.18, if needed**

■ ■ ■ ■

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

►►**Go to step 14**

▼ **Continued on next page** ▼

▼ Smoke, Fire or Fumes continued ▼

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

15 Instruct the cabin crew to:

Turn on cabin reading lights.

Turn on galley attendants work lights.

Turn off cabin fluorescent light switches.

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

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

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

19 ISOLATION VALVE switch. . . . . CLOSE

20 R PACK switch . . . . OFF

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

▼ Continued on next page ▼

22 Choose one:

◆Smoke or fumes are **decreasing**:

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.18, if needed**

■ ■ ■ ■

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

R PACK switch . . . . AUTO

L PACK switch . . . . OFF

▶▶**Go to step 23**

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

24 Choose one:

◆Smoke or fumes are **decreasing**:

▶▶**Go to the Smoke or Fumes Removal checklist on page 8.18, 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 8.18, 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.

[737 - 600/700]

3 RECIRC FAN switch . . . . OFF

[737 - 800/900]

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

5 PACK switches (both) . . . . HIGH

[Option - Airplanes equipped with #4 galley chiller]

6 CAB/UTIL switch. . . . . OFF

This prevents galley chiller exhaust from carrying smoke or fumes into the cabin.

7 Plan to land at the nearest suitable airport.

8 **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 . . . . ____

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

[Without automatic ignition]
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.

■ ■ ■ ■

SMOKE

LAVATORY SMOKE

[Option]

Condition: Smoke is detected in one or more lavatories.

1 Verify that the lavatory fire is contained.

■ ■ ■ ■

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**

▼ **Continued on next page** ▼

▼ Smoke or Fumes Removal continued ▼

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

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.

▼ Continued on next page ▼

▼ **Smoke or Fumes Removal continued** ▼

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.

▼ **Continued on next page** ▼

▼ Smoke or Fumes Removal continued ▼

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.

■ ■ ■ ■

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- -

Table of Contents

Intentionally
Blank

Elevator Tab Limit Cycle Oscillation

Condition: An elevator tab limit cycle oscillation (LCO) is encountered in flight. One or more of the following may be evidence of an elevator tab LCO:

- High frequency resonant vibration that originates, and is strongest, in the aft part of the airplane but can be felt throughout the entire structure
- The vibration may or may not be felt in the control wheel.

1 Airspeed . . . . Reduce to 270 KIAS or until the vibration ceases, whichever is lower

2 Do not use speedbrakes or change aircraft configuration to reduce airspeed.

- -

3 Remain at or below the indicated airspeed at which the vibration ceased, but do not exceed 270 knots.

4 Do not use speedbrakes for the remainder of the flight.

Note: Ground spoilers may be used for landing.

5 Consider landing at the nearest suitable airport.

■ ■ ■ ■

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**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ____

▼ Continued on next page ▼

▼ Runaway Stabilizer continued ▼

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . VREF ____, Minimums ____

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

Airspeed and Trim

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

Landing Checklist

[Without automatic ignition]
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**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ____

Recall . . . . Checked

Autobrake . . . . ____

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

▼ Continued on next page ▼

▼ All Flaps Up Landing continued ▼

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 . . . . ___

Additional Deferred Items

FASTEN BELTS switch . . . . ON

[With automatic ignition]
ENGINE START switches . . . . CONT

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

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

[Option]

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.

▼ **Continued on next page** ▼

▼ Jammed or Restricted Flight Controls continued ▼

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.

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 . . . . ____

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

[Without automatic ignition]
ENGINE START switches. . . . . CONT

Speedbrake . . . . ARMED

▼ Continued on next page ▼

▼ Jammed or Restricted Flight Controls continued ▼

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 9.33**

■ ■ ■ ■

◆ **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**

▼ **Continued on next page** ▼

▼ LEADING EDGE FLAPS TRANSIT continued ▼

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

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.

▼ Continued on next page ▼

▼ **LEADING EDGE FLAPS TRANSIT continued** ▼

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 . . . . ____

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.

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

Landing Checklist

[Without automatic ignition]
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

[Without Load Alleviation System]

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 . . . . ____

▼ Continued on next page ▼

SPEED BRAKE DO NOT ARM continued

Landing Checklist

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

SPEED BRAKE DO NOT ARM

SPEED BRAKE DO NOT ARM

[Load Alleviation System]

Condition: An automatic speedbrake fault occurs.

Note: Speedbrakes may be used in flight.

1 Choose one:

◆SPEED BRAKE DO NOT ARM light is illuminated with the flaps **up**:

Limit airspeed to 320 knots maximum.

■ ■ ■ ■

◆SPEED BRAKE DO NOT ARM light illuminates or stays illuminated with the flaps **not** up:

►►**Go to step 2**

2 Do **not** arm the speedbrake for landing. Manually deploy the speedbrakes immediately upon landing. Increased force may be needed to move the SPEED BRAKE lever to the UP position.

3 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ____

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . .VREF ____, Minimums ____

Approach briefing . . . . Completed

▼ Continued on next page ▼

▼ **SPEED BRAKE DO NOT ARM continued** ▼

Approach Checklist

Altimeters . . . . ____

Landing Checklist

[Without automatic ignition]
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 9.22**

■ ■ ■ ■

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.

▼ Continued on next page ▼

▼ **Stabilizer Trim Inoperative continued** ▼

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.

►► **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.

▼ **Continued on next page** ▼

▼ Stabilizer Trim Inoperative continued ▼

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

▼ Continued on next page ▼

▼ Stabilizer Trim Inoperative continued ▼

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 . . . . ____

Additional Deferred Item

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

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

■ ■ ■ ■

STBY
RUD ON

STANDBY RUDDER ON

[737 Modified rudder installed]

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:

■ ■ ■ ■

Intentionally
Blank

Trailing Edge Flap Asymmetry

Condition: One or more of 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.

▼ Continued on next page ▼

▼ Trailing Edge Flap Asymmetry continued ▼

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 9.40**

■ ■ ■ ■

▼ 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

▼ Continued on next page ▼

▼ Trailing Edge Flap Asymmetry continued ▼

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 . . . . ____

Additional Deferred Item

GROUND PROXIMITY FLAP INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

[Without automatic ignition]
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 Choose one:

◆Trailing edge flap asymmetry **exists**:

►►**Go to the Trailing Edge Flap Asymmetry checklist on page 9.28**

■ ■ ■ ■

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

►►**Go to step 2**

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**

▼ Continued on next page ▼

▼ **Trailing Edge Flap Disagree continued** ▼

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.

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.

▼ **Continued on next page** ▼

▼ Trailing Edge Flap Disagree continued ▼

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 . . . . ____

▼ 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**

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.

▼ Continued on next page ▼

▼ **Trailing Edge Flap Disagree continued** ▼

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 9.28

■ ■ ■ ■

◆ 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 9.40

■ ■ ■ ■

◆ 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

▼ Continued on next page ▼

▼ Trailing Edge Flap Disagree continued ▼

Landing Checklist

[Without automatic ignition]
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.

▼ Continued on next page ▼

▼ **Trailing Edge Flaps Up Landing continued** ▼

4 Choose one:

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

►► **Go to the All Flaps Up Landing checklist on page 9.4**

■ ■ ■ ■

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

►► **Go to step 5**

5 Burn off fuel to reduce touchdown speed.

6 Set VREF 40 + 40 knots.

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**

Deferred Items

Descent Checklist

Pressurization. LAND ALT ____

Recall . . . . Checked

Autobrake . . . . ____

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

▼ **Continued on next page** ▼

▼ Trailing Edge Flaps Up Landing continued ▼

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 . . . . ___

Additional Deferred Items

FASTEN BELTS switch . . . . .ON

[With automatic ignition]
ENGINE START switches. . . . . CONT

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.

▼ Continued on next page ▼

▼ Trailing Edge Flaps Up Landing continued ▼

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

Landing Checklist

[Without automatic ignition]
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.

■ ■ ■ ■

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.

■ ■ ■ ■

Non-Normal Checklists — Chapter NNC

Flight Instruments, Displays — Section 10

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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 **Checklist Complete Except Deferred Items**

Deferred Items

Review before descent:

Establish landing configuration early

Radio altitude reference is available below 2,500 feet

▼ Continued on next page ▼

▼ ALT DISAGREE continued ▼

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

■ ■ ■ ■

AOA DISAGREE

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 7.13**

■ ■ ■ ■

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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M S G

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

[Option - Single FMC]

Condition: One or more of these occur:
- Loss of FMC data on a CDU
- Loss of FMC data on a navigation display map mode
- Illumination of the FMC alert light.

1 Resume conventional navigation. Without an operating FMC, LNAV and VNAV are not available.

2 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.

3 **When** preparing for 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.

■ ■ ■ ■

Intentionally
Blank

FMC
P/RST

FMC FAIL

[Option - Dual FMC]

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**

▼ **Continued on next page** ▼

▼ **FMC FAIL continued** ▼

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:

■ ■ ■ ■

4 Resume conventional navigation. Without an operating FMC, LNAV and VNAV are not available.

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

[With GLS capability]

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

[With GLS capability]

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.

■ ■ ■ ■

FAULT

IRS FAULT

[Without SB 737-22-1140 incorporated]

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**

▼ Continued on next page ▼

▼ **IRS FAULT continued** ▼

3 **After** the ALIGN light extinguishes:

IRS mode selector . . . . NAV

Enter present position.

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.

▼ **Continued on next page** ▼

▼ IRS FAULT continued ▼

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 13**

9 Do the next step **only** if the captain's **or** first officer's primary attitude display is failed.

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.

▼ Continued on next page ▼

▼ IRS FAULT continued ▼

[Option - Heading Up]

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.

The MAP display on the failed side is not available.

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**

▼ Continued on next page ▼

▼ IRS FAULT continued ▼

[Option - Track Up]

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

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

[Option - U10.7 and later.]

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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Non-Normal Checklists — Chapter NNC

Fuel — Section 12

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CONFIG

[Option - Center tank auto shutoff]

Condition: All of these occur:
- Both center tank fuel pump switches are off
- There is more than 726 kgs / 1600 lbs 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

[Option - Without center tank auto shutoff]

Condition: All of these occur:
- Both center tank fuel pump pressures are low
- There is more than 726 kgs / 1600 lbs 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.

■ ■ ■ ■

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 / 500 lbs or more in 30 minutes should be considered an engine fuel leak.

5 **If** conditions allow:

Visually check for an engine fuel leak.

▼ Continued on next page ▼

▼ Engine Fuel Leak continued ▼

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 16**

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.

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**

▼ Continued on next page ▼

▼ Engine Fuel Leak continued ▼

10 Choose one:

◆Fuel LOW alert is **shown**:

▶▶**Go to step 11**

◆Fuel LOW alert is **not** shown:

■ ■ ■ ■

11 CROSSFEED selector . . . . Open

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

12 FUEL PUMP switches (all). . . . . .ON

This ensures that all fuel is available for use.

13 Plan to land at the nearest suitable airport.

14 Apply thrust changes slowly and smoothly.

15 **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

16 Autothrottle . . . . .Disengage

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

▼ Continued on next page ▼

▼ Engine Fuel Leak continued ▼

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

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

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

20 Choose one:

◆ APU is **available** for start:

APU . . . . START

When APU is running:

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

►► **Go to step 21**

◆ APU is **not** available:

►► **Go to step 21**

21 Transponder mode selector . . . . TA ONLY

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

22 After engine shutdown, all remaining fuel can be used for the operating engine. Balance fuel as needed.

23 Plan to land at the nearest suitable airport.

[Airplanes without Fail Operational Autoland Capability]

►► **Go to the One Engine Inoperative Landing checklist on page 7.26**

▼ Continued on next page ▼

▼ Engine Fuel Leak continued ▼

[Airplanes with Fail Operational Autoland Capability]

▶▶**Go to the One Engine Inoperative Landing checklist on page 7.29**

■ ■ ■ ■

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.

■ ■ ■ ■

Intentionally
Blank

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**

▼ Continued on next page ▼

▼ **FUEL PUMP LOW PRESSURE continued** ▼

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

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 / 1000 lbs.
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

[Option - LOW Alert below 2000 lbs/907 kgs]

Condition: The fuel quantity in a main tank is less than 907 kgs / 2000 lbs.

Objective: To check for indications of an engine fuel leak and ensure all remaining fuel is available to both engines.

[Option - LOW Alert below 1000 lbs/453 kgs]

Condition: The fuel quantity in a main tank is less than 453 kgs / 1000 lbs.

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.

Continued on next page

▼ **LOW continued** ▼

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 CROSSFEED selector. . . . . Open

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

4 FUEL PUMP switches (all) . . . . ON

This ensures that all fuel is available for use.

5 Plan to land at the nearest suitable airport.

6 Apply thrust changes slowly and smoothly.

7 **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.

▼ Continued on next page ▼

▼ LOSS OF SYSTEM A continued ▼

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**

Deferred Items

Descent Checklist

Pressurization. . . . . LAND ALT ____

Recall . . . . Checked

Autobrake . . . . ____

Landing data . . . . VREF ____, Minimums ____

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ Continued on next page ▼

▼ **LOSS OF SYSTEM A continued** ▼

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

[Without automatic ignition]
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

▼ Continued on next page ▼

▼ LOSS OF SYSTEM B continued ▼

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

▼ Continued on next page ▼

▼ LOSS OF SYSTEM B continued ▼

Autobrake . . . . **OFF**

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

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

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.

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.

▼ Continued on next page ▼

▼ LOSS OF SYSTEM B continued ▼

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

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . ARMED

Landing gear . . . . Down

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

■ ■ ■ ■

MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B

FLT CONTROL A	FLT CONTROL B	HYD PUMPS ENG 1 ELEC 2	HYD PUMPS 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.

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B continued ▼

4 Plan to land at the nearest suitable airport.

5 Plan a flaps 15 landing.

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.

▼ Continued on next page ▼

▼ **MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B continued** ▼

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 ____

Recall . . . . Checked

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

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

Approach briefing . . . . Completed

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B continued ▼

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 . . . . ____

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.

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

▼ Continued on next page ▼

▼ **MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B continued** ▼

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.

Wait 15 seconds after the last manual gear extension handle is pulled:

LANDING GEAR lever . . . . DN

▼ Continued on next page ▼

▼ MANUAL REVERSION or LOSS OF SYSTEM A AND SYSTEM B continued ▼

Additional Deferred Item

GROUND PROXIMITY FLAP
INHIBIT switch . . . . FLAP INHIBIT

Landing Checklist

[Without automatic ignition]
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.

■ ■ ■ ■

Non-Normal Checklists — Chapter NNC
Landing Gear — Section 14

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Blank

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 . . . . ___

Landing Checklist

[Without automatic ignition]
ENGINE START switches. . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . Down

Flaps . . . . ___, Green light

■ ■ ■ ■

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

▼ Continued on next page ▼

▼ AUTO BRAKE DISARM continued ▼

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**

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ____

Recall . . . . Checked

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

Landing data . . . . .VREF ____, Minimums ____

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

Landing Checklist

[Without automatic ignition]
ENGINE START switches. . . . . CONT

Speedbrake . . . . .ARMED

▼ Continued on next page ▼

▼ AUTO BRAKE DISARM continued ▼

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.

■ ■ ■ ■

BRAKE TEMP

BRAKE TEMPERATURE

[Option - Brake Temperature Indicator]

Condition: One or more brake temperatures are high.

1 Choose one:

◆On the **ground**:

Check the Recommended Brake Cooling Schedule in the Advisory Information section of the Performance Inflight chapter for needed cooling time.

■ ■ ■ ■

◆**In flight**:

▶▶**Go to step 2**

270K/.82M maximum.

2 ⚠ LANDING GEAR lever . . . . DN

This allows cooling air to flow around the brakes.

3 **When** the BRAKE TEMP light is **extinguished**:

Wait 7 minutes. This ensures sufficient cooling time.

235K maximum.

4 ⚠ LANDING GEAR lever . . . . UP

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

LANDING GEAR lever . . . . OFF

■ ■ ■ ■

GEAR DISAGREE

LEFT GEAR	NOSE GEAR	RIGHT GEAR

Condition: The landing gear position disagrees with the LANDING GEAR lever position.

1 **If** the LANDING GEAR lever will not move to the UP position:

▶▶**Go to the Landing Gear Lever Will Not Move Up After Takeoff checklist on page 14.18**

■ ■ ■ ■

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

Do not use FMC fuel predictions with gear extended.

2 Choose one:

◆LANDING GEAR lever is **UP**:

▶▶**Go to step 5**

◆LANDING GEAR lever is **OFF**:

▶▶**Go to step 3**

◆LANDING GEAR lever is **DN**:

▶▶**Go to step 9**

235K maximum

3 ⚠ LANDING GEAR lever. . . . . UP

▼ Continued on next page ▼

▼ **GEAR DISAGREE continued** ▼

4 Choose one:

◆**All red and green** landing gear indicator lights are **extinguished**:

The landing gear lever should be kept in the UP position to keep the landing gear retracted.

■ ■ ■ ■

◆**Any red** landing gear indicator light is **illuminated**:

►►**Go to step 8**

5 Choose one:

◆**All red and green** landing gear indicator lights are **illuminated**:

Open and close the manual gear extension access door. Verify the door is fully closed.

►►**Go to step 6**

◆**Any other combination** of landing gear indicator lights is **illuminated**:

►►**Go to step 8**

235K maximum

6 ⚠ LANDING GEAR lever . . . . DN, then UP

▼ **Continued on next page** ▼

▼ GEAR DISAGREE continued ▼

7 Choose one:

◆**All** landing gear indicator lights **extinguish**:

LANDING GEAR lever . . . . OFF

■ ■ ■ ■

◆**Any** red landing gear indicator light is **illuminated**:

►►**Go to step 8**

8 Flight with gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down performance tables in the Performance Inflight section.

■ ■ ■ ■

9 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.

▼ Continued on next page ▼

▼ **GEAR DISAGREE continued** ▼

10 Choose one:

◆**Any** landing gear is **not** down and locked:

►►**Go to the Manual Gear Extension checklist on page 14.22**

■ ■ ■ ■

◆**All** landing gear indicate **down and locked** and all **red** landing gear indicator lights are also **illuminated**:

►►**Go to step 11**

11 Verify landing gear lever is pushed in and fully in the DN detent.

[Option - Ground Proximity Gear Inhibit switch]

12 Choose one:

◆**All red** landing gear indicator lights **extinguish**:

■ ■ ■ ■

◆**All red** landing gear indicator lights stay **illuminated**:

GROUND PROXIMITY GEAR INHIBIT switch . . . . .GEAR INHIBIT

Land normally.

▼ **Continued on next page** ▼

▼ **GEAR DISAGREE continued** ▼

[Option - Without Ground Proximity Gear Inhibit switch]

13 Choose one:

◆ **All red** landing gear indicator lights **extinguish**:

■ ■ ■ ■

◆ **All red** landing gear indicator lights stay **illuminated**:

GND PROX WARN
circuit breaker (P18–1:B7) . . . . Pull

Land normally.

■ ■ ■ ■

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.

▼ Continued on next page ▼

▼ Landing Gear Lever Jammed in the Up Position continued ▼

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 14.22**

■ ■ ■ ■

6 NOSE WHEEL STEERING switch . . . . Verify NORM

Nose wheel steering is not available.

Warning! Do not use alternate nose wheel steering because the landing gear may retract on the ground.

▼ Continued on next page ▼

Landing Gear Lever Jammed in the Up Position continued

270K/.82M maximum.

7 Manual gear extension handles (all). . . . . Pull

The uplock is released when the handle is pulled to its limit. The related red landing gear indicator light illuminates, indicating uplock released.

Note: 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.

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.

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 14.24**

■ ■ ■ ■

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 . . . . ____

Additional Deferred Item

[Option - Ground Proximity Gear Inhibit switch]
GROUND PROXIMITY GEAR
INHIBIT switch . . . . GEAR INHIBIT

[Option - Without Ground Proximity Gear Inhibit switch]
GND PROX WARN
circuit breaker (P18–1:B7) . . . . Pull

▼ Continued on next page ▼

▼ **Landing Gear Lever Jammed in the Up Position continued** ▼

Landing Checklist

[Without automatic ignition]
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.

■ ■ ■ ■

Intentionally
Blank

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.

▼ Continued on next page ▼

▼ Landing Gear Lever Will Not Move Up After Takeoff continued ▼

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

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

LANDING GEAR lever . . . . OFF

▼ Continued on next page ▼

▼ Landing Gear Lever Will Not Move Up After Takeoff continued ▼

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**

▼ Continued on next page ▼

▼ Landing Gear Lever Will Not Move Up After Takeoff continued ▼

Deferred Items

Descent Checklist

Pressurization . . . . LAND ALT ___

Recall . . . . Checked

Autobrake . . . . **OFF**

Landing data . . . . VREF ___, Minimums ___

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ___

Gear Down Verification

LANDING GEAR lever. . . . . Verify DN

Landing Checklist

[Without automatic ignition]
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)

2 270K/.82M maximum.
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.

▼ Continued on next page ▼

▼ **Manual Gear Extension continued** ▼

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 14.24**

■ ■ ■ ■

6 Choose one:

◆ LANDING GEAR **lever** is in the **DN** position:

Land normally.

■ ■ ■ ■

◆ LANDING GEAR **lever** is in the **OFF** position:

[Option - Ground Proximity Gear Inhibit switch]
GROUND PROXIMITY GEAR
INHIBIT switch . . . . .GEAR INHIBIT

[Option - Without Ground Proximity Gear Inhibit switch]
GND PROX WARN
circuit breaker (P18–1:B7) . . . . Pull

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 14.22**

■ ■ ■ ■

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.

▼ Continued on next page ▼

▼ Partial or All Gear Up Landing continued ▼

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**

Landing data **. . . . . VREF 40, Minimums ____**

Approach briefing . . . . Completed

Approach Checklist

Altimeters . . . . ____

▼ Continued on next page ▼

▼ Partial or All Gear Up Landing continued ▼

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

[Option - Ground Proximity Gear Inhibit switch]
GROUND PROXIMITY GEAR
INHIBIT switch . . . . GEAR INHIBIT

[Option - Without Ground Proximity Gear Inhibit switch]
GND PROX WARN
circuit breaker (P18–1:B7) . . . . Pull

When on approach:

Engine BLEED air switches. . . . . OFF

This ensures the airplane is depressurized at touchdown.

▼ Continued on next page ▼

Partial or All Gear Up Landing continued

Landing Checklist

[Without automatic ignition]
ENGINE START switches . . . . CONT

Speedbrake . . . . **DOWN detent**

Landing gear . . . . ___ **Down**

Flaps. . . . . **40, Green light**

■ ■ ■ ■

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Non-Normal Checklists — Chapter NNC
Warning Systems — Section 15

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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		Right Forward Panel	
TAKEOFF CONFIG	CABIN ALTITUDE	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.

▼ Continued on next page ▼

▼ WARNING HORN (INTERMITTENT) or WARNING LIGHT - CABIN ALTITUDE OR TAKEOFF CONFIGURATION continued ▼

►►**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.

[Option - 737-600/700/800 with PSEU -4 or later]

1 Choose one:

◆PSEU light **stays** illuminated when the Master Caution system is reset:

►►**Go to step 2**

◆PSEU light **extinguishes** when the Master Caution system is reset:

■ ■ ■ ■

▼ Continued on next page ▼

▼ PSEU continued ▼

[Option - 737-600/700/800 with PSEU -4 or later]

2 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:

■ ■ ■ ■

[Option - 737-900ER only]

3 **If** the PSEU light stays illuminated when the parking brake is set or when both engines are shut down:

Do not takeoff.

■ ■ ■ ■

SPSEU

SPSEU

Condition: A supplemental proximity switch electronics unit fault occurs.

Note: The SPSEU light illuminates on the ground only.

1 Do not takeoff.

■ ■ ■ ■

INOP

RUNWAY AWARENESS AND ADVISORY SYSTEM (RAAS) INOPERATIVE

[Option - With Runway Awareness and Advisory System]

Condition: One of these occurs:
- RAAS is failed
- RAAS is unavailable because GPS position accuracy is inadequate
- RAAS is unavailable because the airport is not in the GPWS database
- The ground proximity runway inhibit switch is in the INHIBIT position and airspeed has been 250 knots or greater for 60 seconds or more.

■ ■ ■ ■

Tail Strike

Condition: The tail hits the runway.

Caution! Do not pressurize the airplane. Pressurizing the airplane may cause further 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

Note: This Section Reserved For Operator-Developed Information.

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737-600 CFM56-7B22 KG FAA EU-OPS CATD

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
40000	PITCH ATT	**4.5**	**4.0**	**4.0**	
	V/S (FT/MIN)	1800	1100	500	
30000	PITCH ATT	**4.5**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2700	2000	1500	1200
20000	PITCH ATT	**7.5**	**6.5**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3200	2600	2100
10000	PITCH ATT	**10.5**	**9.0**	**8.5**	**8.0**
	V/S (FT/MIN)	5400	4300	3400	2800
SEA LEVEL	PITCH ATT	**14.5**	**12.5**	**11.0**	**10.0**
	V/S (FT/MIN)	6600	5200	4300	3600

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
40000	PITCH ATT	**2.0**	**2.5**	**3.5**	
	%N1	82	85	90	
35000	PITCH ATT	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	82	84	87
30000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**
	%N1	80	81	82	84
25000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**
	%N1	76	77	78	80
20000	PITCH ATT	**1.0**	**1.5**	**2.5**	**3.0**
	%N1	72	74	75	76
15000	PITCH ATT	**1.0**	**1.5**	**2.5**	**3.0**
	%N1	69	70	71	73

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
40000	PITCH ATT	**-1.5**	**-0.5**	**0.0**	**0.5**
	V/S (FT/MIN)	-2800	-2500	-2500	-2800
30000	PITCH ATT	**-3.0**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN)	-3000	-2500	-2200	-2100
20000	PITCH ATT	**-3.0**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-2700	-2200	-2000	-1800
10000	PITCH ATT	**-3.0**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN	-2400	-2000	-1800	-1600
SEA LEVEL	PITCH ATT	**-3.5**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN)	-2200	-1800	-1600	-1500

Flight With Unreliable Airspeed/Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	52	57	62	66
5000	**PITCH ATT**	**5.0**	**5.5**	**5.0**	**5.0**
	%N1	48	54	58	62

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		40	50	60	70
FLAPS 1 (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**
(VREF40 + 50)	%N1	51	56	60	64
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**
(VREF40 + 30)	%N1	52	57	62	66
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**
(VREF40 + 20)	%N1	59	65	70	74

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		40	50	60	70
FLAPS 15	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**
(VREF15 + 10)	%N1	42	47	51	54
FLAPS 30	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.5**
(VREF30 + 10)	%N1	47	52	56	60
FLAPS 40	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF40 + 10)	%N1	54	59	64	68

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	88.4	88.6	88.5	88.2	88.9	91.3	92.9	94.3	94.4	92.7
55	89.2	89.4	89.3	89.1	89.3	90.6	92.3	93.6	93.7	92.0
50	90.0	90.1	90.1	89.9	90.2	90.7	91.6	92.9	93.0	91.3
45	90.7	90.8	90.9	90.7	91.1	91.6	91.6	92.2	92.3	90.6
40	91.5	91.6	91.6	91.4	92.0	92.4	92.4	91.5	91.6	89.9
35	92.0	92.3	92.3	92.2	92.8	93.2	93.2	92.3	91.6	90.0
30	91.3	93.0	93.0	92.9	93.6	94.0	93.9	93.1	92.5	91.0
25	90.5	93.0	93.8	93.6	94.3	94.8	94.6	93.9	93.3	92.0
20	89.8	92.3	94.5	94.3	95.1	95.5	95.3	94.6	94.1	92.9
15	89.1	91.5	93.9	95.1	95.8	96.2	96.0	95.4	94.9	93.9
10	88.3	90.8	93.1	95.3	96.7	96.9	96.6	96.1	95.7	94.8
5	87.5	90.0	92.4	94.5	97.7	97.8	97.3	96.9	96.5	95.7
0	86.8	89.2	91.6	93.7	97.1	98.9	98.3	97.8	97.4	96.6
-5	86.0	88.4	90.8	92.9	96.3	98.8	99.3	98.5	98.2	97.7
-10	85.2	87.6	89.9	92.1	95.5	98.0	99.6	99.4	99.1	98.6
-15	84.4	86.8	89.1	91.2	94.7	97.3	98.8	100.4	100.1	99.6
-20	83.6	86.0	88.3	90.4	93.9	96.5	98.0	100.1	100.6	100.2
-25	82.8	85.2	87.5	89.6	93.1	95.7	97.2	99.2	99.8	99.4
-30	82.0	84.3	86.6	88.7	92.3	94.9	96.4	98.4	98.9	98.6
-35	81.2	83.5	85.8	87.9	91.4	94.0	95.5	97.6	98.1	97.7
-40	80.4	82.6	84.9	87.0	90.6	93.2	94.7	96.7	97.2	96.9

%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	88.5	89.3	89.4									
52	125	55	89.2	90.1	90.3	90.4	90.5							
47	116	50	90.0	90.9	91.0	91.2	91.3	91.4	91.4	91.3				
42	108	45	90.9	91.7	91.9	92.0	92.1	92.2	92.2	92.1	91.8	91.4		
37	99	40	91.8	92.6	92.7	92.8	92.9	93.0	93.0	92.9	92.6	92.2	92.1	92.0
32	90	35	91.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	93.0	92.9
27	81	30	91.2	93.4	94.1	94.5	94.6	94.6	94.6	94.5	94.1	93.8	93.8	93.7
22	72	25	90.5	92.6	93.3	94.0	94.7	95.5	95.4	95.3	95.0	94.6	94.5	94.5
17	63	20	89.7	91.9	92.6	93.3	94.0	94.7	95.2	95.8	96.0	95.7	95.3	95.3
12	54	15	89.0	91.1	91.8	92.5	93.2	93.9	94.5	95.0	95.6	96.2	96.8	96.5
7	45	10	88.3	90.4	91.0	91.7	92.4	93.2	93.7	94.2	94.8	95.4	96.1	96.7
2	36	5	87.5	89.6	90.3	90.9	91.6	92.4	92.9	93.4	94.0	94.6	95.3	95.9
-3	27	0	86.7	88.8	89.5	90.1	90.9	91.6	92.1	92.6	93.2	93.8	94.5	95.1
-8	18	-5	86.0	88.0	88.7	89.4	90.1	90.8	91.3	91.8	92.4	93.0	93.7	94.3
-13	9	-10	85.2	87.2	87.9	88.5	89.2	89.9	90.5	91.0	91.6	92.2	92.9	93.5
-17	1	-15	84.4	86.4	87.1	87.7	88.4	89.1	89.7	90.2	90.8	91.4	92.0	92.7
-22	-8	-20	83.6	85.6	86.3	86.9	87.6	88.3	88.8	89.3	90.0	90.5	91.2	91.9
-27	-17	-25	82.8	84.8	85.4	86.1	86.8	87.5	88.0	88.5	89.1	89.7	90.4	91.1
-32	-26	-30	82.0	84.0	84.6	85.2	85.9	86.6	87.1	87.6	88.3	88.9	89.5	90.2
-37	-35	-35	81.2	83.1	83.8	84.4	85.1	85.8	86.3	86.8	87.4	88.0	88.7	89.4
-42	-44	-40	80.3	82.3	82.9	83.5	84.2	84.9	85.4	85.9	86.5	87.1	87.8	88.5
-47	-53	-45	79.5	81.4	82.1	82.7	83.4	84.0	84.5	85.0	85.7	86.3	87.0	87.6
-52	-62	-50	78.6	80.6	81.2	81.8	82.5	83.1	83.6	84.1	84.8	85.4	86.1	86.8

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
A/C HIGH	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
70	144	146	152
66	139	141	147
62	135	137	143
58	130	132	138
54	125	127	133
50	120	122	128
46	115	117	122
42	110	112	117
38	104	106	111

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Performance Inflight - QRH — Chapter PI-QRH
Advisory Information — Section 11

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	775	65/-45	15	-30	100	10	-5	15	-15	60	15	30
MAX AUTO	1005	65/-60	20	-40	130	0	0	20	-20	100	0	0
AUTOBRAKE 3	1375	105/-105	35	-65	215	0	0	35	-35	165	0	0
AUTOBRAKE 2	1745	150/-150	50	-85	300	20	-25	50	-50	170	50	50
AUTOBRAKE 1	1925	175/-175	60	-100	350	50	-60	55	-55	160	20	230

Good Reported Braking Action

MAX MANUAL	1240	90/-80	30	-55	210	30	-20	30	-25	100	70	160
MAX AUTO	1365	95/-90	30	-55	215	25	-15	30	-25	115	75	175
AUTOBRAKE 3	1585	125/-120	45	-70	255	10	0	45	-40	190	10	20
AUTOBRAKE 2	2010	175/-170	60	-95	345	25	-25	60	-55	200	60	60

Medium Reported Braking Action

MAX MANUAL	1670	140/-130	50	-90	340	70	-55	45	-40	130	190	485
MAX AUTO	1750	140/-130	50	-90	340	65	-45	45	-40	145	190	480
AUTOBRAKE 3	1785	140/-130	50	-90	345	50	-25	50	-45	190	140	445
AUTOBRAKE 2	2060	180/-175	60	-105	395	50	-45	60	-55	200	100	240

Poor Reported Braking Action

MAX MANUAL	2165	200/-180	70	-135	545	175	-110	55	-55	160	420	1205
MAX AUTO	2275	200/-180	70	-135	535	175	-105	55	-55	160	430	1215
AUTOBRAKE 3	2275	200/-180	70	-135	535	175	-100	55	-55	175	420	1210
AUTOBRAKE 2	2320	210/-200	70	-140	555	150	-95	60	-60	200	330	1095

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 50 m.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	750	55/-40	15	-30	95	5	-5	15	-15	55	10	25
MAX AUTO	955	60/-60	20	-35	125	0	0	20	-20	95	0	0
AUTOBRAKE 3	1290	95/-95	30	-60	210	0	0	35	-35	155	0	0
AUTOBRAKE 2	1635	135/-135	45	-85	285	20	-30	45	-45	150	45	45
AUTOBRAKE 1	1800	160/-160	55	-95	335	50	-50	50	-50	145	170	210

Good Reported Braking Action

MAX MANUAL	1200	85/-80	30	-55	205	30	-20	30	-25	100	65	145
MAX AUTO	1315	90/-85	30	-55	210	25	-15	30	-25	115	70	160
AUTOBRAKE 3	1490	110/-105	35	-65	245	10	-5	45	-40	180	10	20
AUTOBRAKE 2	1885	160/-155	55	-95	330	25	-30	55	-50	175	55	55

Medium Reported Braking Action

MAX MANUAL	1595	130/-120	50	-85	335	70	-50	45	-40	130	175	430
MAX AUTO	1665	130/-120	50	-85	330	65	-45	45	-40	145	170	420
AUTOBRAKE 3	1695	135/-125	50	-90	340	50	-30	45	-40	180	135	405
AUTOBRAKE 2	1935	165/-160	60	-100	380	50	-50	55	-50	175	95	215

Poor Reported Braking Action

MAX MANUAL	2045	185/-170	65	-130	525	170	-105	55	-50	150	370	1030
MAX AUTO	2145	180/-165	65	-130	525	170	-100	55	-50	150	375	1035
AUTOBRAKE 3	2145	185/-165	65	-130	525	165	-95	55	-50	170	370	1030
AUTOBRAKE 2	2180	190/-180	65	-135	545	145	-95	60	-55	175	395	940

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 50 m.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	750	55/-40	15	-30	100	10	-5	15	-15	60	10	25
MAX AUTO	930	55/-55	20	-35	125	0	0	20	-20	95	0	0
AUTOBRAKE 3	1255	90/-90	30	-60	205	0	0	30	-30	150	0	0
AUTOBRAKE 2	1590	130/-130	45	-80	285	20	-30	40	-40	145	35	35
AUTOBRAKE 1	1750	155/-150	55	-95	330	50	-50	45	-45	140	150	185

Good Reported Braking Action

BRAKING CONFIGURATION	REF DIST	WT ADJ	ALT ADJ	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	APP SPD ADJ	ONE REV	NO REV
MAX MANUAL	1185	85/-70	30	-55	205	30	-20	30	-25	100	65	140
MAX AUTO	1290	90/-85	30	-55	210	25	-15	30	-25	115	65	150
AUTOBRAKE 3	1445	105/-100	35	-65	245	10	-5	35	-30	175	10	20
AUTOBRAKE 2	1830	150/-145	55	-90	330	25	-30	50	-45	170	45	45

Medium Reported Braking Action

BRAKING CONFIGURATION	REF DIST	WT ADJ	ALT ADJ	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	APP SPD ADJ	ONE REV	NO REV
MAX MANUAL	1565	130/-120	45	-85	330	70	-50	45	-40	130	165	405
MAX AUTO	1635	130/-120	50	-85	330	65	-45	45	-40	145	165	395
AUTOBRAKE 3	1660	130/-120	50	-90	335	55	-30	45	-40	175	140	390
AUTOBRAKE 2	1875	150/-155	55	-100	375	50	-50	55	-50	170	85	205

Poor Reported Braking Action

BRAKING CONFIGURATION	REF DIST	WT ADJ	ALT ADJ	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	APP SPD ADJ	ONE REV	NO REV
MAX MANUAL	2005	180/-165	60	-130	525	165	-105	55	-50	150	345	945
MAX AUTO	2095	180/-165	60	-130	520	170	-100	55	-50	150	355	955
AUTOBRAKE 3	2095	180/-165	65	-130	520	165	-95	55	-50	165	345	945
AUTOBRAKE 2	2125	185/-175	65	-135	530	145	-95	55	-55	170	285	870

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 50 m.
Distances and adjustments for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M) REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
ALL FLAPS UP	VREF40+55	1075	105/-55	30/30	-40	145	10	-10	65
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1300	95/-90	35/45	-65	265	40	-30	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	890	55/-50	20/30	-35	120	10	-10	80
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	865	50/-50	20/25	-35	120	10	-10	85
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	865	50/-50	20/25	-35	120	15	-10	90
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	895	55/-55	20/25	-35	130	10	-10	70
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1255	80/-80	30/40	-55	185	30	-30	135
LEADING EDGE FLAPS TRANSIT	VREF15+15	910	60/-50	20/25	-35	120	10	-10	65
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	810	55/-45	15/20	-30	110	10	-10	60
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	790	50/-45	15/20	-30	110	10	-10	60

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 (305 m 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 (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	800	55/-45	15/25	-30	110	10	-10	60
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	800	55/-45	15/25	-30	110	10	-10	60
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	790	55/-40	20/25	-30	110	10	-5	65
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	800	55/-45	15/20	-30	110	10	-10	60
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	925	70/-50	20/30	-35	120	10	-10	60
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	790	55/-40	20/25	-30	110	10	-5	65
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	800	55/-45	15/20	-30	110	10	-10	60
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	925	70/-50	20/30	-35	120	10	-10	60
TRAILING EDGE FLAPS UP	VREF40+40	970	80/-50	20/30	-35	125	10	-10	65

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 (305 m 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 (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
ALL FLAPS UP	VREF40+55	1455	90/-90	40/55	-60	210	30	-25	80
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1435	115/-105	40/60	-80	320	60	-45	120
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1200	85/-85	30/45	-55	200	30	-25	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1155	80/-80	30/40	-55	195	30	-25	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1140	80/-80	30/40	-55	195	30	-25	115
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1105	75/-75	25/40	-50	185	25	-20	90
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1420	95/-90	35/50	-65	225	45	-40	150
LEADING EDGE FLAPS TRANSIT	VREF15+15	1225	80/-80	30/40	-55	195	25	-25	85
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1105	75/-75	25/30	-50	190	25	-25	90
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1065	70/-70	25/35	-50	185	25	-25	90

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 (305 m 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 CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M) REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	1065	70/-70	25/35	-50	180	25	-20	80
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1065	70/-70	25/35	-50	180	25	-20	80
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1040	70/-70	25/35	-50	175	25	-20	85
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1065	70/-70	25/30	-50	180	25	-20	80
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1250	80/-80	30/45	-55	195	25	-25	80
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1040	70/-70	25/35	-50	175	25	-20	85
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1065	70/-70	25/30	-50	180	25	-20	80
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1250	80/-80	30/45	-55	195	25	-25	80
TRAILING EDGE FLAPS UP	VREF40+40	1310	80/-80	35/45	-55	200	25	-25	80

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 (305 m 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 DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
ALL FLAPS UP	VREF40+55	2005	145/-150	65/85	-95	345	80	-60	110
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1790	155/-140	55/80	-115	490	150	-90	140
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1610	135/-130	50/70	-85	325	80	-60	145
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1530	130/-120	45/65	-85	320	80	-60	140
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1500	125/-120	45/65	-85	315	80	-60	140
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1480	120/-115	45/60	-80	310	65	-50	115
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1945	150/-145	55/80	-100	355	95	-80	185
LEADING EDGE FLAPS TRANSIT	VREF15+15	1640	130/-125	50/70	-85	320	70	-55	115
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1555	125/-125	45/60	-85	325	75	-60	125
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1470	115/-115	40/60	-85	315	70	-55	120

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 (305 m 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 DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	1430	115/-110	40/55	-80	300	60	-45	105
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1430	115/-110	40/55	-80	300	60	-45	105
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1385	110/-105	40/55	-75	290	60	-45	110
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1430	115/-110	40/60	-80	300	55	-45	105
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1695	130/-125	50/70	-85	320	70	-55	110
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1385	110/-105	40/55	-75	290	60	-45	110
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1430	115/-110	40/60	-80	300	55	-45	105
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1695	130/-125	50/70	-85	320	70	-55	110
TRAILING EDGE FLAPS UP	VREF40+40	1785	135/-130	55/75	-85	330	65	-55	105

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 (305 m 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 (M): REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
ALL FLAPS UP	VREF40+55	2610	220/-215	90/115	-140	545	200	-120	135
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2340	220/-205	75/110	-190	890	420	-200	150
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2055	195/-180	70/100	-130	510	200	-115	170
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1940	180/-170	65/95	-125	500	190	-110	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1890	175/-160	60/90	-120	495	190	-110	155
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1900	175/-160	60/90	-120	490	175	-100	140
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2480	215/-200	75/115	-145	545	190	-145	205
LEADING EDGE FLAPS TRANSIT	VREF15+15	2100	185/-175	70/100	-125	505	180	-105	135
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2100	190/-180	65/95	-135	535	235	-130	155
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1965	175/-165	60/85	-130	520	170	-120	150

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 (305 m 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 (M) REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 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 ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1775	160/-150	55/80	-115	455	145	-95	130
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2185	185/-180	75/100	-125	505	180	-105	130
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1775	160/-150	55/80	-115	455	145	-95	130
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	2185	185/-180	75/100	-125	505	180	-105	130
TRAILING EDGE FLAPS UP	VREF40+40	2310	195/-190	80/110	-130	515	180	-110	130

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 (305 m 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																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
70	0	13.0	15.1	17.6	19.6	22.9	26.6	27.2	31.6	36.8	35.6	41.4	48.2	44.9	52.1	60.7	54.4	63.0	73.4
	10	13.4	15.6	18.2	20.3	23.6	27.5	28.1	32.6	38.0	36.8	42.7	49.8	46.3	53.8	62.7	56.1	65.0	75.8
	15	13.6	15.9	18.5	20.6	24.0	28.0	28.5	33.2	38.6	37.4	43.4	50.6	47.1	54.6	63.6	57.0	66.0	76.9
	20	13.8	16.1	18.8	20.9	24.4	28.4	29.0	33.7	39.2	38.0	44.1	51.4	47.8	55.4	64.6	57.9	67.0	78.1
	30	14.3	16.7	19.4	21.6	25.1	29.3	29.8	34.7	40.4	39.1	45.4	52.9	49.2	57.1	66.5	59.6	68.9	80.3
	40	14.6	17.1	19.9	22.1	25.8	30.0	30.6	35.6	41.4	40.1	46.6	54.2	50.5	58.5	68.2	61.1	70.7	82.4
	50	14.7	17.2	20.0	22.3	26.0	30.3	30.9	36.0	42.0	40.6	47.2	55.1	51.2	59.5	69.5	62.2	72.1	84.2
60	0	11.5	13.5	15.7	17.3	20.2	23.5	23.8	27.7	32.2	31.0	36.1	42.0	39.0	45.2	52.7	47.6	55.1	64.3
	10	11.9	13.9	16.2	17.9	20.8	24.3	24.6	28.6	33.3	32.0	37.3	43.4	40.2	46.7	54.5	49.1	56.9	66.4
	15	12.1	14.1	16.5	18.2	21.2	24.7	25.0	29.1	33.8	32.6	37.8	44.1	40.9	47.5	55.3	49.9	57.8	67.4
	20	12.3	14.4	16.7	18.5	21.5	25.0	25.4	29.5	34.4	33.1	38.4	44.8	41.5	48.2	56.1	50.7	58.7	68.4
	30	12.7	14.8	17.3	19.0	22.2	25.8	26.1	30.4	35.4	34.1	39.6	46.1	42.8	49.6	57.8	52.2	60.4	70.4
	40	13.0	15.2	17.7	19.5	22.7	26.5	26.8	31.2	36.3	34.9	40.6	47.3	43.9	50.9	59.3	53.5	62.0	72.2
	50	13.1	15.3	17.8	19.7	22.9	26.7	27.1	31.5	36.7	35.3	41.1	48.0	44.4	51.7	60.3	54.3	63.1	73.6
50	0	10.1	11.8	13.8	15.0	17.5	20.3	20.4	23.7	27.6	26.4	30.7	35.8	33.0	38.4	44.7	40.1	46.6	54.3
	10	10.5	12.2	14.3	15.5	18.0	21.0	21.1	24.5	28.6	27.3	31.8	37.0	34.1	39.7	46.2	41.5	48.1	56.1
	15	10.7	12.4	14.5	15.7	18.3	21.4	21.4	24.9	29.0	27.7	32.3	37.6	34.7	40.3	46.9	42.1	48.9	56.9
	20	10.8	12.6	14.7	16.0	18.6	21.7	21.7	25.3	29.5	28.2	32.8	38.2	35.2	40.9	47.6	42.8	49.6	57.8
	30	11.2	13.0	15.2	16.5	19.2	22.4	22.4	26.1	30.4	29.0	33.8	39.3	36.3	42.1	49.1	44.0	51.1	59.5
	40	11.5	13.4	15.6	16.9	19.7	22.9	23.0	26.7	31.1	29.8	34.6	40.3	37.2	43.2	50.3	45.2	52.4	61.0
	50	11.5	13.4	15.7	17.0	19.9	23.1	23.2	27.0	31.5	30.1	35.0	40.8	37.6	43.8	51.1	45.8	53.2	62.1
40	0	8.8	10.2	11.9	12.7	14.8	17.2	17.0	19.8	23.0	21.7	25.3	29.5	27.0	31.4	36.6	32.6	37.9	44.2
	10	9.1	10.6	12.3	13.1	15.3	17.8	17.5	20.4	23.8	22.5	26.2	30.5	27.9	32.4	37.8	33.7	39.2	45.7
	15	9.2	10.7	12.5	13.3	15.5	18.1	17.8	20.8	24.2	22.8	26.6	31.0	28.3	32.9	38.4	34.3	39.8	46.4
	20	9.4	10.9	12.7	13.5	15.8	18.3	18.1	21.1	24.6	23.2	27.0	31.4	28.8	33.5	39.0	34.8	40.4	47.1
	30	9.7	11.3	13.1	13.9	16.3	18.9	18.7	21.7	25.3	23.9	27.8	32.4	29.7	34.5	40.2	35.9	41.7	48.5
	40	9.9	11.5	13.4	14.3	16.7	19.4	19.1	22.3	25.9	24.5	28.5	33.2	30.4	35.3	41.2	36.8	42.7	49.7
	50	9.9	11.6	13.5	14.4	16.8	19.5	19.3	22.5	26.2	24.7	28.8	33.6	30.7	35.8	41.7	37.2	43.3	50.5

***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	8.0	16.5	25.4	34.7	44.3	54.2	64.1	74.1	84.1
	MAX AUTO	7.6	15.6	24.0	32.8	42.0	51.6	61.8	72.4	83.5
	AUTOBRAKE 3	7.3	14.8	22.4	30.4	38.7	47.6	57.0	67.2	78.1
	AUTOBRAKE 2	6.8	13.7	20.6	27.7	35.1	42.8	50.9	59.6	68.9
	AUTOBRAKE 1	6.4	12.7	18.9	25.2	31.7	38.6	46.0	54.1	63.0

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

Two Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.3	15.2	23.5	32.2	41.2	50.4	59.7	69.0	78.3
LANDING	MAX AUTO	6.3	13.1	20.5	28.3	36.7	45.7	55.2	65.3	76.0
LANDING	AUTOBRAKE 3	4.7	9.9	15.6	21.9	28.7	36.0	43.9	52.3	61.2
LANDING	AUTOBRAKE 2	2.7	6.1	10.0	14.5	19.5	24.9	30.8	37.0	43.6
LANDING	AUTOBRAKE 1	1.8	4.0	6.5	9.4	12.8	16.6	21.0	25.9	31.5

Cooling Time (Minutes)

	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.

Intentionally
Blank

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	96.0	95.8	95.6	95.4	95.1	94.7	94.2	93.9	93.1
15	96.6	96.4	96.1	96.0	95.9	95.4	95.0	94.7	94.0
10	97.2	97.1	96.7	96.6	96.6	96.2	95.7	95.5	94.9
5	97.4	97.8	97.5	97.3	97.3	96.9	96.5	96.3	95.8
0	96.7	98.0	98.4	98.2	98.1	97.7	97.4	97.1	96.7
-5	95.9	97.2	98.4	99.1	99.0	98.5	98.2	98.0	97.7
-10	95.1	96.4	97.6	98.9	99.8	99.4	99.1	98.9	98.6
-15	94.3	95.7	96.9	98.1	99.4	100.3	100.0	99.8	99.6
-20	93.5	94.9	96.1	97.3	98.6	99.8	100.3	100.1	99.9
-25	92.7	94.1	95.3	96.5	97.8	98.9	99.5	99.3	99.1
-30	91.8	93.3	94.5	95.7	96.9	98.1	98.6	98.4	98.2
-35	91.0	92.5	93.6	94.8	96.1	97.2	97.8	97.6	97.4
-40	90.1	91.7	92.8	94.0	95.3	96.4	96.9	96.7	96.5

%N1 Adjustments for Engine Bleed

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	96.0	96.9	97.8	98.7	99.5	98.9	98.0	96.8	95.5	93.9	92.4	91.1
200	.63	95.3	96.2	97.1	98.0	98.8	99.7	99.4	98.6	97.7	96.7	95.5	94.4
240	.74	94.4	95.3	96.1	97.0	97.9	98.7	99.6	100.0	99.2	98.4	97.6	96.6
280	.86	93.6	94.5	95.4	96.3	97.1	98.0	98.8	99.6	100.4	100.1	99.2	98.4
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	95.8	96.7	97.6	98.5	99.4	99.1	98.3	97.2	96.0	94.6	93.2	92.0
200	.60	95.4	96.4	97.2	98.1	99.0	99.9	99.8	98.8	97.9	96.9	95.7	94.6
240	.71	94.3	95.2	96.1	97.0	97.9	98.7	99.6	100.1	99.4	98.8	97.9	96.9
280	.82	93.1	94.0	94.8	95.7	96.5	97.4	98.2	99.0	99.8	99.6	98.8	98.0
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	96.7	97.6	98.4	99.3	100.1	99.3	98.4	97.2	95.9	94.5	93.1	91.9
200	.58	96.3	97.2	98.1	99.0	99.8	100.7	99.8	98.9	97.9	96.7	95.5	94.4
240	.68	95.2	96.1	97.0	97.8	98.7	99.5	100.4	100.1	99.5	98.6	97.6	96.6
280	.79	93.6	94.4	95.3	96.1	97.0	97.8	98.6	99.4	99.8	99.0	98.1	97.3
320	.89	92.9	93.8	94.7	95.5	96.3	97.2	98.0	98.8	99.6	100.3	100.0	99.1
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	96.7	97.5	98.4	99.3	100.2	100.3	99.5	98.4	97.2	95.8	94.4	93.1
200	.55	96.4	97.3	98.1	99.0	99.9	100.7	100.9	100.0	99.0	97.9	96.6	95.4
240	.66	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.6	99.8	99.0	98.0	97.0
280	.76	93.1	94.0	94.8	95.6	96.5	97.3	98.1	98.9	99.7	99.0	98.1	97.2
320	.85	91.7	92.5	93.4	94.2	95.0	95.8	96.6	97.4	98.2	99.0	99.2	98.3
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	97.4	98.3	99.2	100.0	100.9	100.5	99.5	98.4	97.1	95.6	94.3	93.0
200	.53	96.8	97.7	98.6	99.4	100.3	101.1	100.6	99.6	98.6	97.4	96.2	95.0
240	.63	95.6	96.4	97.3	98.1	99.0	99.8	100.6	100.3	99.4	98.5	97.4	96.5
280	.73	93.5	94.3	95.2	96.0	96.8	97.6	98.4	99.2	99.3	98.4	97.4	96.7
320	.82	91.3	92.2	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	97.7	96.9
360	.91	91.3	92.2	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	99.3

%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	97.3	98.1	99.0	99.9	100.7	101.5	100.5	99.5	98.3	96.9	95.6	94.3
200	.51	96.2	97.1	98.0	98.8	99.7	100.5	101.0	100.1	99.1	98.0	96.8	95.6
240	.60	94.9	95.8	96.7	97.5	98.3	99.2	100.0	100.6	99.6	98.6	97.6	96.7
280	.70	92.9	93.7	94.6	95.4	96.2	97.0	97.8	98.6	99.4	98.6	97.6	96.8
320	.79	90.8	91.6	92.5	93.3	94.1	94.9	95.6	96.4	97.2	97.9	97.8	97.1
360	.88	90.0	90.9	91.7	92.5	93.4	94.2	95.0	95.7	96.5	97.3	98.0	98.6
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.1	98.9	99.8	100.7	101.5	101.6	100.6	99.5	98.3	96.9	95.7	94.4
200	.49	96.7	97.6	98.5	99.3	100.1	100.9	100.8	99.8	98.8	97.6	96.5	95.4
240	.58	95.0	95.8	96.7	97.5	98.3	99.1	99.9	99.7	98.8	97.8	96.8	95.9
280	.67	93.1	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.8	96.8	96.1
320	.76	90.8	91.7	92.5	93.3	94.1	94.9	95.7	96.5	97.2	97.8	97.1	96.4
360	.85	89.5	90.3	91.2	92.0	92.9	93.7	94.5	95.3	96.1	96.9	97.6	97.4
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	97.3	98.2	99.1	99.9	100.7	101.5	100.4	99.3	98.1	96.8	95.6	94.4
200	.48	96.1	96.9	97.8	98.6	99.4	100.2	100.6	99.6	98.6	97.4	96.3	95.3
240	.57	94.5	95.3	96.1	96.9	97.8	98.6	99.3	99.7	98.7	97.6	96.7	95.8
280	.66	92.7	93.5	94.3	95.1	95.9	96.7	97.5	98.3	98.8	97.7	96.7	96.0
320	.75	90.2	91.1	91.9	92.7	93.5	94.4	95.2	95.9	96.7	97.5	96.9	96.2
360	.83	88.7	89.6	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	96.9
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	96.7	97.6	98.4	99.2	100.1	100.2	99.0	97.8	96.6	95.5	94.4	93.3
200	.46	95.5	96.4	97.2	98.0	98.8	99.6	99.3	98.1	97.0	96.0	95.0	94.0
240	.55	94.1	94.9	95.8	96.5	97.3	98.1	98.9	98.5	97.3	96.4	95.5	94.7
280	.63	92.5	93.3	94.1	94.9	95.7	96.4	97.2	97.9	97.6	96.7	95.8	95.1
320	.72	90.1	91.0	91.8	92.7	93.5	94.3	95.1	95.9	96.7	96.8	96.0	95.3
360	.80	88.4	89.2	90.1	90.9	91.7	92.6	93.4	94.2	95.0	95.8	96.3	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	95.3	96.1	97.0	97.8	98.6	99.4	98.8	97.4	96.2	95.2	94.2	93.2
200	.44	94.2	95.0	95.8	96.6	97.4	98.2	98.9	97.8	96.4	95.5	94.6	93.7
240	.53	92.8	93.6	94.4	95.2	96.0	96.8	97.5	98.2	97.0	95.9	95.1	94.3
280	.61	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.4	96.5	95.6	94.9
320	.69	89.1	90.0	90.8	91.6	92.5	93.3	94.1	94.9	95.7	96.5	95.8	95.1
360	.77	87.4	88.3	89.1	90.0	90.8	91.6	92.4	93.2	94.0	94.8	95.6	95.4

%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	94.5	95.3	96.1	96.9	97.7	98.4	97.3	95.9	94.9	94.0	93.0	92.1
200	.42	93.4	94.2	95.0	95.8	96.6	97.3	97.6	96.3	95.2	94.4	93.5	92.6
240	.51	91.9	92.7	93.5	94.3	95.1	95.9	96.7	96.7	95.6	94.7	94.0	93.2
280	.59	90.4	91.3	92.1	92.9	93.8	94.6	95.4	96.1	96.1	95.2	94.4	93.7
320	.67	88.9	89.7	90.5	91.4	92.2	93.0	93.8	94.6	95.4	95.5	94.8	94.1
360	.75	87.3	88.2	89.0	89.8	90.7	91.5	92.3	93.1	93.9	94.7	95.1	94.5
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	93.0	93.8	94.6	95.4	96.1	96.9	97.2	96.0	94.8	94.0	93.1	92.2
200	.41	91.6	92.4	93.2	94.0	94.8	95.6	96.4	96.1	95.0	94.1	93.3	92.5
240	.49	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	95.4	94.5	93.7	92.9
280	.57	89.0	89.9	90.7	91.5	92.4	93.2	94.0	94.8	95.6	94.9	94.1	93.4
320	.64	87.8	88.6	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1	94.5	93.8
360	.72	86.5	87.3	88.2	89.0	89.8	90.6	91.4	92.2	93.0	93.8	94.6	94.2
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	92.4	93.2	94.1	94.9	95.7	96.4	96.4	95.5	94.6	93.8	92.9	92.0
200	.39	91.0	91.9	92.7	93.5	94.3	95.1	95.9	95.1	94.2	93.4	92.6	91.8
240	.47	90.0	90.9	91.7	92.5	93.3	94.1	94.9	95.4	94.6	93.7	93.0	92.3
280	.54	88.9	89.8	90.6	91.4	92.3	93.1	93.9	94.7	94.9	94.1	93.4	92.7
320	.62	87.8	88.7	89.5	90.3	91.2	92.0	92.8	93.5	94.3	94.5	93.8	93.1
360	.69	86.7	87.5	88.3	89.1	90.0	90.8	91.5	92.3	93.1	93.9	94.2	93.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	91.8	92.6	93.4	94.2	95.0	95.8	95.5	94.8	94.0	93.2	92.4	91.5
200	.38	90.7	91.5	92.3	93.1	93.9	94.7	95.2	94.3	93.5	92.7	92.0	91.2
240	.45	89.8	90.7	91.5	92.3	93.1	93.9	94.7	94.7	93.8	93.1	92.4	91.6
280	.52	88.9	89.8	90.6	91.4	92.2	93.0	93.8	94.6	94.2	93.5	92.8	92.1
320	.60	87.9	88.8	89.6	90.4	91.2	92.0	92.8	93.6	94.3	93.9	93.2	92.5
360	.67	86.8	87.7	88.5	89.3	90.1	90.9	91.6	92.4	93.2	93.9	93.5	92.9

%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	90.5	91.4	92.2	93.0	93.8	94.6	95.4	94.7	94.1	93.3	92.5	91.7
200	.36	89.6	90.4	91.3	92.1	92.9	93.7	94.5	94.5	93.7	92.9	92.2	91.4
240	.43	88.9	89.7	90.6	91.4	92.2	93.0	93.8	94.5	94.0	93.1	92.4	91.7
280	.51	88.1	89.0	89.8	90.6	91.4	92.2	93.0	93.8	94.4	93.6	92.8	92.2
320	.58	87.2	88.0	88.8	89.6	90.4	91.2	92.0	92.8	93.5	93.9	93.2	92.5
360	.65	86.2	87.0	87.8	88.6	89.4	90.2	91.0	91.7	92.5	93.2	93.6	92.9
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	89.1	89.9	90.7	91.5	92.3	93.1	93.7	93.5	93.2	92.5	91.8	91.0
200	.33	88.7	89.5	90.3	91.1	91.8	92.6	93.4	93.3	92.9	92.3	91.6	90.8
240	.40	88.1	88.9	89.7	90.5	91.3	92.0	92.8	93.3	92.5	91.8	91.1	90.3
280	.46	87.5	88.3	89.1	89.8	90.6	91.4	92.2	92.9	92.9	92.1	91.4	90.7
320	.53	86.8	87.6	88.3	89.1	89.9	90.7	91.4	92.2	92.9	92.5	91.8	91.1
360	.59	86.0	86.7	87.5	88.3	89.1	89.8	90.6	91.3	92.0	92.8	92.2	91.5
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	88.8	89.6	90.4	91.2	91.9	92.7	93.1	92.9	92.6	91.8	91.1	90.3
200	.32	88.5	89.3	90.0	90.8	91.6	92.3	93.1	92.8	92.5	91.8	91.1	90.3
240	.38	87.9	88.7	89.5	90.3	91.0	91.8	92.5	92.6	91.8	91.0	90.3	89.6
280	.45	87.4	88.1	88.9	89.7	90.5	91.2	92.0	92.7	92.2	91.4	90.7	90.0
320	.51	86.7	87.5	88.3	89.0	89.8	90.5	91.3	92.0	92.5	91.8	91.1	90.4
360	.57	85.9	86.7	87.5	88.2	89.0	89.7	90.5	91.2	91.9	92.2	91.5	90.7
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	87.7	88.5	89.3	90.0	90.8	91.6	92.3	92.3	91.8	91.2	90.5	89.7
200	.31	87.4	88.2	89.0	89.7	90.5	91.3	92.0	92.4	92.0	91.5	90.8	90.0
240	.37	86.9	87.7	88.5	89.3	90.0	90.8	91.5	92.3	91.9	91.2	90.4	89.7
280	.43	86.4	87.2	87.9	88.7	89.5	90.2	90.9	91.7	92.1	91.4	90.7	89.9
320	.49	85.8	86.6	87.4	88.1	88.9	89.6	90.4	91.1	91.8	91.8	91.1	90.3
360	.55	85.1	85.9	86.7	87.4	88.1	88.9	89.6	90.3	91.1	91.8	91.4	90.7

%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
70	67	241	21800	20300	18100
65	62	233	24300	22900	21300
60	57	225	26500	25500	24300
55	53	215	28800	27800	26700
50	48	205	30900	30100	29100
45	43	195	33000	32300	31400
40	38	184	35400	34700	33800
35	33	172	38000	37300	36500

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
140	130	121	113	106	100	95	90	85	81	78
280	259	241	226	212	200	189	180	171	163	156
419	388	362	339	318	300	284	269	256	244	234
559	518	482	451	424	400	378	359	342	326	312
698	647	602	564	530	500	473	449	427	408	390
837	776	723	677	636	600	568	539	513	489	468
976	905	843	789	742	700	663	629	599	571	546
1115	1033	963	902	848	800	757	719	684	653	624
1253	1162	1083	1014	954	900	852	809	770	734	702
1392	1291	1203	1127	1060	1000	947	899	855	816	780
1531	1420	1324	1240	1166	1100	1041	989	941	898	858
1670	1549	1444	1352	1272	1200	1136	1079	1027	980	936
1809	1677	1564	1465	1377	1300	1231	1169	1112	1061	1015
1948	1806	1684	1577	1483	1400	1325	1258	1198	1143	1093
2087	1936	1805	1690	1589	1500	1420	1348	1283	1224	1171
2227	2065	1925	1803	1695	1600	1515	1438	1369	1306	1249

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 KG)								
	35	40	45	50	55	60	65	70	
100	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0:17
200	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1	0:34
300	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	0:51
400	1.5	1.6	1.8	1.9	2.1	2.3	2.4	2.5	1:08
500	1.9	2.0	2.2	2.4	2.6	2.8	3.0	3.2	1:25
600	2.2	2.4	2.7	2.9	3.2	3.4	3.6	3.9	1:42
700	2.6	2.8	3.1	3.4	3.7	4.0	4.2	4.5	1:59
800	2.9	3.2	3.5	3.9	4.2	4.5	4.8	5.1	2:15
900	3.3	3.6	4.0	4.3	4.7	5.1	5.4	5.8	2:32
1000	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	2:49
1100	3.9	4.4	4.8	5.3	5.7	6.2	6.6	7.0	3:06
1200	4.3	4.7	5.2	5.7	6.2	6.7	7.2	7.6	3:23
1300	4.6	5.1	5.6	6.2	6.7	7.2	7.7	8.3	3:39
1400	4.9	5.5	6.0	6.6	7.2	7.8	8.3	8.9	3:56
1500	5.3	5.8	6.4	7.1	7.7	8.3	8.9	9.5	4:13
1600	5.6	6.2	6.8	7.5	8.2	8.8	9.4	10.1	4:30

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
70	16400	13800	11300
65	20600	17200	14300
60	23800	21300	18200
55	26600	25100	22200
50	29200	28000	26300
45	31600	30800	29500
40	34000	33200	32100
35	36600	35900	34800

With engine anti-ice on, decrease altitude capability by 2000 ft.
With engine and wing anti-ice on, decrease altitude capability by 7000 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)											
		10	15	17	19	21	23	25	27	29	31	33	35
70	%N1	86.2	90.5	92.1	93.8								
	MACH	.510	.562	.582	.595								
	KIAS	282	284	283	278								
	FF/ENG	2470	2497	2499	2463								
65	%N1	84.1	88.4	90.2	91.9	93.7	96.2						
	MACH	.491	.542	.563	.584	.596	.612						
	KIAS	271	274	274	273	268	265						
	FF/ENG	2280	2305	2309	2310	2279	2303						
60	%N1	82.0	86.3	88.0	89.8	91.6	93.5	96.2					
	MACH	.471	.521	.543	.564	.585	.597	.614					
	KIAS	261	263	263	263	263	258	254					
	FF/ENG	2097	2115	2119	2121	2123	2098	2132					
55	%N1	79.7	83.9	85.7	87.4	89.2	91.1	93.1	95.9				
	MACH	.453	.498	.520	.541	.563	.585	.597	.614				
	KIAS	250	251	252	252	253	252	247	244				
	FF/ENG	1924	1926	1929	1931	1935	1940	1922	1958				
50	%N1	77.3	81.3	83.1	84.9	86.7	88.5	90.4	92.4	95.4			
	MACH	.434	.475	.495	.516	.538	.561	.583	.596	.613			
	KIAS	240	239	239	240	241	241	241	236	233			
	FF/ENG	1760	1740	1741	1743	1746	1750	1759	1750	1779			
45	%N1	74.9	78.6	80.2	82.0	83.8	85.6	87.5	89.4	91.5	94.4	98.2	
	MACH	.415	.452	.469	.489	.511	.533	.556	.578	.593	.610	.632	
	KIAS	229	227	227	227	228	229	229	229	225	222	220	
	FF/ENG	1602	1569	1560	1556	1559	1563	1569	1583	1578	1599	1673	
40	%N1	72.2	75.7	77.3	78.9	80.6	82.5	84.3	86.1	88.0	90.3	93.1	96.7
	MACH	.395	.429	.445	.462	.480	.502	.525	.548	.571	.589	.604	.626
	KIAS	218	215	215	214	214	215	216	216	216	214	210	208
	FF/ENG	1448	1407	1392	1381	1373	1377	1384	1394	1406	1409	1417	1475
35	%N1	69.1	72.7	74.1	75.6	77.3	79.0	80.7	82.5	84.4	86.3	88.6	91.3
	MACH	.375	.406	.420	.435	.452	.469	.490	.513	.536	.560	.584	.597
	KIAS	207	203	202	202	201	201	201	202	203	203	202	198
	FF/ENG	1302	1255	1236	1219	1205	1197	1200	1211	1219	1228	1241	1237

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	539	513	489	468
1263	1137	1027	939	865	800	757	718	683	651	623
1585	1425	1287	1175	1082	1000	947	897	853	813	777
1910	1716	1547	1412	1299	1200	1136	1076	1023	975	932
2237	2008	1810	1649	1517	1400	1324	1255	1193	1136	1087
2567	2302	2072	1887	1734	1600	1513	1434	1362	1297	1240
2899	2597	2336	2126	1952	1800	1702	1613	1531	1459	1394

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

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	1.2	0:46	1.1	0:43	1.0	0:41	0.9	0:39	0.8	0:38
400	2.6	1:30	2.3	1:25	2.1	1:20	2.0	1:15	1.8	1:12
600	3.8	2:14	3.5	2:07	3.3	2:00	3.0	1:52	2.8	1:46
800	5.1	2:59	4.7	2:50	4.4	2:39	4.1	2:29	3.8	2:21
1000	6.4	3:45	5.9	3:33	5.5	3:20	5.1	3:07	4.8	2:56
1200	7.7	4:31	7.1	4:16	6.6	4:01	6.1	3:45	5.7	3:31
1400	8.9	5:18	8.3	5:00	7.7	4:42	7.1	4:23	6.7	4:07
1600	10.1	6:05	9.4	5:45	8.7	5:24	8.1	5:02	7.6	4:43
1800	11.3	6:53	10.5	6:30	9.8	6:06	9.1	5:41	8.6	5:19

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG) 30	40	50	60	70
1	-0.1	-0.1	0.0	0.1	0.3
2	-0.3	-0.2	0.0	0.2	0.6
3	-0.5	-0.2	0.0	0.4	1.0
4	-0.6	-0.3	0.0	0.5	1.3
5	-0.8	-0.4	0.0	0.7	1.7
6	-1.0	-0.5	0.0	0.8	2.0
7	-1.1	-0.6	0.0	0.9	2.3
8	-1.3	-0.7	0.0	1.0	2.5
9	-1.5	-0.7	0.0	1.2	2.8
10	-1.7	-0.8	0.0	1.3	3.0
11	-1.8	-0.9	0.0	1.4	3.3
12	-2.0	-1.0	0.0	1.5	3.5

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
70	%N1	75.7	78.5	82.7	87.1	92.3			
	KIAS	229	229	230	231	233			
	FF/ENG	2240	2230	2230	2250	2290			
65	%N1	73.6	76.5	80.7	85.0	89.7	98.0		
	KIAS	221	221	222	223	224	225		
	FF/ENG	2080	2070	2060	2070	2090	2260		
60	%N1	71.3	74.4	78.4	82.8	87.4	94.0		
	KIAS	212	212	213	214	215	216		
	FF/ENG	1930	1910	1900	1900	1910	1990		
55	%N1	69.0	71.9	76.0	80.4	84.9	90.1		
	KIAS	203	203	204	204	205	207		
	FF/ENG	1770	1750	1740	1730	1730	1770		
50	%N1	66.5	69.2	73.6	77.7	82.2	87.0	95.2	
	KIAS	193	194	194	195	196	197	198	
	FF/ENG	1620	1600	1580	1570	1560	1580	1700	
45	%N1	63.7	66.5	70.6	74.9	79.3	84.0	89.7	
	KIAS	183	183	184	185	185	186	187	
	FF/ENG	1470	1450	1430	1420	1400	1400	1460	
40	%N1	60.5	63.6	67.5	71.9	76.1	80.7	85.6	94.4
	KIAS	177	177	177	177	177	177	177	178
	FF/ENG	1330	1310	1280	1270	1240	1240	1270	1370
35	%N1	57.3	60.1	64.3	68.4	72.9	77.3	81.9	87.7
	KIAS	170	170	170	170	170	170	170	170
	FF/ENG	1180	1160	1150	1130	1100	1090	1110	1140

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
70	23100	19900	16300
65	25900	24000	20200
60	28400	26900	25100
55	30700	29500	27900
50	32800	31800	30600
45	35000	34000	32900
40	37400	36400	35300
35	40100	39200	38100

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)										
		10	21	23	25	27	29	31	33	35	37	39
70	%N1	80.7	90.0	92.0								
	MACH	.440	.541	.557								
	KIAS	243	242	240								
	FF/ENG	1980	1970	1959								
65	%N1	78.7	88.1	89.7	91.9	94.8						
	MACH	.425	.524	.543	.560	.578						
	KIAS	235	234	233	231	229						
	FF/ENG	1835	1820	1814	1812	1845						
60	%N1	76.6	85.8	87.6	89.3	91.6	94.7					
	MACH	.409	.504	.525	.544	.562	.580					
	KIAS	226	225	225	224	222	220					
	FF/ENG	1694	1666	1667	1664	1669	1703					
55	%N1	74.4	83.4	85.2	87.0	88.7	91.1	94.4				
	MACH	.393	.484	.504	.525	.545	.562	.581				
	KIAS	217	216	216	216	215	213	211				
	FF/ENG	1554	1517	1515	1519	1522	1527	1561				
50	%N1	71.8	80.9	82.6	84.4	86.2	88.0	90.4	93.7			
	MACH	.376	.463	.482	.502	.523	.544	.561	.580			
	KIAS	207	206	206	206	206	205	203	201			
	FF/ENG	1417	1371	1368	1370	1377	1381	1383	1415			
45	%N1	69.0	78.1	79.8	81.5	83.3	85.1	86.9	89.3	92.7		
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578		
	KIAS	197	196	196	196	196	196	195	193	191		
	FF/ENG	1285	1229	1222	1224	1231	1236	1239	1240	1267		
40	%N1	66.1	74.9	76.7	78.4	80.1	81.9	83.8	85.6	87.8	91.6	
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573	
	KIAS	187	185	185	185	185	185	185	185	183	181	
	FF/ENG	1158	1094	1081	1081	1088	1091	1095	1097	1098	1122	
35	%N1	63.0	71.6	73.2	74.9	76.7	78.4	80.2	82.0	83.9	86.4	90.2
	MACH	.321	.392	.408	.425	.442	.461	.481	.503	.526	.547	.566
	KIAS	177	174	174	173	173	173	173	173	173	172	170
	FF/ENG	1034	964	949	944	949	950	952	953	955	962	982

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
343	302	267	240	219	200	187	176	166	157	150
694	610	538	483	438	400	376	353	333	316	300
1052	921	811	726	658	600	563	530	499	472	449
1416	1238	1087	971	879	800	750	705	664	629	598
1788	1559	1365	1217	1101	1000	937	880	829	785	746
2166	1884	1646	1465	1322	1200	1124	1056	994	940	893
2554	2215	1930	1714	1545	1400	1311	1230	1158	1095	1040
2950	2551	2217	1965	1768	1600	1497	1405	1322	1249	1186
3355	2893	2507	2217	1992	1800	1683	1578	1485	1402	1331

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	2.2	0:53	2.0	0:51	1.8	0:49	1.6	0:47	1.5	0:45
400	4.5	1:45	4.1	1:39	3.8	1:34	3.5	1:29	3.2	1:25
600	6.7	2:37	6.2	2:29	5.7	2:21	5.3	2:13	4.9	2:06
800	8.9	3:31	8.3	3:20	7.6	3:08	7.0	2:57	6.6	2:47
1000	11.0	4:27	10.3	4:12	9.5	3:57	8.8	3:43	8.2	3:29
1200	13.1	5:23	12.2	5:05	11.3	4:46	10.5	4:29	9.8	4:12
1400	15.2	6:21	14.1	5:59	13.1	5:37	12.1	5:16	11.4	4:56
1600	17.2	7:21	16.0	6:55	14.8	6:29	13.7	6:04	12.9	5:41
1800	19.1	8:22	17.8	7:52	16.5	7:22	15.3	6:53	14.4	6:26

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
2	-0.4	-0.2	0.0	0.2	0.5
4	-0.8	-0.4	0.0	0.5	1.0
6	-1.2	-0.6	0.0	0.7	1.5
8	-1.6	-0.8	0.0	0.9	2.0
10	-1.9	-1.0	0.0	1.2	2.5
12	-2.3	-1.2	0.0	1.4	3.0
14	-2.7	-1.4	0.0	1.7	3.5
16	-3.0	-1.6	0.0	1.9	3.9
18	-3.4	-1.8	0.0	2.2	4.4
20	-3.7	-2.0	0.0	2.4	4.9

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	22	240	89
39000	21	240	85
37000	21	240	80
35000	20	230	76
33000	19	230	72
31000	18	230	68
29000	17	220	64
27000	17	220	60
25000	16	210	56
23000	15	210	52
21000	14	200	48
19000	13	190	44
17000	12	190	40
15000	11	180	36
10000	9	150	26
5000	6	120	16
1500	4	100	9

Allowances for a straight-in approach are included.

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
70	%N1	70.4	73.4	77.4	81.8	86.3	92.0			
	KIAS	213	213	213	213	213	213			
	FF/ENG	1860	1840	1830	1830	1830	1870			
65	%N1	68.6	71.5	75.7	79.9	84.4	89.3			
	KIAS	208	208	208	208	208	208			
	FF/ENG	1740	1720	1710	1700	1700	1720			
60	%N1	66.7	69.5	73.8	77.8	82.3	87.0	94.5		
	KIAS	203	203	203	203	203	203	203		
	FF/ENG	1630	1600	1590	1580	1570	1580	1670		
55	%N1	64.7	67.4	71.6	75.7	80.1	84.7	90.4		
	KIAS	196	196	196	196	196	196	196		
	FF/ENG	1510	1490	1470	1460	1440	1440	1490		
50	%N1	62.3	65.2	69.1	73.4	77.7	82.2	87.0		
	KIAS	190	190	190	190	190	190	190		
	FF/ENG	1400	1380	1350	1340	1320	1310	1340		
45	%N1	59.8	62.8	66.7	71.0	75.2	79.7	84.3	91.4	
	KIAS	183	183	183	183	183	183	183	183	
	FF/ENG	1280	1260	1240	1220	1200	1190	1210	1260	
40	%N1	57.4	60.1	64.3	68.3	72.7	77.0	81.5	86.7	
	KIAS	177	177	177	177	177	177	177	177	
	FF/ENG	1170	1160	1140	1120	1090	1070	1090	1100	
35	%N1	54.9	57.4	61.6	65.6	70.0	74.2	78.7	83.3	92.4
	KIAS	170	170	170	170	170	170	170	170	170
	FF/ENG	1070	1050	1030	1010	990	960	970	980	1060

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
70	66	212	3400	1300	
65	62	207	6600	4800	3000
60	57	202	9900	8000	6300
55	52	196	13000	11300	9500
50	48	190	16300	14800	13000
45	43	183	19500	18100	16500
40	38	176	22700	21600	20300
35	34	170	25700	25000	24100

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
60	4300	1300	
55	8700	6400	4000
50	12900	10700	8400
45	17000	15300	13100
40	21300	19800	18000
35	25000	23900	22600

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 5	7	9	11	13	15	17	19	21
60	%N1	90.2								
	MACH	.364								
	KIAS	220								
	FF/ENG	3193								
55	%N1	87.7	89.3	91.0						
	MACH	.351	.362	.374						
	KIAS	212	211	210						
	FF/ENG	2922	2910	2908						
50	%N1	85.2	86.7	88.2	90.0	91.7				
	MACH	.338	.348	.359	.371	.384				
	KIAS	204	203	202	201	200				
	FF/ENG	2665	2644	2630	2627	2634				
45	%N1	82.5	83.9	85.4	86.9	88.6	90.4	92.7		
	MACH	.325	.334	.344	.355	.367	.380	.393		
	KIAS	196	195	193	192	191	190	189		
	FF/ENG	2419	2391	2369	2354	2350	2352	2359		
40	%N1	79.6	81.0	82.4	83.8	85.3	87.0	88.8	90.8	94.1
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2188	2152	2122	2100	2085	2075	2068	2065	2101
35	%N1	76.5	77.8	79.1	80.4	81.9	83.4	85.0	87.0	88.9
	MACH	.296	.305	.313	.322	.331	.342	.353	.367	.383
	KIAS	179	178	176	174	172	171	170	170	170
	FF/ENG	1959	1929	1891	1861	1838	1818	1800	1802	1808

Long Range Cruise Diversion Fuel and Time
Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
178	156	137	122	110	100	94	87	82	76	72
361	314	274	244	220	200	186	173	161	152	143
546	473	412	366	331	300	278	258	241	226	214
732	634	551	489	441	400	370	344	321	301	285
920	796	691	613	552	500	463	430	401	376	355
1109	958	832	737	663	600	555	515	480	450	425
1300	1122	973	861	774	700	648	601	560	525	495
1493	1287	1115	986	885	800	740	686	639	599	565
1687	1452	1256	1110	997	900	832	772	719	673	635
1883	1619	1399	1235	1108	1000	924	857	797	747	704

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time
Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	6		10		14		18	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	1.1	0:29	1.0	0:28	0.9	0:27	0.8	0:26
200	2.3	0:56	2.1	0:54	2.0	0:52	1.9	0:50
300	3.5	1:24	3.3	1:21	3.0	1:17	2.9	1:14
400	4.7	1:52	4.4	1:47	4.1	1:42	4.0	1:37
500	5.9	2:20	5.5	2:14	5.1	2:08	4.9	2:01
600	7.1	2:49	6.6	2:41	6.2	2:33	5.9	2:26
700	8.2	3:17	7.6	3:09	7.2	3:00	6.9	2:50
800	9.3	3:47	8.7	3:36	8.2	3:26	7.8	3:15
900	10.4	4:16	9.7	4:04	9.2	3:52	8.8	3:40
1000	11.5	4:46	10.8	4:33	10.1	4:19	9.7	4:05

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
1	-0.2	-0.1	0.0	0.2	0.4
2	-0.4	-0.2	0.0	0.4	0.9
3	-0.6	-0.3	0.0	0.7	1.3
4	-0.8	-0.4	0.0	0.9	1.8
5	-1.0	-0.5	0.0	1.1	2.3
6	-1.2	-0.6	0.0	1.3	2.7
7	-1.4	-0.7	0.0	1.5	3.1
8	-1.6	-0.8	0.0	1.7	3.5
9	-1.8	-0.9	0.0	1.9	4.0
10	-2.0	-1.0	0.0	2.1	4.4
11	-2.2	-1.1	0.0	2.3	4.7
12	-2.4	-1.2	0.0	2.4	5.1

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
70	%N1	89.1					
	KIAS	213					
	FF/ENG	3570					
65	%N1	87.1	90.2				
	KIAS	208	208				
	FF/ENG	3310	3340				
60	%N1	84.8	87.9				
	KIAS	203	203				
	FF/ENG	3060	3070				
55	%N1	82.4	85.5	90.1			
	KIAS	196	196	196			
	FF/ENG	2820	2820	2840			
50	%N1	79.9	82.9	87.3	92.4		
	KIAS	190	190	190	190		
	FF/ENG	2580	2570	2580	2630		
45	%N1	77.3	80.2	84.6	89.3		
	KIAS	183	183	183	183		
	FF/ENG	2360	2340	2340	2360		
40	%N1	74.6	77.4	81.7	86.2	91.7	
	KIAS	177	177	177	177	177	
	FF/ENG	2140	2120	2110	2120	2140	
35	%N1	71.5	74.5	78.7	83.1	88.0	96.8
	KIAS	170	170	170	170	170	170
	FF/ENG	1930	1910	1890	1890	1900	2030

This table includes 5% additional fuel for holding in a racetrack pattern.

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (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 15, 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 appropriate 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.

Performance Inflight - QRH Chapter PI-QRH

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737-700 CFM56-7B24 LB FAA CATB

Performance Inflight - QRH — Chapter PI-QRH
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Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.

Climb (280/.76)
Flaps Up, Set Max Climb Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1700	1100	500		
30000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2500	2000	1500	1200	900
20000	**PITCH ATT**	**7.5**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3300	2700	2200	1800
10000	**PITCH ATT**	**11.0**	**9.5**	**8.5**	**8.0**	**8.0**
	V/S (FT/MIN)	5600	4500	3700	3100	2600
SEA LEVEL	**PITCH ATT**	**14.5**	**12.5**	**11.5**	**10.5**	**10.0**
	V/S (FT/MIN)	6700	5400	4500	3800	3300

Cruise (.76/280)
Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	83	87	91		
35000	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	81	83	85	88	92
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	81	83	84	86
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	80	82
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	73	74	75	76	78
15000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	69	70	71	73	74

Descent (.76/280)
Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**-1.5**	**-0.5**	**0.0**	**0.5**	**1.0**
	V/S (FT/MIN)	-2800	-2600	-2600	-2800	-3000
30000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	**0.0**
	V/S (FT/MIN)	-3100	-2700	-2400	-2200	-2100
20000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2900	-2400	-2200	-2000	-1900
10000	**PITCH ATT**	**-3.5**	**-2.5**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN	-2700	-2300	-2000	-1900	-1800
SEA LEVEL	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-2500	-2200	-1900	-1700	-1600

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	62	66	69
5000	**PITCH ATT**	**5.5**	**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 LB)				
		90	110	130	150	170
FLAPS 1 (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF 40 + 50)	%N1	52	56	60	64	67
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 30)	%N1	52	57	62	65	69
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 20)	%N1	60	65	70	74	78

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		90	110	130	150	170
FLAPS 15	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**	**4.0**
(VREF 15 + 10)	%N1	43	46	50	54	57
FLAPS 30	**PITCH ATT**	**1.5**	**2.0**	**2.0**	**2.0**	**2.5**
(VREF 30 + 10)	%N1	47	51	55	59	62
FLAPS 40	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF 40 + 10)	%N1	53	58	63	66	69

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	89.4	89.7	89.7	89.8	89.6	91.4	93.0	94.4	94.5	92.8
55	90.2	90.5	90.5	90.7	90.0	90.8	92.4	93.7	93.8	92.1
50	90.9	91.2	91.3	91.5	91.0	90.8	91.7	93.0	93.1	91.4
45	91.6	91.9	92.1	92.3	91.9	91.7	91.7	92.3	92.4	90.7
40	92.4	92.6	92.9	93.1	92.7	92.5	92.5	91.6	91.7	90.0
35	92.9	93.3	93.6	93.8	93.6	93.3	93.3	92.4	91.7	90.1
30	92.2	94.1	94.3	94.6	94.4	94.1	94.0	93.2	92.6	91.1
25	91.5	94.1	95.0	95.2	95.2	94.8	94.7	94.0	93.4	92.1
20	90.7	93.3	95.8	96.0	95.9	95.6	95.4	94.7	94.2	93.0
15	90.0	92.5	95.2	96.8	96.7	96.3	96.1	95.5	95.0	94.0
10	89.2	91.8	94.4	97.1	97.6	97.0	96.7	96.2	95.8	94.9
5	88.4	91.0	93.6	96.3	98.5	97.9	97.4	97.0	96.6	95.8
0	87.7	90.2	92.8	95.5	97.9	99.0	98.4	97.8	97.5	96.7
-5	86.9	89.4	92.0	94.7	97.2	98.9	99.4	98.6	98.3	97.7
-10	86.1	88.6	91.2	93.9	96.4	98.1	99.7	99.5	99.2	98.7
-15	85.3	87.8	90.3	93.1	95.6	97.4	98.9	100.5	100.1	99.7
-20	84.5	87.0	89.5	92.3	94.8	96.6	98.1	100.2	100.7	100.3
-25	83.7	86.1	88.7	91.4	94.1	95.8	97.3	99.3	99.9	99.5
-30	82.9	85.3	87.8	90.6	93.3	95.0	96.5	98.5	99.0	98.7
-35	82.0	84.5	87.0	89.8	92.4	94.1	95.6	97.6	98.2	97.8
-40	81.2	83.6	86.1	88.9	91.6	93.3	94.8	96.8	97.3	96.9

%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)											
°F	°C		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
134	57	60	91.0	91.8	91.8									
125	52	55	91.7	92.6	92.6	92.5	92.5							
116	47	50	92.5	93.3	93.3	93.3	93.3	93.3	93.2	93.2				
108	42	45	93.3	94.1	94.1	94.1	94.0	94.0	94.0	93.9	93.9	93.8		
99	37	40	94.1	94.9	94.9	94.8	94.8	94.7	94.7	94.6	94.6	94.6	94.5	94.4
90	32	35	94.3	95.8	95.8	95.7	95.7	95.6	95.5	95.5	95.4	95.3	95.3	95.2
81	27	30	93.5	95.7	96.3	96.5	96.5	96.4	96.4	96.3	96.2	96.2	96.1	96.0
72	22	25	92.8	94.9	95.5	96.1	96.7	97.3	97.3	97.2	97.1	97.0	97.0	96.9
63	17	20	92.0	94.2	94.7	95.3	95.9	96.5	97.2	97.9	98.3	98.2	98.1	98.0
54	12	15	91.3	93.4	94.0	94.5	95.1	95.8	96.5	97.2	97.9	98.7	99.4	99.4
45	7	10	90.5	92.6	93.2	93.8	94.4	95.0	95.7	96.4	97.1	97.9	98.7	99.5
36	2	5	89.7	91.8	92.4	93.0	93.6	94.2	94.9	95.6	96.4	97.1	98.0	98.8
27	-3	0	89.0	91.0	91.6	92.2	92.8	93.4	94.1	94.8	95.6	96.4	97.2	98.1
18	-8	-5	88.2	90.2	90.8	91.4	92.0	92.6	93.3	94.0	94.8	95.6	96.4	97.3
9	-13	-10	87.4	89.4	90.0	90.6	91.1	91.8	92.5	93.2	94.0	94.8	95.7	96.5
1	-17	-15	86.6	88.6	89.2	89.7	90.3	90.9	91.7	92.4	93.2	94.0	94.9	95.8
-8	-22	-20	85.8	87.8	88.3	88.9	89.5	90.1	90.8	91.6	92.3	93.2	94.1	95.0
-17	-27	-25	84.9	86.9	87.5	88.1	88.6	89.3	90.0	90.7	91.5	92.3	93.3	94.2
-26	-32	-30	84.1	86.1	86.7	87.2	87.8	88.4	89.2	89.9	90.7	91.5	92.5	93.4
-35	-37	-35	83.3	85.2	85.8	86.3	86.9	87.6	88.3	89.0	89.8	90.7	91.6	92.6
-44	-42	-40	82.4	84.4	84.9	85.5	86.1	86.7	87.4	88.2	89.0	89.8	90.8	91.8
-53	-47	-45	81.6	83.5	84.1	84.6	85.2	85.8	86.6	87.3	88.1	89.0	90.0	90.9
-62	-52	-50	80.7	82.6	83.2	83.7	84.3	84.9	85.7	86.4	87.2	88.1	89.1	90.1

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	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 LB)	FLAPS		
	40	30	15
170	151	153	159
160	147	149	155
150	142	144	150
140	137	140	145
130	132	134	139
120	126	129	133
110	120	123	127
100	114	117	121
90	108	111	115

Intentionally
Blank

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	2910	210/-140	60/90	-110	380	30	-30	60	-60	220	60	130
MAX AUTO	3650	190/-180	80/120	-140	460	0	0	80	-80	350	0	10
AUTOBRAKE 3	5090	310/-300	140/190	-230	760	0	0	140	-140	580	0	0
AUTOBRAKE 2	6570	440/-440	200/270	-310	1060	70	-90	190	-190	620	130	130
AUTOBRAKE 1	7340	530/-520	240/330	-370	1260	200	-220	210	-210	580	650	750

Good Reported Braking Action

MAX MANUAL	3950	220/-220	100/140	-180	630	90	-80	90	-60	300	210	480
MAX AUTO	4340	240/-240	110/150	-180	650	80	-70	100	-80	350	240	540
AUTOBRAKE 3	5100	310/-300	140/190	-230	780	20	-10	140	-140	580	10	50
AUTOBRAKE 2	6570	440/-440	200/270	-310	1060	70	-90	190	-190	620	130	130

Medium Reported Braking Action

MAX MANUAL	5430	350/-340	160/230	-290	1050	240	-190	140	-140	400	600	1490
MAX AUTO	5650	360/-350	170/230	-290	1040	210	-160	140	-140	460	600	1470
AUTOBRAKE 3	5760	370/-350	170/230	-290	1070	170	-110	150	-150	580	460	1380
AUTOBRAKE 2	6740	450/-450	210/270	-340	1210	150	-150	190	-190	620	260	680

Poor Reported Braking Action

MAX MANUAL	7130	510/-490	240/330	-440	1670	600	-390	190	-200	490	1330	3670
MAX AUTO	7440	510/-490	240/330	-430	1650	600	-390	190	-200	490	1340	3700
AUTOBRAKE 3	7440	510/-490	240/340	-430	1660	600	-360	190	-200	550	1330	3680
AUTOBRAKE 2	7610	540/-520	250/340	-450	1710	520	-350	210	-210	610	1030	3320

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 170 ft.
Actual (unfactored) distances are shown.
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 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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	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	2840	190/-130	60/80	-100	370	30	-30	60	-60	210	60	120
MAX AUTO	3480	170/-170	80/100	-130	450	0	0	80	-80	340	0	10
AUTOBRAKE 3	4820	290/-280	130/170	-220	740	0	-10	130	-130	550	0	0
AUTOBRAKE 2	6190	400/-400	180/250	-300	1030	80	-110	170	-170	550	130	130
AUTOBRAKE 1	6890	480/-480	220/300	-350	1210	190	-200	200	-190	540	570	710

Good Reported Braking Action

MAX MANUAL	3830	210/-210	100/130	-180	620	90	-80	90	-90	300	200	440
MAX AUTO	4190	230/-220	100/150	-180	640	70	-60	90	-100	350	220	490
AUTOBRAKE 3	4830	290/-280	130/170	-220	750	20	-10	130	-130	550	10	50
AUTOBRAKE 2	6190	400/-400	180/250	-300	1030	80	-110	170	-170	550	130	130

Medium Reported Braking Action

MAX MANUAL	5200	330/-320	150/220	-280	1030	240	-190	130	-140	400	540	1320
MAX AUTO	5400	340/-330	160/210	-280	1020	210	-160	130	-140	460	540	1300
AUTOBRAKE 3	5500	340/-330	160/210	-290	1050	170	-120	140	-140	550	440	1250
AUTOBRAKE 2	6350	410/-410	190/250	-330	1170	150	-170	170	-180	550	260	630

Poor Reported Braking Action

MAX MANUAL	6750	470/-460	220/310	-420	1630	570	-370	180	-190	470	1170	3140
MAX AUTO	7040	470/-450	220/310	-420	1620	580	-370	180	-180	480	1180	3170
AUTOBRAKE 3	7040	480/-460	220/310	-420	1620	560	-350	180	-190	520	1170	3150
AUTOBRAKE 2	7190	490/-480	230/320	-440	1670	500	-350	190	-200	550	940	2850

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 170 ft.
Actual (unfactored) distances are shown.
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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	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	2820	170/-130	60/80	-100	370	40	-30	60	-60	220	60	120
MAX AUTO	3390	170/-160	80/100	-130	440	10	0	70	-70	340	0	20
AUTOBRAKE 3	4660	280/-270	130/170	-210	720	0	-10	120	-120	540	0	0
AUTOBRAKE 2	5980	380/-380	180/240	-290	1010	80	-100	170	-170	540	110	110
AUTOBRAKE 1	6670	460/-450	210/300	-340	1190	180	-190	190	-190	520	500	640

Good Reported Braking Action

MAX MANUAL	3780	210/-200	100/130	-170	620	90	-80	90	-90	310	190	420
MAX AUTO	4120	230/-220	100/150	-180	640	80	-60	90	-90	360	210	460
AUTOBRAKE 3	4670	280/-270	130/170	-210	740	20	-10	120	-120	540	10	50
AUTOBRAKE 2	5980	380/-380	180/280	-290	1010	80	-100	170	-170	540	110	110

Medium Reported Braking Action

MAX MANUAL	5100	330/-310	150/220	-280	1020	240	-190	130	-130	400	510	1230
MAX AUTO	5290	330/-320	150/220	-280	1020	210	-160	130	-130	460	500	1210
AUTOBRAKE 3	5370	340/-320	160/210	-280	1030	180	-120	140	-140	540	450	1200
AUTOBRAKE 2	6140	400/-390	180/260	-320	1150	160	-160	170	-170	540	240	600

Poor Reported Braking Action

MAX MANUAL	6590	460/-440	210/310	-420	1620	570	-370	170	-180	470	1090	2870
MAX AUTO	6870	460/-440	210/310	-410	1600	570	-360	170	-180	470	1100	2900
AUTOBRAKE 3	6870	470/-440	220/300	-420	1610	560	-350	170	-180	510	1090	2880
AUTOBRAKE 2	6990	480/-460	220/320	-430	1650	510	-340	190	-190	530	880	2620

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 170 ft.
Actual (unfactored) distances are shown.
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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	3760	340/-200	125/125	-135	605	45	-45	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4540	270/-270	120/160	-230	850	135	-115	365
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3070	160/-155	70/100	-115	405	40	-40	275
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3000	150/-150	65/100	-115	405	45	-40	290
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2990	150/-150	65/100	-115	405	45	-40	305
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3150	165/-165	70/90	-125	455	45	-40	245
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4220	225/-230	100/145	-180	605	105	-95	455
LEADING EDGE FLAPS TRANSIT	VREF15+15	3120	195/-150	70/100	-115	405	40	-35	220
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2790	180/-135	60/80	-105	385	35	-30	210
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2730	160/-135	55/75	-105	375	35	-30	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)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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
STABILIZER TRIM INOPERATIVE	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2710	190/-130	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3200	215/-145	75/100	-115	415	35	-35	215
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2710	190/-130	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3200	215/-145	75/100	-115	415	35	-35	215
TRAILING EDGE FLAPS UP	VREF40+40	3400	255/-160	85/100	-125	445	40	-40	225

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	5070	265/-275	140/190	-200	710	105	-95	275
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5030	315/-315	140/190	-270	1035	195	-160	395
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4170	255/-255	115/150	-185	675	110	-100	385
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4040	240/-240	110/140	-185	665	110	-95	390
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3990	240/-240	105/150	-185	665	110	-95	405
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3840	225/-225	100/130	-175	630	90	-80	310
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4915	280/-280	125/180	-220	750	155	-135	520
LEADING EDGE FLAPS TRANSIT	VREF15+15	4240	240/-245	115/150	-185	660	95	-85	300
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3850	225/-225	95/130	-175	645	95	-85	305
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	3720	215/-215	90/125	-175	635	90	-80	310

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 CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	3710	215/-215	95/120	-170	615	80	-70	280
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	3620	210/-210	100/130	-180	620	90	-80	300
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4340	230/-240	115/160	-185	660	90	-85	280
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	3620	210/-210	100/130	-180	620	90	-80	300
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4340	230/-240	115/160	-185	660	90	-85	280
TRAILING EDGE FLAPS UP	VREF40+40	4580	240/-250	125/170	-190	675	95	-85	270

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	7100	440/-450	230/310	-320	1185	265	-225	385
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6310	445/-430	190/270	-400	1615	435	-320	455
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5650	405/-395	180/230	-295	1110	265	-220	500
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	5400	380/-370	170/230	-290	1090	255	-210	490
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5290	370/-360	165/250	-290	1080	255	-210	490
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5190	355/-350	155/220	-275	1050	220	-185	405
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	6770	445/-435	200/285	-340	1210	340	-290	645
LEADING EDGE FLAPS TRANSIT	VREF15+15	5750	385/-380	180/240	-290	1090	235	-195	400
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	5440	370/-370	160/220	-295	1110	260	-215	430
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	5180	345/-345	150/205	-285	1085	250	-205	420

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	5010	340/-330	145/210	-270	1025	205	-170	375
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4880	330/-320	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	5940	375/-375	185/260	-295	1100	230	-195	375
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4880	330/-320	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	5940	375/-375	185/260	-295	1100	230	-195	375
TRAILING EDGE FLAPS UP	VREF40+40	6330	395/-400	200/270	-305	1125	240	-205	370

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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	9360	660/-655	335/470	-485	1875	610	-460	485
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8300	640/-615	260/400	-655	3000	1530	-725	505
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	7280	580/-550	255/330	-445	1750	580	-425	585
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6910	540/-515	235/340	-430	1715	555	-405	560
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	6710	520/-495	225/370	-425	1695	545	-395	550
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6710	515/-490	225/320	-415	1670	500	-365	490
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	8700	640/-610	280/415	-500	1855	690	-525	725
LEADING EDGE FLAPS TRANSIT	VREF15+15	7420	555/-535	250/360	-435	1725	520	-385	475
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	7410	560/-550	240/330	-465	1835	655	-470	540
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	6960	515/-505	220/310	-450	1780	615	-435	510

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 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	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
STABILIZER TRIM INOPERATIVE	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	6290	470/-460	220/310	-420	1630	570	-370	470
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	7710	550/-540	265/370	-440	1740	520	-390	455
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	6290	470/-460	220/310	-420	1630	570	-370	470
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	7710	550/-540	265/370	-440	1740	520	-390	455
TRAILING EDGE FLAPS UP	VREF40+40	8280	585/-575	285/400	-455	1785	550	-410	455

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 LB)	OAT (°F)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
180	0	14.6	16.4	18.5	21.9	24.7	28.0	30.3	34.3	39.2	39.8	45.2	52.0	50.1	57.1	66.2	59.6	68.3	79.7
	20	15.2	17.1	19.3	22.7	25.7	29.1	31.5	35.7	40.7	41.3	46.9	54.0	52.0	59.3	68.8	61.9	70.9	82.8
	40	15.7	17.7	20.0	23.6	26.6	30.2	32.7	37.0	42.2	42.8	48.7	56.0	53.9	61.5	71.3	64.2	73.6	85.9
	60	16.3	18.3	20.7	24.4	27.5	31.2	33.8	38.3	43.7	44.3	50.4	57.9	55.8	63.7	73.8	66.4	76.1	88.8
	80	16.9	19.0	21.4	25.2	28.5	32.3	34.9	39.6	45.2	45.8	52.0	59.8	57.6	65.8	76.2	68.6	78.5	91.7
	100	17.1	19.2	21.7	25.6	28.9	32.8	35.5	40.3	46.0	46.7	53.1	61.1	58.9	67.3	78.2	70.3	80.6	94.4
	120	17.1	19.3	21.7	25.7	29.1	33.1	35.8	40.7	46.6	47.2	53.8	62.2	59.8	68.6	79.9	71.7	82.5	97.0
160	0	13.4	15.1	17.0	20.0	22.5	25.5	27.5	31.1	35.5	36.0	40.9	46.9	45.2	51.5	59.5	54.6	62.4	72.6
	20	14.0	15.7	17.7	20.8	23.4	26.5	28.6	32.3	36.9	37.4	42.4	48.7	47.0	53.5	61.8	56.7	64.8	75.4
	40	14.5	16.3	18.3	21.5	24.3	27.5	29.7	33.5	38.2	38.8	44.0	50.5	48.7	55.5	64.1	58.8	67.2	78.2
	60	15.0	16.8	19.0	22.3	25.1	28.4	30.7	34.7	39.5	40.1	45.5	52.2	50.4	57.4	66.3	60.8	69.5	80.9
	80	15.5	17.4	19.6	23.0	26.0	29.4	31.7	35.9	40.9	41.5	47.1	53.9	52.1	59.3	68.5	62.8	71.8	83.5
	100	15.7	17.6	19.9	23.4	26.3	29.9	32.2	36.5	41.6	42.2	48.0	55.1	53.2	60.6	70.1	64.3	73.6	85.8
	120	15.7	17.7	19.9	23.5	26.5	30.1	32.5	36.8	42.0	42.7	48.6	55.9	53.9	61.6	71.5	65.4	75.1	87.9
140	0	12.3	13.8	15.5	18.1	20.4	23.0	24.7	27.9	31.7	32.1	36.4	41.6	40.3	45.8	52.7	49.1	56.0	64.9
	20	12.7	14.3	16.1	18.8	21.1	23.9	25.7	29.0	33.0	33.4	37.8	43.3	41.9	47.6	54.8	51.0	58.2	67.4
	40	13.2	14.9	16.7	19.5	21.9	24.8	26.6	30.1	34.2	34.6	39.2	44.9	43.4	49.3	56.8	52.9	60.3	69.9
	60	13.7	15.4	17.3	20.1	22.7	25.7	27.6	31.1	35.4	35.8	40.6	46.4	44.9	51.1	58.8	54.7	62.4	72.3
	80	14.2	15.9	17.9	20.8	23.5	26.5	28.5	32.2	36.6	37.0	42.0	48.0	46.4	52.8	60.7	56.5	64.5	74.6
	100	14.3	16.1	18.1	21.1	23.8	26.9	28.9	32.7	37.2	37.7	42.7	48.9	47.3	53.8	62.0	57.7	65.9	76.5
	120	14.3	16.1	18.2	21.2	23.9	27.1	29.1	32.9	37.5	38.0	43.2	49.5	47.9	54.6	63.1	58.6	67.2	78.2
120	0	11.1	12.5	14.0	16.2	18.2	20.5	21.9	24.7	28.0	28.3	32.0	36.5	35.3	40.0	45.8	42.8	48.7	56.1
	20	11.5	13.0	14.6	16.8	18.9	21.3	22.7	25.7	29.1	29.4	33.2	37.9	36.6	41.5	47.6	44.4	50.6	58.3
	40	12.0	13.4	15.1	17.4	19.6	22.1	23.6	26.6	30.2	30.5	34.5	39.3	38.0	43.1	49.4	46.1	52.4	60.4
	60	12.4	13.9	15.7	18.0	20.3	22.9	24.4	27.6	31.2	31.5	35.7	40.7	39.3	44.6	51.1	47.7	54.2	62.5
	80	12.8	14.4	16.2	18.6	21.0	23.7	25.2	28.5	32.3	32.6	36.9	42.0	40.6	46.1	52.8	49.3	56.0	64.6
	100	13.0	14.6	16.4	18.9	21.3	24.0	25.6	28.9	32.8	33.1	37.5	42.8	41.3	46.9	53.9	50.2	57.2	66.1
	120	13.0	14.6	16.4	18.9	21.3	24.1	25.7	29.1	33.1	33.4	37.8	43.2	41.8	47.5	54.6	50.9	58.1	67.3
100	0	10.0	11.2	12.6	14.3	16.0	18.1	19.1	21.5	24.4	24.4	27.6	31.4	30.2	34.2	39.1	36.5	41.4	47.5
	20	10.4	11.6	13.1	14.8	16.7	18.8	19.8	22.3	25.3	25.4	28.7	32.6	31.4	35.5	40.6	37.9	43.0	49.3
	40	10.8	12.1	13.6	15.4	17.3	19.5	20.6	23.2	26.2	26.3	29.7	33.8	32.5	36.8	42.1	39.3	44.6	51.1
	60	11.1	12.5	14.1	15.9	17.9	20.2	21.3	24.0	27.1	27.2	30.8	35.0	33.7	38.1	43.5	40.6	46.1	52.9
	80	11.5	12.9	14.5	16.4	18.5	20.8	22.0	24.8	28.1	28.1	31.8	36.1	34.8	39.4	45.0	42.0	47.6	54.6
	100	11.6	13.1	14.7	16.6	18.7	21.1	22.3	25.2	28.5	28.6	32.3	36.7	35.4	40.1	45.8	42.8	48.6	55.8
	120	11.7	13.1	14.7	16.7	18.8	21.2	22.4	25.3	28.7	28.7	32.5	37.1	35.7	40.5	46.4	43.2	49.2	56.6
90	0	9.4	10.6	11.9	13.3	15.0	16.9	17.7	19.9	22.5	22.5	25.4	28.8	27.7	31.3	35.7	33.3	37.7	43.2
	20	9.8	11.0	12.4	13.8	15.5	17.5	18.4	20.7	23.4	23.4	26.4	29.9	28.8	32.6	37.1	34.6	39.2	44.9
	40	10.2	11.4	12.8	14.3	16.1	18.2	19.0	21.4	24.2	24.2	27.3	31.0	29.8	33.8	38.5	35.9	40.7	46.5
	60	10.5	11.8	13.3	14.8	16.7	18.8	19.7	22.2	25.1	25.1	28.3	32.1	30.9	34.9	39.8	37.1	42.1	48.2
	80	10.9	12.2	13.7	15.4	17.3	19.4	20.4	23.0	25.9	25.9	29.3	33.2	31.9	36.1	41.1	38.4	43.5	49.8
	100	11.0	12.4	13.9	15.5	17.5	19.7	20.6	23.3	26.3	26.3	29.7	33.7	32.4	36.7	41.9	39.0	44.3	50.7
	120	11.0	12.4	13.9	15.6	17.5	19.8	20.7	23.4	26.5	26.4	29.9	34.0	32.7	37.0	42.3	39.4	44.8	51.4

***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, 60°F.**

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

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	7.5	15.8	24.6	33.8	43.5	53.5	63.6	73.9	84.2
	MAX AUTO	7.3	15.0	23.2	31.9	41.2	51.0	61.3	72.2	83.7
	AUTOBRAKE 3	7.0	14.2	21.8	29.7	38.1	47.1	56.7	67.1	78.3
	AUTOBRAKE 2	6.6	13.3	20.2	27.3	34.7	42.6	51.0	59.9	69.6
	AUTOBRAKE 1	6.3	12.4	18.6	24.9	31.6	38.6	46.2	54.4	63.5

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	6.9	14.5	22.7	31.4	40.4	49.7	59.3	68.9	78.5
	MAX AUTO	6.0	12.6	19.8	27.6	36.0	45.1	54.8	65.3	76.5
	AUTOBRAKE 3	4.5	9.5	15.1	21.3	28.1	35.6	43.7	52.5	62.0
	AUTOBRAKE 2	2.6	5.9	9.7	14.1	19.1	24.7	31.0	37.9	45.4
	AUTOBRAKE 1	1.8	3.8	6.3	9.1	12.5	16.4	21.0	26.3	32.5

Cooling Time (Minutes) - Category B Steel and 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.

Intentionally
Blank

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	96.1	95.9	95.6	95.5	95.2	94.8	94.3	94.0	93.2
15	96.7	96.5	96.2	96.1	96.0	95.5	95.1	94.8	94.1
10	97.3	97.2	96.8	96.7	96.7	96.2	95.8	95.6	95.0
5	97.5	97.9	97.6	97.4	97.4	97.0	96.6	96.4	95.9
0	96.8	98.1	98.5	98.3	98.2	97.8	97.5	97.2	96.8
-5	96.0	97.3	98.5	99.2	99.1	98.6	98.3	98.1	97.8
-10	95.2	96.5	97.7	99.0	99.9	99.5	99.2	99.0	98.7
-15	94.4	95.8	96.9	98.2	99.5	100.4	100.1	99.9	99.7
-20	93.6	95.0	96.2	97.4	98.7	99.8	100.4	100.2	100.0
-25	92.8	94.2	95.4	96.6	97.9	99.0	99.6	99.4	99.2
-30	91.9	93.4	94.6	95.8	97.0	98.2	98.7	98.5	98.3
-35	91.1	92.6	93.7	94.9	96.2	97.3	97.9	97.7	97.5
-40	90.3	91.8	92.9	94.1	95.3	96.5	97.0	96.8	96.6

%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	96.0	97.0	97.9	98.7	99.6	98.9	98.1	96.9	95.6	94.0	92.5	91.1
200	.63	95.4	96.3	97.2	98.1	98.9	99.8	99.5	98.7	97.8	96.8	95.6	94.5
240	.74	94.4	95.3	96.2	97.1	98.0	98.8	99.7	100.1	99.3	98.5	97.7	96.7
280	.86	93.7	94.6	95.5	96.4	97.2	98.1	98.9	99.7	100.5	100.2	99.3	98.5
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	95.9	96.8	97.7	98.6	99.5	99.2	98.4	97.3	96.1	94.7	93.3	92.0
200	.60	95.5	96.4	97.3	98.2	99.1	100.0	99.9	98.9	98.0	97.0	95.8	94.7
240	.71	94.4	95.3	96.2	97.1	98.0	98.8	99.6	100.2	99.5	98.9	98.0	97.0
280	.82	93.2	94.0	94.9	95.8	96.6	97.5	98.3	99.1	99.9	99.7	98.9	98.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	96.8	97.7	98.5	99.4	100.2	99.3	98.5	97.3	96.0	94.6	93.2	92.0
200	.58	96.4	97.3	98.2	99.1	99.9	100.8	99.9	99.0	98.0	96.8	95.6	94.5
240	.68	95.3	96.2	97.1	97.9	98.8	99.6	100.4	100.2	99.6	98.7	97.7	96.7
280	.79	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	99.9	99.1	98.2	97.4
320	.89	93.0	93.9	94.7	95.6	96.4	97.2	98.1	98.9	99.7	100.4	100.0	99.2
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	96.7	97.6	98.5	99.4	100.3	100.4	99.5	98.5	97.3	95.9	94.5	93.2
200	.55	96.5	97.3	98.2	99.1	100.0	100.8	101.0	100.1	99.1	98.0	96.7	95.5
240	.66	95.0	95.9	96.8	97.6	98.5	99.3	100.2	100.7	99.9	99.1	98.1	97.1
280	.76	93.2	94.0	94.9	95.7	96.6	97.4	98.2	99.0	99.8	99.1	98.2	97.3
320	.85	91.8	92.6	93.5	94.3	95.1	95.9	96.7	97.5	98.3	99.1	99.3	98.4
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	97.5	98.4	99.3	100.1	101.0	100.5	99.6	98.5	97.2	95.7	94.4	93.1
200	.53	96.9	97.8	98.7	99.5	100.4	101.2	100.7	99.7	98.7	97.5	96.2	95.1
240	.63	95.7	96.5	97.4	98.2	99.1	99.9	100.7	100.4	99.5	98.6	97.5	96.6
280	.73	93.6	94.4	95.2	96.1	96.9	97.7	98.5	99.3	99.4	98.5	97.5	96.8
320	.82	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	97.8	97.0
360	.91	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.4

%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

270000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	97.3	98.2	99.1	100.0	100.8	101.5	100.6	99.6	98.4	97.0	95.7	94.4
200	.51	96.3	97.2	98.1	98.9	99.8	100.6	101.1	100.2	99.2	98.1	96.9	95.7
240	.60	95.0	95.9	96.7	97.6	98.4	99.2	100.1	100.7	99.7	98.7	97.7	96.8
280	.70	93.0	93.8	94.6	95.5	96.3	97.1	97.9	98.7	99.4	98.7	97.7	96.9
320	.79	90.9	91.7	92.6	93.4	94.2	95.0	95.7	96.5	97.3	98.0	97.9	97.2
360	.88	90.2	91.0	91.8	92.7	93.5	94.3	95.1	95.9	96.6	97.4	98.2	98.7

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.2	99.0	99.9	100.7	101.6	101.7	100.7	99.6	98.4	97.0	95.8	94.5
200	.49	96.8	97.7	98.5	99.4	100.2	101.0	100.9	99.9	98.9	97.7	96.6	95.5
240	.58	95.1	95.9	96.8	97.6	98.4	99.2	100.0	99.8	98.9	97.9	96.9	96.0
280	.67	93.2	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	97.9	96.9	96.2
320	.76	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	97.9	97.2	96.5
360	.85	89.6	90.5	91.3	92.1	93.0	93.8	94.6	95.4	96.2	97.0	97.7	97.5

24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	97.7	98.5	99.4	100.3	101.1	101.9	100.8	99.7	98.5	97.2	96.0	94.7
200	.48	96.4	97.2	98.1	98.9	99.7	100.6	101.0	99.9	98.9	97.8	96.7	95.6
240	.57	94.7	95.6	96.4	97.2	98.0	98.8	99.6	99.9	99.0	97.9	97.0	96.1
280	.66	93.0	93.8	94.6	95.4	96.2	97.0	97.8	98.6	99.1	98.0	97.0	96.3
320	.75	90.6	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.1	97.8	97.2	96.5
360	.83	89.0	89.8	90.7	91.5	92.4	93.2	94.0	94.8	95.6	96.4	97.2	97.2

22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	97.5	98.4	99.2	100.1	100.9	101.0	99.9	98.7	97.5	96.3	95.2	94.0
200	.46	96.3	97.1	98.0	98.8	99.6	100.4	100.1	98.9	97.8	96.8	95.8	94.8
240	.55	94.8	95.6	96.4	97.2	98.0	98.8	99.6	99.1	98.1	97.1	96.2	95.4
280	.63	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	98.4	97.4	96.6	95.8
320	.72	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.4	97.5	96.8	96.1
360	.80	89.0	89.9	90.7	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.0	96.4

20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	96.5	97.4	98.2	99.0	99.8	100.6	100.2	98.9	97.7	96.6	95.5	94.4
200	.44	95.4	96.2	97.0	97.9	98.7	99.4	100.2	99.1	97.8	96.8	95.8	94.9
240	.53	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.3	98.2	97.1	96.2	95.4
280	.61	92.4	93.3	94.1	94.8	95.6	96.4	97.2	97.9	98.5	97.6	96.7	95.9
320	.69	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.6	96.9	96.2
360	.77	88.5	89.3	90.2	91.0	91.8	92.6	93.5	94.3	95.1	95.8	96.6	96.4

%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	96.0	96.8	97.6	98.4	99.2	100.0	98.9	97.5	96.5	95.5	94.5	93.5
200	.42	95.1	95.9	96.7	97.5	98.2	99.0	99.3	98.0	96.7	95.9	95.0	94.1
240	.51	93.7	94.5	95.2	96.0	96.8	97.6	98.3	98.2	97.1	96.2	95.4	94.6
280	.59	92.0	92.9	93.7	94.5	95.3	96.1	96.8	97.6	97.5	96.6	95.8	95.1
320	.67	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	96.9	96.2	95.5
360	.75	88.7	89.5	90.4	91.2	92.0	92.8	93.6	94.4	95.2	96.0	96.4	95.8
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	95.0	95.8	96.6	97.4	98.2	99.0	99.4	98.2	97.0	96.1	95.2	94.2
200	.41	93.9	94.7	95.5	96.3	97.1	97.8	98.6	98.2	97.0	96.0	95.2	94.4
240	.49	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	97.3	96.3	95.5	94.7
280	.57	91.0	91.8	92.6	93.5	94.3	95.1	95.9	96.6	97.4	96.7	95.8	95.1
320	.64	89.4	90.3	91.1	91.9	92.8	93.6	94.4	95.2	95.9	96.7	96.1	95.5
360	.72	88.0	88.9	89.7	90.6	91.4	92.2	93.0	93.8	94.6	95.4	96.2	95.8
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	94.9	95.7	96.5	97.3	98.0	98.8	99.2	98.2	97.3	96.4	95.5	94.6
200	.39	93.6	94.4	95.2	96.0	96.7	97.5	98.3	97.5	96.5	95.7	94.9	94.1
240	.47	92.1	92.9	93.8	94.6	95.4	96.2	96.9	97.4	96.5	95.6	94.8	94.1
280	.54	90.9	91.7	92.5	93.4	94.2	95.0	95.8	96.5	96.8	96.0	95.2	94.5
320	.62	89.6	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.2	95.5	94.8
360	.69	88.3	89.1	89.9	90.7	91.6	92.4	93.2	94.0	94.8	95.5	95.8	95.2
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	94.8	95.6	96.4	97.1	97.9	98.6	97.9	96.8	95.9	95.2	94.4	93.5
200	.38	92.7	93.5	94.3	95.1	95.9	96.7	97.1	96.1	95.1	94.4	93.6	92.8
240	.45	91.6	92.5	93.3	94.1	94.9	95.7	96.4	96.4	95.5	94.7	94.0	93.2
280	.52	90.6	91.4	92.2	93.0	93.8	94.6	95.4	96.2	95.9	95.1	94.4	93.7
320	.60	89.5	90.3	91.2	92.0	92.8	93.6	94.4	95.2	96.0	95.5	94.8	94.1
360	.67	88.3	89.1	90.0	90.8	91.6	92.4	93.2	93.9	94.7	95.5	95.1	94.4

%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	92.7	93.5	94.4	95.2	95.9	96.7	97.5	96.5	95.6	94.9	94.2	93.4
200	.36	91.3	92.1	93.0	93.8	94.6	95.4	96.1	96.1	95.2	94.4	93.7	92.9
240	.43	90.3	91.1	92.0	92.8	93.6	94.4	95.2	95.9	95.4	94.6	93.8	93.1
280	.51	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1	95.7	95.0	94.2	93.5
320	.58	88.6	89.4	90.2	91.0	91.8	92.6	93.4	94.2	95.0	95.4	94.7	93.9
360	.65	87.5	88.3	89.2	90.0	90.8	91.6	92.3	93.1	93.9	94.7	95.0	94.3
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	90.5	91.4	92.2	93.0	93.8	94.5	95.1	94.4	93.6	92.9	92.2	91.4
200	.33	90.0	90.8	91.6	92.4	93.2	93.9	94.7	94.4	93.7	93.0	92.3	91.5
240	.40	89.2	90.0	90.8	91.6	92.4	93.2	93.9	94.4	93.7	92.9	92.2	91.5
280	.46	88.5	89.3	90.1	90.9	91.7	92.5	93.3	94.0	94.0	93.2	92.5	91.8
320	.53	87.8	88.6	89.4	90.2	90.9	91.7	92.5	93.2	94.0	93.6	92.9	92.2
360	.59	86.9	87.7	88.5	89.3	90.1	90.8	91.6	92.3	93.1	93.8	93.3	92.6
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	90.5	91.3	92.1	92.8	93.6	94.4	94.6	93.9	93.2	92.4	91.6	90.7
200	.32	89.9	90.7	91.5	92.3	93.1	93.8	94.6	94.0	93.3	92.5	91.8	91.0
240	.38	88.8	89.6	90.4	91.2	92.0	92.7	93.5	93.5	92.8	92.0	91.3	90.6
280	.45	88.3	89.1	89.9	90.6	91.4	92.2	92.9	93.7	93.1	92.4	91.7	91.0
320	.51	87.6	88.4	89.2	90.0	90.7	91.5	92.2	93.0	93.5	92.8	92.0	91.3
360	.57	86.8	87.6	88.4	89.1	89.9	90.6	91.4	92.1	92.8	93.1	92.4	91.7
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	89.0	89.8	90.6	91.4	92.2	92.9	93.7	93.4	92.7	91.9	91.2	90.3
200	.31	88.7	89.5	90.3	91.0	91.8	92.6	93.3	93.7	93.0	92.2	91.5	90.7
240	.37	87.8	88.6	89.4	90.2	90.9	91.7	92.5	93.2	92.8	92.0	91.3	90.6
280	.43	87.3	88.1	88.8	89.6	90.4	91.1	91.9	92.6	93.1	92.3	91.6	90.9
320	.49	86.7	87.5	88.2	89.0	89.8	90.5	91.3	92.0	92.7	92.7	91.9	91.2
360	.55	85.9	86.7	87.5	88.2	89.0	89.7	90.5	91.2	91.9	92.6	92.3	91.6

%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 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	163	257	18500	17000	15200
160	153	250	20400	19100	17300
150	144	242	22400	21100	19600
140	134	235	24400	23300	21900
130	125	226	26400	25400	24200
120	115	218	28500	27600	26400
110	106	209	30500	29700	28700
100	96	199	32500	31800	30900
90	87	189	34600	33900	33000
80	77	178	36900	36200	35400

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
140	129	120	113	106	100	95	90	85	82	78
279	259	241	226	212	200	189	180	171	163	156
418	388	361	338	318	300	284	270	256	245	234
558	517	482	451	424	400	379	359	342	326	312
697	646	602	564	530	500	473	449	428	408	390
836	775	722	676	636	600	568	539	513	490	468
975	904	843	789	742	700	663	629	599	571	546
1114	1033	963	902	848	800	757	719	684	653	624
1253	1162	1083	1014	954	900	852	809	770	734	702
1392	1291	1204	1127	1060	1000	947	899	855	816	780
1532	1420	1324	1240	1166	1100	1041	989	941	898	858
1671	1550	1444	1353	1272	1200	1136	1078	1026	979	936
1811	1679	1565	1465	1378	1300	1231	1168	1112	1061	1014
1951	1809	1686	1578	1484	1400	1325	1258	1197	1142	1092
2091	1938	1806	1691	1590	1500	1420	1348	1283	1223	1169
2231	2068	1927	1804	1696	1600	1514	1437	1368	1305	1247
2372	2198	2048	1917	1802	1700	1609	1527	1453	1386	1325
2513	2329	2169	2030	1908	1800	1703	1617	1538	1467	1402

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	80	90	100	110	120	130	140	150	160	170	
100	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.1	0:17
200	1.7	1.8	1.9	2.0	2.0	2.2	2.3	2.5	2.5	2.6	0:34
300	2.6	2.8	3.0	3.2	3.3	3.5	3.8	4.0	4.1	4.3	0:50
400	3.5	3.7	4.0	4.3	4.6	4.9	5.2	5.6	5.8	6.1	1:07
500	4.3	4.7	5.1	5.4	5.8	6.2	6.6	7.0	7.4	7.8	1:24
600	5.1	5.6	6.1	6.5	7.0	7.5	8.0	8.4	8.9	9.4	1:41
700	5.9	6.5	7.0	7.6	8.1	8.7	9.3	9.9	10.4	11.0	1:58
800	6.7	7.4	8.0	8.7	9.3	9.9	10.6	11.2	11.9	12.5	2:14
900	7.5	8.3	9.0	9.7	10.4	11.2	11.9	12.6	13.3	14.1	2:31
1000	8.3	9.1	9.9	10.7	11.5	12.4	13.2	14.0	14.8	15.7	2:48
1100	9.1	10.0	10.9	11.8	12.7	13.6	14.5	15.4	16.2	17.2	3:05
1200	9.9	10.8	11.8	12.8	13.8	14.7	15.7	16.7	17.7	18.7	3:22
1300	10.7	11.7	12.8	13.8	14.8	15.9	17.0	18.1	19.1	20.3	3:39
1400	11.4	12.5	13.7	14.8	15.9	17.1	18.2	19.4	20.5	21.8	3:56
1500	12.2	13.4	14.6	15.8	17.0	18.2	19.5	20.7	21.9	23.3	4:13
1600	12.9	14.2	15.5	16.8	18.1	19.4	20.7	22.0	23.3	24.8	4:29
1700	13.7	15.0	16.4	17.8	19.1	20.5	21.9	23.3	24.7	26.3	4:46
1800	14.4	15.8	17.3	18.7	20.2	21.7	23.1	24.6	26.1	27.7	5:04

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	14000	11300	8300
160	16700	14200	11400
150	19300	16800	14400
140	21700	19400	17200
130	24000	22300	20000
120	26400	25000	22700
110	28900	27700	25800
100	31100	30200	28900
90	33300	32500	31400
80	35700	34800	33800

With engine anti-ice on, decrease altitude capability by 2000 ft.
With engine and wing anti-ice on, decrease altitude capability by 6400 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT) 10	15	17	19	21	23	25	27	29	31
170	%N1	89.2	93.3	95.0							
	MACH	.535	.585	.597							
	KIAS	297	296	291							
	FF/ENG	6118	6179	6101							
160	%N1	87.6	91.8	93.4	95.4						
	MACH	.519	.571	.588	.601						
	KIAS	288	288	286	281						
	FF/ENG	5729	5797	5767	5721						
150	%N1	85.8	90.0	91.7	93.5	95.6					
	MACH	.502	.554	.575	.590	.604					
	KIAS	278	280	280	276	272					
	FF/ENG	5342	5406	5415	5366	5363					
140	%N1	83.8	88.1	89.9	91.6	93.5	95.9				
	MACH	.485	.536	.557	.578	.593	.607				
	KIAS	268	270	271	270	266	262				
	FF/ENG	4957	5018	5028	5030	4984	5021				
130	%N1	81.8	86.1	87.9	89.7	91.5	93.4	96.1			
	MACH	.468	.517	.538	.559	.581	.594	.610			
	KIAS	259	260	261	261	261	256	253			
	FF/ENG	4593	4631	4640	4647	4655	4615	4684			
120	%N1	79.8	83.9	85.7	87.5	89.3	91.2	93.3	96.2		
	MACH	.451	.496	.517	.539	.560	.582	.595	.612		
	KIAS	249	250	250	251	251	251	246	243		
	FF/ENG	4245	4246	4256	4260	4271	4283	4258	4340		
110	%N1	77.5	81.5	83.3	85.1	86.9	88.7	90.7	92.9	96.0	
	MACH	.434	.474	.494	.516	.538	.560	.582	.595	.612	
	KIAS	240	238	239	240	241	241	241	236	233	
	FF/ENG	3911	3870	3872	3878	3886	3896	3921	3908	3990	
100	%N1	75.4	79.1	80.7	82.5	84.3	86.2	88.0	90.0	92.2	95.5
	MACH	.416	.454	.471	.491	.513	.535	.558	.580	.594	.611
	KIAS	230	228	228	228	229	230	230	230	226	222
	FF/ENG	3590	3522	3503	3497	3507	3515	3532	3567	3558	3633
90	%N1	73.0	76.4	78.1	79.7	81.5	83.3	85.2	87.0	89.0	91.4
	MACH	.399	.433	.449	.466	.485	.507	.530	.553	.576	.592
	KIAS	220	217	217	216	217	218	218	219	218	215
	FF/ENG	3279	3190	3161	3137	3128	3139	3154	3179	3211	3208
80	%N1	70.2	73.8	75.2	76.8	78.5	80.1	82.0	83.8	85.7	87.7
	MACH	.381	.412	.426	.442	.459	.477	.499	.522	.546	.569
	KIAS	210	207	206	205	204	204	205	206	206	206
	FF/ENG	2978	2878	2837	2803	2779	2764	2780	2803	2826	2849

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
308	279	253	233	215	200	190	180	172	164	157
621	561	509	467	431	400	379	360	343	327	314
938	846	767	702	648	600	569	540	514	491	470
1256	1132	1025	937	864	800	758	720	685	654	626
1576	1419	1283	1173	1081	1000	948	899	856	816	781
1899	1708	1543	1409	1298	1200	1137	1079	1026	979	937
2224	1999	1804	1646	1515	1400	1326	1258	1197	1142	1093
2551	2291	2065	1884	1733	1600	1516	1438	1368	1304	1248
2881	2584	2328	2122	1950	1800	1705	1618	1538	1467	1403

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	2.9	0:44	2.5	0:42	2.3	0:40	2.0	0:38	1.9	0:37
400	5.9	1:27	5.4	1:22	5.0	1:17	4.5	1:13	4.3	1:11
600	8.9	2:10	8.2	2:03	7.6	1:55	7.0	1:48	6.6	1:44
800	11.9	2:53	11.0	2:43	10.2	2:33	9.5	2:24	9.0	2:18
1000	14.8	3:37	13.7	3:25	12.8	3:12	11.9	3:00	11.3	2:52
1200	17.7	4:21	16.5	4:07	15.3	3:51	14.3	3:36	13.5	3:26
1400	20.6	5:06	19.2	4:49	17.8	4:30	16.6	4:13	15.8	4:00
1600	23.4	5:52	21.8	5:32	20.3	5:10	19.0	4:50	18.0	4:35
1800	26.3	6:38	24.5	6:15	22.8	5:51	21.3	5:27	20.2	5:10

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.7	-0.3	0.0	0.7	1.6
10	-1.4	-0.7	0.0	1.4	3.4
15	-2.1	-1.1	0.0	2.1	4.9
20	-2.8	-1.4	0.0	2.7	6.2
25	-3.5	-1.8	0.0	3.2	7.4
30	-4.2	-2.1	0.0	3.6	8.4
35	-4.9	-2.5	0.0	3.9	9.1

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
170	%N1	79.1	82.0	86.3	90.8			
	KIAS	242	243	243	245			
	FF/ENG	5600	5590	5620	5710			
160	%N1	77.5	80.2	84.6	89.0	95.1		
	KIAS	235	235	236	237	239		
	FF/ENG	5270	5250	5260	5330	5480		
150	%N1	75.7	78.5	82.8	87.1	92.3		
	KIAS	227	228	228	229	231		
	FF/ENG	4940	4920	4910	4960	5040		
140	%N1	73.8	76.6	80.8	85.2	89.9	98.2	
	KIAS	220	220	221	222	223	224	
	FF/ENG	4610	4590	4570	4600	4630	5010	
130	%N1	71.6	74.7	78.7	83.1	87.7	94.5	
	KIAS	211	212	213	213	214	216	
	FF/ENG	4290	4260	4230	4240	4260	4450	
120	%N1	69.4	72.4	76.5	80.9	85.4	90.8	
	KIAS	202	204	204	205	206	207	
	FF/ENG	3970	3930	3900	3890	3900	3980	
110	%N1	67.2	70.0	74.2	78.4	83.0	87.7	96.3
	KIAS	194	194	195	196	197	198	199
	FF/ENG	3670	3610	3580	3560	3540	3580	3890
100	%N1	64.7	67.4	71.7	75.8	80.3	85.0	91.4
	KIAS	185	185	186	187	187	188	190
	FF/ENG	3360	3300	3260	3230	3200	3220	3360
90	%N1	61.9	64.7	68.7	73.1	77.4	82.0	87.0
	KIAS	178	178	178	178	178	178	180
	FF/ENG	3060	3010	2950	2920	2870	2870	2940
80	%N1	58.9	61.7	65.7	70.0	74.3	78.8	83.6
	KIAS	172	172	172	172	172	172	172
	FF/ENG	2760	2710	2660	2620	2570	2540	2590

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 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	19100	16400	13600
160	21600	19100	16300
150	23900	21800	19000
140	26100	24500	22000
130	28400	26900	25200
120	30500	29300	27800
110	32400	31500	30200
100	34400	33500	32400
90	36600	35700	34600
80	39100	38100	37000

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
170	%N1	83.7									
	MACH	.460									
	KIAS	254									
	FF/ENG	4891									
160	%N1	82.0	91.4								
	MACH	.447	.548								
	KIAS	247	245								
	FF/ENG	4586	4570								
150	%N1	80.2	89.6	91.6	94.2						
	MACH	.434	.535	.552	.569						
	KIAS	240	239	237	235						
	FF/ENG	4287	4274	4260	4308						
140	%N1	78.3	87.8	89.5	91.6	94.6					
	MACH	.420	.518	.538	.555	.573					
	KIAS	232	232	231	229	227					
	FF/ENG	3996	3965	3962	3963	4033					
130	%N1	76.4	85.7	87.5	89.3	91.6	94.8				
	MACH	.406	.500	.521	.541	.558	.576				
	KIAS	224	223	224	223	221	218				
	FF/ENG	3709	3655	3656	3661	3676	3756				
120	%N1	74.4	83.5	85.3	87.1	88.9	91.4	94.8			
	MACH	.391	.482	.501	.523	.543	.560	.579			
	KIAS	216	215	215	215	214	212	210			
	FF/ENG	3427	3351	3349	3358	3372	3389	3475			
110	%N1	72.0	81.1	82.9	84.6	86.5	88.3	90.9	94.4		
	MACH	.375	.462	.481	.501	.523	.543	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	3149	3054	3049	3055	3072	3084	3100	3190		
100	%N1	69.5	78.5	80.3	82.1	83.8	85.7	87.6	90.3	93.8	
	MACH	.359	.442	.460	.479	.499	.521	.542	.560	.580	
	KIAS	198	197	197	197	196	197	196	194	192	
	FF/ENG	2881	2764	2753	2758	2773	2787	2796	2810	2896	
90	%N1	66.8	75.7	77.5	79.2	81.0	82.8	84.6	86.6	89.3	93.2
	MACH	.343	.421	.438	.456	.475	.496	.518	.540	.558	.578
	KIAS	189	187	187	187	187	187	187	186	184	182
	FF/ENG	2624	2486	2464	2465	2481	2491	2499	2508	2520	2610
80	%N1	64.0	72.7	74.4	76.2	77.9	79.6	81.4	83.3	85.3	88.2
	MACH	.326	.398	.415	.432	.450	.469	.490	.512	.534	.554
	KIAS	179	177	177	176	176	176	176	176	176	174
	FF/ENG	2373	2220	2189	2182	2196	2202	2208	2212	2220	2244

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
324	290	260	236	217	200	188	178	168	160	153
655	584	523	474	435	400	377	357	338	321	307
990	881	787	713	653	600	566	535	507	483	461
1330	1181	1054	953	871	800	755	713	676	642	613
1676	1486	1323	1195	1091	1000	943	891	844	803	766
2027	1793	1594	1437	1310	1200	1131	1069	1013	962	918
2385	2106	1868	1681	1531	1400	1319	1246	1180	1121	1069
2749	2422	2143	1926	1751	1600	1507	1423	1347	1279	1220
3120	2742	2421	2172	1973	1800	1695	1600	1514	1437	1370

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	5.1	0:51	4.6	0:49	4.0	0:46	3.7	0:44	3.4	0:43
400	10.4	1:40	9.6	1:35	8.5	1:28	7.9	1:24	7.4	1:21
600	15.6	2:30	14.5	2:22	12.9	2:11	12.0	2:04	11.3	1:59
800	20.7	3:22	19.3	3:10	17.2	2:55	16.0	2:46	15.1	2:38
1000	25.7	4:14	23.9	4:00	21.4	3:40	20.0	3:27	18.8	3:17
1200	30.5	5:08	28.5	4:50	25.5	4:25	23.8	4:10	22.5	3:57
1400	35.3	6:03	32.9	5:42	29.5	5:12	27.6	4:53	26.1	4:38
1600	39.9	6:59	37.3	6:34	33.4	5:59	31.3	5:37	29.6	5:19
1800	44.5	7:57	41.5	7:28	37.3	6:47	34.9	6:22	33.0	6:01

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.8	-0.4	0.0	0.6	1.5
10	-1.7	-0.8	0.0	1.2	2.9
15	-2.5	-1.2	0.0	1.8	4.3
20	-3.4	-1.7	0.0	2.4	5.5
25	-4.2	-2.1	0.0	2.9	6.6
30	-5.1	-2.5	0.0	3.4	7.7
35	-5.9	-2.9	0.0	3.9	8.6
40	-6.8	-3.4	0.0	4.3	9.5
45	-7.6	-3.8	0.0	4.7	10.2

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
41000	21	590	88
39000	20	580	84
37000	20	570	79
35000	19	560	75
33000	18	550	71
31000	18	540	67
29000	17	530	63
27000	16	520	59
25000	15	500	55
23000	14	490	51
21000	14	470	47
19000	13	450	43
17000	12	440	39
15000	11	410	35
10000	9	360	25
5000	6	290	16
1500	4	230	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
170	%N1	73.5	76.4	80.5	84.8	89.5			
	KIAS	221	221	221	221	221			
	FF/ENG	4550	4520	4500	4520	4550			
160	%N1	71.9	74.9	78.9	83.3	87.9	94.4		
	KIAS	217	217	217	217	217	217		
	FF/ENG	4310	4280	4260	4260	4270	4430		
150	%N1	70.2	73.3	77.3	81.6	86.1	91.6		
	KIAS	212	212	212	212	212	212		
	FF/ENG	4070	4040	4010	4000	4000	4080		
140	%N1	68.6	71.4	75.6	79.8	84.3	89.2		
	KIAS	207	207	207	207	207	207		
	FF/ENG	3840	3790	3760	3740	3730	3780		
130	%N1	66.8	69.5	73.8	77.9	82.4	87.1	94.6	
	KIAS	202	202	202	202	202	202	202	
	FF/ENG	3600	3550	3510	3490	3470	3490	3700	
120	%N1	64.9	67.6	71.8	75.9	80.4	85.0	90.8	
	KIAS	196	196	196	196	196	196	196	
	FF/ENG	3370	3320	3270	3240	3210	3220	3320	
110	%N1	62.7	65.6	69.6	73.9	78.2	82.7	87.6	
	KIAS	190	190	190	190	190	190	190	
	FF/ENG	3130	3080	3030	3000	2960	2960	3020	
100	%N1	60.5	63.5	67.4	71.7	75.9	80.4	85.1	92.6
	KIAS	184	184	184	184	184	184	184	184
	FF/ENG	2910	2860	2810	2770	2720	2700	2750	2900
90	%N1	58.3	61.0	65.1	69.3	73.5	78.0	82.5	88.1
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	2680	2630	2590	2540	2490	2460	2490	2550
80	%N1	56.0	58.6	62.8	66.7	71.2	75.4	79.9	84.6
	KIAS	172	172	172	172	172	172	172	172
	FF/ENG	2460	2420	2380	2330	2280	2230	2260	2270

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

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GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
160	150	214	2600		
150	141	210	5600	3300	
140	132	205	8600	6600	4200
130	123	199	11400	9800	7600
120	114	194	14100	13000	11100
110	105	188	16700	15800	14600
100	95	183	19400	18300	17200
90	86	177	22000	21000	19900
80	76	171	24700	23800	22800

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
140	2300		
130	6500	3600	
120	10500	8100	5300
110	14000	12500	9800
100	17300	16300	15000
90	20600	19500	18300
80	23700	22700	21700

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT) 5	7	9	11	13	15	17	19	21	23
130	%N1	90.1	91.8								
	MACH	.361	.373								
	KIAS	218	217								
	FF/ENG	7007	7011								
120	%N1	87.8	89.4	91.2	93.0						
	MACH	.349	.360	.372	.385						
	KIAS	211	210	209	208						
	FF/ENG	6453	6432	6432	6452						
110	%N1	85.4	87.0	88.5	90.3	92.1	94.8				
	MACH	.337	.348	.359	.371	.383	.397				
	KIAS	204	203	201	200	200	199				
	FF/ENG	5926	5885	5860	5861	5882	5959				
100	%N1	83.0	84.4	85.9	87.5	89.2	91.1	93.7			
	MACH	.325	.335	.345	.356	.368	.381	.395			
	KIAS	197	195	194	193	192	191	190			
	FF/ENG	5423	5366	5324	5299	5299	5309	5350			
90	%N1	80.3	81.7	83.2	84.6	86.2	87.9	89.8	92.2	96.0	
	MACH	.313	.322	.331	.341	.352	.364	.377	.391	.406	
	KIAS	189	188	186	184	183	182	181	181	180	
	FF/ENG	4946	4872	4814	4772	4747	4736	4729	4743	4889	
80	%N1	77.5	78.8	80.2	81.6	83.1	84.7	86.4	88.4	90.5	94.2
	MACH	.300	.309	.317	.326	.336	.347	.359	.373	.388	.404
	KIAS	182	180	178	176	175	173	172	172	172	172
	FF/ENG	4485	4409	4333	4274	4231	4198	4170	4174	4196	4319

Long Range Cruise Diversion Fuel and Time
Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
178	155	135	121	110	100	93	87	81	77	73
361	314	274	244	220	200	186	174	163	154	146
546	473	412	366	331	300	279	260	244	230	218
732	634	551	489	441	400	372	347	325	306	290
920	796	692	613	552	500	465	434	407	383	362
1109	958	832	737	663	600	558	520	487	458	434
1300	1122	973	861	774	700	651	607	568	534	505
1493	1287	1115	986	885	800	744	693	648	610	577
1688	1453	1257	1110	997	900	836	779	729	685	648
1884	1620	1400	1235	1108	1000	929	865	809	760	719

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	2.6	0:28	2.4	0:27	2.1	0:26
200	5.5	0:54	5.1	0:52	4.7	0:50
300	8.3	1:21	7.7	1:17	7.3	1:14
400	11.1	1:48	10.3	1:43	9.8	1:38
500	13.8	2:15	12.9	2:09	12.3	2:03
600	16.5	2:42	15.5	2:35	14.7	2:27
700	19.1	3:10	18.0	3:01	17.1	2:52
800	21.8	3:38	20.5	3:28	19.5	3:17
900	24.4	4:06	22.9	3:54	21.8	3:43
1000	26.9	4:35	25.3	4:22	24.1	4:08

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
2	-0.3	-0.2	0.0	0.3	0.6
6	-1.0	-0.5	0.0	1.0	2.0
10	-1.7	-0.8	0.0	1.8	3.5
14	-2.3	-1.2	0.0	2.5	4.9
18	-3.0	-1.5	0.0	3.2	6.3
22	-3.6	-1.8	0.0	3.8	7.6
26	-4.3	-2.1	0.0	4.4	9.0
30	-5.0	-2.5	0.0	5.0	10.3

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
160	%N1	90.8			
	KIAS	217			
	FF/ENG	8330			
150	%N1	88.9	92.1		
	KIAS	212	212		
	FF/ENG	7800	7880		
140	%N1	87.0	90.1		
	KIAS	207	207		
	FF/ENG	7280	7330		
130	%N1	84.9	87.9	92.7	
	KIAS	202	202	202	
	FF/ENG	6760	6790	6890	
120	%N1	82.7	85.7	90.3	
	KIAS	196	196	196	
	FF/ENG	6270	6270	6330	
110	%N1	80.4	83.4	87.8	93.1
	KIAS	190	190	190	190
	FF/ENG	5790	5770	5790	5920
100	%N1	78.0	80.9	85.3	90.1
	KIAS	184	184	184	184
	FF/ENG	5330	5300	5290	5370
90	%N1	75.6	78.3	82.7	87.3
	KIAS	178	178	178	178
	FF/ENG	4890	4840	4820	4850
80	%N1	72.9	75.8	79.9	84.4
	KIAS	172	172	172	172
	FF/ENG	4450	4410	4360	4370

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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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 appropriate 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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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

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

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

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

Intentionally
Blank

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 15

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	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 VREF15	ONE REV	NO REV
MAX MANUAL	945	70/-55	20/25	-35	115	10	-10	20	-20	65	20	40
MAX AUTO	1225	70/-70	25/35	-45	145	5	-5	30	-30	105	0	0
AUTOBRAKE 3	1745	120/-115	45/60	-75	250	5	-5	45	-45	175	0	0
AUTOBRAKE 2	2240	170/-170	65/85	-100	340	35	-40	65	-65	185	75	75
AUTOBRAKE 1	2465	200/-195	80/105	-115	400	65	-70	70	-70	175	240	325

Good Reported Braking Action

MAX MANUAL	1310	85/-80	35/45	-55	200	30	-25	30	-30	90	70	165
MAX AUTO	1445	90/-85	35/45	-60	205	30	-25	35	-35	100	75	175
AUTOBRAKE 3	1750	120/-115	45/60	-75	250	10	-10	45	-45	175	5	15
AUTOBRAKE 2	2240	170/-170	65/85	-100	340	35	-40	65	-65	185	75	75

Medium Reported Braking Action

MAX MANUAL	1800	135/-130	55/70	-90	330	75	-60	45	-45	120	200	490
MAX AUTO	1885	135/-130	55/75	-90	330	80	-60	45	-50	125	205	500
AUTOBRAKE 3	1935	140/-135	55/75	-95	340	60	-40	50	-50	175	135	425
AUTOBRAKE 2	2290	175/-170	70/90	-110	385	60	-55	65	-65	185	115	245

Poor Reported Braking Action

MAX MANUAL	2360	220/-180	75/105	-135	520	190	-125	65	-65	150	430	1185
MAX AUTO	2450	190/-180	75/105	-135	520	190	-125	65	-65	150	430	1185
AUTOBRAKE 3	2450	190/-180	75/105	-135	520	185	-120	65	-65	160	430	1185
AUTOBRAKE 2	2545	200/-195	80/110	-145	540	170	-110	70	-70	185	350	1040

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m 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 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	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	900	60/-50	20/25	-35	110	10	-10	20	-20	65	15	35
MAX AUTO	1145	65/-60	25/30	-40	140	5	-5	25	-25	100	0	0
AUTOBRAKE 3	1610	105/-105	40/55	-70	235	5	-5	45	-45	165	0	0
AUTOBRAKE 2	2065	150/-150	60/80	-95	325	30	-35	55	-55	170	65	65
AUTOBRAKE 1	2270	175/-175	70/95	-110	385	60	-65	65	-65	160	200	280

Good Reported Braking Action

MAX MANUAL	1250	80/-75	30/40	-55	195	30	-25	30	-30	95	65	145
MAX AUTO	1370	80/-80	35/45	-55	200	30	-25	30	-30	100	70	160
AUTOBRAKE 3	1615	105/-105	40/55	-70	240	10	-10	45	-45	165	5	15
AUTOBRAKE 2	2065	150/-150	60/80	-95	325	30	-35	55	-55	170	65	65

Medium Reported Braking Action

MAX MANUAL	1695	120/-120	50/65	-90	320	75	-60	45	-45	120	175	425
MAX AUTO	1770	125/-120	50/65	-90	320	75	-60	45	-45	120	180	435
AUTOBRAKE 3	1810	125/-120	50/70	-90	330	60	-40	45	-50	165	130	385
AUTOBRAKE 2	2115	155/-155	60/80	-105	370	55	-55	55	-60	170	100	215

Poor Reported Braking Action

MAX MANUAL	2195	175/-165	70/95	-130	505	180	-115	60	-60	140	370	995
MAX AUTO	2280	175/-165	70/95	-130	505	180	-115	60	-60	140	370	1000
AUTOBRAKE 3	2280	175/-165	70/95	-130	505	180	-115	60	-60	150	375	1000
AUTOBRAKE 2	2360	185/-175	75/100	-135	520	160	-105	65	-65	170	305	880

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 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m 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 (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	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	860	55/-45	15/25	-30	110	10	-10	15	-15	65	15	30
MAX AUTO	1070	60/-55	20/30	-40	135	5	-5	25	-25	95	0	0
AUTOBRAKE 3	1485	100/-95	35/50	-65	225	5	-5	40	-40	160	0	0
AUTOBRAKE 2	1910	140/-135	55/70	-90	315	25	-30	50	-50	175	35	35
AUTOBRAKE 1	2115	165/-160	65/85	-105	370	50	-60	60	-60	160	155	205

Good Reported Braking Action

MAX MANUAL	1195	75/-75	30/40	-55	190	30	-25	30	-30	95	60	135
MAX AUTO	1300	80/-75	30/40	-55	195	30	-25	30	-30	100	65	140
AUTOBRAKE 3	1490	100/-95	35/50	-65	230	10	-10	40	-40	160	5	15
AUTOBRAKE 2	1910	140/-135	55/70	-90	315	25	-30	50	-50	175	35	35

Medium Reported Braking Action

MAX MANUAL	1610	115/-110	45/60	-85	315	75	-55	40	-40	120	160	385
MAX AUTO	1675	115/-115	45/65	-85	315	75	-55	40	-40	120	160	385
AUTOBRAKE 3	1700	120/-115	45/65	-90	320	60	-40	45	-45	160	135	365
AUTOBRAKE 2	1960	145/-140	55/75	-100	355	50	-45	50	-55	175	75	185

Poor Reported Braking Action

MAX MANUAL	2080	165/-155	65/90	-130	495	175	-115	55	-55	140	335	885
MAX AUTO	2165	165/-155	65/90	-130	495	175	-115	55	-55	140	335	885
AUTOBRAKE 3	2165	165/-155	65/90	-130	495	175	-115	55	-55	145	335	890
AUTOBRAKE 2	2215	170/-165	65/90	-135	510	155	-100	60	-60	170	270	795

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 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m 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 DISTANCE AND ADJUSTMENT (M)							
		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
ALL FLAPS UP	VREF40+55	1225	170/-70	45/45	-45	205	20	-20	105
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1515	90/-95	40/55	-75	270	45	-40	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1025	70/-55	25/30	-35	125	15	-15	85
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	990	65/-55	20/30	-35	125	15	-10	90
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	950	60/-50	20/25	-35	120	15	-10	90
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1065	55/-60	25/30	-40	140	15	-15	75
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1425	80/-85	35/45	-55	185	35	-30	145
LEADING EDGE FLAPS TRANSIT	VREF15+15	1060	75/-60	25/30	-35	125	10	-10	70
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	955	70/-55	20/25	-35	120	10	-10	65
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	910	60/-50	20/25	-35	115	10	-10	65

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 (305 m 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 (M)							
		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	945	70/-55	20/25	-35	120	10	-10	65
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/25	-35	110	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1050	85/-60	25/30	-35	130	10	-10	70
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/25	-35	110	10	-10	65
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1050	85/-60	25/30	-35	130	10	-10	70
TRAILING EDGE FLAPS UP	VREF40+40	1110	110/-65	30/30	-40	165	15	-10	70

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 (305 m 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 (M)							
		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	1660	90/-95	45/60	-65	225	35	-30	85
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1685	110/-110	45/60	-85	330	65	-55	125
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1485	95/-100	40/55	-60	225	40	-35	130
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1410	90/-90	40/50	-60	220	40	-35	130
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1340	85/-85	35/50	-60	215	40	-35	130
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1350	85/-85	35/45	-60	205	30	-25	100
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1760	105/-110	45/60	-75	250	55	-50	170
LEADING EDGE FLAPS TRANSIT	VREF15+15	1475	90/-90	40/55	-60	215	35	-30	95
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1350	80/-85	35/45	-60	210	35	-30	100
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1285	75/-80	30/45	-55	205	30	-30	100

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 (305 m 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 (M)							
		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	1295	80/-80	35/45	-55	200	30	-25	90
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/40	-55	195	30	-25	95
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1435	80/-85	40/50	-60	210	30	-25	90
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/40	-55	195	30	-25	95
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1435	80/-85	40/50	-60	210	30	-25	90
TRAILING EDGE FLAPS UP	VREF40+40	1510	80/-85	40/55	-60	215	30	-30	85

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 (305 m 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 (M)							
		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	2340	150/-155	75/100	-100	375	85	-75	120
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2130	155/-155	65/90	-130	515	150	-105	145
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2030	155/-150	65/90	-100	365	95	-80	165
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1905	140/-140	60/80	-95	355	90	-75	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1795	130/-130	55/75	-95	345	85	-70	160
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1845	135/-130	55/75	-90	340	80	-65	130
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2425	170/-170	70/100	-115	395	120	-105	210
LEADING EDGE FLAPS TRANSIT	VREF15+15	2020	140/-140	60/85	-95	355	80	-70	125
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1930	135/-140	55/75	-100	360	90	-75	135
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1805	125/-130	50/70	-95	350	85	-70	135

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 (305 m 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 (M) 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	1770	125/-125	50/75	-90	330	70	-60	120
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/65	-90	320	75	-60	120
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1985	130/-135	60/80	-95	350	80	-65	120
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/65	-90	320	75	-60	120
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1985	130/-135	60/80	-95	350	80	-65	120
TRAILING EDGE FLAPS UP	VREF40+40	2110	135/-140	65/85	-100	360	80	-70	115

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 (305 m 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 DISTANCE AND ADJUSTMENT (M)							
		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
ALL FLAPS UP	VREF40+55	3090	220/-225	110/150	-155	590	200	-150	150
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2815	225/-215	85/130	-210	955	515	-245	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2620	220/-210	90/130	-145	570	205	-150	190
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	2435	195/-190	80/115	-140	555	190	-140	180
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2285	180/-175	75/105	-135	540	185	-135	175
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	2390	190/-185	80/115	-135	540	170	-130	155
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	3115	240/-235	105/145	-165	605	240	-185	235
LEADING EDGE FLAPS TRANSIT	VREF15+15	2615	200/-200	90/125	-140	555	180	-135	150
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2635	205/-205	85/115	-155	595	225	-160	170
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2430	185/-185	75/105	-145	575	210	-150	160

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 (305 m 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 (M)							
		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
STABILIZER TRIM INOPERATIVE	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/95	-130	505	180	-115	140
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2595	190/-190	85/120	-140	555	175	-130	145
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/95	-130	505	180	-115	140
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	2595	190/-190	85/120	-140	555	175	-130	145
TRAILING EDGE FLAPS UP	VREF40+40	2780	200/-200	95/130	-145	565	185	-140	145

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 (305 m 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

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

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

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.

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH

Engine Inoperative — Section 32

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.

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

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) 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

GEAR DOWN

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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Gear Down, Engine Inop — Section 34

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

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	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

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
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

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

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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Text Section 35

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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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 appropriate 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 40

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 LB)					
		80	100	120	140	160	180
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1900	1300	700	200		
30000	**PITCH ATT**	**4.0**	**4.0**	**3.5**	**3.5**	**3.5**	**4.0**
	V/S (FT/MIN)	2800	2100	1600	1300	1000	700
20000	**PITCH ATT**	**7.5**	**6.5**	**6.0**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4600	3600	2900	2400	1900	1600
10000	**PITCH ATT**	**11.5**	**10.0**	**9.0**	**8.0**	**8.0**	**7.5**
	V/S (FT/MIN)	6100	4900	4000	3300	2800	2400
SEA LEVEL	**PITCH ATT**	**15.5**	**13.0**	**11.5**	**10.5**	**10.0**	**9.5**
	V/S (FT/MIN)	7400	5900	4800	4000	3400	3000

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
40000	**PITCH ATT**	**1.5**	**2.0**	**3.0**			
	%N1	83	85	88			
35000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	
	%N1	81	83	84	86	90	
30000	**PITCH ATT**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	84	86	88
25000	**PITCH ATT**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	80	82	84
20000	**PITCH ATT**	**0.5**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	74	74	75	77	78	80
15000	**PITCH ATT**	**0.5**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	70	71	72	73	74	76

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
40000	**PITCH ATT**	**-2.5**	**-1.0**	**-0.5**	**0.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3000	-2600	-2500	-2600	-2900	-3500
30000	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-1.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3400	-2800	-2500	-2300	-2100	-2100
20000	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-3100	-2600	-2200	-2000	-1900	-1800
10000	**PITCH ATT**	**-4.0**	**-3.0**	**-1.5**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN	-2800	-2300	-2000	-1800	-1700	-1600
SEA LEVEL	**PITCH ATT**	**-4.5**	**-3.0**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2600	-2100	-1800	-1700	-1500	-1500

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
10000	**PITCH ATT**	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	52	56	60	64	68	71
5000	**PITCH ATT**	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	48	53	56	60	64	67

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
FLAPS 1 (GEAR UP)	**PITCH ATT**	**3.5**	**4.0**	**4.0**	**4.5**	**5.0**	**5.5**
(VREF40 + 50)	%N1	50	55	59	63	67	70
FLAPS 5 (GEAR UP)	**PITCH ATT**	**4.0**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(VREF40 + 30)	%N1	50	55	60	64	68	71
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**4.0**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(VREF40 + 20)	%N1	58	64	68	73	76	80

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
FLAPS 15	**PITCH ATT**	**0.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
(VREF15 + 10)	%N1	42	46	50	54	57	59
FLAPS 30	**PITCH ATT**	**-1.0**	**-1.0**	**-1.0**	**-0.5**	**0.0**	**0.0**
(VREF30 + 10)	%N1	46	51	55	59	62	65
FLAPS 40	**PITCH ATT**	**-1.5**	**-1.5**	**-1.5**	**-1.5**	**-1.5**	**-1.5**
(VREF40 + 10)	%N1	51	56	61	65	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 LB)	FLAPS		
	40	30	15
180	155	166	177
170	151	161	171
160	146	156	166
150	141	151	161
140	139	149	159
130	134	144	153
120	129	138	147
110	123	132	140
100	117	126	134
90	111	119	127

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH
Advisory Information — Section 41

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	3170	210/-170	70	-110	390	40	-30	70	-70	220	70	150
MAX AUTO	4180	220/-220	100	-150	500	0	0	100	-100	390	0	10
AUTOBRAKE 3	5980	370/-370	160	-250	840	10	-10	170	-170	620	20	20
AUTOBRAKE 2	7610	520/-520	230	-340	1140	150	-170	220	-220	550	410	430
AUTOBRAKE 1	8290	600/-600	280	-390	1320	250	-260	240	-240	540	880	1360

Good Reported Braking Action

MAX MANUAL	4400	260/-250	120	-190	660	100	-90	110	-70	300	250	570
MAX AUTO	4880	280/-270	120	-200	690	90	-70	120	-100	380	280	640
AUTOBRAKE 3	5990	370/-370	160	-250	850	20	-20	170	-170	620	30	60
AUTOBRAKE 2	7610	520/-520	230	-340	1140	150	-170	220	-220	550	410	430

Medium Reported Braking Action

MAX MANUAL	6030	400/-390	180	-300	1100	260	-210	160	-160	400	680	1680
MAX AUTO	6350	410/-400	190	-300	1100	230	-180	160	-170	460	700	1710
AUTOBRAKE 3	6570	430/-420	190	-320	1140	180	-130	180	-180	620	460	1390
AUTOBRAKE 2	7770	530/-530	240	-360	1280	230	-220	220	-220	550	540	970

Poor Reported Braking Action

MAX MANUAL	7850	570/-550	260	-460	1730	630	-420	220	-220	480	1460	4000
MAX AUTO	8170	570/-550	260	-450	1710	620	-400	210	-220	500	1450	4010
AUTOBRAKE 3	8170	580/-550	260	-450	1720	580	-360	220	-230	600	1450	4020
AUTOBRAKE 2	8570	610/-600	280	-470	1780	590	-400	240	-240	550	1310	3530

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2990	180/-150	60	-110	370	30	-30	60	-60	220	60	130
MAX AUTO	3850	200/-200	90	-140	470	0	0	90	-90	370	0	0
AUTOBRAKE 3	5430	330/-330	150	-230	790	10	-10	150	-150	560	20	20
AUTOBRAKE 2	6910	450/-450	210	-320	1080	140	-150	190	-190	520	330	330
AUTOBRAKE 1	7530	530/-520	240	-370	1260	230	-230	220	-210	510	690	1110

Good Reported Braking Action

MAX MANUAL	4150	240/-230	110	-180	650	100	-90	100	-100	310	220	510
MAX AUTO	4580	250/-250	110	-190	670	80	-70	110	-110	360	250	570
AUTOBRAKE 3	5440	330/-330	150	-240	800	20	-20	150	-150	560	30	60
AUTOBRAKE 2	6910	450/-450	210	-320	1080	140	-150	190	-190	520	330	330

Medium Reported Braking Action

MAX MANUAL	5620	370/-360	170	-290	1060	250	-200	150	-150	390	600	1450
MAX AUTO	5900	380/-370	170	-290	1060	220	-170	150	-150	450	600	1460
AUTOBRAKE 3	6040	390/-380	170	-300	1100	180	-130	160	-160	560	430	1270
AUTOBRAKE 2	7070	470/-470	210	-340	1220	220	-200	190	-200	520	450	830

Poor Reported Braking Action

MAX MANUAL	7250	520/-500	240	-440	1670	590	-390	200	-200	460	1250	3340
MAX AUTO	7540	510/-500	240	-430	1660	580	-370	200	-200	490	1240	3350
AUTOBRAKE 3	7540	520/-500	240	-440	1670	560	-360	200	-200	540	1270	3390
AUTOBRAKE 2	7840	550/-530	250	-450	1710	560	-370	210	-220	520	1120	2980

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 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air 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	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2820	160/-130	60	-100	360	30	-30	60	-60	220	50	110
MAX AUTO	3530	170/-180	80	-130	450	0	0	80	-80	350	0	0
AUTOBRAKE 3	4900	290/-290	130	-220	750	10	-10	130	-130	540	10	10
AUTOBRAKE 2	6280	400/-400	180	-300	1030	100	-120	170	-170	520	180	180
AUTOBRAKE 1	6940	470/-470	220	-350	1210	190	-210	200	-190	510	550	800

Good Reported Braking Action

MAX MANUAL	3920	220/-210	100	-180	630	100	-80	90	-90	310	200	450
MAX AUTO	4280	230/-230	110	-180	650	80	-70	100	-100	360	220	490
AUTOBRAKE 3	4910	290/-290	130	-220	760	20	-20	130	-130	540	20	60
AUTOBRAKE 2	6280	400/-400	180	-300	1030	100	-120	170	-170	520	180	180

Medium Reported Braking Action

MAX MANUAL	5270	340/-330	150	-280	1040	240	-190	140	-140	400	530	1270
MAX AUTO	5490	340/-340	160	-280	1030	210	-160	140	-140	460	530	1270
AUTOBRAKE 3	5580	350/-340	160	-290	1060	180	-130	150	-150	540	430	1210
AUTOBRAKE 2	6440	410/-410	190	-330	1170	190	-180	180	-180	520	300	660

Poor Reported Braking Action

MAX MANUAL	6790	470/-460	220	-420	1630	570	-380	180	-190	460	1110	2940
MAX AUTO	7070	470/-460	220	-420	1620	580	-360	180	-190	480	1120	2960
AUTOBRAKE 3	7070	480/-470	220	-420	1620	550	-350	180	-190	510	1130	2970
AUTOBRAKE 2	7250	500/-480	230	-440	1670	530	-360	190	-200	520	940	2650

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 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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
ALL FLAPS UP	VREF40+55	3970	530/-210	100/240	-130	460	50	-40	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4960	260/-280	130/180	-240	890	150	-130	380
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3480	210/-170	80/110	-120	430	50	-40	290
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3310	180/-160	80/100	-120	420	50	-40	300
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3120	160/-150	70/90	-110	400	50	-40	310
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3580	170/-180	90/110	-130	470	50	-50	260
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4870	220/-260	120/170	-180	630	120	-100	490
LEADING EDGE FLAPS TRANSIT	VREF15+15	3550	230/-180	90/110	-120	430	40	-40	230
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3200	210/-170	70/90	-110	410	40	-30	220
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	3020	170/-140	70/100	-110	390	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 CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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
STABILIZER TRIM INOPERATIVE	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2990	180/-150	60/TBS	-110	370	30	-30	220
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3410	260/-180	90/100	-120	440	40	-30	230
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2990	180/-150	60/TBS	-110	370	30	-30	220
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3410	260/-180	90/100	-120	440	40	-30	230
TRAILING EDGE FLAPS UP	VREF40+40	3600	340/-190	85/110	-120	430	40	-40	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.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT): REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	5470	270/-280	160/200	-210	750	120	-100	290
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5520	300/-330	150/210	-280	1080	210	-180	420
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5040	270/-300	140/190	-210	750	140	-120	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4720	250/-280	130/180	-200	730	130	-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4410	230/-250	120/160	-190	700	130	-110	430
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4550	240/-260	120/170	-190	690	110	-90	330
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	6010	300/-340	160/220	-240	840	200	-170	580
LEADING EDGE FLAPS TRANSIT	VREF15+15	4950	250/-280	140/180	-200	720	110	-100	320
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	4550	240/-260	120/160	-190	700	110	-100	320
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	4280	220/-240	110/150	-190	690	110	-90	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 CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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
STABILIZER TRIM INOPERATIVE	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4150	240/-230	110/TBS	-180	650	100	-90	310
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4710	240/-250	130/170	-190	700	100	-90	290
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4150	240/-230	110/TBS	-180	650	100	-90	310
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4710	240/-250	130/170	-190	700	100	-90	290
TRAILING EDGE FLAPS UP	VREF40+40	4940	250/-260	140/180	-200	710	110	-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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	7720	450/-460	250/340	-340	1240	290	-250	410
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6950	430/-450	210/300	-420	1690	480	-350	480
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6840	440/-460	220/310	-330	1210	320	-260	540
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6340	390/-420	200/280	-320	1180	300	-250	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5880	360/-380	180/250	-300	1140	290	-230	520
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6190	380/-400	190/270	-300	1140	260	-210	430
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	8210	480/-520	260/350	-380	1330	420	-350	700
LEADING EDGE FLAPS TRANSIT	VREF15+15	6760	410/-430	210/290	-320	1180	270	-230	420
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	6480	390/-420	200/260	-320	1200	300	-250	450
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	6000	350/-380	180/240	-310	1160	290	-230	440

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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	5930	360/-380	180/250	-290	1110	240	-200	390
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	5620	370/-360	170/TBS	-290	1060	250	-200	390
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6490	390/-390	200/270	-310	1150	250	-210	390
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5620	370/-360	170/TBS	-290	1060	250	-200	390
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	6490	390/-390	200/270	-310	1150	250	-210	390
TRAILING EDGE FLAPS UP	VREF40+40	6890	400/-410	220/290	-320	1180	260	-220	390

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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	10230	670/-670	370/500	-510	1970	660	-510	510
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	9150	630/-640	290/430	-690	3140	1650	-800	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8780	630/-640	320/450	-490	1890	660	-500	620
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	8080	560/-570	280/400	-470	1840	620	-460	600
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7480	510/-520	250/360	-450	1780	600	-440	580
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7990	550/-560	270/380	-450	1790	560	-420	510
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	10450	690/-710	360/500	-550	2010	810	-620	770
LEADING EDGE FLAPS TRANSIT	VREF15+15	8710	590/-600	300/420	-470	1840	580	-440	500
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	8810	590/-620	290/390	-510	1970	740	-540	550
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	8040	530/-550	260/350	-480	1900	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 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	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	7660	520/-530	260/360	-440	1750	520	-390	470
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	7250	520/-500	240/TBS	-440	1670	590	-390	460
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	8460	570/-560	290/400	-460	1820	570	-430	480
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	7250	520/-500	240/TBS	-440	1670	590	-390	460
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	8460	570/-560	290/400	-460	1820	570	-430	480
TRAILING EDGE FLAPS UP	VREF40+40	9060	600/-590	310/430	-480	1870	590	-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 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
180	0	15.8	17.8	20.3	22.9	26.2	30.3	31.2	35.9	41.6	40.3	46.4	53.9	50.1	57.8	67.0	59.9	69.0	79.8
	10	16.2	18.3	20.9	23.7	27.1	31.3	32.2	37.1	43.0	41.6	48.0	55.8	51.8	59.7	69.2	61.9	71.3	82.3
	20	16.7	18.9	21.6	24.4	28.0	32.3	33.3	38.3	44.5	43.0	49.6	57.6	53.5	61.6	71.4	63.8	73.4	84.8
	30	17.1	19.3	22.1	25.0	28.7	33.1	34.1	39.3	45.6	44.2	50.9	59.1	54.9	63.3	73.3	65.6	75.5	87.1
	40	17.3	19.6	22.4	25.4	29.2	33.8	34.8	40.1	46.6	45.1	52.0	60.4	56.1	64.8	75.1	67.1	77.3	89.3
	50	17.4	19.8	22.6	25.7	29.5	34.2	35.2	40.6	47.3	45.7	52.8	61.5	57.0	65.9	76.6	68.4	78.9	91.4
160	0	14.4	16.2	18.4	20.8	23.8	27.4	28.2	32.4	37.5	36.3	41.8	48.6	45.1	52.0	60.4	54.2	62.5	72.4
	10	14.9	16.7	19.0	21.5	24.6	28.3	29.1	33.5	38.8	37.5	43.3	50.2	46.6	53.8	62.4	56.0	64.6	74.8
	20	15.3	17.2	19.6	22.2	25.3	29.2	30.1	34.6	40.1	38.8	44.7	51.9	48.1	55.5	64.3	57.8	66.6	77.0
	30	15.6	17.6	20.0	22.7	26.0	30.0	30.9	35.5	41.2	39.8	45.9	53.3	49.4	57.0	66.1	59.4	68.4	79.1
	40	15.8	17.8	20.3	23.1	26.4	30.5	31.4	36.2	42.0	40.6	46.8	54.4	50.5	58.3	67.6	60.7	70.0	81.1
	50	15.9	18.0	20.5	23.3	26.7	30.8	31.8	36.6	42.6	41.1	47.5	55.3	51.2	59.2	68.9	61.8	71.4	82.8
140	0	13.1	14.7	16.6	18.8	21.3	24.5	25.2	28.9	33.4	32.3	37.2	43.2	40.0	46.1	53.6	48.2	55.6	64.6
	10	13.5	15.1	17.1	19.4	22.0	25.3	26.1	29.9	34.6	33.4	38.5	44.6	41.3	47.7	55.4	49.9	57.5	66.7
	20	13.9	15.5	17.6	20.0	22.7	26.1	26.9	30.9	35.7	34.5	39.7	46.1	42.7	49.2	57.1	51.5	59.4	68.8
	30	14.2	15.9	18.0	20.4	23.3	26.8	27.6	31.6	36.7	35.4	40.8	47.4	43.8	50.6	58.7	52.9	61.0	70.7
	40	14.3	16.1	18.2	20.7	23.6	27.2	28.0	32.2	37.4	36.1	41.6	48.3	44.7	51.6	60.0	54.0	62.4	72.3
	50	14.4	16.2	18.4	20.9	23.9	27.5	28.3	32.6	37.8	36.5	42.1	49.1	45.4	52.4	61.0	54.9	63.5	73.8
120	0	11.8	13.1	14.7	16.7	18.9	21.6	22.2	25.4	29.3	28.3	32.5	37.7	34.8	40.1	46.6	42.0	48.4	56.2
	10	12.2	13.5	15.2	17.2	19.5	22.3	23.0	26.2	30.3	29.2	33.6	39.0	36.0	41.5	48.2	43.4	50.1	58.1
	20	12.5	13.9	15.6	17.7	20.1	23.0	23.7	27.1	31.3	30.2	34.7	40.3	37.2	42.9	49.8	44.8	51.7	60.0
	30	12.7	14.1	15.9	18.1	20.6	23.6	24.3	27.8	32.1	31.0	35.6	41.3	38.2	44.0	51.1	46.0	53.1	61.6
	40	12.9	14.3	16.2	18.4	20.9	23.9	24.7	28.3	32.7	31.5	36.3	42.1	38.9	44.9	52.2	47.0	54.2	63.0
	50	12.9	14.4	16.3	18.5	21.0	24.2	24.9	28.5	33.1	31.9	36.7	42.7	39.4	45.5	53.0	47.7	55.1	64.1
100	0	10.5	11.6	12.9	14.6	16.4	18.7	19.2	21.9	25.1	24.2	27.8	32.1	29.6	34.1	39.5	35.4	40.8	47.4
	10	10.8	11.9	13.3	15.1	17.0	19.3	19.9	22.6	26.0	25.0	28.7	33.2	30.6	35.2	40.9	36.6	42.2	49.0
	20	11.1	12.2	13.6	15.5	17.4	19.9	20.5	23.3	26.8	25.9	29.6	34.3	31.6	36.4	42.2	37.8	43.6	50.6
	30	11.3	12.4	13.9	15.8	17.8	20.3	20.9	23.9	27.5	26.5	30.4	35.2	32.4	37.4	43.3	38.8	44.8	52.0
	40	11.4	12.6	14.1	16.0	18.1	20.6	21.3	24.3	28.0	27.0	30.9	35.9	33.0	38.1	44.2	39.6	45.7	53.1
	50	11.5	12.7	14.2	16.2	18.2	20.8	21.4	24.5	28.3	27.2	31.3	36.3	33.4	38.5	44.8	40.1	46.3	54.0
90	0	9.9	10.8	12.0	13.6	15.2	17.2	17.7	20.1	23.0	22.2	25.4	29.3	27.0	31.0	35.9	32.0	36.9	42.8
	10	10.2	11.1	12.3	14.0	15.7	17.8	18.3	20.8	23.8	22.9	26.2	30.3	27.9	32.1	37.1	33.1	38.1	44.3
	20	10.4	11.4	12.6	14.4	16.1	18.3	18.8	21.4	24.6	23.7	27.1	31.3	28.8	33.1	38.4	34.2	39.4	45.7
	30	10.6	11.6	12.9	14.7	16.5	18.7	19.3	21.9	25.2	24.3	27.8	32.1	29.6	34.0	39.4	35.1	40.5	47.0
	40	10.7	11.7	13.0	14.9	16.7	19.0	19.6	22.3	25.6	24.7	28.2	32.7	30.1	34.6	40.2	35.8	41.3	47.9
	50	10.7	11.8	13.1	15.0	16.8	19.1	19.7	22.4	25.8	24.9	28.5	33.0	30.4	35.0	40.7	36.2	41.8	48.6

***To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind. If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.**

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

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	5.9	15.9	25.9	35.7	45.7	55.8	66.2	76.8	87.5
LANDING	MAX AUTO	5.3	14.8	24.3	33.8	43.5	53.6	63.9	74.6	85.7
LANDING	AUTOBRAKE 3	4.7	13.4	21.8	29.8	38.1	47.3	57.2	68.0	79.6
LANDING	AUTOBRAKE 2	4.0	11.9	19.3	26.1	33.1	41.0	50.0	59.9	70.8
LANDING	AUTOBRAKE 1	3.3	10.4	16.8	22.5	28.3	34.9	42.2	50.4	59.3

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.6	14.9	24.1	33.2	42.5	51.9	61.6	71.6	81.8
LANDING	MAX AUTO	4.0	12.1	20.3	28.7	37.4	46.9	56.9	67.6	78.8
LANDING	AUTOBRAKE 3	1.7	7.3	13.0	18.8	25.2	32.4	40.5	49.6	59.6
LANDING	AUTOBRAKE 2	0.1	3.9	7.7	11.5	15.7	20.8	27.0	34.1	42.1
LANDING	AUTOBRAKE 1		1.9	4.4	6.5	8.9	12.1	16.1	20.9	26.5

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	26	29	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	4.0	4.4	4.9	5.0 TO 7.8	7.8 & 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		

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.

Intentionally
Blank

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 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	173	258	18300	17100	15900
170	164	251	19900	18700	17500
160	154	244	21200	20300	19100
150	145	236	22700	21700	20700
140	135	229	24200	23300	22400
130	125	220	26000	25000	24100
120	115	212	28000	27100	26100
110	106	203	30000	29200	28200
100	96	194	32000	31300	30400
90	87	184	34200	33500	32600

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
140	130	121	113	106	100	95	90	85	81	78
280	259	241	226	212	200	189	179	171	163	155
420	389	362	339	318	300	284	269	256	244	233
560	519	483	452	424	400	378	359	341	326	311
700	648	604	565	530	500	473	449	427	407	389
840	778	724	677	636	600	568	538	512	488	467
980	907	845	790	742	700	662	628	598	570	544
1120	1037	965	903	848	800	757	718	683	651	622
1260	1167	1086	1016	955	900	851	808	768	733	700
1400	1296	1207	1129	1061	1000	946	897	854	814	778
1540	1426	1327	1242	1167	1100	1041	987	939	895	856
1680	1555	1448	1355	1273	1200	1135	1077	1024	977	933
1820	1685	1569	1468	1379	1300	1230	1167	1110	1058	1011
1960	1815	1690	1581	1485	1400	1324	1256	1195	1139	1089
2101	1945	1811	1694	1591	1500	1419	1346	1280	1221	1166
2241	2075	1932	1807	1697	1600	1513	1436	1366	1302	1244
2382	2205	2053	1920	1803	1700	1608	1525	1451	1383	1322
2523	2335	2174	2033	1909	1800	1702	1615	1536	1464	1399

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	90	100	110	120	130	140	150	160	170	180	
100	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.2	0:17
200	1.8	1.9	2.0	2.2	2.3	2.4	2.6	2.7	2.8	3.0	0:34
300	2.9	3.1	3.3	3.5	3.7	3.9	4.2	4.4	4.6	4.9	0:52
400	3.9	4.2	4.5	4.8	5.1	5.4	5.8	6.1	6.4	6.8	1:09
500	4.8	5.2	5.6	6.1	6.4	6.8	7.3	7.7	8.1	8.6	1:26
600	5.8	6.3	6.8	7.3	7.7	8.2	8.8	9.3	9.8	10.3	1:43
700	6.7	7.3	7.9	8.5	9.0	9.6	10.2	10.8	11.4	12.1	2:00
800	7.6	8.3	9.0	9.7	10.3	11.0	11.7	12.4	13.0	13.8	2:17
900	8.6	9.3	10.1	10.9	11.6	12.3	13.1	13.9	14.6	15.5	2:34
1000	9.5	10.3	11.1	12.0	12.8	13.7	14.5	15.4	16.2	17.1	2:51
1100	10.4	11.3	12.2	13.2	14.1	15.0	15.9	16.9	17.8	18.8	3:09
1200	11.3	12.3	13.3	14.3	15.3	16.3	17.3	18.4	19.4	20.5	3:26
1300	12.1	13.2	14.3	15.5	16.5	17.6	18.7	19.8	20.9	22.1	3:43
1400	13.0	14.2	15.4	16.6	17.7	18.9	20.1	21.3	22.4	23.7	4:00
1500	13.9	15.1	16.4	17.7	18.9	20.2	21.5	22.7	24.0	25.3	4:17
1600	14.7	16.1	17.4	18.8	20.1	21.4	22.8	24.2	25.5	27.0	4:35
1700	15.6	17.0	18.4	19.9	21.3	22.7	24.2	25.6	27.0	28.5	4:52
1800	16.4	17.9	19.4	21.0	22.4	24.0	25.5	27.0	28.5	30.1	5:09

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 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
190	13600	11200	8300
180	15600	13600	10800
170	17400	15700	13300
160	19300	17600	15700
150	20900	19600	17700
140	22300	21200	19800
130	23900	22800	21500
120	25800	24500	23300
110	28300	26900	25200
100	30600	29600	28100
90	32700	31900	30800

With engine anti-ice on, decrease altitude capability by 1100 ft.
With engine and wing anti-ice on, decrease altitude capability by 5100 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)										
		10	15	17	19	21	23	25	27	29	31	33
180	%N1	91.5	95.3	97.7								
	MACH	.542	.578	.593								
	KIAS	301	292	288								
	FF/ENG	6644	6551	6590								
170	%N1	90.1	93.7	95.7	98.5							
	MACH	.531	.569	.582	.597							
	KIAS	294	287	283	280							
	FF/ENG	6299	6201	6169	6249							
160	%N1	88.6	92.2	93.9	96.1							
	MACH	.519	.557	.572	.586							
	KIAS	287	281	278	274							
	FF/ENG	5951	5852	5803	5796							
150	%N1	87.1	90.6	92.1	94.0	96.5						
	MACH	.505	.545	.561	.575	.590						
	KIAS	280	275	272	269	265						
	FF/ENG	5602	5508	5455	5411	5446						
140	%N1	85.4	89.0	90.5	92.0	94.1	96.9					
	MACH	.492	.531	.547	.563	.577	.593					
	KIAS	272	268	266	263	259	256					
	FF/ENG	5256	5166	5114	5062	5034	5109					
130	%N1	83.6	87.2	88.7	90.2	91.9	94.1	97.1				
	MACH	.477	.517	.533	.549	.565	.579	.595				
	KIAS	264	260	258	256	253	250	246				
	FF/ENG	4911	4821	4774	4721	4681	4669	4772				
120	%N1	81.7	85.3	86.8	88.3	89.8	91.6	94.0	97.1			
	MACH	.461	.500	.517	.533	.550	.566	.580	.597			
	KIAS	255	252	250	249	246	244	240	237			
	FF/ENG	4565	4474	4430	4382	4337	4307	4313	4423			
110	%N1	79.7	83.2	84.7	86.2	87.8	89.3	91.2	93.7	96.9		
	MACH	.445	.483	.499	.516	.533	.549	.566	.580	.597		
	KIAS	246	243	242	240	238	236	234	230	227		
	FF/ENG	4223	4130	4085	4040	4000	3959	3945	3960	4067		
100	%N1	77.4	81.0	82.5	84.0	85.5	87.1	88.6	90.5	93.2	96.3	
	MACH	.428	.464	.480	.497	.514	.531	.548	.564	.579	.596	
	KIAS	237	233	232	231	230	228	226	223	220	217	
	FF/ENG	3890	3786	3743	3698	3660	3623	3595	3592	3604	3705	
90	%N1	75.2	78.6	80.0	81.5	83.0	84.6	86.1	87.6	89.5	92.3	95.4
	MACH	.410	.445	.460	.476	.492	.509	.527	.544	.561	.577	.594
	KIAS	227	223	222	221	220	218	217	215	213	209	206
	FF/ENG	3566	3446	3402	3358	3320	3286	3259	3244	3239	3246	3334

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
296	270	248	230	214	200	190	180	172	164	157
596	544	498	461	429	400	379	360	343	327	314
898	819	750	692	644	600	569	540	514	491	470
1201	1095	1002	924	858	800	758	720	685	654	626
1506	1372	1255	1157	1074	1000	948	899	856	816	781
1813	1650	1508	1390	1289	1200	1137	1079	1026	979	937
2122	1930	1762	1623	1505	1400	1326	1259	1197	1141	1092
2433	2211	2017	1856	1720	1600	1516	1438	1368	1304	1247
2745	2493	2272	2090	1936	1800	1704	1617	1537	1466	1402

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.1	0:42	2.8	0:41	2.5	0:39	2.2	0:38	2.1	0:37
400	6.4	1:22	5.9	1:19	5.4	1:16	4.9	1:13	4.8	1:11
600	9.7	2:03	8.9	1:57	8.2	1:52	7.6	1:48	7.4	1:44
800	12.9	2:44	11.9	2:36	11.0	2:29	10.3	2:23	10.0	2:18
1000	16.1	3:25	14.9	3:15	13.8	3:06	12.9	2:58	12.5	2:52
1200	19.3	4:07	17.9	3:55	16.6	3:43	15.5	3:34	15.0	3:27
1400	22.4	4:49	20.8	4:35	19.3	4:21	18.0	4:10	17.5	4:01
1600	25.5	5:32	23.7	5:15	22.0	5:00	20.6	4:46	19.9	4:36
1800	28.5	6:15	26.5	5:56	24.7	5:38	23.0	5:23	22.2	5:11

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.2	-0.1	0.0	0.2	0.5
4	-0.5	-0.3	0.0	0.6	1.2
6	-0.8	-0.4	0.0	0.9	1.9
8	-1.1	-0.5	0.0	1.2	2.6
10	-1.3	-0.7	0.0	1.6	3.3
12	-1.6	-0.8	0.0	1.9	4.0
14	-1.9	-1.0	0.0	2.2	4.6
16	-2.2	-1.1	0.0	2.5	5.3
18	-2.5	-1.2	0.0	2.7	5.9
20	-2.7	-1.4	0.0	3.0	6.5
22	-3.0	-1.5	0.0	3.3	7.1
24	-3.3	-1.7	0.0	3.5	7.7
26	-3.6	-1.8	0.0	3.8	8.2
28	-3.9	-1.9	0.0	4.0	8.8
30	-4.1	-2.1	0.0	4.2	9.3

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
190	%N1	82.6	85.4	89.7	94.9			
	KIAS	254	254	255	257			
	FF/ENG	6340	6340	6390	6580			
180	%N1	81.0	83.9	88.1	92.8			
	KIAS	247	247	249	250			
	FF/ENG	6000	5990	6020	6140			
170	%N1	79.4	82.3	86.5	91.0	98.7		
	KIAS	240	241	242	243	244		
	FF/ENG	5670	5640	5650	5740	6100		
160	%N1	77.8	80.6	84.8	89.2	95.5		
	KIAS	232	233	234	235	237		
	FF/ENG	5340	5310	5300	5360	5540		
150	%N1	76.2	78.8	83.0	87.3	92.6		
	KIAS	225	226	227	228	229		
	FF/ENG	5020	4980	4950	4990	5080		
140	%N1	74.3	77.0	81.1	85.4	90.1		
	KIAS	218	218	219	220	221		
	FF/ENG	4690	4650	4610	4620	4660		
130	%N1	72.2	75.1	79.0	83.3	87.9	95.0	
	KIAS	209	210	211	212	213	214	
	FF/ENG	4370	4320	4280	4270	4280	4500	
120	%N1	70.1	73.0	76.9	81.1	85.6	91.1	
	KIAS	201	202	202	203	204	205	
	FF/ENG	4060	4000	3960	3930	3920	4020	
110	%N1	67.8	70.5	74.7	78.8	83.2	88.0	96.9
	KIAS	193	193	194	194	195	196	198
	FF/ENG	3750	3680	3640	3600	3570	3610	3950
100	%N1	65.5	68.1	72.2	76.2	80.6	85.2	92.0
	KIAS	187	187	187	187	187	187	188
	FF/ENG	3450	3380	3320	3280	3230	3240	3400
90	%N1	62.9	65.6	69.5	73.6	77.9	82.3	87.3
	KIAS	181	181	181	181	181	181	181
	FF/ENG	3160	3100	3030	2980	2920	2910	2980

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 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	16100	13300	10100
170	18700	16000	13200
160	21200	18700	16000
150	23600	21300	18600
140	25900	24200	21600
130	28100	26600	24800
120	30200	29100	27400
110	32200	31200	29900
100	34200	33200	32100
90	36400	35400	34300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
180	%N1	85.5									
	MACH	.473									
	KIAS	262									
	FF/ENG	5250									
170	%N1	84.0									
	MACH	.460									
	KIAS	254									
	FF/ENG	4943									
160	%N1	82.3	91.7								
	MACH	.447	.548								
	KIAS	247	245								
	FF/ENG	4639	4619								
150	%N1	80.5	89.9	91.9							
	MACH	.434	.535	.552							
	KIAS	240	239	237							
	FF/ENG	4341	4320	4308							
140	%N1	78.7	88.0	89.8	92.0	95.0					
	MACH	.420	.518	.538	.555	.573					
	KIAS	232	232	231	229	227					
	FF/ENG	4052	4008	4006	4011	4089					
130	%N1	76.7	85.9	87.7	89.6	91.9	95.2				
	MACH	.406	.500	.521	.541	.558	.576				
	KIAS	224	223	224	223	221	218				
	FF/ENG	3766	3695	3698	3705	3721	3810				
120	%N1	74.8	83.7	85.5	87.3	89.2	91.7	95.2			
	MACH	.391	.482	.501	.523	.543	.560	.579			
	KIAS	216	215	215	215	214	212	210			
	FF/ENG	3485	3390	3387	3397	3414	3432	3528			
110	%N1	72.5	81.4	83.1	84.9	86.7	88.7	91.3	94.9		
	MACH	.375	.462	.481	.501	.523	.543	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	3209	3092	3085	3090	3109	3124	3142	3241		
100	%N1	70.0	78.9	80.6	82.3	84.1	85.9	87.9	90.7	94.2	
	MACH	.359	.442	.460	.479	.499	.521	.542	.560	.580	
	KIAS	198	197	197	197	196	197	196	194	192	
	FF/ENG	2942	2803	2790	2793	2806	2821	2834	2850	2945	
90	%N1	67.4	76.1	77.8	79.5	81.3	83.0	84.9	87.0	89.7	93.7
	MACH	.343	.421	.438	.456	.475	.496	.518	.540	.558	.578
	KIAS	189	187	187	187	187	187	187	186	184	182
	FF/ENG	2685	2525	2502	2501	2515	2522	2532	2543	2557	2656

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
325	290	260	236	217	200	188	178	168	160	153
657	585	524	475	435	400	377	357	338	321	307
995	884	789	714	653	600	566	535	507	482	460
1337	1186	1056	955	872	800	755	713	676	642	613
1685	1491	1326	1196	1091	1000	943	891	844	802	765
2038	1801	1598	1440	1311	1200	1131	1068	1011	961	917
2398	2114	1872	1683	1532	1400	1319	1245	1179	1120	1068
2765	2432	2149	1929	1753	1600	1507	1422	1346	1278	1218
3139	2754	2428	2176	1974	1800	1694	1598	1512	1435	1368

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	5.4	0:49	4.9	0:47	4.2	0:44	3.9	0:42	3.6	0:41
400	11.0	1:37	10.2	1:32	9.0	1:25	8.4	1:21	7.9	1:18
600	16.5	2:26	15.3	2:18	13.7	2:07	12.7	2:00	12.1	1:54
800	21.9	3:16	20.4	3:05	18.2	2:49	17.0	2:39	16.2	2:31
1000	27.2	4:07	25.3	3:53	22.7	3:32	21.2	3:20	20.2	3:09
1200	32.3	4:59	30.1	4:41	27.0	4:16	25.3	4:01	24.1	3:47
1400	37.3	5:53	34.8	5:31	31.3	5:01	29.3	4:42	27.9	4:26
1600	42.2	6:47	39.4	6:23	35.4	5:47	33.2	5:25	31.6	5:06
1800	47.1	7:43	43.9	7:15	39.5	6:34	37.1	6:08	35.3	5:46

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
5	-0.7	-0.4	0.0	0.7	1.6
10	-1.5	-0.8	0.0	1.4	3.2
15	-2.3	-1.2	0.0	2.1	4.7
20	-3.1	-1.5	0.0	2.7	6.1
25	-3.8	-1.9	0.0	3.3	7.4
30	-4.6	-2.3	0.0	3.8	8.5
35	-5.4	-2.7	0.0	4.2	9.5
40	-6.1	-3.1	0.0	4.6	10.4
45	-6.9	-3.5	0.0	5.0	11.1
50	-7.7	-3.8	0.0	5.3	11.8

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
41000	20	600	87
39000	20	590	83
37000	19	580	79
35000	18	570	74
33000	18	560	70
31000	17	540	66
29000	16	530	62
27000	15	520	58
25000	15	510	54
23000	14	490	50
21000	13	480	46
19000	12	460	42
17000	11	440	39
15000	11	420	35
10000	8	360	25
5000	6	300	16
1500	4	240	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
190	%N1	77.0	79.8	84.1	88.5				
	KIAS	230	230	230	230				
	FF/ENG	5180	5150	5150	5210				
180	%N1	75.6	78.3	82.6	86.9	92.0			
	KIAS	225	225	225	225	225			
	FF/ENG	4910	4880	4870	4900	4970			
170	%N1	74.0	76.8	81.0	85.3	90.0			
	KIAS	221	221	221	221	221			
	FF/ENG	4650	4610	4590	4610	4640			
160	%N1	72.4	75.3	79.3	83.6	88.3			
	KIAS	216	216	216	216	216			
	FF/ENG	4390	4350	4320	4330	4340			
150	%N1	70.6	73.6	77.6	81.9	86.4	92.1		
	KIAS	211	211	211	211	211	211		
	FF/ENG	4140	4090	4060	4050	4050	4150		
140	%N1	69.2	72.0	76.1	80.3	84.7	89.6		
	KIAS	209	209	209	209	209	209		
	FF/ENG	3930	3880	3840	3820	3800	3850		
130	%N1	67.4	70.1	74.3	78.4	82.8	87.5	95.3	
	KIAS	204	204	204	204	204	204	204	
	FF/ENG	3690	3630	3590	3560	3540	3560	3800	
120	%N1	65.6	68.2	72.4	76.4	80.8	85.4	91.5	
	KIAS	199	199	199	199	199	199	199	
	FF/ENG	3460	3400	3340	3310	3270	3280	3400	
110	%N1	63.6	66.3	70.3	74.4	78.7	83.1	88.1	
	KIAS	193	193	193	193	193	193	193	
	FF/ENG	3230	3170	3110	3070	3020	3020	3080	
100	%N1	61.4	64.3	68.1	72.3	76.4	80.9	85.5	93.4
	KIAS	187	187	187	187	187	187	187	187
	FF/ENG	3000	2950	2890	2840	2780	2760	2810	2990
90	%N1	59.2	62.0	65.9	70.0	74.2	78.6	83.1	89.0
	KIAS	181	181	181	181	181	181	181	181
	FF/ENG	2780	2730	2680	2620	2560	2520	2560	2620

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH

Gear Down, Engine Inop — Section 44

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	170	223	2000		
170	161	218	4300	2600	
160	152	214	6500	5100	3000
150	142	210	8600	7200	5300
140	133	207	10700	9500	7700
130	124	202	12900	11900	10400
120	114	197	15100	14300	13300
110	105	191	17400	16600	15800
100	95	186	19700	18800	18000
90	86	180	21900	21000	20200

Includes APU fuel burn.

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
160	1800		
150	4700	2600	
140	7500	5800	3200
130	10300	8900	6500
120	12800	11800	9900
110	15500	14700	13500
100	18300	17400	16600
90	21000	20200	19300

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	21
150	%N1	94.7								
	MACH	.384								
	KIAS	232								
	FF/ENG	8277								
140	%N1	92.6	94.4	97.0						
	MACH	.372	.385	.398						
	KIAS	225	225	224						
	FF/ENG	7681	7688	7778						
130	%N1	90.5	92.1	94.0	96.7					
	MACH	.361	.373	.385	.399					
	KIAS	218	217	217	216					
	FF/ENG	7104	7094	7101	7204					
120	%N1	88.2	89.8	91.5	93.3	96.1				
	MACH	.349	.360	.372	.385	.399				
	KIAS	211	210	209	208	208				
	FF/ENG	6559	6523	6509	6521	6625				
110	%N1	86.0	87.4	89.0	90.7	92.5	95.3			
	MACH	.337	.348	.359	.371	.383	.397			
	KIAS	204	203	201	200	200	199			
	FF/ENG	6045	5985	5946	5934	5947	6029			
100	%N1	83.6	85.0	86.4	87.9	89.6	91.4	94.2	98.5	
	MACH	.325	.335	.345	.356	.368	.381	.395	.409	
	KIAS	197	195	194	193	192	191	190	189	
	FF/ENG	5552	5479	5419	5380	5368	5369	5413	5600	
90	%N1	81.1	82.4	83.8	85.2	86.7	88.3	90.1	92.8	96.9
	MACH	.313	.322	.331	.341	.352	.364	.377	.392	.408
	KIAS	189	188	186	184	183	182	181	181	181
	FF/ENG	5082	4994	4922	4863	4824	4803	4785	4815	5003

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
173	152	134	120	109	100	93	88	83	78	75
354	309	271	242	220	200	187	174	164	155	147
536	467	409	365	330	300	280	262	246	232	220
720	627	548	488	441	400	373	349	328	308	292
906	787	687	611	551	500	466	435	408	385	365
1093	948	826	734	662	600	559	522	489	461	437
1282	1111	967	858	773	700	652	609	570	537	508
1472	1274	1107	982	884	800	744	695	651	612	580
1664	1438	1248	1106	995	900	838	782	732	688	651
1858	1603	1390	1230	1106	1000	930	868	812	764	723

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	2.8	0:27	2.5	0:26	2.3	0:26
200	5.8	0:53	5.4	0:51	5.2	0:49
300	8.8	1:19	8.2	1:15	8.0	1:12
400	11.7	1:45	11.0	1:40	10.7	1:35
500	14.6	2:11	13.7	2:05	13.4	1:59
600	17.5	2:38	16.4	2:30	16.0	2:23
700	20.3	3:05	19.1	2:56	18.6	2:47
800	23.1	3:32	21.7	3:22	21.1	3:12
900	25.9	4:00	24.3	3:48	23.5	3:36
1000	28.6	4:27	26.9	4:14	26.0	4:01

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.3	-0.2	0.0	0.3	0.5
4	-0.6	-0.3	0.0	0.6	1.2
6	-0.9	-0.5	0.0	0.9	1.8
8	-1.2	-0.6	0.0	1.3	2.5
10	-1.5	-0.8	0.0	1.6	3.1
12	-1.8	-0.9	0.0	1.9	3.8
14	-2.1	-1.1	0.0	2.3	4.4
16	-2.4	-1.2	0.0	2.6	5.1
18	-2.7	-1.4	0.0	2.9	5.7
20	-3.0	-1.5	0.0	3.2	6.4
22	-3.3	-1.7	0.0	3.6	7.0
24	-3.6	-1.8	0.0	3.9	7.7
26	-3.9	-2.0	0.0	4.2	8.4
28	-4.2	-2.1	0.0	4.6	9.0
30	-4.5	-2.2	0.0	4.9	9.7
32	-4.8	-2.4	0.0	5.2	10.4

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
170	%N1	93.2			
	KIAS	221			
	FF/ENG	9060			
160	%N1	91.3	94.6		
	KIAS	216	216		
	FF/ENG	8480	8580		
150	%N1	89.4	92.6		
	KIAS	211	211		
	FF/ENG	7920	7990		
140	%N1	87.7	90.7	96.3	
	KIAS	209	209	209	
	FF/ENG	7460	7500	7690	
130	%N1	85.6	88.6	93.3	
	KIAS	204	204	204	
	FF/ENG	6940	6950	7050	
120	%N1	83.5	86.4	90.9	98.2
	KIAS	199	199	199	199
	FF/ENG	6430	6430	6480	6820
110	%N1	81.2	84.2	88.5	93.9
	KIAS	193	193	193	193
	FF/ENG	5960	5930	5950	6070
100	%N1	78.9	81.9	86.1	90.8
	KIAS	187	187	187	187
	FF/ENG	5510	5460	5450	5510
90	%N1	76.6	79.4	83.6	88.1
	KIAS	181	181	181	181
	FF/ENG	5070	5020	4980	5000

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH Chapter PI-QRH

Text Section 45

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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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 appropriate 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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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	500		
30000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**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)	4100	3200	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	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	83	86	90		
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	**4.0**
	%N1	82	83	85	88	92
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**	**3.5**
	%N1	77	78	79	81	83
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**3.0**	**3.5**
	%N1	74	75	76	77	79
15000	**PITCH ATT**	**1.0**	**1.5**	**2.5**	**3.0**	**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**	**-1.5**	**-0.5**	**0.5**	**1.0**	**1.5**
	V/S (FT/MIN)	-2700	-2500	-2400	-2700	-3000
30000	**PITCH ATT**	**-3.0**	**-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	-2400	-2100	-1900	-1800
10000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2600	-2100	-1900	-1700	-1600
SEA LEVEL	**PITCH ATT**	**-4.0**	**-2.5**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2400	-1900	-1700	-1500	-1400

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

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**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	53	58	62	66	69
	KIAS	175	192	211	228	244
5000	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.0**
	%N1	49	54	58	62	66
	KIAS	175	191	210	227	243

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**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
(VREF40+50)	%N1	51	56	61	65	68
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF40+30)	%N1	52	57	62	66	69
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**5.5**	**5.5**
(VREF40+20)	%N1	59	64	69	74	77

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**	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**
(VREF15+10)	%N1	41	46	49	53	56
FLAPS 30	**PITCH ATT**	**0.5**	**1.0**	**1.0**	**1.0**	**1.5**
(VREF30+10)	%N1	47	52	56	60	63
FLAPS 40	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF40+10)	%N	51	56	61	65	68

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	158	161	171
80	153	157	166
75	148	152	160
70	143	147	155
65	137	142	149
60	131	136	143
55	125	130	137
50	119	124	130
45	112	118	123
40	105	111	116

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH
Advisory Information — Section 51

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	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 VREF15	ONE REV	NO REV
MAX MANUAL	2950	210/-160	70/80	-100	360	30	-30	70	-70	200	70	110
MAX AUTO	3820	210/-210	100/130	-150	480	0	0	80	-80	360	0	0
AUTOBRAKE 3	5380	330/-360	160/210	-230	790	0	-20	150	-150	570	0	0
AUTOBRAKE 2	6890	480/-490	230/300	-310	1070	110	-150	200	-200	520	0	260
AUTOBRAKE 1	7580	560/-570	260/360	-360	1250	210	-230	210	-210	510	330	1030

Good Reported Braking Action

MAX MANUAL	4050	230/-250	110/150	-180	620	100	-80	100	-100	280	250	440
MAX AUTO	4480	260/-260	110/160	-180	660	80	-70	100	-100	340	300	520
AUTOBRAKE 3	5400	330/-360	160/210	-230	790	20	-20	150	-150	570	30	50
AUTOBRAKE 2	6890	480/-490	230/300	-310	1070	110	-150	200	-200	520	0	260

Medium Reported Braking Action

MAX MANUAL	5560	380/-380	180/250	-280	1030	230	-180	150	-150	380	820	1380
MAX AUTO	5760	390/-390	180/250	-280	1030	210	-160	150	-150	440	840	1410
AUTOBRAKE 3	5890	390/-410	200/260	-300	1080	160	-110	160	-160	570	790	1180
AUTOBRAKE 2	6960	490/-510	230/310	-340	1210	200	-200	200	-200	520	360	740

Poor Reported Braking Action

MAX MANUAL	7250	560/-540	260/380	-430	1660	590	-380	200	-210	460	2120	3360
MAX AUTO	7550	540/-540	260/380	-430	1640	570	-380	200	-210	480	2150	3380
AUTOBRAKE 3	7550	560/-540	260/380	-430	1640	540	-340	200	-210	560	2150	3400
AUTOBRAKE 2	7860	570/-570	280/390	-440	1710	540	-360	210	-230	520	1900	2970

Reference distance is for sea level, standard day, no wind or slope, VREF15 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 245 ft.
Actual (unfactored) distances are shown.
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 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	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	2810	180/-150	70/80	-100	360	30	-30	50	-50	200	50	100
MAX AUTO	3590	180/-200	80/110	-130	440	0	0	80	-80	340	0	0
AUTOBRAKE 3	5020	300/-330	150/180	-210	750	0	-30	130	-130	510	0	20
AUTOBRAKE 2	6380	430/-440	200/260	-300	1020	110	-130	160	-160	490	0	250
AUTOBRAKE 1	6970	510/-510	230/310	-340	1200	200	-200	200	-200	480	340	900

Good Reported Braking Action

MAX MANUAL	3840	210/-230	100/130	-160	610	80	-80	80	-100	280	210	390
MAX AUTO	4250	230/-250	110/150	-180	640	70	-70	100	-100	330	250	440
AUTOBRAKE 3	5020	300/-330	150/180	-230	750	20	-30	130	-130	510	30	50
AUTOBRAKE 2	6380	430/-440	200/260	-300	1020	110	-130	160	-160	490	0	250

Medium Reported Braking Action

MAX MANUAL	5230	340/-340	160/230	-280	1020	230	-180	130	-150	360	690	1180
MAX AUTO	5400	360/-360	160/230	-280	1020	200	-150	130	-150	430	710	1200
AUTOBRAKE 3	5500	360/-380	180/230	-280	1050	160	-130	150	-150	510	670	1030
AUTOBRAKE 2	6450	440/-460	210/280	-330	1160	200	-180	180	-180	490	310	670

Poor Reported Braking Action

MAX MANUAL	6760	490/-490	250/330	-410	1590	540	-360	180	-200	430	1740	2790
MAX AUTO	7000	490/-490	250/330	-410	1590	540	-330	180	-200	480	1760	2810
AUTOBRAKE 3	7000	510/-490	250/330	-410	1590	520	-330	180	-200	490	1770	2850
AUTOBRAKE 2	7280	520/-520	250/340	-430	1640	510	-340	200	-210	490	1540	2480

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 230 ft.
Actual (unfactored) distances are shown.
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	LANDING DISTANCE AND ADJUSTMENTS (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	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	2690	180/-130	70/80	-100	340	30	-30	50	-50	200	50	80
MAX AUTO	3380	200/-180	80/110	-130	430	0	0	70	-70	330	0	0
AUTOBRAKE 3	4660	310/-300	150/200	-210	720	0	-20	110	-110	510	0	0
AUTOBRAKE 2	5950	430/-410	200/260	-280	980	80	-110	160	-160	490	0	130
AUTOBRAKE 1	6580	490/-480	230/310	-330	1160	160	-200	180	-180	480	230	690

Good Reported Braking Action

BRAKING CONFIGURATION	REF DIST	WT ADJ	ALT ADJ	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	APP SPD ADJ	ONE REV	NO REV
MAX MANUAL	3690	230/-210	100/150	-160	590	80	-80	80	-80	280	200	360
MAX AUTO	4040	250/-230	110/150	-180	620	70	-70	80	-100	340	230	410
AUTOBRAKE 3	4660	310/-300	150/200	-210	720	20	-20	110	-110	510	30	50
AUTOBRAKE 2	5950	430/-410	200/260	-280	980	80	-110	160	-160	490	0	130

Medium Reported Braking Action

BRAKING CONFIGURATION	REF DIST	WT ADJ	ALT ADJ	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	APP SPD ADJ	ONE REV	NO REV
MAX MANUAL	4990	360/-330	160/230	-260	980	210	-180	130	-130	380	620	1070
MAX AUTO	5120	360/-340	160/230	-260	980	200	-150	130	-130	430	620	1080
AUTOBRAKE 3	5200	380/-340	180/250	-280	1020	160	-110	130	-150	510	640	1000
AUTOBRAKE 2	6000	440/-430	200/280	-310	1120	160	-160	160	-160	490	300	560

Poor Reported Braking Action

BRAKING CONFIGURATION	REF DIST	WT ADJ	ALT ADJ	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	APP SPD ADJ	ONE REV	NO REV
MAX MANUAL	6450	510/-460	230/330	-410	1570	540	-340	160	-180	440	1570	2540
MAX AUTO	6710	510/-460	230/330	-410	1560	540	-340	160	-180	460	1590	2580
AUTOBRAKE 3	6710	510/-480	250/330	-410	1560	510	-330	160	-200	480	1590	2590
AUTOBRAKE 2	6870	520/-490	250/340	-410	1610	490	-330	180	-200	490	1460	2280

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 220 ft.
Actual (unfactored) distances are shown.
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 DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	3900	520/-230	100/210	-130/440	50/-30	80/-80	260
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4690	300/-280	130/180	-230/840	130/-110	110/-110	360
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3250	210/-160	70/100	-110/390	30/-30	70/-70	300
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3080	200/-160	70/80	-110/380	30/-30	70/-70	280
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2950	200/-150	70/100	-110/380	30/-30	70/-70	280
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3310	160/-180	80/100	-130/440	50/-50	80/-80	250
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4540	250/-260	110/150	-180/610	110/-100	110/-110	510
LEADING EDGE FLAPS TRANSIT	VREF15+15	3300	230/-180	70/100	-110/390	30/-30	70/-70	210
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2970	210/-180	70/80	-110/380	30/-30	70/-70	210
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2820	180/-150	50/80	-100/360	30/-30	50/-50	200

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 ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2810	180/-150	50/80	-100/360	30/-30	50/-50	200
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3260	300/-180	80/100	-110/390	30/-30	70/-70	200
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2810	180/-150	50/80	-100/360	30/-30	50/-50	200
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3260	300/-180	80/100	-110/390	30/-30	70/-70	200
TRAILING EDGE FLAPS UP	VREF40+40	3490	360/-200	80/110	-110/410	30/-30	80/-80	200

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 ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	5220	300/-300	150/200	-200/710	100/-100	130/-130	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5230	360/-330	150/200	-280/1020	200/-160	130/-130	390
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4690	300/-300	130/180	-200/710	130/-110	110/-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4380	260/-280	110/150	-200/670	110/-100	110/-110	410
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4150	280/-250	110/160	-200/660	110/-100	100/-100	410
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4200	250/-260	110/150	-180/640	100/-80	100/-100	310
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5610	330/-340	150/200	-230/800	180/-160	150/-150	590
LEADING EDGE FLAPS TRANSIT	VREF15+15	4530	260/-260	110/160	-200/670	100/-80	110/-110	300
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	4170	250/-250	100/150	-180/660	100/-80	100/-100	310
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	3950	230/-230	100/130	-180/640	100/-80	100/-100	300

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 ADJUSTMENTS (M)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	3820	210/-210	100/130	-160/610	80/-80	80/-80	280
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4430	250/-250	110/160	-180/660	80/-80	110/-110	260
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	3820	210/-210	100/130	-160/610	80/-80	80/-80	280
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4430	250/-250	110/160	-180/660	80/-80	110/-110	260
TRAILING EDGE FLAPS UP	VREF40+40	4720	260/-260	130/180	-200/670	100/-80	110/-110	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 DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABVISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	7370	490/-480	250/330	-330/1180	260/-230	210/-210	380
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6610	510/-460	210/300	-410/1590	440/-330	160/-180	460
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6380	480/-460	200/280	-330/1150	300/-250	180/-180	540
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	5920	430/-430	180/250	-310/1100	260/-230	160/-160	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5590	430/-390	180/260	-300/1080	260/-210	150/-150	490
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5730	390/-390	180/250	-300/1070	230/-200	150/-150	410
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	7710	520/-520	230/330	-360/1300	390/-340	200/-210	720
LEADING EDGE FLAPS TRANSIT	VREF15+15	6140	410/-410	200/260	-300/1080	230/-200	160/-160	380
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	5920	410/-410	180/230	-310/1120	260/-230	160/-160	430
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	5510	380/-380	160/210	-300/1080	250/-210	150/-150	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 ADJUSTMENTS (FT) REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
		60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	5130	340/-340	150/200	-260/1000	200/-160	130/-130	360
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6100	410/-390	200/260	-300/1080	230/-200	160/-160	360
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5130	340/-340	150/200	-260/1000	200/-160	130/-130	360
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	6100	410/-390	200/260	-300/1080	230/-200	160/-160	360
TRAILING EDGE FLAPS UP	VREF40+40	6580	440/-430	210/300	-310/1120	250/-210	180/-180	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 DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	9760	720/-690	360/490	-490/1850	610/-480	300/-300	490
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8780	720/-660	310/440	-670/2940	1570/-750	230/-260	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8230	210/-210	300/430	-480/1790	640/-480	230/-250	620
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	7600	590/-570	260/380	-460/1720	590/-440	210/-230	570
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7170	610/-540	260/360	-440/1690	560/-430	200/-210	560
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7410	570/-560	260/360	-440/1670	520/-390	200/-210	490
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	9860	750/-720	340/480	-540/1970	790/-610	260/-280	790
LEADING EDGE FLAPS TRANSIT	VREF15+15	7870	590/-570	260/380	-440/1710	520/-390	210/-230	440
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	8070	610/-610	260/360	-490/1840	670/-490	230/-250	520
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	7410	540/-540	230/310	-460/1760	610/-440	210/-210	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 DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	6590	490/-480	210/300	-410/1570	460/-340	180/-200	430
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	7960	610/-560	280/390	-440/1710	510/-390	230/-230	440
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	6590	490/-480	210/300	-410/1570	460/-340	180/-200	430
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	7960	610/-560	280/390	-440/1710	510/-390	230/-230	440
TRAILING EDGE FLAPS UP	VREF40+40	8680	640/-610	310/430	-480/1770	560/-430	250/-260	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	15.8	17.9	20.5	23.1	26.2	30.0	31.4	35.7	41.1	40.6	46.2	53.3	50.4	57.4	66.5	59.8	68.3	79.4
	10	16.3	18.5	21.2	23.8	27.1	31.0	32.4	36.9	42.4	41.9	47.7	55.0	52.0	59.3	68.6	61.8	70.4	81.9
	15	16.6	18.8	21.5	24.2	27.5	31.5	32.9	37.4	43.0	42.5	48.4	55.8	52.8	60.1	69.6	62.7	71.4	83.0
	20	16.8	19.1	21.8	24.5	27.9	31.9	33.4	38.0	43.6	43.1	49.0	56.5	53.5	60.9	70.5	63.5	72.3	84.0
	30	17.3	19.6	22.4	25.2	28.6	32.8	34.3	38.9	44.7	44.2	50.3	57.9	54.8	62.4	72.2	65.0	74.0	85.9
	40	17.5	19.9	22.7	25.5	29.0	33.2	34.8	39.5	45.4	44.9	51.1	59.0	55.8	63.5	73.6	66.2	75.5	87.8
	50	17.5	19.9	22.8	25.7	29.2	33.5	35.0	39.9	45.9	45.4	51.7	59.8	56.6	64.6	75.0	67.4	77.0	89.9
70	0	14.3	16.2	18.5	20.7	23.6	27.0	28.1	32.0	36.7	36.2	41.2	47.5	44.9	51.1	59.1	54.1	61.6	71.5
	10	14.8	16.8	19.2	21.4	24.4	27.9	29.1	33.0	37.9	37.4	42.6	49.0	46.4	52.8	61.0	55.8	63.6	73.7
	15	15.0	17.1	19.5	21.8	24.7	28.3	29.5	33.5	38.5	38.0	43.2	49.7	47.0	53.6	61.9	56.6	64.5	74.8
	20	15.2	17.3	19.7	22.1	25.1	28.7	29.9	34.0	39.0	38.5	43.8	50.4	47.7	54.3	62.7	57.3	65.3	75.7
	30	15.7	17.8	20.3	22.7	25.8	29.5	30.7	34.9	40.0	39.5	44.9	51.7	48.9	55.6	64.2	58.8	66.9	77.5
	40	15.9	18.0	20.5	23.0	26.1	29.9	31.1	35.4	40.6	40.1	45.6	52.5	49.7	56.6	65.4	59.8	68.2	79.1
	50	15.9	18.0	20.6	23.1	26.2	30.1	31.3	35.7	41.0	40.5	46.1	53.2	50.3	57.4	66.5	60.7	69.4	80.7
60	0	12.8	14.6	16.6	18.4	20.9	23.9	24.8	28.2	32.3	31.7	36.1	41.5	39.3	44.7	51.6	47.4	53.9	62.4
	10	13.3	15.1	17.2	19.0	21.6	24.7	25.6	29.1	33.3	32.8	37.3	42.9	40.6	46.2	53.3	48.9	55.7	64.4
	15	13.5	15.3	17.5	19.3	22.0	25.1	26.0	29.5	33.8	33.3	37.9	43.5	41.2	46.9	54.0	49.6	56.5	65.3
	20	13.7	15.5	17.7	19.6	22.3	25.5	26.4	29.9	34.3	33.8	38.4	44.1	41.8	47.5	54.7	50.3	57.2	66.1
	30	14.1	16.0	18.2	20.1	22.9	26.1	27.1	30.7	35.2	34.6	39.4	45.2	42.8	48.7	56.1	51.5	58.6	67.8
	40	14.2	16.1	18.4	20.4	23.2	26.5	27.4	31.2	35.7	35.1	40.0	46.0	43.5	49.5	57.1	52.4	59.7	69.1
	50	14.2	16.2	18.5	20.5	23.3	26.6	27.6	31.4	36.0	35.4	40.3	46.5	44.0	50.1	57.9	53.1	60.6	70.3
50	0	11.4	12.9	14.7	16.1	18.3	20.9	21.4	24.3	27.9	27.3	31.0	35.6	33.5	38.1	43.9	40.3	45.8	52.9
	10	11.8	13.4	15.2	16.6	18.9	21.6	22.2	25.2	28.8	28.2	32.0	36.7	34.6	39.4	45.3	41.6	47.3	54.6
	15	11.9	13.6	15.5	16.9	19.2	21.9	22.5	25.6	29.2	28.6	32.5	37.3	35.2	40.0	46.0	42.2	48.0	55.4
	20	12.1	13.8	15.7	17.1	19.5	22.2	22.8	25.9	29.7	29.0	32.9	37.8	35.6	40.5	46.6	42.8	48.7	56.1
	30	12.5	14.1	16.1	17.6	20.0	22.8	23.4	26.6	30.4	29.8	33.8	38.8	36.6	41.6	47.8	43.9	49.9	57.5
	40	12.6	14.3	16.3	17.8	20.2	23.1	23.7	27.0	30.9	30.2	34.3	39.4	37.1	42.2	48.6	44.6	50.8	58.5
	50	12.6	14.3	16.3	17.9	20.3	23.2	23.8	27.1	31.1	30.4	34.6	39.7	37.4	42.6	49.1	45.1	51.4	59.4
40	0	10.0	11.3	12.9	13.8	15.6	17.8	18.1	20.6	23.5	22.8	25.9	29.6	27.8	31.6	36.3	33.2	37.7	43.4
	10	10.3	11.7	13.3	14.2	16.2	18.4	18.7	21.2	24.3	23.5	26.7	30.6	28.7	32.7	37.5	34.3	39.0	44.8
	15	10.5	11.9	13.5	14.4	16.4	18.7	19.0	21.6	24.7	23.9	27.1	31.1	29.2	33.1	38.0	34.8	39.5	45.5
	20	10.6	12.0	13.7	14.7	16.6	19.0	19.3	21.9	25.0	24.2	27.5	31.5	29.6	33.6	38.6	35.3	40.1	46.1
	30	10.9	12.4	14.1	15.1	17.1	19.5	19.8	22.5	25.7	24.9	28.3	32.4	30.4	34.5	39.6	36.2	41.1	47.3
	40	11.0	12.5	14.3	15.2	17.3	19.7	20.0	22.8	26.0	25.2	28.7	32.8	30.8	35.0	40.2	36.7	41.8	48.0
	50	11.0	12.5	14.3	15.3	17.3	19.8	20.1	22.9	26.2	25.3	28.8	33.1	31.0	35.3	40.5	37.0	42.2	48.6

***To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind. If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.**

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

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	7.6	15.9	24.8	34.3	44.3	54.6	65.2	76.0	86.9
	MAX AUTO	7.1	14.7	22.8	31.5	40.9	51.1	62.0	73.7	86.4
	AUTOBRAKE 3	6.6	13.5	20.8	28.5	36.9	45.9	55.7	66.5	78.4
	AUTOBRAKE 2	6.0	12.1	18.4	25.1	32.2	40.0	48.4	57.8	68.1
	AUTOBRAKE 1	5.6	11.0	16.4	22.1	28.0	34.4	41.5	49.4	58.3

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	7.2	15.0	23.4	32.2	41.5	51.2	61.2	71.5	82.1
	MAX AUTO	5.9	12.3	19.4	27.2	35.7	45.0	55.1	66.2	78.3
	AUTOBRAKE 3	4.1	8.8	14.0	20.0	26.6	34.0	42.1	51.1	60.9
	AUTOBRAKE 2	2.2	4.8	8.1	11.9	16.3	21.4	27.2	33.6	40.8
	AUTOBRAKE 1	1.7	3.5	5.5	7.9	10.7	14.1	18.3	23.3	29.2

Cooling Time (Minutes) - Category H 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 P 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	35.2	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.

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH
Engine Inoperative — Section 52

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 ON	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-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	82	256	18200	17000	15800
80	77	249	19800	18700	17400
75	72	241	21300	20400	19200
70	67	233	22800	21900	20900
65	62	225	24500	23600	22600
60	57	216	26500	25500	24500
55	53	207	28600	27700	26700
50	48	198	30700	30000	29000
45	43	188	32900	32200	31300
40	38	179	35300	34600	33700

Includes APU fuel burn.

Driftdown/LRC Cruise Range Capability

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
141	130	121	113	106	100	94	89	85	81	77
282	260	242	226	212	200	188	179	170	162	154
422	390	363	339	318	300	283	268	255	243	232
563	520	484	452	424	400	378	358	340	324	310
703	650	604	565	530	500	472	448	426	406	387
843	779	725	678	636	600	567	537	511	487	465
982	909	846	791	742	700	661	627	596	569	543
1122	1038	966	903	848	800	756	717	682	650	621
1262	1168	1087	1016	954	900	851	807	767	732	699
1401	1297	1207	1129	1060	1000	945	897	853	813	777
1541	1426	1328	1242	1166	1100	1040	986	938	895	855
1680	1556	1448	1355	1272	1200	1135	1076	1024	976	933
1820	1685	1569	1467	1378	1300	1229	1166	1109	1057	1010
1960	1815	1689	1580	1484	1400	1324	1256	1195	1139	1088
2100	1944	1810	1693	1590	1500	1418	1346	1280	1220	1166
2240	2074	1931	1806	1697	1600	1513	1435	1365	1302	1244
2381	2204	2052	1919	1803	1700	1607	1525	1450	1383	1321
2522	2334	2173	2032	1909	1800	1702	1615	1536	1464	1399

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

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	0.6	0:18
200	0.8	0.9	0.9	0.9	1.0	1.1	1.2	1.2	1.3	1.3	0:35
300	1.3	1.4	1.5	1.5	1.7	1.8	1.9	2.0	2.1	2.2	0:52
400	1.7	1.8	2.0	2.1	2.3	2.5	2.6	2.8	2.9	3.1	1:10
500	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	1:27
600	2.5	2.8	3.0	3.2	3.5	3.7	4.0	4.2	4.4	4.7	1:44
700	2.9	3.2	3.5	3.8	4.0	4.3	4.6	4.9	5.2	5.5	2:01
800	3.3	3.6	4.0	4.3	4.6	4.9	5.3	5.6	5.9	6.3	2:18
900	3.7	4.1	4.4	4.8	5.2	5.5	5.9	6.3	6.6	7.0	2:35
1000	4.1	4.5	4.9	5.3	5.7	6.1	6.6	7.0	7.4	7.8	2:52
1100	4.5	4.9	5.4	5.8	6.3	6.7	7.2	7.6	8.1	8.6	3:09
1200	4.9	5.4	5.9	6.3	6.8	7.3	7.8	8.3	8.8	9.3	3:26
1300	5.3	5.8	6.3	6.8	7.4	7.9	8.4	9.0	9.5	10.1	3:43
1400	5.6	6.2	6.8	7.3	7.9	8.5	9.1	9.6	10.2	10.8	4:00
1500	6.0	6.6	7.2	7.8	8.5	9.1	9.7	10.3	10.9	11.5	4:17
1600	6.4	7.0	7.7	8.3	9.0	9.6	10.3	10.9	11.6	12.3	4:35
1700	6.8	7.4	8.1	8.8	9.5	10.2	10.9	11.6	12.3	13.0	4:52
1800	7.1	7.9	8.6	9.3	10.0	10.8	11.5	12.2	12.9	13.7	5:09

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC 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	15400	13200	10200
80	17300	15600	13000
75	19300	17700	15600
70	21000	19800	17800
65	22600	21500	20100
60	24200	23200	21900
55	26500	25000	23800
50	29200	27900	26200
45	31500	30600	29300
40	33900	33000	31900

With engine anti-ice on, decrease altitude capability by 1300 ft.
With engine and wing anti-ice on, decrease altitude capability by 5900 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)										
		10	15	17	19	21	23	25	27	29	31	33
85	%N1	91.7	95.4	97.8								
	MACH	.548	.582	.597								
	KIAS	304	294	291								
	FF/ENG	3048	2989	3006								
80	%N1	90.3	93.7	95.7	98.5							
	MACH	.536	.572	.586	.601							
	KIAS	297	289	285	281							
	FF/ENG	2883	2820	2805	2840							
75	%N1	88.7	92.2	93.8	96.0							
	MACH	.524	.562	.575	.589							
	KIAS	290	284	279	276							
	FF/ENG	2718	2662	2629	2625							
70	%N1	87.1	90.6	92.0	93.8	96.2						
	MACH	.510	.549	.564	.577	.592						
	KIAS	283	277	274	270	266						
	FF/ENG	2553	2499	2471	2440	2452						
65	%N1	85.4	88.9	90.3	91.8	93.7	96.4					
	MACH	.496	.534	.550	.565	.579	.594					
	KIAS	274	269	267	264	260	256					
	FF/ENG	2390	2336	2310	2281	2258	2283					
60	%N1	83.6	87.0	88.5	89.9	91.5	93.5	96.3				
	MACH	.480	.519	.535	.550	.566	.579	.595				
	KIAS	266	261	259	257	254	250	246				
	FF/ENG	2226	2172	2146	2120	2096	2080	2113				
55	%N1	81.5	85.0	86.4	87.9	89.4	91.0	93.1	96.0			
	MACH	.464	.502	.518	.534	.550	.566	.579	.595			
	KIAS	256	253	251	249	246	244	239	236			
	FF/ENG	2059	2008	1983	1958	1936	1916	1906	1941			
50	%N1	79.3	82.8	84.3	85.7	87.2	88.7	90.3	92.5	95.5		
	MACH	.446	.483	.499	.515	.531	.548	.564	.578	.594		
	KIAS	246	243	242	240	238	236	233	229	226		
	FF/ENG	1894	1845	1821	1796	1774	1754	1740	1735	1765		
45	%N1	76.9	80.4	81.8	83.3	84.7	86.2	87.7	89.3	91.6	94.6	
	MACH	.427	.463	.479	.495	.511	.528	.544	.561	.576	.592	
	KIAS	236	233	231	230	228	226	224	222	218	215	
	FF/ENG	1733	1680	1658	1635	1613	1593	1578	1570	1564	1589	
40	%N1	74.5	77.7	79.2	80.6	82.1	83.5	85.0	86.5	88.1	90.3	93.2
	MACH	.407	.441	.456	.472	.488	.505	.521	.539	.556	.571	.587
	KIAS	225	222	220	219	218	216	214	213	210	207	204
	FF/ENG	1575	1516	1494	1473	1453	1434	1419	1409	1401	1395	1409

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (KTS)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
295	270	248	230	214	200	190	180	172	164	158
594	543	498	461	429	400	379	361	344	328	315
895	817	749	692	643	600	569	541	516	492	472
1196	1091	999	923	858	800	759	722	687	656	629
1500	1368	1252	1155	1073	1000	949	902	859	820	785
1805	1645	1504	1387	1288	1200	1138	1081	1030	983	942
2113	1924	1758	1621	1504	1400	1327	1261	1201	1146	1098
2422	2204	2013	1854	1719	1600	1517	1442	1372	1309	1253
2733	2485	2267	2087	1935	1800	1707	1621	1543	1472	1409

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	0:42	1.2	0:41	1.1	0:39	1.0	0:38	0.9	0:37
400	2.9	1:22	2.6	1:18	2.4	1:15	2.2	1:13	2.1	1:11
600	4.4	2:02	4.0	1:57	3.7	1:52	3.4	1:48	3.3	1:44
800	5.8	2:42	5.4	2:35	5.0	2:28	4.6	2:23	4.4	2:18
1000	7.3	3:23	6.7	3:14	6.2	3:05	5.8	2:58	5.6	2:52
1200	8.7	4:05	8.0	3:53	7.4	3:43	6.9	3:33	6.7	3:26
1400	10.1	4:47	9.4	4:33	8.7	4:20	8.1	4:09	7.8	4:01
1600	11.5	5:29	10.7	5:13	9.9	4:58	9.2	4:45	8.8	4:36
1800	12.9	6:12	11.9	5:53	11.1	5:36	10.3	5:22	9.9	5:10

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
1	-0.1	-0.1	0.0	0.1	0.2
2	-0.3	-0.1	0.0	0.3	0.6
3	-0.4	-0.2	0.0	0.5	1.0
4	-0.6	-0.3	0.0	0.7	1.4
5	-0.7	-0.4	0.0	0.9	1.8
6	-0.9	-0.4	0.0	1.1	2.2
7	-1.0	-0.5	0.0	1.3	2.6
8	-1.2	-0.6	0.0	1.5	2.9
9	-1.3	-0.7	0.0	1.6	3.3
10	-1.5	-0.7	0.0	1.8	3.7
11	-1.6	-0.8	0.0	2.0	4.1
12	-1.8	-0.9	0.0	2.1	4.4
13	-1.9	-1.0	0.0	2.3	4.8
14	-2.0	-1.0	0.0	2.4	5.2

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
90	%N1	82.9	85.7	90.0	95.1				
	KIAS	257	258	259	261				
	FF/ENG	2910	2910	2930	3020				
85	%N1	81.2	84.1	88.3	92.9				
	KIAS	250	251	252	253				
	FF/ENG	2740	2740	2750	2810				
80	%N1	79.6	82.4	86.6	91.0	98.6			
	KIAS	242	243	244	245	247			
	FF/ENG	2590	2570	2570	2610	2770			
75	%N1	77.9	80.6	84.8	89.2	95.3			
	KIAS	234	236	236	238	239			
	FF/ENG	2430	2410	2400	2430	2500			
70	%N1	76.1	78.7	82.9	87.1	92.3			
	KIAS	227	227	228	229	231			
	FF/ENG	2270	2250	2240	2250	2280			
65	%N1	74.1	76.8	80.8	85.1	89.7	98.0		
	KIAS	219	219	220	221	222	224		
	FF/ENG	2110	2090	2070	2080	2090	2260		
60	%N1	71.9	74.8	78.6	82.9	87.4	94.0		
	KIAS	210	210	211	212	213	214		
	FF/ENG	1960	1940	1910	1910	1910	1980		
55	%N1	69.6	72.4	76.3	80.5	84.9	90.1		
	KIAS	200	201	202	203	204	205		
	FF/ENG	1810	1780	1760	1740	1740	1770		
50	%N1	67.1	69.8	73.9	77.9	82.3	87.0	95.2	
	KIAS	191	191	192	193	194	195	196	
	FF/ENG	1660	1630	1610	1580	1570	1580	1700	
45	%N1	64.5	67.1	71.2	75.2	79.5	84.0	89.8	
	KIAS	182	182	182	183	184	185	186	
	FF/ENG	1510	1480	1450	1430	1410	1410	1460	
40	%N1	61.4	64.3	68.1	72.3	76.3	80.8	85.6	94.5
	KIAS	175	175	175	175	175	175	175	176
	FF/ENG	1360	1340	1310	1280	1250	1240	1270	1370

This table includes 5% additional fuel for holding in a racetrack pattern.

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Gear Down Section 53

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	15100	12000	8900
80	17900	15100	12100
75	20800	18000	15300
70	23300	20900	18200
65	25800	24000	21300
60	28300	26800	24900
55	30600	29400	27800
50	32700	31700	30400
45	34900	33900	32700
40	37300	36300	35200

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
85	%N1	86.2									
	MACH	.482									
	KIAS	267									
	FF/ENG	2446									
80	%N1	84.5									
	MACH	.468									
	KIAS	259									
	FF/ENG	2294									
75	%N1	82.8	92.1								
	MACH	.454	.554								
	KIAS	251	248								
	FF/ENG	2145	2123								
70	%N1	80.9	90.1	92.1							
	MACH	.440	.541	.557							
	KIAS	243	242	240							
	FF/ENG	1998	1981	1971							
65	%N1	78.9	88.2	89.8	92.0	95.0					
	MACH	.425	.524	.543	.560	.578					
	KIAS	235	234	233	231	229					
	FF/ENG	1855	1832	1825	1824	1858					
60	%N1	76.8	85.9	87.7	89.4	91.7	94.9				
	MACH	.409	.504	.525	.544	.562	.580				
	KIAS	226	225	225	224	222	220				
	FF/ENG	1716	1678	1679	1676	1681	1716				
55	%N1	74.7	83.6	85.3	87.1	88.9	91.3	94.6			
	MACH	.393	.484	.504	.525	.545	.562	.581			
	KIAS	217	216	216	216	215	213	211			
	FF/ENG	1577	1530	1527	1531	1534	1539	1573			
50	%N1	72.2	81.0	82.7	84.5	86.3	88.1	90.6	93.9		
	MACH	.376	.463	.482	.502	.523	.544	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	1442	1385	1381	1381	1389	1392	1395	1429		
45	%N1	69.5	78.3	80.0	81.7	83.4	85.2	87.1	89.5	92.9	
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578	
	KIAS	197	196	196	196	196	196	195	193	191	
	FF/ENG	1311	1244	1237	1237	1242	1247	1251	1252	1280	
40	%N1	66.6	75.2	76.9	78.6	80.3	82.0	83.9	85.8	88.0	91.8
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573
	KIAS	187	185	185	185	185	185	185	185	183	181
	FF/ENG	1186	1109	1097	1095	1100	1103	1105	1108	1109	1136

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
324	290	260	236	217	200	188	178	168	160	153
655	584	523	474	435	400	377	357	338	321	307
990	881	787	713	653	600	566	535	507	482	460
1330	1181	1054	953	871	800	755	713	676	642	613
1675	1485	1323	1195	1091	1000	943	891	844	803	766
2026	1792	1593	1436	1310	1200	1131	1069	1013	962	918
2383	2104	1866	1680	1530	1400	1319	1246	1180	1121	1069
2746	2420	2142	1925	1751	1600	1507	1423	1347	1279	1220
3116	2740	2420	2171	1972	1800	1695	1600	1514	1437	1370

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	5.0	1:36	4.6	1:32	4.1	1:25	3.8	1:20	3.5	1:17
600	7.5	2:25	6.9	2:17	6.2	2:06	5.7	1:59	5.4	1:54
800	9.9	3:14	9.2	3:03	8.2	2:48	7.7	2:38	7.3	2:31
1000	12.3	4:05	11.4	3:51	10.2	3:31	9.6	3:18	9.1	3:08
1200	14.6	4:56	13.6	4:39	12.2	4:14	11.4	3:59	10.8	3:46
1400	16.9	5:49	15.7	5:28	14.1	4:59	13.2	4:40	12.6	4:25
1600	19.1	6:43	17.8	6:19	16.0	5:44	15.0	5:22	14.2	5:04
1800	21.3	7:39	19.9	7:11	17.9	6:30	16.7	6:05	15.9	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	-0.6	-0.3	0.0	0.6	1.4
6	-1.0	-0.5	0.0	0.9	2.0
8	-1.3	-0.7	0.0	1.2	2.6
10	-1.6	-0.8	0.0	1.4	3.2
12	-2.0	-1.0	0.0	1.6	3.7
14	-2.3	-1.2	0.0	1.9	4.2
16	-2.7	-1.3	0.0	2.1	4.6
18	-3.0	-1.5	0.0	2.2	5.0
20	-3.3	-1.7	0.0	2.4	5.4
22	-3.7	-1.8	0.0	2.5	5.7

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	21	280	90
39000	20	280	86
37000	19	270	81
35000	19	270	77
33000	18	260	72
31000	17	260	68
29000	16	250	64
27000	16	240	60
25000	15	240	56
23000	14	230	52
21000	13	220	48
19000	12	220	44
17000	12	210	40
15000	11	200	36
10000	8	170	26
5000	6	140	16
1500	4	120	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
90	%N1	77.5	80.2	84.5	89.0				
	KIAS	233	233	233	233				
	FF/ENG	2390	2380	2380	2400				
85	%N1	76.0	78.7	82.9	87.3				
	KIAS	228	228	228	228				
	FF/ENG	2260	2250	2240	2260				
80	%N1	74.4	77.1	81.3	85.6	90.2			
	KIAS	223	223	223	223	223			
	FF/ENG	2130	2120	2100	2110	2130			
75	%N1	72.6	75.5	79.5	83.8	88.4			
	KIAS	218	218	218	218	218			
	FF/ENG	2010	1990	1970	1980	1980			
70	%N1	70.7	73.7	77.6	81.9	86.4	92.0		
	KIAS	213	213	213	213	213	213		
	FF/ENG	1880	1860	1850	1840	1840	1880		
65	%N1	68.9	71.7	75.8	80.0	84.4	89.2		
	KIAS	207	207	207	207	207	207		
	FF/ENG	1770	1740	1720	1710	1700	1720		
60	%N1	67.0	69.7	73.9	77.9	82.3	86.9	94.4	
	KIAS	201	201	201	201	201	201	201	
	FF/ENG	1650	1620	1600	1580	1570	1580	1670	
55	%N1	64.9	67.6	71.7	75.7	80.1	84.6	90.2	
	KIAS	195	195	195	195	195	195	195	
	FF/ENG	1530	1510	1480	1460	1440	1440	1490	
50	%N1	62.5	65.4	69.3	73.5	77.7	82.2	86.9	
	KIAS	189	189	189	189	189	189	189	
	FF/ENG	1420	1390	1360	1340	1320	1320	1340	
45	%N1	60.0	63.0	66.8	71.0	75.1	79.6	84.2	91.2
	KIAS	182	182	182	182	182	182	182	182
	FF/ENG	1300	1280	1250	1230	1200	1190	1210	1260
40	%N1	57.7	60.3	64.4	68.3	72.6	76.9	81.3	86.5
	KIAS	175	175	175	175	175	175	175	175
	FF/ENG	1190	1170	1150	1120	1090	1070	1090	1100

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight - QRH — Chapter PI-QRH
Gear Down, Engine Inop — Section 54

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	76	222	3800	2100	
75	71	217	6200	4700	2600
70	66	212	8600	7300	5300
65	62	207	11000	9800	8000
60	57	201	13300	12400	11000
55	52	195	15800	15000	14000
50	47	189	18400	17500	16700
45	43	182	20900	20100	19200
40	38	176	23300	22500	21700

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	1100		
70	4200	2000	
65	7300	5600	2900
60	10400	8900	6500
55	13100	12100	10300
50	16000	15200	14200
45	19100	18200	17300
40	22100	21300	20300

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 5	7	9	11	13	15	17	19	21
70	%N1	95.1								
	MACH	.389								
	KIAS	235								
	FF/ENG	3802								
65	%N1	92.8	94.6	97.2						
	MACH	.376	.389	.402						
	KIAS	228	227	226						
	FF/ENG	3509	3512	3554						
60	%N1	90.5	92.1	93.9	96.6					
	MACH	.364	.375	.388	.402					
	KIAS	220	219	218	218					
	FF/ENG	3226	3220	3222	3266					
55	%N1	88.1	89.6	91.3	93.1	95.7				
	MACH	.351	.362	.374	.387	.400				
	KIAS	212	211	210	209	209				
	FF/ENG	2960	2941	2933	2936	2974				
50	%N1	85.7	87.1	88.6	90.2	91.9	94.5	98.5		
	MACH	.338	.348	.359	.371	.384	.398	.412		
	KIAS	204	203	202	201	200	199	198		
	FF/ENG	2710	2680	2660	2651	2654	2677	2758		
45	%N1	83.1	84.4	85.8	87.3	88.9	90.6	93.0	96.8	
	MACH	.325	.334	.344	.355	.367	.380	.393	.408	
	KIAS	196	195	193	192	191	190	189	189	
	FF/ENG	2471	2435	2405	2384	2375	2372	2377	2436	
40	%N1	80.3	81.6	82.9	84.3	85.7	87.3	89.1	91.1	94.4
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2244	2201	2165	2136	2114	2099	2088	2082	2119

Long Range Cruise Diversion Fuel and Time
Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 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

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

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	4.0	1:18	3.7	1:15	3.6	1:12
400	5.3	1:44	4.9	1:39	4.8	1:35
500	6.6	2:10	6.2	2:04	6.0	1:58
600	7.9	2:37	7.4	2:29	7.2	2:22
700	9.2	3:04	8.6	2:55	8.3	2:46
800	10.4	3:31	9.8	3:20	9.5	3:10
900	11.7	3:58	11.0	3:46	10.6	3:35
1000	12.9	4:25	12.1	4:12	11.7	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	-0.7	-0.4	0.0	0.7	1.3
5	-0.9	-0.4	0.0	0.9	1.7
6	-1.0	-0.5	0.0	1.0	2.0
7	-1.2	-0.6	0.0	1.2	2.4
8	-1.4	-0.7	0.0	1.4	2.7
9	-1.5	-0.8	0.0	1.5	3.0
10	-1.7	-0.9	0.0	1.7	3.4
11	-1.9	-1.0	0.0	1.9	3.7
12	-2.1	-1.1	0.0	2.0	4.0
13	-2.2	-1.1	0.0	2.2	4.4

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000
80	%N1	93.6				
	KIAS	223				
	FF/ENG	4160				
75	%N1	91.5	94.8			
	KIAS	218	218			
	FF/ENG	3880	3920			
70	%N1	89.4	92.6			
	KIAS	213	213			
	FF/ENG	3600	3640			
65	%N1	87.4	90.4	95.7		
	KIAS	207	207	207		
	FF/ENG	3340	3360	3430		
60	%N1	85.1	88.1	92.7		
	KIAS	201	201	201		
	FF/ENG	3090	3090	3130		
55	%N1	82.7	85.7	90.2	96.9	
	KIAS	195	195	195	195	
	FF/ENG	2840	2840	2850	2970	
50	%N1	80.1	83.1	87.4	92.4	
	KIAS	189	189	189	189	
	FF/ENG	2600	2590	2590	2630	
45	%N1	77.5	80.4	84.7	89.3	97.1
	KIAS	182	182	182	182	182
	FF/ENG	2380	2360	2340	2360	2470
40	%N1	74.9	77.6	81.9	86.2	91.6
	KIAS	175	175	175	175	175
	FF/ENG	2160	2140	2120	2120	2130

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH Chapter PI-QRH

Text Section 55

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 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

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 appropriate 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.

Maneuvers — Chapter Man

Table of Contents — Section 0

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.

Intentionally
Blank

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

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.

<table>
<tr><th>Captain</th><th>First Officer</th></tr>
<tr><td>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.</td><td>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 “SPEEDBRAKES NOT UP.”
Reverse thrust applied.
Call out omitted action items.</td></tr>
<tr><td>Field length permitting:
Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.</td><td>Call out 60 knots.
Communicate the reject decision to the control tower and cabin as soon as practical.</td></tr>
<tr><td colspan="2">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
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.</td></tr>
</table>

Runway Awareness and Advisory System (RAAS)

[Option - With Runway Awareness and Advisory System]

Accomplish the following if a RAAS callout or alert differs from the flight crew's expectation:

Pilot Flying	Pilot Monitoring
Verify position. Contact ATC for assistance, if needed.	

Terrain Avoidance

Ground Proximity Caution

Accomplish the following maneuver for any of these aural alerts:

- SINK RATE
- TERRAIN
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- GLIDESLOPE
- BANK ANGLE

  [Option - Enhanced GPWS]
- CAUTION TERRAIN

  [Option - Peaks and Obstacles]
- 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:

[Basic]
- Activation of “PULL UP” warning.

[Option -Enhanced GPWS]
- Activation of “PULL UP” or “TERRAIN TERRAIN PULL UP” warning.

[Option - Peaks and Obstacles]
- 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 commands until clear of conflict.

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.

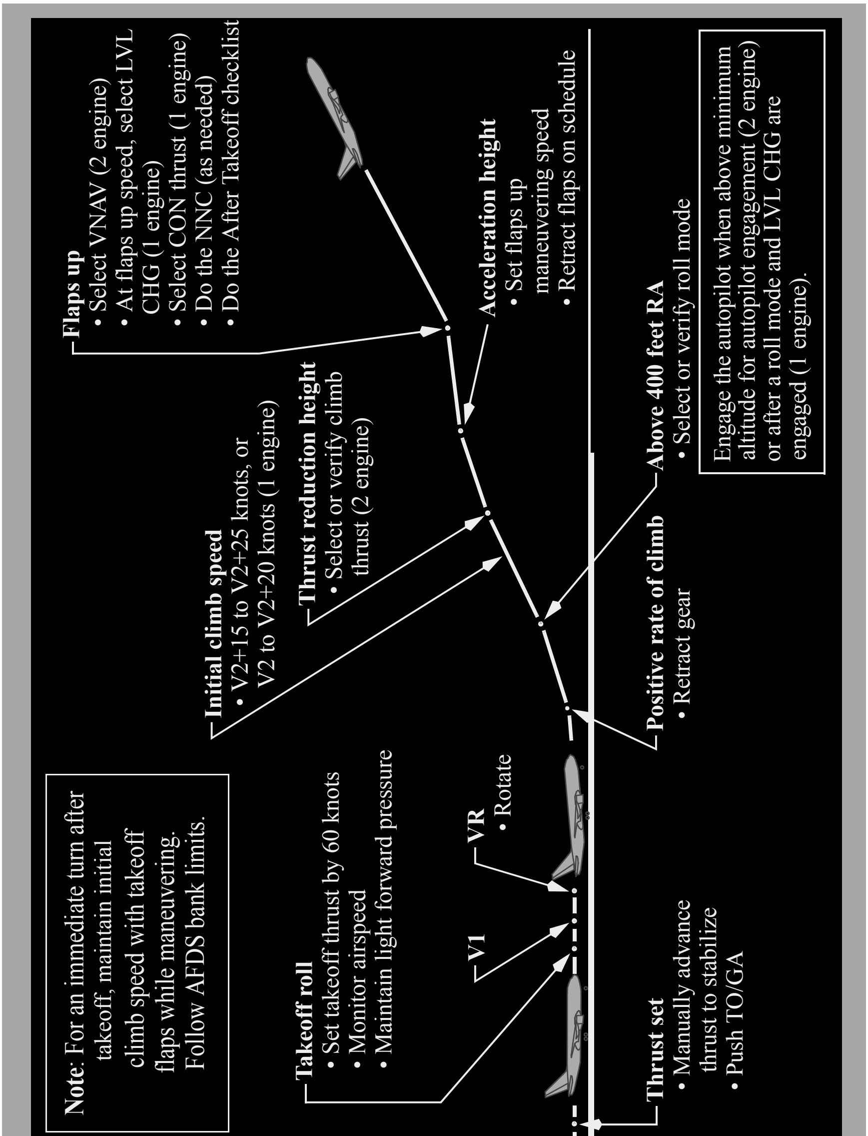
Note: *Maximum thrust can be obtained by advancing the thrust levers full forward if the EEC's are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: ** If TO/GA is not available, disconnect autopilot and autothrottle and fly manually.

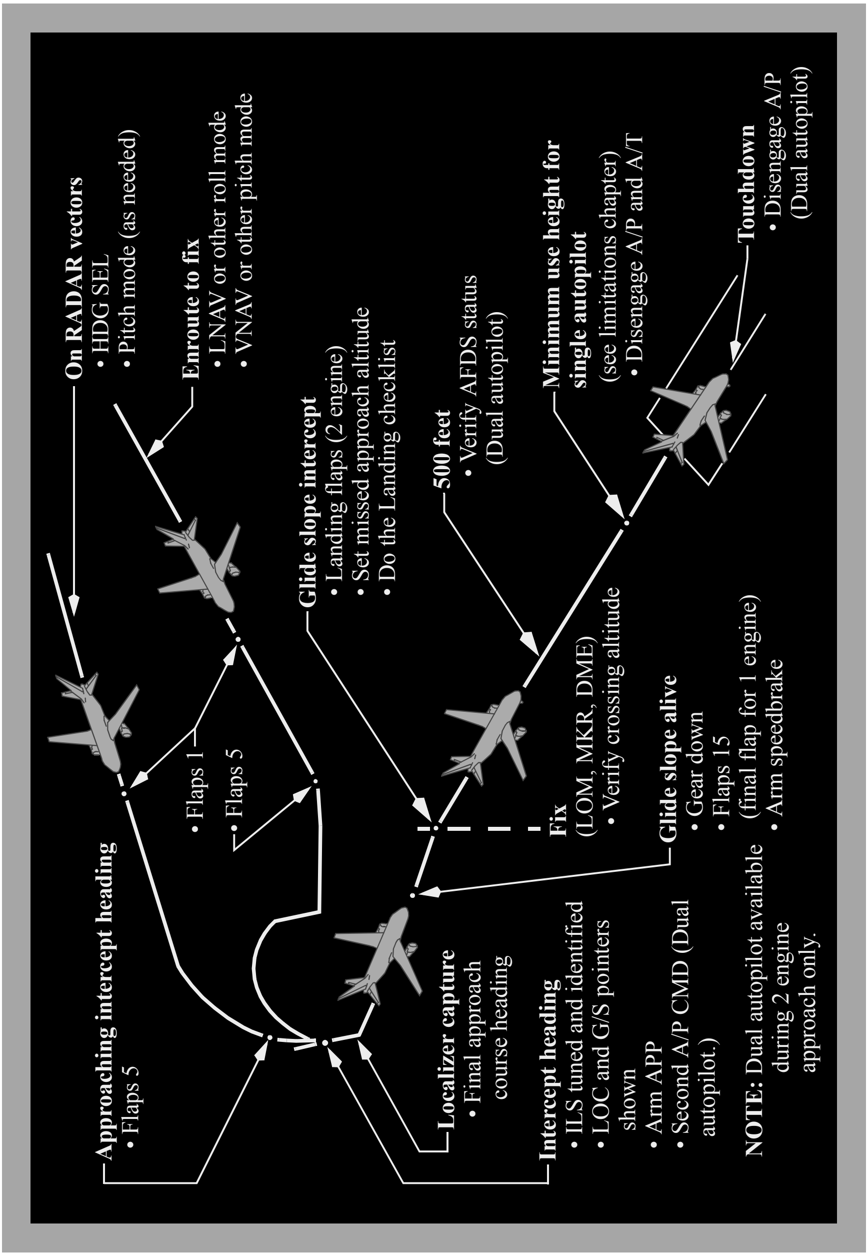
WARNING: * Severe windshear may exceed the performance of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle and fly manually.**

Takeoff

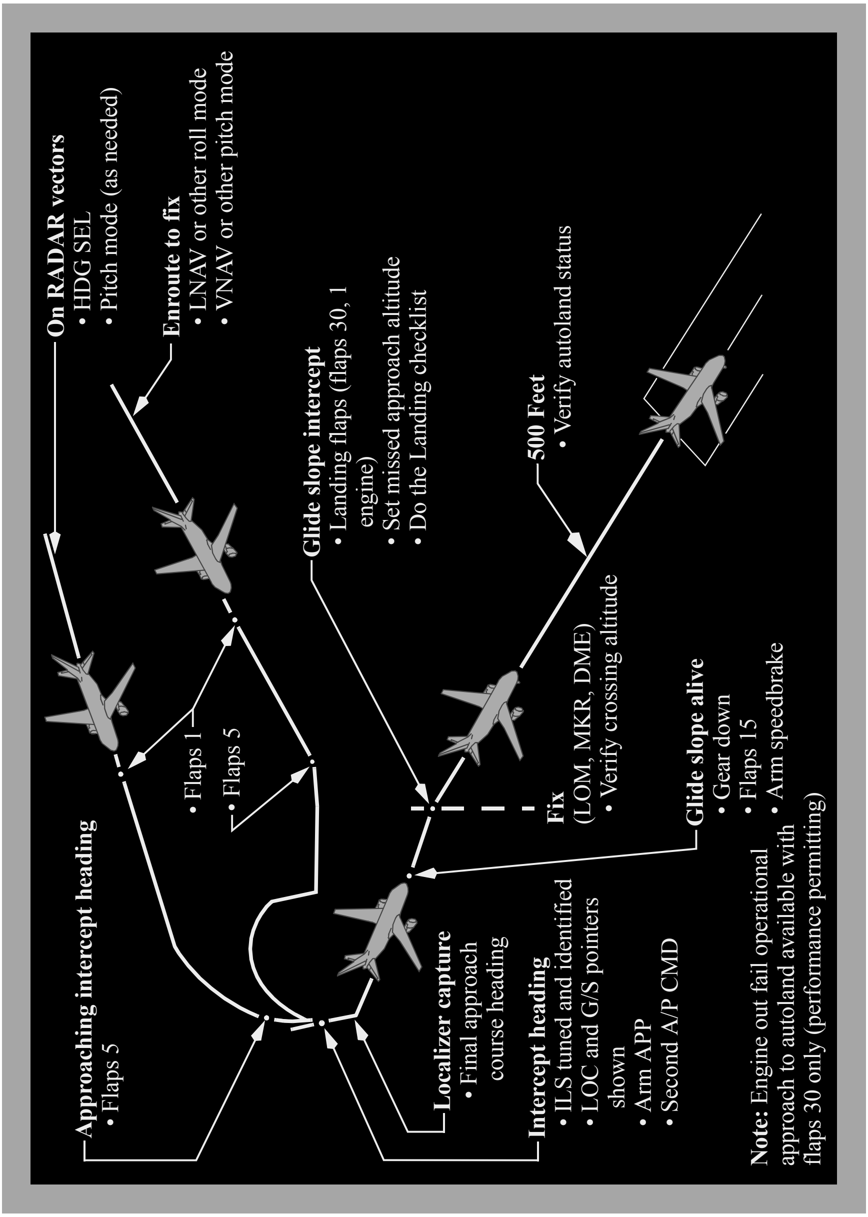
[Option - With FMC U10.7 and earlier]



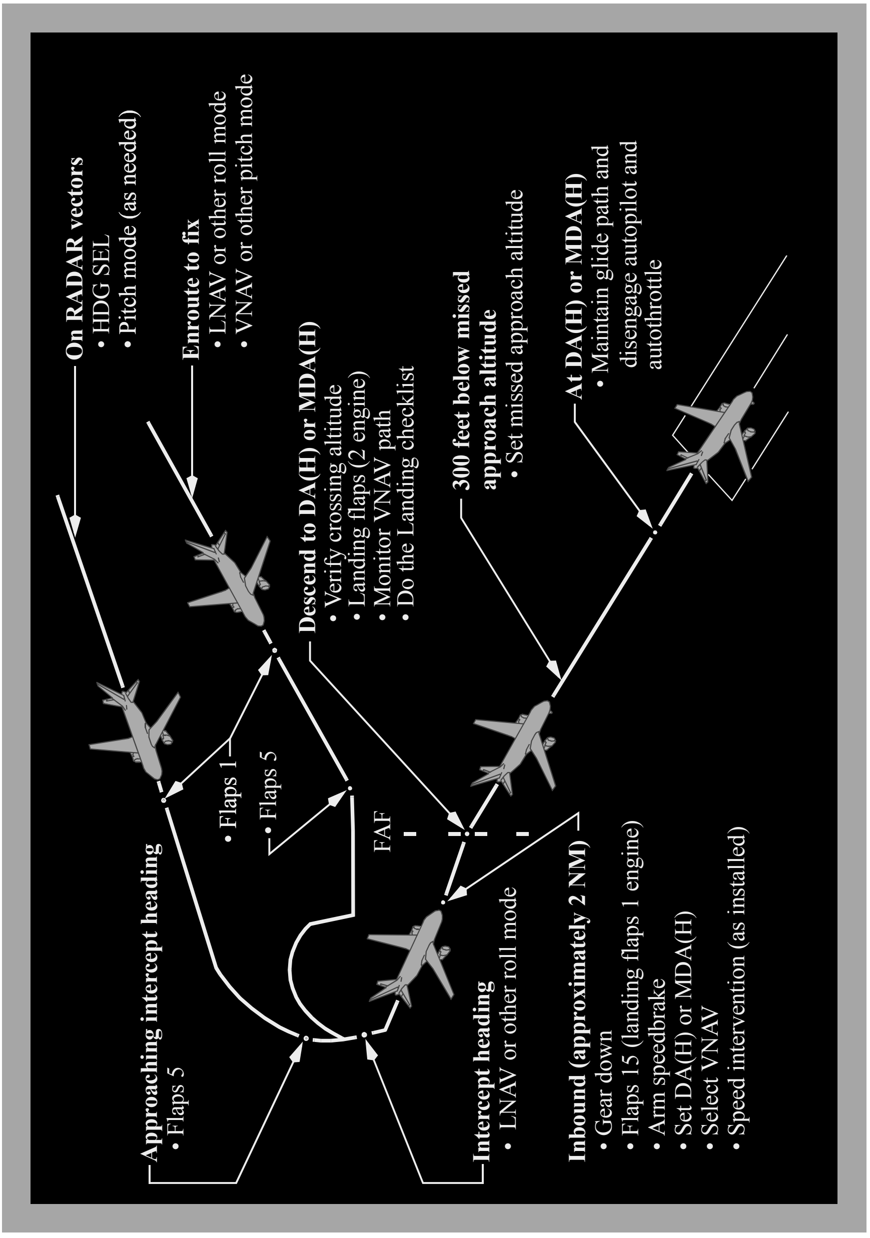
ILS Approach - Fail Passive



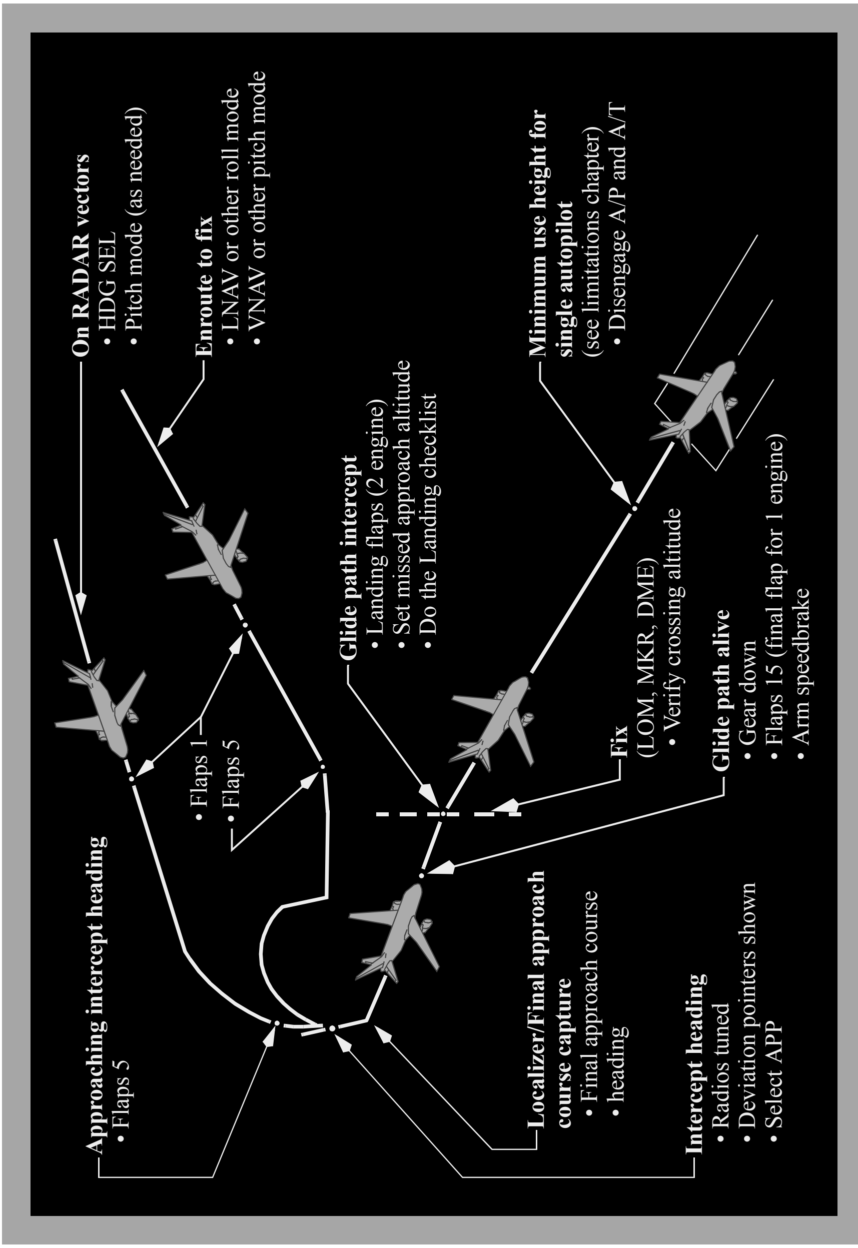
ILS Approach - Fail Operational



Instrument Approach Using VNAV

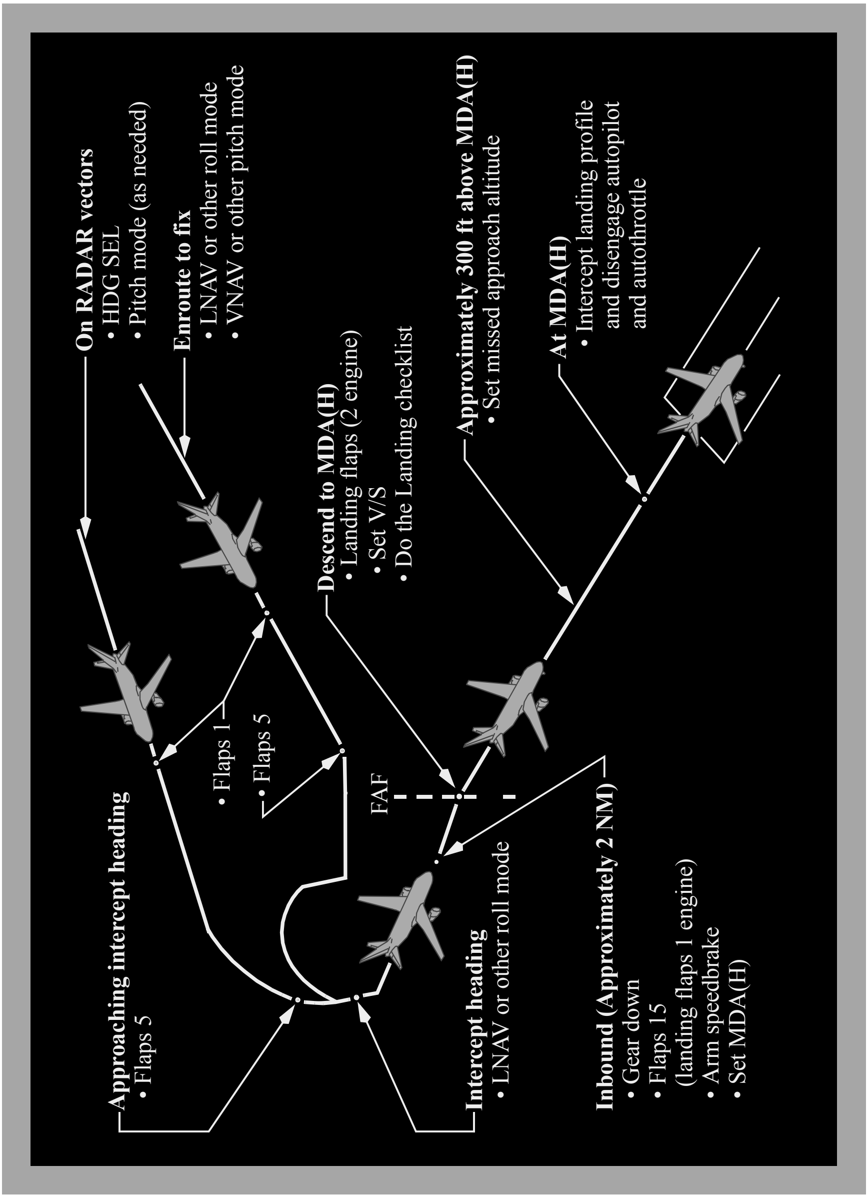


Instrument Approach Using IAN (As installed)

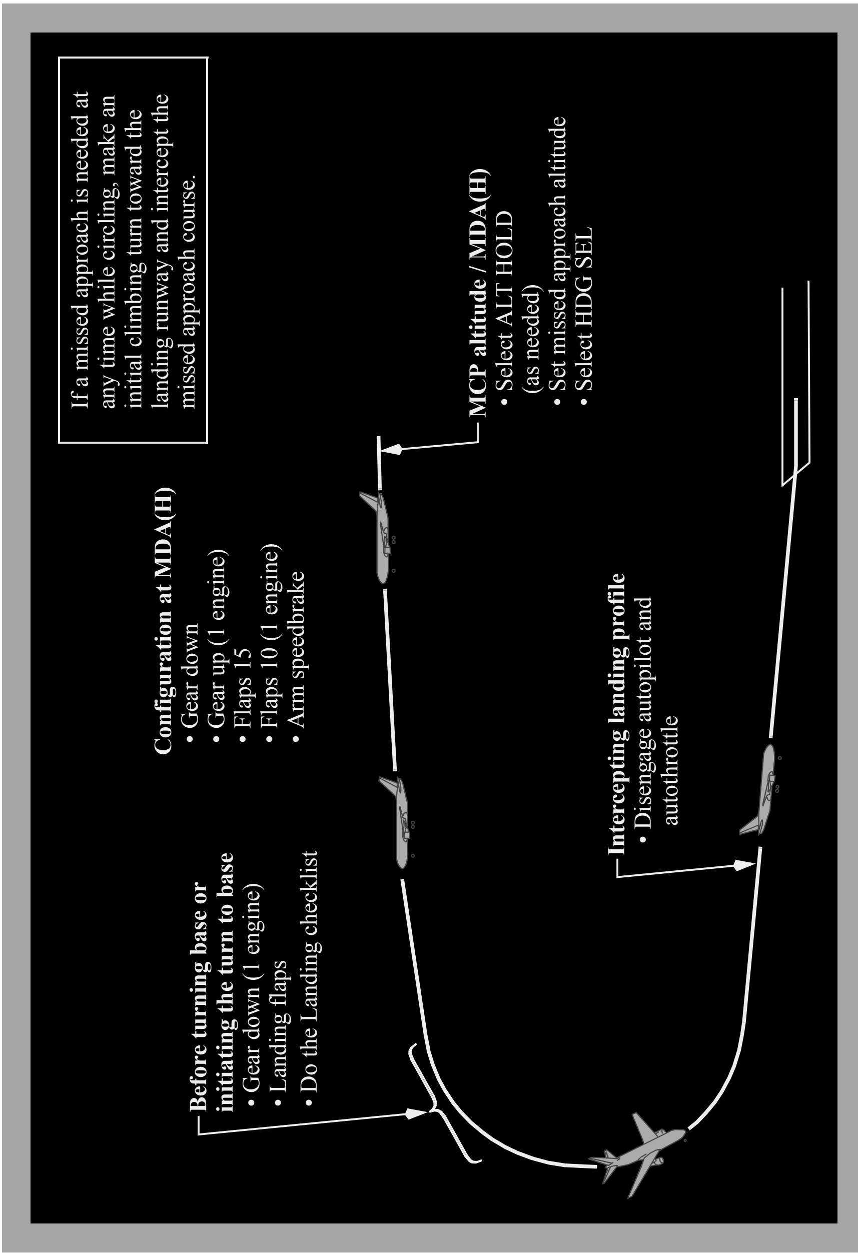


DO NOT USE FOR FLIGHT

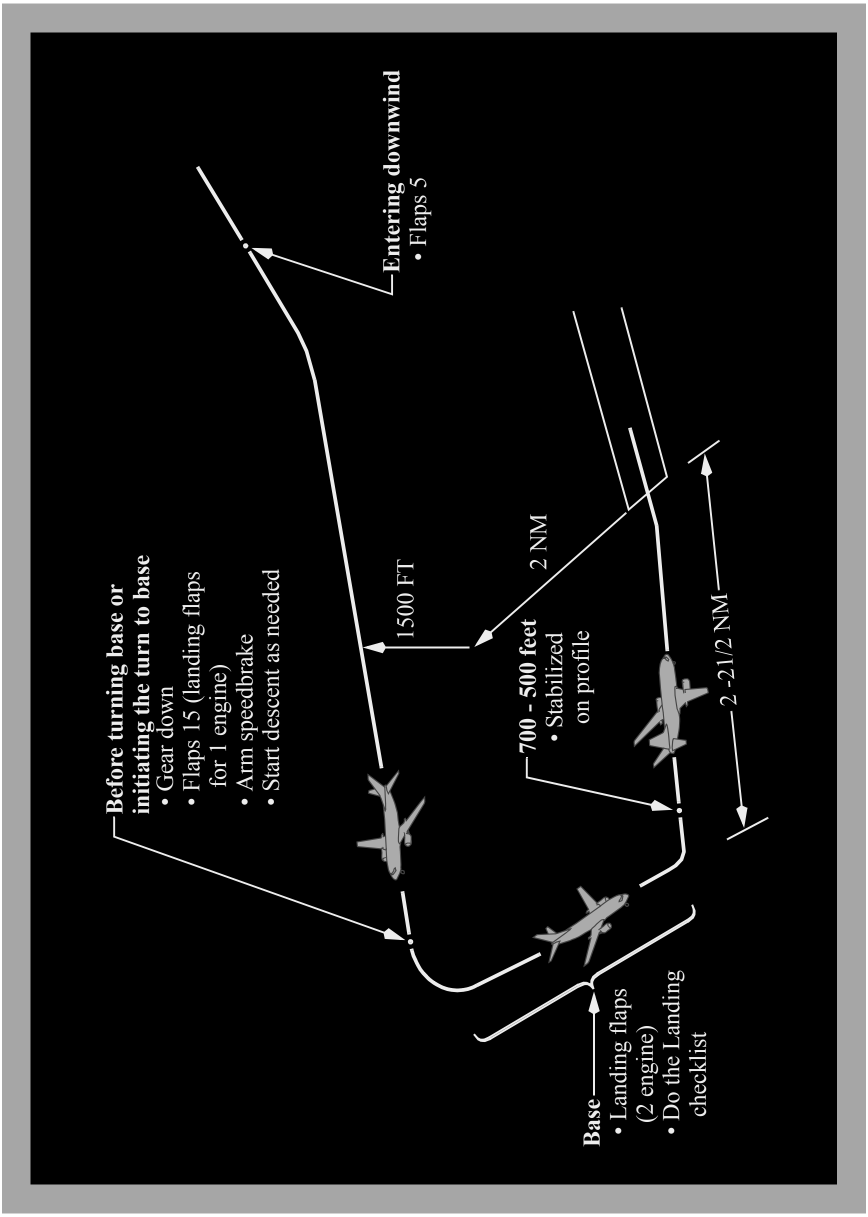
Instrument Approach Using V/S



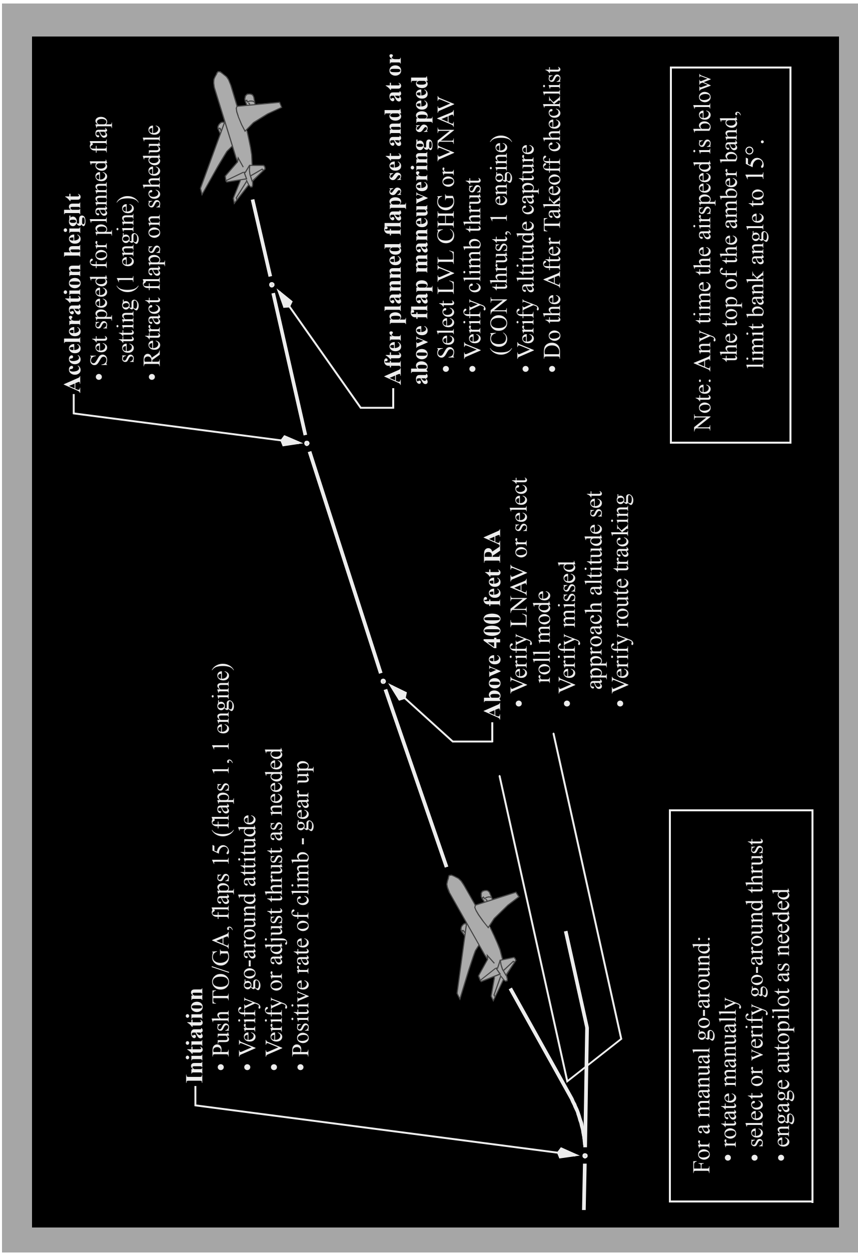
Circling Approach



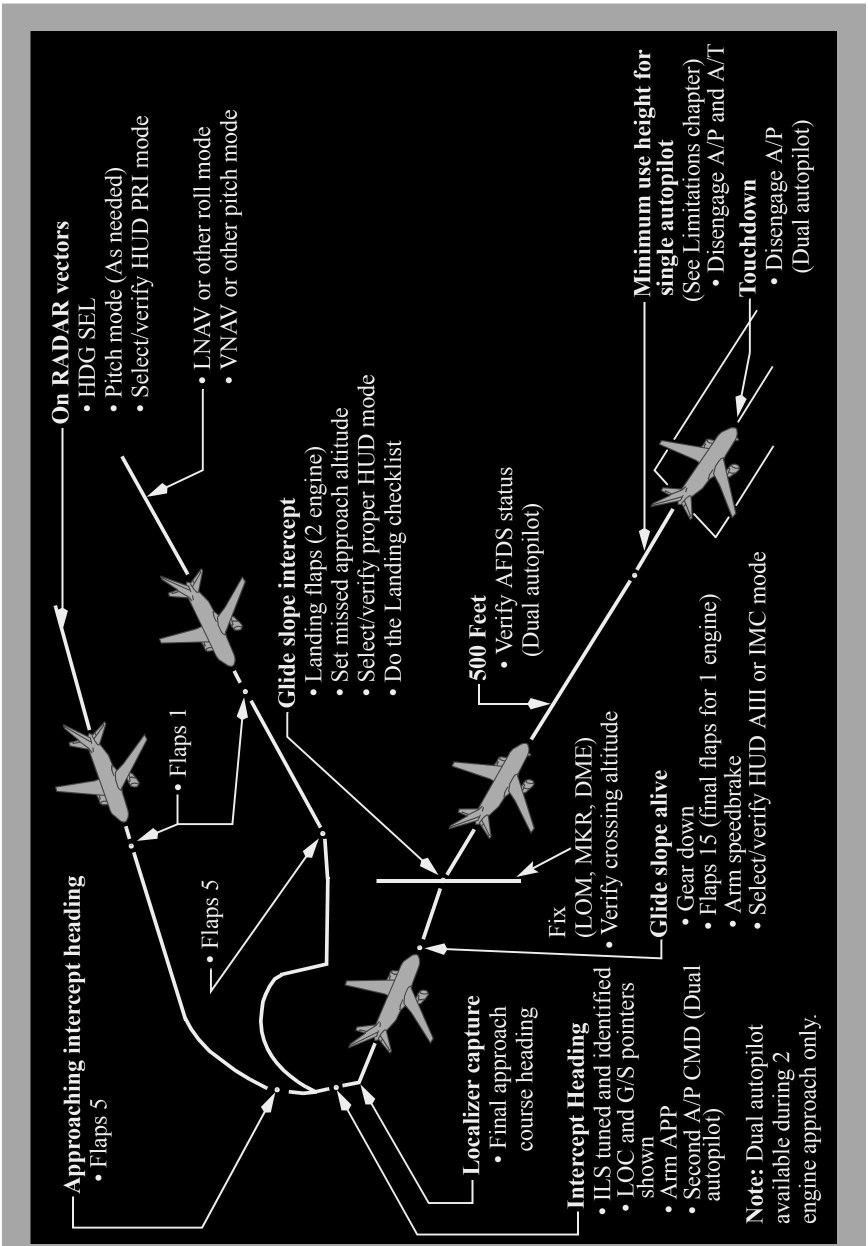
Visual Traffic Pattern



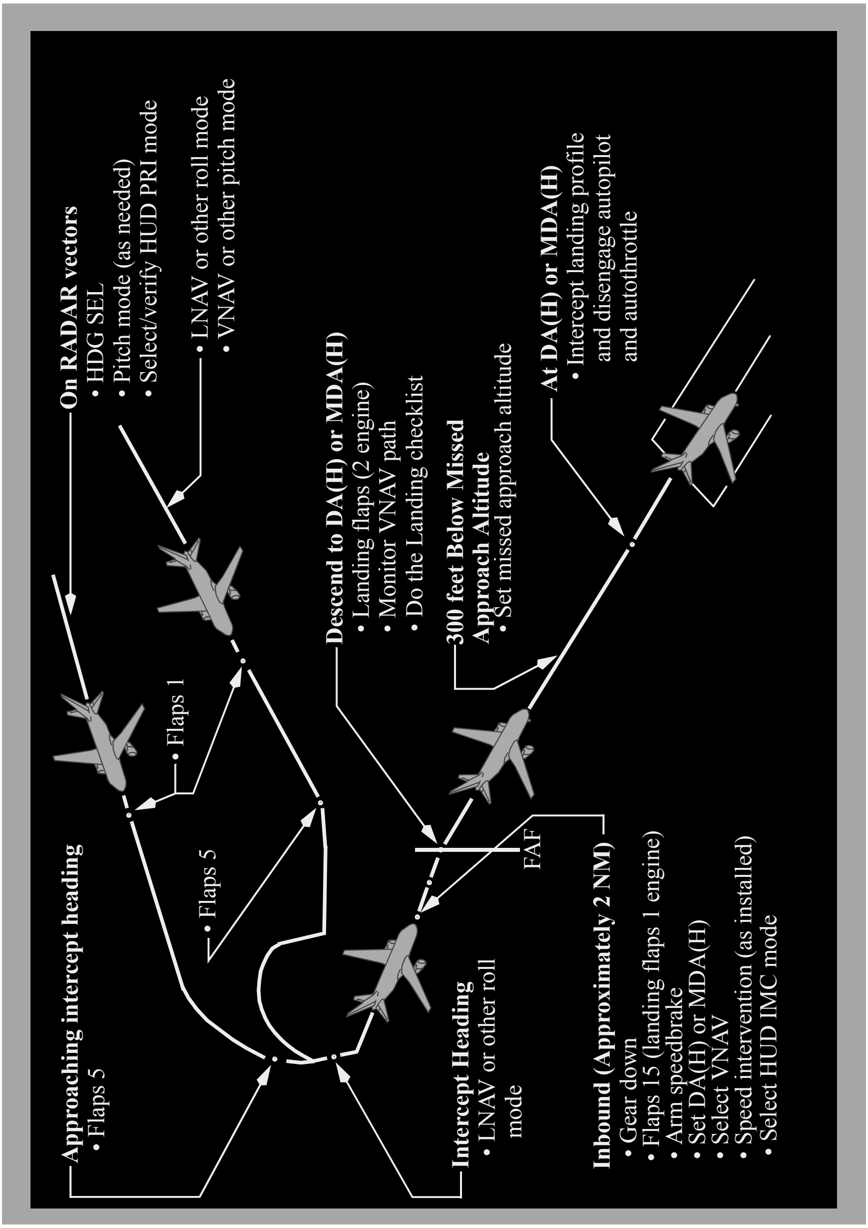
Go–Around and Missed Approach



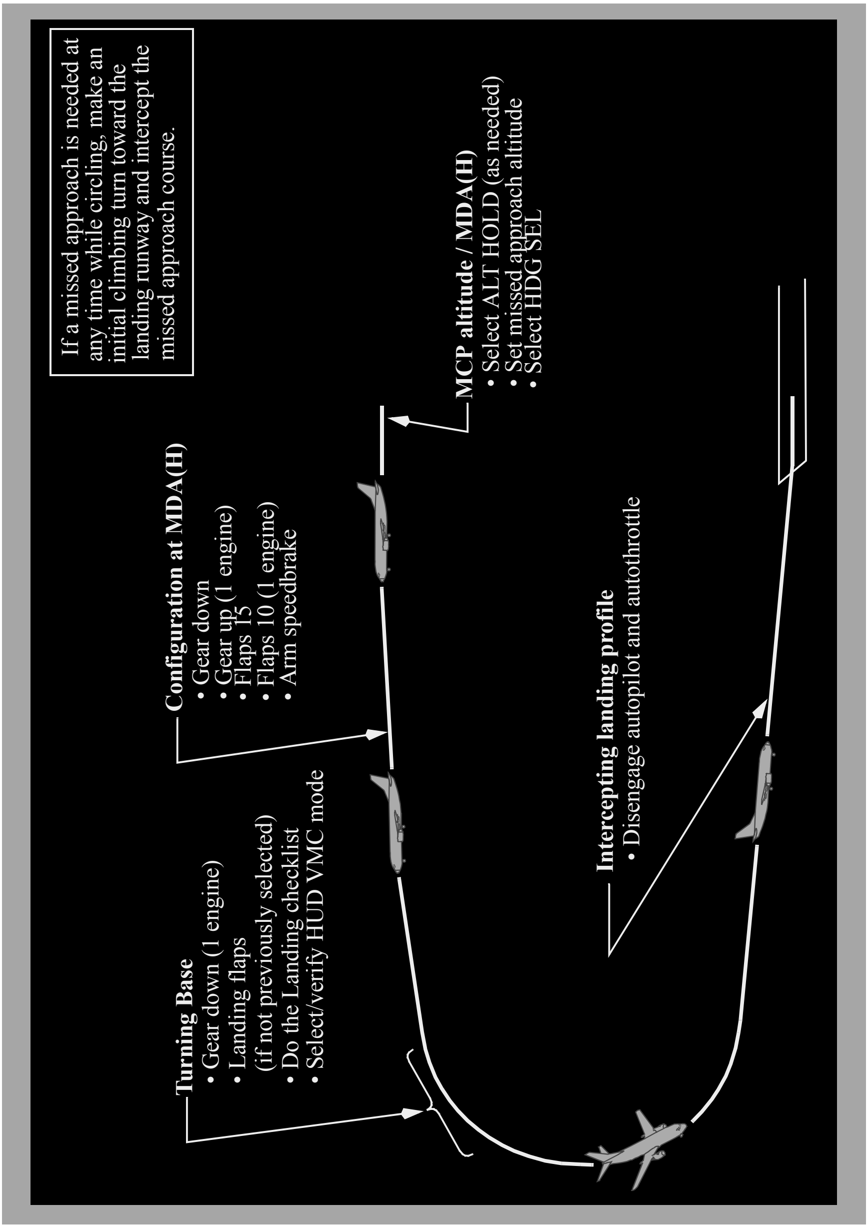
ILS Approach Using HUD



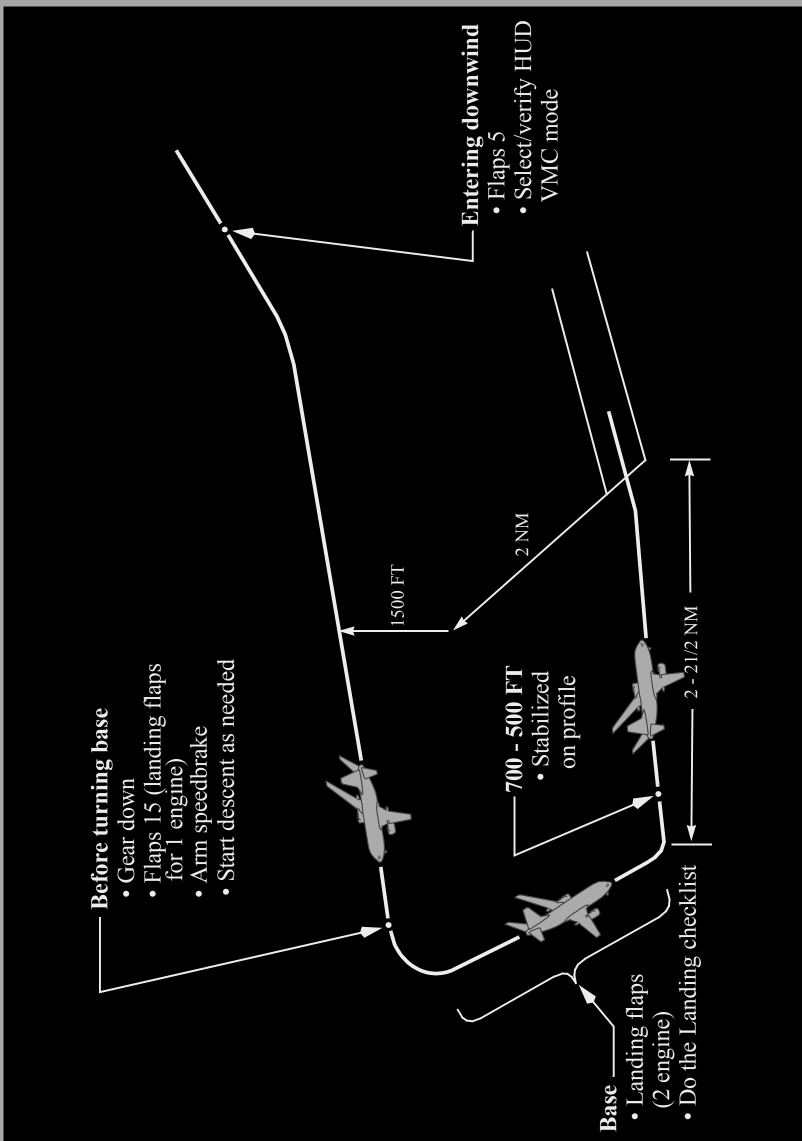
Instrument Approach Using VNAV and HUD



Circling Approach Using HUD



Visual Traffic Pattern Using HUD



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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
YX600	YX600	YX600	YX600
YX700	YX700	YX700	YX700
YX800	YX800	YX800	YX800
YX900	YX900	YX900	YX900
YX910	YX910	YX910	YX910

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Checklist Instructions — Chapter CI
Revision Record — Section RR

Revision Transmittal Letter

To: All holders of The Boeing Company 737 Flight Crew Operations Manual, Boeing Document Number D6-27370-TBC.

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
1	March 5, 1998		2	July 31, 1998	
3	January 29, 1999		4	July 30, 1999	
5	January 28, 2000		6	August 30, 2000	
7	June 6, 2001		8	October 15, 2001	
9	March 15, 2002		10	September 30, 2002	
11	March 31, 2003		12	September 26, 2003	
13	March 29, 2004		14	September 27, 2004	
15	March 28, 2005		16	September 29, 2005	
17	March 31, 2006		18	September 28, 2006	
19	March 15, 2007		20	September 24, 2007	
21	January 25, 2008		22	May 15, 2008	
23	September 18, 2008		24	March 27, 2009	
25	September 25, 2009		26	March 25, 2010	

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.

Chapter NNC - Non-Normal Checklists

Section 6 - Electrical

SOURCE OFF

6.10 - Replaced the "If" statement with a "Choose one" decision step.

Section 9 - Flight Controls

Trailing Edge Flap Disagree

9.33 - Replaced the "If" statement with a "Choose one" decision step.

Section 10 - Flight Instruments, Displays

ALT DISAGREE

10.2 - Changed for cross-model standardization.

Section 12 - Fuel

Engine Fuel Leak

12.6 - Moved the step to open the crossfeed selector earlier in the checklist for Boeing cross-model standardization. Added amplifying information to clarify the reason for the step.

12.6 - Revised the step to turn ON all pump switches in tanks that have fuel in the event of a low fuel condition. In a low fuel non-normal situation, both center tank fuel pumps may be selected ON and all center tank fuel may be used regardless of the amount of fuel remaining in the tank.

12.6 - Added a step to land at the nearest suitable airport for Boeing cross-model standardization.

LOW

12.15 - Moved the step to open the crossfeed selector earlier in the checklist for Boeing cross-model standardization. Added amplifying information to clarify the reason for the step.

12.15 - Revised the step to turn ON all pump switches in tanks that have fuel in the event of a low fuel condition. In a low fuel non-normal situation, both center tank fuel pumps may be selected ON and all center tank fuel may be used regardless of the amount of fuel remaining in the tank.

12.15 - Added a step to land at the nearest suitable airport for Boeing cross-model standardization.

Section 14 - Landing Gear

GEAR DISAGREE

14.7 - Added a new checklist to address common gear retraction and extension non-normal situations.

Landing Gear Lever Jammed in the Up Position

14.14 - Deleted the step to not wait for an indication that a landing gear is down and locked before pulling the next handle. This is not needed for the 737NG since there is no need to deplete residual pressure before the gear will extend and lock.

14.14 - Moved uplock release information to amplifying information for consistency.

14.14 - Added Note to provide information about indications to determine if the related landing gear is down and locked.

Section 15 - Warning Systems

PSEU

15.4 - Revised wording to indicate that the check of the status of the PSEU light should be accomplished following a Master Caution system reset.

RUNWAY AWARENESS AND ADVISORY SYSTEM (RAAS) INOPERATIVE

15.6 - Added Runway Awarness and Advisory System NNC.

Tail Strike

15.6 - Deleted "on takeoff" from the title and from the condition statement. This change was made to cover the small chance of striking the tail during a go-around.

15.6 - Changed Caution for cross-model standardization.

Chapter PI-QRH - Performance Inflight - QRH

Section 10 - Table of Contents

PI-QRH.TOC.10.1 - 737-600 CFM56-7B22 KG FAA EU-OPS CATD was added as Section 10.

Section 10 - General

General

PI-QRH.10.1 - 737-600 CFM56-7B22 KG FAA EU-OPS CATD was added as Section 10.

Section 20 - Table of Contents

PI-QRH.TOC.20.1 - 737-700 CFM56-7B24 LB FAA CATB was added as Section 20.

Section 21 - Advisory Information

Recommended Brake Cooling Schedule

PI-QRH.21.12 - Added (1000 FT) to header to read PRESSURE ALTITUDE (1000 FT).

Section 30 - Table of Contents

PI-QRH.TOC.30.1 - 737-800 CFM56-7B26 KG FAA CATC/N was added as Section 30.

Section 40 - Table of Contents

PI-QRH.TOC.40.1 - 737-900 CFM56-7B26 LB FAA CATG was added as Section 40.

Section 50 - Table of Contents

PI-QRH.TOC.50.1 - 737-900ERW CFM56-7B26 KG FAA was added as Section 50.

Chapter Man - Maneuvers

Section 1 - Non-Normal Maneuvers

Runway Awareness and Advisory System (RAAS)

MAN.1.4 - Added RAAS Maneuver.

Chapter CI - Checklist Instructions

Section 2 - Non-Normal Checklists

Non–Normal Checklist Operation

CI.2.2 - Added information regarding in-flight troubleshooting.

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Checklist Instructions — Chapter CI
QRH List of Effective Pages — Section LEP

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	Quick Action Index	
	QA.Index.1-2	September 25, 2009
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	Unannunciated (tab)	
*	Unann.Index.1-2	March 25, 2010
	Alphabetical (tab)	
*	Alpha.Index.1-12	March 25, 2010
	Normal Checklists (tab)	
*	NC.1-4	March 25, 2010
	0 Miscellaneous (tab)	
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	3 Anti-Ice, Rain (tab)	
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	4 Automatic Flight (tab)	
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	5 Communications (tab)	
	5.TOC.1-2	May 15, 2008
	5.1	May 15, 2008
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	6 Electrical (tab)	
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*	6.10	March 25, 2010
	6.11-14	September 25, 2009

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* PI-QRH.32.6-10	March 25, 2010
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Introduction

This introduction gives guidelines for use of the Normal Checklist (NC).

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation

Normal checklists are used after doing all respective procedural items.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Captain	First officer	Both	Area of responsibility
BEFORE START	Captain	First officer	Both	Area of responsibility
BEFORE TAXI	Captain	First officer	Both	Area of responsibility
BEFORE TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot flying
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring
DESCENT	Pilot flying	Pilot monitoring	Both	Area of responsibility
APPROACH	Pilot flying	Pilot monitoring	Both	Area of responsibility
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Area of responsibility
SECURE	Captain	First officer	Both	Area of responsibility

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that an entire procedure was not done:

- stop the checklist
- complete the entire procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, do the checklist from the start. If the checklist is stopped for a long time, also do the checklist from the start.

After completion of each checklist, the pilot reading the checklist calls, "___ CHECKLIST COMPLETE."

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.

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

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.

It should be noted that, in determining the safest course of action, troubleshooting, i.e., taking steps beyond published non-normal checklist steps, may cause further loss of system function or system failure. Troubleshooting should only be considered when completion of the published non-normal checklist results in an unacceptable situation.

There are some situations where the flight crew must land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non–normal checklist includes the item “Plan to land at the nearest suitable airport.”
- fire or smoke continues
- only one AC power source remains (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 takeoff, the associated non–normal checklist is done if a non-normal situation is identified. After completion of the checklist, the Dispatch Deviations Guide or operator equivalent is consulted to determine if Minimum Equipment List dispatch relief is available.
- System controls are in the normal configuration for the phase of flight before the start of the non–normal checklist.
- 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.

[Option - Single battery]

- In flight, reset of a tripped circuit breaker is not recommended. However, a tripped circuit breaker may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. On the ground, flight crew reset of a tripped circuit breaker should only be done after maintenance has determined that it is safe to reset the circuit breaker.

[Option - Dual battery]

- 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

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, at the direction of the pilot flying, both crewmembers do all memory items in their areas of responsibility without delay.

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical phase of flight (such as takeoff or landing)
- all memory items are complete.

The pilot monitoring reads aloud:

- the checklist title
- as much of the 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 Loss of Thrust on Both Engines checklist.

With the airplane stationary 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 or in motion on the ground:

- the pilot flying and the pilot monitoring take action based on each crewmember's Areas of Responsibility.

After moving the control, the crewmember taking the action also states the checklist response.

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 Legend

Redirection Symbol

▶▶

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.

Intentionally
Blank

Evacuation checklist is on the reverse side of this page.

Evacuation

Condition: Evacuation is needed.

1 PARKING BRAKE . . . . Set C

2 Speedbrake lever . . . . DOWN C

3 FLAP lever . . . . 40 F/O

4 Pressurization mode selector . . . . . MAN F/O

5 Outflow VALVE switch . . . . Hold in OPEN until the outflow VALVE position indicates fully open F/O

6 **If** time allows:

Verify that the flaps are 40 before the engine start levers are moved to CUTOFF. C

7 Engine start levers (both) . . . . . CUTOFF C

8 Advise the cabin to evacuate. C

9 Advise the tower. F/O

10 Engine and APU fire switches (all) . . . . Override and pull F/O

11 **If** an engine or APU fire warning occurs:

Illuminated fire switch . . . . Rotate to the stop and hold for 1 second F/O

■ ■ ■ ■