General

This chapter contains Normal Procedures. The first section incorporates routine normal procedures and associated flight patterns. The second section incorporates supplementary procedures that are accomplished as required rather than routinely performed.

Controls and Indications – Nomenclature

Controls and indications appear in all UPPERCASE type to correspond to the words on the control panel or display. For example, the following item has UPPERCASE words to match what is found on the panel:

EQUIPMENT COOLING switches ..... NORMAL

The word EQUIPMENT is spelled out, even though it is abbreviated on the panel.

The following appears in all lower case because there are no words identifying the panel name.

Engine display control panel ..... Set

Normal Procedures

Normal procedures are used by the trained flight crew to ensure airplane condition is acceptable and that the flight deck is correctly configured for each phase of flight. These procedures assume all systems are operating normally and automated features are fully utilized.

Procedures are performed from recall and follow a panel flow. Checklists are used to verify that critical items affecting safety have been accomplished. These procedures are designed to minimize crew workload and are consistent with flight deck technology.

During accomplishment of procedures, it is the crew member's responsibility to ensure proper system response. If an improper indication is noted, first verify that the system controls are properly positioned. Then, if necessary, check the appropriate circuit breaker(s), and test related system light(s.)

Before engine start, individual system lights are used to verify system status. If an individual system light is indicating an improper condition prior to engine start, determine if the condition may affect dispatch and require maintenance action or compliance with the Minimum Equipment List (MEL.)

After engine start, the MASTER CAUTION system, annunciator lights, and alerts are used as the primary means to alert the crew to a non-normal system condition. Illumination of the MASTER CAUTION and system annunciator lights requires accomplishment of the appropriate non–normal procedure. Upon completion of the procedure and prior to takeoff, the Dispatch Deviations Guide (DDG) or airline equivalent should be consulted to determine if MEL relief is available.

Flight crew duties are organized in accordance with an area of responsibility concept. Each crewmember is assigned a flight deck area where the crewmember initiates actions for required procedures.The panel illustrations in this section describe each crewmember's area of responsibility for pre/post flight and phase of flight.

Pre/post flight duties are apportioned between the captain and first officer, while phase of flight duties are apportioned between the Pilot Flying (PF) and Pilot Not Flying (PNF.) A normal scan flow is encouraged; however, certain items may be handled in the most logical sequence for existing conditions. Actions outside the crew member's area of responsibility are initiated at the direction of the captain. General phase of flight responsibilities are as follows:

Pilot flying (PF):

- flight path and airspeed control
- airplane configuration
- navigation.

Pilot not flying (PNF):

- checklist reading
- communications
- tasks requested by PF
- start levers and fire switches (with PF concurrence.)

Phase of flight duties, beginning with the Takeoff Procedure and ending with completion of the Landing Roll Procedure, are presented in table form in the appropriate procedures section.

The first officer, when flying the airplane, performs the duties listed under PF, and the captain performs those duties listed under PNF.

Note: Although the mode control panel is designated as the PF's responsibility, the PNF should operate the controls on the mode control panel at the direction of the PF when the airplane is being flown manually.

The captain retains final authority for all actions directed and performed.

Autopilot Flight Director System and Flight Management System Monitoring

When the autopilot, flight director, or autothrottles are in use and a mode change is selected or is scheduled to occur, the annunciation must be verified on the flight mode annunciation display. Airplane course, vertical path, and speed must always be monitored.

Similarly, when a thrust mode change is selected or is scheduled to occur, the annunciation must be verified on the thrust mode display.

In LNAV and VNAV, all airplane course, vertical path, thrust and speed changes must be verified.

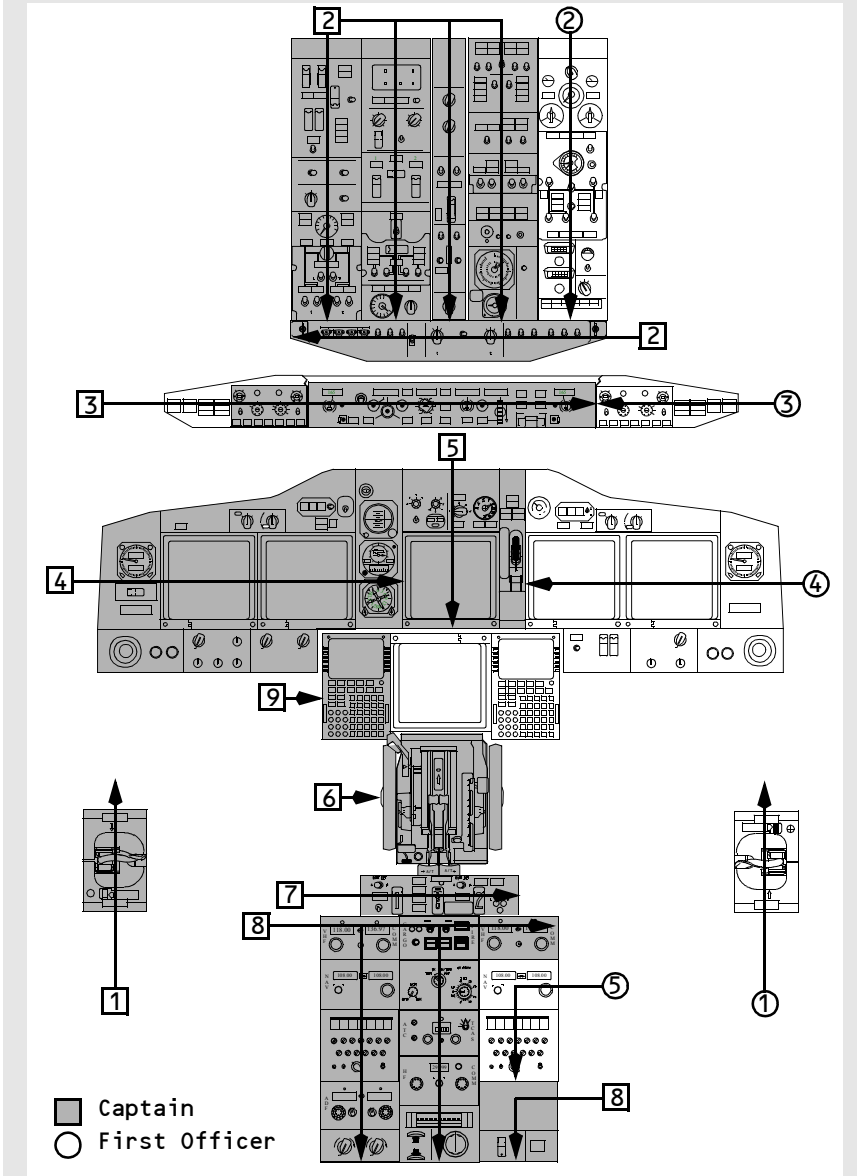
CDU Operation

On the ground, the control display unit (CDU) entries are normally performed by the first officer and verified by the captain.

In flight, CDU entries are normally accomplished by the pilot not flying and verified by the pilot flying prior to execution. CDU entries should be accomplished prior to high workload periods such as departure, arrival, or holding. During high workload periods, using the autopilot modes such as heading select, level change, and the altitude and speed intervention features, if available, may be more efficient than entering complex route modifications into the CDU.

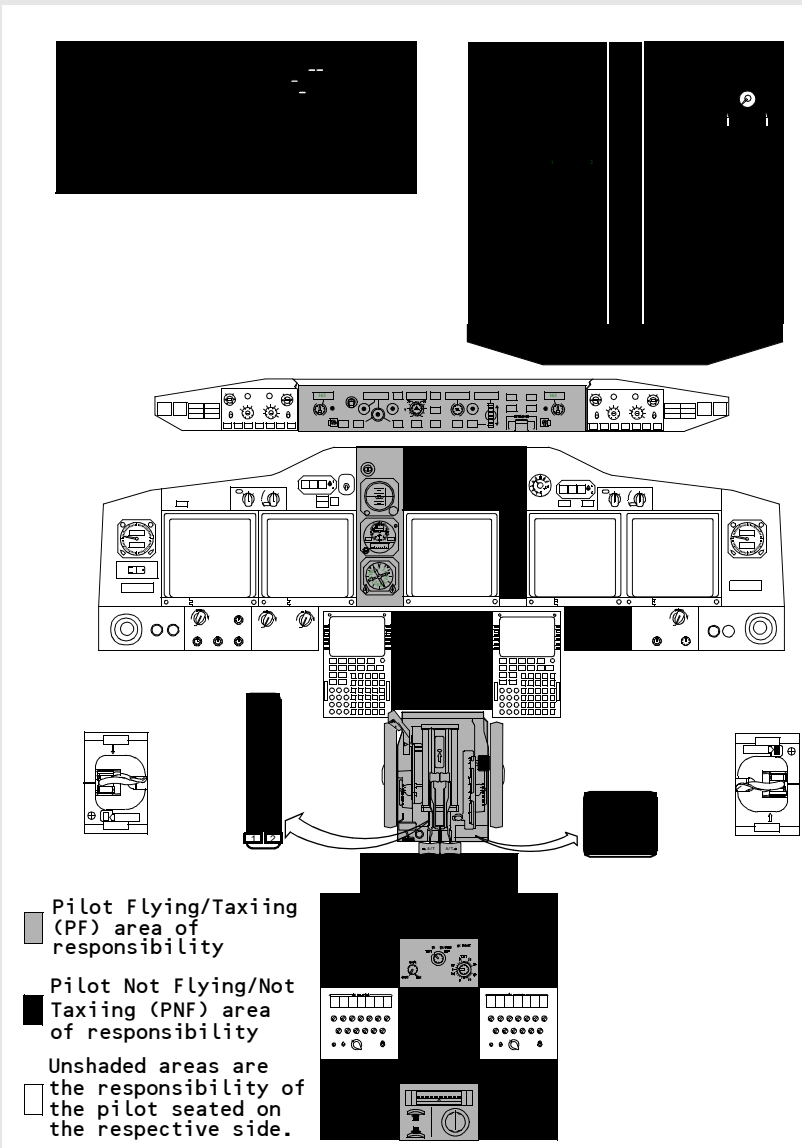
Panel Scan Diagram

The diagram below describes each crew member's area of responsibility and scan flow pattern for each panel when the airplane is not moving under its own power.



Pilot Flying/Taxiing and Pilot Not Flying/Not Taxiing Areas of Responsibility

The diagram below describes each crew member's area of responsibility for each panel when the airplane is moving under its own power.



Intentionally
Blank

Exterior Safety Inspection – Captain or First Officer

Surfaces and chocks ..... Check

Visually check that all movable surfaces are clear and the chocks are in place.

Maintenance status ..... Check

Verify maintenance status is acceptable for flight and ensure agreement with authorized dispatch deviations if required.

Flight Deck Safety Inspection – Captain or First Officer

Perform the following checks prior to assuming normal crew positions.

BATTERY switch ..... ON

Guard – Down

ELECTRIC HYDRAULIC PUMP switches ..... OFF

LANDING GEAR lever ..... DN

All green landing gear indicator lights – Illuminated

Preliminary Flight Deck Preparation – Captain or First Officer

GROUND POWER switch (if ground power is available) ..... ON

SOURCE OFF lights – Extinguished

Fault/Inop detection ..... Check

OVERHEAT DETECTOR switches – NORMAL

TEST switch – Hold to FAULT/INOP

Verify MASTER CAUTION, OVHT/DET annunciator, FAULT and APU DET INOP lights are illuminated.

If the FAULT light fails to illuminate, the fault monitoring system is inoperative.

If APU DET INOP light fails to illuminate, do not operate APU.

Fire/Overheat warning ..... Check

Note: Alert ground personnel before this test is accomplished with the APU operating. The fire warning light flashes and the horn sounds on the APU ground control panel.

TEST switch – Hold to OVHT/FIRE

Verify fire warning bell sounds, master FIRE WARN lights, MASTER CAUTION lights and OVHT/DET annunciator illuminate.

Master FIRE WARNING light – Push

Verify master FIRE WARN lights and fire warning bell cancel.

Verify engine No. 1, APU, and engine No. 2 fire warning switch and engine No. 1 and engine No. 2 OVERHEAT lights are illuminated. If AC busses are powered, verify WHEEL WELL fire warning light is illuminated.

If an engine fire warning switch and an ENG OVERHEAT light do not illuminate, a detection loop is inoperative.

EXTINGUISHER TEST switch ..... Check

Position TEST Switch to 1, verify the green extinguisher test lights are illuminated. Release switch and verify the lights are extinguished. Repeat for test position 2.

APU .....Start & on busses

When the APU GEN OFF BUS light illuminates:

APU GENERATOR bus switches – ON

SOURCE OFF lights – Extinguished

Note: It is recommended that the APU be operated for one minute before using as a bleed air source.

FLAP lever .....Set

Position the FLAP lever to agree with the FLAPS position indicator.

CARGO FIRE system ..... Check

DETECTOR SELECT switches – NORM

TEST switch – Push

Verify fire warning bell sounds and master FIRE WARN lights illuminate.

Master FIRE WARN light – Push

Verify master FIRE WARN lights and fire warning bell cancel.

Verify cargo fire (FWD, AFT) warning lights are illuminated.

Verify DETECTOR FAULT light remains extinguished.

Note: If a cargo fire warning light does not illuminate and the DETECTOR FAULT light illuminates, a detection loop is inoperative.

Verify the green EXTINGUISHER test lights are illuminated.

Verify the cargo fire bottle DISCHARGE light is illuminated.

Manual gear extension access door .....Closed

Emergency equipment ..... Check

Fire extinguisher – Check and stow

Verify safetied.

Circuit breakers (P–6) ..... Check

Verify circuit breakers are in or collared in compliance with dispatch requirements.

[Option]
VOICE RECORDER switch ..... As required

Flight recorder ..... Test

FLIGHT RECORDER OFF light – Illuminated

FLIGHT RECORDER test switch – TEST

FLIGHT RECORDER OFF light – Extinguished

FLIGHT RECORDER test switch – NORMAL

MACH AIRSPEED WARNING TEST switches ..... Push

Verify clacker sounds.

STALL WARNING TEST switches ..... Push

Verify control column vibration when each switch is pushed.

Note: The stall warning test requires that AC transfer busses are powered for up to 4 minutes.

Note: With hydraulic power off, the leading edge flaps may droop enough to cause an asymmetry signal, resulting in a failure of the stall warning system test. Should this occur, place the "B" system electric pump ON and retract the flaps. When flaps are retracted repeat the test.

[Option]
EVACUATION activation switch ..... OFF

Guard – Down

EVACUATION light – Extinguished

REVERSER lights ..... Extinguished

EEC switches ..... ON

ALTERNATE lights – Extinguished

PASSENGER OXYGEN switch ..... NORMAL

Guard – Down

PASS OXY ON light – Extinguished

CAUTION: Switch activation will cause deployment of passenger oxygen masks.

CREW OXYGEN pressure indicator ..... Check

Verify pressure meets dispatch requirements.

SERVICE INTERPHONE switch ..... As required

GPS light .....Extinguished

IRS mode selectors .....NAV

Note: Prior to commencing the alignment procedure the airplane must be parked and not moved until alignment is complete and the ALIGN lights extinguish.

Verify both ON DC lights illuminate momentarily followed by steady illumination of the ALIGN lights. The ALIGN lights will remain illuminated until the IRS enters the NAV mode.

[Option]
Emergency locator transmitter switch .....ARM

PSEU light .....Extinguished

Circuit breakers (P–18) ..... Check

Verify circuit breakers are in or collared in compliance with dispatch requirements.

Crash axe .....Stowed

Exterior Inspection

Prior to each flight, the flight crew must accomplish or verify that the maintenance crew has accomplished the following checks.

Note: Alert ground personnel before pressurizing hydraulic system.

ELECTRIC HYDRAULIC PUMP switches ..... ON

System A and B pressure – 2800 PSI minimum

Parking brake ..... Set

Parking brake warning light – Illuminated

Exterior lights ..... Check

General airplane condition ..... Check

Check airplane free of damage and fluid leakage.

Probes, sensors, ports, vents and drains ..... Unobstructed

Doors, latches and access panels (not in use) ..... Properly secured

Tires, brakes and wheels ..... Check

If brake wear indicator pins are even with brake housing, check with maintenance.

Gear struts and doors ..... Check

Verify door seals secure, impact fittings intact, and struts not fully compressed.

Ground locking pins ..... Removed

Nose gear steering lockout pin ..... Check

Installed if pushback or tow out will be accomplished, otherwise removed.

Nose wheel snubbers ..... In place

Wheel well light switches ..... NORMAL

Oxygen pressure relief green disc ..... In place

Cargo compartments ..... Check

Check condition of compartments, tie–downs and lights.

Ram air deflector door ..... Extended

Flight control surfaces ..... Unobstructed

Check all surfaces clear of ice, snow, or frost.

Fuel measuring sticks ..... Check

Verify measuring sticks agree with alignment marks.

Wing Surfaces ..... Check

Visually inspect the lower wing surface. If there is frost or ice on the lower surface outboard of measuring stick 4, there may also be frost or ice on the upper surface. The distance that frost extends outboard of measuring stick 4 can be used as an indication of the extent of frost on the upper surface.

Note: Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel, is permissible; however, all leading edge devices, all control surfaces, tab surfaces, upper wing surfaces and balance panel cavities must be free of snow or ice.

Note: Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel, is permissible; however, all leading edge devices, all control surfaces, tab surfaces, upper wing surfaces, winglet surfaces and balance panel cavities must be free of snow or ice.

A & B hydraulic reservoir quantity indicators ..... RF or above

Brake accumulator indicator ..... 2800 psi minimum

APU fire control handle ..... UP

Outflow valve ..... Full open

[737-800]

Tail skid ..... Check

Replace shoe if worn to wear dimple.

Replace cartridge assembly if warning decal is red.

Engine fire extinguishers ..... Check

Verify pressure adequate per bottle data plate.

ELECTRIC HYDRAULIC PUMP switches ..... OFF

Exterior lights ..... As required

Flight Deck Preparation – Captain or First Officer

Light test .....Test

Master LIGHTS test and dim switch – TEST

Use scan flow to check all lights flashing or illuminated. Use individual test switches or push to test feature to check appropriate lights which do not illuminate during the light test. The fire warning lights are not checked during this test.

Master LIGHTS test and dim switch – As desired

FMC/CDU .....Set present position

POS INIT page – Select

Using the most accurate information available, enter present position on the SET IRS POS line. Confirm that the box prompts are replaced by the entered present position.

Flight Deck Preparation – Captain

Escape strap ..... Check

Ensure strap is connected to structure.

Sun visors and smoke goggles ..... Stowed

Oxygen and interphone ..... Check

Audio control panel – Set

[Option - Microphone selector]
Push FLIGHT INTERPHONE transmitter selector and receiver switches. Adjust volume on FLIGHT INTERPHONE receiver and SPEAKER switches. Position microphone selector to MASK.

Oxygen panel – Set

Check mask is properly stowed and NORMAL/100% switch is at 100%.

RESET/TEST button – Push down and hold

Observe momentary yellow cross in oxygen flow indicator.

EMERGENCY/TEST selector – Push and hold

While holding RESET/TEST button down, push the EMERGENCY/TEST selector and observe constant yellow cross in oxygen flow indicator.

Push–To–Talk switch – I/C

While holding RESET/TEST button down and pushing the EMERGENCY/TEST selector, simultaneously key microphone and listen for oxygen flow sound through the overhead speaker. Release/reset all switches.

Oxygen pressure – Check

Verify pressure meets dispatch requirements.

Flight control panel ..... Check

All 5 switch guards – Down

ALTERNATE FLAPS position switch – OFF

YAW DAMPER switch ..... ON

YAW DAMPER light – Extinguished

NAVIGATION transfer and
DISPLAYS switches .....AUTO & NORMAL

Fuel system ..... _____KGS/LBS & pumps ON

ENGINE VALVE CLOSED lights – Illuminated dim

SPAR VALVE CLOSED lights – Illuminated dim

FILTER BYPASS lights – Extinguished

CROSSFEED selector – Closed

VALVE OPEN light – Extinguished

Fuel quantity – Check

Verify total fuel quantity meets dispatch requirements.

FUEL PUMPS switches (for tanks containing fuel) – ON

Center tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 453 kgs/1000 lbs.

LOW PRESSURE lights – Extinguished

CAUTION: If a LOW PRESSURE light does not extinguish when the switch is positioned ON, position the switch OFF.

CAB/UTIL power switch ..... ON

IFE/PASS seat power switch ..... ON

Electrical system ..... Set

STANDBY POWER switch – AUTO (guard down)

Generator drive DISCONNECT switches – Guards down

BUS TRANSFER switch – AUTO (guard down)

CIRCUIT BREAKER and PANEL light controls..... As desired

EQUIPMENT COOLING switches .....NORMAL

OFF lights – Extinguished

EMERGENCY EXIT lights switch ..... ARMED

Guard – Down

NOT ARMED light – Extinguished

Passenger signs .....Set

NO SMOKING switch – AUTO or ON

FASTEN BELTS switch – AUTO or ON

Windshield WIPER selectors ..... PARK

WINDOW HEAT switches .....ON

Position switches ON at least 10 minutes before takeoff.

OVERHEAT lights – Extinguished

[Option]
ON lights – Illuminated (except at high ambient temperatures)

[Option]
OFF lights – Extinguished (except at high ambient temperatures)

PROBE HEAT switches ..... OFF

WING and ENGINE ANTI – ICE switches ..... OFF

VALVE OPEN lights – Extinguished

Hydraulics ..... Normal

Note: Alert ground personnel before pressurizing hydraulic system.

System A HYDRAULIC PUMPS switches – ON

System B HYDRAULIC PUMPS switches – ON

Electric pump LOW PRESSURE lights – Extinguished

Brake pressure – 2800 PSI minimum

[Option]
MFD SYSTEM switch – Push

System A and B pressure – 2800 PSI minimum

Quantity indicators – No RF indication displayed

Pressurization indicators ..... Check

Cabin differential pressure – Zero

Cabin altitude – Field elevation

Cabin rate of climb – Zero

[Option]
High altitude landing switch – ON light extinguished

Exterior light switches ..... As desired

Ignition select switch .....IGN L or R

Alternate ignition select switch on subsequent starts.

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

[Automatic ignition]
ENGINE START switches ..... AUTO

EFIS control panel ..... Set

MINIMUMS reference selector – As desired

Select RADIO or BAROMETRIC. Adjust decision height or altitude reference, as appropriate.

[Option]
FLIGHT PATH VECTOR switch – As desired

METERS switch – As desired

BAROMETRIC reference selector – Set

Select barometric altitude reference. Set local altimeter setting.

VOR/ADF switches – As desired

Mode selector – MAP

CENTER switch – As desired

Range selector – As desired

TRAFFIC switch – As desired

MAP switches – As desired

Mode control panel .....Set

When selecting a value on the MCP, ensure the corresponding display on the instrument panel changes, if applicable.

COURSE(S) – Set and crosscheck

FLIGHT DIRECTOR switches – ON

Position the switch for the pilot flying to ON first.

AUTOTHROTTLE switch – OFF

Heading – Runway heading

Bank angle limit – As desired

Altitude – As desired

Autopilots – Disengaged

Clock .....Set

TIME/DATE pushbutton - UTC time

NOSE WHEEL STEERING switch .....NORM

Display select panel .....Set

MAIN PANEL DISPLAY UNITS selector – NORM

LOWER DISPLAY UNIT selector – NORM

[Option - EFIS/MAP]

Left flight instruments .....Set

Note: IRS alignment must be complete.

EFIS – Correct

A/T, pitch, and roll FMA's - Blank

A/P status FMA - FD

Flight instrument indications are correct.

The NO V SPD flag is displayed until V–speeds are selected.

Verify no other flags displayed.

Altimeter – Set

MAP – Correct

Verify no flags displayed

Route – Displayed, correct

[Option - PFD/ND]

Left flight instruments ..... Set

Note: IRS alignment must be complete.

PFD – Correct

Flight mode annunciators – Blank

AFDS status is FLT DIR

Flight instrument indications are correct.

The NO V SPD flag is displayed until V–speeds are selected.

Verify no other flags displayed.

Altimeter – Set

ND – correct

Verify no flags displayed

Route – Displayed, correct

[Option]

Integrated standby flight display ..... Check

Approach mode display – Blank

Set local altimeter setting

Verify flight instrument indications are correct

Verify no flags or messages are displayed.

Light controls ..... As desired

Engine display control panel ..... Set

N1 SET selector – AUTO

Permits FMC control of N1 bugs.

FUEL FLOW switch – RATE

Move switch to RESET, then RATE.

SPEED REFERENCE selector – AUTO

Permits FMC control of reference speed bugs.

AUTO BRAKE select switch ..... RTO

AUTO BRAKE DISARM light – Extinguished

ANTISKID INOP light ..... Extinguished

Engine instruments ..... Check

[Option]
MFD ENGINE switch – Push

Note: EGT, F/F, oil pressure and oil temperature pointers and digital readouts are not displayed until the start switch is moved to GRD.

Primary and secondary engine indications – Normal

- engine indications display existing conditions
- no exceedance values are displayed
- engine oil quantity meets dispatch requirements

SPEED BRAKE lever .....DOWN detent

Reverse thrust levers .....Down

Forward thrust levers .....Closed

Start levers ..... CUTOFF

Parking brake .....Set

Parking brake warning light – Illuminated

STABILIZER TRIM cutout switches ..... NORMAL

Wheel well fire warning system ..... Test

Note: Delete this test if AC busses were powered during the fire warning check. Alert ground personnel before this test is accomplished with the APU operating. The fire warning light flashes and the horn sounds on the APU ground control panel.

Test switch – Hold to OVERHEAT/FIRE

Verify fire warning bell sounds, master FIRE WARNING lights, MASTER CAUTION lights and OVERHEAT/DET annunciator illuminate.

Fire warning BELL CUTOUT switch – Push

Verify WARN lights and fire warning bell cancel.

WHEEL WELL fire warning light – Illuminated

[Option]
HUD system ..... As required

[Option]

Radio tuning panel ..... Set

PANEL OFF light – Extinguished

Set panel – As desired

WARNING: Do not key HF radio while airplane is being fueled. Injury to personnel or fire may result.

[Option]

VHF comm radios ..... Set

VHF NAVIGATION radios ..... Set for departure

Audio control panel ..... Set

ADF radios ..... Set

FLOOD and PANEL light controls ..... As desired

Weather radar ..... Set

Transponder ..... Set

RUDDER and AILERON trim ..... Free & zero

Check trim for freedom of movement, set trim at zero units.

STABILIZER TRIM override switch ..... NORMAL

Seat ..... Adjust

Verify positive horizontal (fore and aft) seat lock.

Rudder pedals ..... Adjust

Adjust rudder pedals to permit full rudder deflection and brake application. Hold nose wheel steering wheel while moving rudder pedals.

Papers ..... Aboard

FMC/CDU ..... Set

IDENT page – Check

Verify airplane and engine MODEL and NAV DATA ACTIVE dates are correctly displayed.

POS INIT page – Set

Verify GMT is correct. Enter local time if desired.

RTE page – Select

Enter route by company route identifier or origin and destination airports, then waypoints and/or airways.

DEPARTURES page – Select

Select the active runway and departure/transition procedures if known.

RTE page – Select

Verify selected departure and route. Correct route discontinuities, ACTIVATE and EXEC.

PERF INIT page – Select

Verify total fuel quantity is displayed on the CDU and that the fuel quantity indicators agree, and are adequate for the planned flight. Enter gross weight or zero fuel weight, fuel reserve and cost index. Enter cruise altitude and verify transition altitude. If desired, enter cruise wind and ISA deviation or top–of–climb temperature. EXEC.

DEPARTURES page – Select (if not previously entered)

Select appropriate runway and departure/transition procedures. Select the RTE page. Verify selected departure. Correct any route discontinuities and EXEC.

Thrust mode display – Check

[Option - Non-aspirated TAT]
Verify dashes are displayed.

[Option - Aspirated TAT]
Verify TO is displayed.

[Option - FMC U 10.1 and later]
N1 LIMIT page – Select

[Option - Non-aspirated TAT]

Enter OAT

[Option - Aspirated TAT]

Check displayed OAT against reported value. Enter correct value if necessary.

If reduced thrust takeoff is planned, enter assumed (SEL) temperature.

If reduced thrust climb is planned, select desired mode.

[Option - FMC U 10.1 and later]
TAKEOFF REF page – Select

Verify preflight complete.

Enter takeoff flaps and V speeds.

Note: Verify N1 reference bugs reflect the full rated N1 value or the derated N1 value if a TAKEOFF DERATE is selected.

[Option - FMC U 10.1 and later with automatic T/O thrust reduction]
TAKEOFF REF page 2/2 – Select

Enter thrust reduction altitude if different from displayed value.

Takeoff data ..... Review

Review takeoff data to include N1, V1, VR, V2, flap setting, zero fuel weight, temperature, altimeter setting, gross weight, and stabilizer trim setting.

Flight Deck Preparation – First Officer

Escape strap ..... Check

Ensure strap is connected to structure.

Sun visors and smoke goggles ..... Stowed

Oxygen and interphone ..... Check

Audio control panel – Set

[Option - Microphone selector]
Push FLIGHT INTERPHONE transmitter selector and receiver switches. Adjust volume on FLIGHT INTERPHONE receiver and SPEAKER switches. Position microphone selector to MASK.

Oxygen panel – Set

Check mask is properly stowed and NORMAL/100% switch is at 100%.

RESET/TEST button – Push down and hold

Observe momentary yellow cross in oxygen flow indicator.

EMERGENCY/TEST selector – Push and hold

While holding RESET/TEST button down, push the EMERGENCY/TEST selector and observe constant yellow cross in oxygen flow indicator.

Push–To–Talk switch – I/C

While holding RESET/TEST button down and pushing the EMERGENCY/TEST selector, simultaneously key microphone and listen for oxygen flow sound through the overhead speaker. Release/reset all switches.

Oxygen pressure – Check

Verify pressure meets dispatch requirements.

Air conditioning system ..... ____ pack(s), bleeds ON

AIR TEMPERATURE source selector – As desired

[737-800/900]
TRIM AIR switch – ON

Temperature selectors – As desired

RAM DOOR FULL OPEN lights – Illuminated

[737-600/700]
RECIRCULATION FAN switch – AUTO

[737-800/900]
RECIRCULATION FAN switches – AUTO

Air conditioning PACK switches – AUTO or HIGH

ISOLATION VALVE switch – OPEN

Engine BLEED air switches – ON

APU BLEED air switch – As required

ON unless external air is used for start.

Pressurization system ..... Set

FLIGHT ALTITUDE indicator – Cruise altitude

LANDING ALTITUDE indicator – Destination field elevation

Pressurization mode selector – AUTO

AUTOMATIC FAIL light – Extinguished

EFIS control panel ..... Set

MINIMUMS reference selector – As desired

Select RADIO or BAROMETRIC. Adjust decision height or altitude reference, as appropriate.

[Option]
FLIGHT PATH VECTOR switch – As desired

METERS switch – As desired

BAROMETRIC reference selector – Set

Select barometric altitude reference. Set local altimeter setting.

VOR/ADF switches – As desired

Mode selector – MAP

CENTER switch – As desired

Range selector – As desired

TRAFFIC switch – As desired

MAP switches – As desired

Mode control panel .....Set

When selecting a value on the MCP, ensure the corresponding display on the instrument panel changes, if applicable.

COURSE(S) – Set and crosscheck

FLIGHT DIRECTOR switches – ON

Position the switch for the pilot flying to ON first.

Clock .....Set

TIME/DATE pushbutton - UTC time

Display select panel .....Set

MAIN PANEL DISPLAY UNITS selector – NORM

LOWER DISPLAY UNIT selector – NORM

[Option - EFIS/MAP]

Right flight instruments .....Set

Note: IRS alignment must be complete.

EFIS – Correct

A/T, pitch, and roll FMA's - Blank

A/P status FMA - FD

Flight instrument indications are correct.

The NO V SPD flag is displayed until V–speeds are selected.

Verify no other flags displayed.

Altimeter – Set

MAP – correct

Verify no flags displayed

Route – Displayed, correct

[Option - PFD/ND]

Right flight instruments .....Set

Note: IRS alignment must be complete.

PFD – Correct

Flight mode annunciators – Blank

AFDS status is FLT DIR

Flight instrument indications are correct.

The NO V SPD flag is displayed until V–speeds are selected.

Verify no other flags displayed.

Altimeter – Set

ND – Correct

Verify no flags displayed

Route – Displayed, correct

GROUND PROXIMITY warning SYSTEM
TEST switch ..... Push momentarily

Verify switch guards down.

Verify proper operation of the following:
- BELOW G/S and GPWS INOP lights illuminate
- PULL UP and WINDSHEAR alerts illuminate
- "GLIDE SLOPE", "PULL UP", and "WINDSHEAR" aurals sound
- TERR FAIL and TERR TEST show on navigation displays
- terrain display test pattern shows on navigation displays
- terrain caution aurals sound and TERRAIN caution message shows on navigation displays.

Note: If the test switch is held until aurals begin, the above indications and additional GPWS aural warnings are tested.

Light controls ..... As desired

VHF NAVIGATION radios ..... Set for departure

Audio control panel ..... Set

Seat ..... Adjust

Verify positive horizontal (fore and aft) seat lock.

Rudder pedals ..... Adjust

Adjust rudder pedals to permit full rudder deflection and brake application. Ensure the captain holds the nose wheel steering wheel while moving rudder pedals.

Takeoff data ..... Review

Review takeoff data to include N1, V1, VR, V2, flap setting, zero fuel weight, temperature, altimeter setting, gross weight, and stabilizer trim setting.

Final Flight Deck Preparation – Captain and First Officer

[Option - EFIS/MAP]
N1 & IAS bugs ..... Set

Verify N1 reference bugs reflect the full rated N1 value or the derated N1 value if a TAKEOFF DERATE is selected. Set V2 in the MCP IAS/Mach display and check airspeed cursors. Check speed bugs at V1, VR, V2 + 15, and flaps up maneuvering speed.

[Option - PFD/ND]
N1 & IAS bugs ..... Set

Verify N1 reference bugs reflect the full rated N1 value or the derated N1 value if a TAKEOFF DERATE is selected. Set V2 in the MCP IAS/Mach display. Verify V1 speed is displayed at the top of airspeed indication.

Engine start clearance ..... Obtain

The captain calls "BEFORE START CHECKLIST DOWN TO THE LINE."

The first officer accomplishes the BEFORE START checklist, down to the line.

– – – – – – – – – – – – CLEARED FOR START – – – – – – – – – – – –

Doors ..... Closed

All exterior door annunciator lights – Extinguished

Flight deck windows ..... Locked

Verify the lock levers are in the locked (forward) position.

Air conditioning PACK switches .....OFF

ANTI COLLISION light switch ..... ON

Alerts the ground crew and tower that the flight crew is starting engines.

The captain calls "BEFORE START CHECKLIST BELOW THE LINE."

The first officer completes the BEFORE START checklist.

Engine Start Procedure

CAPTAIN	FIRST OFFICER
Announce engine start sequence. Normal starting sequence is 2, 1.	
Call “STARTING ENGINE No. ___.” Position ENGINE START switch to GRD.	
Verify increase in N2 RPM.	
Acknowledge first officer’s report.	Verify increase in oil pressure by the time engine is stabilized at idle and call “OIL PRESSURE RISING” when observed.
Position engine start lever to IDLE detent when: • N1 rotation is observed and • N2 RPM reaches 25% or (if 25% N2 is not achievable) • at max motoring and a minimum of 20% N2. Max motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds.	
Verify fuel flow and EGT indication.	
[Without automatic ignition] At 56% N2 RPM check ENGINE START switch moves to OFF; if not, position start switch to OFF. [Automatic ignition] At 56% N2 RPM check ENGINE START switch moves to AUTO; if not, position start switch to AUTO.	[Without automatic ignition] Verify START VALVE OPEN alert extinguishes as the ENGINE START switch moves to OFF and report “STARTER CUTOUT.” [Automatic ignition] Verify START VALVE OPEN alert extinguishes as the ENGINE START switch moves to AUTO and report “STARTER CUTOUT.”
Monitor N1, N2, EGT, fuel flow and oil pressure for normal indications as the engine accelerates and stabilizes at idle.	

Note: Standard day, sea level, approximate stabilized idle indications for the CFM56–7 engine.

- N1 RPM – 20%
- N2 RPM – 59%
- EGT – 410°C**
- Fuel Flow – 272 KGPH/600 PPH

** Idle EGT may vary from 320°C – 520°C depending on OAT, bleed configuration, and engine conditions.

Starter Duty Cycle

- Limit each start attempt to a maximum of 2 minutes
- A minimum of 10 seconds is required between start attempts

CAUTION: Normal engine start considerations:

- Advancing engine start lever to idle prematurely can cause a “HOT” start.
- Keep hand on engine start lever while observing RPM, EGT and fuel flow until stabilized.
- If fuel is shutoff inadvertently (by closing engine start lever) do not reopen engine start lever in an attempt to restart engine.
- Failure of ENGINE START switch to hold in GRD until starter cutout RPM is reached can result in a “HOT” start. Do not re–engage ENGINE START switch until engine RPM is below 20% N2.

Note: Accomplish the ABORTED ENGINE START checklist for one or more of the following conditions:

- No N1 rotation before the engine start lever is raised to IDLE.
- No oil pressure indication by the time the engine is stabilized at idle.
- No increase in EGT within 10 seconds of raising the engine start lever to IDLE.
- No increase in, or a very slow increase in N1 or N2 after EGT indication.
- EGT rapidly approaching or exceeding the start limit.

After Start Procedure

Electrical ..... Generators ON

Both GENERATOR switches – ON

GEN OFF BUS lights – Extinguished

SOURCE OFF lights – Extinguished

PROBE HEAT switches ..... ON

All probe heat lights – Extinguished

Anti–Ice ..... As required

Air conditioning and pressurization ..... Set

Pack switches – AUTO

APU BLEED air switch – OFF

ISOLATION VALVE switch ..... AUTO

APU ..... As required

Start levers ..... IDLE detent

Ground equipment ..... Removed

Seat belts and shoulder harnesses ..... Fastened

The captain calls “AFTER START CHECKLIST.”

The first officer accomplishes the AFTER START checklist.

Pushback or Tow Out Procedure

This procedure is required when the airplane is to be pushed back or towed away from the terminal or loading area.

WARNING: Prior to installing the nose gear steering lockout pin, do not make any electrical or hydraulic power changes with tow bar connected. Any change to electrical power may cause momentary pressurization of the nose wheel steering actuators causing unwanted tow bar movement.

Flight interphone contact with ground crew ..... Establish

Nose gear steering lockout pin ..... Installed

System A HYDRAULIC PUMPS switches ..... ON/OFF

If the nose gear steering lockout pin is installed, pushback or tow out may be accomplished with system A pressurized or depressurized.

CAUTION: If the nose gear steering lockout pin is not installed, system A HYDRAULIC PUMPS must be placed off.

When cleared for pushback or tow out:

Brakes ..... Off

When airplane is stopped:

Brakes ..... On

Parking brake ..... Set

Tow bar ..... Disconnected

Clearance from ground crew ..... Clear

Nose gear steering lockout pin ..... Removed

System A HYDRAULIC PUMPS switches ..... ON

Interphone ..... Removed

Before Takeoff Procedure

Recall ..... Check

Flight controls ..... Check

Displace rudder pedals, control wheel and control column in both directions. Verify full travel, freedom of movement and controls return to center. Hold nose wheel steering wheel during rudder check to prevent nose wheel movement.

Flaps ....._____, Green light

Flap position indicator and FLAP lever – Set for takeoff

LEADING EDGE FLAPS EXTENDED green light – Illuminated

Stabilizer trim ..... _____units

Verify stabilizer trim is set for takeoff.

Cabin door ..... Lock

CABIN DOOR UNLOCKED light – Extinguished

Takeoff briefing ..... Review

The pilot taxiing calls “BEFORE TAKEOFF CHECKLIST DOWN TO THE LINE.”

The pilot not taxiing accomplishes the BEFORE TAKEOFF checklist down to the line.

– – – – – – – – – – – CLEARED FOR TAKEOFF – – – – – – – – – – –

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

LANDING lights and STROBE light switches .....As desired

ON unless weather conditions make it undesirable.

Autothrottle .....ARM

When approaching the takeoff runway, arm the autothrottle.

FMC position update .....As desired

[Option - Runway position update with TO/GA activation]

Enter runway offset on TAKEOFF REF page of FMC/CDU.

[Option - Runway position update with the CDU only]

Update to runway threshold on the TAKEOFF REF page of FMC/CDU.

Transponder ..... ON

The pilot taxiing calls “BEFORE TAKEOFF CHECKLIST BELOW THE LINE.”

The pilot not taxiing completes the BEFORE TAKEOFF checklist.

Takeoff Procedure

PILOT FLYING	PILOT NOT FLYING
Advance thrust levers to approximately 40% N1.	
Observe engine instruments stabilized and normal.	
Push either TO/GA switch to advance the thrust levers to takeoff N1.	
Verify mode annunciation.	Ensure thrust levers advance to takeoff N1. Observe mode annunciation. **Note:** In cases of extreme headwind, the thrust levers may not advance to full N1. In this case, manually advance the thrust levers as required.
Note: After takeoff thrust is set, the captain's hand must be on the thrust levers until V1.	
Hold light forward pressure on the control column, maintain directional control.	Monitor engine instruments. Verify oil pressure is not in the amber band.
Verify 80 knots.	Call "80 KNOTS." Verify that A/T annunciation changes to THR HLD by 84 knots.
Monitor airspeed, noting V1, and rotate smoothly at VR.	[Automatic V1 callout] Confirm automatic V1 callout or call "V1". At VR call "ROTATE". Monitor flight instruments.
When a positive rate of climb is indicated, call "GEAR UP" and continue rotation to takeoff pitch attitude.	Verify positive rate of climb. Position landing gear lever UP.
Check flight instrument indications.	

After Takeoff Procedure

PILOT FLYING	PILOT NOT FLYING
Maintain a minimum of V2 + 15 knots during initial climb. At light gross weight a higher speed (up to V2 + 25) may be selected, to synchronize F/D pitch command and avoid objectionable body attitude.	Monitor engine instruments and cross–check flight progress.
Above 400 feet, call for appropriate roll mode, if required. Verify proper mode annunciation.	Select/verify roll mode. Verify proper mode annunciation.
[Without auto T/O thrust reduction] Above 1,000 feet, call for N1 and flaps up maneuvering speed. Verify flight and thrust mode annunciations. [Auto T/O thrust reduction] Above 1,000 feet, call for flaps up maneuvering speed. Verify flight and thrust mode annunciations at thrust reduction altitude.	[Without auto T/O thrust reduction] Select N1 and set flaps up maneuvering speed. [Auto T/O thrust reduction] Set flaps up maneuvering speed. Verify climb thrust is set. Verify proper mode annunciation.
When above minimum altitude for autopilot engagement, engage A/P. Verify flight mode annunciation.	Verify autopilot engaged.
Retract flaps on takeoff flap retraction speed schedule.	Position FLAP lever as directed and monitor flaps and slats retraction.
Call “AFTER TAKEOFF CHECKLIST” when flaps are up.	Position landing gear lever OFF, APU and engine start switches as required. Verify air conditioning and pressurization operating normally. Accomplish the AFTER TAKEOFF checklist.
Above 3,000 feet AGL, engage VNAV or select normal climb speed and verify annunciation.	Verify proper mode annunciation.

CAUTION: To avoid the possibility of shoulder harness buckles snapping back and pulling or damaging circuit breakers, hold both straps before releasing and then allow straps to retract slowly to the stowed position.

Takeoff Flap Retraction Speed Schedule

T/O FLAPS	SELECT FLAPS	AT: (for all weights)
25	15 5 1 UP	V2 + 15 “15” “5” “1”
15	5 1 UP	V2 + 15 “5” “1”
10	5 1 UP	V2 + 15 “5” “1”
5	1 UP	V2 + 15 “1”
1	UP	“1”

- “UP” – Flaps up maneuvering speed.
- “1”, “5”, “10”, “15”. “25” – Number corresponding to flap maneuvering speed.

Note: Limit bank angle to 15 degrees until reaching V2 + 15.

Climb and Cruise Procedure

PILOT FLYING	PILOT NOT FLYING
	Position landing lights OFF passing through 10,000 feet.
Set altimeters to standard at transition altitude.	
Approaching selected FMC cruise altitude, verify level off and proper mode/N1 limit annunciation.	
	Position center tank fuel pump switches OFF when both pump LOW PRESSURE lights illuminate.
	During the last hour of cruise on all extended range (more than one hour from an adequate airport) flights, perform Fuel Crossfeed Valve check.
Set MCP altitude selector for descent.	Prior to top of descent, select and verify the planned arrival procedure on the FMC.
At top of descent point observe descent initiated and verify proper mode annunciation.	

Note: If a center tank LOW PRESSURE light(s) illuminates during takeoff or initial climb, the center tank pump(s) may remain on until the climb attitude is reduced and the light(s) extinguishes or workload allows for the pump(s) to be positioned OFF.

Note: When established in a level attitude at cruise, if the center tank contains usable fuel and the center tank pump switches are off, the center tank pump switches should be positioned ON again. If the center tank contains more than 1000 lbs/453 kgs, the center tank pump switches must be positioned ON. Verify the LOW PRESSURE lights extinguish and position both switches OFF when both LOW PRESSURE lights illuminate.

Descent and Approach Procedure

PILOT FLYING	PILOT NOT FLYING
	Position center tank fuel pump switches OFF when both pump LOW PRESSURE lights illuminate.
Check and set VREF and approach speeds as required.	
	Set anti–ice as required.
	Verify pressurization set for destination airport elevation and system operating normally.
Set AUTO BRAKE select switch to desired brake setting.	
Set and crosscheck altimeters at transition level.	
Set and crosscheck course selection and RADIO/BARO minimums as required for approach.	
Set and verify ADF and VHF NAV radios for approach.	
	Position fixed landing lights ON passing through 10,000 feet.
Call "DESCENT–APPROACH CHECKLIST."	Accomplish the DESCENT–APPROACH checklist.
Call "FLAPS __" according to flap speed schedule.	Position FLAP lever as directed and monitor flap and slat extension. Accomplish standard callouts.
Approaching selected FMC altitude verify level off and mode annunciation.	

Note: If a center tank LOW PRESSURE light(s) illuminate(s) during descent, position the center tank fuel pump switch(es) to OFF.

Note: When established in a level attitude, if the center tank contains usable fuel and the center tank pump switches are off, the center tank pump switches should be positioned ON again. If the center tank contains more than 1000 lbs/453 kgs, the center tank pump switches must be positioned ON. Verify the LOW PRESSURE lights extinguish and position both switches OFF when both LOW PRESSURE lights illuminate.

Approach Procedure

Using flaps as speed brakes is not recommended.

The following procedures are used for flap extension:

- Select flaps 1 when decelerating through the flaps–up maneuvering speed, displayed on the airspeed display as a “UP”.
- Set airspeed cursor to the flap maneuvering speed displayed as “1”.
- When appropriate, select the next flap position and then set the airspeed cursor to that flap maneuver speed.

Note: Flap maneuver speeds provide approximately 15 to 20 knots above the minimum maneuvering speed for each flap setting.

Note: If performance requires the use of flaps 15 for landing, place the GROUND PROXIMITY flap inhibit switch to FLAP INHIBIT.

If the flap maneuvering speeds cannot be displayed, reference the Performance In–flight section for speed schedules.

When on final approach in landing configuration, it is not recommended to set the A/T command speed to allow for wind or gust corrections. Through airspeed and acceleration sensing, the A/T corrects for normal wind gusts. Higher command speed settings result in excessive approach speeds. The recommended A/T approach speed setting is VREF + 5.

Landing Procedure

PILOT FLYING	PILOT NOT FLYING
When on localizer intercept heading, verify ILS tuned and identified, LOC and G/S pointer displayed, arm APP mode and engage second autopilot.	Set transponder mode selector to desired TCAS mode.
Verify mode annunciation.	
At localizer capture verify proper mode annunciation and set appropriate heading.	Verify proper mode annunciation.
At glide slope “alive”, call “GEAR DOWN”, “FLAPS 15." Arm speed brake and check green light illuminated. Call “LANDING CHECKLIST DOWN TO FLAPS.”	[Without automatic ignition] Position landing gear lever DN, FLAP lever to the 15 detent. Position engine start switches to CONT. Check RECALL. [Automatic ignition] Position landing gear lever DN, FLAP lever to the 15 detent. Check RECALL.
	Accomplish the LANDING checklist down to flaps. State “HOLDING AT FLAPS.”
At glide slope capture, verify proper mode annunciation, check N1 reference bug at the go–around limit and set missed approach altitude.	
Call “FLAPS ____” as required for landing. Set MCP speed selector at VREF + 5 knots.	Position FLAP lever as directed.
At final approach fix/OM, verify crossing altitude.	
Call “COMPLETE THE LANDING CHECKLIST.”	Complete the LANDING checklist.
Monitor approach progress and guard the controls. At 500 feet AGL, verify FLARE is armed. At approximately 50 feet AGL, verify FLARE is engaged. Ensure the autothrottle retards the thrust levers to idle by touchdown.	

Go–Around Procedure

PILOT FLYING	PILOT NOT FLYING
Push TO/GA switch. Call “FLAPS 15.” If full GA thrust is required, push TO/GA switch again after reduced GA thrust is established.	Monitor N1 indication. Position FLAP lever to 15 and monitor flap retraction.
Confirm rotation to go–around attitude and monitor autopilot.	
Verify mode annunciation.	
When positive rate of climb is indicated, call “GEAR UP” and monitor acceleration.	Verify positive rate of climb. Position landing gear lever UP.
Check flight instrument indications (MCP speed window blanks).	
Call “TUNE RADIOS FOR MISSED APPROACH.”	Tune radios as directed.
Above 400 feet, select appropriate roll mode and verify proper mode annunciation.	Observe mode annunciation.
Retract flaps on flap speed schedule.	Position FLAP lever as directed and monitor flaps and slats retraction.
Verify airplane levels off at selected altitude and maintains flap maneuvering speed.	
Call “AFTER TAKEOFF CHECKLIST.”	Accomplish the AFTER TAKEOFF checklist.

Landing Roll Procedure

PILOT FLYING	PILOT NOT FLYING
Ensure thrust levers at idle.	
Disengage autopilot and control airplane manually. Verify autothrottle disengages automatically.	Verify autothrottle is disengaged.
Verify SPEED BRAKE lever (ground spoilers) - UP.	Verify SPEED BRAKE lever UP. Call out "SPEED BRAKES UP." If SPEED BRAKE lever not UP, call "SPEED BRAKES NOT UP."
Verify proper autobrake operation.	
Without delay, raise reverse thrust levers to the interlocks, hold light pressure until release, and then apply reverse thrust as required.	Monitor engine instruments and announce any engine limit being approached, exceeded or any other abnormalities.
At 60 knots, reduce reverse thrust to be at IDLE reverse when reaching taxi speed.	Call "60 KNOTS"
Approaching taxi speed, slowly move the reverse thrust levers to the full down position.	Verify REV indication extinguished.
Prior to taxi speed, disarm the autobrake and continue manual braking as required.	

WARNING: After reverse thrust has been initiated, a full stop landing must be made.

Taxi In Procedure

When clear of the active runway, the pilot taxiing positions the SPEED BRAKE lever to the DOWN detent and the pilot not taxiing accomplishes the following:

SPEED BRAKE lever ..... Verify DOWN

FLAP lever ..... UP

APU (if required) ..... START

PROBE HEAT switches ..... OFF

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

LANDING/TAXI light and STROBE light switches ..... As desired

FLIGHT DIRECTOR switches ..... OFF

WEATHER RADAR ..... Off

Transponder ..... As desired

APU GENERATOR switches (if APU operating) ..... ON

CAUTION: To avoid the possibility of shoulder harness buckles snapping back and pulling or damaging circuit breakers, hold both straps before releasing and then allow straps to retract slowly to the stowed position.

Shutdown Procedure

After the airplane has come to a complete stop, perform the following actions:

Parking brake ..... Set

Parking brake warning light – Illuminated

Electrical ..... On___

Verify APU powering busses. If APU is not to be used, connect external power.

Start levers ..... CUTOFF

If possible, operate the engines at idle for three minutes prior to shutdown to thermally stabilize the engine hot sections. Operating times at or near idle, such as taxiing before shutdown, are applicable to this three–minute period. If operational requirements dictate, the engines may be shut down with a one–minute cooling period.

FASTEN BELTS switch ..... OFF

ANTI COLLISION light switch ..... OFF

FUEL PUMP switches ..... OFF

CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.

CAB/UTIL power switch ..... As required

IFE/PASS seat power switch ..... As required

WINDOW HEAT switches ..... OFF

WING and ENGINE ANTI–ICE switches ..... OFF

ELECTRIC HYDRAULIC PUMP switches ..... OFF

[737-600/700]
RECIRCULATION FAN switch ..... As desired

[737-800/900]
RECIRCULATION FAN switches ..... As desired

Air conditioning PACK switches ..... AUTO

ISOLATION VALVE switch – OPEN

Engine BLEED air switches ..... ON

APU BLEED air switch ..... ON

Exterior lights ..... As required

WEATHER RADAR ..... OFF

AUTO BRAKE select switch ..... OFF

Flight deck lights ..... As desired

SPEED BRAKE lever ..... DOWN detent

Parking brake ..... As required

With chocks in place, the parking brake may be released.

Transponder ..... As required

Cabin door ..... Unlock

The captain calls “SHUTDOWN CHECKLIST.”

The first officer accomplishes the SHUTDOWN checklist.

Secure Procedure

IRS mode selectors ..... OFF

EMERGENCY EXIT lights switch ..... OFF

Air conditioning PACK switches ..... OFF

APU switch/GROUND POWER switch ..... OFF

If APU was operating:

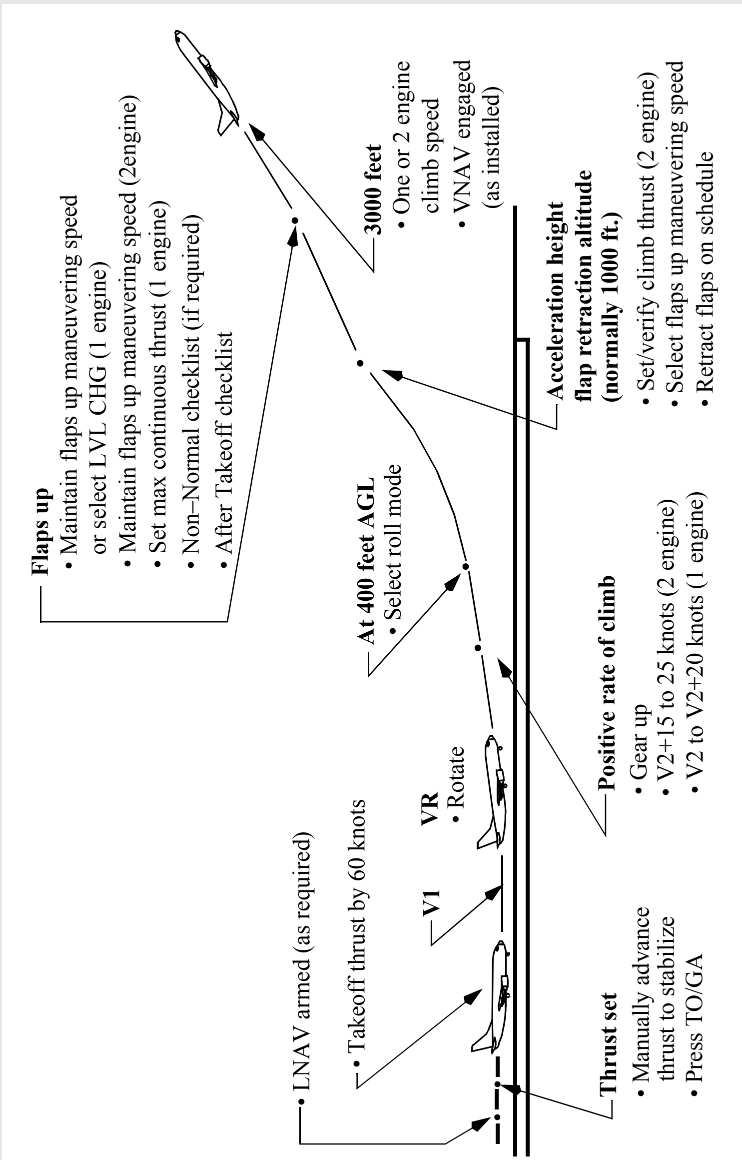
Delay approximately 2 minutes after the APU GEN OFF BUS light extinguishes before placing the BATTERY switch OFF.

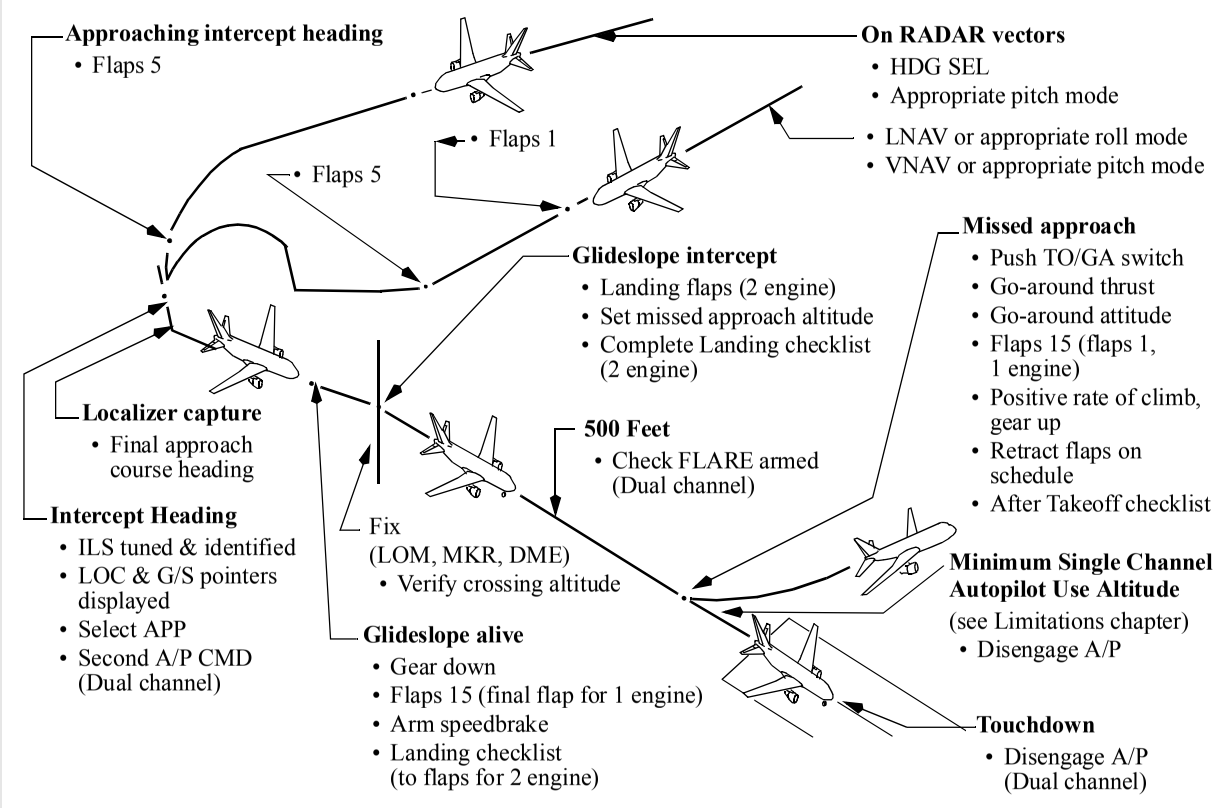
BATTERY switch ..... OFF

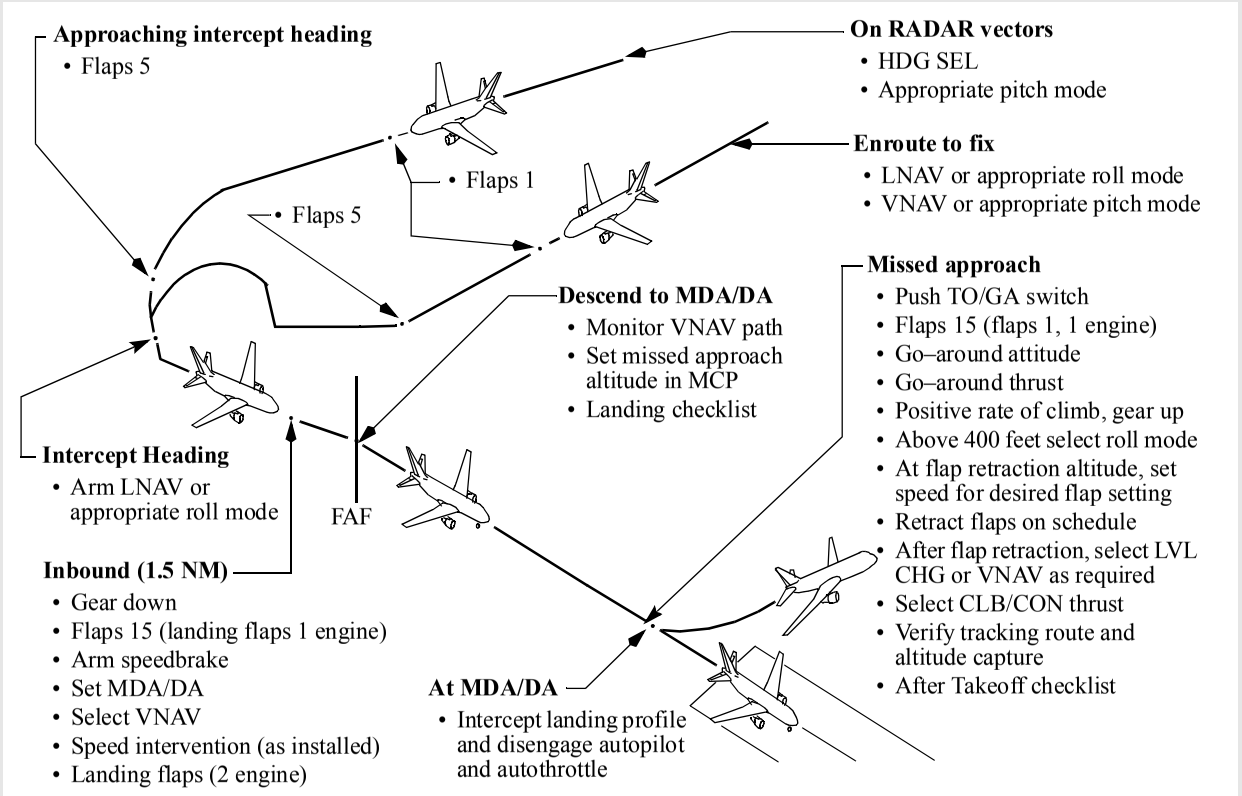
The captain calls “SECURE CHECKLIST.”

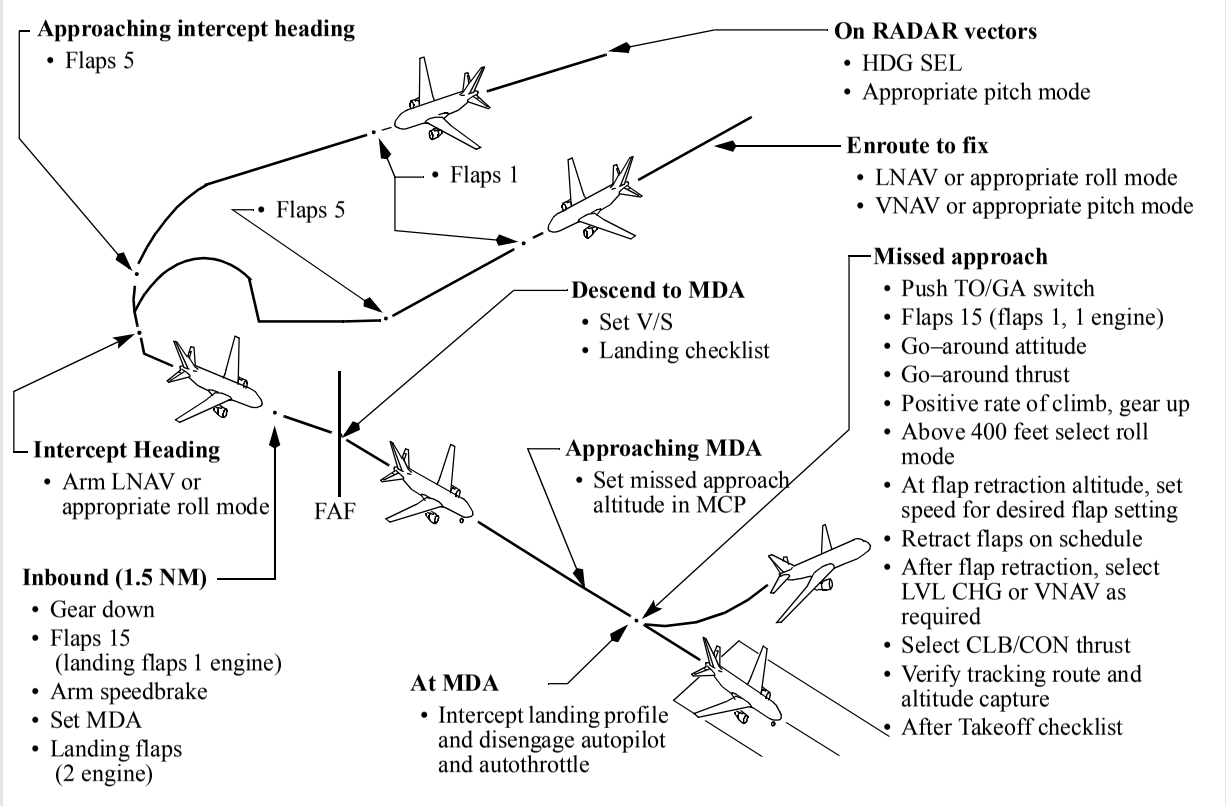
The first officer accomplishes the SECURE checklist.

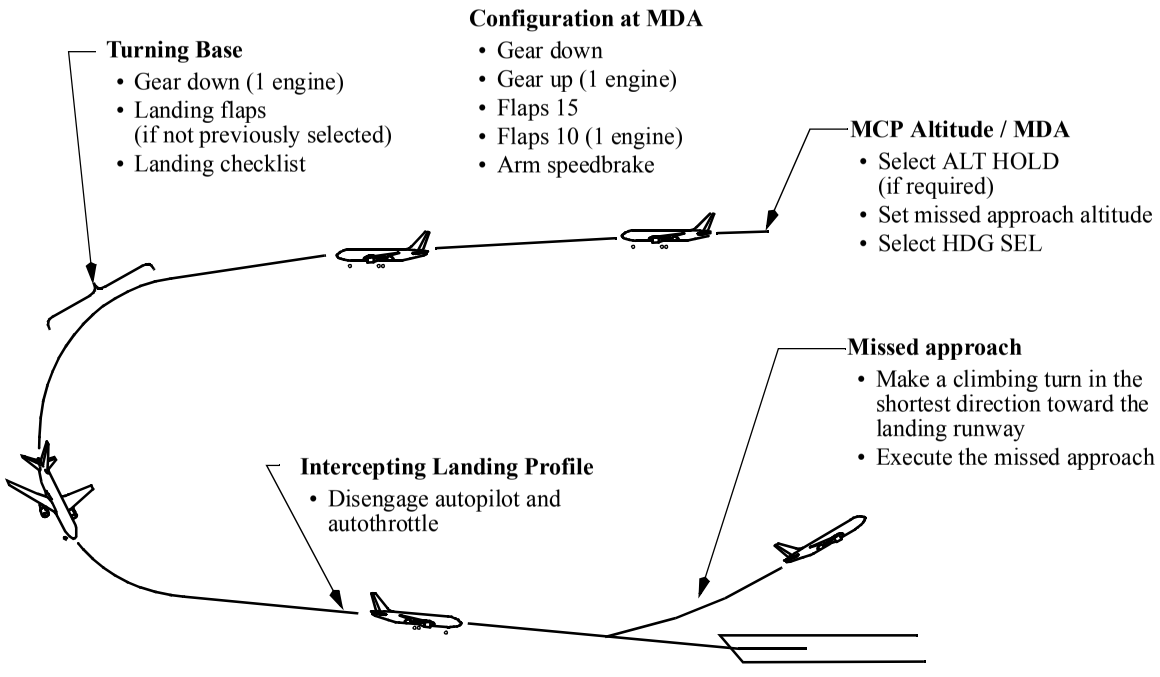
Takeoff

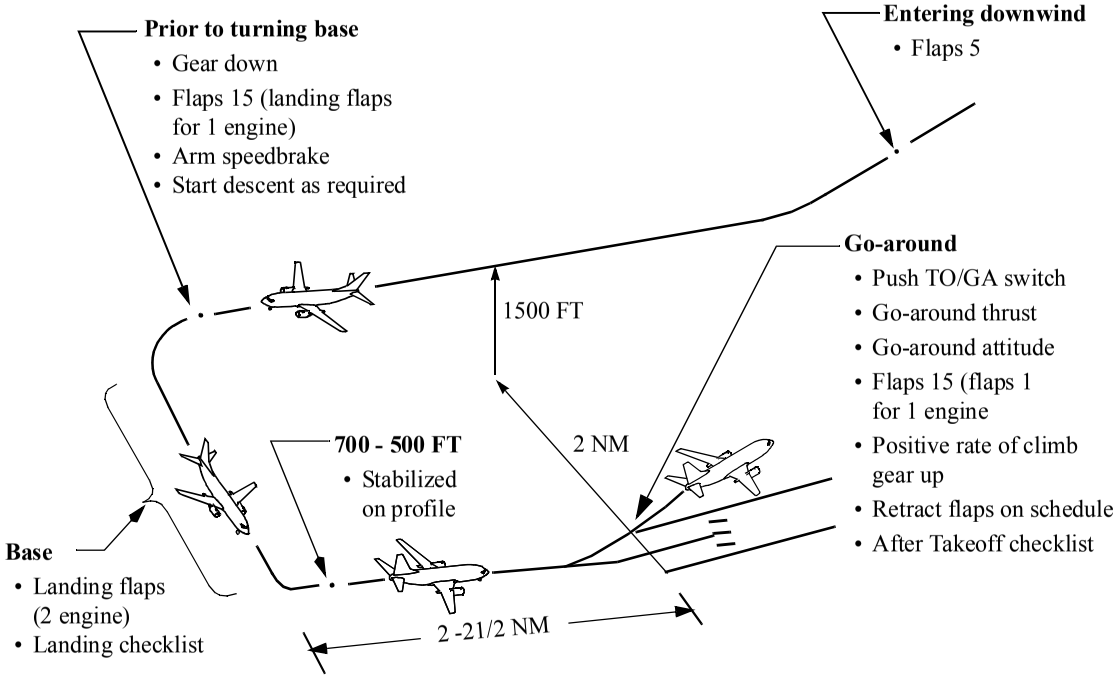

Flaps up
• Maintain flaps up maneuvering speed or select LVL CHG (1 engine)
• Maintain flaps up maneuvering speed (2engine)
• Set max continuous thrust (1 engine)
• Non–Normal checklist (if required)
• After Takeoff checklist
3000 feet
• One or 2 engine climb speed
• VNAV engaged (as installed)
Acceleration height flap retraction altitude (normally 1000 ft.)
• Set/verify climb thrust (2 engine)
• Select flaps up maneuvering speed
• Retract flaps on schedule
At 400 feet AGL
• Select roll mode
Positive rate of climb
• Gear up
• V2+15 to 25 knots (2 engine)
• V2 to V2+20 knots (1 engine)
VR
• Rotate
V1
• LNAV armed (as required)
• Takeoff thrust by 60 knots
Thrust set
• Manually advance thrust to stabilize
• Press TO/GA


Approaching intercept heading
• Flaps 5
On RADAR vectors
• HDG SEL
• Appropriate pitch mode
• LNAV or appropriate roll mode
• VNAV or appropriate pitch mode
• Flaps 1
• Flaps 5
Glideslope intercept
• Landing flaps (2 engine)
• Set missed approach altitude
• Complete Landing checklist (2 engine)
Missed approach
• Push TO/GA switch
• Go-around thrust
• Go-around attitude
• Flaps 15 (flaps 1, 1 engine)
• Positive rate of climb, gear up
• Retract flaps on schedule
• After Takeoff checklist
Localizer capture
• Final approach course heading
500 Feet
• Check FLARE armed (Dual channel)
Intercept Heading
• ILS tuned & identified
• LOC & G/S pointers displayed
• Select APP
• Second A/P CMD (Dual channel)
Fix
(LOM, MKR, DME)
• Verify crossing altitude
Minimum Single Channel Autopilot Use Altitude
(see Limitations chapter)
• Disengage A/P
Glideslope alive
• Gear down
• Flaps 15 (final flap for 1 engine)
• Arm speedbrake
• Landing checklist (to flaps for 2 engine)
Touchdown
• Disengage A/P (Dual channel)


Approaching intercept heading
• Flaps 5
On RADAR vectors
• HDG SEL
• Appropriate pitch mode
Enroute to fix
• LNAV or appropriate roll mode
• VNAV or appropriate pitch mode
• Flaps 1
• Flaps 5
Missed approach
• Push TO/GA switch
• Flaps 15 (flaps 1, 1 engine)
• Go–around attitude
• Go–around thrust
• Positive rate of climb, gear up
• Above 400 feet select roll mode
• At flap retraction altitude, set speed for desired flap setting
• Retract flaps on schedule
• After flap retraction, select LVL CHG or VNAV as required
• Select CLB/CON thrust
• Verify tracking route and altitude capture
• After Takeoff checklist
Descend to MDA/DA
• Monitor VNAV path
• Set missed approach altitude in MCP
• Landing checklist
Intercept Heading
• Arm LNAV or appropriate roll mode
FAF
Inbound (1.5 NM)
• Gear down
• Flaps 15 (landing flaps 1 engine)
• Arm speedbrake
• Set MDA/DA
• Select VNAV
• Speed intervention (as installed)
• Landing flaps (2 engine)
At MDA/DA
• Intercept landing profile and disengage autopilot and autothrottle


Approaching intercept heading
• Flaps 5
On RADAR vectors
• HDG SEL
• Appropriate pitch mode
• Flaps 1
Enroute to fix
• LNAV or appropriate roll mode
• VNAV or appropriate pitch mode
• Flaps 5
Missed approach
• Push TO/GA switch
• Flaps 15 (flaps 1, 1 engine)
• Go–around attitude
• Go–around thrust
• Positive rate of climb, gear up
• Above 400 feet select roll mode
• At flap retraction altitude, set speed for desired flap setting
• Retract flaps on schedule
• After flap retraction, select LVL CHG or VNAV as required
• Select CLB/CON thrust
• Verify tracking route and altitude capture
• After Takeoff checklist
Descend to MDA
• Set V/S
• Landing checklist
Intercept Heading
• Arm LNAV or appropriate roll mode
FAF
Approaching MDA
• Set missed approach altitude in MCP
Inbound (1.5 NM)
• Gear down
• Flaps 15 (landing flaps 1 engine)
• Arm speedbrake
• Set MDA
• Landing flaps (2 engine)
At MDA
• Intercept landing profile and disengage autopilot and autothrottle


Turning Base
• Gear down (1 engine)
• Landing flaps (if not previously selected)
• Landing checklist
Configuration at MDA
• Gear down
• Gear up (1 engine)
• Flaps 15
• Flaps 10 (1 engine)
• Arm speedbrake
MCP Altitude / MDA
• Select ALT HOLD (if required)
• Set missed approach altitude
• Select HDG SEL
Missed approach
• Make a climbing turn in the shortest direction toward the landing runway
• Execute the missed approach
Intercepting Landing Profile
• Disengage autopilot and autothrottle


Prior to turning base
• Gear down
• Flaps 15 (landing flaps for 1 engine)
• Arm speedbrake
• Start descent as required
Entering downwind
• Flaps 5
Go-around
• Push TO/GA switch
• Go-around thrust
• Go-around attitude
• Flaps 15 (flaps 1 for 1 engine
• Positive rate of climb gear up
• Retract flaps on schedule
• After Takeoff checklist
1500 FT
2 NM
700 - 500 FT
• Stabilized on profile
Base
• Landing flaps (2 engine)
• Landing checklist
2 -21/2 NM

Fuel Balancing

If a fuel leak is suspected:

Accomplish the INFLIGHT ENGINE FUEL LEAK checklist.

Maintain main tank No. 1 and No. 2 fuel balance within limitations.

Note: Fuel pump pressure should be supplied to the engines at all times. At high altitude, without fuel pump pressure, thrust deterioration or engine flameout may occur.

If the center tank contains fuel:

Center tank fuel pump switches ..... OFF

[Fuel CONFIG indication may be displayed with fuel in the center tank.]

Crossfeed selector ..... Open

Fuel pump switches (low tank) ..... OFF

When quantities are balanced:

Fuel pump switches (main tank) ..... ON

Center tank fuel pump switches ..... ON

Crossfeed selector ..... Close

If the center tank contains no fuel:

Crossfeed selector ..... Open

Fuel pump switches (low tank) ..... OFF

When quantities are balanced:

Fuel pump switches ..... ON

Crossfeed selector ..... Close

Refueling

Fuel Load Distribution

Main tanks No. 1 and No. 2 should normally be serviced equally until full. Additional fuel is loaded into the center tank until the desired fuel load is reached.

Note: Main tanks No. 1 and No. 2 must be scheduled to be full if the center tank contains more than 453 kgs / 1,000 lbs of fuel. With less than 453 kgs / 1,000 lbs of center tank fuel, partial main tank fuel may be loaded provided the effects of balance have been considered.

Fuel Pressure

Apply from a truck or fuel pit. A nozzle pressure of 50 psi provides approximately 1136 liters / 300 U.S. gallons per minute.

Normal Refueling

[Option - Fuel Quantity selector]
When a full fuel load is required, the fuel shutoff system closes the fueling valves automatically when the tanks are full. When a partial fuel load is required, the fuel shutoff system closes the fueling valves automatically when the quantity preselected on the fuel quantity selector (located on the test gauges and fueling panel) is reached.

[Option - Without Fuel Quantity selector]
When a full fuel load is required, the fuel shutoff system closes the fueling valves automatically when the tanks are full. When a partial fuel load is required, the fuel quantity indicators are monitored and the fueling valves are closed by manually positioning the fueling valve switches to CLOSED when the desired fuel quantity is aboard the airplane.

Refueling with Battery Only

When the APU is inoperative and external power is not available, refueling can be accomplished as follows:

Battery switch ..... ON

Note: The refueling system will operate normally. Operation is limited only by battery life.

Refueling with No AC or DC Power Source Available

When it becomes necessary to refuel with the APU inoperative, the aircraft battery depleted, and no external power source available, refueling can still be accomplished:

Fueling hose nozzle .....Attached to the refueling receptacle

Fueling valves ..... Open for the tanks to be refueled

Note: Main tanks No. 1 and No. 2, and the center tank refueling valves each have a red override button that must be pressed and held while fuel is being pumped into the tank. Releasing the override button allows the spring in the valve to close the valve.

Caution must be observed not to overfill a tank, since there is no automatic fuel shutoff during manual operation. When the desired amount of fuel has been pumped into the tanks, the refueling valves for the respective tanks can be released.

Ground Transfer of Fuel

Fuel can be transferred from one tank to another tank by using the appropriate fuel pumps, the fueling valve, the defueling valve, and the crossfeed valve. AC power must be available. To transfer fuel from the main tanks to the center tank:

Main tank fuel pump switches ..... ON

Crossfeed selector ..... Open

Manual defueling valve ..... Open

Center tank fueling valve switch ..... OPEN

Fuel transfer .....Monitor

The center tank fuel quantity indicator shows an increase in fuel. The main tank indicators show a decrease in fuel.

Center tank fueling valve switch ..... CLOSED

When the required amount of fuel has been transferred, the switch is closed at the fueling panel.

Manual defueling valve .....Close

Crossfeed selector .....Close

Main tank fuel pump switches ..... OFF

Main Tanks ..... Refill

Refueling panel and defuel panel access doors ..... Close

Fuel Crossfeed Valve Check

Crossfeed selector ..... Open

Verify crossfeed VALVE OPEN light illuminates bright and then dim.

Crossfeed selector ..... Close

Verify crossfeed VALVE OPEN light illuminates bright and then extinguishes.

Introduction

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, precipitation, turbulence, and windshear. Procedures in this section supplement normal procedures and should be observed when applicable.

The following recommendations apply to adverse weather operations in general:

- Do not use assumed temperature reduced thrust for takeoff on a contaminated runway.
- V1 may be reduced down to minimum V1 (assuming all weight limitations are considered) to provide increased stopping distance performance.
- Takeoffs on slippery runways are not recommended if the crosswind exceeds 15 knots or when slush or wet snow is more than 1/2 inch (13mm) in depth.
- Improved stall margins can be achieved by the following:
  - If excess runway is available, consider using improved climb procedures for flaps 5.
  - If runway is limited for the planned takeoff flap setting, consider using the next greater flap position with improved climb performance. This will provide additional stall margins with minimum performance penalties.

Cold Weather Operation

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice and snow on the airplane, ramps, taxiways and runways.

Icing conditions exist when OAT (on the ground) or TAT (inflight) is 10°C (50°F) or below and:

- visible moisture (clouds, fog with visibility less than one mile, rain, snow, sleet, ice crystals, and so on) is present, or
- standing water, ice, or snow is present on the ramps, taxiways, or runways.

CAUTION: Do not operate engine or wing anti–ice when inflight total air temperature (TAT) is above 10°C (50°F.)

Preflight

Although removal of surface snow, ice or frost is normally a maintenance function, the flight crew should use additional care and scrutiny during preflight preparation to inspect areas where surface snow or frost could change or affect normal system operations.

Exterior Safety Inspection

Surface ..... Check

[Option: 737-800 without Blended Winglets]
Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel, is permissible; however, all leading edge devices, all control surfaces, tab surfaces, upper wing surfaces and balance panel cavities must be free of snow or ice.

[Option: 737-800 with Blended Winglets]
Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel, is permissible; however, all leading edge devices, all control surfaces, tab surfaces, upper wing surfaces, winglet surfaces and balance panel cavities must be free of snow or ice.

Thin hoarfrost is acceptable on the upper surface of the fuselage provided all vents and ports are clear. Thin hoarfrost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to distinguish surface features underneath, such as paint lines, markings or lettering.

Control balance cavities ..... Check

Check drainage after snow removal. Puddled water may refreeze in flight.

Landing gear doors ..... Check

Landing gear doors should be free of snow or ice.

Air conditioning inlets and exits ..... Clear

Verify air inlets and exits, including the outflow valve, are clear of snow or ice. If the APU is operating, check that the outflow valve is full open.

Engine inlets ..... Clear

Check inlet cowling free of ice or snow and verify the fan is free to rotate.

APU air inlets ..... Check

The APU inlet door and cooling air inlet must be free of snow or ice prior to APU start.

Fuel tank vents ..... Clear

Check all fuel tank vents. All traces of ice or frost should be removed.

Pitot probes and static ports ..... Clear

Check all pitot probes and static ports free of ice and snow. Water rundown after snow removal may refreeze immediately forward of static ports and cause an ice buildup which disturbs airflow over the static ports resulting in erroneous static readings even when static ports themselves are clear.

Flight Deck Preparation

PROBE HEAT ..... ON

All probe heat lights – extinguished.

Flight controls ..... Check

This check should be accomplished whenever the airplane has been exposed to snow, freezing rain or other conditions which could restrict flight control movement.

Increase in control forces can be expected at low temperatures because of increased resistance in cables and thickened oil in snubbers and bearings.

If any flight control is suspected of binding or restricted movement, maintenance personnel should accomplish the appropriate portion of the flight control checks in SP.9, supplementary procedures.

Engine Start

Accomplish a normal engine start with the following modifications:

- If the engine has been cold soaked for three or more hours at ambient temperatures less than -40°C, do not start or motor the engine. Maintenance personnel should accomplish appropriate procedures for adverse weather starter servicing.
- If ambient temperature is below -35°C (-31°F), idle the engine for two minutes before changing thrust lever position.
- Up to three and one–half minutes may be allowed for oil pressure to reach the minimum operating pressure. During this period, the LOW OIL PRESSURE light may remain illuminated, pressure may go above the normal range and the FILTER BYPASS light may illuminate. Operate the engine at idle thrust until oil pressure returns to the normal range.

After Start

Electrical power ..... Generators ON

Normally engine IDGs stabilize within one minute, although due to cold oil, up to five minutes may be required to produce steady power.

Flight controls ..... Check

Move flight controls through full travel to ensure freedom of movement.

Flaps ..... Check

Move flaps through full travel to ensure freedom of movement.

CAUTION: The flap position indicator and leading edge devices annunciator panel should be closely observed for positive movement. If the flaps should stop, the flap lever should be placed immediately in the same position as indicated.

Engine Anti–Ice Operation–On the Ground

Engine anti–ice must be ON during all ground operations when icing conditions exist or are anticipated.

WARNING: Do not rely on airframe visual icing cues before activating engine anti–ice. Use the temperature and visible moisture criteria.

When engine anti–ice is required (on the ground):

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

ENG ANTI–ICE switches ..... ON

COWL VALVE OPEN lights – illuminated dim

COWL ANTI–ICE lights – extinguished

Note: If COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, position APU BLEED air switch to OFF and increase thrust slightly (up to a maximum of 30% N1).

Engine run–up ..... Accomplish as required

Run–up to as high a thrust setting as practical (70% N1 recommended) at 30 minute intervals for approximately 30 seconds duration.

Wing Anti–Ice Operation–On the Ground

Wing anti–ice must be ON during all ground operations between engine start and takeoff, when icing conditions exist or are anticipated, unless the airplane is protected by the application of Type II or Type IV fluid in compliance with an approved ground de–icing program.

WARNING: Ground use of the wing anti–ice system is intended to complement, and not replace, ground de–icing/anti–icing and inspection procedures. Close inspection is still required to ensure that no frost, snow or ice is adhering to the wing, leading edge devices, stabilizer, control surfaces, or other critical airplane components at takeoff.

WING ANTI–ICE switch ..... As required

If wing anti–ice switch is ON:

VALVE OPEN lights – illuminated dim

Note: The wing anti–ice VALVE OPEN lights may cycle bright/dim due to control valves cycling closed/open in response to thrust setting and duct temperature logic.

Taxi–Out

Nose wheel steering ..... Check

Nose wheel steering should be exercised in both directions during taxi to circulate warm hydraulic fluid through steering cylinders and minimize steering lag caused by low temperatures.

Flaps ..... As required

If taxi route is through slush or standing water in low temperatures or if precipitation is falling with temperatures below freezing, taxi with flaps up. Taxiing with flaps extended subjects the flaps and flap drives to snow and slush accumulations from the main gear wheels. Leading edge devices are also susceptible to slush accumulations.

If exterior deicing is required:

Flaps ..... UP

Prevents ice and slush from accumulating in flap cavities.

Thrust levers ..... Idle

Reduces the possibility of injury to personnel at inlet or exhaust areas.

Stabilizer trim ..... Full APL NOSE DOWN

Set stabilizer to the APL NOSE DOWN limit to prevent deicing fluid and slush run–off from entering the stabilizer balance panel cavity.

Trim the airplane to the electrical APL NOSE DOWN limit. Then continue trimming manually to the manual APL NOSE DOWN limit.

WARNING: To avoid personal injury, ensure that the stabilizer trim wheel handle is stowed prior to using electric trim.

APU and engine BLEED air switches ..... OFF

Reduces the possibility of fumes entering the air conditioning system.

APU ..... As required

If not required, the APU should be shut down to eliminate the possibility of deicing fluid entering the APU inlet.

CAUTION: With APU operating, ingestion of deicing fluid causes objectionable fumes and odors to enter the airplane. This may also cause erratic operation or damage to the APU.

Wait approximately one minute after completion of deicing to turn engine BLEED air switches on to ensure all deicing fluid has been cleared from the engine:

Engine BLEED air switches ..... ON

[Without PRR 38506 or Service Bulletin 737-55A-1080]

Control column ..... Move full forward/full aft

Slowly cycle the control column full forward to full aft a minimum of three (3) times to drain residual fluid from the elevator balance bay.

Stabilizer trim ..... ___ units

Verify stabilizer trim is set for takeoff.

Before Takeoff

Flaps ..... Set

Extend the flaps to the takeoff setting at this time if they have been held due to slush, or standing water or icing conditions.

BEFORE TAKEOFF Checklist ..... Accomplish

To ensure the airplane is configured for takeoff, accomplish the complete BEFORE TAKEOFF checklist.

If airplane deicing was accomplished:

A visual inspection of the airplane wings should be made by the pilots just prior to takeoff.

Engine run–up .....Accomplish as required

If moderate to severe icing conditions are present, takeoff roll must be preceded by a static run–up to 70% N1 and stable engine operation observed prior to brake release. If the airplane starts to slide on ice or snow during engine power check, release brakes and begin takeoff roll. Continue engine check during early part of takeoff roll.

Climb and Cruise

Note: After the flaps are up, wing anti–ice should be used to melt any accumulation of slush.

Engine Anti–Ice Operation-Inflight

Engine anti–ice must be ON during all flight operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below –40°C SAT. Engine anti–ice must be ON prior to, and during, descent in all icing conditions, including temperatures below –40°C SAT.

When operating in areas of possible icing, activate engine anti–ice prior to entering icing conditions. Late selection of engine anti–ice may allow inlet ice buildup and ice shedding into the engine.

[Without Icing Advisory Light]

WARNING: Do not rely on airframe visual icing cues before activating engine anti–ice. Use the temperature and visible moisture criteria.

[Option - Icing Advisory Light]

WARNING: Do not rely on airframe visual icing cues or illumination of the ICING light before activating engine anti–ice. Use the temperature and visible moisture criteria.

When engine anti–ice is required inflight:

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

ENG ANTI–ICE switches ..... ON

COWL VALVE OPEN lights – illuminated dim

COWL ANTI–ICE lights – extinguished

Note: If COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, position APU BLEED air switch to OFF and increase thrust slightly (up to a maximum of 30% N1).

CAUTION: Avoid prolonged operation in moderate to severe icing conditions.

Severe icing can usually be avoided by a change in altitude and/or airspeed. If flight in moderate to severe icing conditions cannot be avoided accomplish the following, on both engines, one engine at a time at approximately 15 minute intervals:

Thrust ..... Increase

Increase thrust to a minimum of 80% N1 to ensure the fan blades and spinner are clear of ice.

Engine vibration may occur due to fan blade/spinner icing. If engine vibration continues after increasing thrust, accomplish the following on both engines, one engine at a time:

ENGINE START switch ..... FLT

Thrust ..... Adjust

Adjust thrust to 45% N1. After approximately five seconds, increase thrust lever slowly to a minimum of 80% N1.

Note: Engine vibration may reduce to a low level before 80% N1 is reached, however, thrust increase must continue to a minimum of 80% N1 to remove ice from the fan blades.

Note: Engine vibration may indicate full scale prior to shedding ice; however, this has no adverse effect on the engine.

If vibration does not decrease, accomplish the procedure for HIGH ENGINE VIBRATION "If not in icing conditions."

When engine anti–ice is no longer required:

ENG ANTI–ICE switches ..... OFF

COWL VALVE OPEN lights – extinguished

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

[Automatic ignition]
ENGINE START switches .....AUTO

Wing Anti–Ice Operation – Inflight

The wing anti–ice system may be used as a de–icer or anti–icer in flight only. The primary method is to use it as a de–icer by allowing ice to accumulate before turning wing anti–ice on. This procedure provides the cleanest airfoil surface, the least possible runback ice formation, and the least thrust and fuel penalty.

The secondary method is to use wing anti—ice prior to ice accumulation. Operate the wing anti–ice system as an anti–icer only during extended operations in moderate or severe icing conditions, such as holding.

Ice accumulation on the flight deck window frames, windshield center post or on the windshield wiper arm may be used as an indication of structural icing conditions and the need to turn on wing anti–ice.

Normally it is not necessary to shed ice periodically unless extended flight through icing conditions is necessary (holding).

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

When wing anti–ice is required:

WING ANTI–ICE switch .....ON

R and L VALVE OPEN lights – illuminated dim

When wing anti–ice is no longer required:

WING ANTI–ICE switch ..... OFF

Note: Prolonged operation in icing conditions with the leading edge and trailing edge flaps extended is not recommended. Holding in icing conditions with flaps extended is prohibited.

Approach and Landing

Use normal procedures and reference speeds unless a flaps 15 landing is planned.

If a flaps 15 landing will be made:

Set VREF 15

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

- 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.

Taxi–In and Park

If prolonged operation in icing conditions with the leading and trailing edge flaps extended was required:

Flaps 15

Retraction to less than flaps 15 is not recommended until ice has been removed or a ground inspection has been made.

After landing in icing conditions:

Stabilizer trim ..... Set 0 to 2 units

Prevents melting snow and ice from running into balance bay areas and prevents the stabilizer limit switch from freezing. With flaps retracted, this requires approximately eight hand wheel turns of manual trim.

WARNING: To avoid personal injury, ensure that the stabilizer trim wheel handle is stowed prior to using electric trim.

Engine anti–ice ..... As required

If icing conditions exist, engine anti–ice must be ON.

Secure (Airplane Attended)

If warm air circulation through cargo and E/E compartments is desired:

APU ..... ON

APU GEN switches ..... ON

PACK switches ..... AUTO

ISOLATION VALVE switch ..... OPEN

Pressurization mode selector ..... MAN

Outflow valve switch ..... OPEN

Prevents aircraft pressurization.

Note: The airplane must be parked into the wind when the outflow valve is full open.

APU BLEED switch ..... ON

Secure (Airplane Unattended)

The flight crew should ensure that the following actions are accomplished as required:

Pressurization mode selector ..... MAN

Outflow valve ..... Closed

Inhibits intake of snow and ice.

Wheel chocks ..... Check in place

Parking brakes ..... OFF

Eliminates the possibility of brakes freezing.

Protective covers and plugs ..... Installed

Water storage containers ..... Drained

Toilets ..... Drained

Battery ..... Removed

If the battery will be exposed to temperatures below -18° C (0° F), the battery should be removed and stored in an area warmer than -18° C (0 ° F), but below 40° C (104° F). Subsequent installation of the warm battery ensures the starting capability of the APU.

Doors and sliding windows ..... Closed

Hot Weather Operation

During ground operation the following considerations will help keep the airplane as cool as possible:

- While the airplane is electrically powered, packs should be run or cooling air supplied to the airplane when the OAT exceeds 40° C (103° F) to protect the reliability of electrical and electronic equipment in the airplane.

- If cooling air is available from an outside source, the supply should be plugged in immediately after engine shutdown and should not be removed until just prior to engine start.
- Keep all doors and windows, including cargo doors, closed as much as possible.
- Electronic components which contribute to a high temperature level in the flight deck should be turned off while not needed.
- Open all passenger cabin gasper outlets and close all window shades on the sun–exposed side of the passenger cabin.

Brake temperature levels may be reached which can cause the wheel fuse plugs to melt and deflate the tires. Consider the following actions:

- Be aware of brake temperature buildup when operating a series of short flight sectors. The energy absorbed by the brakes from each landing is accumulative.
- Extending the landing gear early during the approach provides additional cooling for tires and brakes.
- In–flight cooling time can be determined from the "Brake Cooling Schedule" in the Performance–Inflight section.

During flight planning consider the following:

- High temperatures inflict performance penalties which must be taken into account on the ground before takeoff.
- Alternate takeoff procedures (No Engine Bleed Takeoff, Improved Climb Performance, etc.)

Moderate to Heavy Rain

Flights should be conducted to avoid thunderstorm or hail activity by overflight or circumnavigation. To the maximum extent possible, moderate to heavy rain should also be avoided.

If heavy rain is encountered:

ENGINE START switches ..... CONT

Thrust Levers ..... Adjust Slowly

If thrust changes are necessary, move the thrust levers slowly. Avoid changing thrust lever direction until engines have stabilized at a selected setting.

Turbulence

During flight in light to moderate turbulence, the autopilot and/or autothrottle may remain engaged unless performance is objectionable. Increased thrust lever activity can be expected when encountering wind, temperature changes and large pressure changes. Short–time airspeed excursions of 10 to 15 knots can be expected.

Passenger signs ..... ON

Advise passengers to fasten seat belts prior to entering areas of reported or anticipated turbulence. Instruct flight attendants to check that all passengers' seat belts are fastened.

Severe Turbulence

Autothrottle ..... DISENGAGE

AUTOPILOT ..... CWS

A/P status annunciators display CWS for pitch and roll.

Note: If sustained trimming occurs, disengage the autopilot.

ENGINE START switches ..... FLT

Thrust ..... Set

Set thrust as required for the phase of flight. Change thrust setting only if required to modify an unacceptable speed trend.

PHASE OF FLIGHT	AIRSPEED
CLIMB	280 knots or .76 Mach
CRUISE	Use FMC recommended thrust settings. If the FMC is inoperative, refer to the Unreliable Airspeed page in the Performance–Inflight section for approximate N1 settings that maintain near optimum penetration airspeed.
DESCENT	.76 Mach/280/250 knots. If severe turbulence is encountered at altitudes below 15,000 feet and the airplane gross weight is less than the maximum landing weight, the airplane may be slowed to 250 knots in the clean configuration.

Note: If an approach must be made into an area of severe turbulence, delay flap extension as long as possible. The airplane can withstand higher gust loads in the clean configuration.

Windshear

Windshear is a change of wind speed and/or direction over a short distance along the flight path. Severe windshear is that which produces airspeed changes greater than 15 knots or vertical speed changes greater than 500 feet per minute.

Avoidance

The flight crew should search for any clues to the presence of windshear along the intended flight path. Stay clear of thunderstorm cells and heavy precipitation and areas of known windshear. If severe windshear is indicated, delay takeoff or do not continue an approach.

The presence of windshear may be indicated by:

- Thunderstorm activity
- Virga (rain that evaporates before reaching the ground)
- PIREPS
- Low level windshear alerting system (LLWAS) warnings

Precaution

If windshear is suspected, be especially alert to any of the danger signals and be prepared for the possibility of an inadvertent encounter. The following precautionary actions are recommended if windshear is suspected:

Takeoff

- Use maximum takeoff thrust instead of reduced thrust.
- Use the longest suitable runway.
- Be alert for any airspeed fluctuations during takeoff and initial climb. Such fluctuations may be the first indication of windshear.
- Know the all–engine initial climb pitch attitude. Rotate at the normal rate to this attitude for all non–engine failure takeoffs. Minimize reductions from the initial climb pitch attitude until terrain and obstruction clearance is assured, unless stick shaker activates.
- Crew coordination and awareness are very important. Develop an awareness of normal values of airspeed, attitude, vertical speed, and airspeed build–up. Closely monitor vertical flight path instruments such as vertical speed and altimeters. The pilot not flying should be especially aware of vertical flight path instruments and call out any deviations from normal.
- Should airspeed fall below the trim airspeed, unusual control column forces may be required to maintain the desired pitch attitude. Stick shaker must be respected at all times.

- If windshear should be encountered near VR, and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to the normal VR. If there is insufficient runway left to stop, initiate a normal rotation at least 2000 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.

Approach and Landing

- Select the minimum landing flap position consistent with field length.
- Add an appropriate airspeed correction (correction applied in the same manner as gust), the maximum command speed should not exceed the lower of Vref + 20 knots or landing flap placard speed minus 5 knots.
- Avoid large thrust reductions or trim changes in response to sudden airspeed increases as these may be followed by airspeed decreases.
- Crosscheck flight director commands using vertical flight path instruments.
- Crew coordination and awareness are very important, particularly at night or in marginal weather conditions. Closely monitor the vertical flight path instruments such as vertical speed, altimeters, and glideslope displacement. The pilot not flying should call out any deviations from normal. Use of the autopilot and autothrottle for the approach may provide more monitoring and recognition time.

Recovery

Accomplish the Windshear Escape Maneuver found in Non–Normal Maneuvers section of this manual.

737-600 CFM56-7B22 KG FAA JAR CATD

737-700 CFM56-7B24 LB FAA CATB

737-800 CFM56-7B26 KG FAA CATC

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1270	1250	1230	1220	1200	1170	1150	1120	1100
1400	1490	1470	1440	1420	1400	1360	1320	1280	1240
1600	1710	1680	1660	1630	1600	1550	1490	1440	1390
1800	1940	1900	1870	1830	1800	1730	1670	1600	1530
2000	2160	2120	2080	2040	2000	1920	1840	1760	1680
2200	2380	2340	2290	2250	2200	2110	2010	1920	1820
2400	2610	2560	2500	2450	2400	2290	2180	2080	1970
2600	2830	2770	2720	2660	2600	2480	2360	2240	2120
2800	3050	2990	2930	2860	2800	2670	2530	2400	2260
3000	3280	3210	3140	3070	3000	2850	2700	2550	2410
3200	3500	3430	3350	3280	3200	3040	2880	2710	2550
3400	3720	3640	3560	3480	3400	3220	3050	2870	2700
3600	3950	3860	3770	3690	3600	3410	3220	3030	2840
3800	4170	4080	3990	3890	3800	3600	3390	3190	2990
4000	4390	4300	4200	4100	4000	3780	3570	3350	3130
4200	4620	4510	4410	4300	4200	3970	3740	3510	3280
4400	4840	4730	4620	4510	4400	4160	3910	3670	3420
4600	5070	4950	4830	4720	4600	4340	4080	3830	3570
4800	5290	5170	5040	4920	4800	4530	4260	3990	3710
5000	5510	5380	5260	5130	5000	4710	4430	4140	3860

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	850	970	1080	1200	1270	1350	1420	1500
1400	1030	1150	1280	1400	1480	1560	1640	1720
1600	1210	1340	1470	1600	1680	1760	1850	1940
1800	1380	1520	1660	1800	1880	1970	2060	2160
2000	1560	1710	1850	2000	2090	2180	2280	2380
2200	1740	1890	2050	2200	2290	2380	2490	2610
2400	1910	2080	2240	2400	2490	2590	2700	2830
2600	2090	2260	2430	2600	2690	2800	2920	3050
2800	2270	2450	2620	2800	2900	3010	3130	3270
3000	2450	2630	2820	3000	3100	3210	3350	3490
3200	2620	2820	3010	3200	3300	3420	3560	3720
3400	2800	3000	3200	3400	3500	3630	3770	3940
3600	2980	3180	3390	3600	3710	3840	3990	4160
3800	3150	3370	3580	3800	3910	4040	4200	4380
4000	3330	3550	3780	4000	4110	4250	4410	4600
4200	3510	3740	3970	4200	4320	4460	4630	4820
4400	3690	3920	4160	4400	4520	4670	4840	5050
4600	3860	4110	4350	4600	4720	4870	5060	5270
4800	4040	4290	4550	4800	4920	5080	5270	5490
5000	4220	4480	4740	5000	5130	5290	5480	5710

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1220	58.1		53.4	53.0	52.7	52.5	52.3	52.2	52.0	47.9	46.7	45.4
1400	62.3		57.2	56.8	56.5	56.3	56.1	55.9	55.7	51.4	50.0	48.6
1600	66.5		61.1	60.7	60.3	60.1	59.9	59.7	59.5	54.8	53.4	51.9
1800	70.6		64.8	64.4	64.0	63.7	63.5	63.3	63.1	58.1	56.6	55.0
2000	72.5		68.7	68.2	67.8	67.6	67.4	67.1	66.9	61.6	60.0	58.4
2200	72.5		71.7	71.2	70.8	70.5	70.3	70.1	69.8	64.3	62.6	60.8
2400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	66.7	64.9	63.0
2600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.3	67.4	65.4
2800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.6	69.7	67.6
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.6	69.5
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.4
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	68.8		68.2	68.1	68.1	68.0	67.9	67.9	67.8	60.4	58.1	55.8

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1220	56.8		52.0	51.7	51.3	51.2	51.0	50.7	50.0	46.3	45.1	43.8
1400	60.9		55.8	55.4	55.0	54.9	54.6	54.3	53.6	49.7	48.4	47.0
1600	65.0		59.6	59.2	58.8	58.6	58.3	58.0	57.2	53.0	51.6	50.2
1800	69.0		63.2	62.8	62.3	62.1	61.9	61.5	60.7	56.2	54.7	53.2
2000	72.5		67.0	66.5	66.1	65.9	65.6	65.2	64.4	59.6	58.0	56.4
2200	72.5		69.9	69.4	69.0	68.7	68.4	68.0	67.2	62.1	60.4	58.7
2400	72.5		72.5	72.1	71.6	71.4	71.1	70.7	69.7	64.4	62.7	60.9
2600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	66.9	65.1	63.2
2800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.1	67.2	65.2
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.1	69.1	67.1
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0	68.9
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.6
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.3
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	67.7		67.2	67.1	67.0	66.9	66.9	66.8	65.6	58.5	56.2	54.0

Takeoff Field & Climb Limit Weights - Dry Runway
Flaps 5
2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1220	55.5		50.5	50.1	49.8	49.6	49.5	48.9	48.3	44.8	43.6	42.3
1400	59.4		54.1	53.8	53.4	53.2	53.0	52.4	51.8	48.0	46.7	45.4
1600	63.5		57.8	57.4	57.0	56.8	56.6	56.0	55.3	51.2	49.8	48.4
1800	67.4		61.3	60.9	60.5	60.3	60.1	59.4	58.7	54.3	52.8	51.3
2000	71.4		65.0	64.5	64.1	63.9	63.7	62.9	62.2	57.6	56.0	54.5
2200	72.5		67.8	67.3	66.9	66.6	66.4	65.6	64.8	60.0	58.3	56.7
2400	72.5		70.4	69.9	69.4	69.2	69.0	68.1	67.3	62.2	60.4	58.7
2600	72.5		72.5	72.5	72.2	71.9	71.7	70.8	69.9	64.6	62.7	60.9
2800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.3	66.7	64.8	62.9
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	68.6	66.6	64.6
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.4	68.4	66.4
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.2	70.1	68.1
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.8	69.7
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.3
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	66.6		66.0	65.9	65.8	65.8	65.7	64.7	63.6	56.5	54.3	52.2

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1220	54.2		49.2	48.9	48.6	48.4	47.8	47.3	46.7	43.2	42.1	40.9
1400	58.1		52.7	52.4	52.1	51.9	51.3	50.7	50.1	46.4	45.1	43.9
1600	62.0		56.3	55.9	55.6	55.4	54.7	54.1	53.4	49.5	48.1	46.8
1800	65.8		59.7	59.3	58.9	58.8	58.1	57.3	56.6	52.4	51.0	49.6
2000	69.7		63.3	62.9	62.5	62.3	61.6	60.8	60.1	55.6	54.1	52.6
2200	72.5		66.0	65.6	65.2	65.0	64.2	63.4	62.6	57.9	56.3	54.8
2400	72.5		68.5	68.1	67.6	67.4	66.6	65.8	64.9	60.0	58.3	56.7
2600	72.5		71.2	70.8	70.3	70.1	69.2	68.3	67.4	62.3	60.5	58.8
2800	72.5		72.5	72.5	72.5	72.4	71.5	70.6	69.7	64.3	62.4	60.7
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	71.7	66.1	64.2	62.4
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	67.9	65.9	64.0
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.6	67.6	65.7
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.3	69.2	67.3
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.8	68.8
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.4	70.3
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.8
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	65.6		65.1	65.0	64.9	64.9	63.7	62.6	61.4	54.6	52.4	50.4

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1240	1230	1220	1210	1200	1180	1170	1150	1130
1400	1470	1450	1430	1420	1400	1370	1340	1310	1290
1600	1700	1670	1650	1620	1600	1560	1520	1480	1440
1800	1930	1900	1860	1830	1800	1750	1700	1650	1600
2000	2160	2120	2080	2040	2000	1940	1880	1810	1750
2200	2390	2340	2290	2250	2200	2130	2050	1980	1900
2400	2620	2560	2510	2450	2400	2310	2230	2140	2060
2600	2850	2790	2720	2660	2600	2500	2410	2310	2210
2800	3080	3010	2940	2870	2800	2690	2580	2480	2370
3000	3310	3230	3160	3080	3000	2880	2760	2640	2520
3200	3540	3460	3370	3290	3200	3070	2940	2810	2680
3400	3770	3680	3590	3490	3400	3260	3120	2970	2830
3600	4000	3900	3800	3700	3600	3450	3290	3140	2990
3800	4230	4120	4020	3910	3800	3640	3470	3310	3140
4000	4460	4350	4230	4120	4000	3820	3650	3470	3300
4200	4690	4570	4450	4320	4200	4010	3830	3640	3450
4400	4920	4790	4660	4530	4400	4200	4000	3800	3600
4600	5150	5020	4880	4740	4600	4390	4180	3970	3760
4800	5380	5240	5090	4950	4800	4580	4360	4140	3910
5000	5620	5460	5310	5150	5000	4770	4530	4300	4070

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	830	960	1080	1200	1280	1370	1450	1550
1400	1000	1130	1270	1400	1490	1580	1680	1770
1600	1170	1310	1460	1600	1690	1790	1900	2000
1800	1340	1490	1650	1800	1900	2010	2120	2230
2000	1510	1670	1840	2000	2110	2220	2340	2460
2200	1680	1850	2030	2200	2310	2430	2560	2690
2400	1850	2030	2220	2400	2520	2640	2780	2920
2600	2020	2210	2410	2600	2720	2860	3000	3140
2800	2190	2390	2600	2800	2930	3070	3220	3370
3000	2360	2570	2790	3000	3140	3280	3440	3600
3200	2520	2750	2970	3200	3340	3490	3660	3830
3400	2690	2930	3160	3400	3550	3710	3880	4060
3600	2860	3110	3350	3600	3750	3920	4100	4290
3800	3030	3290	3540	3800	3960	4130	4320	4520
4000	3200	3470	3730	4000	4170	4350	4540	4740
4200	3370	3650	3920	4200	4370	4560	4760	4970
4400	3540	3830	4110	4400	4580	4770	4980	5200
4600	3710	4010	4300	4600	4780	4980	5200	5430
4800	3880	4190	4490	4800	4990	5200	5420	5660
5000	4050	4360	4680	5000	5200	5410	5640	5890

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1450	63.3		57.7	57.3	56.9	56.7	56.5	56.3	56.1	51.7	50.3	49.0
1600	66.4		60.5	60.1	59.7	59.5	59.3	59.1	58.9	54.1	52.8	51.3
1800	70.4		64.0	63.6	63.2	63.0	62.7	62.5	62.3	57.3	55.9	54.4
2000	72.5		67.8	67.3	66.8	66.6	66.4	66.2	65.9	60.7	59.1	57.5
2200	72.5		70.7	70.2	69.7	69.5	69.3	69.0	68.8	63.2	61.6	60.0
2400	72.5		72.5	72.5	72.5	72.3	72.0	71.8	71.5	65.7	64.0	62.3
2600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	68.3	66.6	64.7
2800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.7	68.9	67.0
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0	69.1
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.1
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	68.8		68.2	68.1	68.1	68.0	67.9	67.9	67.8	60.4	58.1	55.8

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1450	61.8		56.2	55.7	55.2	55.0	54.8	54.6	53.9	49.9	48.6	47.4
1600	64.8		58.9	58.3	57.9	57.7	57.5	57.2	56.5	52.3	51.0	49.6
1800	68.6		62.4	61.8	61.3	61.1	60.8	60.6	59.9	55.4	53.9	52.5
2000	72.5		66.0	65.4	64.8	64.6	64.4	64.2	63.3	58.6	57.1	55.6
2200	72.5		68.9	68.2	67.6	67.4	67.2	66.9	66.1	61.1	59.5	57.9
2400	72.5		71.6	70.9	70.3	70.1	69.8	69.6	68.7	63.4	61.8	60.1
2600	72.5		72.5	72.5	72.5	72.5	72.5	72.3	71.4	66.0	64.2	62.5
2800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	68.3	66.5	64.7
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.4	68.6	66.7
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.5	68.6
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.5
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.3
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	67.7		67.2	67.1	67.0	66.9	66.9	66.8	65.6	58.5	56.2	54.0

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1450	60.2		54.4	54.1	53.7	53.5	53.3	52.7	52.1	48.2	47.0	45.7
1600	63.1		57.1	56.7	56.3	56.1	55.9	55.3	54.6	50.5	49.2	47.9
1800	66.9		60.4	60.0	59.6	59.4	59.2	58.5	57.8	53.4	52.1	50.7
2000	70.8		63.9	63.5	63.1	62.9	62.7	61.9	61.2	56.6	55.1	53.7
2200	72.5		66.7	66.2	65.8	65.6	65.3	64.6	63.8	58.9	57.4	55.9
2400	72.5		69.3	68.8	68.4	68.1	67.9	67.1	66.3	61.2	59.6	58.0
2600	72.5		72.1	71.6	71.1	70.9	70.6	69.8	68.9	63.6	62.0	60.3
2800	72.5		72.5	72.5	72.5	72.5	72.5	72.2	71.3	65.8	64.1	62.4
3000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	67.9	66.1	64.3
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.9	68.1	66.2
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.8	69.9	68.0
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.7	69.7
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.4
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	66.6		66.0	65.9	65.8	65.8	65.7	64.7	63.6	56.5	54.3	52.2

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	24	26	28	30	42	46	50
	°F	-40	57	64	72	75	79	82	86	108	115	122
1450	58.7		53.0	52.7	52.3	52.2	51.5	50.9	50.3	46.5	45.4	44.2
1600	61.5		55.6	55.2	54.8	54.7	54.0	53.3	52.7	48.7	47.5	46.3
1800	65.2		58.8	58.5	58.1	57.9	57.2	56.5	55.8	51.6	50.3	49.0
2000	69.0		62.3	61.9	61.5	61.3	60.5	59.8	59.0	54.6	53.2	51.9
2200	72.0		64.9	64.5	64.1	63.9	63.1	62.3	61.5	56.9	55.4	54.0
2400	72.5		67.5	67.0	66.6	66.4	65.5	64.7	63.9	59.1	57.5	56.0
2600	72.5		70.2	69.7	69.2	69.0	68.1	67.3	66.4	61.4	59.8	58.2
2800	72.5		72.5	72.2	71.7	71.4	70.5	69.6	68.8	63.5	61.9	60.3
3000	72.5		72.5	72.5	72.5	72.5	72.5	71.8	70.9	65.5	63.8	62.1
3200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	67.4	65.6	63.9
3400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.2	67.4	65.6
3600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0	69.1	67.3
3800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.8	68.9
4000	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.4	70.5
4200	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.0
4400	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4800	72.5		72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	65.6		65.1	65.0	64.9	64.9	63.7	62.6	61.4	54.6	52.4	50.4

Takeoff Obstacle Limit Weight

Flaps 5

Sea Level 30°C & Below, Zero Wind

Based on engine bleed for packs on and anti-ice off

Reference Obstacle Limit Weight (1000 KG)

OBSTACLE HEIGHT (M)	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	67.8	70.8									
20	61.6	65.4	68.0	69.8	71.1						
40	56.6	60.3	63.2	65.5	67.2	68.5	69.6	70.5	71.2	71.8	
60	52.8	56.6	59.6	62.0	63.9	65.5	66.8	67.8	68.7	69.5	70.1
80	49.7	53.6	56.6	59.1	61.1	62.8	64.3	65.5	66.5	67.4	68.1
100	47.1	50.9	54.0	56.6	58.7	60.5	62.0	63.4	64.5	65.5	66.3
120	44.8	48.6	51.8	54.4	56.6	58.4	60.0	61.4	62.6	63.7	64.6
140	42.8	46.6	49.7	52.4	54.6	56.5	58.2	59.6	60.9	62.0	63.0
160	41.0	44.8	47.9	50.6	52.9	54.8	56.5	58.0	59.3	60.5	61.5
180	39.4	43.1	46.3	48.9	51.2	53.2	55.0	56.5	57.8	59.0	60.1
200		41.6	44.7	47.4	49.7	51.7	53.5	55.1	56.5	57.7	58.8
220		40.2	43.3	46.0	48.3	50.4	52.1	53.7	55.2	56.4	57.6
240		39.0	42.0	44.7	47.0	49.1	50.9	52.5	53.9	55.2	56.4
260			40.8	43.5	45.8	47.8	49.7	51.3	52.8	54.1	55.3
280			39.7	42.3	44.6	46.7	48.5	50.2	51.7	53.0	54.2
300				41.3	43.5	45.6	47.4	49.1	50.6	52.0	53.2

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope. When using line-up allowances the obstacle distance from brake release must be reduced by the ASDA adjustment.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	40	44	48	52	56	60	64	68
30 & BELOW	0	0	0	0	0	0	0	0
32	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1	-1.2	-1.3
34	-1.4	-1.6	-1.7	-1.9	-2.0	-2.2	-2.4	-2.5
36	-2.1	-2.4	-2.6	-2.8	-3.1	-3.3	-3.5	-3.8
38	-2.8	-3.2	-3.5	-3.8	-4.1	-4.4	-4.7	-5.0
40	-3.5	-3.9	-4.2	-4.6	-5.0	-5.4	-5.8	-6.2
42	-4.1	-4.6	-5.0	-5.5	-5.9	-6.4	-6.9	-7.3
44	-4.8	-5.3	-5.8	-6.3	-6.9	-7.4	-7.9	-8.5
46	-5.4	-6.0	-6.6	-7.2	-7.8	-8.4	-9.0	-9.6
48	-6.0	-6.7	-7.4	-8.0	-8.7	-9.4	-10.1	-10.7
50	-6.7	-7.4	-8.1	-8.9	-9.6	-10.4	-11.1	-11.9

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	40	44	48	52	56	60	64	68
S.L.& BELOW	0	0	0	0	0	0	0	0
1000	-1.5	-1.7	-1.8	-1.9	-2.0	-2.1	-2.3	-2.4
2000	-2.9	-3.2	-3.4	-3.6	-3.9	-4.1	-4.4	-4.6
3000	-4.3	-4.6	-5.0	-5.4	-5.7	-6.1	-6.4	-6.8

Takeoff Obstacle Limit Weight

Flaps 5

Sea Level 30°C & Below, Zero Wind

Based on engine bleed for packs on and anti-ice off

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	40	44	48	52	56	60	64	68
15 TW	-7.9	-7.6	-7.3	-7.1	-6.8	-6.5	-6.2	-5.9
10 TW	-5.3	-5.1	-4.9	-4.7	-4.5	-4.3	-4.1	-4.0
5 TW	-2.6	-2.5	-2.4	-2.4	-2.3	-2.2	-2.1	-2.0
0	0	0	0	0	0	0	0	0
10 HW	1.0	0.9	0.9	0.8	0.7	0.6	0.6	0.5
20 HW	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.0
30 HW	3.1	2.9	2.6	2.4	2.2	2.0	1.8	1.6
40 HW	4.2	3.9	3.6	3.3	3.0	2.7	2.4	2.1

With engine bleed for packs off, increase weight by 800 kg.
With engine anti-ice on, decrease weight by 150 kg.
With engine and wing anti-ice on, decrease weight by 700 kg.

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
70	34500	-15	37700*	37700*	37700*	36400	35100
65	36000	-18	39200*	39200*	39200*	38000	36600
60	37700	-18	40700*	40700*	40700*	39700	38300
55	39500	-18	41000	41000	41000	41000	40100
50	41000	-18	41000	41000	41000	41000	41000
45	41000	-18	41000	41000	41000	41000	41000
40	41000	-18	41000	41000	41000	41000	41000
35	41000	-18	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
70	34500	-9	37000*	37000*	37000*	36400	35100
65	36000	-13	38300*	38300*	38300*	38000	36600
60	37700	-13	39800*	39800*	39800*	39700	38300
55	39500	-13	41000	41000	41000	41000	40100
50	41000	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	41000	-13	41000	41000	41000	41000	41000
35	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
70	34500	-4	35700*	35700*	35700*	35700*	35100
65	36000	-7	37200*	37200*	37200*	37200*	36600
60	37700	-7	38700*	38700*	38700*	38700*	38300
55	39500	-7	40200*	40200*	40200*	40200*	40100
50	41000	-7	41000	41000	41000	41000	41000
45	41000	-7	41000	41000	41000	41000	41000
40	41000	-7	41000	41000	41000	41000	41000
35	41000	-7	41000	41000	41000	41000	41000

***Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

Long Range Cruise Trip 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
278	258	240	225	212	200	190	181	173	166	159
551	513	479	450	424	400	381	364	349	334	322
823	767	717	673	635	600	573	548	524	504	485
1095	1021	955	897	846	800	764	731	700	673	648
1366	1274	1192	1120	1057	1000	955	914	877	842	811
1636	1527	1429	1344	1268	1200	1147	1098	1053	1011	974
1906	1780	1666	1567	1480	1400	1338	1281	1229	1181	1137
2175	2032	1903	1790	1691	1600	1530	1465	1405	1350	1300
2443	2283	2139	2013	1901	1800	1721	1648	1581	1520	1464
2711	2535	2375	2236	2112	2000	1913	1832	1757	1689	1627
2978	2785	2611	2458	2323	2200	2104	2016	1934	1859	1791
3245	3035	2846	2681	2534	2400	2296	2199	2110	2028	1954
3511	3285	3081	2903	2744	2600	2488	2383	2287	2198	2118
3776	3534	3316	3125	2955	2800	2679	2567	2463	2368	2281
4041	3783	3550	3346	3165	3000	2871	2751	2640	2538	2445
4305	4032	3784	3568	3375	3200	3062	2935	2816	2708	2609
4569	4280	4018	3789	3586	3400	3254	3119	2993	2878	2773
4831	4527	4252	4011	3796	3600	3446	3302	3170	3048	2936
5093	4774	4485	4232	4006	3800	3637	3486	3346	3218	3100
5355	5021	4718	4453	4216	4000	3829	3670	3523	3388	3264
5616	5267	4951	4674	4426	4200	4021	3854	3699	3557	3428
5876	5513	5184	4894	4636	4400	4212	4038	3876	3727	3592
6136	5758	5416	5114	4846	4600	4404	4221	4052	3897	3755
6395	6003	5648	5335	5055	4800	4595	4405	4229	4067	3919
6653	6247	5879	5555	5265	5000	4787	4589	4405	4237	4083

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	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	0:38	1.4	0:37	1.4	0:37	1.4	0:36	1.4	0:36
400	2.4	1:08	2.4	1:07	2.4	1:06	2.3	1:05	2.3	1:04
600	3.4	1:39	3.4	1:37	3.3	1:34	3.3	1:33	3.2	1:31
800	4.5	2:09	4.4	2:06	4.3	2:03	4.2	2:00	4.1	1:59
1000	5.5	2:39	5.4	2:36	5.2	2:31	5.1	2:28	5.0	2:26
1200	6.5	3:09	6.4	3:04	6.2	2:59	6.1	2:56	6.0	2:53
1400	7.6	3:38	7.4	3:33	7.2	3:27	7.1	3:23	6.9	3:20
1600	8.7	4:07	8.4	4:01	8.2	3:55	8.0	3:50	7.8	3:47
1800	9.7	4:37	9.5	4:30	9.2	4:23	9.0	4:18	8.8	4:14
2000	10.8	5:06	10.5	4:58	10.2	4:51	9.9	4:45	9.7	4:41
2200	11.9	5:34	11.6	5:26	11.3	5:18	11.0	5:12	10.7	5:08
2400	13.0	6:03	12.7	5:53	12.3	5:45	12.0	5:39	11.7	5:34
2600	14.1	6:31	13.7	6:21	13.4	6:12	13.0	6:06	12.7	6:01
2800	15.3	6:59	14.8	6:49	14.4	6:39	14.0	6:33	13.7	6:28
3000	16.4	7:28	15.9	7:16	15.5	7:06	15.0	7:00	14.7	6:55
3200	17.5	7:55	17.0	7:43	16.6	7:33	16.1	7:26	15.8	7:21
3400	18.7	8:22	18.2	8:10	17.7	8:00	17.2	7:53	16.9	7:48
3600	19.9	8:50	19.3	8:37	18.8	8:27	18.2	8:20	18.0	8:14
3800	21.1	9:17	20.5	9:04	19.9	8:53	19.3	8:46	19.1	8:41
4000	22.2	9:44	21.6	9:31	21.0	9:20	20.4	9:13	20.1	9:07
4200	23.5	10:11	22.8	9:58	22.1	9:47	21.6	9:39	21.3	9:34
4400	24.7	10:38	24.0	10:24	23.3	10:13	22.7	10:06	22.5	10:00
4600	25.9	11:05	25.2	10:51	24.4	10:39	23.9	10:32	23.7	10:27
4800	27.2	11:31	26.4	11:17	25.6	11:06	25.0	10:59	24.9	10:53
5000	28.4	11:58	27.6	11:44	26.8	11:32	26.2	11:25	26.1	11:20

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)			
	30	40	50	60
5	-0.8	-0.4	0.0	0.7
10	-1.7	-0.9	0.0	1.5
15	-2.5	-1.3	0.0	2.5
20	-3.4	-1.8	0.0	3.7
25	-4.3	-2.3	0.0	5.1
30	-5.2	-2.7	0.0	6.6

Based on 280/.78 climb, Long Range Cruise and .78/280/250 descent.

Long Range Cruise Step Climb

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
1325	1244	1173	1109	1052	1000	953	911	872	836	803
1843	1733	1636	1549	1471	1400	1336	1277	1224	1174	1129
2360	2222	2099	1989	1890	1800	1718	1644	1576	1513	1455
2876	2710	2561	2428	2309	2200	2101	2011	1928	1852	1781
3392	3197	3023	2868	2727	2600	2484	2378	2281	2191	2108
3907	3684	3485	3307	3146	3000	2867	2745	2633	2530	2435
4421	4170	3947	3746	3565	3400	3250	3113	2986	2870	2762
4934	4656	4408	4185	3983	3800	3633	3480	3339	3210	3090
5448	5142	4869	4624	4402	4200	4016	3847	3693	3550	3417
5961	5628	5330	5062	4820	4600	4399	4215	4046	3890	3745
6474	6113	5791	5501	5238	5000	4782	4583	4399	4230	4073

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)				TIME (HR:MIN)
	LANDING WEIGHT (1000 KG)				
	30	40	50	60	
1000	3.7	4.3	5.0	5.7	2:27
1400	5.1	5.9	6.8	7.9	3:22
1800	6.5	7.5	8.7	10.1	4:16
2200	7.8	9.1	10.7	12.3	5:10
2600	9.3	10.8	12.6	14.7	6:04
3000	10.7	12.5	14.7	17.1	6:58
3400	12.2	14.2	16.8	19.5	7:51
3800	13.7	16.0	19.0	22.1	8:44
4200	15.3	17.9	21.2	24.7	9:37
4600	16.9	19.8	23.5	27.4	10:30
5000	18.5	21.8	25.9	30.1	11:23

Based on 280/.78 climb, Long Range Cruise or .79 cruise and .78/280/250 descent.
Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

Short Trip 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
92	79	69	61	55	50	46	42	39	37	34
157	141	128	117	108	100	93	87	82	77	73
222	203	186	172	160	150	141	133	125	119	113
287	264	244	228	213	200	189	178	169	161	153
351	325	302	283	265	250	236	224	213	203	194
415	385	360	337	318	300	284	270	257	246	235
478	446	417	392	370	350	332	316	301	288	276
542	506	475	447	422	400	380	362	346	331	317
607	568	533	502	475	450	428	408	389	373	357
673	629	591	557	527	500	476	453	433	415	398

Trip Fuel and Time Required

AIR DIST (NM)		LANDING WEIGHT (1000 KG) 30	35	40	45	50	55	60	TIME (HRS:MIN)
50	FUEL (1000 KG)	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0:14
	ALT (FT)	17000	15000	9000	7000	5000	5000	5000	
100	FUEL (1000 KG)	0.7	0.8	0.8	0.9	0.9	0.9	1.0	0:22
	ALT (FT)	25000	23000	21000	19000	15000	13000	11000	
150	FUEL (1000 KG)	0.9	1.0	1.1	1.1	1.2	1.2	1.3	0:30
	ALT (FT)	31000	29000	27000	25000	23000	21000	19000	
200	FUEL (1000 KG)	1.1	1.2	1.3	1.4	1.4	1.5	1.6	0:37
	ALT (FT)	39000	37000	35000	31000	29000	27000	25000	
250	FUEL (1000 KG)	1.3	1.4	1.5	1.6	1.7	1.8	1.9	0:43
	ALT (FT)	41000	41000	41000	37000	35000	33000	31000	
300	FUEL (1000 KG)	1.4	1.6	1.7	1.8	1.9	2.0	2.1	0:50
	ALT (FT)	41000	41000	41000	41000	37000	35000	33000	
350	FUEL (1000 KG)	1.6	1.7	1.9	2.0	2.1	2.2	2.4	0:57
	ALT (FT)	41000	41000	41000	41000	37000	35000	33000	
400	FUEL (1000 KG)	1.8	1.9	2.0	2.2	2.3	2.5	2.6	1:03
	ALT (FT)	41000	41000	41000	41000	37000	35000	33000	
450	FUEL (1000 KG)	1.9	2.1	2.2	2.4	2.5	2.7	2.9	1:10
	ALT (FT)	41000	41000	41000	39000	37000	35000	33000	
500	FUEL (1000 KG)	2.1	2.2	2.4	2.6	2.8	2.9	3.1	1:18
	ALT (FT)	41000	41000	41000	39000	37000	35000	33000	

Based on 280/.78 climb, Long Range Cruise and .78/280/250 descent.

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR) PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000	25000	30000	35000	41000
70	2490	2450	2420	2400	2360	2330	2390	2470	
65	2330	2290	2260	2230	2200	2150	2210	2260	
60	2180	2130	2100	2070	2040	1980	2020	2060	2330
55	2020	1970	1940	1910	1870	1830	1840	1880	2030
50	1870	1820	1780	1750	1710	1680	1690	1710	1810
45	1720	1660	1650	1610	1580	1550	1530	1530	1610
40	1600	1550	1490	1450	1420	1400	1380	1360	1420
35	1450	1400	1350	1310	1280	1250	1230	1210	1240

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

Crew Oxygen Requirements

Required Pressure (PSI) for 76 Cu. Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	735	1055	1360
45	113	725	1040	1340
40	104	715	1020	1320
35	92	700	1005	1300
30	86	690	990	1280
25	77	680	975	1255
20	68	670	960	1240
15	59	655	940	1215
10	50	645	925	1195
5	41	635	910	1175
0	32	620	890	1150
-5	23	610	875	1130
-10	14	600	860	1110

Required Pressure (PSI) for 114/115 Cu. Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	530	735	945
45	113	520	725	930
40	104	510	715	915
35	92	505	700	900
30	86	495	690	885
25	77	485	680	870
20	68	480	670	860
15	59	470	655	840
10	50	460	645	830
5	41	455	635	815
0	32	445	620	800
-5	23	440	610	785
-10	14	430	600	770

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
32	39.7		
30	43.4	42.2	40.8
28	47.3	45.9	44.4
26	51.4	49.8	48.2
24	55.1	53.3	51.6
22	58.4	56.4	54.5
20	61.8	59.6	57.1
18	65.3	62.8	59.9
16	68.6	65.8	62.4
14	72.5	69.0	65.4
12	72.5	72.0	68.5
10	72.5	72.5	71.6
8	72.5	72.5	72.5

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)												
	PRESSURE ALTITUDE (1000 FT)												
	8	10	12	14	16	18	20	22	24	26	28	30	32
ENGINE ONLY		-2.2	-2.0	-2.7	-2.1	-1.8	-1.6	-1.4	-1.3	-1.2	-1.2	-1.1	-0.8
ENGINE & WING	-5.8	-8.1	-8.1	-7.9	-7.4	-7.0	-6.4	-5.6	-4.9	-4.5	-4.3	-4.1	

ALL ENGINES

Long Range Cruise Critical Fuel Reserves

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
294	268	247	229	214	200	188	177	168	159	152
603	548	501	462	429	400	375	352	333	315	299
913	827	756	695	644	600	561	528	498	471	447
1224	1106	1010	929	860	800	748	703	662	626	594
1534	1386	1264	1162	1075	1000	935	878	827	782	742
1844	1665	1518	1395	1290	1200	1122	1053	992	938	889
2154	1945	1772	1628	1505	1400	1308	1228	1157	1094	1037
2465	2224	2027	1861	1721	1600	1495	1403	1322	1249	1184
2775	2504	2281	2094	1936	1800	1682	1578	1487	1405	1332

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	35	40	45	50	55	60	65	70
200	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.1
300	2.4	2.4	2.5	2.6	2.7	2.8	2.9	3.0
400	3.1	3.1	3.2	3.4	3.5	3.6	3.7	3.9
500	3.8	3.8	4.0	4.1	4.3	4.4	4.6	4.7
600	4.5	4.5	4.7	4.9	5.0	5.2	5.4	5.6
700	5.2	5.2	5.4	5.6	5.8	6.0	6.2	6.4
800	5.9	5.9	6.1	6.4	6.6	6.8	7.0	7.3
900	6.6	6.6	6.8	7.1	7.3	7.6	7.8	8.1
1000	7.3	7.3	7.5	7.8	8.1	8.4	8.6	8.9
1100	8.0	8.0	8.2	8.5	8.8	9.1	9.4	9.7
1200	8.7	8.7	8.9	9.3	9.6	9.9	10.3	10.6
1300	9.4	9.4	9.6	10.0	10.4	10.7	11.1	11.4
1400	10.1	10.1	10.3	10.7	11.1	11.5	11.8	12.2
1500	10.8	10.8	11.0	11.4	11.8	12.2	12.6	13.0
1600	11.5	11.5	11.7	12.1	12.6	13.0	13.4	13.8
1700	12.2	12.2	12.4	12.8	13.3	13.7	14.2	14.6
1800	12.9	12.9	13.1	13.5	14.0	14.5	15.0	15.4

Based on: Emergency descent to 10000 ft. Level cruise at 10000 ft. 250 KIAS descent to 1500 ft. 15 minute hold at 1500 ft. One missed approach; approach and land. 5% allowance for wind errors.
Increase fuel required 0.8% for each 10°C hotter than ISA conditions.
If icing conditions exist, increase fuel by 14% to account for engine and wing anti-ice on and ice accumulation on unheated surfaces.
Allowance for performance deterioration not included.
Compare the fuel required from this table with critical fuel reserves for one engine inoperative and use the higher of the two.

ENGINE INOP

Long Range Cruise Critical Fuel Reserves

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
299	272	250	231	214	200	188	177	167	158	150
617	557	507	465	430	400	374	351	330	312	296
935	841	764	700	646	600	560	525	494	466	442
1253	1126	1022	935	862	800	746	699	657	620	587
1572	1411	1279	1170	1078	1000	932	873	821	775	733
1890	1695	1537	1405	1295	1200	1118	1047	984	929	879
2209	1980	1794	1640	1511	1400	1304	1221	1148	1083	1025
2527	2265	2052	1875	1727	1600	1491	1395	1311	1237	1171
2845	2549	2309	2110	1943	1800	1677	1569	1475	1391	1316

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	35	40	45	50	55	60	65	70
200	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.0
300	2.1	2.1	2.2	2.3	2.4	2.5	2.6	2.8
400	2.7	2.7	2.9	3.0	3.1	3.3	3.4	3.6
500	3.3	3.3	3.5	3.7	3.8	4.0	4.2	4.4
600	3.9	4.0	4.2	4.4	4.6	4.7	5.0	5.2
700	4.5	4.6	4.8	5.0	5.3	5.5	5.7	6.0
800	5.2	5.2	5.4	5.7	6.0	6.2	6.5	6.7
900	5.8	5.8	6.1	6.4	6.6	6.9	7.2	7.5
1000	6.4	6.4	6.7	7.0	7.3	7.6	7.9	8.3
1100	7.0	7.0	7.3	7.6	8.0	8.3	8.7	9.0
1200	7.6	7.6	7.9	8.3	8.7	9.0	9.4	9.8
1300	8.2	8.3	8.5	8.9	9.3	9.7	10.1	10.6
1400	8.8	8.9	9.1	9.6	10.0	10.4	10.9	11.3
1500	9.5	9.5	9.8	10.2	10.7	11.1	11.6	12.0
1600	10.1	10.1	10.4	10.9	11.3	11.8	12.3	12.8
1700	10.7	10.7	11.0	11.5	12.0	12.5	13.0	13.5
1800	11.3	11.3	11.6	12.1	12.6	13.2	13.7	14.3

Based on: Emergency descent to 10000 ft. Level cruise at 10000 ft. 250 KIAS descent to 1500 ft. 15 minute hold at 1500 ft. One missed approach; approach and land. 5% allowance for wind errors.
Increase fuel required 0.8% for each 10°C hotter than ISA conditions.
If icing conditions exist, increase fuel by 15% to account for engine and wing anti-ice on and ice accumulation on unheated surfaces.
Allowance for performance deterioration not included.
Compare the fuel required from this table with critical fuel reserves for all engines operative and use the higher of the two.

Intentionally
Blank

Landing Field Limit Weight
Flaps 40
Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1000		810	900	1000	1060	1130	1200	1270
1200	890	990	1100	1200	1270	1340	1420	1500
1400	1070	1180	1290	1400	1470	1560	1640	1720
1600	1250	1360	1480	1600	1680	1770	1850	1950
1800	1430	1550	1670	1800	1890	1980	2070	2170
2000	1610	1730	1860	2000	2100	2190	2290	2400
2200	1790	1920	2050	2200	2310			
2400	1970	2110	2250	2400				
2600	2150	2290						
2800	2330							

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)							
	0		1000		2000		3000	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET
1000	36.8							
1200	47.5	39.1	46.1	37.9	44.6	36.7	43.3	
1400	57.4	48.4	56.1	47.0	54.8	45.5	53.3	44.2
1600	66.1	57.1	64.4	55.8	62.7	54.4	61.2	52.9
1800	74.3	64.4	72.6	62.9	70.8	61.3	69.1	59.9
2000		71.9		70.2		68.5		66.6
2200								73.2

Decrease field limit weight 4500 kg when using manual speed brakes.

Landing Climb Limit Weight

Valid for approach with Flaps 15 and landing with Flaps 30 or 40

Based on engine bleed for packs on and anti-ice off

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	54.2			
52	126	55.3	53.5		
50	122	56.4	54.6	52.7	
48	118	57.5	55.7	53.8	52.0
46	115	58.7	56.8	54.9	53.0
44	111	59.8	57.9	55.9	54.1
42	108	61.0	59.0	57.0	55.1
40	104	62.2	60.2	58.1	56.2
38	100	63.4	61.4	59.3	57.3
36	97	64.7	62.6	60.5	58.5
34	93	66.0	63.8	61.7	59.6
32	90	67.3	65.1	62.9	60.7
30	86	68.6	66.3	64.0	61.8
28	82	68.7	67.5	65.2	63.0
26	79	68.7	67.6	66.4	64.1
24	75	68.8	67.6	66.4	65.3
22	72	68.8	67.7	66.5	65.3
20	68	68.9	67.7	66.5	65.3
18	64	68.9	67.8	66.6	65.4
16	61	69.0	67.8	66.6	65.5
14	57	69.0	67.9	66.7	65.5
12	54	69.1	67.9	66.7	65.6
10	50	69.1	67.9	66.7	65.6
-40	-40	69.6	68.4	67.2	66.1

With engine bleed for packs off, increase weight by 1100 kg.

With engine anti-ice on, decrease weight by 200 kg.

With engine and wing anti-ice on, decrease weight by 950 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 4550 kg.

ENGINE INOP

Go-Around Climb Gradient
Flaps 15
Based on engine bleed for packs on and anti-ice off
Reference Go-Around Gradient (%)

OAT (°C)	PRESSURE ALTITUDE (FT)			
	0	1000	2000	3000
54	2.77			
50	3.31	2.87	2.41	
46	3.87	3.40	2.94	2.48
42	4.44	3.95	3.46	2.99
38	5.04	4.53	4.02	3.53
34	5.66	5.13	4.60	4.08
30	6.28	5.72	5.17	4.63
26	6.31	6.02	5.72	5.19
22	6.34	6.05	5.75	5.47
18	6.36	6.07	5.77	5.49
14	6.39	6.09	5.79	5.51
10	6.41	6.12	5.81	5.54

Gradient Adjustment for Weight (%)

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)							
	0	1	2	3	4	5	6	7
65	-2.33	-2.53	-2.83	-3.11	-3.36	-3.60	-3.85	-4.08
60	-1.70	-1.83	-2.05	-2.25	-2.43	-2.61	-2.79	-2.96
55	-0.92	-1.01	-1.13	-1.23	-1.33	-1.43	-1.53	-1.61
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	1.12	1.25	1.36	1.48	1.61	1.74	1.88	2.02
40	2.54	2.84	3.10	3.36	3.66	3.96	4.25	4.60

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)							
	0	1	2	3	4	5	6	7
VREF	-0.32	-0.34	-0.35	-0.35	-0.36	-0.36	-0.36	-0.36
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.17	0.18	0.19	0.19	0.19	0.19	0.19	0.19
VREF+20	0.33	0.33	0.32	0.30	0.28	0.25	0.24	0.22
VREF+30	0.25	0.19	0.12	0.05	-0.01	-0.05	-0.07	-0.09

With engine bleed for packs off, increase gradient by 0.3%.
With engine anti-ice on, decrease gradient by 0.1%.
With engine and wing anti-ice on, decrease gradient by 0.3%.
When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 0.6%

Quick Turnaround Limit Weight
Flaps 40

OAT		LIMIT WEIGHT (1000 KG)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
50	122	72.2	70.9	69.5	
40	104	72.5	72.0	70.6	69.3
30	86	72.5	72.5	71.8	70.4
20	68	72.5	72.5	72.5	71.6
10	50	72.5	72.5	72.5	72.5
0	32	72.5	72.5	72.5	72.5
-10	14	72.5	72.5	72.5	72.5
-20	-4	72.5	72.5	72.5	72.5
-30	-22	72.5	72.5	72.5	72.5
-40	-40	72.5	72.5	72.5	72.5

Increase weight by 700 kg per 1% uphill slope. Decrease weight by 950 kg per 1% downhill slope. Increase weight by 1750 kg per 10 knots headwind. Decrease weight by 6400 kg per 10 knots tailwind.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 62 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, ensure that each brake pressure plate surface temperature, without artificial cooling, is less than 218°C as follows: No sooner than 10 and no later than 15 minutes after parking, measure each brake pressure plate surface temperature at a minimum of two points per brake by an accurate method (using a Doric Microtemp 450 hand held thermometer or equivalent, hold temperature probe in place for 20 seconds or until reading stabilizes). If each measured temperature is less than 218°C, immediate dispatch is allowed; otherwise the required minimum ground wait period of 62 minutes applies.

Introduction

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The takeoff data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between the data presented in this chapter and that contained in the approved Airplane Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb and Obstacle Limit Weights as determined from the tables shown. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

JAROPS-1 requires that the runway length be adjusted to account for alignment of the airplane prior to takeoff. The table below provides TORA, TODA and ASDA adjustments for both 90 degree taxiway entry and 180 degree turnaround. For the 180 degree turnaround case, adjustments are provided for both a nominal 60 m runway as well as the minimum required for the stated minimum pavement width. These values may be used when obtaining takeoff weights from the Airplane Flight Manual or a takeoff analysis program. When using line-up allowances with the Field Length Limit chart, the field length available must be reduced by the ASDA adjustment.

	90 DEGREE TAXIWAY ENTRY	180 DEGREE TURNAROUND	
	MINIMUM LINE-UP DISTANCE (M)	NOMINAL LINE-UP DISTANCE (M) (60.0 M RUNWAY)	MINIMUM LINE-UP DISTANCE (M) (24.4 M RUNWAY)
TORA & TODA	9.6	15.0	15.0
ASDA	20.9	26.4	26.4

Field Limit Weight - Slope and Wind Corrections

These tables for dry and wet runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the appropriate table with the available field length and runway slope to determine the slope corrected field length. Next enter the appropriate table with slope corrected field length and wind component to determine the slope and wind corrected field length.

Field and Climb Limit Weight

Tables are presented for selected airport pressure altitudes and runway conditions and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude and runway condition with “Slope and Wind Corrected Field Length” determined above and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude. When finding a maximum weight for a wet runway, the dry runway limit weight must also be determined and the lower of the two weights used.

Obstacle Limit Weight

The Reference Obstacle Limit Weight table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the adjustment tables to adjust the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

When using line-up allowances with the Obstacle Limit chart, the obstacle distance from brake release must be reduced by the ASDA adjustment.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that this table considers both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 100 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 15° may cause the airplane to lose speed and/or altitude. The altitudes shown in the table are limited to the maximum certified altitude of 41000 ft.

Long Range Cruise Trip Fuel and Time

Long Range Cruise Trip Fuel and Time tables are provided to determine trip time and fuel required to destination.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with

air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the planned landing weight to obtain the adjustment to the fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

The Long Range Cruise Step Climb Trip Fuel and Time tables are provided to determine trip time and fuel required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time Required table with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. Obtain air distance from the table using the ground distance and wind component to the alternate. Enter the Trip Fuel and Time Required table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

Holding Planning

This table provides total fuel flow information necessary for planning flaps up holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flaps up maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

Crew Oxygen Requirements

Tables are provided to determine the minimum dispatch oxygen pressure for protective breathing equipment used by the flight crew. Enter the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature and size. These pressures provide sufficient oxygen for 15 minutes of protective breathing for each flight crew member plus 10% contingency at 8000 ft cabin pressure altitude. Route specific analysis is necessary to determine if additional oxygen pressure is needed to meet supplemental oxygen requirements.

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

Extended Range Operations

Regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one engine inoperative speed" from an adequate diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes." This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Long Range Cruise Critical Fuel Reserves

Enter the Ground to Air Miles Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter the Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for inservice deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for a single landing flap.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight, or maximum certified landing weight.

Landing Field Limit Weight

Obtain wind corrected field length by entering the Wind Corrected Field Length table with field length available and wind component along the runway. Now enter the Field Limit Weight table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

Go-Around Climb Gradient

Enter the Reference Go-Around Gradient table with airport OAT and pressure altitude to determine the reference go-around gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided to determine the weight and speed adjusted go-around gradient. Apply the necessary corrections for engine bleed configuration and icing conditions as noted.

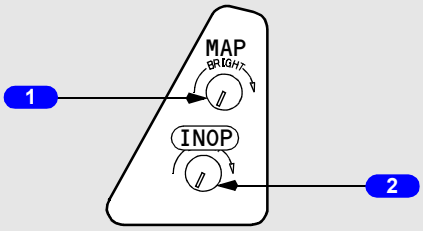
Quick Turnaround Limit Weight

Enter the table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

Flight Deck Lighting

Map and Chart Light Controls



SIDEWALL PANELS

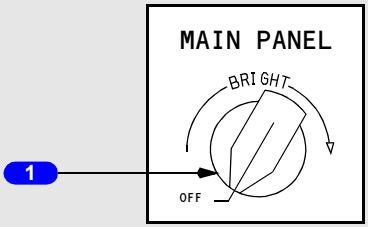
1 MAP Light Control

Rotate – adjusts brightness of Captain/First Officer map lights

2 CHART Light Control

Rotate – adjusts brightness of Captain/First Officer chart lights

Main Panel Lighting



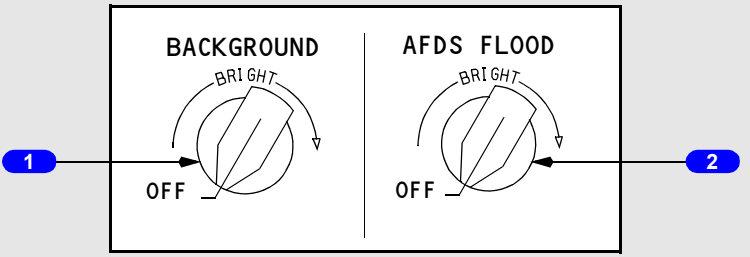
LEFT/RIGHT FORWARD PANELS

1 MAIN PANEL Light Control

Rotate –

- Captain – controls brightness of Captain's panel and instrument lighting, center instrument panel, and AFDS panel displays and edge lighting
- First Officer – controls brightness of First Officer's panel and instrument lighting.

Background and AFDS Flood Light Control



LEFT FORWARD PANEL

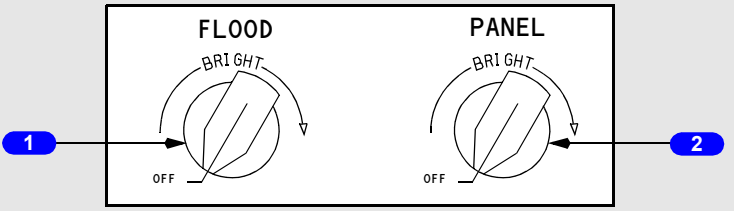
1 BACKGROUND Light Control

Rotate – controls incandescent lighting brightness for Captain's panel, First Officer's panel, and center panel.

2 AFDS FLOOD Light Control

Rotate – controls brightness of lighting directed at AFDS panel.

Flood and Aft Electronics Lights Controls



AISLE STAND

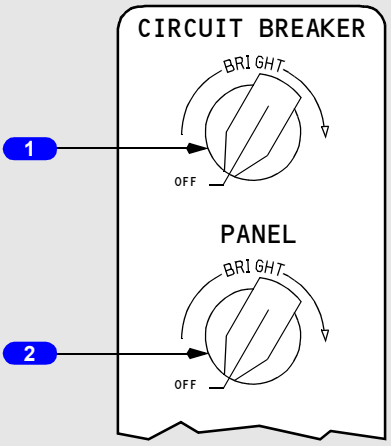
1 FLOOD Light Control

Rotate – controls overhead spotlight brightness directed at thrust lever quadrant.

2 PANEL Light Control

Rotate – controls forward and aft electronic control panel lights brightness.

Overhead/Circuit Breaker Panel Light Controls



FORWARD OVERHEAD PANEL

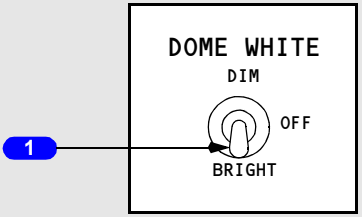
1 CIRCUIT BREAKER Light Control

Rotate – controls P–6 and P–18 circuit breaker panels light brightness.

2 PANEL Light Control

Rotate – controls forward and aft overhead panel lights brightness.

Dome Light Control



AFT OVERHEAD PANEL

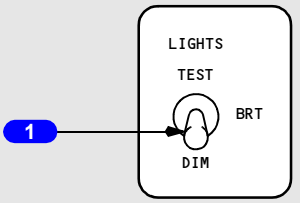
1 DOME Light Control

DIM – sets overhead dome lights to low brightness.

OFF – overhead dome lights are extinguished.

BRIGHT – sets overhead dome lights to full brightness.

Master Lights Test and Dim Switch



LEFT FORWARD PANEL

1 Master LIGHTS TEST and DIM SWITCH

TEST – illuminates all system lights on forward and aft overhead panels, and some lights on Captain and First Officer instrument panels to full brightness.

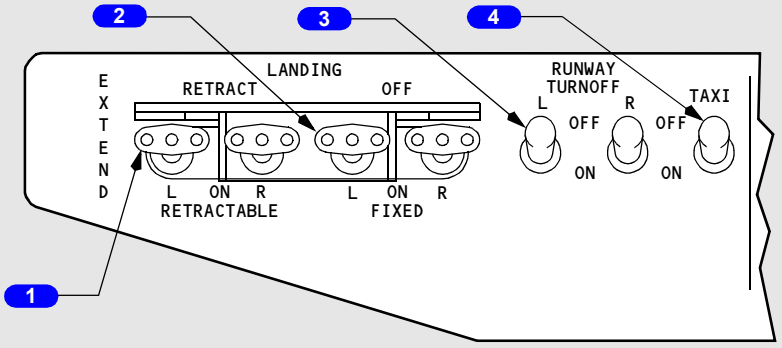
BRT (bright) – sets all system lights on forward and aft overhead panels, and some lights on Captain and First Officer panels to full brightness.

DIM – sets all system lights on forward and aft overhead panels, and some lights on Captain and First Officer panels to low brightness.

Exterior Lighting

Landing, Runway Turnoff and Taxi Lights

[Option - Typical]



FORWARD OVERHEAD PANEL

1 RETRACTABLE LANDING Light Switch

RETRACT – retractable landing lights are retracted and extinguished

EXTEND – retractable landing lights are extended and extinguished

ON – retractable landing lights are extended and illuminated.

2 FIXED LANDING Light Switch

OFF – fixed landing lights are extinguished.

ON – fixed landing lights are illuminated.

3 RUNWAY TURNOFF Light Switch

OFF – runway turnoff lights located in leading edge of wing root are extinguished.

ON – runway turnoff lights are illuminated.

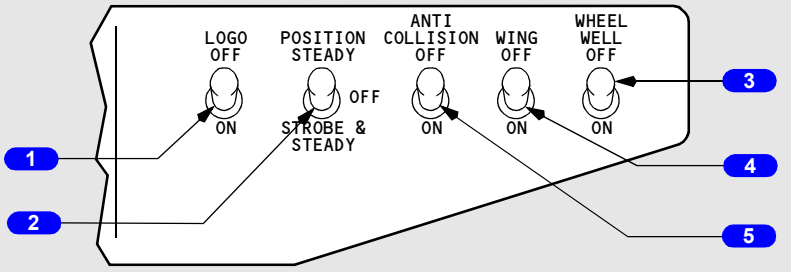
4 TAXI Light Switch

OFF – nose wheel well taxi light extinguished.

ON – nose wheel well taxi light illuminated.

Miscellaneous Exterior Lights

[Option - Typical]



FORWARD OVERHEAD PANEL

1 LOGO Light Switch

OFF – logo lights on each side of vertical fin extinguished.

ON – logo lights illuminated.

2 POSITION Light Switch

STROBE & STEADY – red and green wing–tip position lights, white trailing edge wing–tip lights and wing–tip and tail strobe lights illuminated.

OFF – red and green wing–tip position lights, white trailing edge wing–tip lights and wing–tip and tail strobe lights extinguished.

STEADY – red and green wing–tip position lights and white trailing edge wing–tip lights illuminated.

3 WHEEL WELL Light Switch

OFF – three wheel well lights extinguished.

ON – wheel well lights illuminated.

4 WING Illumination Switch

OFF – wing leading edge lights on fuselage forward of wing extinguished.

ON – wing leading edge lights illuminated.

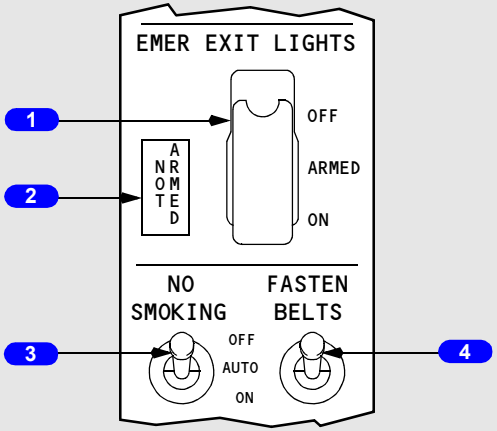
5 ANTI–COLLISION Light Switch

OFF – red rotating beacon lights on upper and lower fuselage extinguished.

ON – red rotating beacon lights illuminated.

Emergency Lighting and Passenger Signs

Flight Deck



FORWARD OVERHEAD PANEL

1 Emergency (EMER) EXIT LIGHTS Switch

OFF – prevents emergency lights system operation if airplane electrical power fails or is turned off.

ARMED – (guarded position) all emergency lights illuminate automatically if airplane electrical power to DC bus No. 1 fails or AC power is turned off.

ON – all emergency lights illuminate.

2 Emergency (EMER) EXIT LIGHTS NOT ARMED Light

Illuminated (amber) – EMER EXIT LIGHTS switch not in ARMED position.

3 NO SMOKING Switch

OFF – the NO SMOKING signs are not illuminated.

AUTO – the NO SMOKING signs are illuminated or extinguished automatically with reference to airplane configuration (refer to the Lighting System Description section).

ON – the NO SMOKING signs are illuminated.

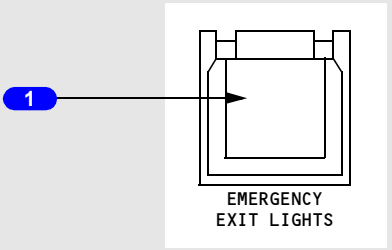
4 SEAT BELTS Switch

OFF – the FASTEN SEAT BELTS and RETURN TO SEAT signs are not illuminated.

AUTO – the FASTEN SEAT BELTS and RETURN TO SEAT signs are illuminated or extinguished automatically with reference to airplane configuration (refer to the Lighting System Description section).

ON – the FASTEN SEAT BELTS and RETURN TO SEAT signs are illuminated.

Passenger Cabin



AFT ATTENDANT PANEL

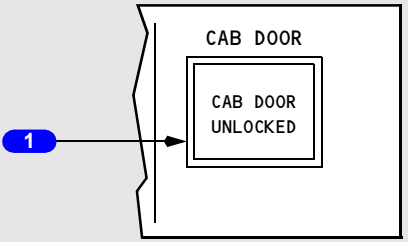
1 Passenger Cabin Emergency Lights Switch (guarded)

On – illuminates all emergency lights and bypasses flight deck control.

Doors

Cabin Door

[Original Flight Deck Door]



AISLE STAND

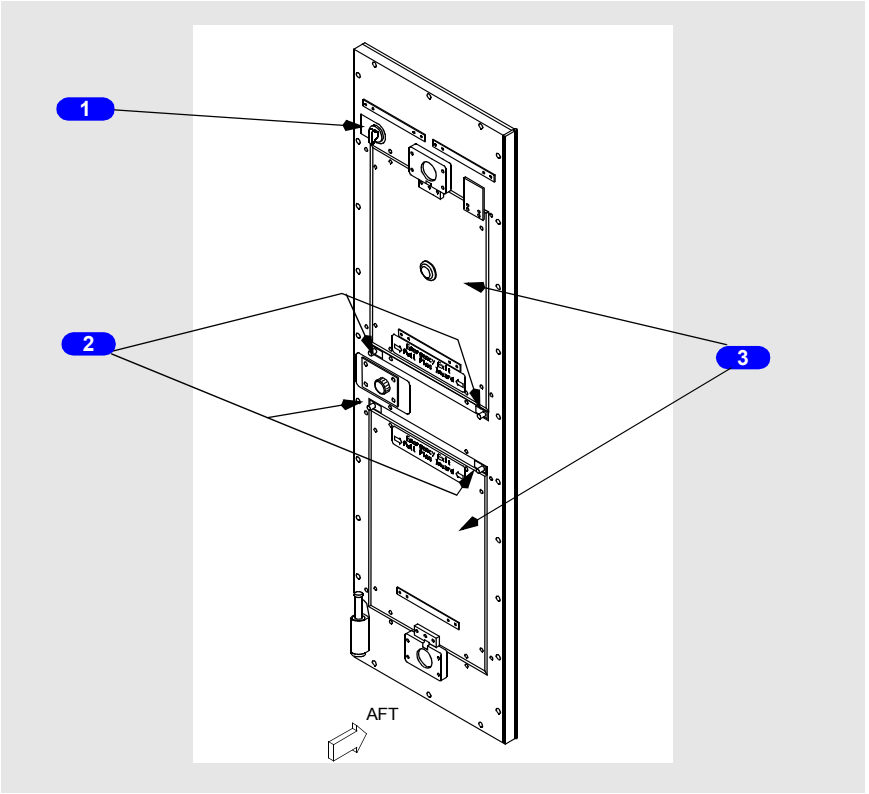
1 Cabin Door (CAB DOOR) Lock Switch

Illuminated (amber) – cabin door is unlocked.

Push – with DC power available, locks cabin door

Flight Deck Security Door

[New Flight Deck Security Door]



1 Deadbolt

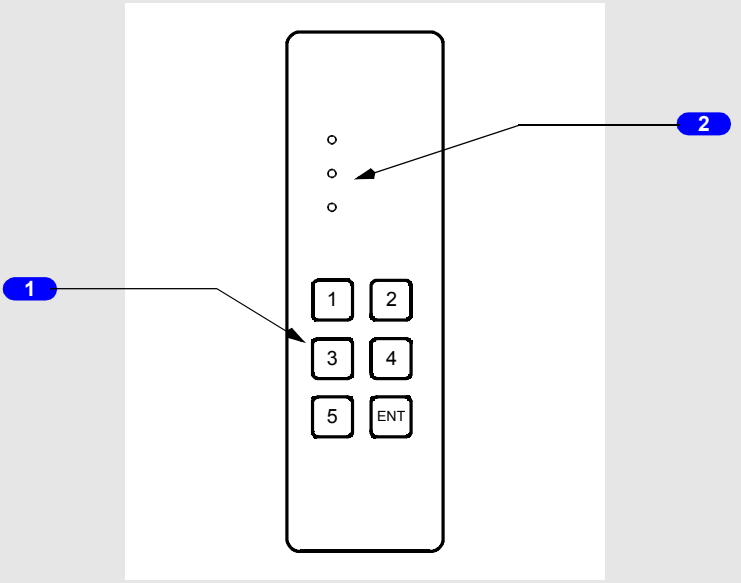
2 Release Pins

Pull pins inward - manually separates decompression panel from a jammed door to allow panel opening and egress.

3 Decompression Panel

Provides emergency egress path and automatically opens during cabin decompression.

Flight Deck Emergency Access Panel



PASSENGER SIDE DOOR POST

1 Keypad

Push - enters 3 to 8 digit emergency numeric access code. Entry of correct emergency access code sounds flight deck chime.

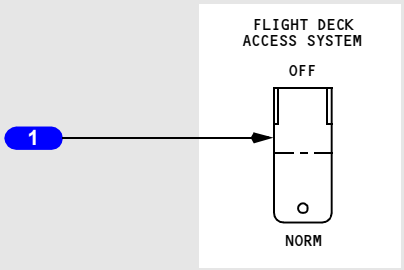
2 Access Lights

Illuminated (red) - door locked.

Illuminated (amber) - correct emergency access code entered.

Illuminated (green) - door unlocked.

Flight Deck Access System Switch



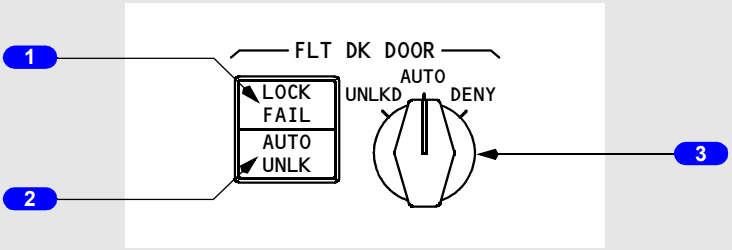
FLIGHT DECK SIDE DOOR POST

1 Flight Deck Access System Switch

OFF - removes electrical power from door lock.

NORM (Normal) - flight deck access system configured for flight.

Flight Deck Door Lock Panel



AISLE STAND

1 LOCK FAIL Light

Illuminated (amber) - Flight Deck Door Lock selector in AUTO and door lock has failed or Flight Deck Access System switch is OFF.

2 AUTO Unlock (UNLK) Light

Illuminated (amber) - correct emergency access code entered in keypad. AUTO UNLK light flashes and continuous chime sounds before timer expires and door unlocks.

3 **Flight Deck (FLT DK) Door Lock Selector**

Spring loaded to AUTO. Selector must be pushed in to rotate from AUTO to UNLKD. Selector must not be pushed in to rotate from AUTO to DENY.

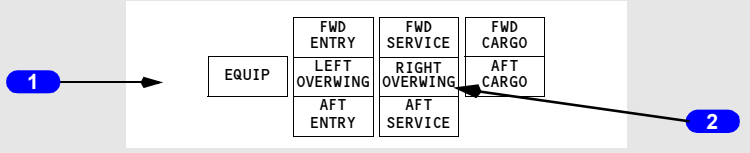
UNLKD - door unlocked while selector in UNLKD.

AUTO - door locked. Allows door to unlock after entry of emergency access code and expiration of timer, unless crew takes action.

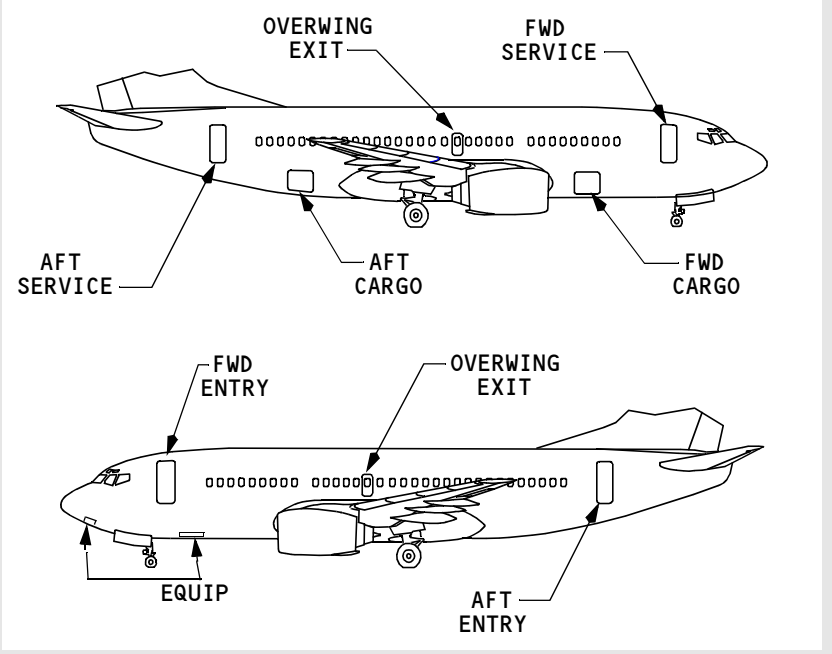
DENY - rejects keypad entry request and prevents further emergency access code entry for a time period.

Exterior Door Annunciator Lights

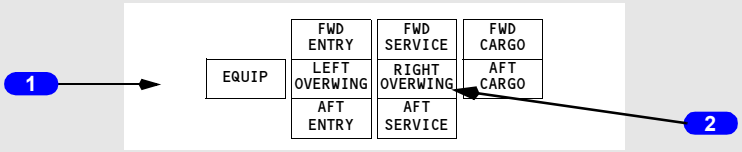
[Option - Typical 737-600 without airstairs]



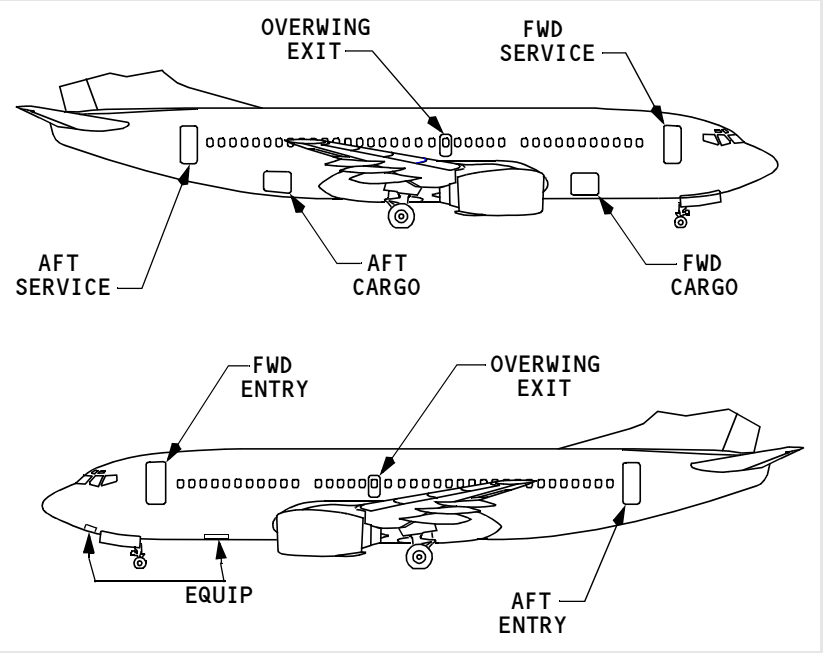
FORWARD OVERHEAD PANEL



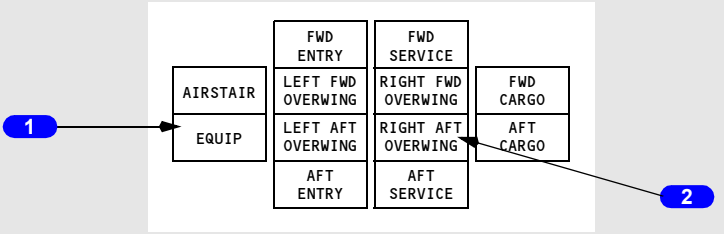
[Option - Typical 737-700 without airstairs]



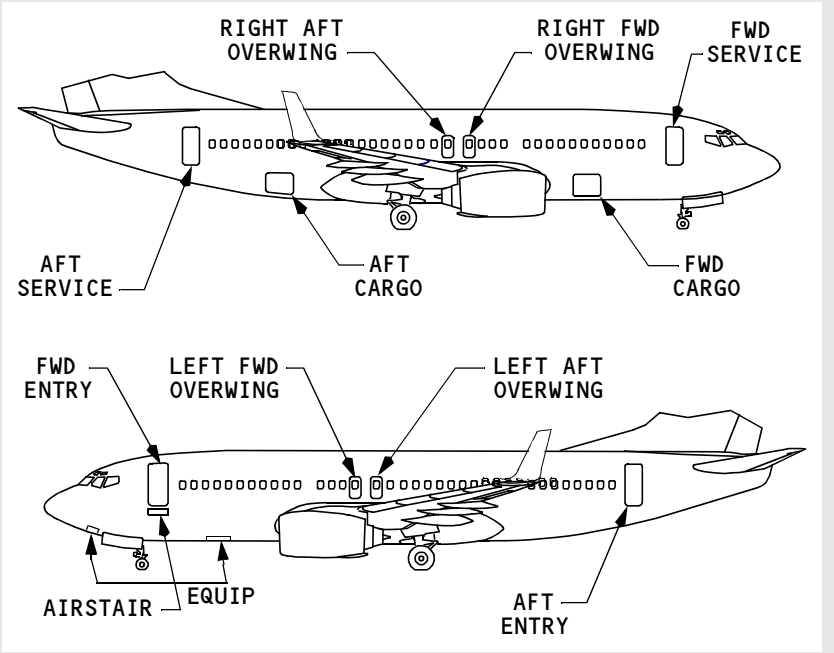
FORWARD OVERHEAD PANEL



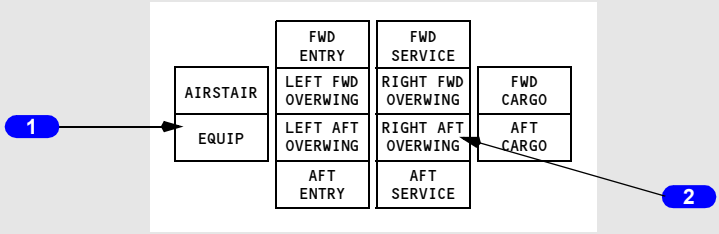
[Option - Typical 737-800/900 with airstairs and winglets]



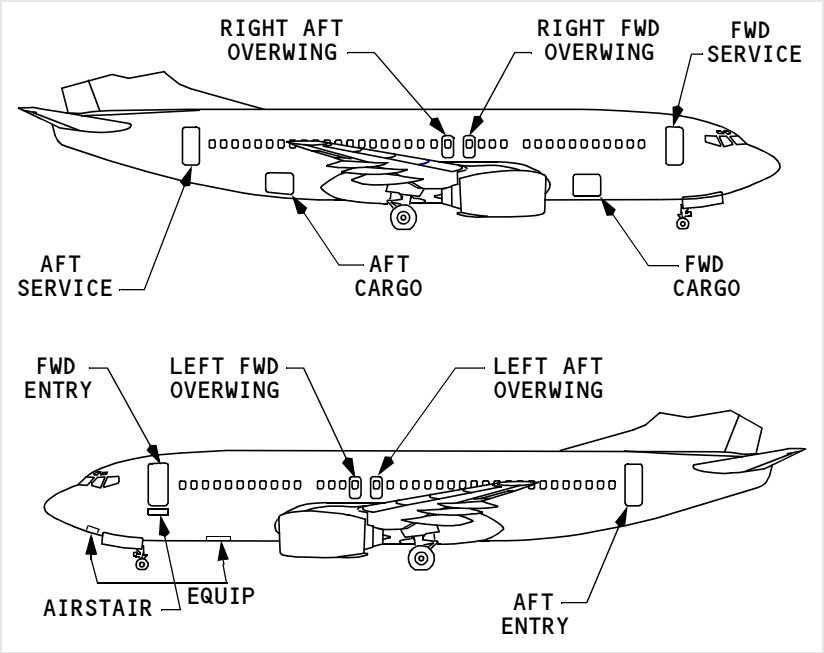
FORWARD OVERHEAD PANEL



[Option - Typical 737-900 with airstairs]



FORWARD OVERHEAD PANEL



1 Exterior Door Annunciations

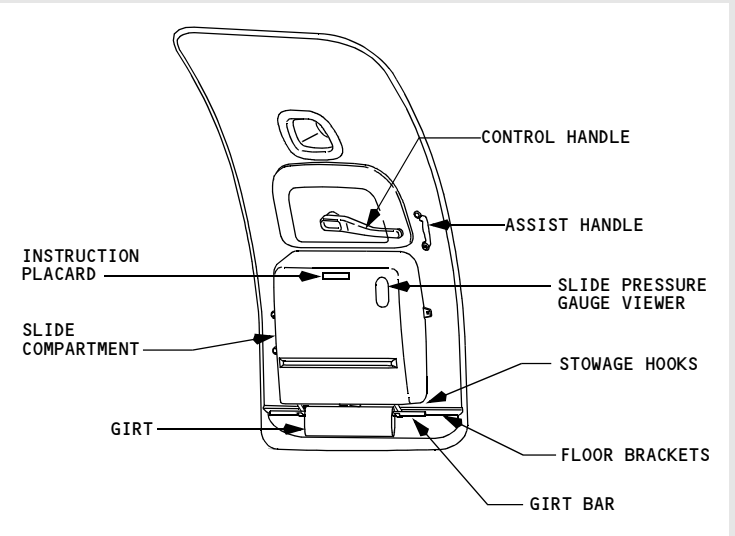
Illuminated (amber) – related door is not closed and locked.

2 Overwing Exit Annunciations

Illuminated (amber) –.

- related overwing exit is not closed and locked
- related flight lock failed to engage when commanded locked.

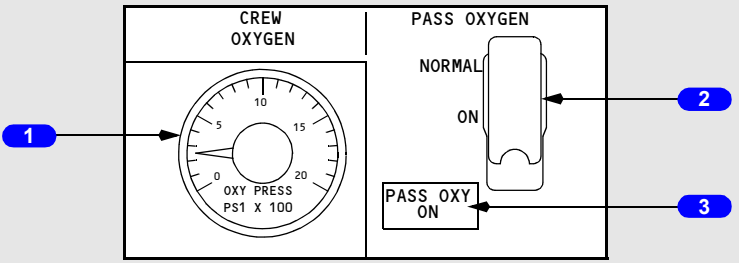
Passenger Entry/Galley Service Doors



PASSENGER CABIN

Oxygen

Oxygen Panel



AFT OVERHEAD PANEL

1 Flight CREW OXYGEN Pressure Indicator

Indicates pressure at the crew oxygen cylinder.

2 Passenger Oxygen (PASS OXYGEN) Switch

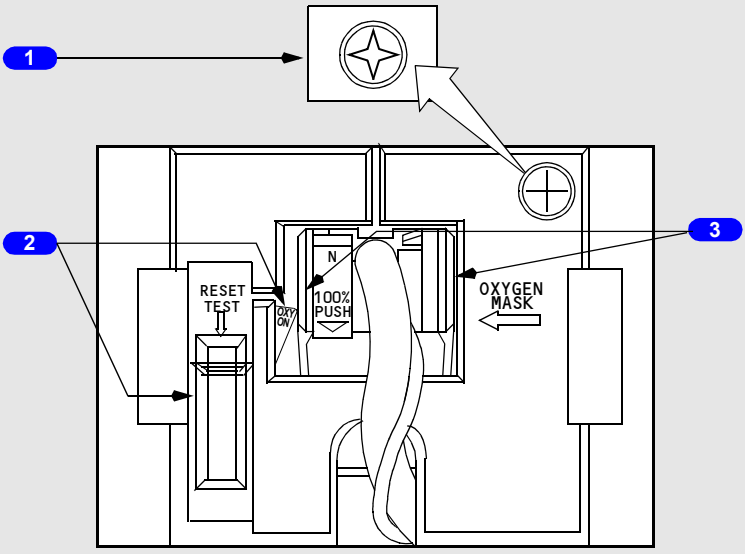
NORMAL – (guarded position) passenger masks drop and passenger oxygen system activated automatically if cabin altitude climbs to 14,000 feet

ON – activates system and drops masks if automatic function fails.

3 Passenger Oxygen On Light

Illuminated (amber) – passenger oxygen system is operating and masks have dropped.

Oxygen Mask Panel



CREWMEMBER STATION

1 Oxygen Flow Indicator

Indicates a yellow cross when oxygen is flowing.

2 RESET/TEST Slide Lever

Push –

- if mask is stowed, activates oxygen flow momentarily to test regulator
- if mask is not stowed and stowage box doors are closed, retracts OXY ON flag, shuts off oxygen, and shuts off microphone.

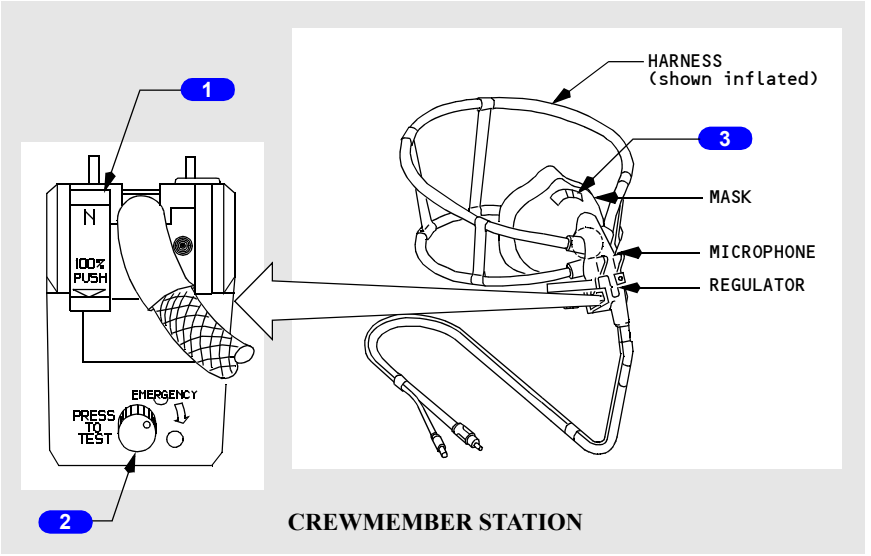
3 Inflation Levers

Squeeze and pull up –

- releases mask from stowage box
- releases OXY ON flag when stowage box doors open

- activates oxygen and microphone
- inflates mask harness when inflation lever is squeezed
- flow indicator shows a yellow cross momentarily as harness inflates.

Oxygen Mask and Regulator



CREWMEMBER STATION

1 NORMAL/100% Switch

N (normal) – supplies air/oxygen mixture on demand (ratio depends on cabin altitude).

100% – supplies 100% oxygen on demand.

2 Oxygen Mask EMERGENCY/Test Selector (rotary)

Rotate – supplies 100% oxygen under positive pressure at all cabin altitudes.

PRESS TO TEST – tests positive pressure supply to regulator.

3 Smoke Vent Valve Selector

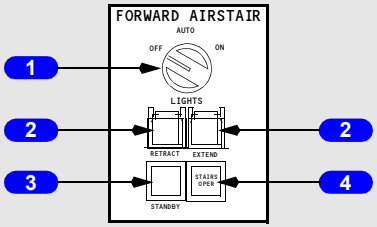
Up - vent valve closed.

Down - vent valve open, allowing oxygen flow to smoke goggles.

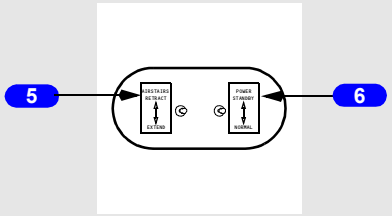
Forward Airstairs

Interior and Exterior Controls

[Option]



FORWARD ATTENDANT PANEL



BELOW AND AFT OF FWD ENTRY DOOR

1 LIGHTS Switch

AUTO – the airstair tread lights illuminate automatically upon airstair extension and extinguish upon retraction.

ON – illuminates the airstair tread lights.

2 Normal Control Switches

Note: AC and DC electrical power must be available on airplane.

RETRACT – retracts the airstair. The handrail extensions must be stowed prior to retracting the airstair.

EXTEND – extends the airstair.

3 STANDBY Control Switch

Note: Switch must be held in while using EXTEND or RETRACT. Battery switch must be ON.

Extend – extends the airstair.

Retract – retracts the airstair.

CAUTION: Use of standby bypasses all safety circuits. Airstair handrail extensions must be stowed or substantial damage could result.

4 STAIRS Operating (OPER) Light

Illuminated (amber) – indicates the airstair is in transit.

5 AIRSTAIRS Control Switch

EXTEND – extends the airstair.

RETRACT – retracts the airstair.

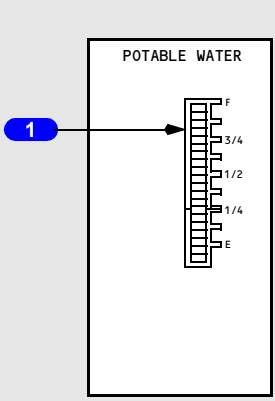
6 POWER Switch

(spring-loaded to NORMAL)

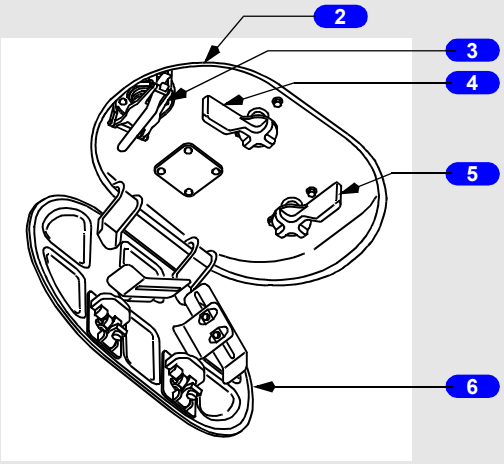
NORMAL – requires both AC and DC power.

STANDBY – requires DC power.

Water System Controls



AFT ATTENDANT PANEL



BELOW AFT ENTRY DOOR

1 Water Quantity Indicator

Indicates quantity of water in reservoir.

2 Water System Service Panel

3 Fill Fitting

Used to fill tank.

4 Fill and Overflow Valve Handle

Open - enables filling or gravity draining water tank.

Closed - normal position.

5 Tank Drain Valve Handle

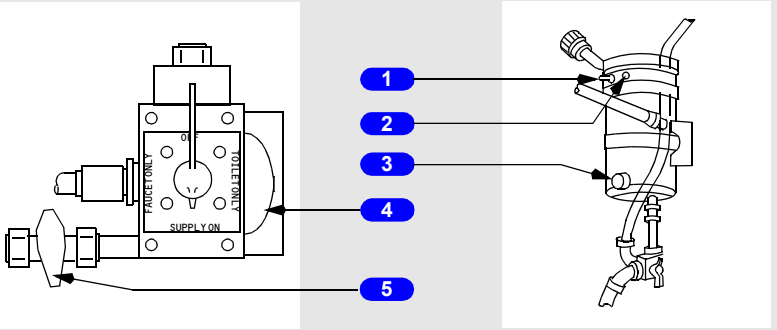
Open - drains water from tank.

Closed - normal position.

6 Access Panel

Cannot be closed unless the Fill and Overflow Valve and Tank Drain Valve Handles are in the closed position.

Lavatory Controls



LAVATORY SINK CABINET

1 Water Heater Switch

On – activates the water heater.

2 Water Heater Light

Illuminated - heater operating.

3 Temperature Control Switch

4 Water Supply Selector Valve

SUPPLY ON – provides water to lavatory sink faucets and water heater (normal position).

FAUCET ONLY– water is supplied to faucet only.

OFF – shuts off water to lavatory sink faucets and water heater.

TOILET ONLY– water is supplied to toilet only.

5 Drain Valve

Located in the forward lavatory.

Introduction

This chapter describes miscellaneous airplane systems, including:

- lighting systems
- oxygen systems
- fire extinguishers
- emergency equipment
- doors and windows
- cargo compartments
- emergency egress
- flight deck seats
- galleys
- water systems
- lavatories
- airstairs.

Lighting Systems

Lighting systems described in this chapter include:

- exterior lighting
- flight deck lighting
- passenger cabin lighting
- emergency lighting.

Exterior Lighting

Exterior lighting consists of these lights:

- landing
- runway turnoff
- taxi
- logo
- position (navigation)
- strobe
- anti–collision
- wing illumination
- wheel well.

Retractable Landing Lights

Retractable landing lights are installed in the lower airplane fuselage. The lights are designed to extend and shine forward, parallel to the waterline of the airplane. The lights may be extended at any speed.

Fixed Landing Lights

Two fixed landing lights are in the wing leading edge. The lights shine forward and down in a fixed position.

Runway Turnoff Lights

Runway turnoff lights are in each wing root. The lights illuminate the area in front of the main gear.

Taxi Lights

The taxi light is mounted on the nose wheel strut and points in the same direction as the nose wheel.

Logo Lights

Logo lights are located on the top of each horizontal stabilizer surface to point light on both sides of the vertical stabilizer.

Position Lights

The navigation lights are the standard red (left forward wingtip), green (right forward wingtip), and white (aft tip of both wings) position lights.

Strobe Lights

Three high intensity white strobe lights are installed on the left forward wing tip, right forward wing tip, and tail cone.

Anti–collision Lights

Two red anti–collision strobe lights are located on the top and bottom of the fuselage.

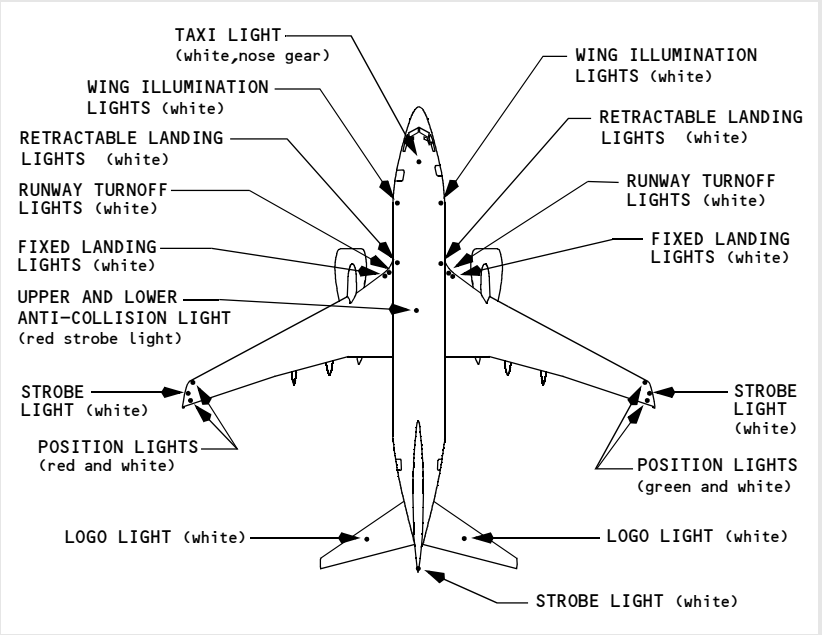
Wing Illumination Lights

Wing lights are installed on the fuselage and illuminate the leading edge of the wing.

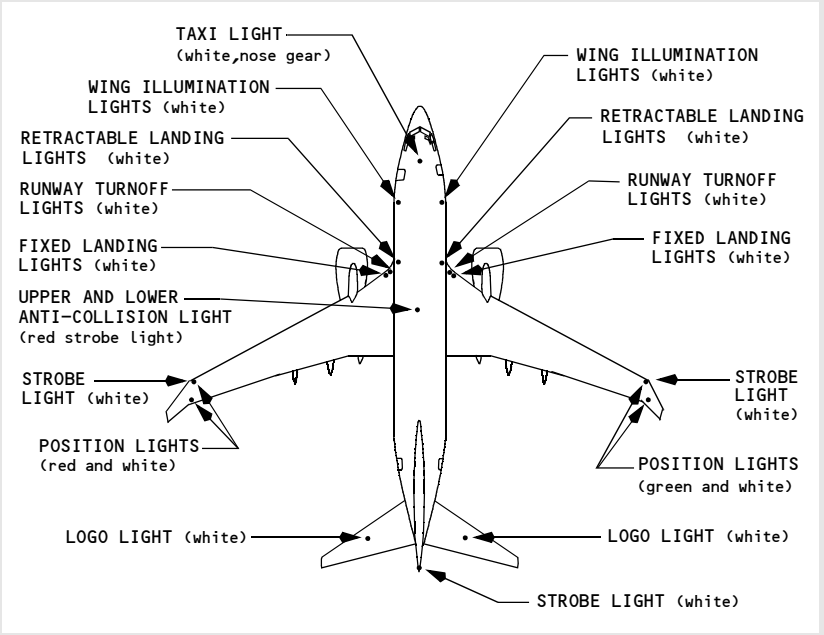
Wheel Well Lights

Lights are installed in the wheel well of the nose gear and each main gear.

Exterior Lighting Locations



[Option: Winglets]



Flight Deck Lighting

Flight deck lighting is provided for panel illumination, area lighting and localized illumination. Dome lights supply general flight deck flood lighting. The glareshield supplies background light for the main instrument panels. Each instrument and instrument panel has its own integral lights. Floodlights are installed for the MCP, aisle stand, and aft circuit breaker panel.

Map lights, chart lights and utility lights are available at the pilot stations, each with individual controls.

If normal electrical power is lost, standby electrical power is automatically provided to the standby compass light, dome lights, instrument flood lights and selected system information and warning lights.

Passenger Cabin Lighting

Passenger cabin lighting is supplied by incandescent and fluorescent lights. General cabin lighting is provided by window lights, ceiling lights, and entry lights. Reading lights are located above each passenger seat in the passenger service unit. Lights are also installed in the lavatories and galleys.

Passenger Cabin Signs

The passenger cabin signs are controlled by a switch on the forward overhead panel. With Auto selected, the signs are controlled automatically by reference to landing gear and flap positions:

FASTEN BELTS and RETURN TO SEAT signs:

- illuminate when flaps or gear are extended
- extinguish when flaps and gear are retracted.

NO SMOKING signs:

- illuminate when gear is extended
- extinguish when gear is retracted.

All passenger signs can be controlled manually by positioning the respective switch to ON or OFF.

When the passenger cabin signs illuminate or extinguish, a low tone sounds over the PA system.

Emergency Lighting

Exit lights are located throughout the passenger cabin to indicate the approved emergency exit routes. The system is controlled by a switch on the overhead panel. The switch has three positions, OFF, ARMED and ON and is guarded to the ARMED position. With the switch in the ARMED position, the emergency exit lights are normally extinguished. If electrical power to DC bus No. 1 fails or if AC power has been turned off, the emergency exit lights illuminate automatically.

The emergency exit lights may also be illuminated by a switch on the aft attendants panel. Lifting the guard and pushing the switch ON overrides the flight deck control and illuminates the emergency exit lights. Control from this panel is available in the event of failure of the automatic control.

The flight deck aft DOME light contains a separate bulb that is powered by the emergency lighting system to provide for flight deck evacuation.

Interior Emergency Lighting

Interior emergency exit lights are located:

- in the lower inboard corner of stowage bins to illuminate the aisle
- over the entry/service and overwing emergency hatches to indicate the door and hatch exits
- in the ceiling to locate the exits and provide general illumination in the area of the exits.

Self–illuminating exit locator signs are installed at the forward, middle, and aft end of the passenger cabin.

Floor proximity emergency escape path lighting consists of locator lights spaced at regular intervals down one side of the aisle. Lighted arrows point to overwing exits and a lighted EXIT indicator is near the floor by each door and overwing exit. Escape path markings are provided for visual guidance for emergency cabin evacuation when other sources of cabin lighting are obscured.

Interior Emergency Lighting

[Option: Photoluminescent Lighting System]
Interior emergency exit lights are located:

- in the lower inboard corner of stowage bins to illuminate the aisle
- over the entry/service and overwing emergency hatches to indicate the door and hatch exits
- in the ceiling to locate the exits and provide general illumination in the area of the exits.

Self–illuminating exit locator signs are installed at the forward, middle, and aft end of the passenger cabin.

A photoluminescent floor path marking system is installed along the cabin aisle. The photoluminescent material, when excited by light, will glow and provide exit path guidance. At the exit, electrically operated lights and markers provide exit identification.

The photoluminescent strips need to be properly charged. The table below contains charging information and can be used to determine how long the strips remain illuminated. For charging, the cabin ceiling, and sidewall lights need to be on at full intensity, and the strips should not be covered or blocked.

Charge Scenario	Photoluminescent Duration (Hours)	Remarks
First flight of the day - bins closed, no passengers • 5 minute charge • 10 minute charge • 15 minute charge • 30 minute charge • 45 minute charge	• 4.25 • 8 • 9.5 • 14 • 16	Close overhead bins during charging and cabin activity is limited to minor aisle traffic of crew and personnel. Passengers will shadow the system and are not allowed on board during charging.
First flight of the day - bins open, no passengers • 15 minute charge • 30 minute charge	• 5.75 • 7.5	Cabin activity is limited to minor aisle traffic of crew and personnel. Passengers will shadow the system and are not allowed on board during charging.
Photoluminescent duration can be extended beyond the initial charge, by using the following charge scenarios:		
In flight/taxi - with cabin lighting on	No limit with ceiling lights on dim or greater	
In flight/taxi - with cabin lighting off • 15 minute charge • 30 minute charge	• 8 • 11.25	Begin charging prior to previous discharge duration ending.

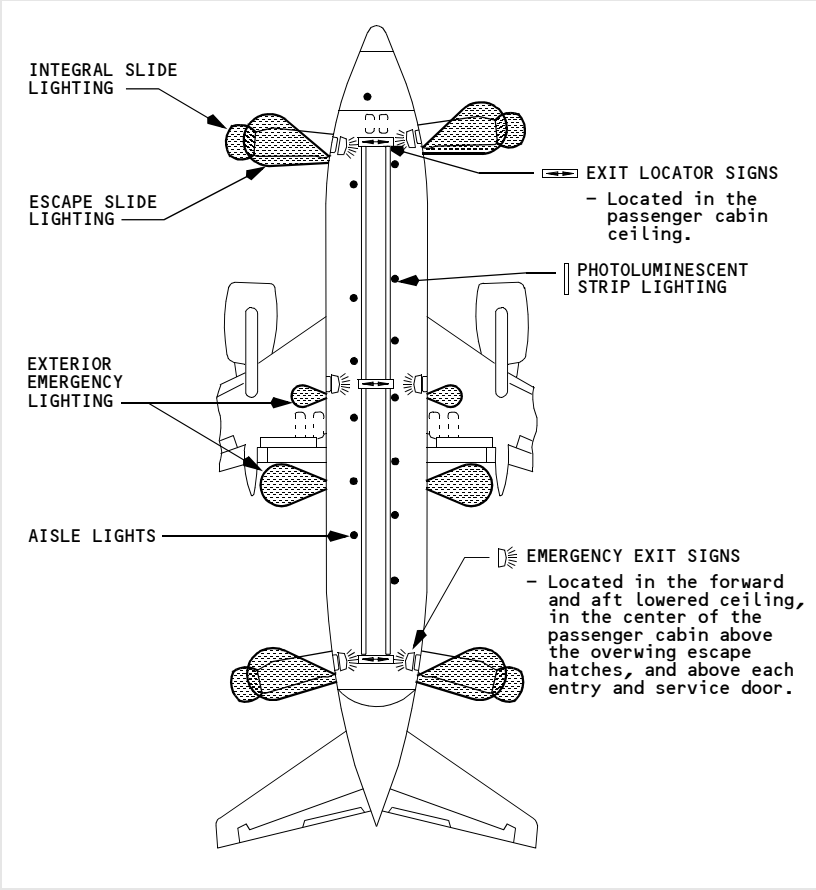
Charge Scenario	Photoluminescent Duration (Hours)	Remarks
Ground turn with bin doors open and passengers in seats • 15 minute charge • 30 minute charge	• 6.75 • 9	Bin doors can be open during charging. Passenger loading and unloading periods cannot be included in the charge time. Passengers can be on the airplane. Begin charging prior to previous discharge duration.
Ground turn with bin doors open and no passengers in seats • 15 minute charge • 30 minute charge	• 7.5 • 10	Bin doors can be open during charging. Passenger loading and unloading periods cannot be included in the charge time. Passengers cannot be on the airplane. Begin charging prior to previous discharge duration.

Exterior Emergency Lighting

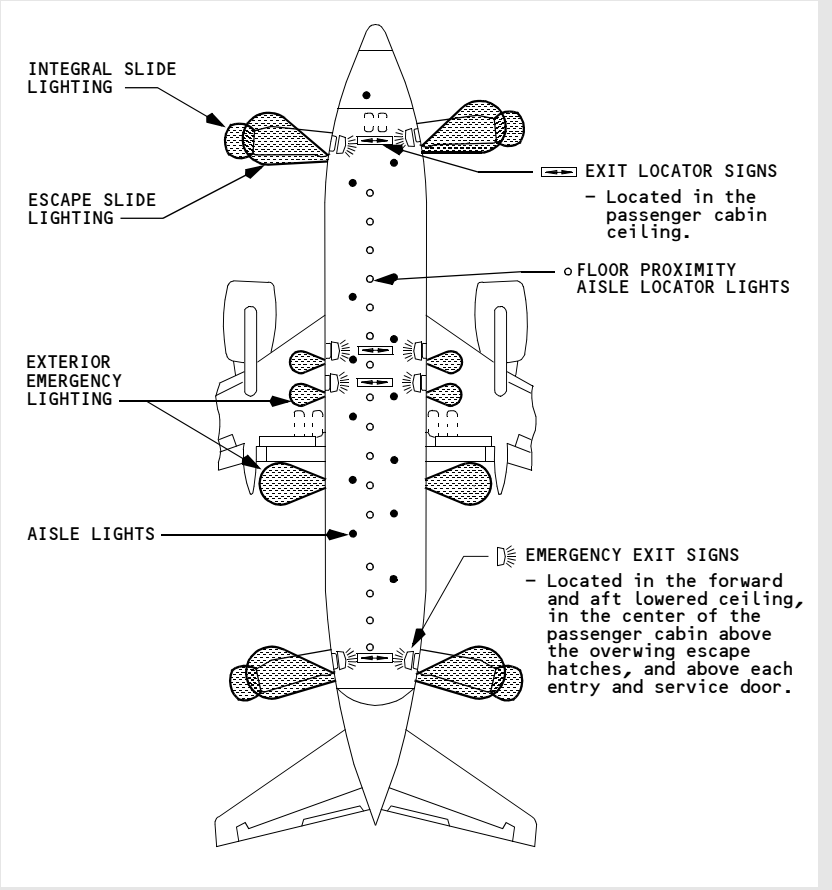
Exterior emergency lights illuminate the escape slides. The fuselage installed escape slide lights are adjacent to the forward and aft service and entry doors. Lights are also installed on the fuselage to illuminate the overwing escape routes and ground contact area.

Emergency Exit Lighting

[Option - 737-600/700]



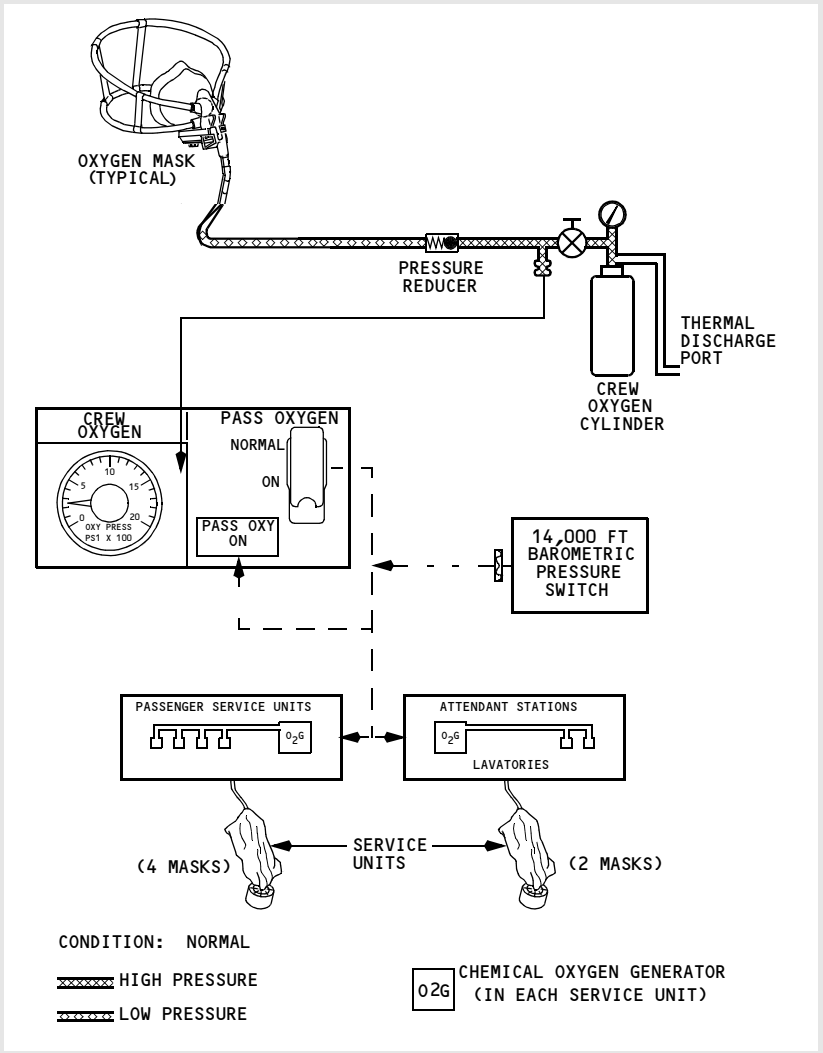
[Option - 737-800/900]



Oxygen Systems

Two independent oxygen systems are provided, one for the flight crew and one for the passengers. Portable oxygen cylinders can be located throughout the airplane for emergency use. These cylinders are normally found in the forward and aft areas of the passenger cabin.

Oxygen System Schematic



Flight Crew Oxygen System

The flight crew oxygen system uses quick-donning, diluter-demand masks/ regulators located at each crew station. Oxygen is supplied by a single cylinder. Oxygen pressure is displayed on the Oxygen Pressure indicator located on the aft overhead panel when the battery switch is ON. Oxygen flow is controlled through an in-line, pressure-reducing regulator to supply low-pressure oxygen to the regulator on the mask. System pressure may be as high as 1850 psi.

Oxygen flow is controlled by a regulator mounted on the oxygen mask. By pushing the NORMAL/100% control lever, the regulator is adjusted from the air/oxygen mixture to 100% oxygen. By rotating the EMERGENCY/PUSH TO TEST selector, the regulator is adjusted to supply oxygen under pressure.

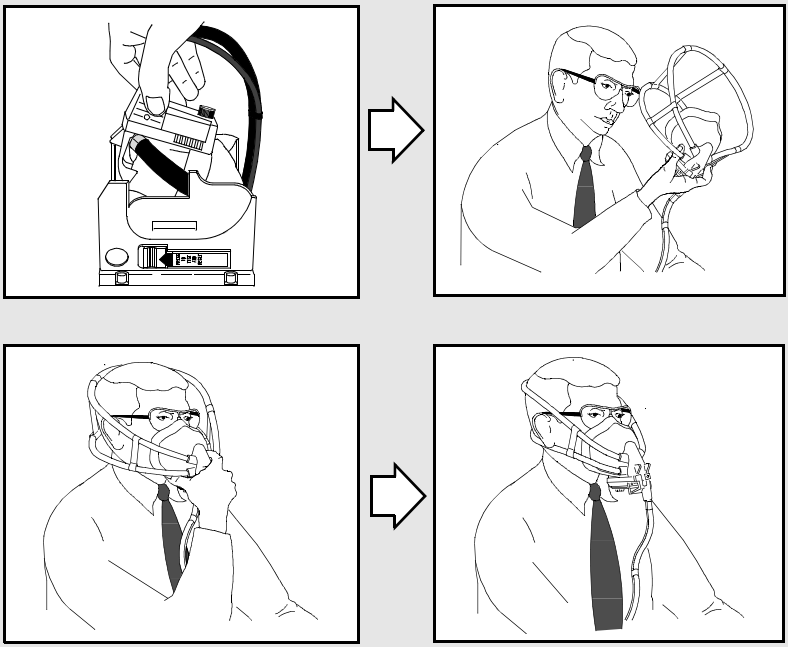
Flight Crew Oxygen Mask Usage

Donning Instructions

To don the mask, grasp the regulator with the thumb and forefinger and remove from stowage. Squeezing the inflation levers and removing from the box:

- inflates the mask harness
- momentarily displays a colored oxygen flow indicator.
- Place the mask over the head and release the levers. The harness contracts to fit the mask to head and face.

The observer's oxygen mask, regulator, and harness unit is the same as the pilots'.



Mask Donning

Portable Protective Breathing Equipment

Protective Breathing Equipment (PBE/Smoke Hood) devices for crew use (for combating fires and/or entering areas of smoke or fume accumulation) may be stowed throughout the airplane; however, they are normally found in the forward and aft sections of the passenger cabin. The device is placed over the head and, when activated, provides approximately 15 to over 20 minutes of oxygen depending upon the device used. Manufacturer's operating instructions are placarded on the container.

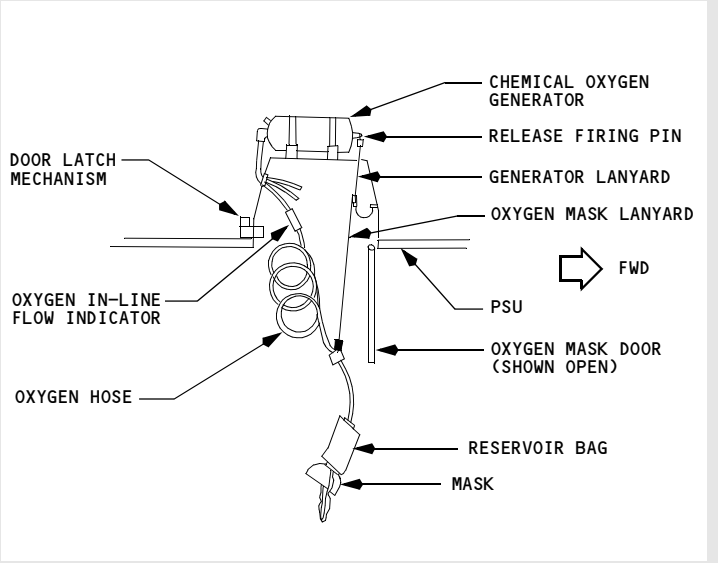
Passenger Oxygen System

The passenger oxygen system is supplied by individual chemical oxygen generators located at each Passenger Service Unit (PSU). Four continuous flow masks are connected to each generator. A generator with two masks is located above each attendant station and in each lavatory.

The system is activated automatically by a pressure switch at a cabin altitude of 14,000 feet or when the Passenger Oxygen Switch on the aft overhead panel is positioned to ON. When the system is activated, the PASS OXY ON light illuminates and OVERHEAD illuminates on the Master Caution System.

Activating the system causes the masks to drop from the stowage compartments. The oxygen generators are activated when any mask in the unit is pulled down. Pulling one mask down causes all masks in that unit to come down and 100% oxygen flows to all masks. A green in–line flow indicator is visible in the transparent oxygen hose whenever oxygen is flowing to the mask. Oxygen flows for approximately 12 minutes and cannot be shut off. If the passenger oxygen is activated and a PSU oxygen mask compartment does not open, the masks may be dropped manually.

PSU Oxygen Mask Compartment



WARNING: When using passenger oxygen, the "NO SMOKING" sign should be strictly observed. Once the generator is activated, the flow of oxygen is constant, whether or not the mask is being worn.

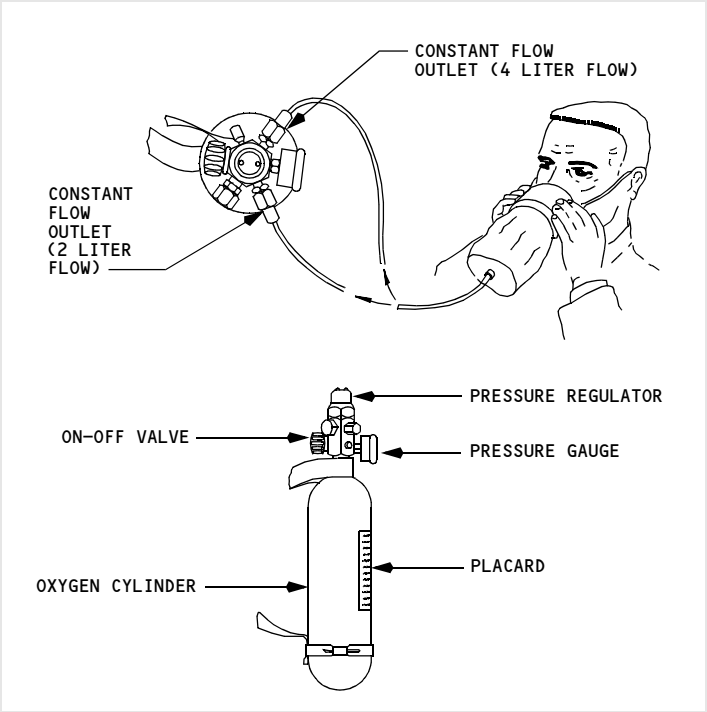
WARNING: Do not use passenger oxygen with cabin altitude below 14,000 feet when smoke or an abnormal heat source is present. The use of passenger oxygen does not prevent the passengers from inhaling smoke. Air inhaled is a mixture of oxygen and cabin air.

Passenger Portable Oxygen

First aid and supplemental portable oxygen cylinders are installed at suitable locations in the passenger cabin. The cylinders are fitted with a pressure gage, pressure regulator and on–off valve. The cylinders are pressurized to 1800 psi. At this pressure and a temperature of 70 degrees Fahrenheit, (21 degrees Celsius) the cylinders have a capacity of 4.25 cubic feet (120 liters) of free oxygen. Two continuous flow outlets are provided on each cylinder, one regulates flow at two liters per minute for walk–around; the second outlet provides flow at four liters per minute. The four–liter flow is used for first aid.

Duration can be determined by dividing capacity by outflow (120 liters divided by 4 liters/minute = 30 minutes).

Passenger Portable Oxygen Schematic



Fire Extinguishers

Fire extinguishers are located in the flight deck and passenger cabin.

Water Fire Extinguishers

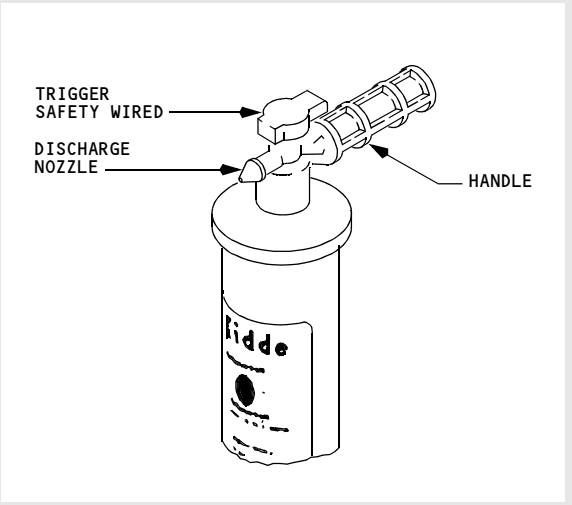
Water fire extinguishers contain a solution of water mixed with antifreeze. The container is pressurized by a CO2 cartridge when the extinguisher handle is rotated fully clockwise. The extinguisher should be used on fabric, paper or wood fires only.

To use the water fire extinguisher:

- remove from stowage
- rotate handle fully clockwise
- aim at base of fire and press trigger.

CAUTION: Do not use on electrical or grease type fires.

Water Fire Extinguisher



Halon (BCF) Fire Extinguishers

Halon (BCF) fire extinguishers contain a liquefied gas agent under pressure. The pressure indicator shows an acceptable pressure range, a recharge range, and an overcharged range. A safety pin with a pull ring prevents accidental trigger movement. When released the liquefied gas agent vaporizes and extinguishes the fire. The extinguisher is effective on all types of fires, but primarily on electrical, fuel and grease fires.

To use the Halon fire extinguisher:

- remove from stowage
- hold upright and remove ringed safety pin
- aim at base of fire from a distance of six feet and press top lever
- use side to side motion to suppress fire.

BCF Fire Extinguisher (Halon 1211)