Flying the NGX

A Flight Crew Operations Manual for the Boeing 737- 800 NG

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Version 1.0

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About this manual

This manual has been produced with three purposes in mind. First, to assist in learning how to proficiently fly the PMDG 737-800 NGX, starting from a cold and dark cockpit environment. Secondly to master the programming of the NGX Flight Management Computer (FMC) via the Computer Display unit (CDU). Thirdly, to prepare for flying a fully operational 737-800 simulator operated by *Flight Experience*™.

The manual has been compiled from a range of resources and acknowledgement is given to the work that has been done by others prior to this publication on the reference page at the end of the document.

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Operational Limitations

Limitations**,** Normal Procedures and Supplementary Procedures in this manual are based on a Boeing FCOM. Some parts have been shortened or abbreviated for editorial purposes and in consideration of the limitations of the PMDG 737-800 NGX and Microsoft *Flight Simulator X*.

Operational Limitations

Maximum Takeoff and land tailwind component	15 knots
Maximum takeoff and landing crosswind component	33 knots (winglets) 36 knots (no winglets)
Maximum Operating Altitude	41,000 feet
Maximum takeoff and landing altitude	8,400 feet

Weight Limitations

Maximum Taxi Weight (MTW)	133,500 pounds
Maximum Takeoff Weight (MTOW)	133,000 pounds
Maximum Landing Weight (MLW)	128,000 pounds
Maximum Zero Fuel Weight (ZFW)	120,500 pounds

Autopilot/Flight Director System

Do not engage the autopilot below 400 feet.

The autopilot will disengage below 50 feet AGL

The maximum wind speeds for landing with autopilot are:

- Headwind**,** 25 knots
- Crosswind, 20 knots
- Tailwind 10 knots

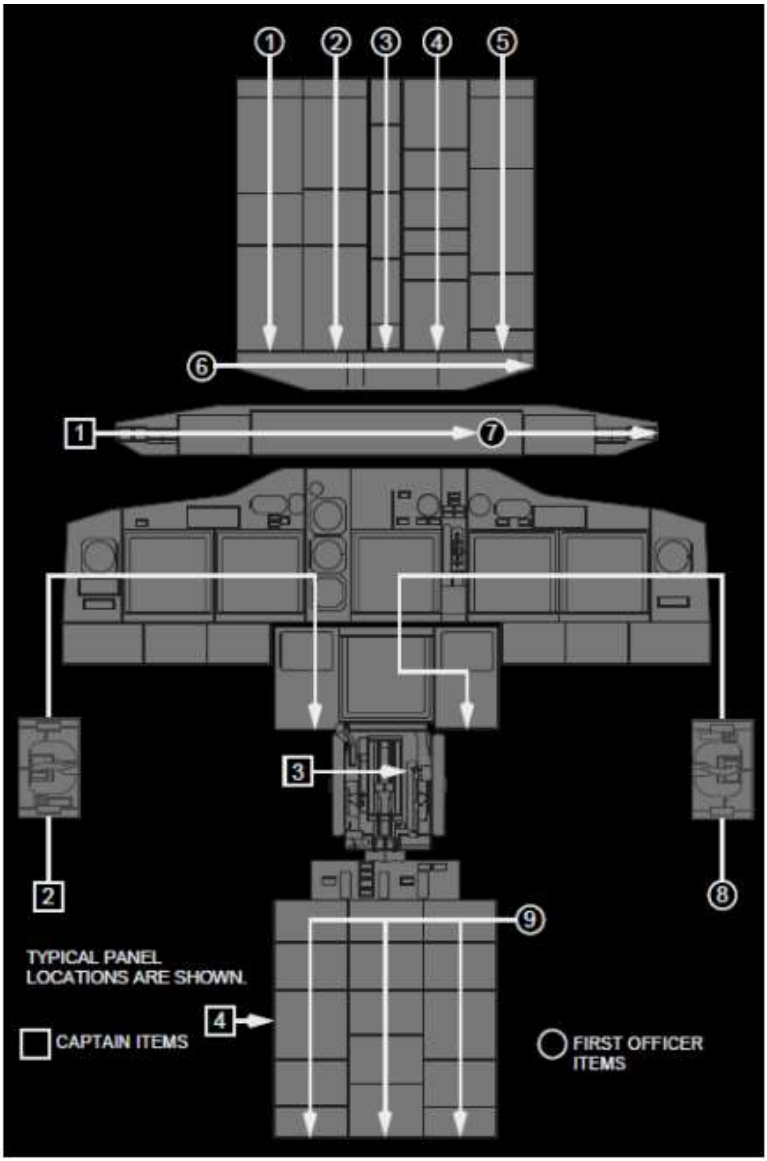
Engines and APU

Maximum and minimum limits are shown in red in the displays. Engine Ignition must be used for takeoff, landing, operating in heavy rain and anti-ice operation. Maximum altitude for using APU is 10,000 feet.

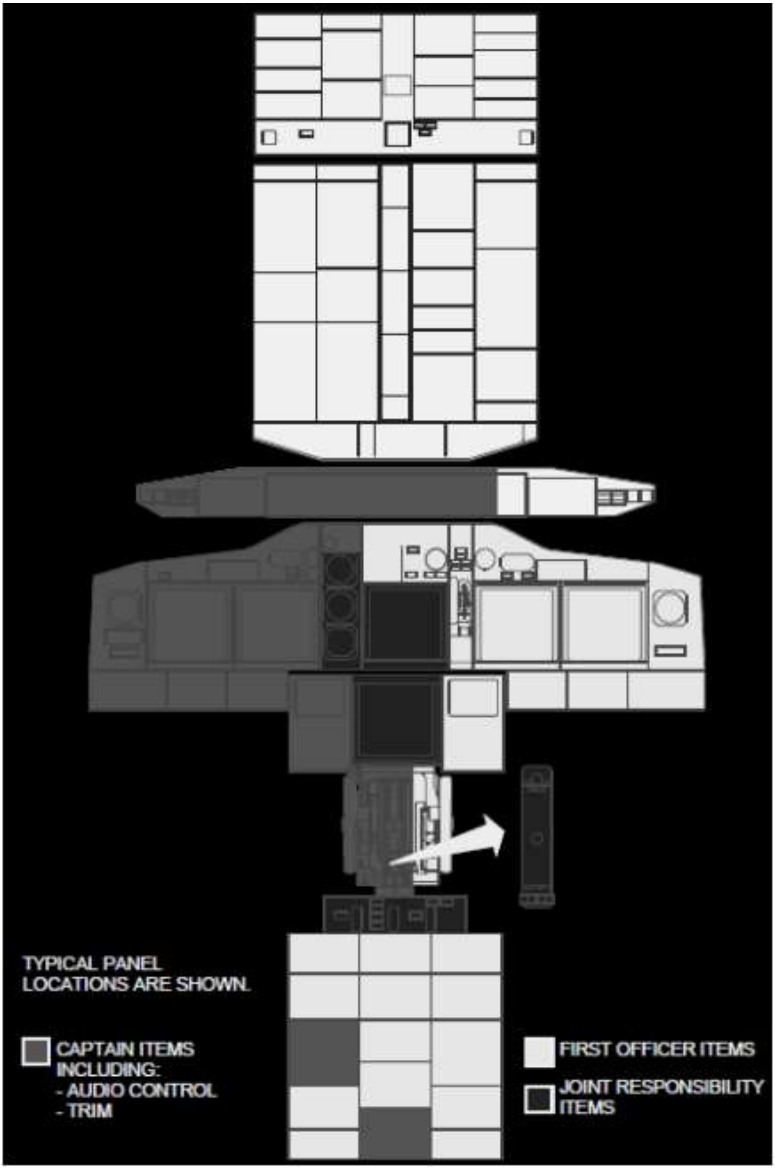
Flight Controls

Maximum altitude for flap extension is 20,000 feet.

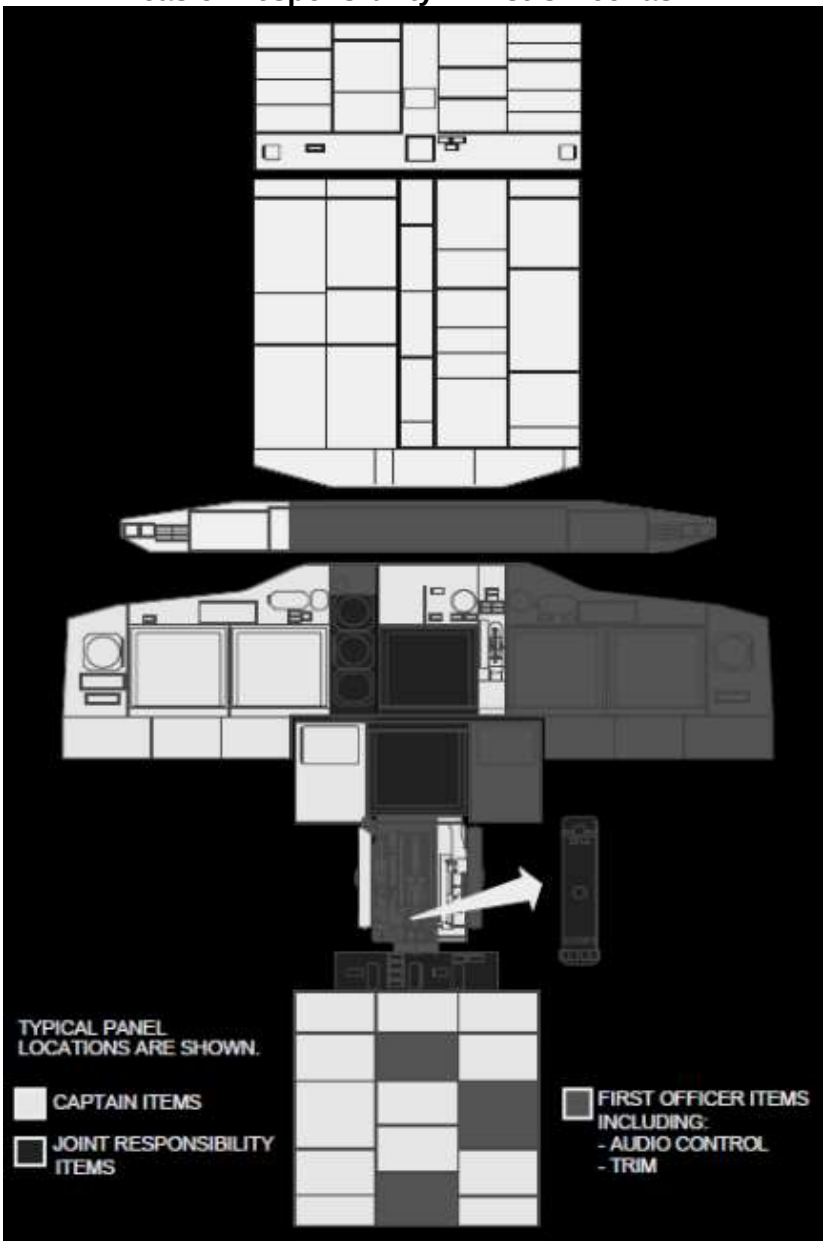
Pre-flight and Post-flight Scan Flow



Areas of Responsibility – Captain as PF



Areas of Responsibility – First Officer as PF



737 – 800 Main Overhead Panel

Flight Control Panel	26. STANDBY POWER switch	**Air Conditioning Panel**
1. FLT CONTROL switches	27. BAT DISCHARGE, TR UNIT, & ELEC lights	53. AIR TEMP SOURCE selector
2. LOW PRESSURE lights	28. DRIVE DISCONNECT switches	54. TRIM AIR switch*
3. SPOILER switches	29. DRIVE lights	55. DUCT OVERHEAT lights*
4. YAW DAMPER light	30. BUS TRANSFER switch	56. ZONE TEMP lights*
5. YAW DAMPER switch	31. TRANSFER BUS OFF light	57. RAM DOOR FULL OPEN lights*
6. STANDYBY HYD lights	32. SOURCE OFF lights	58. RECIRCULATION FAN switches
7. ALT FLAPS master switch	33. GEN BUS OFF light	59. Air Con PACK switches
8. ALT FLAPS position switch	34. APU switch	60. ISOLATION VALVE switch
9. FEEL DIFF PRESS light	35. APU GENERATOR bus switches	61. APU BLEED air switch
10. SPEED TRIM FAIL light	36. LAVATORY SMOKE light	**CABIN PRESSURISATION**
11. MACH TRIM FAIL light	37. EQUIPMENT COOLING switches	62. AUTO FAIL light
12. AUTO SLAT FAIL light	38. EMERGENCY EXIT switch	63. OFF SCHED DESCENT light*
13. VH NAV transfer switch	39. PASSENGER SIGNS switches	64. FLIGHT ALTITUDE indicator*
14. IRS transfer switch	40. WINDSHIELD WIPER switch	65. LANDING ALT indicator
Displays Panel	41. WINDOW HEAT switches	66. Pressurisation MODE selector
15. SOURCE selector	42. PROBE HEAT switches	67. ALTN light*
16. CONTROL PANEL switch	43. WING ANTI-ICE switch	68. MANUAL light*
17. ENG VALVE CLOSED light	44. VALVE OPEN lights	**Lighting Panel**
18. SPAR VALVE CLOSED light	45. ENGINE ANTI-ICE switches	69. LANDING light switches
19. FILTER BYPASS lights	46. COWL ANTI-ICE lights	70. RUNWAY TURNOFF lights
20. CROSS FEED selector	47. COWL VALVE OPEN lights	71. TAXI light switch
21. FUEL PUMP switches	48. ENGINE HYD PUMP switches	72. IGNITION SELECT switch
22. Cent tank LOW PRESS lights	49. Eng Hyd LOW PRESSURE light	73. ENGINE START switches
23. Wing tank LOW PRESS lights	50. ELECTRIC HYD PUMP switches	74. LOGO light switch
Electrical Panel	51. Elec Hyd OVERHEAT lights	75. POSITION light switch
24. BATTERY switch	52. Elec Hyd PRESSURE lights	76. ANTI COLLISION light switch
25. CAB/UTIL switch		77. WING lights switch

*Not shown on this diagram

NOTE: An A4-sized version of the annotated 737-800 Main Overhead Panel shown on page 9 is available on the Flight Simulation Australia website www.flightsimaus.com.au.

Computer Display Unit (CDU)

FSX Preflight Preparations

Establish CDU cold and dark panel state (FSX)

- Display CDU [Shift+3]
- Clear messages [CLR]
- PMDG SETUP [4R]
- PANEL STATE LOAD [2R]
- NGX CLDDRK [1L]
- EXEC

Electrical Power Up Procedure

Battery Switch……GUARDS CLOSED

Standby Power Switch……...GUARDS CLOSED

Alternate Flaps Master Switch……GUARDS CLOSED

Windshield Wiper Selectors……PARK

Electric Hydraulic Pump Switches……OFF

Landing Gear Lever……DN

- Verify green landing gear indicator lights illuminated
- Verify red landing gear indicator lights extinguished

Ground Power (if external power is needed..CONNECTION

- Verify GRD Power Available Light is illuminated

Ground Power Switch……..ON

- Verify Source OFF Lights are extinguished
- Verify transfer Bus OFF Lights are extinguished
- Verify Power OFF Indicator Light is extinguished

Engine/APU Fire System & Extinguishers……..TEST

Overheat Detector Switches……...NORMAL

Test Switch……Hold to FAULT/INOP

- Verify MASTER CAUTION Light is illuminated
- Verify OVHT/DET light is illuminated
- Verify FAULT and APU DET INOP lights illuminated

Test Switch……...Hold to OVHT/FIRE

- Verify fire bell
- Verify left & right red FIRE WARN lights illuminated
- Verify left & right yellow MASTER CAUTION lights illuminated.

Master FIRE WARN Light & Bell……..…PUSH TO CANCEL

- Verify both FIRE WARN lights are extinguished
- Verify fire warning bell cancels
- Verify Engine 1, APU, Engine 2 fire switches remain illuminated
- Verify ENG 1 OVERHEAT, and ENG 2 OVERHEAT lights are illuminated.
- Verify WHEEL WELL lights stay illuminated.

Test Switch (cancel)……..……CENTRE

Extinguisher Test Switch……POSITION 1 and HOLD

- Verify test lights are green illuminated

Extinguisher Test Switch……..POSITION 2 AND HOLD

CHECKLIST COMPLETE

Preliminary Preflight Procedure

Start the Preliminary Preflight Procedure when electrical power is on, after the Power Up Procedure or when another crew left the cockpit with power on.

IRS Mode Selectors……..……OFF then NAV

Voice Recorder Switch…….……ON

Maintenance documents……CHECK

Emergency equipment……..…CHECK

PSEU Light……...……..Verify EXTINGUISHED

GPS Light…….……Verify EXTINGUISHED

Interphone Switch……..…….OFF

Engine Panel……..……..……SET

- Verify Reverser Lights are extinguished
- Verify Engine Control Lights are extinguished
- EEC Switches ON

Oxygen Panel……..……..SET

- Passenger Oxygen Switch GUARD/CLOSED
- Verify PASS OXY light is extinguished

Landing Gear lights…….……Verify ILLUMINATED

Manual gear extension door……..……..CLOSED

Parking Brake……..……..SET

CHECKLIST COMPLETE

CDU Preflight Procedure

Captain or first officer can start the CDU Preflight Procedure any time after the Preliminary Preflight Procedure. All entries must be verified by the other pilot. In general, the CDU Preflight Procedure will be done between preflight procedure.

Initial Data……..……....SET

IDENT page

- Verify model and engine rating correct
- Verify that the data base is correct

POS INIT page

- Establish root menu: [MENU]
- Display POS INIT page: FMC [1L]
- Verify the time is correct
- Select POS IDENT: POS INIT [6R]
- Enter current position via SP: REF AIRPORT [2L]

Navigation Data……..……...SET

Route page

- Display RTE page: ROUTE [6R]
- Enter ORIGIN airport via SP to [L1]
- Enter DEST airport via SP to [1R]
- Enter FLT NO via SP to [2R]
- Enter CO ROUTE (if required) via SP to [2L]
- Go to next page: NEXT PAGE
- Enter intermediate waypoints via SP to Right LSKs
- Enter selected SID: DEP/ARR + DEP [1L]
- Select departure runway: Right LSKs
- Select departure: NEXT PAGE + an LSK

Departures page

- Display DEP ARR INDEX page: DEP ARR
- Select DEPARTURES page: DEP [1L]
- Select departure runway: Right LSKs
- Select required SID: Left LSKs (NEXT PAGE if needed)

An option at this point is to make the STAR and Approach entries if known or it can be deferred to enroute after receiving arrival vectors from ATC.

STAR and Approach entry

- Display ARRIVAL STARS: DEP/ARR + ARR [2R]
- Select planned STAR: Left LSKs
- Select planned transition point: An LSK below the STAR.

Activate and execute route

- Display RTE page: ROUTE
- Select RTE Page 2: NEXT PAGE
- Activate route: ACTIVATE [6R]
- Execute: EXEC
- Check LEGS page for any route discontinuity and amend as needed.

Fuel and Payload……..SET

Load fuel

- Display FUEL page: FS ACTIONS [5R] + FUEL [1L]
- Enter set fuel quantity by Right LSKs
    - SET FULL [3R]
    - SET 2/3 [4R]
    - SET 1/3 [5R]

OR enter by SP entry

- TANK 1 [2L]
- TANK 2 [3L]
- CENTRE TANK [4L]

Note the ZFW and CG values.

Payload – passengers

- Display PAYLOAD page: RETURN [6L] + PAYLOAD [2L]
- Enter passenger payload by Right LSKs
    - SET FULL [4R]
    - SET EMPTY [5R]
    - SET RANDOM [6R]

- OR enter by SP entry
  - FIRST CLASS [1L]
  - COACH [2L]

Payload – cargo
- Return to root FS ACTIONS page: RETURN [6L]
- Display PAYLOAD page: PAYLOAD [2L]
- Enter cargo weight by Right LSKs
  - SET FULL [4R]
  - SET EMPTY [5R]
  - SET RANDOM [6R]
- OR set by SP entry
  - AFT CARGO [5L]
  - FWD CARGO [4L]

Performance Data……..…..SET
Fuel Weight
- Display PERF REF page: FMC [1L]
- Enter ZFW via SP to: ZFW [3L]
- Enter reserve value via SP to: RESERVES [4L]
- Verify sufficient fuel and CDU fuel quantity agree

Cost Index
- Enter Cost Index <2.6> via SP to: COST INDEX [5L]

If the destination fuel is predicted to be below 2000lbs, regardless of reserves, an INSUFFICIENT FUEL message appears

Cruise Altitude
- Enter <cruise altitude> via SP to: CRZ ALT [1R]
- Execute PERF REF data: EXEC

N1 Limits
- Display N1 LIMIT page: N1 LIMIT
- Select Takeoff Derate thrust
  - Derate 24K thrust: TO-1 [3L]
  - Derate 22K thrust: To-2 [L4]
  - Takeoff Bump: TO-B [L5]
- Enter OAT via SP to: SEL/OAT [L1]

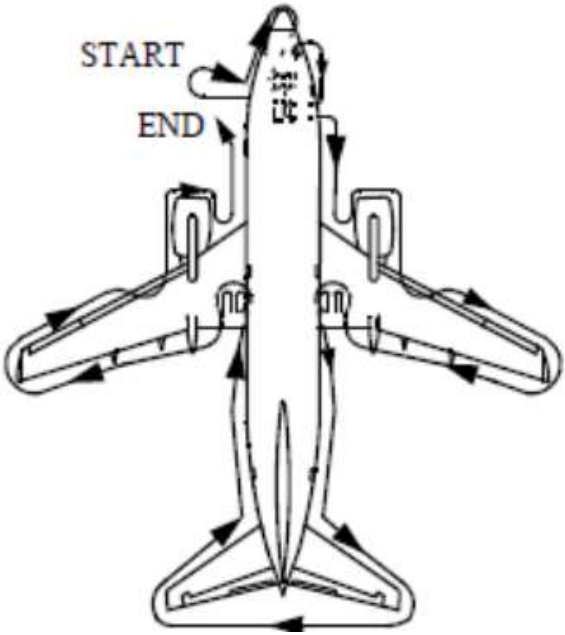
Takeoff Reference

- Display TAKEOFF REF page: [6R]
- Enter <5> (flaps 5) via SP to: FLAPS [1L]
- Enter CG via SP to: CG [3L]
- Verify Trim value
- Select or enter takeoff V speeds:
  - V1 [R1]
  - VR [R2]
  - V2 [R3]
- Enter ACCEL HT (1500 AGL): NEXT PAGE + [4L]
- Enter EO ACCEL HT (800 AGL): [4R]

CDU SETUP COMPLETE

External Inspection

Before each flight the captain or first officer or maintenance crew must verify that the aircraft is able for a safe flight. Check that nothing is damaged, full compressed and each inlet is clear of dirt. Walk around the way shown below and check all necessary items like engine inlets, gear and lights.



In FSX this is not necessary as outside damage is not simulated.

Preflight Procedure – First Officer

FLIGHT CONTROL PANEL

Flight Control Switches……..……GUARDS CLOSED

- Verify LOW PRESSURE lights are illuminated

Flight Spoiler Switches……..…….GUARDS CLOSED

Yaw Damper Switch……..……ON

- Verify standby hydraulic LOW QUANTITY light is extinguished
- Verify standby hydraulic LOW PRESSURE light is extinguished

Alternate Flaps Master Switch…….GUARD CLOSED

Alternate Flaps Position Switch……..……..OFF

- Verify FEEL DIF PRESSURE light is extinguished
- Verify SPEED TRIM Fail light is extinguished
- Verify MACH TRIM FAIL light is extinguished
- Verify AUTO SLAT FAIL light is extinguished

NAVIGATION PANEL

VHF NAV Transfer Switch……..…….NORMAL

IRS Transfer Switch……..……..NORMAL

DISPLAYS PANEL

Source Selector……..……AUTO

Control Panel Select Switch……..……..NORMAL

FUEL PANEL

- Verify ENG VALVE CLOSED lights are illuminated
- Verify SPA VALVE CLOSED lights are illuminated
- Verify FILTER BYPASS lights are extinguished

CROSS FEED selector……..…….CLOSED

- Verify VALVE OPEN light is extinguished

FUEL PUMP switches……..……..OFF

- Verify centre tank fuel pump LOW PRESSURE lights are extinguished
- Verify main tank fuel pump LOW PRESSURE lights are illuminated.

ELECTRICAL PANEL

BATTERY switch……..GUARD CLOSED

CAB/UTIL power switch……ON

STANDBY POWER switch……..……..GUARD CLOSED

- Verify STANDBY PWR OFF light is extinguished
- Verify BAT DISCHARGE light is extinguished
- Verify TR UNIT light is extinguished
- Verify ELEC light is extinguished

Generator drive DISCONNECT switches...GUARD CLOSED

- Verify DRIVE lights are extinguished

BUS TRANSFER switch……..…GUARD CLOSED

- Verify TRANSFER BUS OFF lights are extinguished
- Verify SOURCE OFF lights are extinguished
- Verify GEN OFF Bus lights are extinguished

OVERHEAT AND FIRE PROTECTION PANEL

Do this check here only if an ELECTRICAL POWER UP Supplementary procedure was not previously conducted

APU POWER

APU power can be established here or delayed until passenger boarding and cargo loading is completed

Left Centre Tank FUEL switch……ON

APU switch (as needed)……..……START

When APU GEN OFF BUS light is illuminated

APU GENERATOR bus switches……...ON

- Verify SOURCE OFF lights are extinguished
- Verify TRANSFER BUS OFF lights are extinguished
- Verify LAVATORY SMOKE light is extinguished

EQUIPMENT COOLING……..…NORM

- Verify OFF lights are extinguished

EMERGENCY EXIT LIGHTS switch…….GUARD CLOSED

- Verify NOT ARMED light is extinguished

NO SMOKING LIGHT switch…….……AUTO or ON

FASTEN SEAT BELT switch……..AUTO or ON

WINSHIELD WIPER selectors……..…….PARK

- Verify windscreen wipers are stowed

WINDOW HEAT switches……...ON

- Position switches ON at least 10 minutes before takeoff
- Verify OVERHEAT lights are extinguished

PROBE HEAT Switches……..OFF

- Verify all lights are ILLUMINATED

WING ANTI-ICE switch……..…….OFF

- Verify VALVE OPEN lights are extinguished

ENGINE ANTI-ICE switches……..….OFF

- Verify Cowl ANTI-ICE lights are extinguished
- Verify COWL VALVE OPEN lights are extinguished

ENGINE HYDRAULIC PUMPS switches……..…ON

AIR CONDITIONING PANEL

AIR TEMPERATURE source selector……..AS NEEDED

TRIM AIR switch……..……ON

- Verify ZONE TEMP lights are extinguished

TEMPERATURE SELECTORS……...AS NEEDED

- Verify RAM DOOR FULL OPEN lights are illuminated

RECIRCULATION FAN switches……..…….AUTO

Air conditioning PACK switches……..…AUTO or HIGH

ISOLATION VALVE switch……..OPEN

Engine BLEED air switches……..……ON

APU BLEED air switch……..ON

- Verify DUAL BLEED light is ILLUMINATED
- Verify PACK lights are extinguished
- Verify WING BODY OVERHEAT lights extinguished
- Verify BLEED TRIP OFF lights are extinguished

CABIN PRESSURISATION PANEL

- Verify AUTO FAIL light is extinguished
- VERIFY OFF SCHED DESCENT light is extinguished

FLIGHT ALTITUDE indicator…….CRUISE ALTITUDE

LANDING ALT indicator……..DESTINATION ELEVATION

PRESSURISATION MODE selector……..AUTO

- Verify ALTN light is extinguished
- Verify MANUAL light is extinguished

LIGHTING PANEL

LANDING light switches……..……OFF

RUNWAY TURNOFF light switches……..…OFF

TAXI light switch……...OFF

IGNITION SELECT switch…….IGN L or R

ENGINE START switches……..……OFF

LOGO light switch……ON

POSITION light switch…….…ON

ANTI COLLISION light switch……..……OFF

STROBE LIGHT switch……..……OFF

WING LIGHT switch……OFF

MODE CONTROL PANEL

MINIMUMS reference selector……..…RADIO or BARO

MINIMUMS selector…….Set DH or ALTITUDE reference

METERS switch……AS NEEDED

BAROMETRIC reference Selector……IN or HPA

BAROMETRIC Selector……....Set LOCAL ALTIMETER

VOR/ADF switches……...……AS NEEDED

MODE selector……MAP

CENTRE switch……AS NEEDED

RANGE selector……AS NEEDED

TRAFFIC switch……..……AS NEEDED

WEATHER RADAR……...OFF

OXYGEN……..……TEST & SET

- Crew oxygen pressure - Check
- Oxygen mask – Stowed and doors closed
- REST/TEST switch – Push and hold
- Verify yellow cross shows momentarily in the flow indicator
- EMERGENCY /Test selector – Push and hold

CLOCK……..…SET

Display select panel……..…SET

- MAIN PANEL DISPLAY UNITS selector - NORM
- LOWER DISPLAY UNIT Selector - NORM

TAKEOFF CONFIG light (if installed)… Verify extinguished

CABIN ALTITUDE (if installed)…….Verify extinguished

Disengage light TEST switch……..…..Hold to 1

- Verify A/P light is illuminated steady amber
- Verify A/T light is illuminated steady amber
- Verify FMC light is illuminated steady amber

Disengage light TEST switch……...……Hold to 2

- Verify A/P light is illuminated steady red
- Verify A/T light is illuminated steady red
- Verify FMC light is illuminated steady amber

Flight Instruments……..……..CHECK

- Verify flight instrument indicators are correct
- Verify that only these flags are shown:
  - TCAS - OFF
  - STROBE light switch – OFF
  - NO VSPD
  - Expected RMI flags
- Verify flight mode annunciations are correct:
  - Autothrottle mode is blank
  - Roll mode is blank
  - Pitch mode is blank
  - AFDS status is FD
- Select route map mode

BRAKE TEMPERATURE light……Verify extinguished

Ground Proximity Panel

FLAP INHIB switch……GUARD CLOSED

GEAR INHIB switch……..……..GUARD CLOSED

TERRAIN INHIB switch……..……GUARD CLOSED

- Verify INOP light is extinguished

Landing Gear Panel

LANDING GEAR lever……...DN

- Verify green gear indicator lights are illuminated
- Verify red gear indicator lights are extinguished

AUTO BRAKE selector……..……RTO

- Verify AUTO BRAKE DISARM light is extinguished
- Verify ANTISKID INOP light is extinguished

Engine Instruments

Engine Display control panel……SET

- N1 SET selector – AUTO
- SPEED REFERENCE selector – Auto
- FUEL FLOW switch – RATE

Engine Instruments……..……..SET

- Verify that the primary and secondary engine indicators show existing conditions
- Verify that no exceedance is shown
- Verify hydraulic quantity indicators do not show RF

Engine Display control panel……SET

- N1 SET selector – AUTO
- SPEED REFERENCE selector – Auto
- FUEL FLOW switch - RATE

Engine Instruments……..SET

- Verify that the primary and secondary engine indicators show existing conditions
- Verify that no exceedance is shown
- Verify hydraulic quantity indicators do not show RF

Radio Panel

VHF communications radios……..SET

VHF navigation radios……..……..SET

Audio control panel……..SET

ADF radios……..SET

WEATHER RADAR panel……SET

Transponder panel……..……SET

STABILIZER TRIM override switch……....GUARD CLOSED

Seat, rudder pedals and harness……Adjust as needed

CHECKLIST COMPLETE

Preflight Procedure - Captain

Lights……....TEST

- Master LIGHTS TEST and DIM switch – TEST
- Master LIGHTS TEST and DIM switch – As needed

EFIS control panel……SET

- MINIMUMS reference selector – RADIO or BARO
- MINIMUMS selector – Set DH of ALT reference
- FLIGHT PATH VECTOR switch – As needed
- METERS switch – As needed
- BAROMETRIC reference selector – IN or HPA
- BAROMETRIC selector – Set local altimeter setting
- VOR/ADF switches – As needed
- Mode selector – MAP
- CENTRE switch – As needed
- Range selector – As needed
- TRAFFIC switch – As needed
- WEATHER RADAR – OFF
- Map switches – As needed

Mode control panel……..SET

- COURSE – Set
- FLIGHT DIRECTOR switch – ON
  (Move switch for pilot flying ON first)
- Bank angle selector – As needed
- Autopilot DISENGAGE bar - UP

Oxygen……..……..TEST & SET

- Crew oxygen pressure - Check
- Oxygen mask – Stowed and doors closed
- REST/TEST switch – Push and hold
- Verify yellow cross shows momentarily in the flow indicator
- EMERGENCY /Test selector – Push and hold

Clock……..SET

Display select panel……SET

- MAIN PANEL DISPLAY UNITS selector – NORM

- LOWER DISPLAY UNIT selector - NORM

TAKEOFF CONFIG light……VERIFY EXTINGUISHED

CABIN ALTITUDE……..……VERIFY EXTINGUISHED

Disengage light TEST switch…….……..Hold to 1

- Verify A/P light is illuminated steady amber
- Verify A/T light is illuminated steady amber
- Verify FMC light is illuminated steady amber

Disengage light TEST switch……..……Hold to 2

- Verify A/P light is illuminated steady red
- Verify A/T light is illuminated steady red
- Verify FMC light is illuminated steady amber

Do the Initial Data and Navigation Data steps from CDU Pre-flight Procedure. Verify IRS alignment is complete

STAB OUT OF TRIM light……..…Verify extinguished

Flight Instruments……SET

- Verify flight instrument indicators are correct
- Verify that only these flags are shown
    - TCAS OFF
    - NO VSPD
    - Expected RMI flags
- Verify flight mode annunciations are correct
    - Autothrottle mode is blank
    - Roll mode is blank
    - Pitch mode is blank
    - AFDS status is FD
- Select map mode

Standby instruments ……..SET

- Standby horizon – SET
    - Gyro caging control – Pull, then release
    - Approach mode selector – As needed
    - Verify flight instruments are correct
    - Verify no flags are shown
- Standby altimeter – SET
    - Verify flight indications are correct

SPEED BRAKE lever……DOWN DETENT

- Verify SPEED BRAKE ARMED light extinguished
- Verify SPEED BRAKE DO NOT ARM light extinguished

REVERSE THURST levers……DOWN

FORWARD THRUST levers……..CLOSED

FLAP lever……..……..SET

- Set the flap lever to agree with flap position

PARKING BRAKE……SET

- Verify parking brake warning light is ILLUMINATED

ENGINE START levers……..…….CUTOFF

STABALISER TRIM CUTOUT switches…….NORMAL

Radio tuning panel……...SET

- Verify OFF light is extinguished

VHF communication radios……..SET

VHF NAVIGATION radios……...Set for departure

Audio control panel……SET

Seat, rudder pedals and harness……Adjust as needed

CHECKLIST COMPLETE

Before Start Procedure

Flight deck door……..……CLOSED & LOCKED

CDU Display……..…SET

N1 bugs……CHECK

IAS bugs……SET

MCP……..SET

- AUTOTHROTTLE ARM switch – ARM
- IAS/MACH selector – SET V2
- Arm LNAV as needed
- Initial heading – SET
- Initial altitude - SET

Taxi & Takeoff briefing……..……..COMPLETE

Exterior doors……..…Verify closed

Flight deck windows……....Closed & locked

Pushback & Start clearance…….Obtain

- Obtain a clearance to commence pushback and start engines

Fuel panel……..…SET

- LEFT and RIGHT CENTRE FUEL PUMP switches ON
  - Verify LOW PRESSURE lights illuminate momentarily then extinguish
  - If LOW PRESSURE lights stays illuminated turn off CENTER FUEL PUMPS switch
- AFT and FORWARD FUEL PUMPS ON
  - Verify LOW PRESSURE lights are extinguished

Hydraulic panel……..…SET

If pushback is needed:

- System A HYDRAULIC PUMP switches – OFF
- System B electric HYDRAULIC PUMP switches – OFF
- Verify brake pressure in 2,800 psi minimum
- Verify system B pressure is 2,800 psi minimum

If pushback is not needed:

- Electric HYRAULIC PUMP switches ON
- Verify brake pressure is 2,800 psi minimum
- Verify System A & B pressures are 2,800 psi minimum

ANTI COLLISION LIGHT……..…ON

Trim……..…SET

- Stabilizer trim - __UNITS
- Set trim for takeoff
- Verify trim in the green band
- Aileron trim – 0 units
- Rudder trim – 0 units

Pushback or towing procedure

- Engine Start procedure may be done during pushback or towing
- Establish communications with ground handing crew
- No not use airplane brakes to stop the aircraft during pushback.
- Set or release parking brake as directed by ground crew
- When pushback is complete:
    - Verify towbar is removed
    - Verify nose gear steering pin is removed
    - System A HYDRAULIC PUMP switches – ON
    - Verify system A pressure is 2,800 psi minimum.

CHECKLIST COMPLETE

Engine Start Procedure

(C) Announce start sequence

(F/O) Air conditioning PACK switches……..……OFF

(C) Call "Start Engine___"

(F/O) ENGINE START switch……..…GND

- Verify N2 RPM increases
- When N1 rotation is seen and N2 is at 25%.....

(C) ENGINE START lever……..IDLE

- At 56% N2, verify ENGINE START moves to OFF. If not move ENGINE START switch to OFF.
- Verify START VALVE OPEN alert extinguished when ENGINE START switch moves to OFF.

Call "Starter CUTOUT"

- Monitor N1, N2, EGT fuel flow for normal operations while engine accelerates to a stable idle.
- After engine is stable at idle, **start other engine**.

Normal engine start considerations:

- Do not exceed 2 minutes during engine start attempt.
- A minimum of 10 seconds is required between engine start attempts.
- Do not move an engine start lever to idle early.
- Keep a hand on the engine start lever while monitoring RPM, EGT and fuel flow until stable.
- If fuel is shutoff accidently do not reopen the engine start lever in an attempt to restart the engine.

Do the ABORTED ENGINE START checklist for one or more of the following abort start conditions:

- N1 or N2 does not increase or increases very slowly
- No oil pressure indication
- EGT does not increase by 10 seconds after engine start lever is moved to idle
- EGT quickly nears or exceed the start limit.

CHECKLIST COMPLETE

Before Taxi Procedure (F/O)

GENERATOR 1 and 2 switches……..ON

PROBE HEAT SWITCHES……ON

WING ANTI-ICE switch……...As needed

ENGINE ANTI-ICE switches……..As needed

PACK SWITCHES……AUTO

ISOLATION VALVE switch……..AUTO

APU BLEED switch……..OFF

APU switch……..……OFF

ENGINE START switches……..CONT

(C) ENGINE START levers……...…IDLE detent

(C, F/O) Verify that ground equipment is clear

(C) Call "FLAPS__" As needed for takeoff

(F/O) FLAP lever……..……SET takeoff flaps

(C) Flight controls……..……CHECK

(F/O) Blank lower display unit

(F/O) Transponder……As needed

(C, F/O) Recall……CHECK

- Verify all system annunciator panel lights illuminate then extinguish

(C) Update changes to taxi briefing as needed.

Before Takeoff Procedure	
Engine warm up procedure ○ Verify increasing oil temperature before takeoff ○ Run engines for at least 2 minutes.	
Pilot Flying	**Pilot monitoring**
	Check centre fuel quantity. Centre tank fuel pump switches must be OFF
	Notify cabin crew to prepare for takeoff. Verify cabin is secure.
The pilot who will do the takeoff updates changes to the takeoff briefing as needed	
Set weather radar as needed. Terrain display as needed.	
Call “BEFORE TAKEOFF CHECKLIST”	Do the BEFORE TAKEOFF checklist
Brakes……..……..SET **Throttle……..IDLE** **Flaps set…….…….……CHECK** **Spoilers……..RETRACTED** **Engine instruments……..……CHECK** **Takeoff data (V1, Vr, V2)…….……CHECK** **Nav equipment…….……..CHECK** **Landing lights…….……..OFF** **Strobe lights……..OFF** **Taxi lights……ON** **Anti-ice……..……AS REQUIRED**	

Takeoff Procedure	
Pilot Flying	**Pilot Monitoring**
	When entering runway, set STROBE light switch to ON
Verify brakes are released. Align aircraft with the runway	When cleared for takeoff, set LANDING light switches to ON. Set transponder to TA/RA
Advance thrusters to approximately 40% N1	
Allow engines to stabalize	
Push TO/GA switch	
Verify correct takeoff thrust set	
	Monitor engine instruments during takeoff. Call out abnormal indications. Adjust takeoff thrust before 60kts as needed
	During strong headwinds, if the thrust levers do not advance to planned takeoff thrust by 60kts, manually advance the thrust levers.
After takeoff thrust is set, captains hand must be on the thrust levers until V1.	
Monitor airspeed. Maintain light forward pressure on the control column	Monitor airspeed and call out any abnormal indications

Verify 80 knots and call “CHECK”	Call “80 KNOTS”
Verify V1 speed	Verify the automatic V1 callout or call “V1”
At VR, rotate 15° pitch attitude. After liftoff, follow F/D commands. Establish positive rate of climb	At VR, call “ROTATE”. Monitor airspeed and vertical speed.
Verify positive rate of climb and call “GEAR UP”	Verify a positive rate of climb and call “POSITIVE RATE”
Above 400 ft radio altitude, call for a roll mode as needed	Select or verify roll mode
At thrust reduction height, verify climb thrust is set	
At acceleration height, call “SET FLAPS UP SPEED”	Set flaps up manoeuvering speed
Verify acceleration Call “FLAPS__” according to the flaps retraction schedule	Set FLAPS as directed Monitor flaps and slats retraction

Takeoff Flap Retraction Speed Schedule

Takeoff flaps	At Speedtape “display”	Select Flaps
25	V2 + 15 “15” “5” “1”	15 5 1 UP
15 or 10	V2 + 15 “5” “1”	5 1 UP
5	V2 + 15 “1”	UP
1	“1”	UP

After flaps and slats retraction is complete, call “VNAV”	Push VNAV switch
Engage AUTOPILOT when above minimum altitude for autopilot engagement	
	After flap retraction is complete: ○ Set or verify engine bleed and air conditioning packs are operating
	○ Set ENGINE START switches to OFF ○ Set AUTO BRAKE selector to OFF ○ Select LANDING GEAR lever to OFF after landing gear retraction is complete
Call “AFTER TAKEOFF CHECKLIST”	Do AFTER TAKEOFF checklist
Throttle……..……AS REQUIRED **Trim……..……SET FOR 250 KNOTS** **Autothrottle……..ARM & SET** **Autobrake……...OFF**	

CHECKLIST COMPLETE

Climb and Cruise Procedure	
Pilot Flying	**Pilot Monitoring**
	If centre fuel pump switches were OFF for takeoff and contain more than 1000lbs, set both centre tank fuel pump switches ON above 10,000 ft.
	At or above 10,000 ft, set landing light switches to OFF
	Set passenger signs as needed.
	When established in a level altitude at cruise, if centre tank contains more than 1000lbs and the centre tank fuel pump switches are OFF, set centre tank fuel switches to ON. Set both centre tank fuel pump switches to OFF when centre tank quantity reaches approximately 1000lbs.
	During the last hour of cruise on ETOPS flights, do a Fuel Crossfeed Valve check. Verify or centre the correct RNP for arrival.

Descent Procedure	
Start Descent Procedure before the aircraft descends below cruise altitude for arrival at destination.	
Pilot Flying	**Pilot Monitoring**
	Set one centre tank fuel pump switch to OFF when centre tank fuel quantity reaches approximately 3000lbs. Open cross feed valve to minimise fuel imbalance. Turn the remaining centre tank fuel pump switch OFF without delay and close the cross feed valve when Master Caution and FUEL system annunciator illuminate.
	If established in level flight for an extended time prior to approach and landing with more than 2000lbs in the centre tank and the centre tank fuel pump switches are OFF, one centre tank fuel pump switch may be turned ON. Open cross feed valve to mimimise fuel imbalance. Turn remaining centre tank fuel pump switch OFF without delay and close cross feed valve when Master Caution and FUEL system annunciator illuminate.

	Verify pressurisation is set to landing altitude.
Review system annunciator lights.	Recall and review system annunciator lights
Verify VREF on the Approach REF page of CDU	Enter VREF on APROACH page of CDU
Set RADIO/BARO minimums for approach	
Set or verify navigation radios and course for approach	
	Set AUTO BRAKE selector to the needed brake setting
Do approach briefing	
30nm before T/D, Call ”DESCENT CHECKLIST”	Do the DESCENT checklist

ATIS/Metar information……..…RETRIEVE

Altimeter…….……..…CHECK

Radios……..…SET

De-Ice……..……AS REQUIRED

Descent speed……to FL240 0.75 MACH
to FL180 0.65 MACH
to FL 120 280 KIAS
below 10,000ft 250 KIAS

Fuel quantities and balance…….……..…CHECK

CHECKLIST COMPLETE

Approach Procedure

In general the Approach Procedure is started at transition level. Complete the Approach Procedure before:

- Initial Approach Fix
- Start of radar vectors to final
- Start of visual approach

For ILS, LOC, BCRs, SDF or LDA approach, select appropriate localizer frequency.

If a Flaps 15 landing is needed: GROUND PROXIMITY flap **Inhibit switch……..…FLAP INHIBIT**

Pilot Flying	Pilot Monitoring
	Set passenger signs as needed
	At or above 10,000ft, set LANDING light switches to ON
At 10,000ft, set and crosscheck altimeters to local QNH	
Update arrival and approach procedures as needed, Update RNP as needed.	
Update approach briefing as needed	
Call “APPROACH CHECKLIST”	Do APPROACH checklist

Fasten Seat Belt sign……...ON

No Smoking sign……...ON

APU……START / CHECK RUN

APU GEN……..ON / CHECK VOLTS

Avionics & Radios……SET

Speed established……....210 knots

Flap Extension Schedule

Current Flap Position	At Speedtape "Display"	Select Flaps	Command Speed for selected flaps
UP	"UP"	1	"1"
1	"1"	5	"5"
5	"1\5"	15	"15"
15	"15"	30 or 40	VREF 30 or VREF 40 + wind additives

CHECKLIST COMPLETE

Landing Procedure - ILS	
Procedure is for a complete **ILS landing**, including autoland	
Pilot flying	**Pilot monitoring**
	Notify cabin crew to prepare for landing
Call “FLAPS __” according to flap extension schedule	Set flap lever as directed. Monitor flaps and slats extension
When on localizer intercept heading: ○ Verify ILS is tuned and identified ○ Verify LOCX and G/S pointers are shown	
Arm APP mode Engage other autopilot	
Use HDG SEL to intercept final approach course as needed	
	Call “GLIDE SLOPE ALIVE”
At glide slope alive, call ○ “GEAR DOWN” ○ FLAPS 15”	Set landing gear lever to DN Verify green landing indicator lights are illuminated Set flap lever to 15 Engine start switches to CONT
Set speed brake lever to ARM Verify SPEED BRAKE ARMED light is illuminated	

At glide slope capture, call “FLAPS __” as needed for landing	Set flap lever as directed
Set missed approach altitude on the MCP	
Call “LANDING CHECKLIST”	Do LANDING checklist

Landing gear……..……..CHECK DOWN

A/P……....OFF

A/T……OFF

Landing speed……135 KNOTS

CHECKLIST COMPLETE

At FAF or OM, verify crossing altitude
Monitor approach
Verify call outs and autoland status at 500ft

<table>
<tr><th colspan="2">Landing Procedure – Using VNAV</th></tr>
<tr><td colspan="2">Use autopilot during approach to give:
Autopilot alerts and mode fail indications
More accurate course and glidepath tracking
Lower RNP limits
This procedure is not authorised using QFE</td></tr>
<tr><th>Pilot Flying</th><th>Pilot monitoring</th></tr>
<tr><td></td><td>Notify cabin crew to prepare for landing. Verify cabin is secure</td></tr>
<tr><td>Call “FLAP __” according to flap extension schedule</td><td>Set flap lever as directed. Monitor flaps and slats for extension</td></tr>
<tr><td colspan="2">The recommended role modes for final approach are:
For RNAV or GPS approach LNAV
For a LOC-BC, VOR or NDB approach use LNAV
For a LOC, SDF or LDA approach use LNAV or VOR/LOC</td></tr>
<tr><td></td><td>Verify VNAV glide path angle is shown on the final approach segment of LEGS page on CDU</td></tr>
<tr><td colspan="2">When on the final approach course intercept heading for LOC-BC, SDF or LDA approaches:
Verify localizer is tuned and identified
Verify LOC pointer is shown</td></tr>
<tr><td>Select LNAV or arm VOR/LOC mode</td><td></td></tr>
<tr><td>Use LNAV or HDG SEL to intercept final approach course as needed</td><td></td></tr>
</table>

Verify LNAV engaged or VOR/LOC is captured	
Approximately 2nm before FAF and after ALT HOLD or VNAV PTH or VNAV ALT is annunciated: ○ Verify A/P is engaged ○ Set DA(H) or MDA(H) on MCP ○ Select or verify speed ○ Select or verify VNAV	
Approaching glide path, call ○ "GEAR DOWN" ○ "FLAPS 15"	Set landing gear lever to DN. Verify green landing gear indicator lights are illuminated Set flap lever to 15 Set ENGINE START switches to CONT
Call "Landing checklist"	Do LANDING checklist
Landing gear……..……CHECK DOWN	
When at least 300ft below missed approach altitude, set missed approach altitude on MCP	
At FAF, verify crossing altitude and crosscheck altimeters	
Monitor approach	
If suitable visual reference is established at DA(H), MDA(H) or MAP, disengage A/P and A/T Maintain glide path to landing.	

Go-around and Missed Approach Procedure	
Pilot Flying	**Pilot Monitoring**
At the same time: ○ Push TO/GA switch ○ Call “FLAPS 15”	Position the FLAP lever to 15 and monitor flap retraction
Verify: ○ Rotation to go-around altitude ○ Thrust increases	
	Verify thrust is sufficient for go-around or adjust as needed
Verify a positive rate of climb on the altimeter and call “GEAR UP”	Verify a positive rate of climb on the altimeter and call “POSITIVE RATE”. Set landing gear lever to UP
	Verify missed approach altitude is set
If airspeed is below top of amber band, limit bank angle to 15°	
Above 400ft, verify LNAV or select HDG SEL as appropriate Above 400ft, select appropriate roll mode and verify proper mode annunciation	Observe annunciation
Verify missed approach route is tracked	

At acceleration height, call “FLAPS __” according to flap retraction schedule	Set FLAP lever as directed. Monitor flaps and slats for retraction.
After flap retraction to planned flap setting, select LVL CHG. VNAV may be selected if flaps are up.	
Verify climb thrust is set	
Verify missed approach altitude is captured	
	Set landing gear lever to OFF after landing gear retraction is complete. Set ENGINE START switches as needed.
Call “AFTER TAKEOFF CHECKLIST”	Do AFTER TAKEOFF checklist
Throttle……..……AS REQUIRED **Trim……SET FOR 250 KNOTS** **Autothrottle……..ARM & SET** **Autobrake……..OFF**	

CHECKLIST COMPLETE

Landing Roll Procedure	
Pilot flying	**Pilot Monitoring**
Disengage A/P. Control aircraft manually	
Verify THRUST levers are closed Verify SPEED BRAKE lever is UP Without delay, fly the nose wheel smoothly onto runway	Verify SPEED BRAKE lever is UP Call “SPEED BRAKES UP” If the SPEED BRAKE lever is not UP, call “SPEED BRAKES NOT UP” Monitor roll out progress
Verify correct auto brake operation	
Without delay, move REVERSE THRUST levers to interlocks and hold light pressure until the interlocks are released. Then apply reverse thrust as needed.	
By 60kts, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed	Call “60 KNOTS”
Before taxi speed, disarm auto brakes. Use manual braking as needed.	

After Landing Procedure	
Start After Landing Procedure when clear of runway	
Pilot Flying	**Pilot monitoring**
Move or verify SPEED BRAKES lever is DOWN	Start APU
	Set: ○ LANDING lights switches OFF ○ TAXI light switch ON ○ STROBE light switch OFF
	Set ENGINE START switches to OFF
Set weather radar OFF	
	Set AUTO BRAKE selector to OFF
	Set FLAP lever UP
	Set transponder mode selector to STBY

Shutdown Procedure

Start Shutdown Procedure after taxi is complete and the parking brake is set.

If possible, after high thrust operation, including reverse thrust, run engines for at least 3 minutes before shutdown. Time near idle includes taxiing.

The following is done by the F/O:

Electrical power……..…SET

If APU power is needed:

- Verify APU GENERATOR OFF BUS light is illuminated
- APU GENERATOR BUS switches – ON
- Verify SOURCE OFF lights are extinguished

If external power is needed:

- Verify GND POWER AVAILABLE light is illuminated
- GND POWER switch – ON
  Verify SOIURCE OFF lights are extinguished

FASTEN SEAT BELT switch……..……..…OFF

ANTI COLLISION light switch……..……...…OFF

FUEL PUMP switches……..…….OFF

CAB/UTIL switches……..……..OFF

WING ANTI-ICE switch……OFF

ENGINE ANTI-ICE switch……...……OFF

Hydraulic panel……..…….SET

- ENGINE HYDRAULIC PUMP switches – ON
- ELECTRIC HYDRAULIC PUMP switches – OFF

RECIRCULATION FAN switches…….……AS NEEDED

Air conditioning PACK switches…….……ON

ISOLATION VALVE switch……...……..OPEN

Engine BLEED air switches……..……ON

APU BLEED air switch……ON

Exterior light switches…….AS NEEDED

FLIGHT DIRECTOR switch……OFF

After wheel chocks are in place:

- Parking brake – RELEASE

APU switch……..…….……AS NEEDED

(C) Call “SHUTDOWN CHECKLIST”

F/O Do SHUTDOWN checklist

Parking brake……SET

Thrust levers……..….IDLE

Passenger signs……...OFF

Pitot Heat switch……...…….OFF

De-ice switches……OFF

Taxi lights……...OFF

F/D……...….OFF

Master Start switches……..……..OFF

Beacon / Anti Collision lights……...OFF

Hydraulic Pump switches……..OFF

Secure Aircraft Procedure
ILS Mode selectors……..…OFF
EMERGENCY EXIT LIGHTS switch…….OFF
WINDOW HEAT switches……..……OFF
Air Conditioning PACK switches……..OFF
APU Gen, APU……..…OFF
BATT Master switch……..….OFF
CHECKLIST COMPLETE

Acknowledgements

I am indebted to those whose work has been drawn upon for the production of this manual. Particular acknowledgement goes to Tom Risager, Nobleair Virtual Airline, for his definitive PMDG 737 NGX publication *From Cold and Dark to Shutdown Checklist*. Thanks also to lukas1992 whose diagrams on pages 5 to 7, 17 have been used.

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