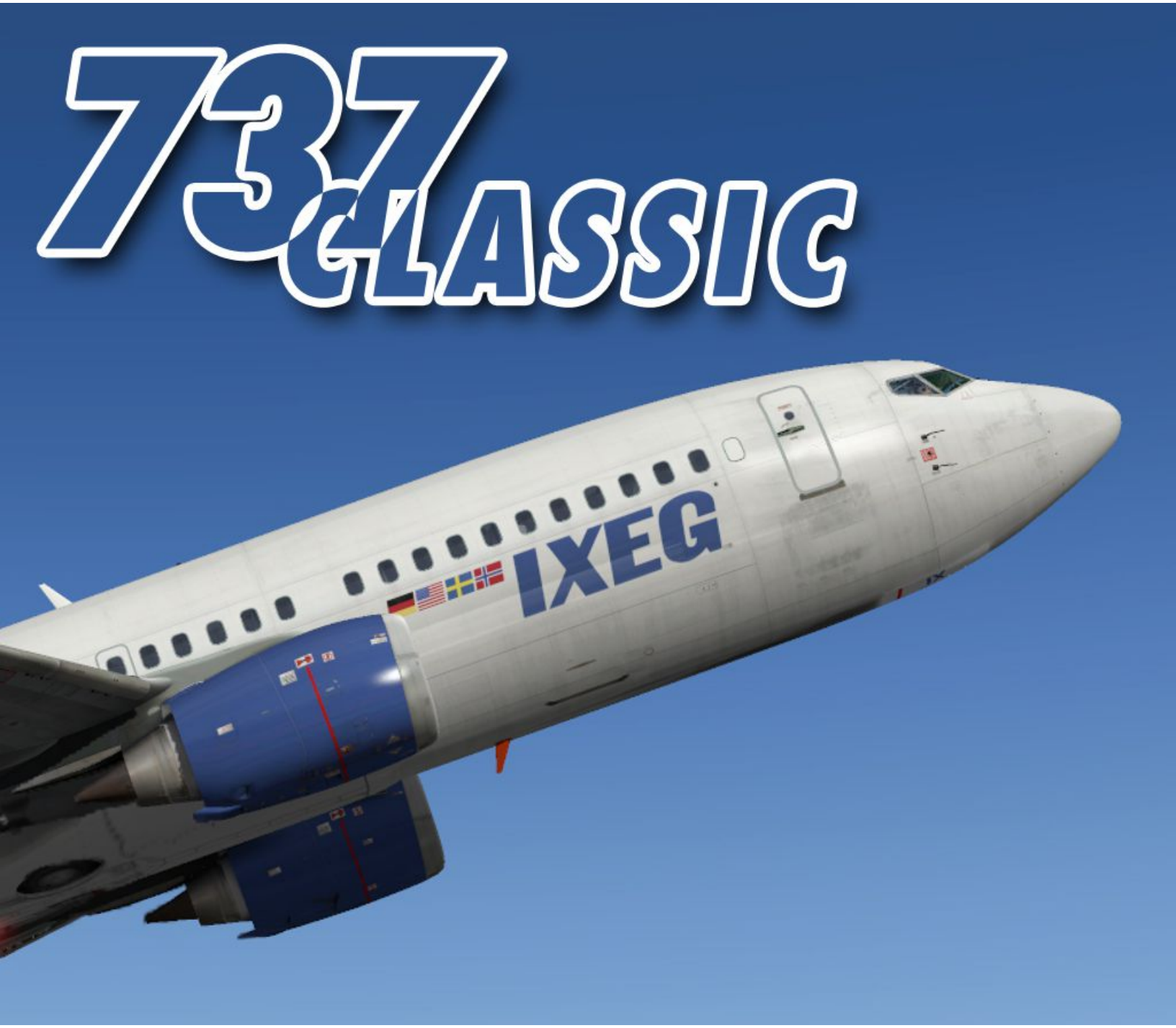
IXEG

international x-plane engineering group

737 CLASSIC



Pilot Quick Reference Handbook

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B733 HISTORY

In the 1970's recession, the Boeing 737-200 gave Boeing a steady flow of orders. It was the fastest selling aircraft of Boeing. In 1979 it got another boost with Lufthansa replacing it's -100 fleet with -200's. Even though the 737-200 didn't show any signs of sales declining, Boeing already was preparing for an upgrade of the B737 airframe.

In 1980, the first details were released of the B737-300 design.The main benefits of the design was the new engine design which was larger and quieter and without needing an expensive and lengthy redesign of the wing.

No production decision could be made however without timing the production with the development of the new power plant. Also pre-orders were needed to justify a project launch. In 1981, USAir and Southwest Airlines both ordered 10 examples each with another 20 option. This was a low number, but Boeing could accept this because of the low development costs ($250 mill). In 1982 UK airline Orion Airways placed an order as the first european airline.

The engine development, the CFM56, was started in the early 70's and the first run was in 1974. A Caravelle and YC-15 was equipped with one example of the engine in 1977. The first commercial engine orders were received in 1978 when airlines wanted to retrofit their DC-8s with the CFM56-2 with 24.000lbf thrust. A scaled down version of the engine, the CFM56-3 was chosen to power the B737-300. A converted 707 was used for the testing over a 3 month period at Edwards AFB with satisfactory results.

The B737-200 had very low ground clearance with the JT8D's and the CFM was even bigger. One solution for the bigger engine was to extend the gear, but that would require another redesign, adding costs and weight. Part of the solution CFM did was to relocate the engine accessories from the top and bottom to the side of the engine making the vertical diameter less. This however was not enough, and the additional solution was to attach the engine to a pylon so the engine nacelle could be placed in from of the wing. To avoid heating up the flaps and underside of the wing, the engine was canted 5 deg up. This not only solved the problem, but also provided more space inside the wing for fuel. A slight relocation of the nose gear also helped gain some ground clearance.

The added weight meant that approach speeds would be higher. Boeing didn't want to completely redesign the wing and so this was solved by adding a new leading edge slat. It was more than twice the size of the -200 and increased the chord by about 4% across the whole wing. The new leading edge also meant an increase in cruise altitude capability of about 4000 feet.

The fuselage was extended by a total of 2,64m by 2 plugin sections in front and aft of the wing. Number of exits allowed for max 149 seats by FAA regulations.

Due to more powerful engines, meaning more asymmetric thrust in an engine out scenario, an increase in vertical stabilizer area was required. Also the horizontal stabilizer area was increased.

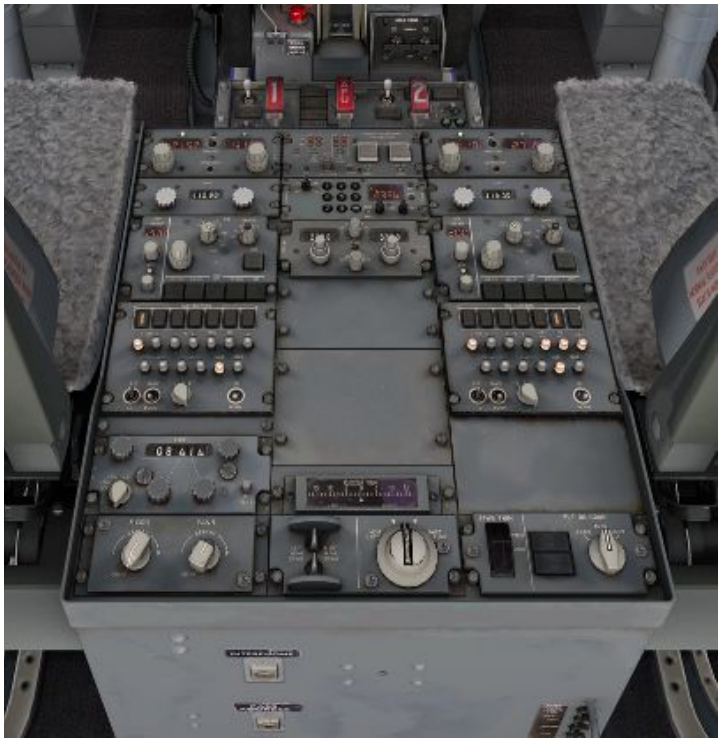
In 1983, the -300 took shape inside the Boeing factory's. The assembly went well and no unforeseen problems were encountered. So, on time, the B737-300 was rolled out on Jan 17th 1984 watched by 10.000 spectators. On feb 24th 1984, the -300 took the air for the first time at Renton. After 1294 test flight hours with 3 aircraft, it turned out the aircraft was even more efficient than predicted. It was 24% more efficient than the -200, 3% better than expected.

By November the same year, orders had been placed from 13 airlines for 155 aircraft and first flight in service was on Dec 5th 1984 by Southwest Airlines.

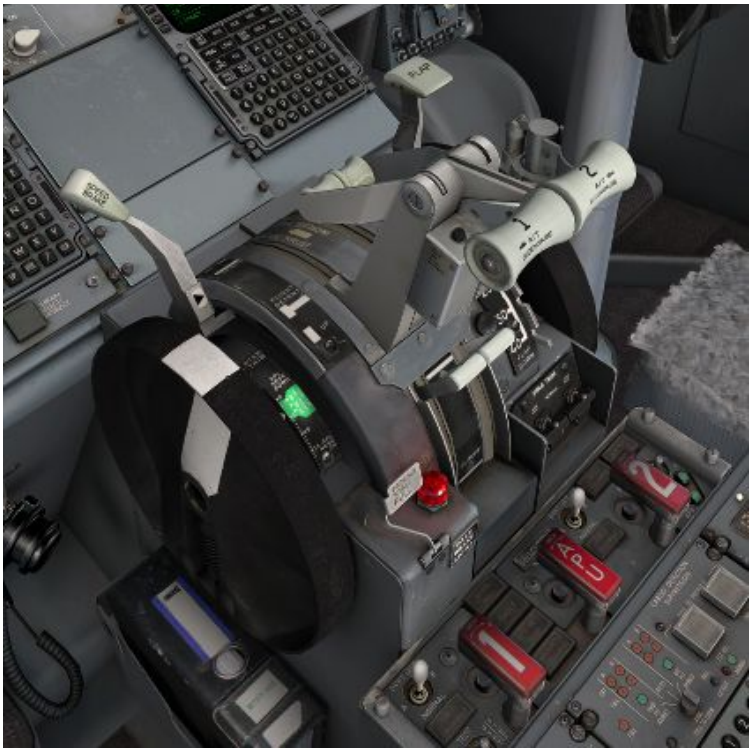
GENERAL COCKPIT LAYOUT

The cockpit is divided into different parts and zones to make description of where to find controls and manipulators easier.

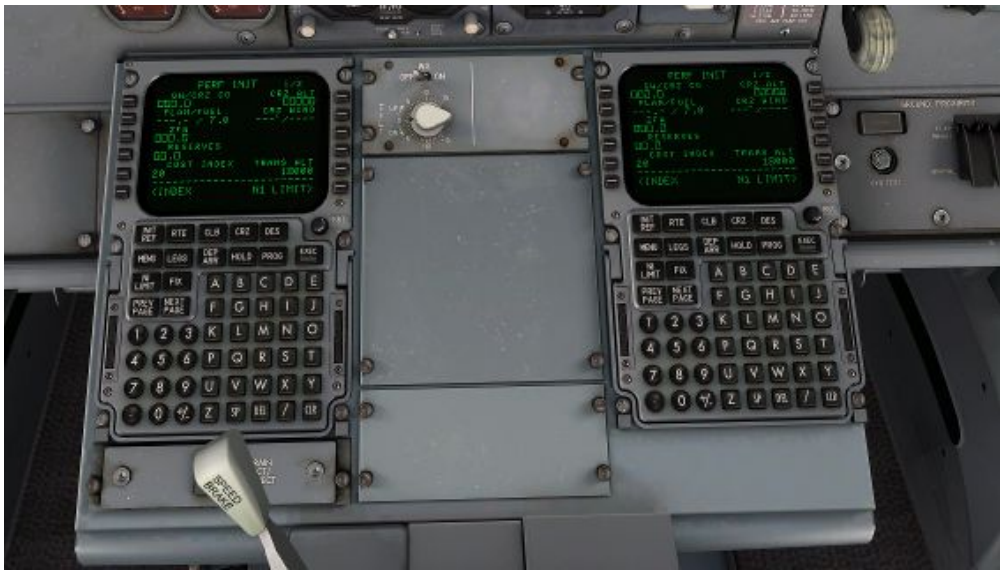
If you look forward from the cockpit door you will see two pilots seats. In between the pilots seats is the "center pedestal" or "aft electronic panel". It holds the communication equipment, navigation radios, EFIS (electronic flight instrument system) controls, fire fighting equipment and trim controls.



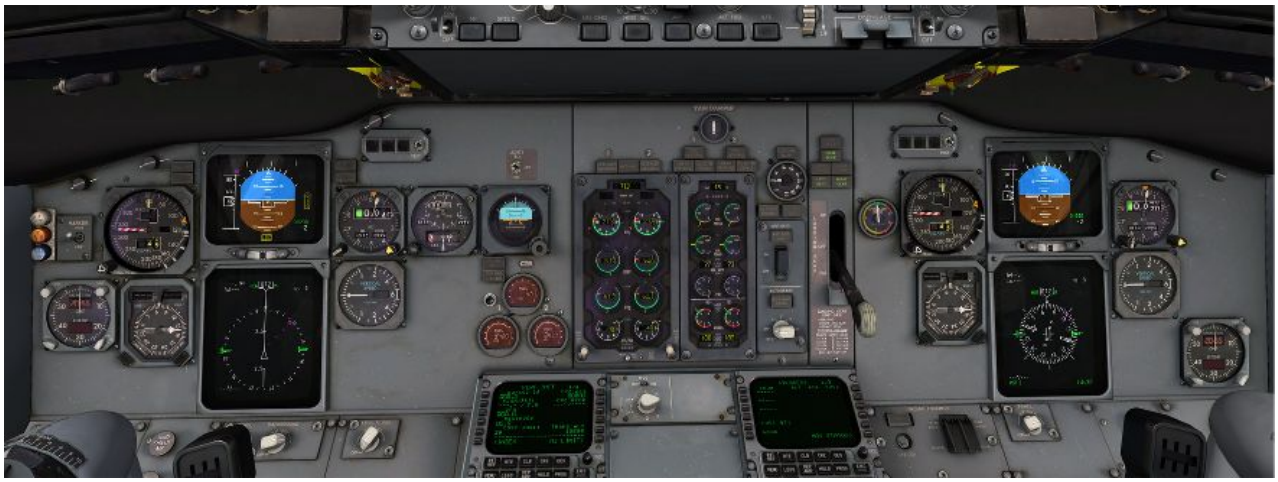
Forward of that panel is the "control stand". It holds the thrust levers, speedbrake control, flap lever and trim wheels.



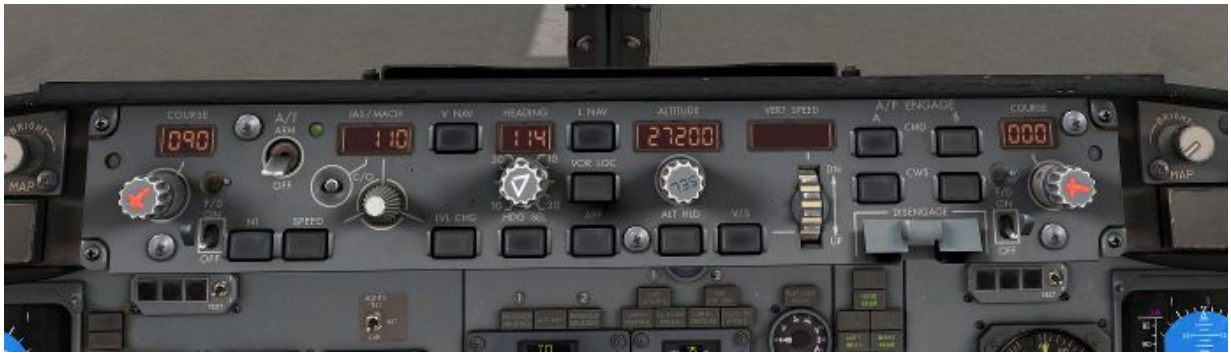
In front of the control stand is the "forward electronic panel". It holds the CDU´s (control display units) to interface with the FMC, also the controls for the weather radar.



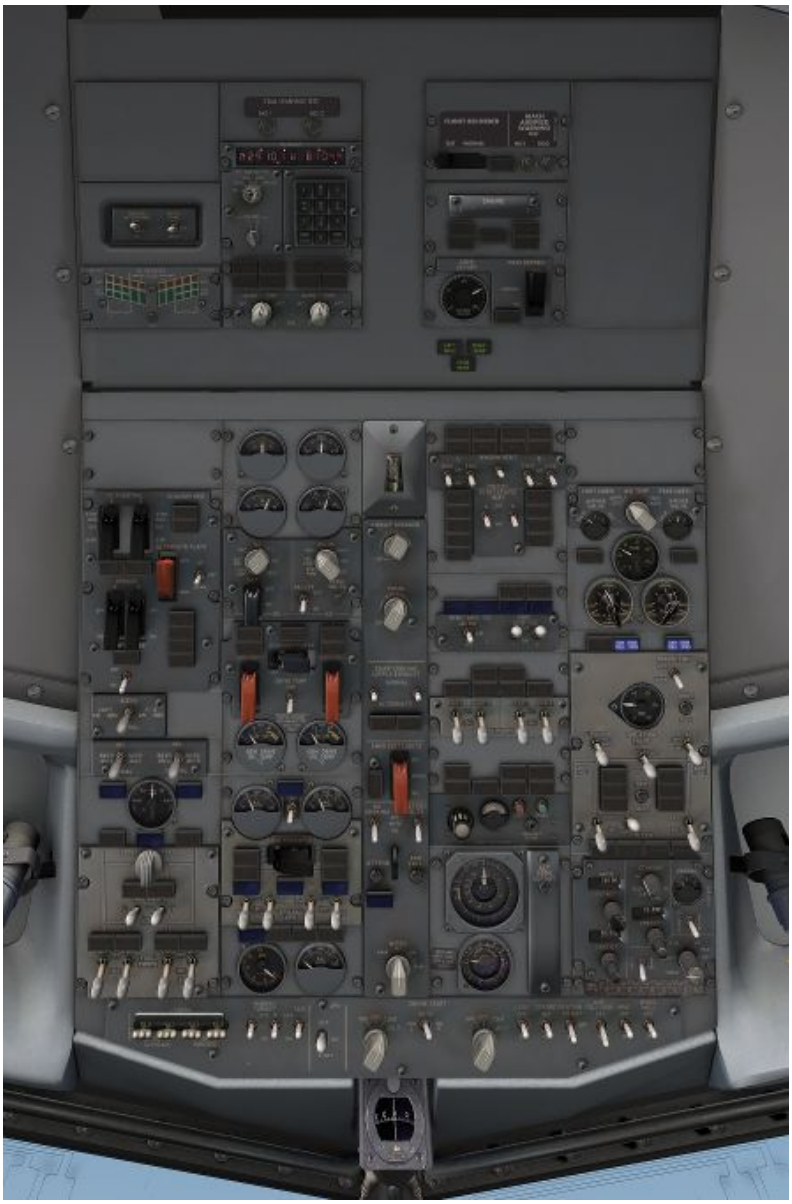
Prominently in front of the pilots is the "instrument panel", divided into a left (captain), center (engine instruments) and right part (copilot). It holds the primary flight and navigation instruments and the engine indication instruments.



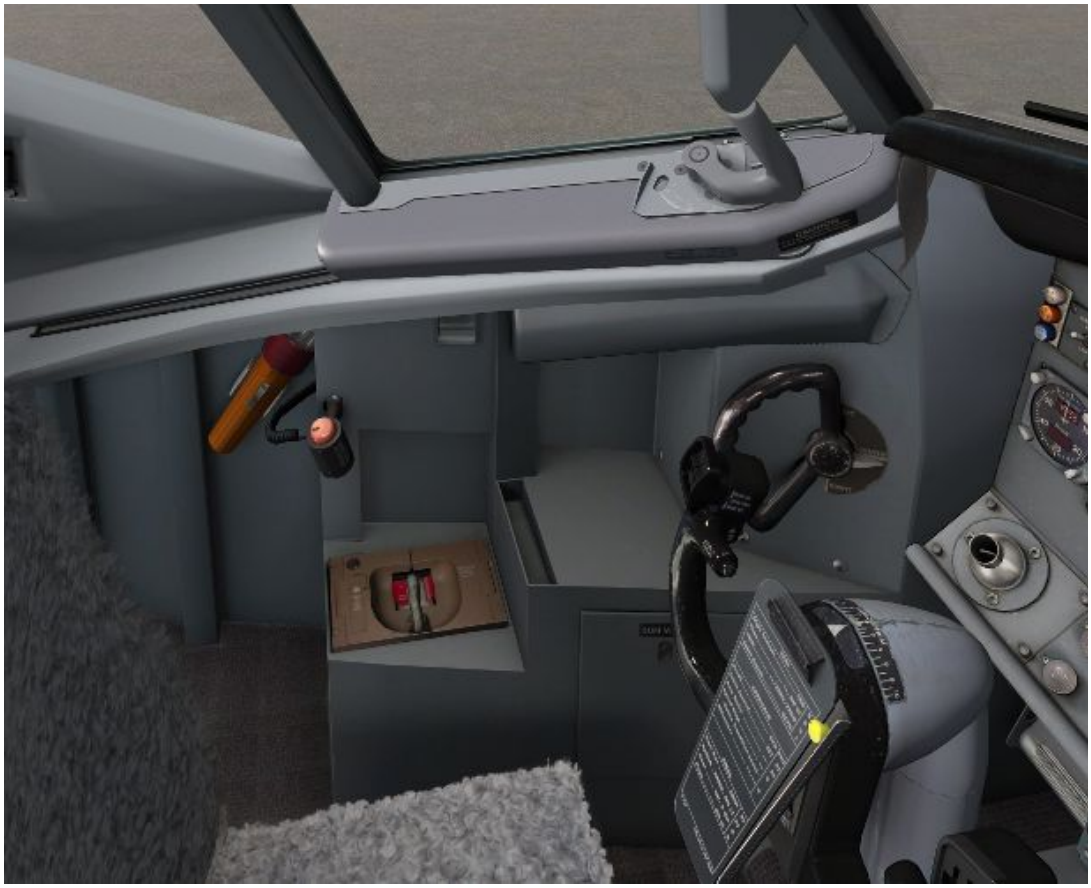
The instrument panel is shielded from direct light by the "glareshield" that has the mode-control-panel (MCP) in the front. The MCP holds all controls for the automatic flight system.



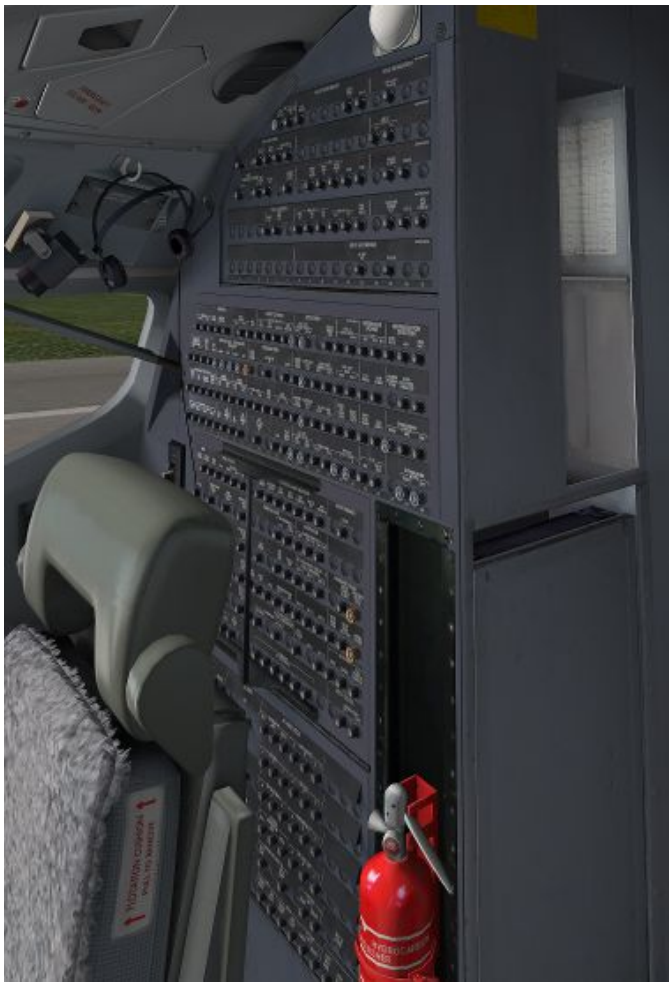
Above the pilots is the "overhead panel", divided into a "forward" and an "aft" part. It holds controls and indications for systems not regularly manipulated – either just once before the flight or during abnormal situations. Some exceptions apply, of course, for example the light switches or seat-belt switch.



To the left and right of the pilots are the "sidewall" panels. They hold the oxygen masks and the flash-light flash-light, for example.



Behind the pilots are the circuit-breaker panels. Circuit breakers (CB´s) are not used in normal situations. Some have a specially coloured collar that makes them more prominent if they need to be used during an abnormal situation.



NORMAL PROCEDURES

These procedures aim to instruct the customer in the proper use of the IXEG 737-300. It will include the basic steps needed to operate the aircraft, will point out additional items to operate it realistically and offer further background information.

These procedures are divided into chapters that duplicate the distinct phases of flight operations, i.e. "Take-off".

Within these chapters there are different subchapters to highlight different possibilities of operating the aircraft (i.e. manual take-off, Flight-director take-off, low visibility take-off)

Please be aware that there are many different methods and procedures in use worldwide, and even within one airline or operator they change all the time.

We are using a color convention to help the user distinguish between different text:

- Absolutely necessary steps will be highlighted in red color.
- Items that would be required to operate the aircraft safely and legal are in green color.
- Background information will be provided in black color.

CHAPTER 1

POWERING UP THE AIRCRAFT

Battery switch ON

- Powers up some important busses, gives you some light in the cockpit if it is dark and also powers up many warning lights.

Electrical Hydraulic Pump Switches OFF

- Makes sure the hydraulic system stays unpowered, preventing unwanted flight control movement that could endanger outside personnel

Landing Gear Lever DOWN

- Prevents inadvertent retraction of landing gear in case the air-ground sensor is faulty.

WXR radar switch OFF

- Prevents the weather radar from transmitting on ground near ground personnel.

Ground power switch (if ground power is available) ON

- Move the ground power switch up momentarily. Connects AC ground power to the Generator busses.

Fire Warning TEST

- Run through the test-cycle of engine, APU, wheel well and cargo bay fire detection systems. For information on the full test refer to original Boeing AOM.

The following two steps can be delayed until prior to engine start to avoid fuel use and noise:

APU START

- Place the APU switch momentarily to "start", then release it to on. The APU will start up automatically. Once it is available, the blue APU AVAIL light will come on.

APU ON BUSSES

- Move the APU generator switches up momentarily. This will close the breakers connecting the APU to the generator busses. If another AC power source (like ground power) was already connected, it will be disconnected automatically. On ground both generator busses can be connected to the APU generator. In flight only one can be connected. Connecting the other one will disconnect the first one.

Circuit breakers CHECK

- Make sure no circuit breakers are popped.

Emergency equipment CHECK

- Check fire extinguishers, escape ropes, crash axe, oxygen masks, flashlights, etc. for completeness and good condition.

Brake accumulator CHECK

- With the hydraulic system unpowered pump the brakes repeatedly to bleed off any residual brake pressure (make sure chocks are in place, or the aircraft will start rolling downhill without any chance to stop it!). The pressure should bottom out around 1000psi, this is the precharge of the emergency brake cylinder.

Emergency exit lights ARM

- Now the exit lights in the cabin will light up if the AC busses become unpowered.

Galley power switch ON

- Provides power to the galleys of the aircraft.

IRS mode selectors NAV

- This starts the alignment cycle of the IRS´s. Make sure aircraft is not moving during the whole cycle (ca. 13 mins). Both ON DC lights illuminate momentarily, then the ALIGN lights come on until alignment is complete. The status display will count down the minutes (starting with 7).

IRS display selectors TEST

- Lights on the IRS units momentarily illuminate, followed by a self test.

FMC enter position

- On the POS INIT page of the FMC enter the current latitude and longitude in the hollow boxes. While IRS´s are still aligning, the INIT REF page will always take you to the POS INIT page. Otherwise select INDEX, then POS.

This concludes the "initial" preparation of the aircraft, powering up essential and time-critical equipment. The subsequent items follow a standard "scan" pattern to test and set various systems.

AFT OVERHEAD PANEL

Service interphone switch OFF

- The service interphone allows communication with maintenance personal using headphone jacks in various location of the aircraft. To avoid distortions during normal flight, place it to OFF.

Stall warning TEST

- Each stick shaker activates.

Flight recorder TEST

- Place switch to TEST. This powers the tape motor and the "OFF" light will extinguish. Put switch to normal.

Mach Airspeed warnings TEST

- Push each button to hear the "overspeed clacker".

Engine lights CHECK

- Verify Reverser, PMC and Low Idle lights off.
- Oxygen panel CHECK
- Verify passenger oxygen switch closed and wired. Verify PAX OXY light out.

Secondary landing gear indicators 3 GREEN

SIDEWALL PANEL

Oxygen mask CHECK

- Verify crew oxygen valve open. Check oxygen flowing in mask. Check mask microphone working.

OVERHEAD PANEL

Flight control panel CHECK

- Make sure the flight control panel is set correctly. Flight control LOW PRESSURE lights should be illuminated (no hydraulic pressure yet). SPEED TRIM FAIL light may be on until IRS alignment is complete.

Audio transfer switch NORMAL

EFI transfer switch NORMAL

IRS transfer switch NORMAL

Fuel Panel SET

- Turn on all fuel pumps for tanks containing fuel. Turn on center fuel pumps only if more than 450kgs of fuel are in center tank. If less than 450kgs of fuel is in center tank delay usage of those pumps until in flight. This aims to prevent explosion of kerosene fumes. Observe respective "low pressure lights" extinguish.

Electrical system SET

- Verify electrical panel set up correctly. LOW OIL PRESSURE/DRIVE lights should be illuminated with engines not running.

Equipment cooling system NORMAL

- Verify switches in normal position, EQUIPMENT COOLING OFF lights out.

Cabin signs ON

- Place "fasten belts" and "no smoking" signs to ON.

Windshield wiper selector OFF

Window heat switches ON

- Switch these on at least 10 minutes prior to take-off to guarantee flexibility of windows in case of a bird strike.

Pitot static heat switches OFF

- Verify all lights are illuminating. These will be turned on just before taxiing to avoid overheating of the pitot-tubes on the ground.

TAT test switch PRESS then release

- The amber TEMP PROBE light will extinguish when button is released, then light up again with the corresponding master caution.

Wing anti-ice switch OFF

- Verify valve open lights extinguished.

Engine anti-ice switch OFF

- Verify lights extinguished.

Hydraulic panel SET

- After making sure that no one is near the flight controls place all hydraulic pump switches to ON. This will pressurize the hydraulic system to 3000psi. Check pressure and quantity of both systems.

Cockpit voice recorder TEST

- Press button for 5 seconds, verify indicator needle in green range.

Wing body overheat system TEST

- Hold overheat test switch for 5 seconds. Both Wing-Body Overheat lights will illuminate with corresponding master caution. Release to extinguish.

Cabin control SET, GRD:

Place temperature selectors in AUTO, straight up initially.

Isolation valve switch AUTO.

Engine bleed switches ON. APU bleed switch ON, check pressure.

One pack on for air conditioning on ground (left or right).

Recirculation fan to AUTO.

Set FLT ALTITUDE to planned cruising altitude.

Set LAND ALT to elevation of landing airport.

Set FLT/GRD switch to GRD.

Check pressurization mode selector in AUTO and green STANDBY light extinguished. If it is on, move mode selector to STBY, then AUTO.

Exterior light switches AS REQUIRED

- Turn on position lights and logo lights when needed.

Engine start switches OFF

Ignition select switch SET

- Set ignition to LEFT on odd days, RIGHT on even days to keep testing both loops. BOTH is not used in normal operation.

INSTRUMENT PANEL

Disengage light test switch TEST

- Place to TEST 1 (all lights amber) , then to TEST 2 (FMC light amber, others red).

Air temp/TAS indicator SET

- Set to TAT.

Airspeed indicator CHECK

- Check for correct indications, no flags.

EADI CHECK

- Check for proper attitude and no flags.

Altimeter SET

- Set to correct QNH/QFE.

RMI, EHSI CHECK

- Check for correct heading with standby compass, no flags.

Clock CHECK

- Check for correct time of day, date, adjust if necessary.

EGPWS test switch PRESS

- If pressed less than 2 seconds, a short self test is initiated. If pressed longer than 2 seconds, all audio messages play.

Light test switch TEST/BRT/DIM

- Use scan to check all lights working, replace bulbs if necessary (spare bulbs on FO´s sidewall panel)

Fuel quantity indicators TEST

- Push test button until ERR4 appears, then release. Observe test cycle.

Fuel used reset pushbutton PUSH

Engine instruments CHECK

- Check for normal readings, verify N1 reference knobs in unless manual use desired.

Engine oil quantity pushbutton PRESS

- Observe both indicators move to zero, then up when released

Anti-skid switch ON

- Check INOP light out.

Auto brake switch RTO

- Auto brake disarm light extinguishes after 2 seconds.

CONTROL STAND

Takeoff configuration warning horn TEST

- Move thrust levers forward with flaps up to test the warning horn.

Speedbrake DOWN DETENT

Reverse thrust levers DOWN

Engine start levers CUTOFF

Stabilizer trim cutout switches NORMAL
WXR radar switch ON

Decision height SET -20 on both sides

- This will disable the minimum callout at 200 feet radar altitude. Only used for Cat2/3a approaches.

Transponder SET

- Place altitude reporting switch to ON, mode switch to STBY.

Rudder and aileron trim CHECK 0

CHAPTER 2

PREPARING THE POWERED AIRCRAFT FOR FLIGHT

Navigational preparation:

- This will point out the steps to set up the instruments and radios for departure. If use of the flight-director is not desired, leave switches OFF.

AUTOPILOT MODE CONTROL PANEL

Place flight director switches to ON, starting with the side of the pilot who will fly the aircraft to determine the "MASTER" side

Set the course selectors appropriately (i.e. the first radial to be captured), tune NAV radios accordingly

Set the MCP altitude to first level-off altitude (i.e. 5000 feet)

Set the HDG selector to runway heading

Set correct frequencies on COM radio 1

- i.e. "Ground" active on left side, "departure" preselected on standby side). COM 2 is typically used to monitor guard frequency of 121.5

Verify autopilots are OFF

PREPARING THE FMC:

- The FMC can be used to varying degrees. It is possible to fly the aircraft without the FMC even working , using it partially (i.e. using the N1-limiting functions of the autothrottle) or fly use it to the maximum extent (LNAV, VNAV, ECON modes). For a full description of the FMS please refer to the appropriate subchapter. This is just a rough description of typical steps.

Enter ORIGIN and DESTINATION and other information as required on the RTE page 1

Select runway and SID for departure on the DEP/ARR page

Enter routing with fixes and airways on the RTE page 2 and following pages

Select runway and STAR (and transition, if needed) for arrival on the DEP/ARR page

Check routing on the LEGS page with PLAN mode on the EHSI selected for continuity and consistency with filed/expected routing

Enter performance information on the PERF page (weights, cruising altitude, wind, etc.)

Enter takeoff performance information on the N1 LIMIT page and the TAKEOFF REF page (TASS, V-speeds, Flap setting, etc.)

Once all this is completed, read the:

COCKPIT CHECKLIST

Fuel..... kgs/lbs, PUMPS ON

Cabin signs.....ON

Window heat.....ON

Hydraulics.....NORMAL

Cabin control.....SET, GRD

Instruments.....

Altimeters.....

Auto brake.....RTO

FMC..... SET

Speedbrake.....DOWN DETENT

Radios.....SET

CHAPTER 3

STARTING ENGINES AND PREPARING FOR TAXI

Set speed bugs on the MASI (set one plastic bug to V1, one plastic bug to Vr, the MCP speed cursor to V2 and one more plastic bug to V2 +15)

Door annunciator lights OUT

- Don´t start engines with any doors open (unless in some non-normal situations)!

Transponder Code ENTER

Transponder mode selector AUTO

- ATC needs to be able to see your aircraft to follow it with the airport surface movement radar

Anti-Collision light ON

Parking brake AS REQUIRED

- Set the brake to on when starting the engines without pushing back

BEFORE START CHECKLIST

Anti-Collision light..... ON

TASS..... deg

Parking brake.....

Contact ground crew for engine start/pushback

- Use the GROUND SERVICE menu to contact the ground mechanic. Observe that the parking brake must be OFF for pushback, and that ground electrical power will disconnect once the aircraft starts moving (the chord is only so long...)

TO START THE ENGINES (NORMAL START WITH APU BLEED AIR):

Ensure proper bleed air pressure of at least 30psi by turning off all packs

Verify isolation valve is open (both ducts at same pressure)

Turn engine start switch to GRD (usually start with engine no.2 first)

When N2 is above 20%, ideally at 25% move the engine start lever to IDLE DETENT

Observe starter cutting out at 46% N2

Turn engine start switch for other engine to GRD, repeat steps above.

ONCE BOTH ENGINES ARE RUNNING STABILIZED, PERFORM THE FOLLOWING ITEMS:

Both engine generator switches to ON

- This will connect the engine electrical generators to the AC busses, and simultaneously disconnect the APU generator from those busses

Pitot static heat switches ON

Engine anti-ice switches AS REQUIRED

- Turn these on if the temperature outside is below +10C and visible moisture is present

Cabin Control SET, FLT

- Make sure the pressurization panel is set correct. Both engine bleeds ON, APU bleed OFF, both packs AUTO, isolation valve AUTO and the FLT/GRD switch to FLT

Engine start switches GRD

APU OFF

Recall CHECK

- This will verify that no more amber lights are on and also verify that all systems have full capability. If, for example, one channel of the MACH TRIM system isn´t working, the corresponding light will only come on during RECALL

Flaps EXTEND

Flight controls CHECK

Move the primary flight controls to the stops to verify them moving freely

AFTER START CHECKLIST

Electric..... SET

Pitot Heat.....ON

Anti-Ice.....

Cabin Control..... SET, FLT

Engine Start Switches..... CONT

APU.....

Rating, Speed bugs.....20K, ...

Engine Start Levers.....IDLE DETENT

RECALL..... CHECKED

CHAPTER 4

FLIGHT OPERATIONS FROM TAXI TO CRUISE

When ready to taxi get the clearance from ATC and your ground-crew.

Taxi light ON

Parking brake RELEASE

Increase thrust as necessary - about 35%N1 should be enough under most circumstances, 40% if heavy, high or hot. Taxi speed should be limited to 15kts during turns and to 35kts during straight runs.

The airplane will usually start rolling even at idle thrust. Turns will bleed off speed. Anticipate power needs - i.e. if going straight, reduce thrust to idle, entering a tight turn, advance thrust slightly to compensate (usually about 28% N1 is a good setting).

Use the GS readout on the EHSI, it is very hard to judge speed accurately in a simulator (even in the big Level D ones).

During taxiing read the

TAXI CHECKLIST

Flight Controls..... CHECK

Flaps.....GREEN LIGHT

Trim.....ZERO, ZERO

BEFORE ENTERING THE RUNWAY:

Strobe lights ON

Autothrottle ARM

TCAS mode selector TA/RA

Terrain select switch ON

Landing lights ON

TAKING OFF:

Advance the thrust levers manually until N1 is about 40%.

Push the TO/GA buttons on top of the thrust levers - the autothrottle will advance the thrust levers to achieve takeoff N1 (you really want to map the TO/GA buttons to a joystick button).

Attention: To avoid triggering RTO mode due to a jittery hardware-throttle, advance hardware throttle full forward after the TO/GA mode engages!

Alternatively set takeoff thrust manually (in this case, only move hardware throttle to an appropriate position to achieve calculated takeoff N1, look for the little marker on the N1 gauge).

If turned on, the flight-directors will engage now in TOGA (pitch) and HDG SEL (ROLL). The pitch bar will initially point down, then at 60kts or so go up to +15deg. Don´t follow it yet, or you will scrape your tail. Disregard the FD until Vr.

At 84kts the autothrottle will switch to THR HOLD - then to ARM

At Vr start rotating smoothly. This requires some practice as you first need quite a bit of input to start the rotation, then relax to almost neutral stick, then pull back some more around 10deg nose-up, then relax again.

Aim for 3 deg/second and rotate to 15 - 20 deg nose-up. This should take 6-7 seconds. If you rotate early/too fast you will have a tailstrike. If you rotate too late/too slow you will waste performance on takeoff which could bite you in an engine-failure scenario.

Ideally your speed after rotation should stabilize at V2 + 20kts! This allows full bank angle of 30 degrees and good climb performance.

Landing gear UP

Some FWD fuel pumps may uncover and trigger the LOW PRESS light during acceleration and steep climb angles - this is normal and will not trigger the master caution.

Above 400 feet AGL you can select another roll mode if desired, usually LNAV.

Above 1000feet AGL you may engage one autopilot, usually A if the captain is flying

When the autopilot engages, the pitch mode of the flight-director will switch from TOGA to MCP SPD. Watch out for a correct speed setting - the MCP speed window might still show V2, not the autopilot will pitch up to slow to that speed again! Proper procedure is to set the speed to whatever

speed you are accelerating to, first (i.e. 210kts).

At the thrust-reduction altitude (as entered on TAKEOFF REF page 2/2) the autothrottle will automatically reengage (N1 mode) and set climb thrust, by default this happens at 1500 ´AGL.

At the acceleration altitude (check local regulations) you can start to increase speed by either lowering the nose manually or selecting a higher speed on the MCP or selecting VNAV

As speed increases you may raise the flaps according to the flap retraction schedule:

Takeoff flaps	Retract to	at this speed	then to	at this speed	then up at this speed
15	5	V2+15	1	170	190
5	1	V2+15			190
1					190

- Keep accelerating to at least 210kts.

Increase all the above speeds by 10kts if weight is above 53.000kgs/116.600lbs (high weight flaps speed schedule)

Landing gear lever OFF

- This will remove hydraulic pressure from the gear-up line

Engine start switches OFF

- This turns of the continuous ignition, extending igniter life

During climb-out accelerate to 250kts below 10.000feet, then to 290kts above that until 290kts equals M.74. At this point keep climbing with M.74. These are the standard climb speeds, but you may choose to fly ECON speeds or any other speed you like.

Use the autopilot as desired - refer to the dedicated "autoflight" chapter for more information on that.

At the transition altitude set the altimeters to standard 1013.2hPa or 29.92inHG

Passing FL100:

Landing lights OFF

Fasten belts switch AUTO

Auto brake OFF

Level off smoothly at the cruising altitude

Verify the cruising altitude is correct as set on the cabin control panel, if needed adjust.

Also verify the cruising altitude is set correctly in the FMC, otherwise fuel-, performance- and top of descent predictions may be erroneous

Set the fuel panel as desired, turn of center fuel pumps when they run dry. Balance fuel as needed.

CHAPTER 5

APPROACH AND LANDING

As you close in on your destination you will need to start planning your descent. The FMC has also done that – and you can see it´s result on your EHSI. There will be a green T/D symbol on your routing where it wants you to leave your cruising altitude. But beware, the FMC´s calculation is only as good as the data it has available. It´s planning depends on certain parameters (height above ground, distance to fly, weight, descent speeds, winds aloft, altimeter setting, temperature, use of anti-ice, enroute altitude and speed restrictions and so on...). In other words – never trust your FMC. If you have failed to enter the correct cruising altitude or decide to cut the input routing short – you may end up hopelessly high.

The standard descent for the 737 assumes that you maintain Mach .74 in the descent initially, until this Mach number equals 280kts IAS. Then you maintain 280kts until you reach FL100. Here you decelerate to 250kts and then descend with that until about 3NM from your final descent point (where the final descent glide slope starts).

Planning for this descent can be done roughly by multiplying the remaining distance with 3.3. The result is the height above landing field elevation you want to be at. So at 60NM to run you want to be roughly at FL200. Now you need to adjust this for weight (usually heavier weights need more distance to glide down), wind (tailwind needs more distance), descent speed (slower speeds need more distance).

Proper descent planning is 40% science, 40% experience and 20% luck... few things are more satisfying than chopping the thrust levers to idle at FL370 and arriving at your final descent point with flaps 5 and 180kts without ever having to use the speedbrake or needing to add thrust prematurely!

During the descent you want to review the approach (brief yourself – altitudes to be flown, special aspects, terrain considerations, minimum and weather, runway length, missed approach) and set the navigational aids as needed (frequencies, inbound courses, minimum, verify FMC setup correctly).

Roughly 15 minutes before touchdown do the approach items:

Fasten belts ON

- This serves as a reminder to the cabin crew to stop the service and start getting the cabin ready for landing.

Cabin control CHECK

- Make sure that the cabin is increasing pressure on schedule and the landing altitude is set correctly. If needed increase cabin descent rate by switching to standby mode, set the cabin alt to landing elevation -200 and use the rate-knob to increase descent rate.

Landing lights ON

- This increases visibility to other traffic and birds.

Recall CHECK

- This will verify that no amber warning lights are on in the cockpit.

Autobrake SET as required

- Set the autobrake to the desired deceleration level. I recommend 2 for normal conditions with sufficient runway available. RTO setting is not available. Be aware that MAX is less than maximum manual braking (despite the name).

Vref DETERMINE AND SET

- Pilot flying reads and sets the FMC computed Vref on the APPROACH REF page, i.e. 30/128. The PM calculates current gross weight and reads of corresponding Vref on the table above the forward window.

Altimeters SET QNH/Altimeter setting

- Once the aircraft is cleared to an altitude below the transition level both pilots can set their altimeters to QNH/altimeter setting. Then they can read the approach checklist, it can be found as a placard on the yoke:

APPROACH CHECKLIST

Recall..... CHECKED

Cabin control.....SET

Autobrake.....

Altimeter.....

The idea behind all this preparation is to prepare as well as possible for the approach to be flown. The approach is a phase of high workload, so “proper preparation prevents poor performance”. In my training we used the word WARNBIC as a reminder to do all necessary steps, and they apply for all airplanes and any approach:

W-eather (get ATIS, review, discuss)
A-pproach (which one to expect, alternatives)
R-adios (set up frequencies, communicate intentions with ATC)
N-avigation (plan the descent, check terrain, continuously monitor position of aircraft vs. intended flight path)
B-riefing (brief the approach, even if flying solo)
I-tems (do the approach items to prepare the aircraft for landing)
C-hecklist (read the approach checklist)
Once all this is done you can concentrate on flying the aircraft and the approach. The 737 is best operated according to standardized procedures. You just don´t wing it somehow to the airport and onto the runway – there is a certain choreography of steps to follow – not only to make sure you arrive in the right position to land safely, but also to give your fellow pilot the chance to monitor what you are doing! Your company also has some rules for you to follow (maximum descent rates, altitudes to be fully established at, etc.) and ATC wants to be able to guess what you are doing next.

Therefore Boeing has established some standardized approach patterns for pilots to follow. Review the official FCTM for the exact nature, I will give a rough rundown in the following chapters.

All approaches start out with the approach configuration: Flaps 5, speed 170kts (180 if over 53.000kgs). All approaches end stabilized (hopefully) at 1000 feet above landing threshhold elevation (a little less than 500 on a low-visibility circling approach) with landing flaps, speed on target and power at the correct setting. This concept of the “stabilized approach” allows the pilot to fly the last 1-2 minutes with steady flight parameters and concentrate on landing the airplane safely.

NOISE ABATEMENT ILS APPROACH

This is the type of approach that a real pilot will fly 95% of the time. It starts typically at 10NM from the threshold at 3000´AGL.

Make sure you establish on the ILS localizer timely before intercepting the glideslope. Arm APP mode if you want to use flight-director or autopilot. Thrust for level flight and flaps 5 is roughly 60%N1.

Don´t use the autothrottle in speed mode unless the autopilot is controlling the airplane (manual flight = manual thrust!). It should be in ARM. The autothrottle in ARM mode will engage into SPEED mode automatically each time a new pitch mode becomes active. This is a safety feature and can be a nuisance if you want to fly manually with the flight-director on. So I recommend using the autopilot until GS is captured, then disengage SPD mode and autopilot.

When intercepting the glideslope, start final descent to follow it. Target rate of descent is 5x groundspeed. Power will be almost idle.

At 2000´AGL drop the landing gear. Then select flaps 15 in one step (omit flaps 10).

Once speed slows to 160kts, select flaps 25, then at 150kts select landing flap setting (30/40).

Be ready for the "ballooning effect" when extending flaps to 15. Lift will increase a lot during the extension, and you need to aggressively add nose-down input to avoid getting high on the glideslope. Forces lessen again as speed slows. This also applies to further flap extension but to a lesser extent.

Check your final altitude when passing the outer marker or equivalent fix.

At your decision height determine if runway is in sight. If not, follow the missed approach procedure as detailed below.

If the approach lights/runway are in sight, continue approach. Disconnect autopilot at 100 ´AGL at the latest.

NON-PRECISION APPROACH

The non-precision approach is usually flown a bit more conservative, with final flaps and gear-down from the point of descent. The pilot needs to concentrate on tracking the vertical flight path, configuration and speed changes would only complicate this. You CAN also fly

it more like the noise-abatement ILS, this saves fuel and noise, and with the aid of the vertical deviation pointer on the EHSI and an alert co-pilot this is certainly a good option for non-critical weather.

Non-precision approaches should be flown without flight-director, but of course you can use the autopilot

Here are the steps for the most conservative approach:

At 2NM from the point of final descent drop the landing gear, then select flaps 15 (maintain altitude during the "balloon effect".

At speed 160kts select flaps 25, at 150kts select landing flaps (30/40).

Aim to start final descent fully configured with target speed.

Keep tracking the approach nav-aid (VOR, NDB, LOC) and check current altitude against target altitude. Ideally you want to follow an “imaginary glide-slope” that will take you down a 3deg path to the touchdown zone – while clearing all necessary minimum altitudes the vertical profile of the approach demands. It is of great help to have a table that lists distance to go (DME) vs. altitude. This way you can read off: DME 4NM, altitude should be 1290feet!

Look at the geometry of the minimum and missed approach point. There is a misconception that you need to fly down to the minimum, level off, proceed to the missed approach point, then do the missed approach if you haven´t found the runway. This might be possible in a Cessna, but not in a passenger jet. We have something called a “visual approach point”, sometimes even denoted on approach charts with a little “V”. This is the lateral point where the minimum descent altitude intersects the “imaginary glide-slope”. You want to fashion your descent to arrive at this point exactly at the "minimum". If you see the runway, you are in the perfect spot to continue your 3deg descent to the touchdown zone. If you don´t you might as well start the missed approach – if you hang around at the minimum and spot the runway 10 seconds later you will not be in a vertical position to do a safe landing anymore, anyway.

VISUAL APPROACH

These are the steps for a standard visual approach:

Join the downwind leg at 170kts and 1500´AGL. You want to have a lateral distance of about 2.5NM to the runway. Your wind-correction should be equal to the driftangle, in other words stay at the same lateral distance to the runway in a crosswind.

Look out your side window. When you pass abeam the landing threshhold, start the stopwatch,

drop the gear and select flaps 15. Don´t change the powersetting, it stays at whatever was needed for flaps 5 + 170kts (ca. 60%N1).

The airplane decelerates to 150kts. When 45 seconds have passed (subtract half the tailwind components in knots, so for 20kts tailwind start your turn at 35secs) select flaps 25, start a 500fpm descent and 25deg bank toward the runway. Roll out on base heading briefly, then select final landing flaps.

Look at the runway, start your turn to final and adjust pitch to get on profile.

LOW-VISIBILITY CIRCLING APPROACH

This is one of the hardest approaches to do right. It is intended to enable you to land on airports that only have an instrument approach in one direction, but in a situation where the tailwind wouldn´t allow you to land safely in that direction. The basic idea is to follow the published approach down to an altitude where you can see the airport, then do a visual pattern at that (very low) altitude and circle around to land - all the time trying to keep the airport in view in possibly bad visibility, stormy weather and just skirting the low clouds...fun!

Fly the standard instrument approach with gear down and flaps15, 150kts. Determine the MDA (minimum descent altitude) for the circling minimum. It could be as low as 600 feet above the aerodrome.

When you approach that altitude and have the airport in sight, level off, break out to the left or right as desired (if no direction is specified, try to keep the airport on "your" side, so you can see it better during the turns towards the runway).

Turn to a heading that is 80deg off the runway track. Adjust this heading according to drift angle that you measured during the approach. If the crosswind is blowing you away from the runway, reduce the heading by 2xDA. If it is blowing you towards the runway, maintain the 80deg off-runway for 2xDA in sec.

After this time elapsed, turn back immediately to downwind heading, adjust for wind (1xDA).

Abeam the threshold start the timing (3x Altitude in feet/100 - 1/2 Tailwind(kts)).

When the time elapses do a continuous 30deg bank turn towards the runway and immediately select landing flaps (30/40, omit 25).

Slow to target speed. Keep turning. Once you determine to be "in slot" vertically, start your descent.

MISSED APPROACH

If at any time during an approach you decide that you cannot land safely, do not hesitate to initiate a go-around and follow the missed approach procedure.

The initial steps are always to push the TO/GA buttons on the thrust levers. This will advance the thrust levers to reduced or full (with a second press of the TOGA buttons) go-around thrust.

Raise the nose to 15deg nose up, and immediately select flaps 15, then raise the gear.

At 1500 feet above aerodrome drop the nose to 10deg, start acceleration and raise the flaps according to schedule as you would during a flaps15 take-off. Observe how the speed cursor moves to a new safe maneuvering speed in relation to flaps retracting.

LOW-VISIBILITY APPROACHES

This term applies to CAT2 and CAT3a approaches. The 737-300 is certified to fly those to a minimum of 100feet/300mRVR and 50feet/200mRVR, respectively. These are flown like the standard ILS approach, with a few subtle differences as follows:

CAT2: This approach can be flown with one autopilot down to the minimum of 100feet radio altitude, or with both autopilots and autoland (like the CAT3a). If you use one autopilot only, disconnect it at the minimum and land manually. The single autopilot will also disconnect automatically when you push the TO/GA buttons for a go-around.

CAT3A: This approach will be flown with both autopilots engaged. It has an "autoland" feature where the autopilot will flare the aircraft and fly it to touchdown. It also has an automatic go-around feature, where the autopilots can control the aircraft during a go-around (pilot still has to push the TO/GA buttons to initiate it).

1.) set the ILS frequency on BOTH receivers
2.) set DH, according to landing minimum for CAT2, to 50 for CAT3b
3.) engage second autopilot in CMD when on localizer (latest at 800feet AGL)
4.) watch for the white FLARE indication after self-test around 1500feet is successful
5.) at 50 feet the FLARE will become active
6.) at 27feet the autothrottle will enter "RETARD" mode

7.) after touchdown disconnect the autopilots and roll-out manually

In case you need to go-around, just push the TO/GA buttons (after FLARE is white, this means the auto-go-around is also armed). The autopilot will fly the go-around for you. Above 400 feet you can select another pitch and roll mode to accelerate and follow the missed-approach procedure.

LANDING

Set the speed cursor on the MCP to target speed. Calculate target speed as follows:

Determine Vref (according to current weight). Add half the steady headwind to that. Add the full gust-factor to that. MINIMUM target speed is Vref+5. Maximum is Vref+20.

Examples:

Runway 27. Vref 130kts. Wind 200/20G30. Steady headwind is ca. 8kts. Gust factor is 10 kts. So target speed would be 130 + 4 + 10 = 144kts.

Runway 27. Vref 130kts. Wind 180/15. Steady headwind is 0. Gust factor is 0.

So target speed would be 130 + 0 + 0 = 130 but we need always at least +5 so it is: 135kts.

When on final approach:

Speedbrake ARM

- Move the speedbrake lever up from the down detent towards the arm notch, until the green ARM light comes on

Flaps/landing gear EXTEND ON SCHED

Cabin ready RECEIVE

- Make sure the passenger cabin is secure for landing

Now it´s time to read the FINAL checklist - it can be found as a placard on the yoke.

FINAL CHECKLIST

Engine start switches.....CONT

Speedbrake.....ARMED, GREEN LT

Landing gear.....DOWN, 3 GREEN

FLAPS..... GREEN LIGHT

Landings are done best if you aim to always arrive over the threshold with the same conditions. Altitude should be 50 feet. Speed should be Vref+5. Sinkrate should be 700fpm.

Obviously this is not always possible. Speed will vary with wind-additionals. Sinkrate will vary with weight (as Vref changes). You will need to adjust your "break" a bit for that...

What is the "break"? The idea behind this is to avoid "flaring" the aircraft. Flaring leads to long floating, waisting valuable runway length. The "break" is done at 10-20 feet and is a rapid short nose-up input that will "break" your sinkrate from 700 to maybe 200 feet per minute. Simultaneously chop the power to idle.

If executed perfectly the ground-effect will help you to reduce the sinkrate a bit further and you will touch down with 100-150fpm. More important than the ultra-smooth touchdown is the spot of touch-down. Aim to touch down ON the 1000foot distance marker (the fat stripes).

DON´T cross the threshhold below 50feet. DON´T dive for the runway once past the threshhold. DO scold yourself for every feet you touch down beyond the markers. Practice. Pray. Cry if you have to.

After touchdown immediately pull the speedbrake lever to full up. It should deploy automatically, but sometimes on wet runways it won´t - or the servo motor could fail. The ground-spoilers are THE single most important item to help you slow down safely on a slippery runway.

Immediately after that apply brakes (or make sure the autobrake does, watch for the DISARM light).

Open the thrust reverser to at least idle detent. If necessary apply more than that - a good level would be a N1 equal to weight in tons. If runway length is critical, up to full go-around N1 can be used. If, however, you choose to do that on pretty much any European airport on a long and dry runway prepare to explain your actions to the official in charge of environmental impact after you arrive at the gate...

CHAPTER 6

AFTER LANDING AND PARKING

Taxiing the aircraft to the parking position or gate after landing can be very demanding, too. It takes good crew coordination to keep situational awareness, in addition to performing some steps to prepare the aircraft for arrival at the gate.

AFTER-LANDING ITEMS:

Reversers stow

Speedbrake down

Landing lights as required

- Usually turn off the landing lights and turn on taxi-lights and runway-turnoff lights

Flaps up

Pitot-Static-Heat off

- This removes heating from the pitots during ground operation, they would get too hot without the cooling airflow.

FLT/GRD Switch GRD

- This will open the outflow valve, depressurizing the airplane so you can open the cabin doors later on.

Strobe Lights OFF

- They could blind other aircraft/personnel

Engine start switches OFF

APU As required

- Only use the APU if you need it for electrical power or aircondition after parking. Its loud and uses fuel!

Single-engine taxi consider

- You can save a lot of fuel by switching off engine 2 at this point. Observe the minimum engine cooldown time of 3 minutes at idle thrust.

Some systems won´t work, since the generator bus 2 isn´t powered anymore, but nothing critical. If desired, use APU to power generator bus 2.

F/D switches OFF

Auto brake OFF

WXR Mode OFF

- This will de-energize the weather-radar system, to avoid hitting ground personnel with electromagnetic waves

Once arrived at the gate/parking position:

Parking brake set

Electrical supply establish

- This could be the APU or ground power provided by the airport. Make sure you switch supply to the new source, otherwise you will be in the dark after the next step.

Engine start levers CUTOFF

Fasten belts switches OFF

Window heat switches OFF

- This removes power from the window heat, otherwise they get very warm and especially in summer add to the heat problem in the cockpit.

Anti-ice OFF

Cabin control check

- Double check that the airplane is completely depressurized

Anti-collision light OFF

Transponder Standby

Now you can read the:

PARKING CHECKLIST

Window-, pitot heat.....OFF
Anti-ice.....OFF
Anti-collision light.....OFF
Engine start switches.....OFF
Landing lights.....OFF
Flaps.....UP, LIGHTS OUT
Speedbrake.....DOWN DETENT
Engine start levers.....CUTOFF
Parking brake.....
WXR Mode..... OFF

If you decide that you had enough of flying, shut down the airplane with these items:

IRS mode selectors off

Fuel pumps off

Galley power off

Emergency exit lights off

- Leaving these in ARMED would trigger them after turning off the battery, draining their own internal batteries over night.

Electrical hydraulic pumps off

Packs off

Windows close

Stabilizer trim 0

- This will effectively tilt the stabilizer backwards, so de-icing fluid could not run into the balance panel bays if the airplane were to be de-iced at night.

Parking brake as required

- Make sure chocks are applied before releasing the parking brake

Radar off

Lights as required

APU off

Battery switch off

- Wait 20 sec if APU was running, to give it a chance to close its APU air inlet door

Ground service switch as required

- If a GPU is connected, toggling the ground service switch on will power the ground service bus, lighting the interior of the aircraft, powering the power outlets and also charging the airplane battery.

Now you can read the:

LEAVING AIRPLANE CHECKLIST

IRS mode selectors..... OFF
Fuel pumps..... OFF
Galley power..... OFF
Emergency exit lightsOFF
Elec hyd pumps..... OFF
Packs..... OFF
Windows..... CLSD
Stabilizer trim0
Parking brake.....
Radar..... OFF
APU/Battery switch.....

Ground service switch.....

Off to the hotel, it is!

MINIMUM PROCEDURES

These are the minimum steps required to operate the aircraft. Many steps and checks normally performed are omitted for brevity – i.e. the fire-warning-system is not checked because a failure is not assumed for the sake of this simulation. For the full procedure please refer to the original Boeing 737 OM (operations manual) and Boeing 737 FCTM (flight crew training manual). Google is your friend ☺.

COCKPIT PREPARATION

Condition: The airplane is not powered, no systems are running

Goal: To power up the aircraft and prepare it for flight

1.) Switch on the battery (guarded battery switch, overhead panel, electric)
2.) Start the APU (APU switch momentary to start, then on, forward overhead panel)
3.) When APU is running (Blue “off bus” light on) connect APU generator to both main busses (overhead panel, electric)
4.) Turn on IRS´s (Both IRS mode selectors on aft overhead panel to on)
5.) Turn on electrical hydraulic pumps (overhead panel, hydraulic)
6.) Turn on yaw damper (overhead panel, flight controls)
7.) Turn on all window heat switches (overhead panel, anti ice)
8.) Arm emergency exit lights (overhead panel, center)
9.) Set the cabin control panel (dial in desired flight altitude, landing elevation, set to GRD)
10.) Cage standby horizon (CM1 instrument panel, pull “cage” knob then release)
11.) Enter present position into FMS (POS page 1, press INIT/REF to access)
12.) Enter performance data into FMS (PERF page 1, enter weights, cruise alt, reserve fuel, etc.)
13.) Enter Route into FMS (RTE page 1, enter aerodrome of departure and destination, then enter fixes and airways on page 2, then ACTIVATE and EXECute)
14.) Enter departure runway and SID into FMS (DEP/ARR page, then EXECute)
15.) Enter arrival runway and STAR into FMS (DEP/ARR page, then EXECute)
16.) Enter flapsetting for takeoff into FMS (TAKEOFF page)
17.) Enter Vspeeds for takeoff into FMS (TAKEOFF page)
18.) Set plastic speedbugs on airspeed indicator (V1, V2+15)
19.) Set airspeed cursor on mode control panel to V2
20.) Set trim to take-off setting (according to center of gravity)
21.) Setup nav-radios and the mode control panel for the planned departure
22.) Turn flight-directors on, if desired (pilot flying´s side first to make that master)
23.) Set parking-brake
24.) Turn on anti-collision light (forward overhead panel, right side)
25.) Turn on APU bleed, check duct pressure > 30psi (overhead panel, pneumatic)
26.) Make sure IRS´s are fully aligned (EADI shows normal picture), doors closed and

ground-power cable disconnected. Obtain clearance to start engines.

27.) Turn Transponder to “auto” (center pedestal)

START-UP AND TAXI-OUT

Condition: The APU is powering the aircraft electrically and pneumatically. All systems are running, IRS´s are aligned. The FMS is set, radios and navaids are set for departure.

Goal: To start the engines, prepare the airplane for taxi and taxi to the departure runway

1.) Rotate engine start switch No.2 to GND (forward overhead panel, check pneumatic pressure)
2.) When N2 is 25%, move the start lever No.2 to idle (control stand, aft of thrust levers)
3.) Wait for the EGT to decrease again and stabilize
4.) Repeat above steps 1-3 for engine No.1
5.) Connect both engine generators to the main electrical busses (overhead panel, electric)
6.) Turn on all pitot/static heat switches (overhead panel, anti-ice)
7.) Turn on both packs (overhead panel, pneumatic)
8.) Turn on both engine bleeds (overhead panel, pneumatic)
9.) Turn off APU bleed (overhead panel, pneumatic)
10.) Set FLT/GRD switch to FLT (overhead panel, pneumatic)
11.) Turn both engine start switches to CONT (forward overhead panel)
12.) Turn off APU (APU switch on forward overhead panel)
13.) Turn on taxi light (forward overhead panel)
14.) Set flaps for take-off setting (flap handle, control stand)
15.) Receive taxi-clearance
16.) Release parking brake (control stand)
17.) Taxi to departure runway, use up to 40%N1, speeds between 10kts (turns) and 30kts

TAKE-OFF AND CLIMB TO CRUISING LEVEL

Condition: You are at the departure runway, ready for departure, take-off clearance received

Goal: To take off, and climb to cruising altitude

1.) Before line up arm the autothrottle (mode-control panel, left side)
2.) Turn on strobe lights (overhead panel, lights)
3.) Turn on landing lights, turn off taxi and turnoff lights (overhead panel, lights)
4.) Turn on TCAS (center pedestal)
5.) When cleared for take-off: advance thrust levers to 40-50%N1

6.) Push TO/GA button on either thrust lever (move hardware joystick full forward afterwards)
7.) At Vr rotate with 3° per second to about 18° nose-up
8.) When lifted off + positive rate of climb -> gear up
9.) Maintain V2 + 20kts
10.) Above 1000`AGL the autopilot may be engaged
11.) At 1500´ AGL -> set climb power (A/T will do automatically), pitch down to 10°nose up
12.) Retract flaps on schedule: at V2+20 -> flaps 1, 190kts -> flaps up
13.) Climb with 250kts to 10.000 feet (ca. 10°nose up)
14.) Set altimeter to standard 1013hpa when passing transition altitude
15.) Passing 10.000feet accelerate to climb speed (290kts, 5°nose up)
16.) When 290kts equals M0.74 maintain that to cruising level

DESCENT AND FINAL APPROACH

Condition: The aircraft is approaching the top of descent during cruise flight

Goal: To descend the aircraft to initial approach altitude and fly an approach to land

1.) Receive all information pertaining to planned approach (weather, approach, etc.)
2.) Plan approach (routing, terrain, approach type, runway and taxi-route, missed approach)
3.) When distance to threshold is roughly = FlightLevel above airport/3.3) start descent.
Example: Cruise at FL330. Landing Elevation 3000feet. Start descent at 90NM.
4.) Descend with idle power at M0.74 until IAS is 280, then use that to FL100, then descend with 250kts
5.) Perform approach items: Fasten belts on, set autobrake, set speedbugs for Vref+ Vref+15
6.) Landing lights on below FL100 (overhead panel, lights), read approach checklist (on yoke).
7.) Decelerate before starting final approach. At 210kts select Flaps 1, at 190kts select Flaps 5.
8.) Intercept the final descent point with Flaps 5 and 180kts IAS.
9.) Reduce speed on glideslope after lowering gear approx. 2000´above aerodrome.
10.) Select Flaps15 at 170kts, Flaps 25 at 150kts, Flaps 30 or 40 at 140kts, then fly at Vtgt (Vref+5 to Vref+20, depending on wind and gusts).
11.) Arm the spoilers, read landing checklist (on yoke).
12.) After touchdown check speedbrake deploying, open reverser to desired N1, monitor autobrake working
13.) When off the runway, lower speedbrake, check reversers closed
14.) Turn off landing lights, turn on taxi-light (overhead panel, lights)

TAXI TO PARKING AND PARKING

Condition: The aircraft has just left the landing runway, spoilers and reversers are stowed

Goal: To taxi the aircraft to the parking position, and shut down all flight-related systems

1.) Flight directors off (mode control panel)
2.) APU on, if desired (overhead panel, forward)
3.) Pitot/Static heat switches off (overhead panel, anti-ice)
4.) FLT/GRD switch to GRD (overhead panel, pneumatic)
5.) Autobrake selector off
6.) Raise flaps to up
7.) Check WXR mode off (center pedestal)
8.) TCAS mode selector Stby (center pedestal)
9.) If desired connect APU to generator busses (overhead panel, electric)
10.) When approaching parking position: taxi light off
11.) When parked: Parking brake set
12.) Start lever no.2 cutoff
13.) After groundpower or APU connected to busses: Start lever no.1 cutoff
14.) Fasten belts switch to off (overhead panel, center)
15.) Window heat off (overhead panel, anti-ice)
16.) Set airconditioning, if desired (overhead, pneumatic): APU bleed on, one pack on
17.) Anti-collision light off (overhead, lights)
18.) Transponder to Stby (center pedestal)

LEAVING AIRPLANE

Condition: Aircraft is parked, engines are off.

Goal: To shut down and secure the aircraft for an extended time, leaving it unattended

1.) IRS mode selectors off (aft overhead panel)
2.) Fuel pumps off (overhead panel, left)
3.) Galley power off (overhead panel, center)
4.) Emergency exit lights off (overhead panel, center)
5.) Electric hydraulic pumps off (overhead, hydraulics)
6.) Packs off (overhead panel, pneumatic)
7.) Windows closed
8.) Stabilizer trim 0 units
9.) Parking brake as desired
10.) Radar off (center pedestal, forward)
11.) APU off (if running) - wait 20s before next step!
12.) Battery switch off (overhead, electric)

ACRONYMS AND ABBREVIATIONS

A

AFCS.....Automatic Flight Control System
AFDS.....Autopilot Flight Director System
A/P.....Autopilot
APFCS.....Autopilot Flight Control System
A/T.....Autothrottle
ATC..... Air Traffic Control

B

BAT..... Battery

C

C/B.....Circuit Breaker
CDU.....Control Display Unit (to type information into the FMC)
CG..... Center of Gravity
CMD.....Command
CRT.....Cathode Ray Tubes (TV screens)
CVR.....Cockpit Voice Recorder
CWS.....Control Wheel Steering (a mode of the autopilot)

D

DH.....Decision Height
DOW.....Dry Operating Weight

E

EADI.....Electronic Attitude Director Indicator (Upper CRT)
EFIS.....Electronic Flight Instrument System
EGPWS.....Enhanced Ground Proximity Warning System
EGT.....Exhaust Gas Temperature
EHSI.....Electronic Horizontal Situation Indicator (Lower CRT screen)

F

F/D.....Flight Director
FF.....uel Flow
FL.....Flight Level
FLCH.....Flight Level Change (autopilot mode)
FMA.....Flight Mode Annunciation (upper row on the EADI, displaying AFCS status information)
FMC.....Flight Management Computer
FMS.....Flight Management System

G

G .....measure of acceleration (1G equals the earth´s pull on a free object)
G/A.....Go around
GCU.....Generator Control Unit
GPWS.....Ground Proximity Warning System
GS.....Ground Speed
G/S.....Glide Slope
GW.....Gross Weight

H

HDG.....Heading
HSI.....Horizontal Situation Indicator

I

ILS.....Instrument Landing System
INT.....Interphone

L

LAT.....Latitude
LOC.....Localizer
LON.....Longitude

LRC.....Long Range Cruise (a speed 5% faster than MRC)
LRRA.....Low Range Radio Altimeter
LSK.....Line select key (keys next to screen on FMS CDU)

M

M.....Mach
M/A.....Missed Approach
MAC.....Mean Aerodynamic Chord
MAG.....Magnetic
MAP.....Missed Approach Point
MASI.....Mach Airspeed Indicator (the analog airspeed indicator)
MATOW.....Maximum Takeoff Weight
MCDU.....Multipurpose Control Display Unit (same as CDU)
MCP.....Mode Control Panel (panel just below the glareshield for AP controls)
MCP ALT.....Altitude that is dialed in on the MCP ALT window
MCP SPD.....Speed that is dialed in on the MCP SPD window (governing APFCS speed)
MCT.....Maximum Continuous Thrust
MLW.....Maximum Landing Weight
MMO.....Maximum Mach Operating Speed
MRC.....Maximum Range Cruise
MSA.....Minimum Safe Altitude
MSL.....Mean Sea Level
MZFW.....Maximum Zero Fuel Weight

N

N1.....Low Pressure Rotor (Fan) Speed, in percent.
N2.....High Pressure Rotor (Turbine) Speed, in percent.

O

OAT.....Outside Air Temperature

P

P/A.....Passenger Address

PCU.....Power Control Unit
PF.....Pilot Flying
PM.....Pilot Monitoring
PMC.....Power Management Computer
P/RST..... Push To Reset
PRV.....Pressure Regulating Valve
P/S.....Pitot Static
PTT.....Push To Talk

Q

QFE.....Field Elevation Atmospheric Pressure
QNH.....Sea Level Atmospheric Pressure

R

RA.....Radio Altimeter
RDDMI.....Radio Digital Distance Magnetic Indicator
RMI.....Radio Magnetic Indicator
ROC.....Rate of Climb
ROD.....Rate of Descent
RTO.....Rejected Takeoff
RVR.....Runway Visual Range
RVSM.....Reduced Vertical Separation Minima

S

SAT.....Static Air Temperature (Temperature of still air, same as OAT)

T

TA.....Traffic Advisory
TAI.....Thermal Anti Ice
TASS.....Temperature Assumed (determines the dynamic derate of engines for T/O)
TAT.....Total Air Temperature (appearant temperature after speed-induced ramrise)

TCAS.....Traffic Collision Avoidance System
T/C.....Top of Climb
T/D.....Top of Descent
T/O.....Take OFF
TR.....Transformer Rectifier
TRU.....Transformer Rectifier Unit (turns alternating current into direct current)

V

V1.....Takeoff Abort Decision Speed
V2.....Minimum Safe Climbout Speed (usually 1.2 x stall speed at 1G)
VLGE.....Maximum Speed Landing Gear Extended
VLGO.....Maximum Speed Landing Gear Operating
VMCA.....Minimum Control Speed Air
VMCG.....Minimum Control Speed Ground
VMO.....Maximum Operating Speed
VR.....Rotation Speed
VREF.....Reference Speed (Approach) (safe approach speed, usually 1.3 x stall speed at 1G)
V/S.....Vertical Speed
VSI.....Vertical Speed Indicator
VSS.....Stick Shaker Speed (speed at which the stickshaker system springs into operation)

W

WAI.....Wing Anti Ice
WXR.....Weather Radar

Y

Y/D.....Yaw Damper

Z

ZFW.....Zero Fuel Weight