Tutorial

Normal Procedures

This is a brief description of some of the items you will need to understand so you can begin to enjoy one of the most meticulously crafted simulator models ever made – The more you study the handbooks that are provided with this model, the more you will ENJOY!

As a line pilot, it would be possible to have the 737 assigned to you in a cold & dark state, so we train for just such an occasion.

The first thing you would do with a cold and dark aircraft is perform a **cockpit safety check**. Before powering up the aircraft you need to assure all the switches and levers are in the proper position so nothing will move when the plane is brought to life.

COCKPIT SAFETY CHECK

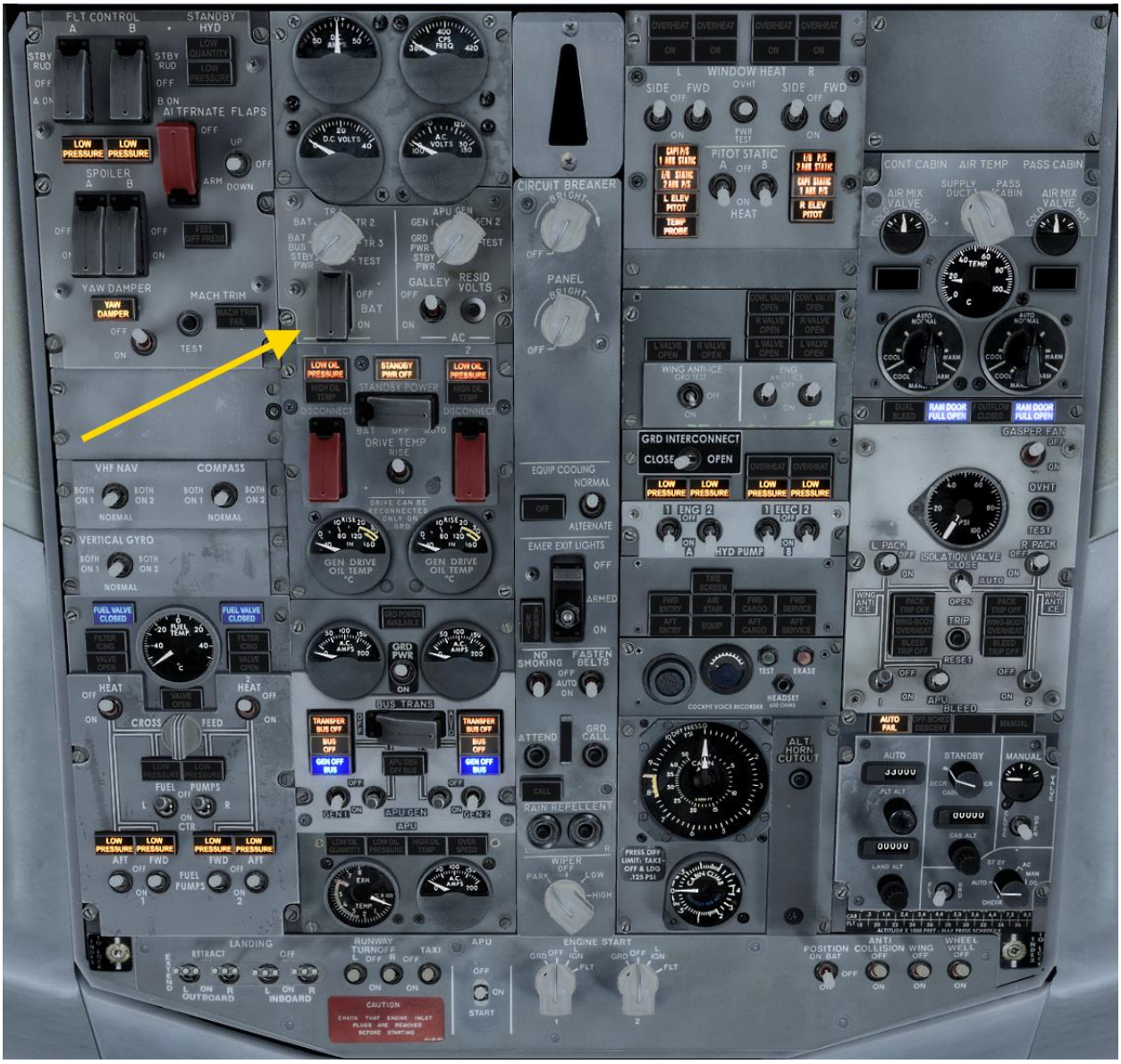
Battery Switch on..... ON
Check that the gear lever is down and locked..... CHECK
Flap lever agrees with flap position..... CHECK
Electric Hydraulic Pump Switches - OFF..... OFF

Establish electrical power on the aircraft.

If **EXT PWR** (external power or ground power) is connected it can be used to power the aircraft. However if it is hot or cold outside the APU should be started to provide air-conditioning and equipment cooling. Also, you will need APU air to start the engines.

APU START - Overhead panel, cold & dark

1. Turn on the battery switch, check battery voltage.

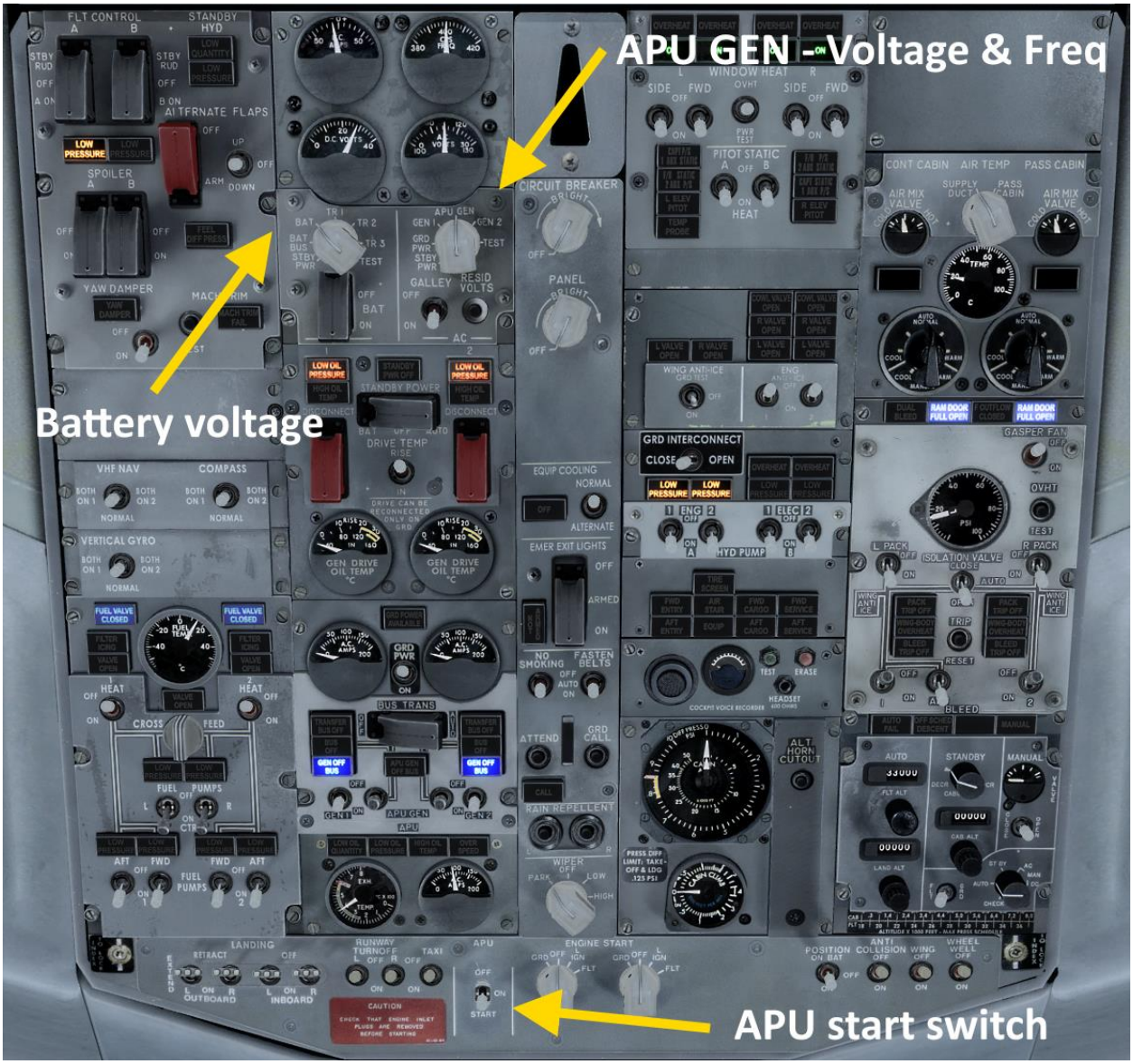


2. Move the momentary APU switch to START and release to ON.

3. Select APU GEN on voltage and frequency switch and monitor start.

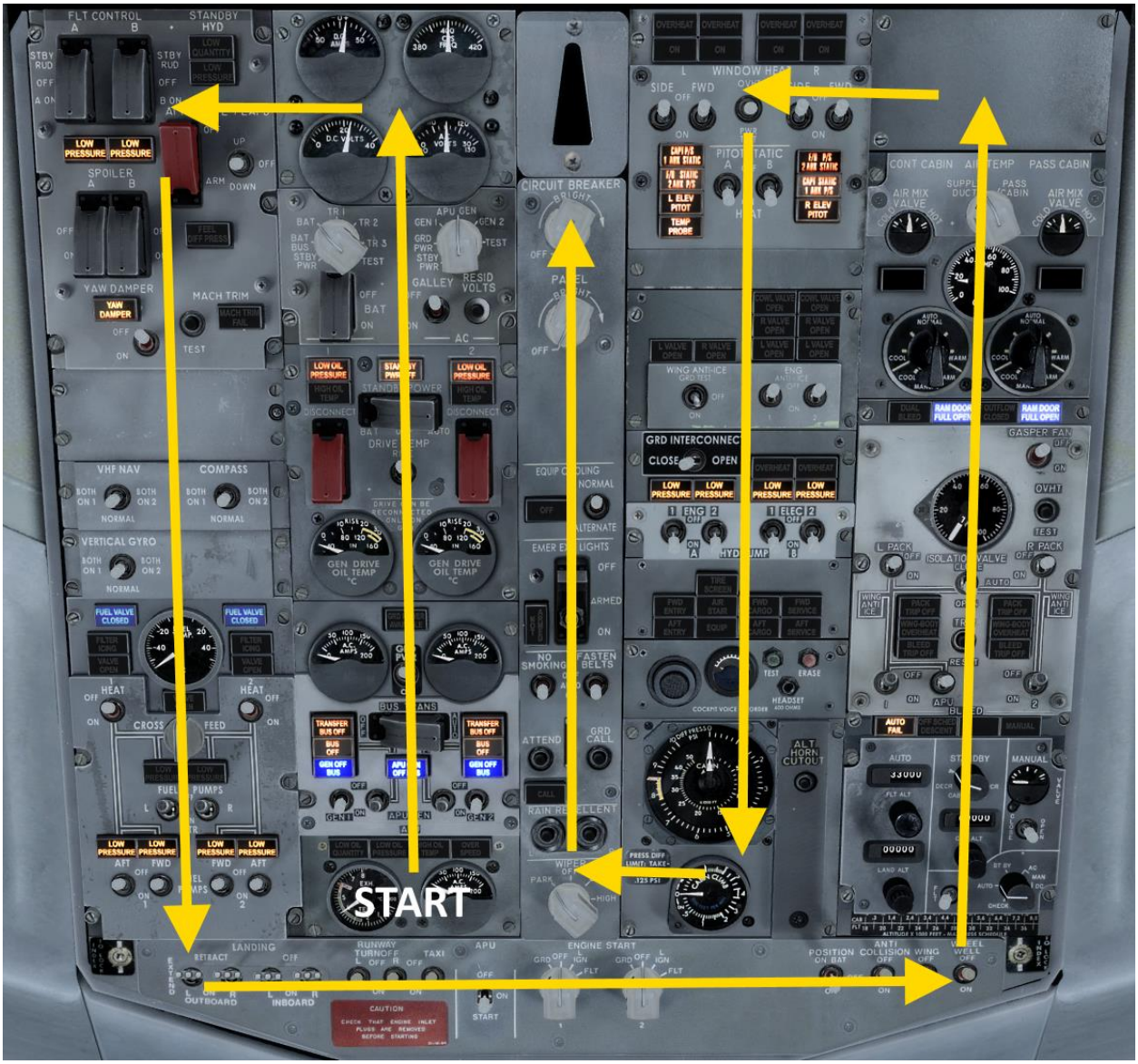
More than you wanted to know…

The button labeled **RESID VOLTS,** next to the galley power switch, shows the amount of current produced by just the permanent magnet in the generator. The **Residual Volts** button may be used to test a generator that has dropped off a bus. When pressed, if a voltage is seen then the generator is still turning.



When the **APU** start is complete, establish electrical power to the aircraft and turn on the air-conditioning system to provide heating or cooling and equipment cooling as well.

Overhead Perflight prior to leaving cockpit.



1. Start at the electrical panel as shown. Move the APU GEN switch to momentary ON and power the plane.

2. Use the flow lines as depicted on the picture to set the overhead panel before leaving the cockpit. This will provide equipment cooling and air-conditioning for the cabin and cockpit. Once the plane is powered by the APU, follow the yellow flow lines up and down the overhead panel. Turn on the fuel pumps, if the center tank has fuel turn them on too.

3. Go across the lighting part of the overhead panel and set the lights as required. On the right side of the lower part of the panel, turn on the NAV lights so you can check them during the walk-around. If it's dark out, turn on the wheel well lights for inspection of the landing gear and tires.

4. Set the air-conditioning and pressurization panel. To set the FLT ALT first left click on the knob to engage, then use the mouse wheel to set the cruise altitude in the window.


Set Altitude

There are three sections to the pressurization panel. **AUTO, STANDBY & MANUAL**
Make sure the selection knob in the lower right of the panel is in **AUTO**. Set both the **FLT ALT & LAND ALT** in the window. If during flight the amber **AUTO FAIL** light would illuminate, select **STANDBY** and set the cabin altitude using the placard along the bottom of the panel. Use the rate of change knob to control how fast or slow the cabin changes pressure. In **MANUAL** you will need to control the outflow valve by using the **OPEN & CLOSE** switch. You will be a busy copilot! The **FLT/GRD** switch is used to place the outflow valve full open after landing to depressurize the plane so the cabin doors can be opened.

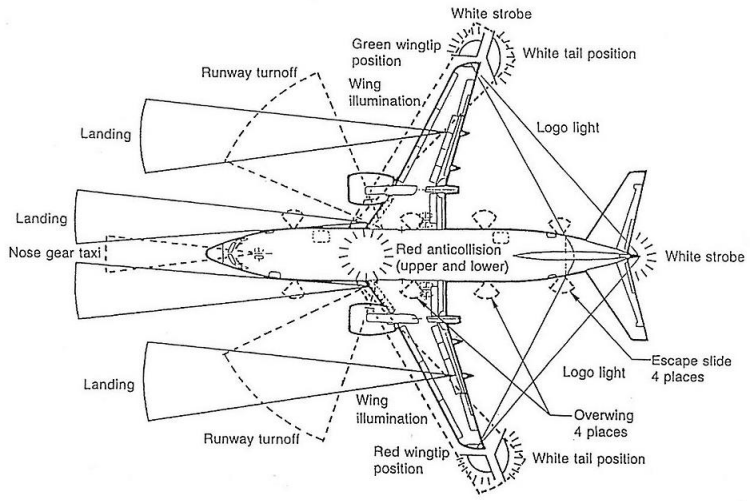
The air-conditioning section is above the pressurization panel. Since you started the APU, open the **APU BLEED** valve. This allows pressurized APU air to enter the A/C system. Open the APU isolation valve to provide air to both A/C packs. Turn on the LEFT and RIGHT packs and observe the pressure drop on the gage. The **GASPER FAN** switch is used to provide extra air to the eye-ball outlets on the units over the passenger seats and to the cockpit vents as well.

Temperature control can be AUTO or MANUAL using the large knobs at the top of the panel. Cockpit temp control is on the left, cabin on the right. Turn on the 4 window heat switches.

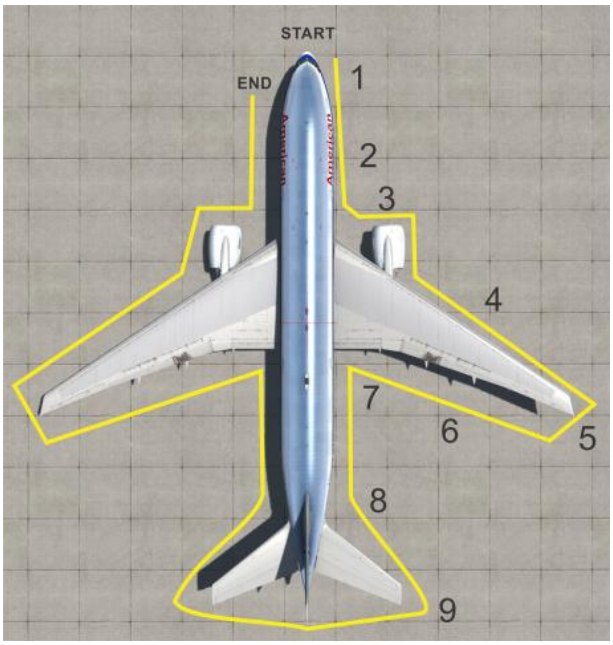
At this point you can continue to pre-flight the cockpit or go outside to do a walk around of the aircraft. If there are two pilots, the pilot flying (PF) will do the cockpit pre-flight and the pilot not flying (PNF) will perform the walk-around.

When I was flying I had a 50/50 rule. If it was under 50 degrees and since I was over 50, the F/O did the walk-around!

Exterior Lighting



EXTERIOR walk-around



Try to start at the same place every time so as not to miss any part of the pre-flight.

Maintenance personnel are responsible to insure the airworthiness of the aircraft. However, a complete exterior preflight is to be accomplished by the flight crew prior to each flight.

During the walk-around observe the general condition of the aircraft. Be careful when walking under the wing or near the engines to avoid fuel or oil drips on your clean uniform. Note that hydraulic fluid will burn skin and eyes. Take care not to get hydraulic fluid on you during the walk-around. Remember, should there be a pinhole leak in a hydraulic line, that the fluid is pressurized at 3,000 PSI and you will likely not be able to see this fine stream before it hits you.

1. Nose wheel - check tire condition and proper inflation.
Gear safety pin may be in place and will be removed by ground crew after pushback.
2. Fuselage - check for any damage. Check static ports, doors, antennas and make sure access panels are properly secured.
3. Engine - General condition of inlet cowl and fan area. Look for leaks in the pylon and under the engine and check the security of engine cowling.
4. Wing Leading Edge - Look at the general condition of the leading edge and check for hydraulic leaks.
5. Wing Tip - Check navigation lights and static discharge wicks. Look for any signs of wing tip scraping.

6. Wing Flaps - Check the trailing edge flaps and flap track canoes. Check the inboard and outboard ailerons. Look for fuel leaks from under the wing.
7. MLG – Check each wheel and tire for wear and any cuts to the side wall. Look at brake wear pins and check for leaking brakes.
8. Aft Fuselage – Check skin condition and cargo doors. Check lower antennas and drain masts. General condition of cabin windows.
9. Tail – Check for hydraulic leaks and condition of vertical and horizontal stabilizers and rudder and elevators. Check static discharge wicks. Check bottom of fuselage for tail strike.

Continue same inspection of left side of aircraft.

INSIDE -

Cabin Inspection – Walk through the cabin and check the general condition of windows, seats and overhead bins. Check the galley and maybe get a cup of coffee.

Cockpit Preflight - Before sitting down, check circuit breakers and all emergency equipment in the cockpit. Check log book entries for airworthiness items.

Check all the instruments!

Use the **NORMAL PROCEDURES MANUAL** for detailed descriptions of the preflight procedures.

Starting the Engines

When ready to start engines, you will need to turn off the A/C packs to provide the air to turn the engines. Insure that the engine bleed valves are open. On the overhead panel, place the left engine start switch to GRD. This will open the engine start switch and begin turning the N2 compressor. When the N2 compressor reaches around 20% and N1 starts to show rotation, raise the left engine start lever to IDLE. Observe engine fuel flow and light off as the fuel ignites. Check for oil pressure within a few seconds. Allow the engine to stabilize at idle – **lower green band** - before starting the right engine.

When both engines are started, close the APU bleed valve and isolation valve on the A/C panel and establish both A/C packs on.

Time to read the after starting engines checklist.

After you have done the preflight of the cockpit and started the engines and finished the checklists, it's time to taxi. A heavy aircraft will require extra breakaway thrust to overcome starting friction. Keep the nosewheel centered until aircraft starts moving. Once the plane is moving it will take extra braking to slow it down. A very light plane may start moving at idle thrust. The taxi checklist should be accomplished when **NOT** moving. This is to avoid any distraction while the plane is in motion.

During taxi, steering can be accomplished with rudder pedal steering for limited corrections. Use the steering tiller on the Captain's left side for greater nose wheel movement.

The FSX or P3D platform has limited nose wheel friction so slow down when making tight turns or the nosewheel will scuff.

TAKEOFF

When cleared by the tower to “line up and wait,” taxi onto the runway and make use of all the runway. The takeoff warning horn will sound if the flaps or stab trim is not set correctly.

Here is an example of a wasted 500 feet of runway. Use it ALL, you might need it!

Remember, there are three things you **can’t** use:
*the runway behind you,
*the fuel back at the pumps
*and the altitude above you!

When cleared for takeoff, start the clock and slowly advance the thrust levers while keeping the aircraft straight using the rudder. Set thrust by 60 knots.

A call out of 80 Knots by the pilot not flying (PNF) marks the high-speed part of the takeoff roll. When takeoff decision speed of **V1** is reached the takeoff must continue, since there is not enough runway remaining to bring the plane to a stop. **VR** – rotate – a smooth rate of 2 degrees per second is the proper rate to assure efficient rotation and not strike the tail on the runway. Positive rate of climb – GEAR UP.

V2 – takeoff safety speed will be reached at least 35 feet above the end of the runway. This is essentially the best one-engine inoperative angle of climb **speed** for the airplane and is a minimum **speed** for flight in that condition until at least 400 feet above the ground.

At 1,000 feet, lower the nose to accelerate and clean up the flaps on schedule. Set or verify climb power. If an engine fails after V1 all movements of the flight controls should be smooth

and a bit slower to achieve V2 to V2+15 in the climb. MAX-Continuous thrust should be selected during the critical climb phase to insure adequate thrust.

CRUISE

Cruise should be hours and hours of boredom. That's if you do it correctly. The old saying is:
Flying is hours & hours of sheer boredom, punctuated by moments of stark terror!
On long flights boredom & complacency are the enemy. Keep alert! Monitor systems and keep an eye on the fuel balance and total quantity. A fuel unbalance without some fuel flow difference could indicate a fuel leak. Keep a running flight log as you approach each new VOR or checkpoint.

Enjoy your crew meal!

DESCENT

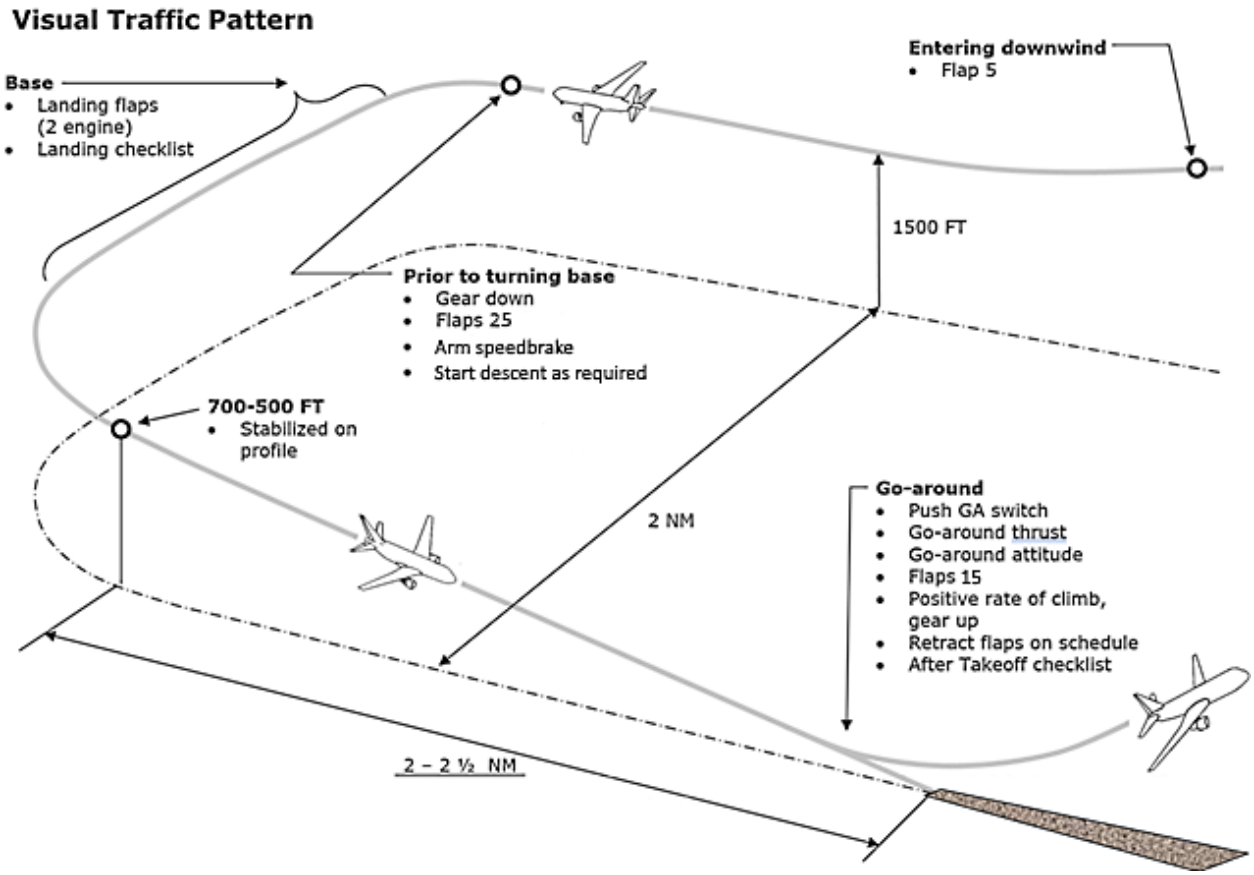
As a rule of thumb to figure when to start down you can use three times the altitude.

Example: Your altitude is FL370, multiply 37 X 3 = 111.

You should plan to start down 111 miles from the destination airport. Of course, this is just a rough way to figure the T/D (top of descent). You would have to consider traffic, direction of landing and winds aloft.

APPROACH AND LANDING

Until you get used to flying the 737, try not to let the plane get ahead of you. Slow down a bit early so things don't happen too fast. The autopilot in the 737 is old school. If you ask it to do too much it will get behind and you'll end up missing a turn or altitude. Make sure you have studied the approach plate and set altitude bugs correctly. Know the missed approach procedure. Make sure you also have the taxi chart page at the ready because you'll need it right after you land.



Visual approach in the traffic pattern

Practice hand flying the plane. It's easy if you try.

Take the time to get set up in the traffic pattern. Memorize the flap limit speeds. They are located just below the landing gear lever.

In most of the world you would be restricted to 250 knots below 10,000 feet. As you approach the airport, listen to the **ATIS** so you will know the weather and active runway and any other information. Remember the turn radius of any plane is determined by the speed. The slower you go the greater the rate of turn for any given bank angle.

Normal traffic pattern is 1,500 to 3,000 feet AGL. If you are using Track-IR this will make flying in the traffic pattern a lot easier. If electronic guidance (ILS) is available always have it as a back-up even when making a visual approach.

Try hand flying as you enter the traffic pattern. **Having the aircraft in trim is the key to reducing your work load.**

Set speed to around 200 knots and begin deploying the flaps. As you turn base leg, try 160 knots and flaps 15. This will give you a nice deck angle and good turn radius. As you approach the extended centerline of the runway, start to intercept the LOC. Give yourself a long final to get the feel of the plane.

When the visual glide slope picture looks like the electronic G/S would be coming alive, set speed to 150, select gear down and flaps 25 and arm the speed brakes (SHIFT+/). Incremental flap settings will lessen the pitch and drag of the flaps and allow you to keep the plane in trim as the power changes. Capture the G/S either visually or electronically, flaps 40 and set speed to VREF.

You can use the handy VREF gauge on the center panel to figure the speeds. Use the left and right mouse buttons on the flap selector knob to show proper speeds.

Final check list:
GEAR DOWN ……. DOWN & CHECKED
FLAPS 40 ……. 40
SPEED BRAKES ARM ……. ARM

Normal Autopilot Approach – ILS

As above, the procedure is pretty much the same as the visual approach except the autopilot is doing the flying and the pilot is making inputs to the autopilot and monitoring how it's doing. The autopilot is normally used in any low visibility approach. You will be on radar vectors from approach control or following a published arrival. Use the autopilot control panel **HDG SEL** to input the heading if on radar vectors. All changes to headings and altitude should be checked by both pilots to avoid an improper command.

Above - Flight Director control panel and Autopilot control panel. With the **AIL & ELEV** paddles engaged, the autopilot uses control wheel steering (CWS) to fly the aircraft. With the mode switch in **MAN**, the pilot can use the control column & wheel to steer the plane. The plane will fly whatever pitch & roll the pilot inputs to the control wheel. Once **ALT HOLD** and **HDG SEL** is engaged the autopilot will then use those inputs. It will maintain the altitude at the time **ALT HOLD** is engaged and heading selection from the HDI heading knob.

Just as in the visual approach, get set up early for the landing. Don't get rushed.
Slow down and give yourself and the plane a chance to make a successful landing.
Consider using AUTO BRAKES (CAT-I select 1, CAT-II, 2,)

Usually if the visibility is restricted the controllers will give each plane a reasonable final.
See the profile below and try several approaches, some with good visibility and then reduce the visibility to see what it looks like with different RVR.

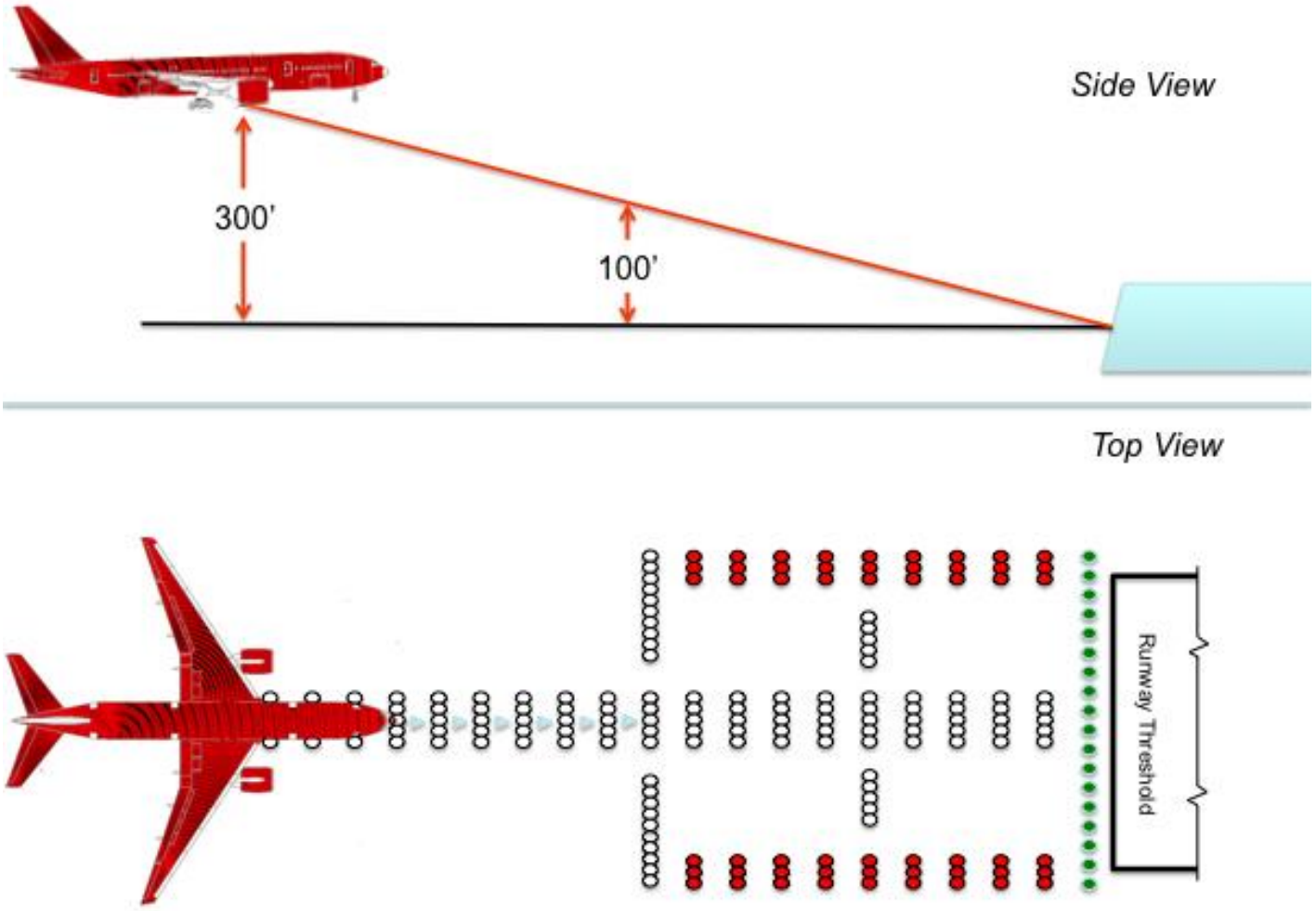
Since the aircraft descends 300 feet per mile on a standard glide slope you can build a mental picture of what you can expect to see with different visibilities.

During a low visibility approach to CAT-II, RVR 1200, only a small portion of the approach light system may be seen.

At 300 feet – **one mile from threshold** – only expect to see the 1,000-foot bar on an ALSF II lighting system. The sequence flashers (SFL) may not be seen since they terminate at the thousand-foot bar. You might just see the glow in the fog as you descend. All these clues are there to give you an idea of where you are on the approach.

Attached to the center post of the windscreen is an alignment device. It is designed to have the pilot's eyes in the proper position for landing. There three small balls, two are orange, and one white. The idea is to move the pilots seat and have the white ball cover the orange ball for each pilot's eye position.

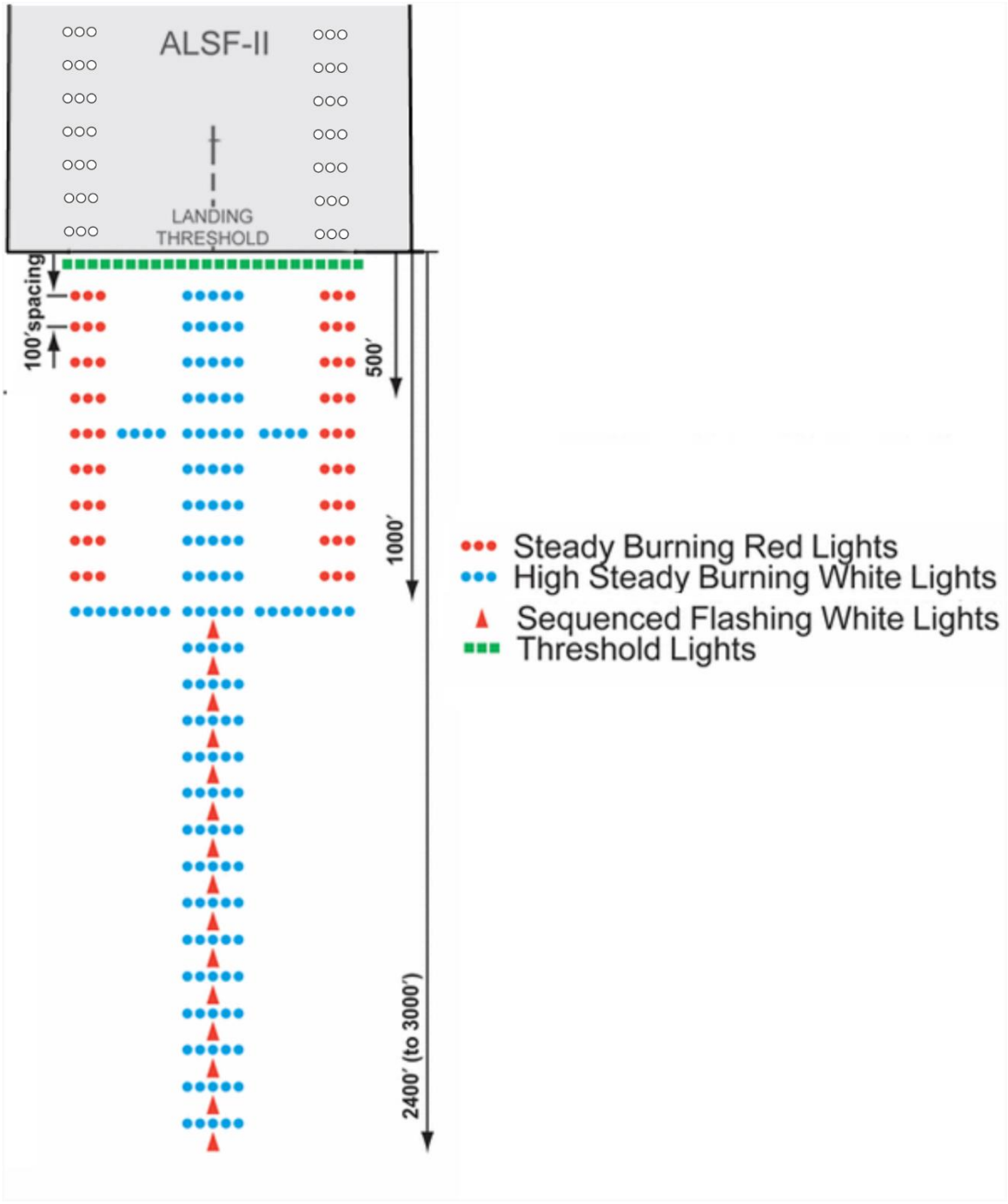
This drawing below shows the plane one mile from the runway threshold at 300 feet AGL.
From your seat position in the cockpit you will just catch a glimpse of the 1,000 foot bar as it passes under the nose of the plane. The SFL may not be seen since they end at the 1,000 foot bar as well. It was designed this way so as not to be blinding to the pilot.



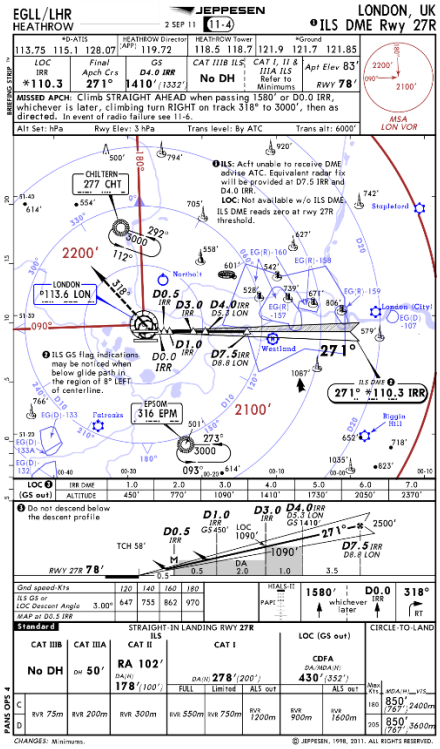
In the picture below at just under **200 feet** the 1,000-foot bar is just out of sight and only the centerline white lights, red alignment bars and the 500-foot bar are seen.

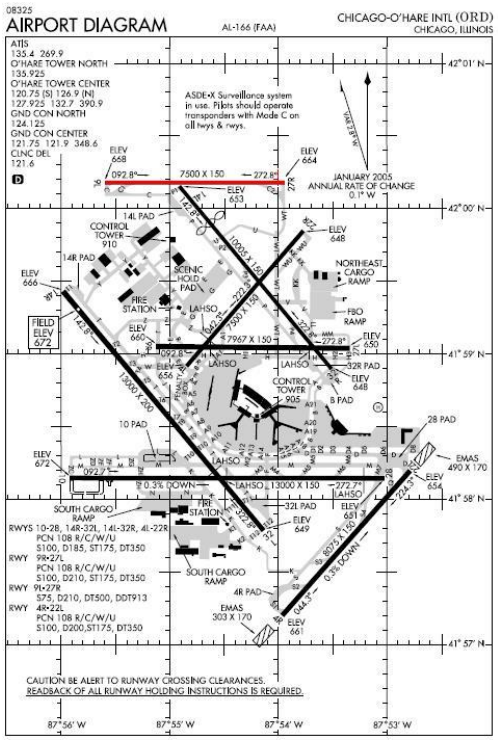
At **100 feet** on the approach, the runway threshold green lights come into view.

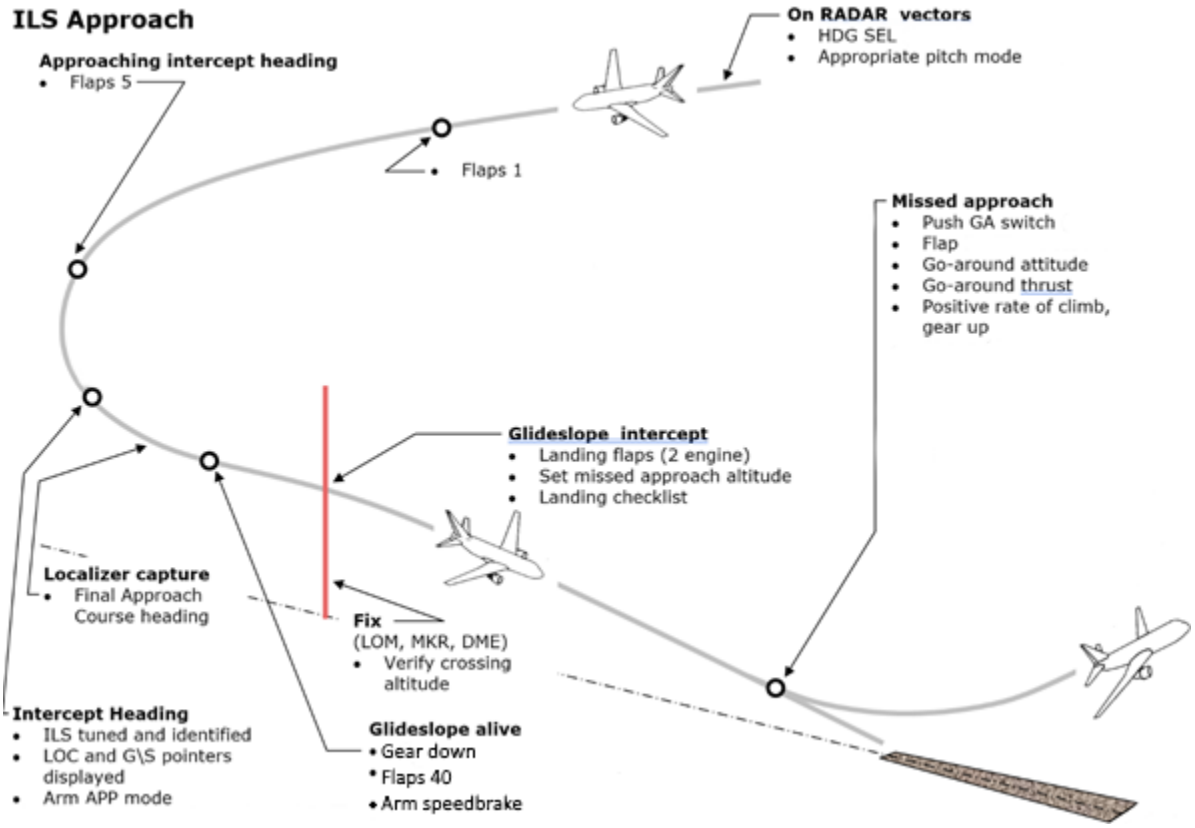
Notice the red alignment bar lights become the TDZL (touchdown zone lights).



Below are two **examples** of charts you will need to have available when landing.
On the left is the ILS 27R for EGLL. On the right is the airport diagram for KORD.







When conducting an autopilot approach many of the things you would do for a visual approach are the same. Again, get set up early by studying the approach plate for your intended runway

and know the missed approach procedure. Try to do this well in advance so you'll be ready for the approach and not be rushed. You will be using the autopilot control panel. When radar vectors are started use **HDG SEL** mode and set the speed assigned by ATC. Flap extension is pretty much the same as in the visual approach and is dependent on the speed assigned by ATC. When assigned approach intercept heading by ATC, arm the autopilot for **AUTO APP**. You would normally be flaps 15 and assigned speed by ATC as you begin to intercept the LOC. When the G/S becomes alive, gear down and select flaps 25 degrees and arm the spoilers. As the G/S approaches one dot, select landing flaps and slow to VREF approach speed. After G/S capture, set missed approach altitude. **Keep one hand on the control yoke and one hand on the throttles at all time. Be ready to press the disconnect button or GO AROUND if necessary.**

FINAL CHECK LIST:

GEAR down and check …….. Down & Check
Flaps 40 degrees …….. 40
Spoilers Arm …….. ARMED

Observe the ADI (Attitude Direction Indicator) as the LOC & G/S are captured during the approach. Always check the **RED** failure flags for signal strength, radio failure or other instrument failures.

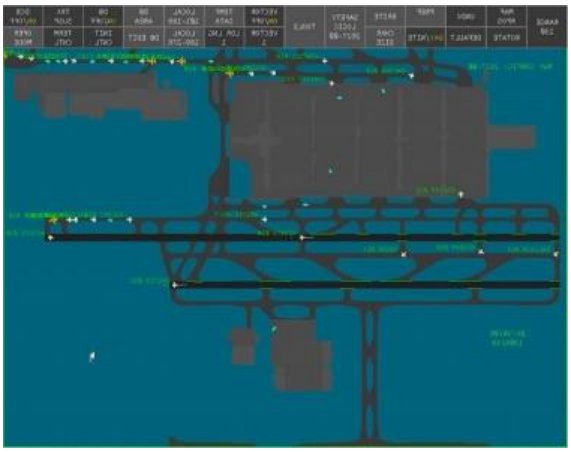
AFTER LANDING

Since the 737-200 is **not** a full Autoland aircraft, the autopilot will have to be disconnected prior to landing. It must be disconnected by 100 feet above the runway. As you flare the aircraft and decrease the thrust maintain the wings level. When the gear touches the runway and the wheels spin up, the spoilers will deploy and auto brakes – if used – will be applied. As the nose wheel touches down the reverses can be deployed. As the reverse levers are lifted the reverse thrust will increase and the plane will slow down. The 737-200 has reverse buckets that reverse the entire engine, unlike more modern aircraft that reverse only the fan part of the engine. Reverse effeteness is greatest at high speed. As the aircraft speed approaches 80 knots reduce the power and plan to be in forward thrust by 80 knots to avoid a compressor stall.

If you apply the toe brakes the autobrakes will trip off.

As the plane slows to a safe speed, the pilot will use the green imbedded runway turnoff lights to vacate the runway. **DO NOT MOVE** any levers until clear of the runway. Only when completely clear of the runway should the spoilers and flaps be retracted. Both pilots need to pay attention to the clearing of the runway since visibility will be very poor. Taxiway markers will be very hard to see. The tower/ground controller has ASDE (airport surface detection equipment) radar to keep track of you. Pilots need to pay close attention to taxi instructions. Don't hesitate to ask the controller to repeat the instructions if not fully understood. Don't read any checklists during aircraft movement.

Below, an example of ASDE & ASDE-X. ASDE-X is a computerized ASDE.



Some interesting facts…

EACH knot of airspeed over VREF will take an extra 50 feet of runway.
Average 737 approach speed = 200 feet per second.

The author of this tutorial of the Captain Sim 737 is Lou Thieblemont. Lou is a retired airline pilot who flew for TWA and American Airlines. Along with being a line pilot, Lou was a simulator and line flight instructor and an FAA Check Airman.

This brief overview of the Boeing 737 in intended to get you started. It does not replace the manuals that are included with this very detailed model by Captain Sim. Spend some time with the normal operations manual so you can understand the flow of the various checklists.

I hope you enjoy flying this plane as much as I do. The amount of detail in Captain Sim aircraft puts me right back in the left seat. The more you fly, the more you learn, the more you will discover the meticulous care that was put into making this a total flying experience for the pilot. Please enjoy!