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 rare to have the 777 assigned to you in a cold & dark state, but it could happen so we train for just such an occasion.

The first thing you would do with a cold and dark aircraft is preform 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.

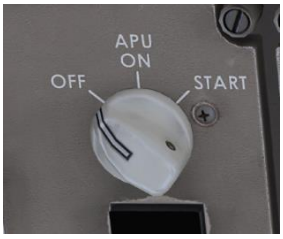
COCKPIT SAFETY CHECK

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 - AUTO..... AUTO

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 air to start the engines.

APU START

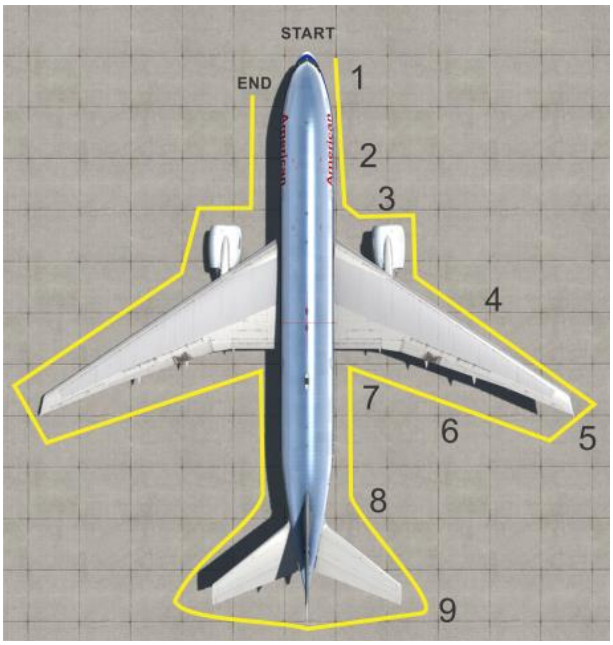


On the overhead panel, move the APU switch to START and release to ON. When the APU starts, press the APU GEN switch to ON and insure the L & R BUS TIE are in AUTO.

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 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 walkaround 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 walkaround. 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 (tire pressure is read on the MFD). 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 aileron. 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 breaks.
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.

Check tire pressure on MFD (multi-function display) in cockpit

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.

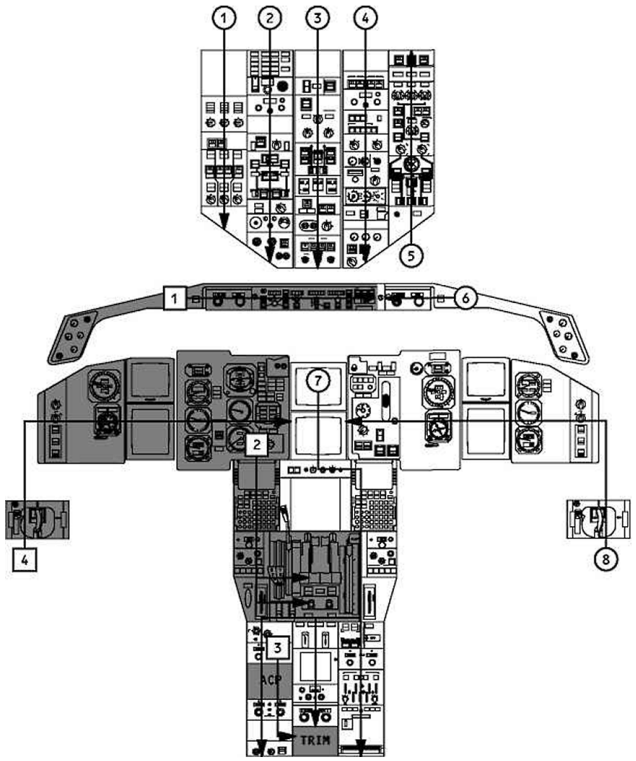
Cockpit Preflight - Before sitting down, check circuit breakers and all emergency equipment in the cockpit. Check log book entries for airworthiness items.

After establishing electrical power on the aircraft, set the air-conditioning system for cabin comfort and equipment cooling.

Start on the overhead panel and check the items as outlined in the Flight Handbook Normal Operating Procedures. *Refer to the CS – Part 3 - Normal Procedures Manual – page 9*

Check all the instruments!

PREFLIGHT AND POSTFLIGHT AREAS OF RESPONSIBILITY AND PANEL FLOW



Audio Control Panel (ACP) and trim location may vary

Captain

First Officer

LEGEND: Shaded area defines Captain's area of responsibility. Unshaded area is First Officer's responsibility.

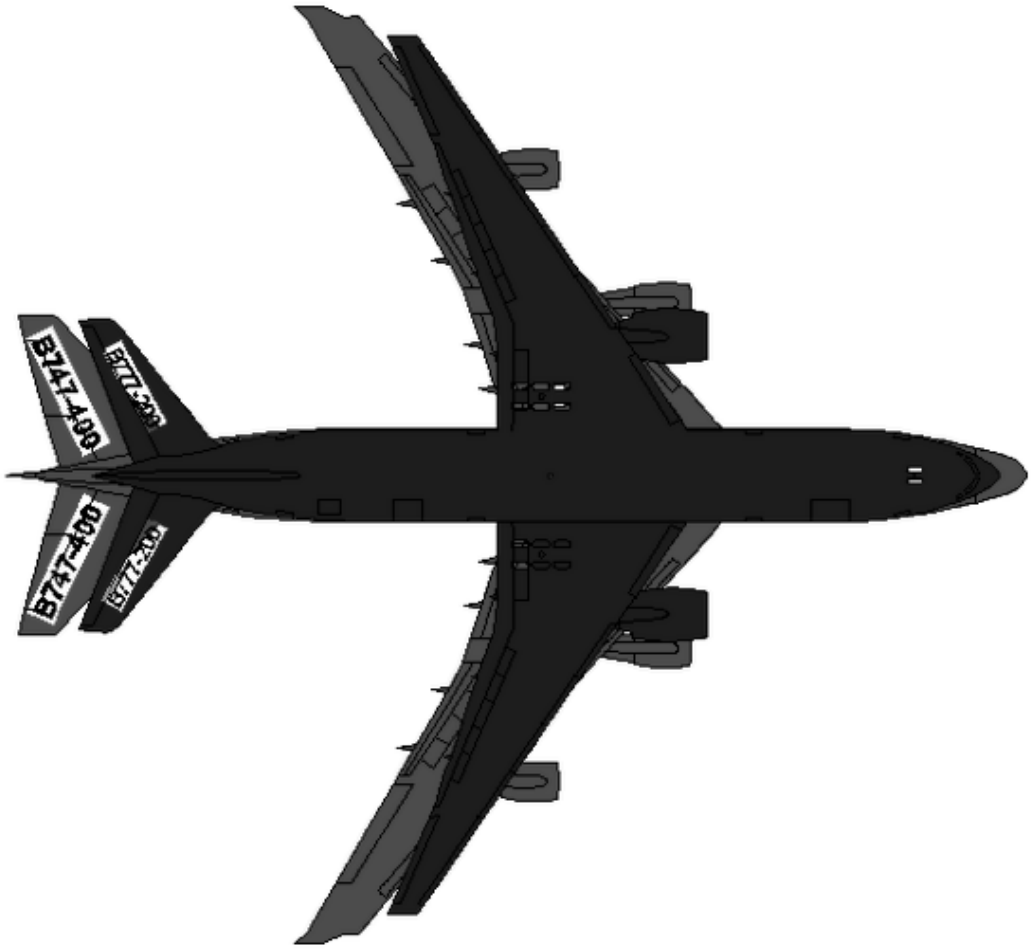
Use the **NORMAL PROCEDURES MANUAL** for detailed descriptions of the preflight procedures.

The 777 is a very automatic aircraft. All the systems have been designed to be fully automatic.

This is a long range aircraft and does not lend itself to short legs. Use of the FMC in both LNAV and VNAV require flight planning to have the most efficient flight. **Refer to the CS 777 Manual 4** for detailed procedures on the operation of the FMS. Today, most airlines use satellite links for over water position reporting. Only a SELCAL check prior to entering MNPS airspace is required, whereas in the past, every 10 degrees, a position report had to be made on old fashioned HF radios. The 777 is one of the first aircraft to be designed for the modern airspace with an eye to the future.

The large engines on the 777 produce a lot of thrust with just a small movement of the thrust levers. During approach, try to make small power changes to avoid large trim changes which would un-stabilize the flight path. The flight controls are very sensitive and response is quick. Make small inputs over a longer period of time for a smoother flight.

The 777 is a large aircraft and like it's brother the 747 be careful while taxiing. Slow down before making tight radius turns to avoid scuffing the nose wheel. The engines produce a lot of thrust, so be aware of objects on the ramp as you taxi out from the gate area.



After you have done the preflight of the cockpit and loaded the flight plan into the FMC 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 breaking 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.

TAKEOFF

When cleared by the tower to “line up and wait,” taxi onto the runway and make use of all the runway.

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.

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.

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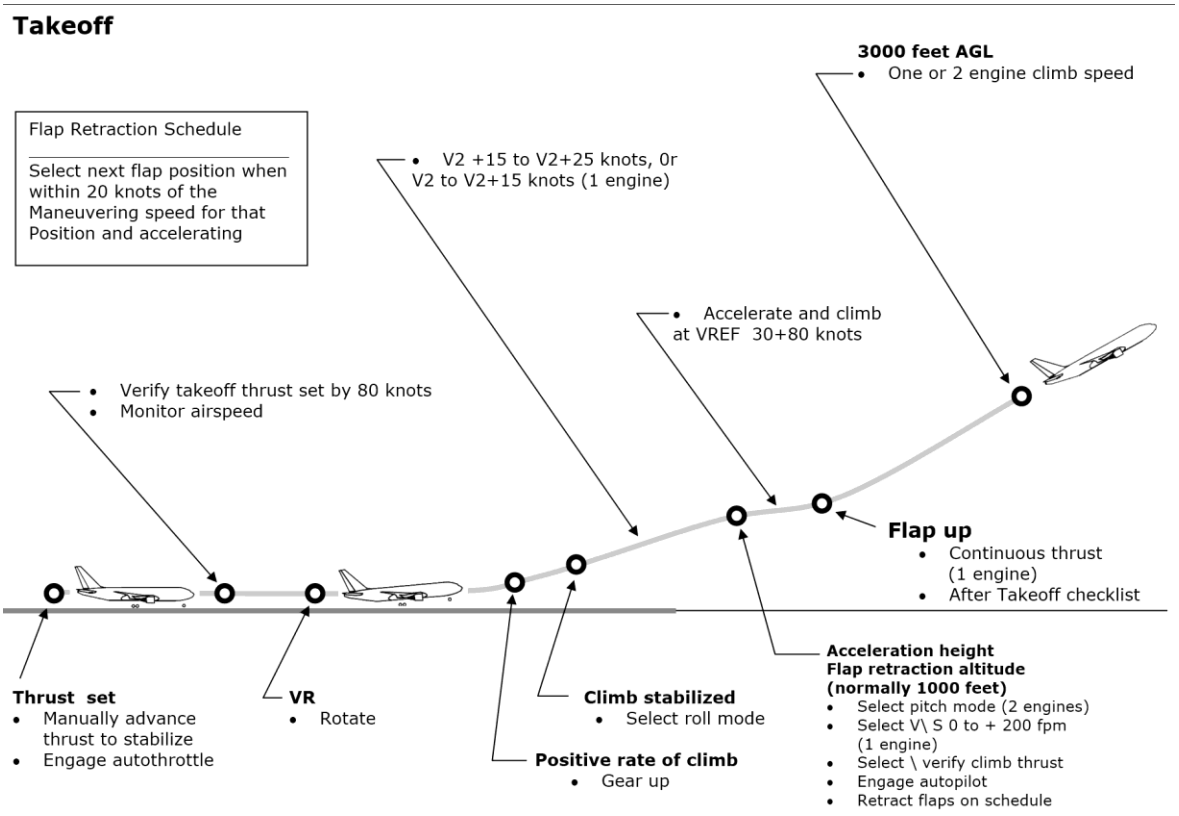

At 1,000 feet, lower the nose to accelerate and clean up the flaps on schedule. Set or verify climb power. If an engine fails after V1 all movements of the flight controls should be smooth and a bit slower to achieve V2 to V2+15 in the climb. Continuous thrust should be selected during the critical climb 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 shear 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. A fuel unbalance without some fuel flow difference could indicate a fuel leak. Keep a running flight log and as you approach each new waypoint, verify that it is correct in the FMC. In the old days of ocean flying the separation was 120 nautical miles laterally, 2,000 feet in altitude and 10 minutes in long track. Now the lateral separation is 30 NM and 1,000 feet in altitude. **You all be careful out there!**

Enjoy your crew meal!

DESCENT

As a rule of thumb to figure when to start down you can use three times the altitude as to when to begin descent. **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 TD (top of descent). You would have to consider traffic, direction of landing and wind.

When using VNAV for your descent you can apply forecast winds aloft and enter that information in the descent page of the FMC. This will improve the ability of the computer to give you proper descent and crossing information.

Keep a sharp eye out to make sure the aircraft is flying the proper descent profile.
One trick we always used was to insert a waypoint of a few miles before a hard descent point to assure not busting the altitude.

Learning all the tricks of the FMC is a study in itself. Spend some time in the **CS 777 Normal Operating Manual.** Take little bites at a time so you are not overwhelmed by all the data.

ALWAYS fly the airplane before messing with the computer. The worst thing is to have both pilots with their heads down pressing buttons.

APPROACH AND LANDING

Until you get used to flying the 777 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 777 is a wonder. But 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. If your using paper plates or the electronic flight bag, 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

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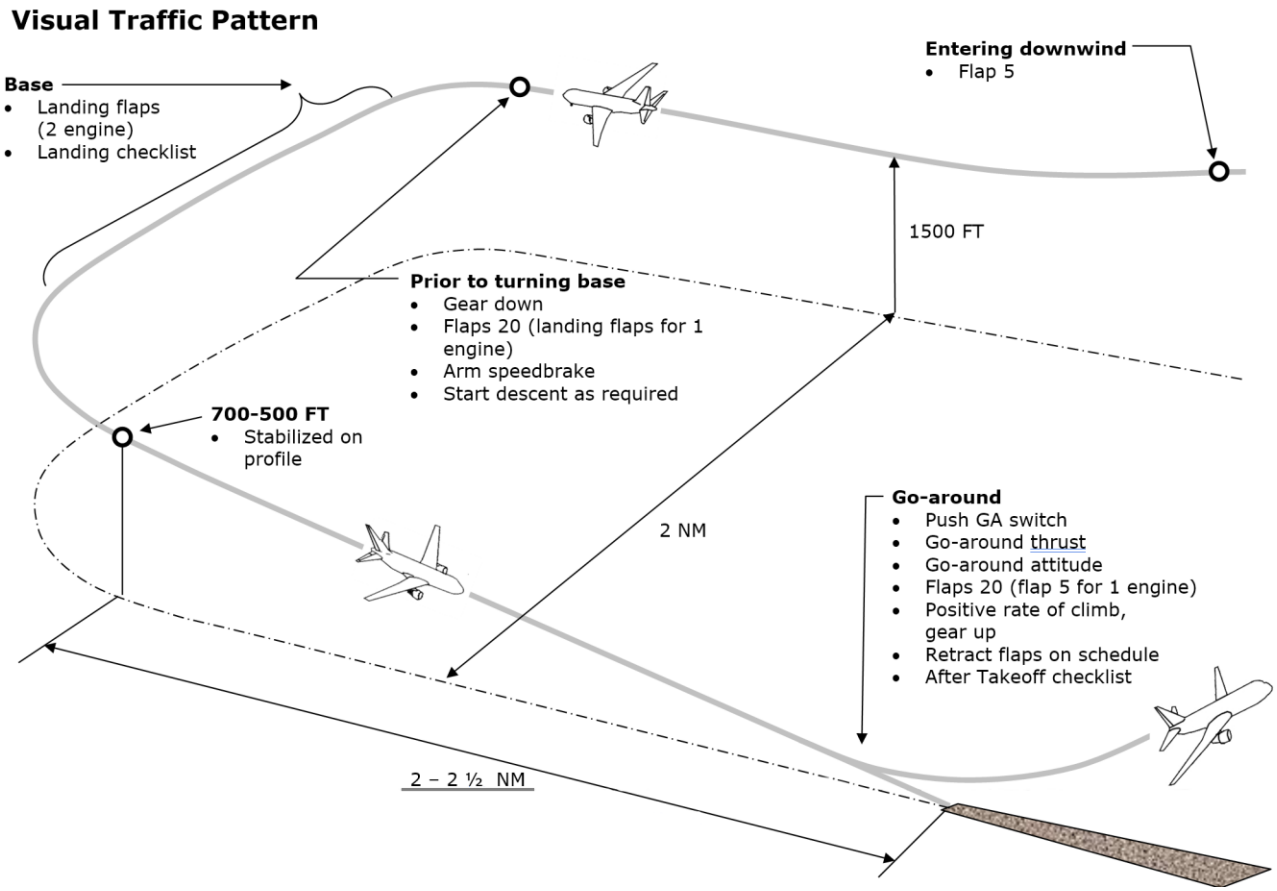

Most pilots hate to give the landing away to the autopilot. Even though this is a large aircraft, it flies like a big Piper Cub. Practice hand flying the plane, it's easy if you try. Who knows, you might need to actually fly the plane, if the computer failed – ***I know computers never fail!***

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 faster 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. Remember this is a wide body plane and the PAPI should show the one red three white and the 2 bar VASI, the far bar a little on the pink side.

Try hand flying as you enter the traffic pattern. Having the aircraft in trim is the key to reducing your work load. Check the FMC approach reference page. It shows approach planning data and approach reference speed (VREF) selection.

Set speed to around 200 knots and begin deploying the flaps. As you turn base leg, try 170 knots and flaps 20. 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. 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. Glide slope capture either visually or electronically, flaps 30 and set speed to VREF.

Final check list:
GEAR DOWN ……. DOWN & CHECKED
FLAPS 30 ……. 30
SPEED BRAKES ARM ……. ARM

Normal Autopilot Approach – ILS

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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 to input the heading if on radar vectors or let LNAV fly the plane if on a fixed approach. All changes to the AFDS should be checked by both pilots to avoid an improper command.

Make sure you have selected the information you wish to display on the ND (navigational display). Each pilot can select: WXR, STA, WPT, ARPT, DATA, POS & TERR. Only display the information you need, don't get too much clutter on the display.

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, CAT-III, 3)

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.

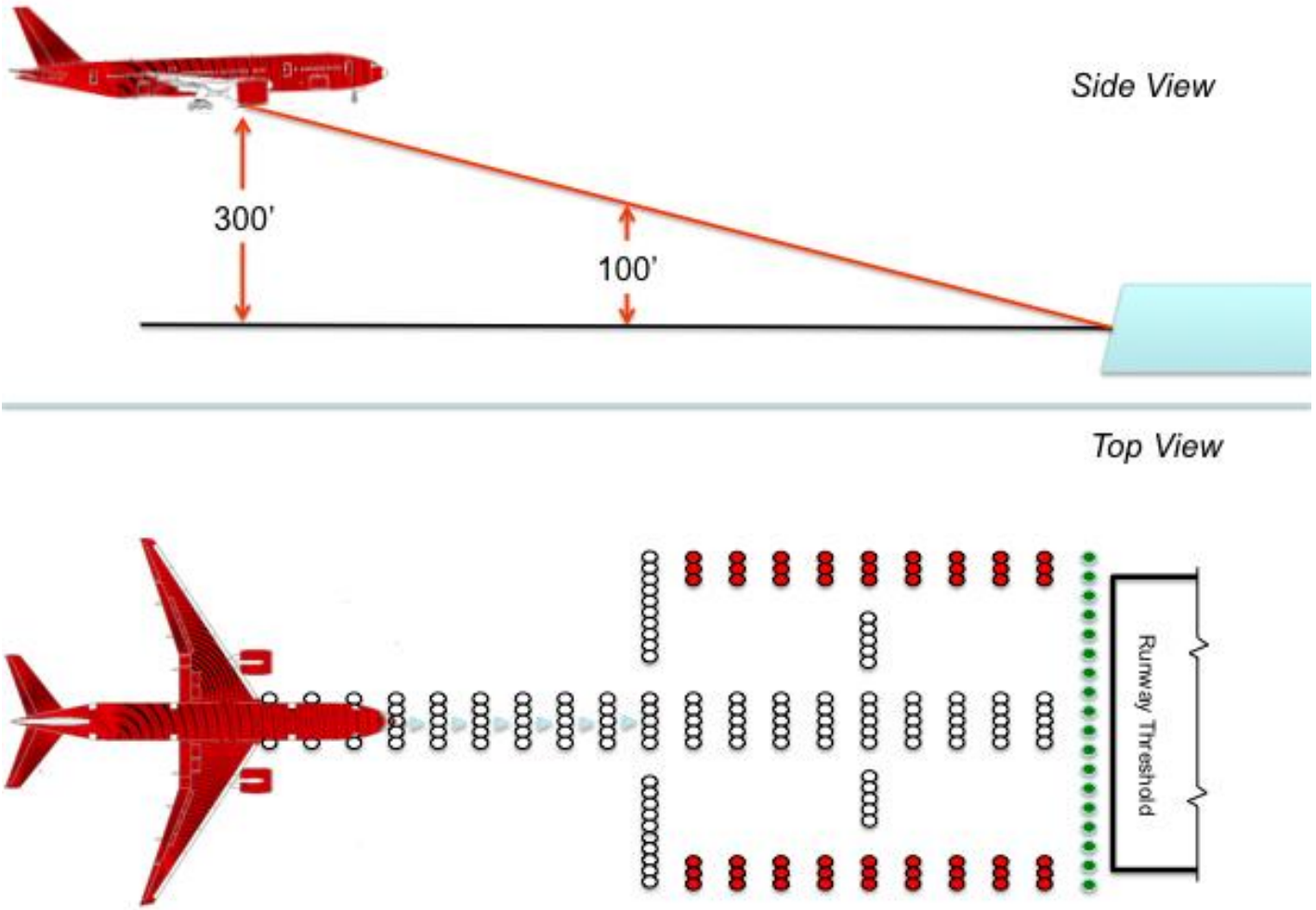
Since the aircraft descends 300 feet per mile on a standard glide slope you can build a mental picture of what you can expect to see with different visibilities.

During a low visibility approach to CAT-IIIB, only a small portion of the approach light system will 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.

In this drawing, it shows the plane one mile from the runway threshold at 300 feet AGL.

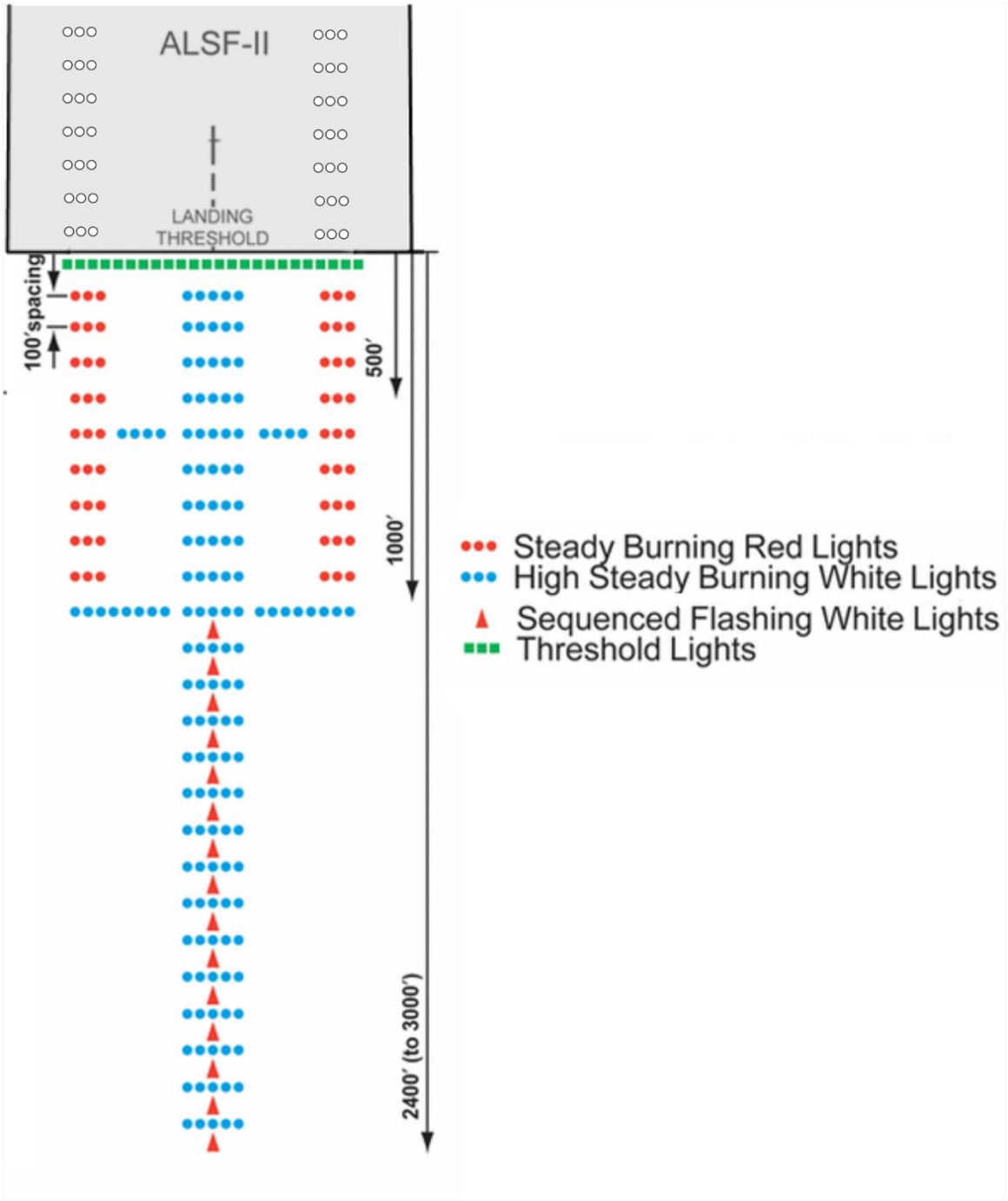
From your seat position in the cockpit you will just catch a glimpse of the 1,000 foot bar as it passes under the nose of the plane. The SFL may not be seen since they end at the 1,000 foot bar as well. It was designed this way so as not to be blinding to the pilot.



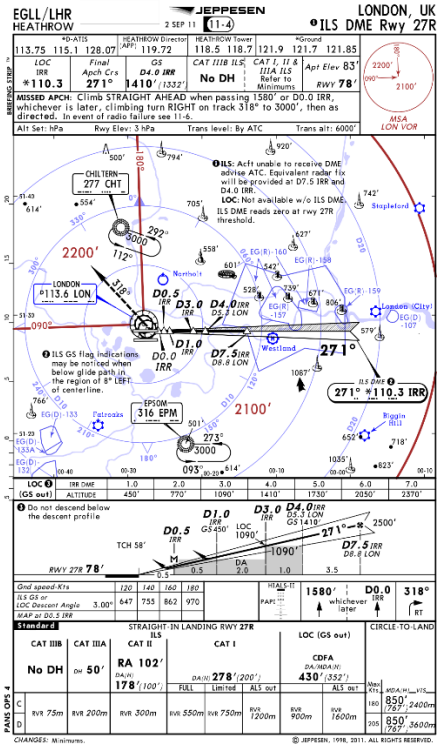
In the picture below at just under **200 feet** the 1,000 foot bar is just out of sight and only the centerline white lights, red alignment bars and the 500 foot bar is seen.

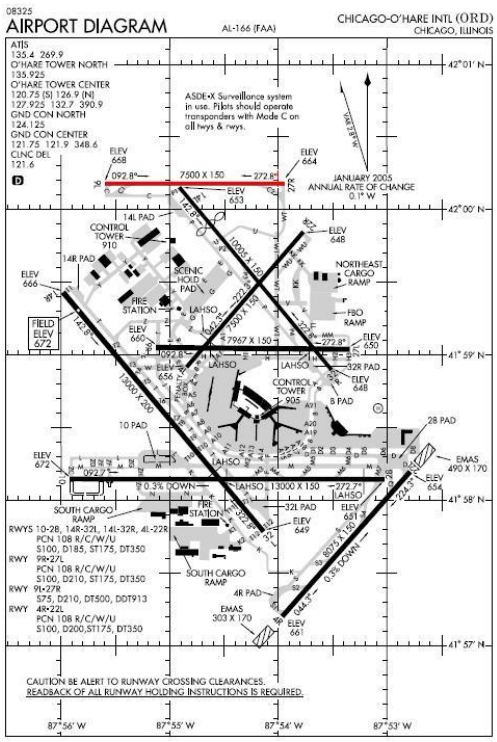
At **100 feet** on the approach, the runway threshold green lights come into view.

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.
One the left is the ILS 27R for EGLL on the right is the airport diagram for KORD.





ILS Approach

Approaching intercept heading
- Flaps 5

On RADAR vectors
- HDG SEL (AFDS)
- Appropriate pitch mode (AFDS)

- Flaps 1
- Flaps 5

- LNAV or appropriate roll mode (AFDS)
- VNAV or appropriate pitch mode (AFDS)

Missed approach
- Push GA switch (AFDS)
- Flap 20 (flap 5 for 1 eng)
- Go-around attitude
- Go-around thrust
- Positive rate of climb, gear up
- Above 400 feet select roll mode (AFDS)
- At flap retraction altitude, set speed for desired flap setting
- Select climb thrust (2 engine)
- Retract flaps on schedule
- After flap retraction, select FLCH or VNAV as required
- Select continuous thrust (1 engine)
- Verify tracking route and altitude capture
- After Takeoff checklist

Glideslope intercept
- Landing flaps (2 engine)
- Set missed approach altitude
- Landing checklist

Localizer capture
- Final Approach Course heading

Fix
(LOM, MKR, DME)
- Verify crossing altitude

Intercept Heading
- ILS tuned and identified
- LOC and G\S pointers displayed
- Arm APP mode

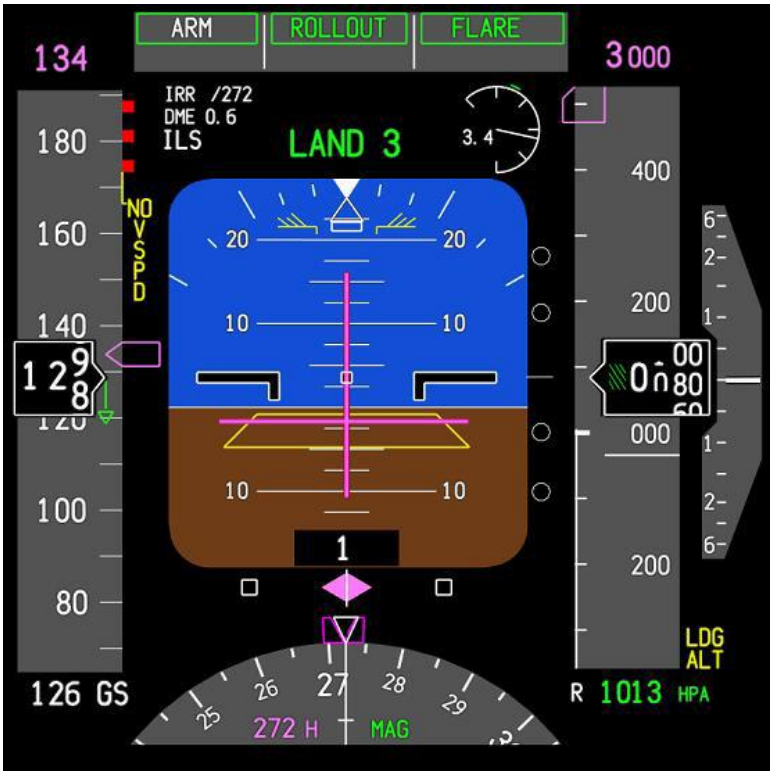
Glideslope alive
- Gear down
- Flap 20 (landing flaps for 1 engine)
- Arm speedbrake

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 assigned speed by ATC. When assigned approach intercept heading by ATC, arm the autopilot for 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 20 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 30 degrees …….. 30
Spoilers Arm …….. ARMED

Observe the PDF (primary flight display) as the various items are captured during the approach.



AFTER LANDING

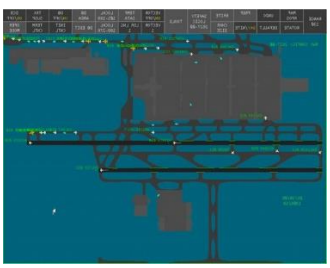
In a full Autoland, the only control input the **pilot** will do is operate is the reverse thrust.

As the aircraft touches down the autopilot will lower the nose wheel to the runway. Alignment will be provided by the LOC (localizer) during rollout phase. Auto Brakes will be applied on touchdown, spoilers deployed by MLG (main landing gear) tilt, so the only thing the pilot needs to do is operate the reverse thrust. **If you apply the toe brakes the autobrakes will trip off.**

In a full CAT-IIIB (50 meters/150 feet - ICAO) landing, the only thing the pilot will see is probably just the centerline lights as the nose wheel touches down.

Having preformed many CAT-IIIB landings in the simulator, nothing can replace the first actual landing in the aircraft with RVR-150 feet. You hear the altitude callouts of 50, 40, etc. but you will not even see the SFL (sequence flashing lights) in the daytime, and only the glow of the flash at night. You will feel the aircraft flare somewhere around 30 feet and the thrust diminish as the plane touches down. Taxiing the aircraft will take great care and concentration to keep the plane on the centerline.

As the plane slows to a safe speed, the pilot will use the 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 almost nil. 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.



Why Autoland should be used in low visibility…