A Look Inside the Boeing 787 Dreamliner Flight Deck

thepointsguy.co.uk/news/look-at-787-flight-deck/

by Charlie Page

News

The Boeing 787 Dreamliner is one of the most-advanced aircraft flying in the sky. As a passenger of the aircraft, you may know it for its quiet ride, shaded window technology and features to help you beat jet lag. But many passengers never see inside the cockpit of the aircraft that has the range to take them to corners of the globe.

Welcome to the Office

The 787 Dreamliner is a two-crew aircraft, meaning that a minimum of two pilots are required to operate it. In most situations, the Captain sits in the left hand seat (LHS) and the First Officer sits in the right hand seat (RHS).

The flight deck of the 787 Dreamliner.

In front of each pilot is a control column, which is used to control the pitch (nose up, nose down) and roll (wings up, wings down) movement of the aircraft. At the feet of the crew are the rudder pedals, which are used to a certain extent on the ground to steer the aircraft and in the air to control yaw (nose left, nose right).

The rudder pedals also act as the brakes. The pilots use their toes to press on the top of each pedal to operate the brakes on the corresponding wheels.

Five screens dominate the front of the flight deck whilst a screen outboard of each pilot acts as an Electronic Flight Bag.

Above our heads, too, are a number of switches and buttons. Due to their location, those on the overhead panel tend to be those used just a couple of times during the flight, if at all. Normally just at the beginning and at the end.

The overhead panel.

Hydraulic system, fuel system and various non-normal situation systems tend to be found on the overhead panel.

Primary Flight Display

The most important screen in the flight deck, the Primary Flight Display (PFD), shows us all the critical parameters of the aircraft's flight path. Being such an important display, it's placed directly in front of the pilot.

The PFD

Starting in the centre, the two L shapes on their side represent the wings. On the ground, as you would imagine, they are level.

Moving to the left and in a clockwise direction is the airspeed indicator, indicating how fast the wind is moving over the wings, measured in knots. On the ground, it has a minimum value of 30kts.

In magenta is the speed selected in the glare-shield panel (more on this later) and then across the top are the Flight Mode Annunciations — FMAs. As there are a number of different ways of flying the aircraft depending on what the priority is (speed, altitude profile, lateral guidance, etc), the FMAs tell us which auto-flight mode is active. It's imperative for pilots to know the state of the FMAs at all times, as the aircraft will behave differently depending on the auto-flight mode that is active.

The next magenta number is the selected altitude — the one at which the autopilot will stop at unless told otherwise.

Below the selected altitude is the altimeter scale, which shows how high the aircraft is. On the ground here, it shows the aircraft at 100 feet above sea level. Below the altitude indication is the pressure setting, here at 1023 HPA. This is the current pressure on the ground and indicates the altitude of the aircraft — its heigh above sea level.

Head Up Display

The defining feature of the 787 flight deck, the Head Up Display (HUD), is military technology in civilian clothing. In other aircraft types, pilots fly by constantly switching their attention between the screens inside and the view outside. By displaying the information from the PFD, the HUD enables us to monitor all the flight parameters whilst simultaneously looking out of the windshield.

The HUD displays what's on the PFD.

The image on the HUD is created by a projector that sits just above the pilot's head. This is then projected onto the combiner glass in front of the pilot's face, which then displays the PFD image. The brightness of this display can be controlled manually to suit the outside lighting conditions.

Whilst it's great during takeoff, it really comes into its own when on approach. At these late stages of flight, we are working our hardest. We are simultaneously scanning the wing and nose position, altitude, speed, heading and the indications guiding us towards the runway. This is very often done whilst in cloud, expecting to see the runway at any moment.

The HUD enables us to do all these tasks together — look out of the windshield at the runway without having to momentarily look inside to scan the flight parameters.

The video below shows a simulator landing at runway 13L at New York's JFK Airport. This approach has a tight turn late on to keep noise to a minimum for those living around the airport.

https://youtu.be/p8Ncm2DmfDE

Navigation Display

Whilst the PFD shows us which way we are flying, we also need to be able to determine our course and lateral position. For this, we have the Navigation Display, or ND. The ND enables us to see the route that the Flight Management Computer (FMC) is expecting to fly, up to 1280 nautical miles ahead. It also shows us airports in our vicinity (green dotted rings), paints weather returns and other useful information such as the wind velocity.

The ND shows the planned route (solid magenta), weather returns and actual route (dotted magenta).

It also enables us to load and display a secondary route, shown in blue, below. This can either be for a diversion, or it can be used to make areas of reported turbulence, like in the example below. In addition to the lateral position of the aircraft, the ND also has an extremely useful extra display — the Vertical Situation Display, or VSD.

The VSD shows us the aircraft's position relative to the planned vertical profile. This gives us greater situational awareness as to how the decent is going and also shows us where any terrain is relative to our altitude.

Glare Shield Panel

The panel that we use most during the flight is conveniently placed right in the middle of the flight deck, allowing for easy access by both pilots. Once the autopilot has been engaged, most of the controlling of the aircraft comes via this panel.

Contrary to common belief, the autopilot does not do all the work. It's only as good as the information the pilots give it — very much like writing an email. If you just hold down the 'h' key, your laptop will write 'hhhhhhhhhhhhhhhhh' beautifully across the screen. It's what you told it to do, but it means nothing.

It's the same with the autopilot.

We have to instruct the autopilot what altitude to climb or descend to, what speed to fly and whether to follow the planned route or fly a different one. This is all done through the buttons and switches on the glare shield panel.

The glare shield panel controls the autopilot.

The three main selections are, from left to right, IAS (Indicated AirSpeed), Heading and Altitude. The other buttons all control other aspects of flight, be it following the FMC loaded route or to fly a certain approach to a runway.

Control Column

Whilst Airbus aircraft are controlled by a side stick, which sits outboard from each pilot, Boeing still employs the traditional control column between the pilot's legs. I could go on for days about the pros and cons of both, but I won't. Some pilots prefer the traditional feel of the control column. Others prefer having the stick out of the way, creating a more comfortable environment during the longer flights.

What ever the preference, the sticks operate in exactly the same fashion.

The control column sits between the pilot's legs.

Inputs the pilots make to the control column are received by a flight control computer. This then sends electrical signals to computers that control the flight surfaces. The elevators on the horizontal stabiliser under the tail, and the ailerons on the wings. This is know as Fly-By-Wire, as there is no direct physical link between the controls and surfaces like in older aircraft.

Push the stick forward, the nose goes down. Pull the stick back, the nose comes up. Turn the wheel/stick to the left, the left wing drops and the right wing rises — a roll to the left. Turn it to the right… you get the picture.

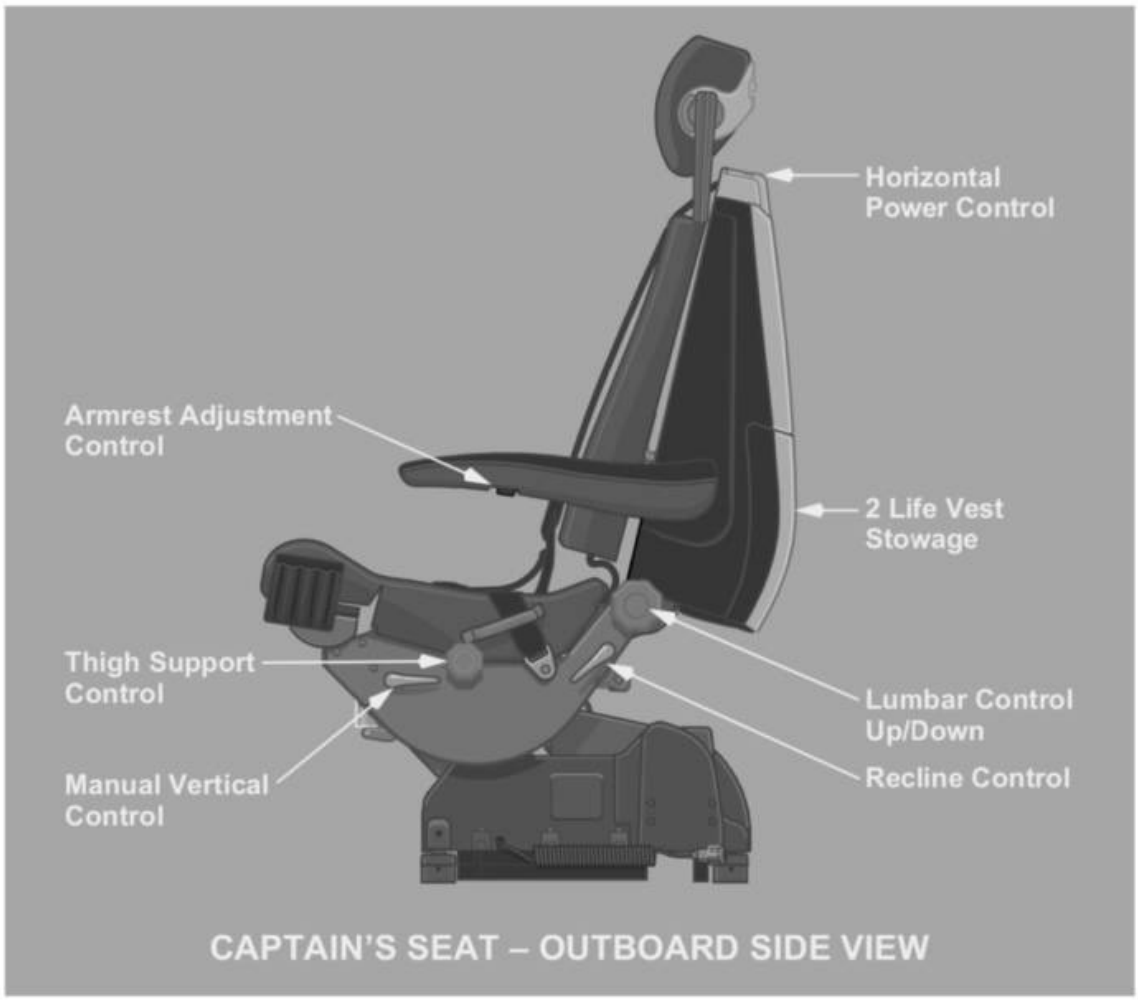
Flight Management Computer

Already mentioned above, the FMC is the brains of the flight. During the preflight set up, we download the planned route from the company's server. We then meticulously check this route against the paper flight plan we printed during the briefing. As mentioned before, the computer is only as good as the information which we give it.

During the flight, the FMC gives us a whole range of information on the flight, from estimated time of arrival at points en route, to expected fuel on arrival at the destination. Any changes to the planned route are done via the FMC.

Seat

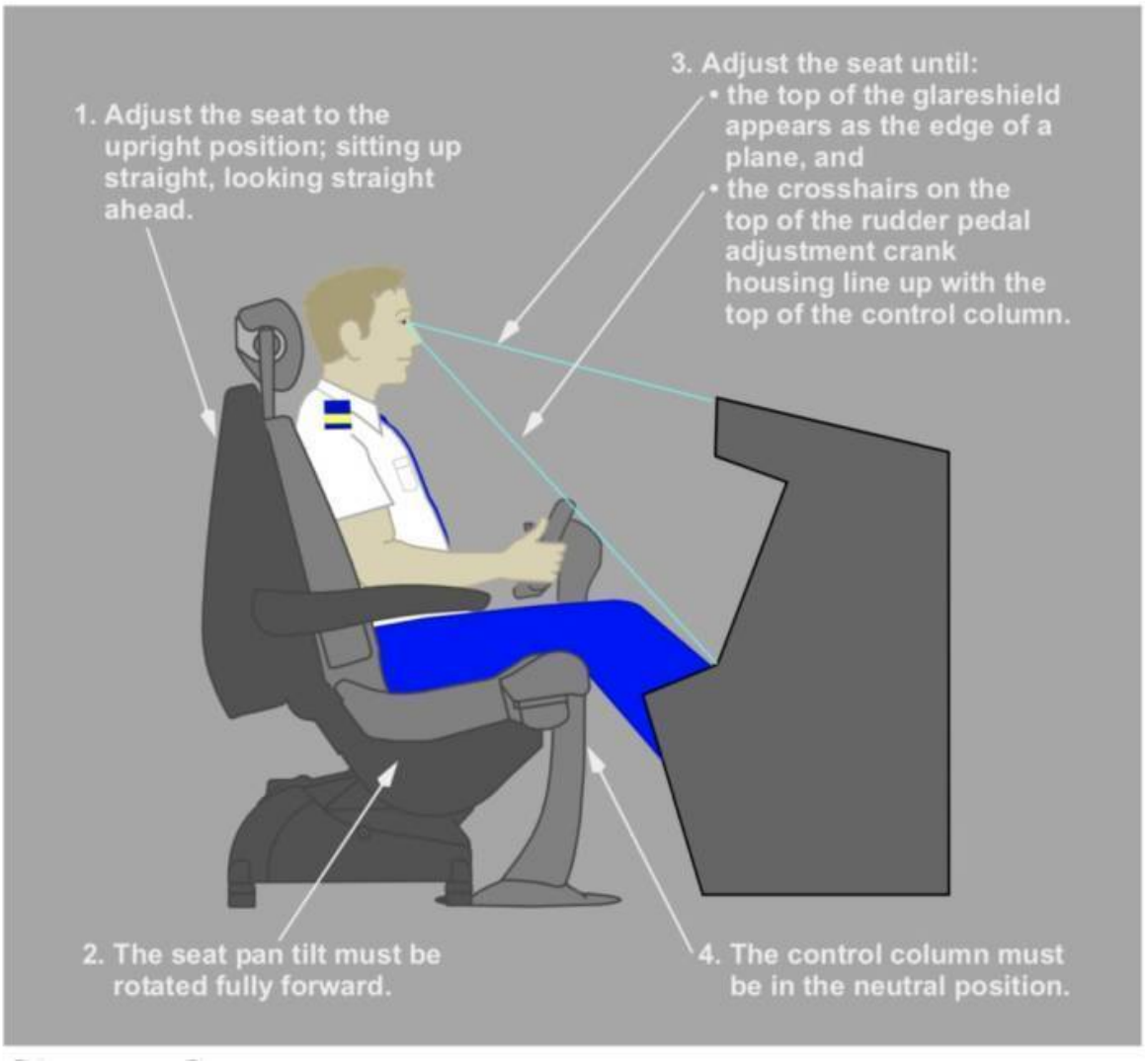
When you're sat in the same seat for more than hours at a time, it needs to be comfortable. It also needs to be functional, enabling us to fly the aircraft safely at all times. As a result, there is always going to be a trade off. As much as I'd love to fly from a comfy sofa, it wouldn't be particularly conducive to being able to access all the aircraft controls.



The pilot's seat on the 787 Dreamliner. (Image courtesy Boeing)

The pilot seats on the 787 are fully adjustable to ensure that we are comfortable and are also in the correct position to fly the aircraft.

The seats move vertically, adjust for lumbar support, adjust for thigh support, have an adjustable head support, move forwards and backwards and also recline and tilt backwards. The vertical and horizontal movements have electrical controls, but the other adjustments must be done manually.



The correct seat position is essential to ensure proper access to all controls.

Oxygen Mask

In case of emergency, all flight deck occupants have access to a fully enclosed oxygen mask. Unlike the masks in the cabin, the masks in the flight deck provide full protection for breathing and vision by totally covering the face.

The oxygen mask is easily accessible for quick donning.

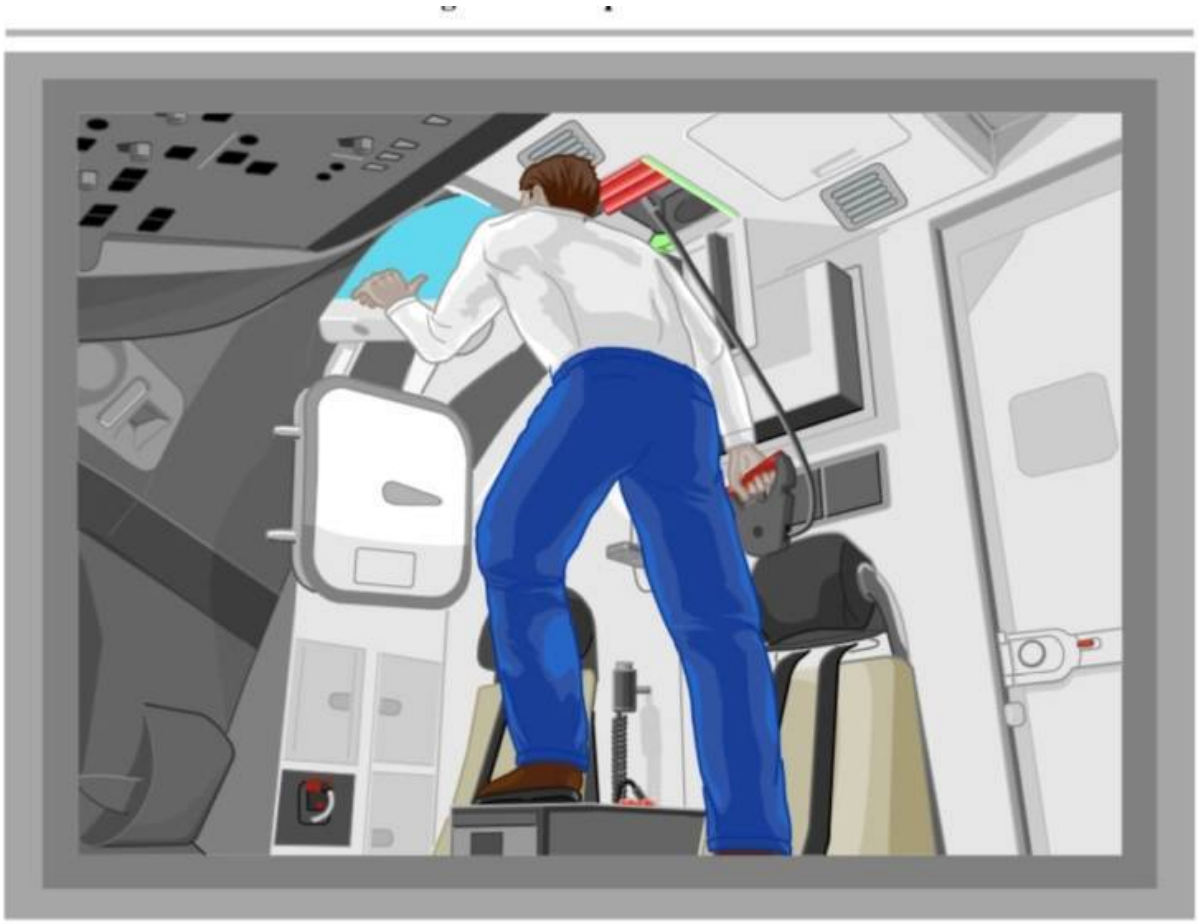
When flying at 43,000 feet, the highest the 787 can fly, in the event of a sudden loss of cabin pressure, you only have around 15 seconds of useful consciousness. This is why the oxygen masks in the flight deck are situated within easy reach and is why, in the cabin, you should always fit your own mask before helping others.

Once fitted on the pilot's head, it can provide 100% pure oxygen and protection from smoke and fumes for a number of hours.

The masks cover the entire face (Image courtesy wearable.com)

In Emergency

In case of emergency on the ground, there are eight doors in the cabin through which passengers can exit. Even if a couple of them won't open or are blocked, there are still plenty of other options to escape. However, in the flight deck, there's only one door in and out. What would happen if this was to become blocked, or unable to be opened? The windows in the flight deck do not open, so in scenarios like this, there's the emergency exit hatch.



The escape hatch is in the roof of the flight deck. (Image courtesy Boeing)

Situated on the roof of the flight deck, this hatch opens inwards, enabling the occupants to escape down the side of the aircraft. However, from this hatch it's an even bigger drop to the ground than down the emergency slides. To help us escape safely, there are inertia reel handles. Before climbing out of the hatch, you take one of these handles from its stowage, as seen in the picture above. As you go to lower yourself down the side of the aircraft, the cord takes the strain and stops you from dropping to the ground too quickly.

Bottom Line

The flight deck of the 787 is a complex place. Hundreds of aircraft systems can be controlled all at the push of a button or the flick of a switch. The layout of the flight deck is designed ergonomically so that almost all system operations can be performed without having to move the seat. With its advances in technology such as the HUD, the 787 flight deck provides a comfortable and practical environment to ensure that the pilots can fly the aircraft to the highest standards of safety. So whether it's a short two-hour hop between Tokyo and Sapporo or a 17-hour epic between Perth and London, you know that your pilots have some of the very best systems in modern aviation at the tips of their fingers.

Charlie Page Charlie Page is an airline pilot flying the Boeing 787 Dreamliner. Each

Saturday he gives you a 'behind the cockpit door' insight to life in the flight deck.
News and deals straight to your inbox every day.

I would like to subscribe to The Points Guy UK newsletter and special email promotions.
The Points Guy UK will not share or sell your email. See PRIVACY POLICY.