

# *Add-on For the X-Plane®*



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The Boeing

*Dreamliner*

**787**

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# CONTENTS

Below you can find information on various elements of development and procedures. Page 11 presents general flight information for the novice. You may skip to page 15 if you are just interested in using the checklist.

→ Credits	Page 3
→ Introduction	Page 4
→ General Information	Page 4
→ The 787 Model	Page 5
→ Model Features	Page 9
→ Using a Joystick	Page 10
→ Novice Instructions	Page 11
→ Checklists	Page 15
→ Fuel Panel Explained	Page 19

Please see the enclosed file "Boeing 787 Reference Manual.pdf" for detailed information and charts.

# INTRODUCTION

The Boeing 787-8 Dreamliner is a super efficient airplane with new passenger-pleasing features. It will bring the economics of large jet transports to the middle of the market, using 20 percent less fuel than any other airplane of its size.

Please see the enclosed file “Boeing 787 Reference Manual.pdf” for detailed information and charts.

General Information	
Maximum Takeoff Weight	502,500 pounds (227,930 kilograms)
Cruise Speed	Mach 0.85
Range	7,650 to 8,200 nautical miles
Seating	210 to 250 Passengers
Height	56 feet (17 meters)
Length	186 feet (57 meters)
Wing Span	197 feet (60 meters)

# Exploring the 787 Dreamliner Model

This model was created with a fully 3D interior. Every attempt was used to make it as easy to use as possible. That is to say the instruments may be oversized for easy readability. Some elements may be placed for ease of use. For those that are only 2D panel users pop-up panels are included so that controls can be operated in forward view. This is also handy for 3D users. It is also recommended that you turn on instrument descriptions to see how each control operates.



The buttons highlighted in red operate the pop up panels.

- R – Radio
- C – Flight Computer
- O – Overhead Panel
- Q – Mini Throttle Quadrant

Some of these pop-ups are redundant and included for convenience.

**TIP!**

*It is recommended that you turn on instrument descriptions in the Sim ( the menu is “Aircraft” then “Show instrument descriptions” ) By hovering the mouse cursor over the various instruments a pop-up description for that instrument will be displayed. There are several custom instruments with custom descriptions so even if you are familiar with X-Plane this may be of help.*

*Flight Panel*

If you are familiar with flying airliners in flight Sims then you will recognize most of these instruments. Most are self explanatory. It is recommended to turn on tool tips for a description of each instrument or control. This is under “Aircraft” “Show instrument descriptions.”

Below is the lighted cabin and cockpit. The lighting is controlled by the cabin flood light switch on the main panel. There are two cabins provided, a normal passenger version and a “VIP” version with deluxe interior.



6

## The Throttle Quadrant



The main controls are the thrust levers, flaps, speed brakes, parking brake, and fuel cut-off levers.

Engine startup can be monitored by watching the EICAS displays, "Engine Indication and Crew Alerting System" You may start your flight with engines running and ready to go or you may go through a start up procedure if you wish. To perform a cold start you can go to "Settings" "Operations & Warnings" and uncheck the box that says "Start each flight with the engines running" More on this later.

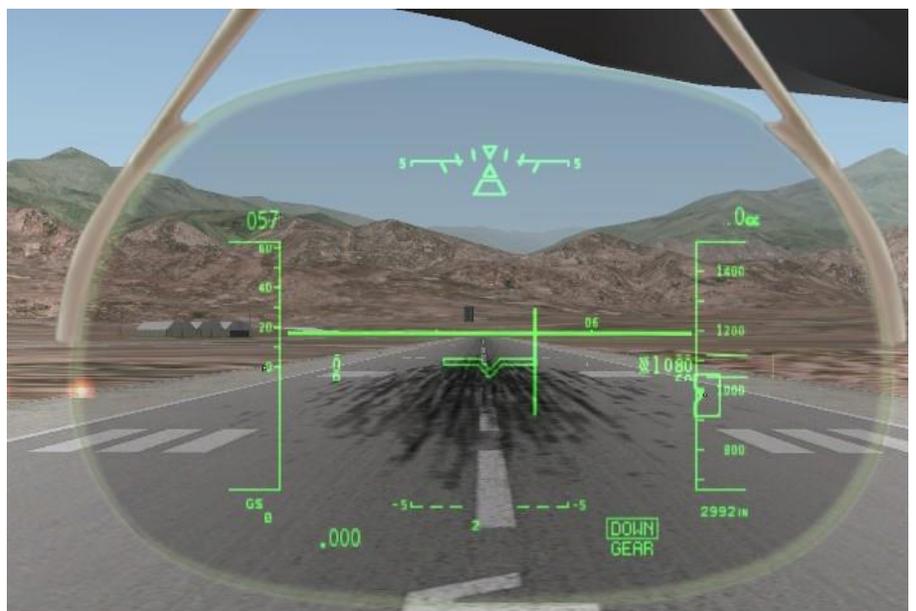
## The Overhead Panel.

Every attempt was made to make all panels easy to read and use. There are a number of custom elements. Conversely there will be custom descriptions included throughout. Make sure to turn on instruments descriptions in the Sim. This is located in the menu bar under “Aircraft” “Show Instrument Descriptions”



## The HUD Display

As of this writing the HUD (Heads Up Display) is only available in 2D mode. One method to toggle this display is to assign a joystick button to toggle between 2D and 3D mode. To assign buttons go to the menu bar and select “Settings” “Joystick, Keys & Equipment” and select the “Buttons: Basic” tab. Refer to page 10 for more on setting up the joystick.



## Other Features

**Wing Flex effects are designed into the 787 model** - The wings will flex as speed increases like the real plane. The wings also will “bend” as more fuel is loaded in response to the extra weight. G-Force effects also are added, the wings bounce on touch down, a hard landing will add to this effect.

**Normal Mapping** - The fuselage makes use of normal mapping. This effect give a 3 dimensional effect to fuselage lines and protrusions such as windows and doors.

**3 Dimensional Controls** – Most knobs and levers are custom made and animated. Most can be manipulated using the mouse.

**Custom Lighting** – By using the “Cabin Flood” control above the main panel you can control the amount of light in the cockpit. This also adds ambient lighting to the cabin area.

**Extra Liveries** – At this writing there are 15 liveries to chose from. A paint kit will be included that can let anyone that can use PSD files create their own liveries by simply adding their own livery colors.

**Two Interiors** – There is a normal passenger version plus a bonus interior that has a custom VIP type interior that features a bar and hot tub.

**Customizable Configuration** – If you do not care to have a custom interior, passengers, or pilots you can easily remove them from the Dreamliner. This procedure is described below.

**Note:** To do the following modifications you will be editing the acf file for each version, the “787.acf” or the “787\_VIP.acf. Please make a backup copy of these files before you begin.

### **To edit the passenger version “787.acf” do the following**

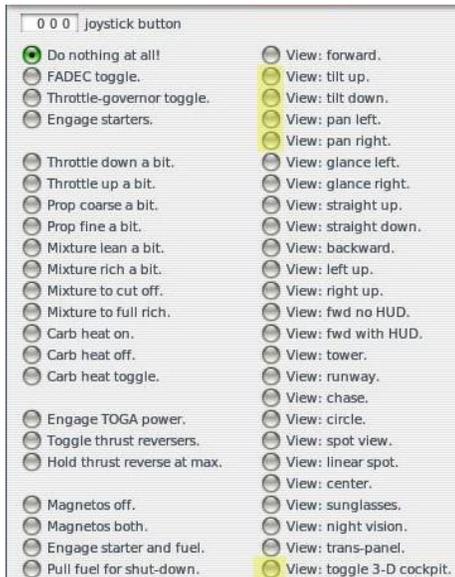
To remove the pilot figures you will need to open the Plane Maker application located in the X-Plane main folder. Go to the the “Standard” menu and click on the “Misc Objects” tab. If you would like to remove the pilots locate the “pilot.obj” then click the “clear” tab. You can also remove the “Seats.obj” and “Passengers.obj” if you wish. Next go to “File” menu, click save then exit. Do not remove any other files as they are required.

### **To edit the passenger version “787\_VIP.acf” do the following**

The procedure is the same as described above but there are two files that can be safely removed, “PASSENGERS LUXURY.obj” and “pilot.obj”

## Using the Joystick

Depending on your setup there will be different levels of how you can setup your equipment to work with X-Plane. These suggestions are general but meant to be of help with flying the 787.



This is a section of the joystick set-up screen from X-Plane. If you have a joystick that has hat switches and buttons you can program how they operate here. I use a Saitek X45 that has several hat switches and a number of buttons. The section highlighted in yellow is a good way to program a method for easy control of the 3D cockpit. You can program a hat switch using the highlighted 'up-down-left-right' and program a button to toggle between 3D and 2D mode.



If you have a second hat switch it is possible to add forward and side-to-side movement by programming your second hat switch using the settings to the left. By setting up two hat switches you can simply press the button you programmed from the above illustration to toggle the 3-D cockpit and by using the two hat switches you can pan around plus move side to side. There are many possibilities. If you have enough buttons it is possible to fly without needing the keyboard. You can program buttons to zoom in and out if you

wish for instance.

If you have limited options for your joystick here are a few suggestions for the keyboard. Also note that you can program the keyboard keys to enhance your setup. For more information please visit [XPlane.com](http://XPlane.com). There is a wealth of information such as down loadable manual plus plenty of technical information.

While in 3-D mode you can use various key commands to move about. The "Page Up & Page Dn" keys will move you forward and backwards while in 3-D mode. The arrow keys on your keyboard will move you UP-DOWN-LEFT-RIGHT while in 3-D mode.

Other options include:

The “Q E S” keys will pan your view whether in 2-D or 3-D modes. The “W” key will give you a forward view and return you to 2-D mode even if you are in 3-D mode.

There are plenty of options so experiment to get the experience that works best for you.

## 10

### **General Flight Instructions:**

Begin by loading the 787 in X-Plane. A more detailed checklist will be discussed in the next section. The following notes are for becoming familiar with operating the 787 model.

You probably won't get very far until the engines are started. You may opt to start the 787 with engines running. If you prefer to do a “Cold Start” then you may need to tell X-Plane first. To set the simulator to start without the engines running then you can select the “Settings” menu and click on “Operations and Warnings.” You can then deselect the box marked “Start each flight with engines running.” You may also opt to have the 787 begin at the ramp here. You will have to re-load the 787.

**Note: All controls can be operated with the mouse or using your joystick throttle control(s) For easy viewing of the overhead panel during start procedure press the “O” button located above main panel displays**

### **Starting the engines:**

*A more detailed procedure is presented in the “Checklists” section*

- Make sure parking brake is set “ON”
- Turn battery master switch on
- Turn APU generator switches on
- Start the APU (Click APU switch on. Click again to engage. Indicator light will illuminate when started)
- Turn the avionics on
- Start engine number 2 first.
- Confirm that N 1 is increasing as N 2 is increasing on Number 2
- Confirm oil pressure Number 2
- Engine Number 2 generators on
- Start Number 1

- Confirming that N 1 is increasing as N 2 is increasing on Number 1
- Confirm oil pressure Number 1
- Engine Number 1 generators on

## 11

### ***Pre Flight Checks***

Check flaps, trim, and other controls. Flaps can be set 5 to 15 degree's for take-off depending on runway length and weight of the aircraft. You have infinite control by moving the flap lever manually if you wish. You may use 20 degree's of flaps if you are heavily loaded. Trim setting of 0 degree's works well. You may also check movement of rudder, elevator, and ailerons. Be sure you can see the panel instruments. In 3D mode you can use your up arrow key on the keyboard to raise your view of the runway. The viewpoint has been pre-adjusted to be able to see runway and main flight instruments but you may adjust to your preference.

### ***Take Off and Initial Climb Speed***

The normal rotation speed will be about 170 KIAS depending on the weight of the 787 on takeoff. Normal Climb speed is 200 KIAS and above not to exceed 250 KIAS below 10,000 feet altitude.

### ***Weight***

Do not load the aircraft with 100% of fuel total in all tanks and/or payload set to maximum. If you plan a long trip load 80-90 percent fuel initially. If you plan on a short trip then use only the fuel you will need, more on this later. It is optimal to have about 45 -60 minutes of fuel in the tanks on approach and landing, enough to be able to fly to an alternate airport and/or to make a go around if necessary. Having a large amount of fuel on landing will make approach and landing much more difficult. In the real world this would cause unnecessary weight and fuel use, not good for economy! The 787 in the real world would not be used for short flights but feel free to do so if you like, just remember to load the plane accordingly. X-Plane's fuel default is tanks half full so keep this in mind when starting your flight.

### ***Takeoff***

Release the brakes. You may use the brake lever or simply click on the brake indicator light. Advance the thrust levers to line up with the runway centerline. Continue to advance thrust levers to full forward. As you begin your takeoff roll take note of the Attitude Indicator.

- Be sure to stay on centerline of the runway. It is recommended to look towards the end of the runway to stay on center.
- Watch the ASI (Airspeed Indicator) as speed increases. The rotate speed will be 140 KIAS.

- At rotate speed pull back on the yoke to achieve 20 degrees of 'Nose Up" attitude.
- After takeoff keep wings level and maintain heading.
- Check vertical speed indicator to make sure you maintain a positive rate of climb then raise the landing gear. **Climb**
- Maintain a 15 degree pitch attitude while climbing. After you retract flaps reduce climb to 1800 fpm.
- After crossing a Flight Level of 22,000 feet (FL220) reduce the climb rate to 1500 fpm.

## 12

- After crossing FL290 reduce climb rate to 1000 FPM. This will reduce the work load of the engines and help conserve fuel.

### **Climbing to cruise altitude**

As an example we will assign a cruise altitude of FL350, or 35,000 feet.

- Maintain climb thrust. A good thrust setting would be 89% N1. For this example we will use a climb speed of 250 KIAS.
- Check panel displays to make sure you maintain course
- Maintain correct airspeed by adjusting the pitch attitude. When climb speed starts to diminish then lower pitch attitude to increase speed as needed.
- Once FL350 is attained maintain altitude and increase speed to cruise speed of Mach 0.85.
- At you approach cruise speed you may engage A/T (Auto throttle) and let the autopilot fly the aircraft.

### **Descending**

You will eventually need to make a descent to land or you may need to descend to avoid air traffic or adverse weather conditions. To do so:

As an example let's say we want to descend to 25,000 feet (FL250) to avoid air traffic.

- Reduce thrust to idle to begin the descent.
- Maintain 300 KIAS using pitch attitude.
- Maintain accurate course and bank angle using roll attitude.
- Scan flight instruments

- Add thrust to maintain 250 KIAS

## Landing

The 787 is a large aircraft so will require time to slow down. You will be using the flaps and speed brakes to aid in slowing the aircraft. Keep in mind the landing gear will induce some drag when lowered. You will need to plan ahead for your landing procedure.

- Normal landing will be 140 KIAS flaps 30. This may differ according to aircraft weight.

- Aim for a speed of 180 KIAS 3 miles from the final approach using flaps 15-20 degrees.

-About a mile from final lower the landing gear and add more flaps 25 degrees. Aim for 140-160 KIAS.

## 13

Cruising Speeds	
Service Ceiling	43,000 feet
Cruise Altitude	FL350 to FL43,000
Normal Cruise	FL 350
Cruise Speed	0.85 Mach

**IMPORTANT:** The optimal cruise altitude is dependent on gross weight of the aircraft. You might find that weather conditions will play a role on actual cruise altitude. It is recommended during cruise you allow the autopilot to control the aircraft.

Weight to Cruise Altitude	
300k	FL430
340k	FL410
380k	FL400
420k	FL390
460k	FL370
500k	FL350

To find the optimal cruise check the weight and balance screen while running X-Plane (Aircraft>Weight and Fuel) to determine the gross weight of the aircraft. Using the above chart will indicate the proper cruising altitude for optimal fuel usage.

### Example:

If total weight of the aircraft is 370,000 lbs your OPTIMAL cruise altitude will be between FL400 and FL 410. Recommended cruise speed is Mach 0.85

Please see the enclosed file “Boeing 787 Reference Manual.pdf” for detailed information and charts.

## 14

### Pre-Flight Checklist

- Parking brakes set
- Battery master switch on
- APU generator switches on
- Start the APU (Click APU switch on. Click again to engage. Indicator light will illuminate when started)
- Avionics on
- Gear down and locked
- Transponder on standby
- Flaps up and trimmed
- Spoilers/speedbrakes fully retracted
- Fuel flow to all engines, cut
- Engine instruments check
- Anti-ice as required
- Aircraft lighting
- Check weather
- Altimeter setting
- Request I F R clearance
- Transponder set
- Set altitude
- Navigation lights on
- Check fuel

### Before Startup Checklist

- Fasten seat belts signs on
- Verify fuel quantity
- Elevator trim set for take off
- Throttles idle

Engine areas clear  
Beacon light on

## Startup Checklist

Start Number 2  
Confirm that N 1 is increasing as N 2 is increasing on Number 2  
Confirm oil pressure Number 2  
Engine Number 2 generators on  
Start Number 1  
Confirming that N 1 is increasing as N 2 is increasing on Number 1  
Confirm oil pressure Number 1  
Engine Number 1 generators on  
Anti-ice as required

15

## Before Taxi Checklist

Check flight controls  
Taxi lights on  
Standby instruments  
Avionics set for departure  
Auto pilot off  
Air speed set  
Flight director on (ARM)  
Elevator trim set for take off  
Request taxi clearance  
Heading indicator set to take off heading

## Taxi Checklist

Check clear on the right. Check clear on the left  
Release brakes

## Before Takeoff Checklist

Check flaps set for take off  
Spoilers/speedbrakes fully retracted

- Flight instruments
- Engine instruments
- Navigation equipment
- Request take off clearance
- Pitot heater set as required
- Landing lights on
- Taxi lights off
- Strobe lights on
- Transponder on auto
- Confirm captains clock is running

## Takeoff and Climbout Checklists

- Release brakes
- Position the aircraft on the center line and apply take off thrust
- Call out....eighty knots
- Call out V1 when airspeed above 135 KIAS
- Call out Rotate when airspeed above 140 KIAS
- Call out V2 when airspeed above 150 KIAS
- Raise gear when positive rate of climb
- Set flaps to one degree when airspeed above 200 KIAS
- Turn on the auto-throttle when airspeed above 200 KIAS
- Enable indicated airspeed (IAS) when airspeed above 200 KIAS
- Turn on the auto-pilot when airspeed above 200 KIAS
- Arm the altitude hold when airspeed above 200 KIAS
- Arm the heading hold when airspeed above 200 KIAS

## 16

- Pull the flaps up
- Turn off the landing lights above 10,000 feet
- Turn off the seat belts sign if no turbulence
- Passing through FL180 reset the altimeter to 29.92
- Set desired speed

## Cruise Checklist

- Flight instruments
- Engine instruments
- Verify fuel quantity
- Radios set

## Descent Checklist

- Anti-ice as required

Radios set  
Passing through 17,500 feet set airspeed  
Landing lights below 10,000 feet  
Verify course setting  
Verify fuel quantity  
Seat belt sign on

## Approach and Landing Checklists

Avionics on?  
Radios set?  
Set the airspeed to 220 when airspeed below 350 KIAS  
Set the flaps to one degree when airspeed below 250 KIAS  
Set the flaps to 5 degrees when airspeed below 230 KIAS  
Set the flaps to 15 degrees when airspeed below 215 KIAS  
Set the airspeed to 170 when airspeed below 210 KIAS  
Set the flaps to 25 degrees when airspeed below 175 KIAS  
Turn off Altitude Hold if Backcourse Approach  
Lower the landing gear below 2,100 feet AGL  
Turn off the Auto-Pilot below 200 feet AGL  
Turn off the Auto-Throttle below 200 feet AGL  
Reverse thrust after touchdown  
Release reverse thrust when groundspeed below 60 knots

17

## Taxi to Ramp/Gate Checklist

Strobe lights off  
Taxi lights on  
Landing lights off  
Flaps fully retracted  
Start the APU  
Transponder reset to one two zero zero  
Transponder on standby

Pitot heater off Elevator  
trim set for take off

## Parking Checklist

Taxi lights off  
Parking brakes set  
Fuel flow to all engines, cut  
Engine Number 1 generator off  
Engine Number 2 generator off  
The fasten seat belts sign off  
Beacon light off  
Anti ice off  
Flight director off

## Shutdown Checklist

Shut down the APU  
Avionics off  
Navigation lights off  
Panel lights off  
Battery master switch off

### **Fuel System Explained**

Below is the “Weight and Fuel” panel from within the X-Plane Simulator and the fuel monitoring/controls. This is located under the “Aircraft” Menu. You can select how much fuel you will need and how it will be distributed. To make things simple you can just use the top slider to load fuel evenly across all tanks and fuel weight will be distributed evenly. Fuel is measured in lbs. For a

rough estimate of fuel you can move the slider to match the estimated length of the flight, this will be a rough estimate so add an additional 45 minutes of fuel in case you need to land at an alternate airport or do a go-around. Additionally you can be more precise and set up each tank individually. The illustration below shows how fuel is distributed in relation to the fuel panel on the overhead panel. If you are planning on a flight of more than 9 hours then it is only necessary to use the center tanks. To do this you may use the “fuel TOTAL” slider to the left to empty all tanks then move the bottom two sliders to fuel only the center tanks. It is important not to overload the aircraft with excess fuel, not only for economy but for safety. Having 100,000 lbs of fuel left on landing puts an enormous strain on the airframe.



Above are the the main fuel controls. The left tank switches turn the fuel pumps on/off for the left wing tank. The right tank switches turn the fuel pumps in the right wing on/off. The center tank is controlled by the lower switches. The FUEL CROSSFEED switch allows the right engine to use fuel from the left tank and visa versa. The BALANCE switch will transfer fuel from the left tanks to the right tanks and visa versa if the aircraft needs to be balanced.

You can see total fuel remaining and amount of fuel on the left and right side of the aircraft on the main panel display.

