# DELTA VIRTUAL AIRLINES

## Airbus A330-200/300

## Aircraft Operations Manual

**1st Edition**

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# Welcome

Welcome to the Delta Virtual Airlines Aircraft Operating Manual (AOM) for the Airbus A330-200 and the A330-300.

This AOM is based upon the DVA Fleet Installer airplane. We are always seeking to improve the accuracy of this AOM.

Should you have questions about the specifics of this airplane, this manual or aviation in general, you should create a helpdesk issue at our website, www.deltva.org that states your question and we will do our best to answer your questions.

# History and Overview

In November 1987, Airbus Industries launched a new program to help airlines find a suitable replacement for the McDonnell Douglas DC-10 and to directly compete with Boeing's 767 aircraft. As part of this effort, two distinct airliner families were created – the twin engine A330, and the four engine A340. The two airliners used a revolutionary electronic flight deck and 'fly by wire' control systems pioneered in the A320 and brought them to a wide-bodied jetliner.

The A330 and A340 projects were launched simultaneously and, much like Boeing's 757 and 767, share many common systems, including the flight deck, airframe, and wings. The only significant difference between the two is the number and type of engines, as well as some slight changes to the wings and fuel tanks.

There are two main variants of the A330 as well as a tanker and freighter version. The A330-300 was launched in 1987 with its introduction into service occurring in 1993. The first delivered aircraft was to Air Inter in 1994. The A330-200 variant was launched in 1995 with the first delivered aircraft going to ILFC/Canada3000 in April of 1998.

Airbus intended the A330 program to directly compete against the Boeing 767-300ER in the ETOPS (extended-range twin engine operation performance standards) market. In November 2009, the A330 became the first aircraft to acquire ETOPS-240 approval, which is now offered by Airbus to all of its customers as an option.

In many ways the A330-200 and –300 fit the same market niche as the Boeing 767-300ER and the –400ER. The former is designed as a long-range intercontinental jet transport, while the latter is designed for shorter, higher-volume stages.

The production and sales of the A330 has gone well. The A330-200 currently has 373 aircraft in operation today with orders of 567 additional aircraft; the A330-300 has 294 in operation with orders for 426.

Delta Air Lines along with Cathay Pacific are the largest operator of the A330's with each company owning 32 aircraft. Delta Air Lines acquired all of its A330-200 and A330-300 aircraft through its merger with Northwest Airlines in 2009. To date, Delta owns 11 A330-200 and 21 A330-300 aircraft.

# Power Plant

Large twin-engine jet airliners such as the A330 and Boeing 777 can chose from a variety of high-powered turbofan engines from all major engine manufactures. The A330-200 and A330-300 have identical engine choices.

## *General Electric CF6-80E1*

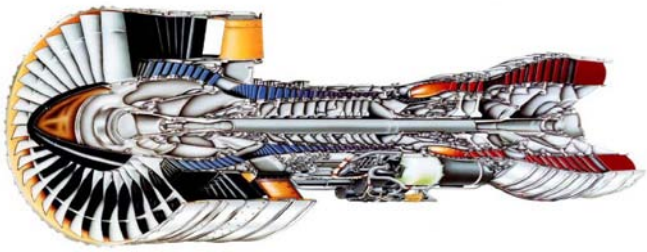
The CF6-80E1 is a large turbofan engine that is a direct descendant of the original CF6 used in the McDonnell-Douglas DC-10 in the 1970s, and a more powerful variant of the CF6-80C2 used in the Boeing 747-400, McDonnell-Douglas MD-11 and the A330's competitors the Boeing 767-200, -300, and –400.

The CF6-80E1 is a 17 –stage high-bypass turbofan engine specifically designed by General Electric for the Airbus A330-200 and the A330-300. Early variants of this engine generated 67,500 pounds of thrust, and the latest CF6-80E1A3 variant develops 72,000 pounds of thrust – almost double that generated by the original CF6!

In the 767 and Airbus A300-600, A310 and A330, the CF6-80 has received 180-minute ETOPS certification from the United States Federal Aviation Administration.

## *Pratt & Whitney PW4164*

Once the limits of the classic JT9D were reached, Pratt & Whitney developed the PW4000 family of turbofan engines, which first entered service in 1987. PW4000 comes in three main variants, with 94, 100, and 112-inch fan diameters. The 100-inch diameter version is used in the A330, with variants developing from 64,500 to 68,600 pounds of thrust.



The PW4000 introduced significant technological advances such as a Full Authority Digital Engine Controller (FADEC), and was one of the first Pratt & Whitney turbofans rated for 180-minute ETOPS operation. The PW4164 is a direct competitor to the General Electric CF6-80E1 and the Rolls-Royce Trent 700 – it is a testament to the demand for the A330 to see all three major jet engine manufacturers develop a competing turbofan engine solely to be used on this one aircraft! Delta Air Lines currently has 32 aircraft all with Pratt & Whitney engines.

# Specifications

The chart below displays technical specifications of the A330-200 and –300 variants in use at Delta Virtual Airlines.

| TYPE | A330-200 | A330-300 |
|---|---|---|
| **DIMENSIONS** | | |
| LENGTH | 192ft-9in | 208ft-8in |
| HEIGHT | 58ft-8in | 54ft-11in |
| WINGSPAN | 197ft-10in | 197ft-10in |
| WING AREA | 3890 Sq-ft | 3890 Sq Ft |
| **POWERPLANTS** | | |
| ENGINE TYPE<br>MAXIMUM RATED THRUST | TWO PW4164<br>68,600 LBS EACH | Two PW4164<br>68,600 LBS EACH |
| **WEIGHTS** | | |
| EMPTY WEIGHT | 265,700 LBS | 274,000 LBS |
| MAXIMUM TAKEOFF WEIGHT | 507,000 LBS | 507,000 LBS |
| MAXIMUM LANDING WEIGHT | 396,800 LBS | 407,900 LBS |
| ZERO FUEL WEIGHT | 370,400 LBS | 381,300 LBS |
| **CAPACITY** | | |
| MAXIMUM FUEL | 36,750 US GAL | 25,670 US GAL |
| MAX SEATING | 293 | 335 |
| COCKPIT CREW | 2 | 2 |
| MAXIMUM PAYLOAD | 700CUFT | 700CUFT |
| **OPERAIONAL LIMITS** | | |
| SERVICE CEILING | FL410 | FL410 |
| NORMAL CRUISE SPEED<br>(FL360) | M.82<br>537 KIAS | M.82<br>537 KIAS |
| MAXIMUM RANGE | 7250 NM | 5850 NM |
| TAKEOFF DISTANCE (MAX TAKEOFF WEIGHT) | 7300 ft | 8200 ft |
| LANDING DISTANCE (MAX LANDING WEIGHT, FLAPS FULL) | 5180 ft | 5670 ft |
| FLAPS UP STALL SPEED<br>(MAX LANDING WEIGHT) | 166 KIAS | 168 KIAS |
| FLAPS 32 STALL SPEED<br>(MAX LANDING WEIGHT) | 124 KIAS | 126 KIAS |
| MAXIMUM INDICATED AIRSPEED (FL360) | M.86<br>563 KIAS | M.86<br>563 KIAS |

# COCKPIT IN MSFS2004

Here are detailed pictures of the FS2004 A330 cockpit. This is an expanded cockpit layout that covers everything in the aircraft cockpit. You should refer to this for cockpit familiarization.

## *MAIN PANEL*

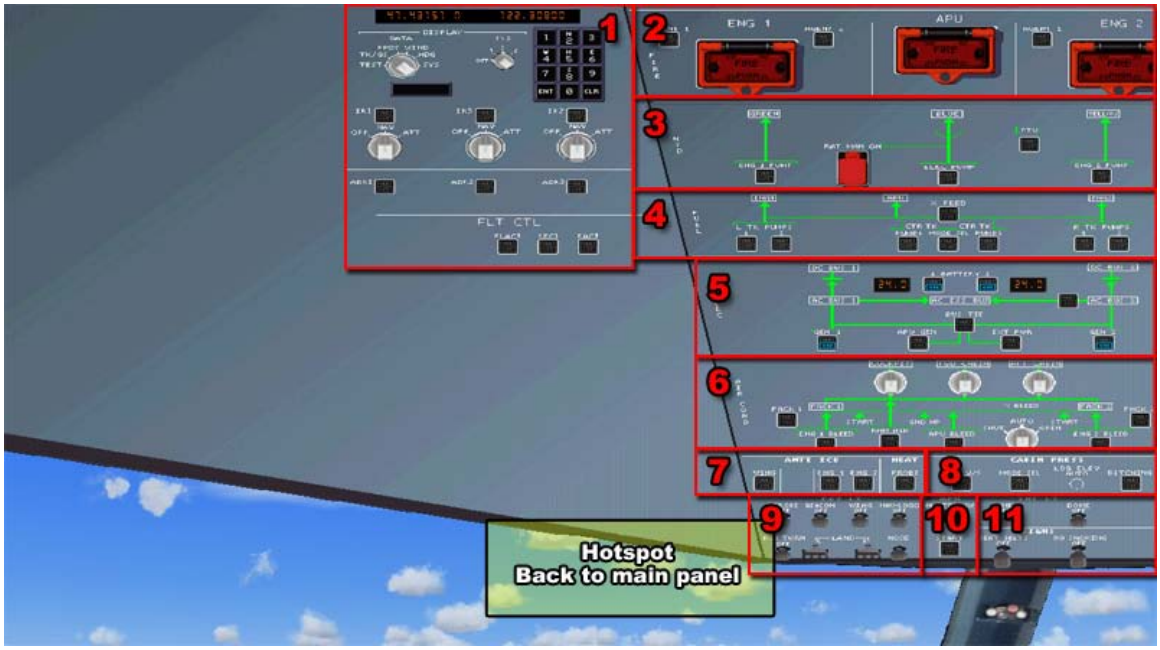
The main panel contains most of what is needed to fly the aircraft successfully.

1. Electronic Flight Instrument Systems (EFIS) control panel. This panel is used to control the data displayed on the Navigation Display (ND).
2. Flight Control Unit (FCU). This panel is used to manage the automatic flight system when not under direct control of the Flight Guidance System, a.k.a. Autopilot
3. Primary Flight Display (PFD). This display features information such as airspeed, altitude, pitch/roll angle, heading, rate of climb, set barometric pressure, and the Flight Mode Annunciator (FMA).
4. Navigation Display (ND). This display features information related to lateral navigation of the aircraft. Display modes include ROSE LS (ILS), ROSE VOR, ROSE NAV, ARC, and PLAN. This display is controlled via the EFIS control panel.
5. Standby Instruments. These instruments serve as backups for the instruments displayed on the PFD.

6. Engine/Warning Display (E/WD). This is the top screen of the Electronic Centralized Aircraft Monitor (ECAM) featuring key information related to the engines, flaps, and other aircraft systems.
7. Landing gear pane. This area contains the controls for operation of the landing gear and automatic brakes.
8. System Display (SD). This is the lower screen of the Electronic Centralized Aircraft Monitor (ECAM) featuring information related to the various aircraft systems. This is controlled via the ECAM control located on the pedestal.

## FS2004 Overhead Panel

The overhead panel contains controls for most of the aircraft's systems and is accessed by clicking the overhead hotspot (shown in yellow).




Air Data and Inertial Reference System Control Display Unit (ADIRS CDU). Switches and displays are used to manage the aircraft's primary navigation system.

Fire Detection and Suppression. Controls in this area are used to detect and manage fire related events in the engines and APU.

Hydraulic System management. Controls in this area are used to manage the engine driven hydraulic systems.

Fuel System management. Controls in this area are used to manage the fuel tanks and fuel pumps on the aircraft.

Electronic System management. Controls in this area are used to manage electrical power on the aircraft including external power and the engine driven generators.

Air Systems. Bleed air for engine start and environment control (heat and air conditioning) can be supplied from the engines or APU. Controls are used to manage the bleed air and environmental control systems on the aircraft.

Anti-Ice Systems. Controls manage the engine, wing, and probe anti-ice systems.

Cabin Pressurization. This area contains the controls to manage the aircraft's cabin pressurization.

Aircraft Light Controls. Controls for external lighting of the aircraft.

Auxiliary Power Unit (APU). Controls for the aircraft's APU.

Internal Lights and Signs. Controls for the flight deck's internal lighting and cabin signs.

## *FS2004 Center Pedestal View*

The center pedestal contains controls and displays related to navigation and communications as well as the thrust levers. Clicking the pedestal hotspot shown in yellow accesses it.

System Display (SD). The lower screen of the Electronic Centralized Aircraft Monitor (ECAM) featuring information related to the various aircraft systems.

Multipurpose Control and Display Unit (MCDU). This equipment is used to interact with the aircraft's Flight Maintenance Guidance System (FMGS).

Electronic Centralized Aircraft Monitor (ECAM) Control Panel. This area is used to switch between the different ECAM system options on the System Display (SD).

Thrust Levers and Pitch Trim Controls. Used to adjust the aircraft's thrust.

GPS Unit. Used as the aircraft's primary navigation system.

Navigation and Communication Radios. Control panel for the aircraft's navigation and communication radios.

Engine Ignition and Start panel. The controls used to start the aircraft's engines.

Navigation and Communication Radios. Control panel for the aircraft's navigation and communication radios.

Spoiler and Air Brakes. Control levers for the spoilers and air brakes.

Flap Lever. Lever used to set the aircraft's flaps.

Transponder. Aircraft's transponder display and related controls.

# COCKPIT IN MSFSX

## *MAIN PANEL*

The main or Captain's panel is the default panel view. The main panel contains most of what is needed to fly the aircraft successfully. In this section, we'll point out the key features of this panel. Also notice the panel selection hotspots in the lower right. These are used to open the different panel views.

1. Electronic Flight Instrument System (EFIS) control panel. This panel is used to control the data displayed on the Navigation Display (ND).
2. Flight Control Unit (FCU). This panel is used to manage the automatic flight system when not under direct control of the Flight Guidance System, a.k.a. Autopilot
3. Primary Flight Display (PFD). This display features information such as airspeed, altitude, pitch/roll angle, heading, rate of climb, set barometric pressure, and the Flight Mode Annunciator (FMA).
4. Navigation Display (ND). This display features information related to lateral navigation of the aircraft. Display modes include ROSE LS

(ILS), ROSE VOR, ROSE NAV, ARC, and PLAN. This display is controlled via the EFIS control panel.

5. Standby Instruments. These instruments serve as backups for the instruments displayed on the PFD.
6. Engine/Warning Display (E/WD). This is the top screen of the Electronic Centralized Aircraft Monitor (ECAM) featuring key information related to the engines, flaps, and other aircraft systems.

## LANDING GEAR PANEL

Landing Gear panel – Accessed using the panel hotspot. This area contains the controls for operation of the landing gear and automatic brakes.

A. Landing Gear Position Indication (green arrows = gear down)

B. Auto Brake Selection Buttons

C. Anti-Skid & Nose wheel Steering Switch

D. Gear Handle

## *MSFSX OVERHEAD PANEL -*

This panel can be accessed using the hotspot button.

Air Data and Inertial Reference System Control Display Unit (ADIRS CDU). These switches and displays are used to manage the aircraft's primary navigation system.

Fire Detection and Suppression. Controls in this area are used to detect and manage fire related events in the engines and APU.

Hydraulic System management. The controls in this area are used to manage the engine driven hydraulic systems.

Air Systems. Bleed air for engine start and environment control (heat and air conditioning) can be supplied from the engines or APU. These controls are used to manage the bleed air and environmental control systems on the aircraft.

Aircraft Light Controls. Controls for external lighting of the aircraft.

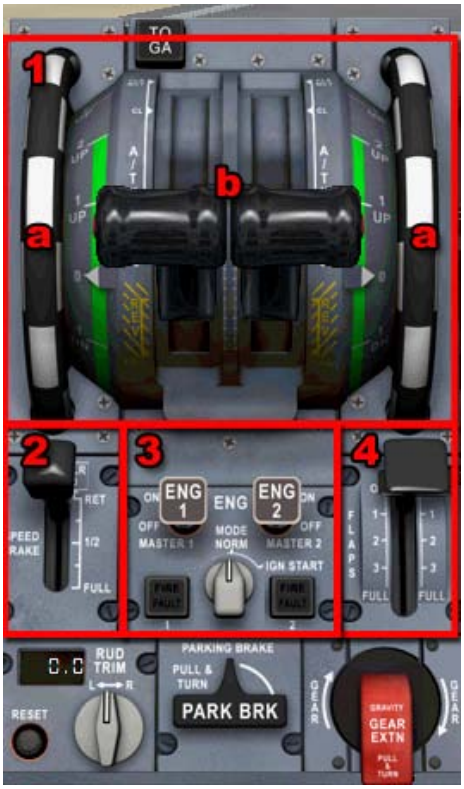
Auxiliary Power Unit (APU). These are the controls for the aircraft's APU.

Internal Lights and Signs. These are the controls for the flight deck's internal lighting and cabin signs.

**Fuel System management. The controls in this area are used to manage the fuel tanks and fuel pumps on the aircraft. Anti-Ice Systems. These controls manage the engine, wing, and probe anti-ice systems.**

## *MSFSX CENTER PEDESTAL VIEW*

**This panel can be accessed using the hotspot button.**




Thrust Levers and Pitch Trim Controls. Used to adjust the aircraft's thrust.

a. Manual Pitch Trim Wheels

b. Thrust Levers

Spoiler and Air Brakes. Control levers for the spoilers and air brakes.

Engine Ignition and Start panel. These controls are used to start the aircraft's engines.

**Flap Lever.** Control lever used to set the aircraft's flaps**.**

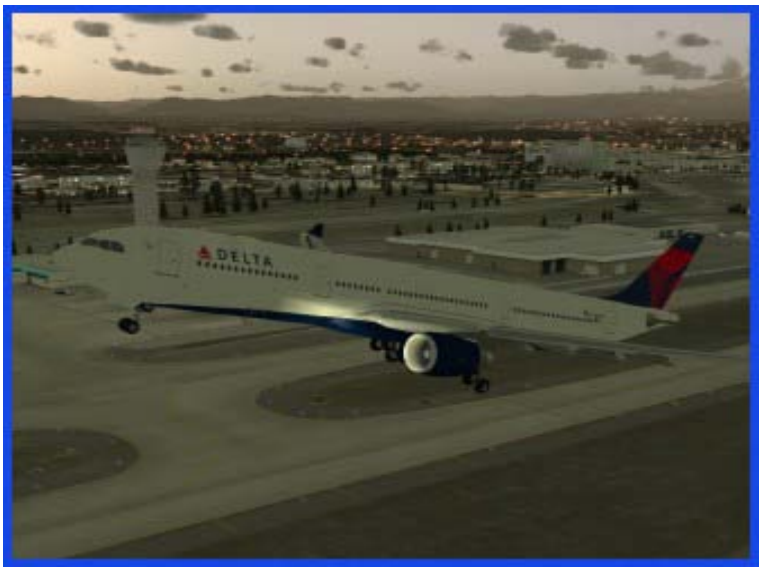
# Tutorial-How to Fly the A330

In this brief tutorial, we will introduce you to your new work environment and briefly describe some of the pertinent systems on the A330 to better familiarize yourself with the procedures. We will be going through the various checklist "flows" and then fly a short hop to cover all of the phases of flying this aircraft.

We will also provide some useful operating techniques that you may find helpful.

## *Transitioning to an Airbus 330*

If you are accustomed to flying more "traditional" aircraft such as the Boeing or McDonnell-Douglas fleets, the move to an Airbus aircraft may be a bit confusing. Aside from the computerized systems throughout the aircraft, there are two main areas that you should be aware of prior to starting. These are the thrust levers and the flap settings. Unlike other aircraft, Airbus has done away with the throttle levers that give the pilot direct control of engine thrust. Instead, the Airbus 330 is equipped with thrust levers that feature several position detents and modes of operation. While on the ground, the pilot can move the thrust levers to indicate the desired thrust setting. The computer will then command the engines accordingly. When taking off, the thrust levers are moved to either the TOGA (Take Off/Go Around) detent or the "Flex" detent if a de-rated takeoff is being performed. In this detent, the computer will automatically apply the proper amount of thrust needed for takeoff. The easiest way to do this in Flight Sim is to press the F4 key on your keyboard.



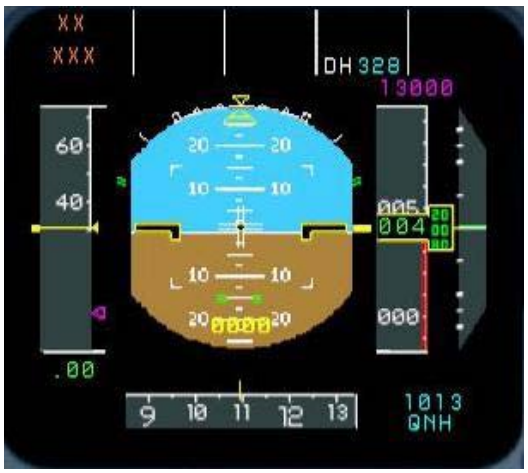

Once the aircraft is stable and climbing, the computer will instruct the pilot to move the levers to the Climb detent. Pressing the F2 key will do this for you. The throttle levers will remain in this detent until the landing phase of the flight.

The next area that should be addressed is the flap setting convention used by Airbus. Instead of listing flap settings in degrees as on other aircraft, Airbus has simply numbered the flap settings as 1, 1+f, 2, 3, and full.

## A330 Flight Deck Familiarization

Using the DVA A330 fleet installer aircraft, you will be working in a two dimensional environment. Above is the instrument panel of the DVA Airbus A330-200. Immediately you will notice that most of your gauges are found on the electronic displays, with only a few standby gauges in case of system failure.

Let's work from left to right as we review what we are looking at:




### Electronic Flight Information System (EFIS):

Primary Flight Display (PFD)-This is the outboard display unit (DU). Within the PFD display unit we have the electronic speed tape on the left and altitude ribbon on the right. Sandwiched between the two is the Electronic Attitude Direction Indicator (EADI). On the bottom is an electronic compass

tape for quick reference to heading with our altimeter setting in the lower right corner.

## NAVIGATION DISPLAY (ND)

The navigation DU is the inboard DU, appropriately situated next to the PFD. The ND can display a number of things, such as TCAS target reference, vertical and horizontal deviation for ILS signals, deviation bars for radio navigation, etc. The view in the screen shot below is the typical configuration for the DVA A330. In ARC mode you will see the frequencies your navigation radios are tuned to and where the aircraft is positioned in reference to these radio facilities. See below for different ND modes.

These are only a few of the different ND modes available, but give you a descent picture of what's available. To the left is ARC, center is PLAN, and right is ARC with WPT selected to display waypoints in your selected range of view.

EFIS Control Panel: This is where you will make selections for the various ND display views using the selector knobs for system and range as well as the various push buttons:

**CSTR:** Shows flight plan constraints on the ND when in ARC mode

**WPT:** Shows waypoints visible within your selected range

**VORD:** Shows VOR stations within range

**NDB:** Shows NDBs within range

**ARPT:** Shows airports within range

Note: Be advised that using the WPT and ARPT buttons with a large range selected will quickly clutter your display and make it very difficult to prioritize. These are best used with the range set to 10 NM (20 NM max).

## *ELECTRONIC CENTRALIZED AIRCRAFT MONITORING (ECAM) SYSTEM:*

### UPPER ECAM DISPLAY (ENGINE DISPLAY)

The center DU on the main instrument panel is part of the ECAM system that consists of an upper display for engine parameters, and a lower display (partially visible on the 2D panel) for system synoptic diagrams and indications. Our focus here is the upper display. This DU presents engine data in the top left quarter of the display indicating from top to bottom: N1 dial, EGT dial, N2, and Fuel Flow (FF). The top right quarter of the display shows flap position indications by diagram and digital readout. The lower left quarter shows takeoff and landing checklists and presents you with other information during flight, such as reminders for landing lights and No Smoking and Seatbelt signs. The lower right quarter shows auto brake settings.

## STANDBY GAUGES

There are a few standby gauges that are essential to flight in the event of a malfunction that renders the Display Units unusable. From top to bottom they are:

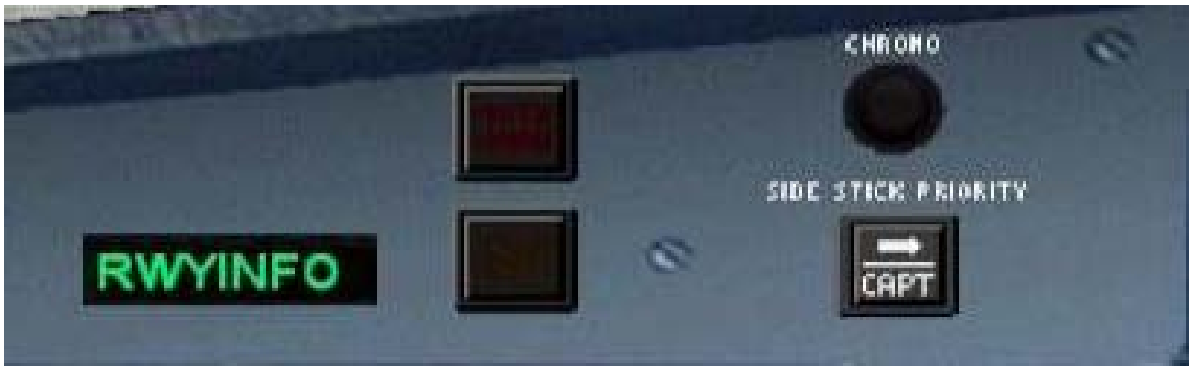
1. Air Speed (top left)
2. Altimeter with barometric calibration (top right)
3. Attitude Direction Indicator (ADI)
4. Clock (bottom left)
5. Horizontal Situation Indicator (HIS) (bottom right)

## *GLARE SHIELD PANEL*

Moving up we come to the glare shield. Again working from left to right we will review the various controls. (Some of them were briefly covered in the proceeding sections.)

## **MASTER CAUTION AND WARNING**

On the left side of the FCU there are two dark buttons, one on the top of the other. These are the Master Warning and Master Caution buttons. Warning is on the top and flashes red, Caution on the bottom and flashes amber. By




pressing them, the lights are extinguished and the audible tone is silenced.

## EFIS CONTROL PANEL

Situated between the autopilot and the master caution/warning panels, the EFIS control panel is the central interface for manipulating the different views on the Navigation Display (covered earlier) and managing the barometric altimeter. The altimeter can be calibrated using inches of mercury (inHg), and hectopascals (hPa). Hectopascal units are the same as QNH readings. Altimeter settings in certain countries outside the United States are reported in hPa, especially France. You can turn the control know to the left or right to change the setting. Above transition altitude when you return the altimeter to standard, 29.92 inches (1010 hPa), pull the knob. For our A330, this is accomplished with a left mouse click. The digital readout will display STD. To return to the changeable setting, simply click the push/pull button again and the window will display the last selected setting.

Below the altimeter controls are two buttons labeled FD and ILS.

**FD:** Engages/disengages the Flight Director

**LS:** Engages/disengages the ILS vertical and lateral deviation dots on the PFD

## FLIGHT CONTROL UNIT (FCU)

If you are a seasoned Boeing pilot, you referred to this as the Mode Control Panel, or MCP. In the Airbus world, however, we call it the Flight Control Unit, or FCU. However, you want to call it, the functions are similar to what you worked with in the Boeing airplanes. The control approach is a bit different. Airbus adopted a push/pull methodology for managing just about all of the controls in the flight deck. The knobs you see on the FCU are all turn/push/pull. In the Delta Virtual Airlines' A330, we simulate a push/pull simply by left clicking on the knob.

There are two modes of automatic flight in the Airbus series: Selected and Managed.

Selected: The pilot is telling the autopilot what you want it to do. For example, with the auto thrust system engaged, you may dial, or select, a particular speed you wish to fly. The same holds true for heading, and to an extent, the altitude.

Managed: In this mode, the autopilot is receiving its commands directly from the Flight Management Guidance Computer (FMGC) based on the data active in the MCDU.

To better understand the push/pull action, you push the knob to give control to the FMGC, which commands the autopilot. You pull the knob to take control from the FMGC. When you are in managed mode, a white dot will appear next to the numerical readout of the speed, heading, and altitude. You can fly the A330 in any mix of modes as well. For example, with the autopilot engaged, you can fly with speed in select mode with the heading and altitude in managed mode, or any combination thereof.

The black button just below the speed window labeled SPD/MACH will change the speed-reading between knots and Mach. The black button labeled

HDG/TRK/VS/FPA located between the two autopilot buttons does several things, but only one is modeled here for our purposes:

Changes the heading readout to display course setting for radio navigation.

{Real world}: This button also changes our display from vertical speed to flight path angle. On the PFD your would notice a little circle denoting the actual flight path angle of the aircraft. This is not simulated in our A330.

Altitude may be set in hundreds or thousands of feet. In the actual aircraft we would be able to use the black button below the altitude window to change between metric altitude when necessary but this is inoperative in our airplane. Clicking above the altitude selector knob will allow you to cycle between 100 and 1,000 feet. Click left or right of the knob to increase or decrease your new altitude.

In the center of the panel are three buttons:

AP1 / AP2: Engages or disengages #1 or #2 autopilot.

A/THR: Engages or disengages auto thrust

These buttons illuminate when they are activated. The lights extinguish when the system is disengaged.

This is the end of our familiarization briefing. Please be sure to review the complete panel documentation as the overhead and pedestal panels are also available, but are beyond the scope of this tutorial. Having familiarized ourselves with the flight deck layout and some of the more important panels and functions, we're now ready to begin our first flight!

# Flying the aircraft – Tutorial

The purpose of this tutorial is to familiarize the pilot with the operation of the Delta Virtual Airlines fleet A330. The starting point will be in a 'cold and dark' cockpit parked at the gate. We will also assume fuel planning and loading is complete – see the Fuel Planning section of this manual for detailed fuel planning and loading guidance. Because the A330 is a Stage 4 aircraft, we will assume the pilot possesses some knowledge of basic procedures including communicating with ATC and determining taxi routes or runways to use.

Let's get started. Load your flight simulator with the fleet A330. Make sure appropriate payload and fuel loading is complete using the Flight Simulator fuel and payload menus. At this point you should be in the aircraft at the Captain's "Main" panel. Before applying power to the aircraft certain safety checks must be completed.

Main Panel

1. Flight Director (F/D) ..... ON
2. A/T and AP ..... OFF

Landing Gear Panel

1. Gear Handle ..... DOWN

Throttle Quadrant

1. Parking Brake ..... SET
2. Engine Switches 1 & 2 ..... OFF (Down)
3. Engine Ignition Selector ..... NORM
4. Speed Brakes ..... RET
5. Flaps ..... 0 (Up)
6. Throttles ..... IDLE DETENT

Overhead

Nav & Logo lights ..... ON

Overhead

1. Battery ..... ON (no light)
2. APU Start Button ..... ON
3. APU Generator Access Bus ..... ON (no light)
4. ADIRS system ..... ON
5. FLT CTL buttons ..... ON (no light)
6. Generators 1 & 2 ..... ON (no light)
7. Fire agent buttons (1, 2, & APU) ..... No lights
8. Air Cross Bleed Selector ..... AUTO
9. Cabin Signs ..... On & On
10. Electric Hyd pump ..... AUTO (no light)
11. Fuel cross feed ..... OFF (no light)
12. Wing and engine anti-ice ..... OFF (no light)
13. Probe Heat ..... AUTO (no light)

If you are flying online, obtain your necessary ATC Clearance.

Now that we have our clearance and should know the departure runway, it is time to program the desired route into the aircraft's navigation system. The fleet A330 uses Flight Simulator's default GPS as its main navigation system. This may be programmed using the Flight Planner within Flight Simulator when using multiple waypoints or via the GPS panel view for a more direct route. At this level of your virtual career, you should be familiar with the basics of proper departure and approach procedures, functionality that is available by using Flight Simulator's Flight Planner.

After the GPS is configured, we should complete the flight deck preparations based on the clearance information provided by ATC.

Main Panel

1. NAV/GPS selector ..... NAV
2. Barometric Pressure ..... SET
3. Speed ..... SET
4. HDG ..... Set
5. Initial Altitude ..... SET
6. V/S ..... SET

It's finally time to push back. Ensure the APU is running by pressing the APU selector button.

The aircraft is now ready for pushback and engine start. If flying online with ATC, obtain push pack and engine start clearance first. Immediately prior to start and push, activate the beacon via the overhead panel, release the parking brake, and push back using the method you prefer.

When the push back is complete, set the parking brake. Once stopped and the brake is set, it is time to start engines. The A330 relies heavily on its automated systems and engine start is no different. First select the ENG selector on the main panel to call up the engine display. Then, on the throttle quadrant, move the engine #2 selector to the up or ON position. Monitor the engine data via the selected display.

Once engine #2 has stabilized, it's time to repeat the start sequence for engine #1. Again, monitor the engine data during start-up.

Now that the engines are started, we can shut off the APU. Select the APU button to bring up the APU display. On the overhead panel, select OFF on the APU GEN button and press the APU Start button to shut-off the APU. Monitor the APU status on the APU display.

Set the flaps for takeoff via the throttle pedestal panel (normally Flaps 1) and activate the anti-skid and nose wheel steering on the landing gear panel.

If flying with ATC, obtain your taxi clearance. Once approved, turn on the taxi light via the overhead panel and advance the throttles slowly to begin forward motion. As you taxi to the departure runway, remember straight ahead taxi speeds should not exceed 30 knots ground speed and turning speeds should not exceed 12 knots ground speed.

Once at the runway obtain your takeoff clearance if flying with ATC guidance.

Once cleared for takeoff, complete these remaining tasks.

Overhead

1. Strobe ..... ON
2. Landing Lights ..... ON

Now taxi onto the runway and line up on the centerline. Once aligned, activate the auto throttle and click the TO/GA button on the throttle pedestal. Maintain runway alignment and monitor engine performance during takeoff roll. Monitor your speed and at Vr apply backpressure and smoothly rotate to an approximate 10-degree nose up attitude. Rotation rate should be about 3 degrees per second. Maintain this attitude until liftoff and a positive rate of climb is achieved. Watch your airspeed and ensure you stay below 250 knots. Once a positive rate of climb is established and the altitude has increased beyond 35' AGL, retract the gear. You may also turn off the taxi light.

Once safely airborne, click the A/P button and engage the heading, speed, and altitude modes by pressing the specific knobs. Ensure that the airspeed continues to increase towards your selected airspeed and do not exceed the 250 knots speed restriction. Retract the flaps to 0 when passing 220 knots.

As your speed stabilizes at the target speed, you can increase the rate of climb. Don't be too aggressive or your speed will decay. Continue your climb out complying with any departure restrictions. Passing 10,000 feet set the target speed to 290 knots, unless your departure procedure dictates otherwise, and turn off the landing lights.

Once you are given clearance to proceed as filed, press the GPS button on the main panel and select LOC. The aircraft will begin to turn towards your first programmed waypoint. Although the GPS is now guiding the aircraft, be sure to monitor each waypoint segment to ensure proper navigation.

Once passing 18,000 feet, select 29.92 for your barometric pressure and select your cruise speed. If you will be cruising above FL230, make sure to toggle the SPD/MACH selector button to change the speed values to MACH. As you climb towards your cruising altitude, you may reduce your vertical speed incrementally to ensure a smooth transition to level flight and maintain your airspeed.

When approximately 200 miles from your destination obtain the current weather and determine the landing runway. Yes, you selected a landing runway during preflight but weather does change especially during longer flights.

Once cleared, you may begin your descent. Manage your descent by selecting the desired altitude and vertical speed. Make sure you will be below 250 knots prior to descending through 10,000 feet. It is also company policy to turn on the landing lights when below 10,000 feet.

We will assume you are flying an ILS approach. Tune in the ILS Frequency in preparation for landing. Select the NAV button on the main panel to activate the navigation radios. Toggle the ILS button to display the localizer and glide slope indicator on the PFD. Continue your arrival towards the Initial Approach Fix (IAF). Plan to reach that point at the charted altitude and 190 KIAS. A good rule of thumb is to deploy FLAPS 1 when slowing thru 220 KIAS. Depart the Initial Approach Fix by following the approach plate information. When you are receiving the localizer and glide slope, you can select APR button on the main panel. Continue flap deployment to Flaps 3 in stabilized segments.

Maintain 180 KIAS until glide slope intercept occurs or you reach a point 10 NM from the runway. At this point, reduce your target speed to 160 KIAS deploying flaps to FULL. Lower the landing gear and turn on the taxi light.

Maintain a stable approach and disengage the autopilot and auto throttle as conditions dictate. When approximately 50 feet off the runway, pull the throttles all the way back to idle. When about 30 feet off the runway, increase pitch about 3 degrees to flare the aircraft. Hold this attitude until touchdown. On touchdown, deploy the spoilers (/) and manually apply reverse thrust by pressing and holding the F2 key. Maintain runway alignment and slow the aircraft. When slowing through 80 KIAS, stow the reverse thrust be pressing the F1 key. Slow to taxi speed and turn off the runway.

Once off the runway

<u>Overhead</u>

1. Strobes ..... OFF
2. Landing Lights ..... OFF
3. APU ..... START

Throttle Pedestal

1. Spoilers ..... RETRACTED
2. Flaps ..... 0

If ATC is present, obtain you taxi clearance and taxi to the gate using the same procedures you did on the way out. Once at the gate:

Throttle Pedestal

1. Parking Brakes ..... SET
2. Engine switches ..... OFF

Overhead

1. Taxi light ..... OFF
2. Beacon ..... OFF
3. Seat belt signs ..... OFF

Congratulations! You have just completed your first of many flights in the A330.

# Fuel Planning and Weight and Balance

Fuel Planning is covered in the Flight Encyclopedia, 5th Edition.

| Altitude | Indicated Airspeed | True Airspeed | Fuel Burn (per Engine) |
|---|---|---|---|
| Ground Operations | N/A | N/A | 800 PPH |
| 12,000' | 280 KIAS | 325 KTAS | 4850 PPH |
| FL180 | 290 KIAS | 371 KTAS | 5070 PPH |
| FL240 | 290 KIAS | 404 KTAS | 5300 PPH |
| FL300 | 310 KIAS | 469 KTAS | 5900 PPH |
| FL360 | 285 KIAS | 480 KTAS | 7420 PPH |
| | | | |

## *FUEL PLANNING*

Delta Virtual Airlines A330 variants have five or six fuel tanks as outlined in the table below.

(Amount, pounds)

| Model/Tank | Center | Left main | Right main | Left aux | Right aux | Cent aux |
|---|---|---|---|---|---|---|
| A330-200 | 74,026 | 74,676 | 74,676 | 6,525 | 6,525 | 10,832 |
| A330-300 | 10,832 | 74,676 | 74,676 | 6,525 | 6,525 | |

It is extremely important to note the Delta Virtual Airlines Airbus A330's are configured by default for a full payload, and therefore **cannot be flown with a full fuel load without reducing passenger or cargo levels.** Operation of the aircraft in such a configuration will exceed Maximum Takeoff Weight, and passenger (and crew!) safety cannot be assured.

To load fuel into your aircraft, select *Aircraft,* then *Fuel* and place in the correct fuel amounts in the correct tanks.

Captains ordering fuel for Delta Virtual Airlines flights should remember that more fuel equates into more drag, requiring more power. An unnecessary overabundance of fuel will only cost the company money. Fuel should be kept as close to the trip fuel required as possible. With that said, *it is always the pilot's responsibility to ensure that there is enough legal fuel for the flight.* Any incident that was the result of miscalculating the fuel load will always be the fault and sole responsibility of that flights captain and crew. When in doubt, take more!

Any trip calculations that you see in this manual are for calm winds and standard outside temperatures. Deviation from the standard winds or temperatures will result in different actual performance for your aircraft.

When loading fuel into the Airbus A330 then left and right aux tanks should be loaded first, then the main right and left tanks, followed by the center aux and then the main center tank.

When flying over long bodies of water, remember that in the event of pressurization problems or an engine failure that requires a descent to 14,000ft MSL for passenger comfort, the fuel burn for the aircraft will increase significantly and may leave you short of your initial destination. Plan accordingly!

## *Typical Fuel Plan*

Route: KATL to KSLC (1408 miles) Alternate KLAS (319 miles)

Aircraft: A330-300 series

Taxi fuel: 3,400lbs

Total Trip Fuel: 39,090lbs

Alternate fuel: 10,320lbs

Minimum Landing fuel: 4,190lbs

Captain's Reserve: 500lbs

Total fuel: 64,110lbs

Fuel distribution:

Left aux tank----6,525lbs

Right aux tank 6,525lbs

Left main tank—25,530lbs

Right main tank 25,530lbs

Center main tank 0 lbs

# Checklist

## *At Gate Parked-Before Engine Start*

| | |
|---|---|
| o All Charts/Flight Plan | **On Board** |
| o Weight/Balance | **Verify** Configuration |
| o ACARS *(Optional)* | Connect-Flight Start (Optional) |
| o Battery Switch | **ON** |
| Gear Lever | **VERIFY** 3 Green Down/Locked |
| Clock/Stopwatch | **VERIFY** SET |
| o Parking Brake | **ON** |
| o Alternate Flaps & Gear Selector | **SET** |
| o NAV lights | **ON** |
| o Fuel Pumps (ALL) | **OFF** |
| o Wing Anti Ice | **OFF** |
| o YAW DAMPER | **ON** |
| o Cabin Altitude Auto Selector | **NORM** |
| o NAV Radios | **SET IDENT** |
| o ADF | **SET IDENT** (if required) |
| o Transponder Standby | **SET** Code/**VERIFY** Squawk |
| o Auto Brakes | **RTO** |
| o Speed Brake Lever | **DOWN** |
| o FLAPS | Lever and Indicator **AGREE** |
| o Passenger Signs | **SET** |

**ATC CLEARANCE** - Call for IFR/VFR Departure-Push/Start Request

| | |
|---|---|
| o Avionics Master | **OFF** |
| o Crew Takeoff Briefing | **Completed** |
| o BEACON Lights | **ON** |

**-BEFORE ENGINE START CHECKLIST COMPLETED**

## *Engine Start*

**ATC Clearance:** Obtain pushback and engine start clearance

**Execute Pushback using method/tool of your choice**

**When pushback complete:**

| | |
|---|---|
| o Parking Brakes | **Verify** ON |
| o Simulator time at start | **Document** |
| o Fuel Pumps (All Tanks with Fuel loaded) | **ON** Press Lights out |
| o Throttle Power Levers | **IDLE** |

**Normal Engine Start Sequence is RIGHT/LEFT**
**Engines may be started two at a time**

| | |
|---|---|
| o Engine Start Switch RIGHT | **PRESS AND HOLD** |
| o N1 | **Monitor** Start |
| o Engine indications Stable | Engine Start Lights out |
| o Engine Start Switch LEFT | **PULL** Lights illuminate |
| o N1 | **Monitor** Start |
| o Engine indications Stable | Engine Start Lights out |

**ENGINE START CHECKLIST COMPLETED**

## *AFTER ENGINE START*

| | |
|---|---|
| o Parking brakes | **Verify** ON |
| | Switch OFF then ON |
| o Anti-Ice / All | **ON** as required |
| o APU | **OFF** |
| GEN CONT switches (ALL) status, | Verify **ON** If Gen is in a Fault |
| | Cycle switch OFF then ON |
| o Flap Selector Set Takeoff Flaps | **SET** |
| o MCP Heading | **SET** (Runway Heading or DP) |
| o MCP IAS | **SET V2+20 (SPD)** |
| o Altitude | **SET (ALT)** |
| o F/D | **ON** |
| o A/T | **ARMED** |
| o Autopilot DISENGAGE | **VERIFY OFF** |
| o Flight Controls (outside) | **Demonstrate** Free and Clear |

**AFTER ENGINE START CHECKLIST COMPLETED**

## *TAXI*

**ATC TAXI CLEARANCE** – Request Taxi to Active Runway

| | |
|---|---|
| o Throttle Power Levers | **IDLE** |
| o Parking Brakes | **Release** |
| o Toe Brakes | **Verify** OPS |
| o Taxi Power | 45% N1 until rolling – adjust for Speed (Max 30 Straight, 10 Turn) |
| o Instrument Check-Taxi | **Verify** Compass/PFD/ND move |
| o Cabin Announcements | **Perform** during Taxi |

## *BEFORE TAKEOFF/HOLD SHORT LINE*

| | |
|---|---|
| o Parking Brakes | **ON** |
| o Flight Director | **Verify** ON |
| o MCP Heading | **VERIFY** Departure Heading |
| o V/S | **CHECK CLIMB RATE** |
| o Landing Lights | **ON** |
| o Taxi Lights | **OFF** |
| o Strobe Lights | **ON** |
| o Takeoff time & Fuel Amount | **DOCUMENT** |
| o Flap Selector & Trim | **VERIFY** Settings |
| o COM's, NAV's & ADF | **VERIFY** Settings |
| o Transponder | **TA/RA** |

**ATC Takeoff CLEARANCE** – Request for Takeoff
**BEFORE TAKEOFF CHECKLIST COMPLETED**

## *TAKEOFF CLEARED OR TAXI INTO POSITION AND HOLD*

| | |
|---|---|
| o Runway | **VERIFY** Clear |
| o Toe Brakes | **ON** |
| o Auto Brakes | **Verify** RTO |
| o Taxi Onto Runway | **ALIGN** |
| o Throttle Power Levers | **Advance** 50% N1 |
| o Engine Instruments | **VERIFY** stabilized |
| o Toe Brakes | **Release** |
| o Throttle Power Levers | **Advance** full power |
| o MCP TO/GA | **SELECT** |

| | |
|---|---|
| o Vr | **Rotate** to 8 degree pitch up |
| o Landing Gear | **UP** at V2 Positive Rate & 150' AGL |
| o Climb Profile | 2,000-2,500 FPM at 250 KIAS |
| Flap Selector | **Retract on schedule** |
| ▪ Auto Brakes | **OFF** |
| ▪ CMD | **SELECT** (any) |

**TAKEOFF CHECKLIST COMPLETED**

## *CLIMB TO ALTITUDE*

| | |
|---|---|
| o Engine Instruments | **MONITOR** |
| o Landing Gear (after flaps up) | **OFF** |
| o Landing Lights (10,000 ft) | **OFF** |
| o Crossing transition altitude (18,000 ft MSL in USA, other countries vary) | **Reset** Altimeter to 29.92 in. |

## *ENROUTE*

| | |
|---|---|
| o Flight progress, fuel flow and engine operations | **MONITOR** |
| o Cruise Speed | **Mach .80** @ FL300 and above |
| o Crew Approach Briefing | **Completed** |

**ENROUTE CHECKLIST COMPLETED**

## *DESCENT*

**ATC Descent CLEARANCE or TOD** (Top of Descent) - Descend

| | |
|---|---|
| o Weather | **OBTAIN** |
| o Arrival and Landing Information | **VERIFY** |
| o MCP Altitude | **RESET** within 40 NM TOD |
| o Anti Ice | **ON** as needed |
| o Landing Airport altimeter (below transition altitude) | **SET** |
| o Airspeed 280 KIAS till 10,000 ft MSL | **VERIFY 2,500 FPM descent** |
| o Airspeed 250 KIAS below 10,000 ft MSL | **VERIFY 1,500 FPM descent** |

- Flight Spoilers **AS NEEDED**
- Landing Lights (crossing 10,000 ft MSL) **ON**

## *APPROACH*

**ATC Approach CLEARANCE** - Approach

- COMM Frequencies **SET**
- Navigation Radios **SET** Freq/**IDENT**
- Flap Selector **SET** per schedule
- MCP SPEED **SET** per speed chart
- DH/MDA **SET**
- Auto Spoilers **ARMED**
- Auto Brakes **SET**
- APP Mode (IF ILS approach) **ARM**

## *FINAL APPROACH*

- MCP SPEED **Set**
- Flap Selector (select 3 or 4) **SET**
- Landing Gear **DOWN**
- Stabilized Approach **Established**

**APPROACH CHECKLIST COMPLETED**

**ATC Landing CLEARANCE** – to Land

- Cross Threshold **ON SPEED**
- Throttle Power Levers **50' GND IDLE**
- FLARE (increase pitch 3 degrees) **30' AGL**
- SPOILERS after touchdown) **VERIFY Extended**
- Engine Reverse **Reverse** > 80 KIAS (F2 Key)
- Toe Brakes (If no auto brake) **APPLY**
- Exit high-speed taxiways at <30 knots, or 8-12 knots at any other runway turn off

**LANDING CHECKLIST COMPLETED**

## *AFTER LANDING*

**ATC Taxi CLEARANCE** – to gate

- Transponder/TCAS **STANDBY**
- Landing Lights **OFF**
- Strobe Lights **OFF**
- Taxi Lights **ON**
- Flap Selector **UP**
- Spoilers **VERFIY Retract**
- APU GEN **ON**

**AFTER LANDING CHECKLIST COMPLETE**

## *GATE SHUTDOWN*

- Parking Brakes **ON**
- Taxi Lights **OFF**
- Anti Ice **OFF**

**Record** the fuel in tanks and compare to fuel plan

- SEAT BELT Signs **OFF**
- Doors **OPEN**
- Fuel Pumps (all) **OFF**
- Beacon **OFF**
- F/D **OFF**
- A/T **OFF**
- Navigation/Panel Lights **OFF**
- Gen – ALL **OFF**
- Battery **OFF**
- Simulator Time at Shutdown Document
  (if you are flying online, note the real world time)
- ACARS Shutdown (optional) End Flight, File PIREP
- Exit Flight Simulator

## *CREW TAKE-OFF BRIEFING*

Captain to Co-pilot

We will be taking off on RWY (active runway), climbing to (altitude). If we encounter an engine malfunction, fire or other emergency before **$V_1$** (critical engine failure recognition speed) KIAS, the flying pilot will retard the throttles to flight idle and bring the aircraft to a complete stop on the runway. The non flying pilot will notify the proper ATC of our intentions and assist the flying pilot as requested or needed to operate the aircraft in a safe manner.

If the aircraft has reached **Vr** (rotate speed) KIAS, the flying pilot will fly the aircraft per company procedures and the non flying pilot will notify the appropriate ATC of our intentions and assist the flying pilot as requested or needed to operate the aircraft in a safe manner and land the aircraft as soon as possible.

Aircraft Weight is: _____ Taxi Instructions to Active: _____

V Speeds for this flight are (calculated) See prepared Flip Chart(s)

Flap Settings: Takeoff _____ Engine Failure Approach _____

Discuss the Departure Procedures for this flight (Ref Charts, SIDs)

Discuss Weather considerations (Ref ATIS, METAR, TF)

## *CREW APPROACH/LANDING BRIEFING*

Captain to Co-pilot

Weather conditions are (obtain from ATIS, METAR and TAF).

Landing on RWY (active runway) at (airport) using the (**???**) approach (Ref STAR)

Descend at (**???**). Our Final Approach altitude will be (**???**)

**V** Speeds for this approach are (calculated) (See prepared Flip Chart(s))

Missed approach Procedures are (Ref Approach Plates)

Taxiway Turnoff _____ Taxi Route from Active _____

Parking at Gate (???)

## *CREW ANOUNCEMENTS*

- Departure
  - "Ladies and gentlemen, on behalf of the flight crew, this is your (captain or first officer) (insert name), welcoming you aboard Delta Virtual Connection flight number (flight) with service to (destination). Or flight time today will be approximately (time en route) to (destination). At this time, I'd like to direct your attention to your to the monitors in the aisles for an important safety announcement. Once again, thank you for flying Delta Virtual Connection."

- Climbing above 10,000 feet MSL
  - Inform cabin crew that use of approved electronic devices is authorized.

- At Cruise Altitude
  - "Ladies and gentlemen, this is the (Captain or First Officer) speaking. We've reached our cruising altitude of (altitude). We should be approximately (time) enroute and expect to have you at the gate on time. I've turned off the fasten seatbelt sign, however, we ask that while in your seat you keep your seatbelt loosely fastened as turbulence is often unpredicted. Please let us know if there is anything we can do to make your flight more comfortable, so sit back and enjoy your flight."
- Approach
  - Inform cabin crew of approach and to discontinue use of electronic devices.

- Landing
  - "On behalf of Delta Virtual Airlines and your entire flight crew we'd like to welcome you to (destination) where the local time is (time). We hope you've enjoyed your flight with us today and hope that the next time your plans call for air travel, you'll fly Delta Virtual Airlines again.

# Appendix – Operating Information

## *TAKEOFF AND LANDING CARD*

| AIRBUS A330-200 | | | | | |
|---|---|---|---|---|---|
| *441,405 LBS* | | | | | |
| Takeoff | | | | | |
| Flaps 1+f | | Flaps 2 | | | |
| $V_1$ | 142 | $V_1$ | 138 | | |
| $V_r$ | 148 | $V_r$ | 144 | | |
| $V_2$ | 150 | $V_2$ | 148 | | |
| Landing | | | | | |
| Flaps | 1 | 1+f | 2 | 3 | full |
| Maneuvering | 220 | 210 | 190 | 175 | 165 |
| $V_{ref}$ | 179 | 170 | 167 | 161 | 148 |
| $V_{app}$ | 184 | 175 | 172 | 166 | 153 |

In this example, 441,405 lbs is the gross weight of the airplane – there are 2 flap settings for takeoff. .

Ground Operations

Taxi – straight ahead between 15 and 25 knots ground speed

Taxi – turning 12 knots ground speed

## DVA AIRBUS A330 CAT III AIRCRAFT

| | | | |
|---|---|---|---|
| Standard Flight Setup Empty Weight | 265,700 lbs | Fuel | 31,040 lbs |
| Payload | 75,326 lbs | Left Aux | 6525 lbs |
| First Class | 2100 lbs | Left Main | 8995 lbs |
| Business Class | 3500 lbs | Right Aux | 6525 lbs |
| Economy Class | 34,500 lbs | Right Main | 8995lbs |
| Forward Galley | 1000 lbs | | |
| Center Galley | 2000lbs | Forward Cargo | 12,000lbs |
| Aft Galley | 1726lbs | Aft Cargo | 18,500 |

| Flap Position | Maximum Speed |
|---|---|
| 1 (1 DEGREE) | 235 KIAS |
| 1+F(8 DEGREE) | 215 KIAS |
| 2 (14 DEGREE) | 196 KIAS |
| 3 (22 DEGREE) | 186 KIAS |

## CLIMB PROFILE

| Speed | Altitude |
|---|---|
| $\mathbf{V}_2$ + 10 KIAS | 1,000 ft AFE |
| 200 KIAS | 2,500 ft AFE |
| 250 KIAS | 10,000 ft |
| 290 KIAS | Cruise Alt |
| .82 mach | Level Cruise |

## *STANDARD RATE CLIMB*

| FPM | Altitude |
|---|---|
| 3000 | Below 10,000 feet |
| 2000 | 10,000 toFL200 |
| 1500 | FL 200 to FL260 |
| 800 | Above FL260 |

## *DESCENT RATE*

| Target Speed | Descent Rate | With Flight Spoilers |
|---|---|---|
| 310 KIAS | 2300 fpm | 5500 fpm |
| 250 KIAS | 1400 fpm | 3600 fpm |
| **V**ref 30 + 80 KIAS | 1100 fpm | 2200 fpm |

## *APPROACH/LANDING SPEEDS*

| Speed | Altitude | Distance from Airport |
|---|---|---|
| 210 KIAS | Below 10,000 feet | 30 nm |
| 180-190 KIAS | | 24 nm |
| 170 KIAS | | 15 nm |
| **V**ref + 5 | Varies | Final Approach Fix |
| **V**ref + 5 @ 32 Flaps | Landing | Runway Threshold |

# Acknowledgements and Legal Stuff

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Mark Springsteen and Matthew Gervais created this manual in February 2010.

Flight Sim screenshots courtesy Mark Springsteen and Matthew Gervais

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