DELTA VIRTUAL AIRLINES

Airbus A320
Aircraft Operations Manual

First Edition
August 31, 2009

Table of Contents

Welcome

Welcome to the Delta Virtual Airlines' Airbus A320 Aircraft Operating Manual (AOM).

The AOM is based upon the DVA Fleet Installer. We are always seeking to improve the accuracy of the AOM. Should you have questions about the specifics of this airplane or this manual, you should create a help desk issue at our website, www.deltava.org

Should you have questions about aviation in general, creating a help desk issue is the best course of action to take. The training department and the flight academy personnel, who will do their best to answer your questions, will address these.

If you are new to flying and would like to learn training that is modeled after real world training, you can sign up for flight instruction in the DVA Flight Academy.

History and Overview

Despite the conventional wisdom holding Boeing and Airbus airliners as very different, a close examination of the Airbus A320 family will lead one to believe that these often-cited differences are merely skin deep. The development of the A320 and its siblings in the 1980's and 1990's is in many ways a repetition of the developments and features that led Boeing to jetliner dominance two decades earlier.

After seeing the success of its early A300 and A310 wide-bodied airliners, Airbus Industries decided to target the 115-185 passenger market dominated by Boeing's 727 and to compete with the B737 family and B757-200. The A320 program was launched in March 1984 with JAA certification for the A320-100 awarded in early 1988 with certification for the definitive A320–200 variant following in November of that year. FAA approval for both models was awarded in December of 1988.

What set the A320 apart from its predecessors and made it a revolutionary aircraft were its extensive use of composite materials and full "fly-by wire" flight controls. While both were used before in commercial jetliners (composites in the A310 and "fly-by wire" in the Concorde), the A320 took both to new levels in the quest to develop the "ultimate profit maker," as Airbus called its new aircraft.

Even for pilots accustomed to newer glass cockpits, entering the A320 flight deck for the first time is an experience. There is no yoke – only a small joystick on the side (the "side stick") and instead of conventional instruments, the pilots have a variety of CRT and LCD screens that can convey a vast multitude of aircraft information.

The "fly-by wire" system translates all pilot control inputs into electronic signals that are passed to the flight controls using four redundant systems. Because there is no direct linkage between the cockpit controls and the control surfaces, computers can monitor the flight and prevent potentially hazardous situations such as stalls, excessive bank and dangerous over-speeds

from occurring, as well as flying the aircraft in autopilot mode in a far more efficient and precise manner than any human pilot.

As mentioned above, Airbus took a page out of Boeing's book and emulated the American manufacturer in two critical ways. First, they created a number of A320 variants (the 319, 321 and now the "Baby Bus" 318) in different sizes to meet different route densities, just like Boeing has done with the different 737 variants.

Second, Airbus took the pioneering Boeing practice of aircraft commonality and took it to new levels. Decades ago, Boeing took many of the fuselage parts of the 707 (most visibly, the nose) and used them on their 727 and 737 airliners – greatly simplifying manufacturing and maintenance. Airbus did the same thing, with a large variety of parts and especially the flight deck, which is shared between all modern Airbus aircraft from the A318 all the way to the giant A340-600. This has resulted in a dramatic reduction in training costs, from reduced simulator counts to shorter type conversion times for flight crews. In early 1994, the FAA approved a common type rating on the A320 and A321 without further training, meaning that a pilot qualified to operate the A320 was fully qualified to operate the A321 without any additional training.

Today, the A320 remains at the top of the list as Airbus' best-selling aircraft with 6,313 ordered and 3,754 delivered as of January 31st, 2009.

Powerplants

All aircraft in the A320 family can be equipped with either the CFM56 or the IAE V2500. It is interesting to note that both engines are the product of collaboration between famous names in the jet engine industry – CFM is owned by France's SNECMA and General Electric, while IAE is a joint venture between Pratt & Whitney, MTU, Rolls Royce and Japanese Aero Engines.

SNECMA CFM56

The Airbus A320 and Boeing 737 families are rivals in the commercial aviation market. Where they meet, however, is in the choice of engine. Both aircraft use variants of the SNECMA CFM56 turbofan engine.

First developed as a JT3D replacement for the United States Air Force's KC-135 and E-3 variants of the Boeing 707 airframe, over 2,400 CFM56 engines are mounted in the A319, A320 and A321, with another 7,000 installed in Boeing 737 airliners. Over 500 examples of the CFM56-2C were used to re-engine DC-8 "Sixty Series" models as part of the "Seventy Series" conversion, and the CFM56-5C is used in the four-engine A340. SNECMA estimates that an aircraft powered with CFM56 engines takes off somewhere in the world every five seconds!

The CFM56-5A and -5B variants are used in the A320 family, producing between 22,000 and 33,000 lbs of thrust combined.

IAE V2500

The V2500 engine (and IAE itself) is the result of major jet turbine manufacturers collaborating to develop a smaller turbofan engine in the 22,000 to 33,000 pound market segment. The V2500 is a slightly more advanced (and complicated) engine than the CFM56, providing improved fuel economy at the cost of slightly more involved maintenance and increased engine weight. The V2500 is also the engine of choice for the McDonnell-Douglas MD-90 series of airliners.

Although Delta/Northwest Airlines does not use the V2500, the engine has been a significant commercial success since its introduction in 1989 on Airbus aircraft by Indian Airlines. Today, three-quarters of all single-aisle Airbus aircraft are delivered with the V2500 as original equipment.

Aircraft Specifications

The chart below provides specifications for the entire family.

	A318	A319	A320-200	A321
WINGSPAN	111 FT 11 IN			
WING AREA	1,320 FT^2			
OVERALL LENGTH	103 FT 2 IN	111 FT	123 FT 3 IN	146 FT
CABIN LENGTH	70 FT 2 IN	78 FT	90 FT 3 IN	113 FT
HEIGHT	41 FT 2 IN	38 FT 7 IN		
CABIN WIDTH	12 FT 1 IN			
EMPTY WEIGHT	84,600 LBS	88,400 LBS	90,400 LBS	105,600 LBS
MAXIMUM TAKEOFF WEIGHT	130,100 LBS	141,100 LBS	162,000 LBS	183,000 LBS
MAXIMUM LANDING WEIGHT	123,500 LBS	134,500 LBS	142,200 LBS	162,000 LBS
MAXIMUM ZERO FUEL WEIGHT	116,800 LBS	125,700 LBS	134,500 LBS	153,200 LBS
FUEL CAPACITY	42,210 LBS			41,942 LBS
RANGE	3,250 NM 6,000 KM	3,700 NM 6,800 KM	3,000 NM 5,700 KM	3,000 NM 5,600 KM
TYPICAL SEATING	107	124	150	185

Cockpit Checkout

The fleet A320 features a different panel depending on what version of flight simulator you are using.

FS9 MAIN (CAPTAIN'S) PANEL

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 but their operation will be covered later in this manual.

Electronic Flight Instrument System (EFIS) control panel. This panel is used to control the data displayed on the Navigation Display (ND).

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.

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).

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, & PLAN. This display is controlled via the EFIS control panel.

Standby Instruments. These instruments serve as backups for the instruments displayed on the PFD.

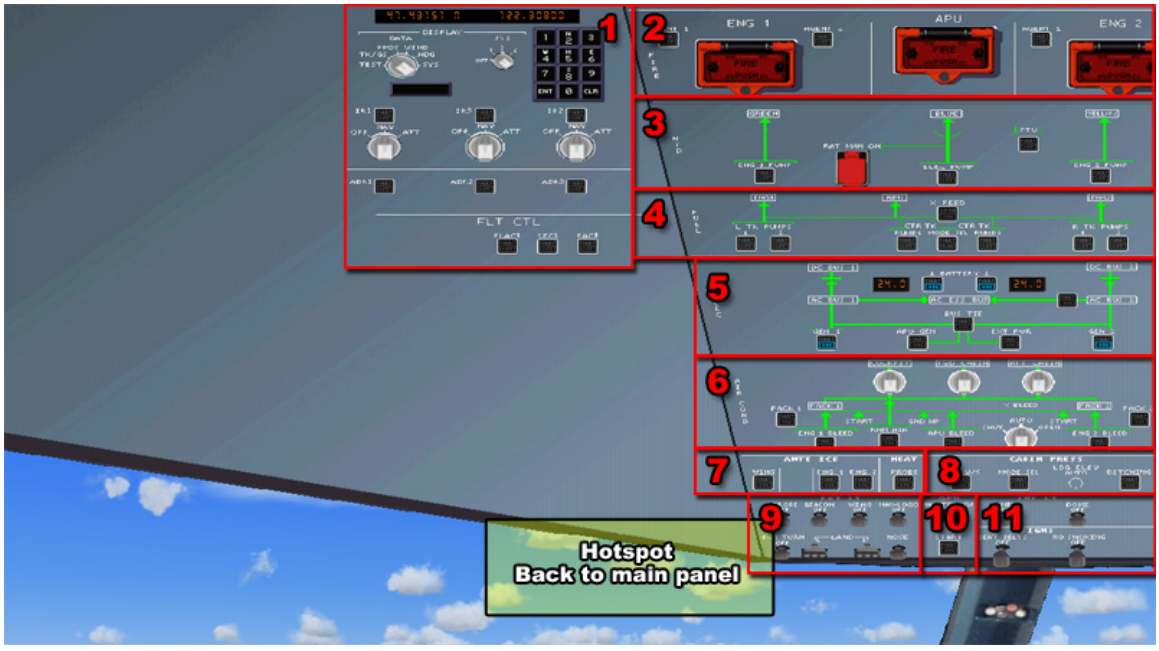
Engine/Warning Display (E/WD). This is the top screen of the Electronic Centralized Aircraft Monitor (ECAM) featuring key information related to the engines, flaps, and other aircraft systems.

Landing gear pane. This area contains the controls for operation of the landing gear and automatic brakes.

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 panel located on the pedestal.

FS9 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.

Electrical 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.

FS9 CENTER PEDESTAL VIEW

The center pedestal contains controls and displays related to navigation and communications as well as the thrust levers. It is accessed by clicking the pedestal hotspot shown in yellow.

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.

FSX MAIN (CAPTAIN'S) 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.

Electronic Flight Instrument System (EFIS) control panel. This panel is used to control the data displayed on the Navigation Display (ND).

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.

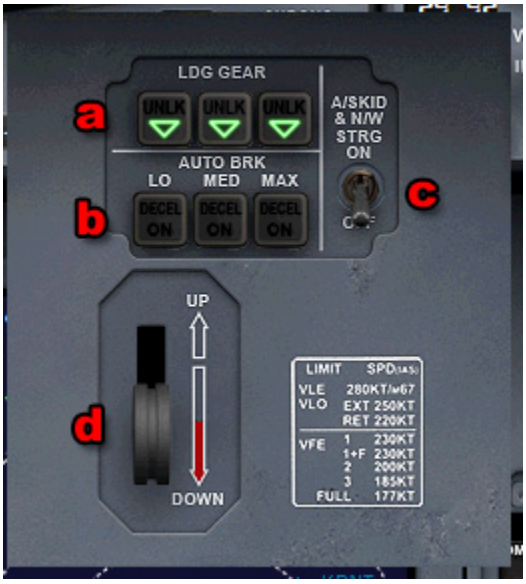
Primary Flight Display (PFD). This display features information such as airspeed, altitude, pitch/roll angle, heading, rate of climb, set barometric pressure, and the Flight Mode Annunciator (FMA).

Navigation Display (ND). Display features information related to lateral navigation of the aircraft. Display modes include ROSE LS (ILS), ROSE VOR, ROSE NAV, ARC, & PLAN. This display is controlled via the EFIS control panel.

Standby Instruments. These instruments serve as backups for the instruments displayed on the PFD.

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

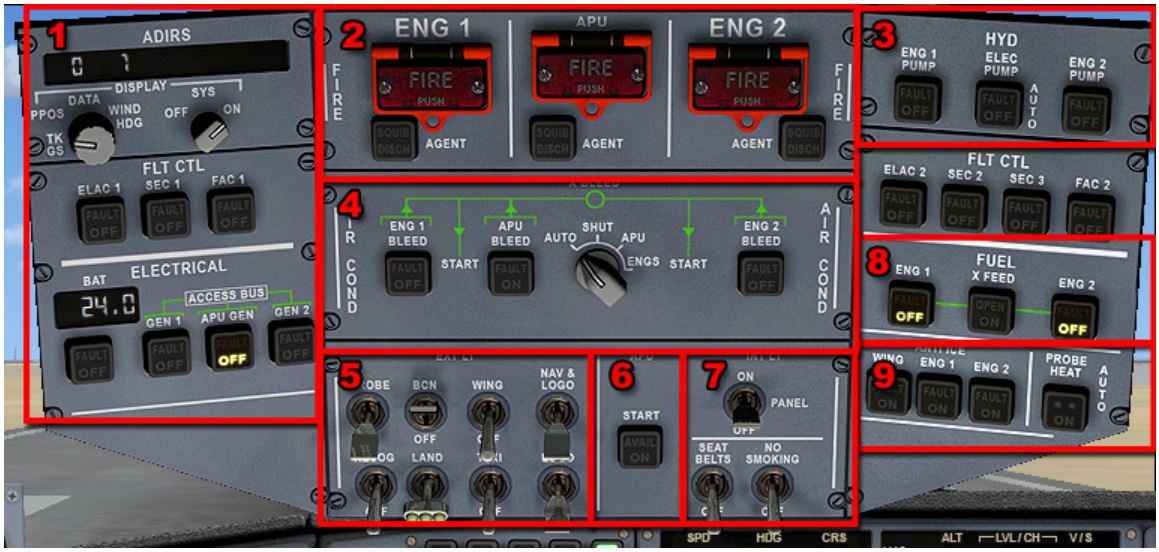


Landing Gear panel – Accessed using the  panel hotstpot. This area contains the controls for operation of the landing gear and automatic brakes.

A. Landing Gear Position Indication (green arrows = gear down)
B. Auto Brake Selection Buttons
C. Anti-Skid & Nose wheel Steering Switch
D. Gear Handle

FSX 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.

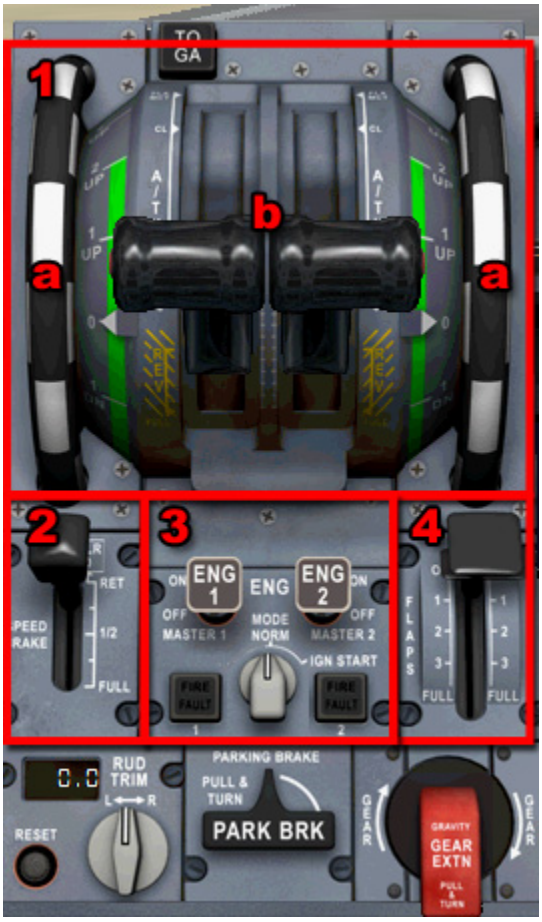
Internal Lights and Signs. These are the controls for the flight deck's internal lighting and cabin signs.

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.

FSX 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.

Manual Pitch Trim Wheels

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 A320

In this brief tutorial, we'll introduce you to your new work environment and briefly describe some of the pertinent systems on the A320 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 320

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 320 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 Fight 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.

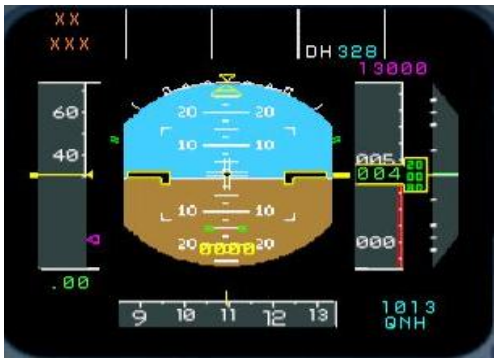
The next area that should be addressed is the flap setting convention used by Airbus. Instead of listing the flap settings in degrees as on other aircraft, Airbus has simply numbered the flap settings as 1, 2, 3, & Full.

A320 FLIGHT DECK FAMILIARIZATION

Using the DVA A320 fleet installer aircraft, you will be working in a two dimensional environment. Above is the instrument panel of the DVA Airbus 320. 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're 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. On the very top is the Flight Mode Annunciator (FMA) that shows us which autopilot functions is engaged.

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 above is the typical configuration for the DVA A320. 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 difficult to prioritize. These are best used with range set to 10NM (20 max).

ELECTRONIC CENRALIZED 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 (HSI) (bottom right)

GLARE SHIELD PANEL

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

MASTER CAUTION AND WARNING

On the left side of the FCU there are two dark buttons, one on top of the other. These are the Master Warning and Master Caution buttons. Warning is on top and flashes red, Caution is below and flashes amber. By pressing them, the lights are extinguished and the audible tone silenced.

CHRONOMETER AND PRIORITY

Next to the caution and warning buttons is a round push button (pb) labeled CHRONO. Pressing this button starts the chronometer and displays in the Navigation Display. This is particularly useful when placed in a holding pattern or on some other time constraint by ATC. For whatever reason you may need it, it's available. To reset the counter, simply press the button again.

Below the chronometer round push button (pb) is the Side Stick Priority Button. This is not simulated in this particular panel, but it provides the flight computers with prioritization between the two side sticks. Assuming you and your first officer are putting opposing force on the side sticks, the one with priority (CAPT or Copilot) is the direction the flight computer will command the flight controls.

EFIS CONTROL PANEL

Situated between the autopilot and master caution/warning control 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 mercury (inHg), and hectopascals (hPa). Hectopascal units are the same as QNH readings. Altimeter settings in certain countries outside the continental United States are reported in hPa, especially France. You can turn the control knob left or right to change the setting. Above transition altitude when you return the altimeter to standard, 29.92 inches (1013 hPa), pull the knob. For our A320, 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

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

FLIGHT CONTROL UNIT (FCU)

If you're 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 Delta Virtual Airlines' A320, we simulate a push/pull simply by left clicking 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 the aircraft 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 A320 in any mix of modes as well. For example, with the autopilot engaged, you can fly with speed in select mode with heading and altitude in manage, or any other combination thereof.

The black button just below the speed window labeled SPD/MACH will change the speed-reading between knots indicated 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 you would notice a little circle denoting the actual flight path angle of the aircraft. This is not simulated in our A320.

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 A320. 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 A320 is a Stage 2 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 A320. 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
4. Flaps..... 0 (Up)
5. Throttles ..... IDLE DETENT

Overhead

1. Nav & Logo lights..... ON

Now it's time to apply power and continue preflight checks.

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 A320 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 A320 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 glideslope 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 200 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

Overhead

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 A320.

Fuel Planning and Weight and Balance

Detailed Fuel Planning is covered in the Flight Encyclopedia. All burn rates are ***per engine*** and were measured at the maximum aircraft gross weight for the altitude and therefore should reflect the worst-case scenario.

Altitude	Indicated Airspeed	True Airspeed	Fuel Burn
Ground Operations	N/A	N/A	400 PPH
12,000’	290 KIAS	360 KTAS	1395 PPH
FL180	290 KIAS	394 KTAS	1391 PPH
FL240	290 KIAS	429 KTAS	1410 PPH
FL300	300 KIAS	480 KTAS	1501 PPH
FL360	260 KIAS	447 KTAS	1100 PPH

Fuel Loading

Delta Virtual’s Airbus A320 variants have three (A319, A321) or five (A318, A320) fuel tanks as outlined in the table below.

Model/Tank	Center	Left Main	Right Main	Left Aux	Right Aux
A318	14,605 lbs	12,256 lbs	12,256 lbs	1,554 lbs	1,554 lbs
A319	14,605 lbs	13,814 lbs	13,813 lbs	-	-
A320	14,605 lbs	12,256 lbs	12,256 lbs	1,554 lbs	1,554 lbs
A321	19,642 lbs	13,713 lbs	13,713 lbs	-	-

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

Checklists

FLIGHT DECK PREPARATION

- All Charts/Flight Plan ..... On Board
- Parking Brake ..... ON
- Throttle Levers ..... IDLE
- Engine Ignition Switches... OFF
- Battery..... ON
- Landing Gear ..... DOWN
- Flaps/Slats..... 0 (Up) (ECAM AGREE)
- Spoilers..... RETRACTED
- Flight Plan ..... Loaded (FS Flight Planner or GPS)
- Fuel Qty ..... CHECK
- Cabin Signs ..... ON
- Nav Lights ..... ON

AT GATE PARKED-BEFORE ENGINE START

- All Charts/Flight Plan ..... On Board
- Weight/Balance ..... Meet Flight Requirements (Check charts)
- ACARS *(optional)* ..... Connected and Flight Started
- ATC Flight Clearance *(if online)* RECEIVED
- Altimeter ..... SET
- Transponder ..... SET/Standby
- COM1 ..... SET as needed
- NAV 1 & 2 ..... SET as needed
- ADF ..... SET as needed
- Airspeed Bug (A/P)..... SET
- Heading Bug (A/P) ..... SET
- Altitude (A/P) .....SET

ATC CLEARANCE - Call for IFR/VFR Departure-Push/Start Request (if flying online)

- All doors ..... Closed / Locked
- Rotating Beacon Switch .... ON
- Parking Brakes..... RELEASED
- Clock/Chrono ..... START
- Pushback..... START

-BEFORE ENGINE START CHECKLIST COMPLETED-

ENGINE START

- BATT Master Switch ..... ON
- Throttle ..... IDLE
- Parking Brakes ..... SET
- APU ..... ON
- #2 Engine Switch (right)... ON
- Engine instruments ..... N1 Increase, Stable
- Generator Switch ..... ON
- #1 Engine Switch (left)..... ON
- Engine instruments ..... N1 Increase, Stable
- Generator Switch ..... ON
- APU ..... OFF

-ENGINE START CHECKLIST COMPLETED-

AFTER ENGINE START

- Internal Lights ..... AS NEEDED
- Taxi Light ..... ON
- Pitot Heat ..... ON
- Elevator Trim ..... SET (+1.0)
- Autopilot ..... SET
- Flaps 1

-AFTER ENGINE START CHECKLIST COMPLETED-

TAXI

ATC TAXI CLEARANCE - Request taxi to active runway (if online)

- Parking Brakes ..... RELEASED
- GPS/NAV Switch..... NAV
- Flight Controls ..... CHECKED (Free & Clear)
- Crew takeoff briefing ..... COMPLETE
- Crew announcements ..... COMPLETE

-TAXI CHECKLIST COMPLETED-

BEFORE TAKEOFF

- Flight Director ..... ON
- Auto Pilot ..... SET (Checked)
- Flaps ..... 1 (Checked)
- Spoilers ..... RETRACTED (Checked)

ATC Take off CLEARANCE - Request for takeoff

-BEFORE TAKEOFF CHECKLIST COMPLETED-

TAKEOFF - CLEARED OR TAXI INTO POSITION & HOLD

- Parking Brakes ..... RELEASED
- Strobe & Landing Lights.... ON
- Transponder ..... ON / Normal

-TAKEOFF CHECKLIST COMPLETED-

After Takeoff / Climb

- Gear ..... UP (Lights Out)
- Flaps ..... 0 (UP)
- Spoilers ..... RETRACTED
- Taxi Light ..... OFF

Passing 10,000 Ft MSL

- Landing Lights ..... OFF
- Seat Belt Signs..... OFF (as conditions permit)

Passing 18,000 Ft MSL

- Altimeters ..... STD (29.92)

CRUISE

- Engine Instruments ..... MONITOR
- Fuel Consumption ..... MONITOR
- Navigation.....MONITOR

-CRUISE CHECKLIST COMPLETED-

DESCENT

ATC Descent CLEARANCE – Descend

Passing 18,000 Ft MSL

- Altimeters..... SET
- Seat Belt Signs..... ON

Passing 10,000 Ft MSL

- Landing Lights ..... ON

-DESCENT CHECKLIST COMPLETED-

APPROACH

ATC Approach CLEARANCE - Approach

- GPS/NAV Switch..... NAV
- ILS Freq ..... SET
- Flaps..... AS SCHEDULED

-APPROACH CHECKLIST COMPLETED-

LANDING

ATC Landing CLEARANCE - to Land

- Landing Gear ..... DOWN (Three Green)
- Taxi Light ..... ON
- Flaps..... FULL
- Autopilot ..... OFF
- Auto throttle ..... OFF

-LANDING CHECKLIST COMPLETED-

AFTER LANDING (WHEN CLEAR OF THE RUNWAY)

ATC Taxi CLEARANCE - To gate

- Landing Lights ..... OFF
- Strobe Lights ..... OFF
- Transponder ..... Standby
- Flaps..... 0 (UP)
- Spoilers..... RETRACTED
- APU.....ON

-AFTER LANDING CHECKLIST COMPLETED-

AT THE GATE / SHUTDOWN

- Parking Brakes .....SET
- Clock/Chrono .....OFF
- Taxi Light .....OFF
- Engine Switches .....OFF
- Rotating Beacon Light.....OFF
- Seat Belt Sign .....OFF
- ACARS Shutdown (optional)
- .....End Flight, File PIREP

Crew Briefings

TAKEOFF

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 **V1** (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)

LANDING

Captain to Co-pilot

Weather conditions are (*obtain from ATIS, Metar and TF*).

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 ANNOUNCEMENTS

Departure

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

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 choose us again. Once again, thank you for flying Delta Virtual Airlines."

Appendix – Operating Information

TAXI SPEEDS:

Do not exceed 20 knots on straight taxiways. Do not exceed 10 knots in turns and when approaching gates or other parking areas.

Exit high-speed taxiways at no more than 35 knots, low speed taxiways at no more than 15 knots.

TYPICAL V SPEEDS

V Speed	KIAS
V_1	149 KIAS
V_R	149 KIAS
V_2	152 KIAS

CLIMB PROFILE

Speed	Altitude
V_2 + 20 KIAS	1,500 ft AFE
250 KIAS	10,000 ft
290 KIAS	FL180
.74 mach	FL240
.78 mach	FL280
.78 mach	Cruise Alt

STANDARD CLIMB RATES

FPM	Altitude
2000 - 2200	Below 10,000 ft
1000 - 2000	10,000 ft to FL180
1000 - 2000	FL180 to FL280
500 – 1500	Above FL280

DESCENT RATE

Target Speed	Descent Rate	Altitude
290 KIAS	2200 fpm	Cruise to 10,000 ft MSL
250 KIAS	1500 fpm	Below 10,000 ft MSL

Approach/Landing Speed Profile

Speed	Altitude	Distance from Airport	Flaps
240 KIAS	Below 10,000 feet	30 nm	Up
200 KIAS		15 nm	1
190 KIAS		10 nm	2
160 KIAS	Varies	Final Approach Fix	3 or Full
V_{ref} + 5	Varies		3 or Full
V_{ref} + 5	Varies	Runway Threshold	3 or Full

Flap Speeds

Flap Position	Flap Degrees	Maximum Speed
0	Slats 0° Flaps 0°	N/A
1	Slats 18° Flaps 10°	230 KIAS
2	Slats 22° Flaps 15°	200 KIAS
3	Slats 22° Flaps 20°	185 KIAS
4 (Full)	Slats 27° Flaps 35°	177 KIAS

Acknowledgements and Legal Stuff

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Larry Foltran and Ryan Watkins created this manual in 2009.

Flight Sim screenshots courtesy Larry Foltran.

While we strive to mirror real-world operations, this manual is not designed for use in the operation of real-world aircraft.

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