

Ready for Pushback

... 2nd Generation

747 *Classic* Flight Handbook

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Introduction

WELCOME TO **READY FOR PUSHBACK...** 2nd Generation, certain to become one of your favorite panels for Microsoft® Flight Simulator. This panel and its supporting software faithfully recreate the cockpit of the Boeing 747-200 series aircraft, both the variant which used an analog “steam” gauge format, and the tape gauge format found in the first release of Ready for Pushback.

For many of you who purchased and use the AETI Classic 747-200 Analog Panel and the Ready for Pushback Tape Panel, you will see similarities but also many additions which enhance the realism of the simulation and provide the necessary operating components to help you become proficient as a Virtual Flight Engineer, as well as First Officer and Pilot.. The Classic 747-200 Analog Panel, and upgrade of the original RFP Tape Panel are not just simple updates to the original release but is over 11 months of work to produce a product that is more complex and more realistic than ever. More than ever before this package is aimed at the advanced flight simmer who is looking for more realism and challenges and is not interested in just simplicity and quick flights. Here are some of the new and improved features of the Analog Panel:

- Analog Round Engine Gauges
- Updated Tape Engine Gauge version
- Updated main and sub-panel graphics
- New Flight Dynamics
- MCP Updated
 - - Revised IAS Climb mode
 - - Revised ALT SEL/ALT HOLD modes
- Revised ADI Graphics (earlier style)

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- Fully functioning Fuel Panel
 - - Tank-to-Engine
 - - Tank-to-Manifold
 - - Fully functional crossfeed valves
 - - Fully functional Boost Pumps
 - - Pressure Refueling - Manual and Automatic selections available
 - - Fuel Jettison and tank-to-tank transfers
 - - Accurate Reserve Tank transfers
 - - Fuel icing simulated
 - - Scavenge pump
 - - Hidden Quick Fuel menu
- Ground Power Carts that charge the ships battery
- APU Updated
 - - APU Charges the ships battery
 - - Accurate use of the APU is required for an engine start
 - - The APU burns fuel
 - - The APU requires the correct fuel tank to be selected in order to start it.
- Realistic engine start routines
- Realistic Bleed Air procedures
- Full Flight Regime Auto Throttle System (FFRATS)
 - - FFRATS linked correctly to the EPR Limiter
- Multiple Panels includes the following:
 - - Analog Panel with round Flap Gauges
 - - Analog Panel with linear Flap Gauge
 - - Revised Tape Panel
- Analog engine gauges linked to the FFRATS
- Analog Flap gauges
- Rolodex style EPR/TAT readouts
- Rolodex style TAS readout
- Maximum Indication pointers on appropriate analog engine gauges.
- Flight Engineers panel for electric, hydraulic, pneumatics and fuel management
- New Ready for Pushback house livery included
- Two new real world liveries added
- Minimum Airspeed protection (ALPHA)
- Flap Over Speed protection (FLAP LIM)
- Full and realistic auto land capabilities for CAT II
- Simulated heating and cooling systems
- Extended tool-tips
- Auto Starts are blocked for added realism
- Failures modeled
 - - Engine Fires
 - - Flame-outs
- Custom 747-200 sound set included
- Assumed Temperature take-off calculator
- Up to 15 aircraft may be included with the download version
- Up to 50 aircraft may be included with the CD version
- Full comprehensive documentation.
- An all new Cold and Dark tutorial flight
- Training videos included with the CD Version.
- Appropriate panels assigned to the aircraft.

This level of panel detail will allow you to follow the step-by-step procedures required to bring the aircraft to life from a cold and dark state if you wish. OR ... if you want a quick flight, you can save the aircraft state on the runway threshold and simply take off and fly; or you can start at any of the myriads of variations in between. Many of the panels have switches that are interrelated. For example, you cannot start the APU without first having electrical power for the aircraft either provided by the switching on the batteries or “virtually” connecting an external power cart. Similarly,

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engines will not spool up and start without sufficient bleed-air duct pressure, ignition source and fuel flow. There is no CTL-E available for starting engines on this sim ... you have to follow the checklists! Many of the switches and gauges operate correctly to provide you with as much procedural reality as possible. Some switches, however, are not connected to simulation program logic so we can provide a balance between functionality and system performance. .

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About This Manual

PLEASE READ ME – VERY IMPORTANT INFORMATION

The purpose of this manual is to teach you the functions of this panel without getting into too much technical information. There of course will be some areas where supplying technical information will be required so please suffer through it as best you can.

In this simulation, you are the Pilot, First Officer AND ... the Flight Engineer. With no sophisticated, computerized electronics to monitor and control all the systems on the aircraft, the Flight Engineer is an equal member of the cockpit TEAM ... manually controlling and monitoring each of the complex systems and their interrelationships.

This document begins with a brief overview of the Boeing 747 Classics and provides some aircraft census data as to how many are still in use and by whom.

Next is a section with a brief presentation of the panels ... a familiarization overview ... to provide you with a “15,000 foot view” of the panel’s functionality modeled of the software.

To get you started in the learning process we will walk you step by step, through a flight from Seattle to Chicago. You can learn the essential skills needed to takeoff, climb, level off, plan an approach, descend and land successfully.

The tutorials will require that you read it over carefully and more than once is certainly recommended. Flying and reading is very difficult to do but you will soon get the hang of it and you will begin working your way through the learning process required to become proficient with this aircraft. At appropriate places in the tutorial, checklists will be inserted, along with “step by step” instruction of what to do.

This is a really powerful way to learn the –200 and the procedures required to get it off the ground, into a stable climb, leveled off ... fly awhile ... and then start the descent, and shoot the approach and land ... hopefully. Remembering all the while that “PRACTICE, PRACTICE, PRACTICE makes PERFECT”.

After the tutorial, is a section “Cold and Dark – Extended Checklist” which really is a very detailed EXTENDED CHECKLIST in two-column format ... based on a 747-200 AOM extended checklist. This format will provide the AOM checklist function in the left column, with the Step-by-Step, button by button description of what to do to accomplish the checklist requirement. This will be ideal for those of you who like to learn by step by step example, and equally as useful for those of you who “Just want the Facts ... only the Facts”

A special enhanced version of S-Combo titled **Classic S-Combo** is used to add checklist, aural crew calls, start routines, cabin announcements and much more.

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Following the “Cold and Dark”, are sections describing each of the various systems modeled in this software. It is a “very MINI” AOM, specifically oriented to each of the panels and the systems they model, with switch by switch descriptions of the function of the switch and gauge and their relationship to the operation of the aircraft.

If you are familiar with the 747-200 series, you will realize that just as each automobile has optional equipment available, Boeing made an almost infinite variety of options available to customers. This particular simulation might match your favorite whale or IT MIGHT NOT .. because there were many, many variations in the equipment on each aircraft AND how the equipment was implemented and operated.

Each section in the MINI-AOM contains three subsections, as follows:

System Description: This subsection will outline the actual operation of a particular subsystem, for instance, FUEL. The source of the information and diagrams is from a PAN AM Aircraft Operations Manual, purchased from ESSCO. The description of each system DOES NOT MEAN that the system is modeled as described, indeed, you will not smell the jet fuel around your desk. The information is to satisfy your technical curiosity, if you have any; and to provide some background information about how the REAL 747-200 aircraft operates. I REPEAT, the information is for your information, and DOES NOT MEAN THAT THE SIMULATION SOFTWARE MODELS THE CONTENT OF THE SYSTEM DESCRIPTION IN ANY WAY, SHAPE, MANNER OR FORM.

Controls and Indications: This subsection describes SOME (NOT ALL) of the switches, knobs, pushbuttons, gauges, and meters that exist in the subsection. For instance, in the FUEL Section, the fuel panel's gauges, knobs and buttons are described along with their function and how the panel is intended to be used in the real work and in the SIMULATION. Of course, there is NO REAL BOOST PUMP or FUEL HEATER.. and in fact, the aircraft engines will start even if you never look at the FUEL Panel or read the information in that section. The engines in the actual aircraft have their own individual fuel pumps, and are gravity fed anyway, since they are under each wing. The boost pumps merely assist gravity. To the extent you wish to add to the reality of your SIMULATED experience, you may follow the instructions and guidance in the AOM FUEL section and as the flight progresses manage your fuel subsystem ... OR NOT.

While every effort was made to faithfully reproduce as many of the functions as possible, not every switch and gauge and knob is tied to a function. Most switches, which have lights, will illuminate the light when switched on, some may not. An attempt has been made to provide a procedural reality so that you can follow the startup, flight and shutdown as closely to the REAL aircraft as possible. But you MUST UNDERSTAND that not every gauge and switch has been reproduced, and NOT every gauge and switch that has been produced has a function.

Normal Procedures: This subsection contains the normal procedures for the aircraft subsystem being discussed for each appropriate stage of flight. An example would be deploying the landing gear while on final approach. Will the SIMULATED aircraft land? Absolutely, but it will land on its belly or maybe even more disastrously, maybe crash. You can choose to OR NOT TO follow any procedure you wish.

Dependencies:

1. Battery: without battery power, nothing functions. A typical problem, which might be, encountered, is lack of function of the electrical system or instruments, or ATC. The usual cause for this is FS2004's penchant for draining the battery very quickly. You must have FSUIPC installed and set to provide “unlimited battery power.” As an alternative you can understand the electrical section of the AOM, and shortly after turning on the battery, either establish “GROUND” power or start the APU. Either source of electricity will charge the battery and provide sufficient electrical power to the aircraft. Please also see the documentation available with FSUIPC.

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2. Hydraulic system, Engine Driven Pumps, (EDPs). The program code of this simulation contains logic that disables FLAP deployment and/or retraction, and Landing Gear deployment and/or retraction if the EDP's are not switched on.

3. As this version of the documentation "goes to press" who knows what other surprises Ralph and Chris have added to the program logic.

FINAL WORDS:

An attempt has been made to create a simulation package that provides entertainment and stimulation to those interested in commercial aircraft simulation. MS Flight Simulator itself, while incredibly robust and function filled, does not support many of the functions we would have liked to include. We have done much custom programming and have tried to create a balance between functionality and the ability to run the program on a reasonable sized computer. The more code, the time taken to execute the code, and the slower everything becomes.

There is no shortcut to reading this manual. If you do less than read it completely and skip the tutorials, you will not get the full benefit of this package.

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DISCLAIMER -- READ ME CAREFULLY

This software package is:

1. a 747-200 simulation, a software add-on to Microsoft Flight Simulator 2004.
2. intended for entertainment purposes ONLY
3. as accurate as it can be given the constraints of the MSFS flight model and available programming interfaces, and the need to balance functionality with ability to execute on a medium powered personal computer.
4. a simulation where NOT ALL of the systems on the 747-200 aircraft have been modeled, and for those systems that have been modeled, some are more complete than others.

This software package is NOT:

1. a training tool for type rating on the 747-200 aircraft, nor is it an instructional guide on how to fly the real thing, or
2. a FAILURE or abnormal procedures simulator. While some systems and functions are dependent on other systems and functions, the software IS NOT designed to train individuals or model every aspect of 747-200 operation or procedures, or
3. an exacting 100% accurate representation of the 747-200. Many gauges and switches have functions that work as described in the AOM part of this manual. There are many switches, lights and gauges that appear to work, but are added and function only to portray as much procedural accuracy as possible. Not all dependencies have been modeled, again with the idea of running this sim on a medium powered PC.

This Manual is:

1. a tool to be used ONLY with this simulation package, and
2. an accurate representation of the systems implemented by the software based on information publicly available, and
3. intended to provide accurate technical explanations, although nowhere complete as necessary to thoroughly understand the intricacies of each system and component.

This Manual is NOT:

1. intended to describe every part or system of the 747-200, or
2. an indication that something described in the manual as operating in a certain way on the REAL aircraft is going to operate the same way in this software add-on, and further, some functions described in the manual are there to provide a sense of completeness, and do not mean that the actual function or component being described has been implemented in the software.

Bottom Line get to the point ...

This is entertainment software, not a training tool. It is an accurate representation of the 747-200 to the extent that it is possible to program on a desktop computer. Some gauges, lights and switches function as intended in the manual, while some gauges, lights and switches are added and even though the switches click, the lights light, and the gauges have moving dials .. there is no real function behind them, and they are added to provide you with some procedural reality and experience.

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The Team:

Gauge Programming

Chris Koegler

Aircraft Design

Herve Dongmo

Aircraft Textures and FDE

Bodo Mueller

Test Pilots

Ed Green, Chris Boyce, Christoph Illmer, Leif Almberg, Darrell Baty, John Valenta, Tom McKenzie

Documentation

Paul Benoit

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Panel Contributors

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HGHB INS

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Virtual Cockpit and Cabin Textures

Anastasio Alexiou

Technical Advisors

Michael Belmonte - Manager of Courseware Development and B747 Instructor with Atlas Airlines

Captain Mel Ott - retired from flying 747's with NWA

Captain Peter Edwards - retired from flying 747's for Qantas Airlines

Captain Dave Baucum - currently flying for Southwest Airlines.

No one was more important than the other on this project and all donated their precious

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time willingly.

Tape vs Analog Panel

As noted above, **Ready for Pushback ... 2nd Generation** is supplied with both Analog and Tape Panels. This documentation has been modified to add the Analog engine and Flap gauges.

The difference between the two panels is very minimal: The Analog gauges and the Tape gauges both represent different approaches to representing

- EPR
- EGT
- N2
- Fuel Flow, and
- Flap position

I have "left" references to the Tape engine/flap gauges in the documentation, and in most cases have put a red border around the tape gauge description, like this to alert you to the different representations.

RFP ... 2nd Generation is supplied with 17 Liveries in its initial release. (Note that the number and type of liveries is subject to change)

Analog

Air Canada
Air France
British Airways
JAL Cargo
Lufthansa
Qantas Old Colors
RFP Livery
United Airlines Old Colors
Virgin Atlantic Old Colors
Continental
China Cargo
ELAL

Tape

America West
KLM
Flying Tigers
Swissair

SAS New Colors

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The Boeing 747 Classics:

Based on Information found at:

http://www.boeing.com/commercial/747family/pf/pf_classic_back.html

The mid-1960s saw the development and introduction of many new jetliners. None, however, has matched the dramatic impact of the 747. Increasingly crowded skies and the availability of large-thrust engines added to the incentive for creating the giant 747. It all began with the 747-100, the first in the 747 Classics series, which also includes the 200 and -300 models.

747-100 - The World's First Jumbo Jet

The 747-100 entered commercial service in 1970. Initially, engines only were available from Pratt & Whitney, but by 1975 engines also were available from General Electric and Rolls Royce. Boeing delivered 250 of the 747-100s, the last in 1986. Boeing built two versions of the 747-100 passenger airplane, one of which had a higher payload capacity and was known as the -100B. The 747-100 also was available as a short-range airplane, which had a modified body structure to accommodate a greater number of takeoffs and landings. This model typically was used by airlines on short flights with a high-passenger capacity, as many as 550. Boeing also built the 747-100SP (special performance), which had a shortened fuselage and was designed to fly higher, faster and farther non-stop than any 747 model of its time.

747-200 - Continuing the Legacy

Although the 747-200 was developed after the 747-100, it was built during roughly the same time frame. The first -200 went into commercial service in 1971, and Boeing delivered a total of 393, the last in 1991. Although its external appearance is nearly identical to the 747-100, it was designed to carry more payload. In addition to being offered as a passenger airplane, the -200 was the first 747 to be configured as a freighter, a combination passenger-freighter and a convertible.

From the beginning, the 747 was designed to serve as an all-cargo transport. The first 747 Freighter could easily carry 100 tons (90,000 kg) across the Atlantic Ocean or across the United States. Its operating cost was 35 percent less per ton-mile than the 707 Freighter. The 747 Freighter has a hinged nose to allow cargo loading through front of the airplane, with the option of a large side-cargo door.

The 747-200 Convertible was configured to serve as a passenger airplane, a freighter or a combination of both. This airplane responded to airlines' needs to carry different payloads at different times of the year, such as higher passenger capacities during the summer and more cargo during the winter. Similar to the convertible is the -200 Combi, which was designed to serve as a passenger-only airplane or as a passenger-freighter mix.

The combi has a large side-cargo door on the main deck, and is used by airlines to make better use of their routes during different times of the year. The convertible has a nose cargo door similar to the freighter.

747-300 - Moving Forward With Significant Changes

The 747-300 entered commercial service in 1983, and was the first to integrate the most significant changes of the 747 Classics. These changes included an extended upper deck and improved engines with a reduced fuel burn of 25 percent per passenger. In addition, passenger capacity increased 10 percent by extending the upper deck and relocating the new straight stairway to the rear of the upper deck (prior models had a spiral-shaped staircase in the center of the upper deck). Boeing delivered 81 747-300s in passenger, combi and short-range configurations, the last in 1990.

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747 Classics With Special Assignments

Boeing has designed or modified 15 747s for special purposes. Among them are two 747-200s delivered as U.S. presidential Air Force One airplanes, and four 747-200s, designated E-4s, delivered to the U.S. Air Force as airborne emergency command and control posts. Another 747 was modified to ferry the U.S. space shuttle between California and Florida. Other 747s have been demonstrated as tankers capable of refueling other airplanes in flight.

In addition, Boeing completed modifications to 19 existing 747-100s to Civil Reserve Air Fleet (CRAF) configurations in 1990. If called into service by the U.S. Air Force, these passenger planes can be converted to freighters in less than 48 hours. Boeing donated the original 747, line No. 1, to Seattle's Museum of Flight. On lease to Boeing, it occasionally is used as a flying test-bed for aeronautical developments.

747-200's in Use Today:

A fascinating look at census information for ALL medium to large sized commercial aircraft is found at <http://www.bird.ch/bharms/asrstart.htm> ... the Commercial Jet Aircraft Census compiled by Bill Harms. Quick analysis of this data (data Copyright by William Harms © 1999- 2002) for the -200 type indicate that there were 412 manufactured with 393 delivered. As of March 13, there were 315 747-200's in service ... quite a tribute to the aircraft and the manufacturer.

The -200 series was powered by "your choice" of engines from three manufacturers

- Pratt and Whitney ... the JT9D-7x (where x = many variations)
- CFM (General Electric) ... the CFM-50E2
- Rolls Royce ... the RB211-524 (C2, C4 and D4)

Companies still operating the -200 series (as of 3/13/02)

Aerolineas Argentinas	Air Atlantic (Iceland)	Air France
Air China	Air Hong Kong	Air Pacific
Air Phillipines	Air Madagascar	Alitalia
All Nippon	Atlas	Ait India
Cargolux	Cathay Pacific	China Airlines
Corsair	EI Al	Evergreen International
Garuda Indonesia	Iberia	JAL
IRAN Air	Iraqi Airways	Japan Airlines
KLM	Korean	Kuwait
Lufthansa Cargo	Malaysia	Martinair
Nippon Cargo (NCA)	Northwest	Olympic
Pakistan	Phillipine	Polar Air Cargo
Qantas	Royan Air Maroc	South African
UPS	Virgin Atlantic	

Immediately prior to the writing of this manual, British Airways had retired their -200 fleet subsequent to the terrible events of 9/11/02001.

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The Panels:

The Main Panels:



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Mini Icons for Sub-Panel Access

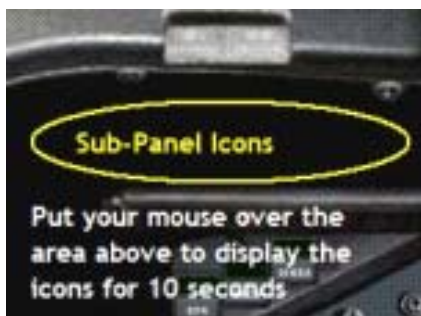


Here are the functions of the mini-icons



F	to access the fuel panel, you can also use the SHIFT + 8 key combination
E	to access the electrics panel, you can also use the SHIFT + 2 key combination
H	to access the Hydraulics/Pressurization Panel, you can also use the SHIFT + 9 key combination
O	to access the Overhead Panel, you can also use the SHIFT + 5 key combination
C	to access the Center Pedestal, you can also use the SHIFT + 6 key combination
Rad Symb	to access the Radio Panel/Read Pedestal/mini INS, you can also use the SHIFT + 3 key combination
GPS Symb	to access the standard MS GPS 500 window, you can also use the SHIFT + 4 key combination
I	to access the INS, you can also use the SHIFT + 7 key combination
ATC Symbol	to access the MS ATC, you can also use the “ ‘/~ “ key (left of the 1 key)
Map Symbol	to access the moving map

Accessing the Sub-Panel Icons



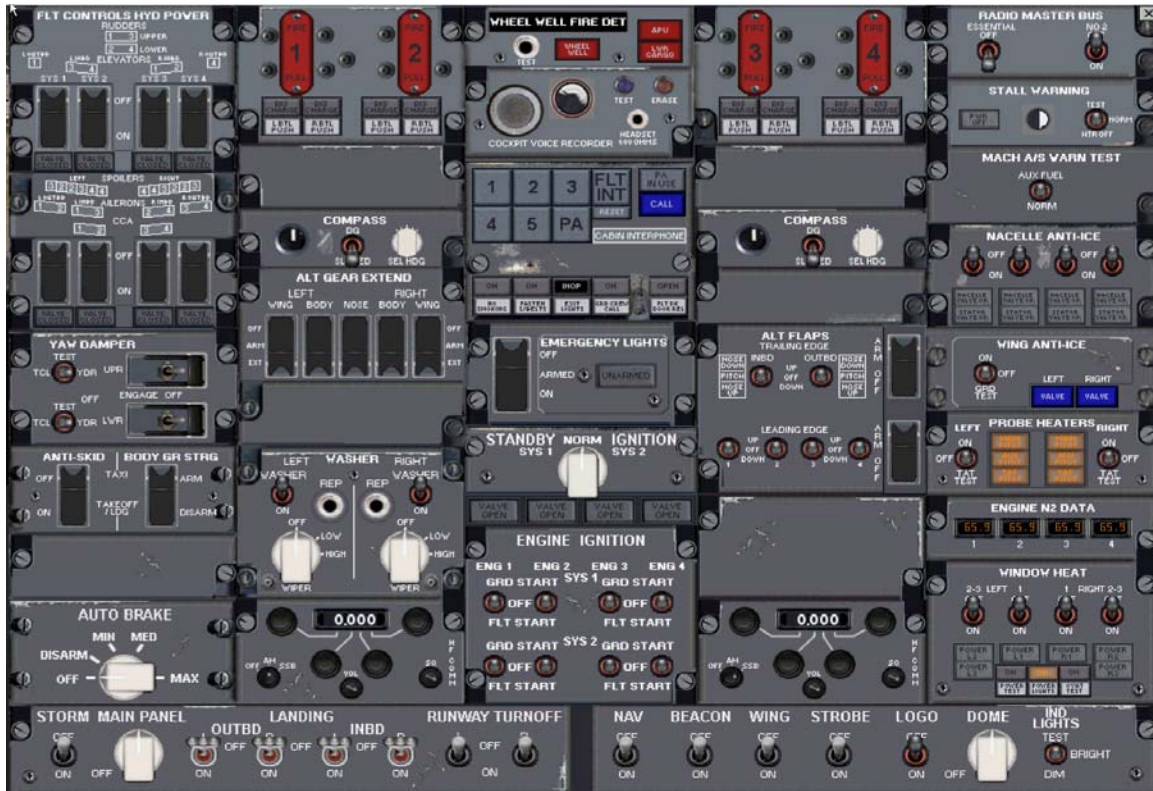
To gain access to the icons required to open the Fuel Panel and other Sub Panels, place your mouse over the circled area shown. The icons will be displayed for 10 seconds. They appear faster normally if you mouse over the left side of the designated area.

Once the icons have appeared you can select the sub panel that you wish to access.

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Overhead Panel



As with almost every part of a Classic 747 there are many varieties and looks depending on how the Airline ordered it and what modifications have been done. The overhead implemented in this add-on is typical of many 747 Classic's although there certainly are other versions.

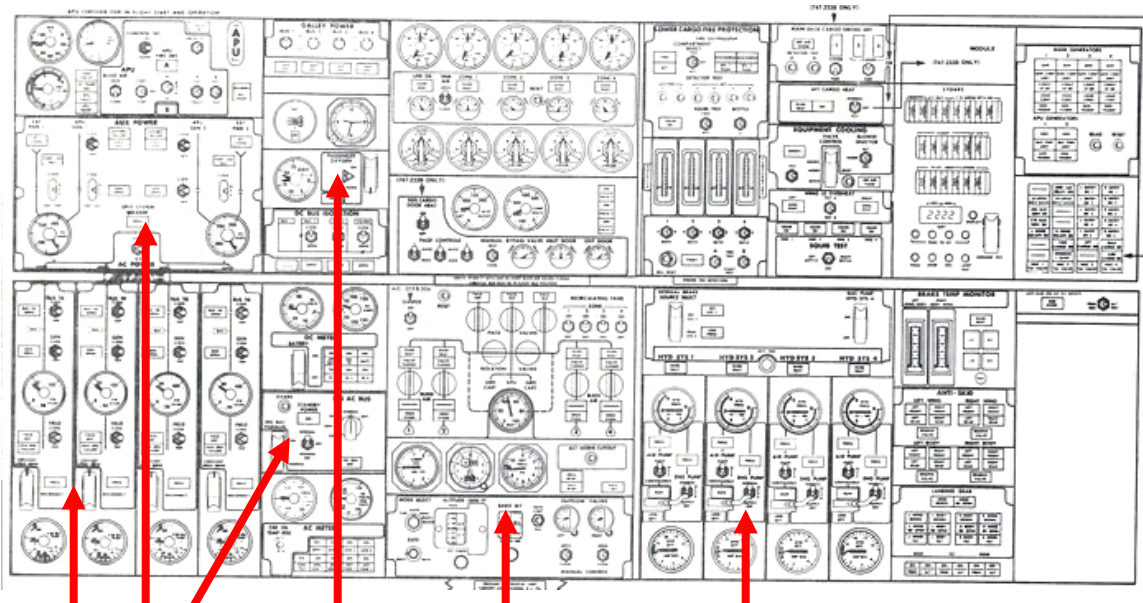
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The Flight Engineer's Panel

On the real -200, there is a three-man crew: Pilot, First Officer and Flight Engineer. The flight engineer manages and uses a large panel which looks like this on the real Aircraft

UPPER PANEL



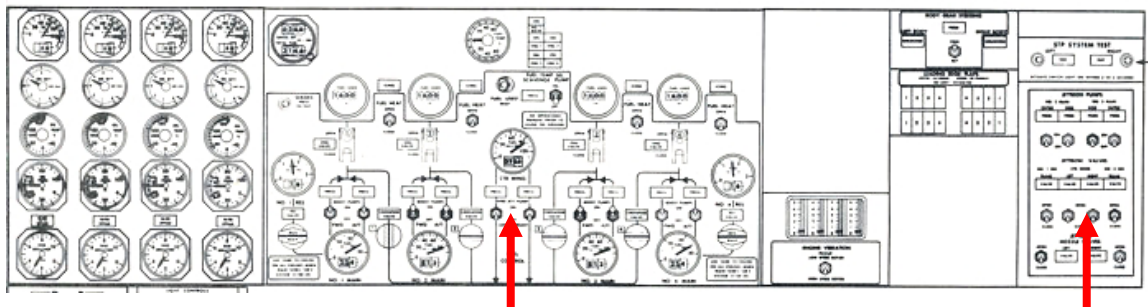
Electrics

APU

A/C & Pneumatics

Hydraulics

LOWER PANEL



Fuel

Jettison

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Fuel, Fuel Jettison, External Fuel Panels



This panel combines the functionality found on two parts of the LOWER Flight Engineer's panel shown above, and the Fueling Panel Access Door that is **located on the underside of the right wing, at the fuel loading location**.

With this panel, you ... as the Virtual Flight Engineer, control loading of fuel, distribution among the various tanks, and monitoring fuel use and temperature during flight. A gross weight gauge on the left side of the fuel panel keeps a running tally of the aircraft's gross weight' an extremely important number. When planning approach and landing, this number must be used in calculations of landing speed reference. Incorrect understanding of aircraft gross weight is a main cause of large holes in the runway touch down zone. In the event your aircraft has a major malfunction, and you need to return to your departure point, or to an enroute emergency airfield capable of "landing the WHALE" ... you will need to use the Fuel Jettison to lower the aircraft's weight to an acceptable landing weight.

Finally, as you monitor the aircraft's progress through the flight, and specifically fuel in each tank, there comes the magic moment for any 747-200 Virtual Flight Engineer ... the "Tank to Engine" point where all four main tanks have the same amount of fuel remaining, and you set up the fuel pumps to pump fuel from one tank to its primary engine ... or Tank to Engine.

Operational details for these panels are explained in detail in the Fuel section of the manual.

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Electrics and APU



The electric panel consists of a number of distinct sub-panels found on the Flight Engineer's panel, here you will find gauges and switches which will help you monitor and control the AC and DC electricity requirements of the aircraft.

Engine Mounted Generators

Auxiliary and External Power (from the ground based power cart)

APU control switches

Galley Power Switches

AC and DC bus isolation

AC Meters and DC Meters

After learning more about this panel in the ELECTRICS section further back in the manual, you will have fulfilled many requirements for an electromechanical engineering degree (just kidding of course, but you will feel like you did the studying!!)

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Hydraulics, Air Conditioning and Pressurization



So, you actually want to let your passengers breathe and stay warm at 37,000 feet ... and you want the flaps to work, the brakes to work, the ground steering to work Well .. this panel has the Hydraulic System, the Air Conditioning System, the Pressurization System, and the Pneumatic or bleed air system,

Each of these sub-panels is described in the AOM section of this manual.

You wanted to be a flight engineer for a day's simulated flight from London to New York ... here you can find out how hard these guy really work.

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Radio

This is the typical radio stack implemented in most aircraft. It provides communications, navigation and ATC (transponder) functionality.



Inertial Navigation System

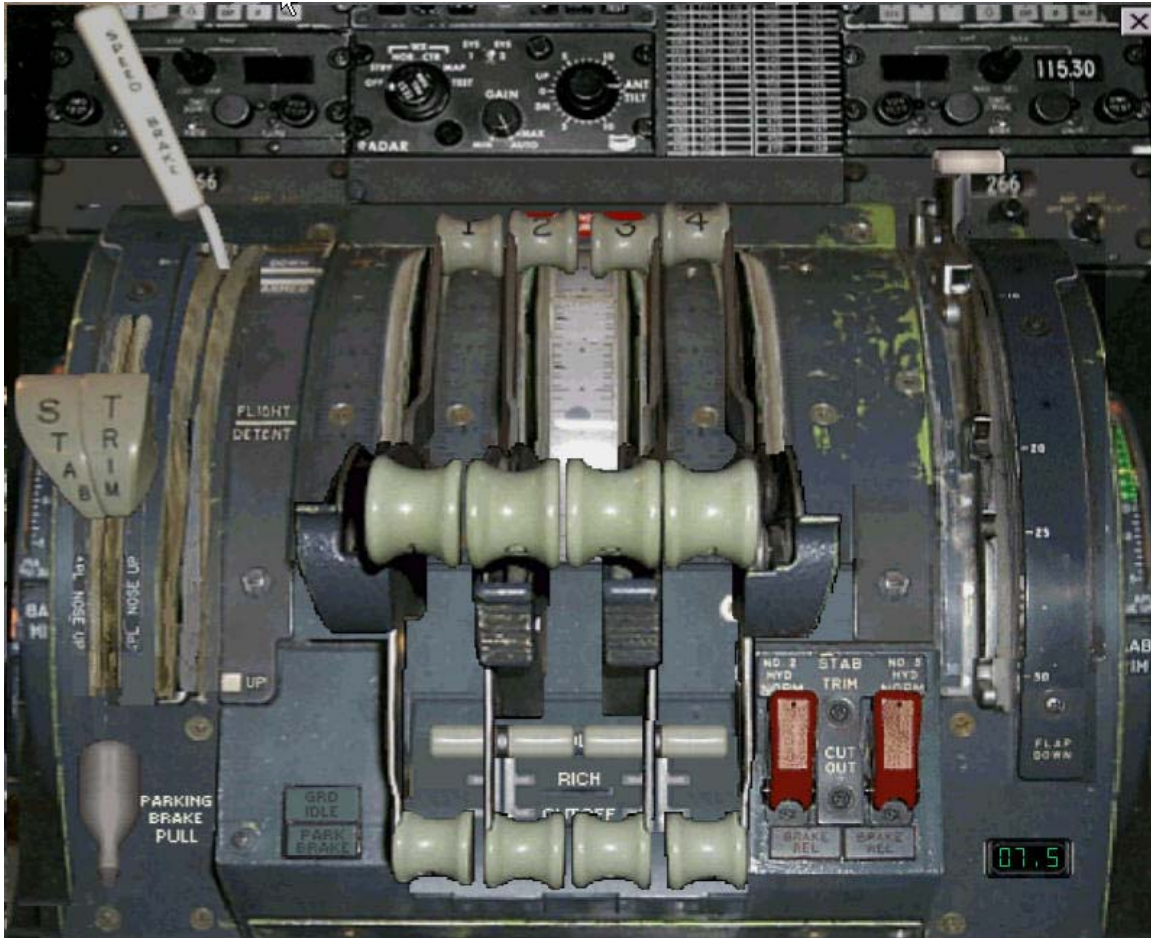


Leave your sextant at home; with a set of good navigation maps, and a knowledge of how to use the INS, you can have automated lateral guidance for your flights. The INS, programmed correctly, can hold up to nine route waypoints at a time.

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Center Pedestal



Here are the throttles, stabilizer trim, spoiler lever, fuel switches and flaps, as well as parking brake.

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Main Panel Views:

Standard View loads with panel



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Night Lighting Examples

Default Night Lighting



Lighting "ON"



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Lighting Switch



On the left glareshield there is a knob labelled PANEL. This knob will activate night panel lighting.

The one drawback with the method we have adopted is when turning on the night lighting during daylight, the daytime bitmap is replaced and the panel does not give the proper effect. The logical solution is to turn on the lighting at night and turn it off during the day.

Virtual Cockpit



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The new model includes:

- Both Analog and Tape Virtual Cockpits are provided
- Opening passenger and cargo doors
- Using Active Camera, a separately available software add-on which you can purchase, you cannot only perform your aircraft inspection, but also climb eth spiral stairs to the upper deck and look around

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Learning Strategy

The manual was prepared for you with three objectives in mind:

- To get you into the air quickly, bring you up to speed with the required procedures to take off, fly and land the aircraft.
- To familiarize you and present you with the detailed procedures which are followed day-in and day-out by real 747-200 flight crews.
- To provide you with detailed aircraft system information and reference material for how these systems are implemented in this simulation software.

There is no QUICK START GUIDE per se. This is it. If you follow the learning strategy outlined below, fly Tutorial One a few times, then review the manual in some detail, we feel you will be satisfied with your progress and successful with the "WHALE."

Let's put it this way, "This ain't no Cessna!!" This is a complex set of systems, designed in the late 1960's using the most sophisticated technology available at the time. Automation is present, but certainly not to the extent available in today's aircraft such as the 747-400 series.

We realize that you will want to "jump in," press Ctrl + E to start the engines, push the throttles to the wall and have at it!! You **CAN'T** do that because the feature is disabled. You will have to follow the instructions and checklists to fly the Whale.

You will find that this is a complex simulation. There are hundreds of switches, lights, gauges, and sounds to learn. Although the simulation is complex, it is NOT complicated ... IF you follow the step-by-step procedures that the flight crew follows for each and every flight.

Here is a recommended learning strategy:

- Review the manual, page by page to get a feel for the contents.
- Read through the "Cold and Dark – Extended Checklist" section after the tutorial. This will provide you an introduction to the "jargon" as well as provide you with a feel for the flow of procedures. Remember, this aircraft has a crew of THREE ... Pilot, First Officer (co-pilot) and Flight Engineer.
- Remember ... "Rome wasn't built in a day."
- Read through the "Get Acquainted Flight" Tutorial carefully, read it again.
- Start up MSFS, and choose the "Tutorial Flight"
- Fly the "Get Acquainted Flight" from SEA to ORD a few times
- Remember there is a PAUSE key ... "P" ... use it often.
- If you practice these skills until you feel comfortable with them, you have really accomplished 90% of the task of learning this aircraft.
- Now review the "Cold and Dark – Extended Checklist" section again ... and you will encounter many of those "AHA" moments. Refer to the "AOM" section for the specific component and read the detail there.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

An Easy Guide to your first flight

**Flying the Ready for Pushback
Classic B747-200**

**FOR
NEWBIE'S**

***The Reference Book
we have all been waiting for and some need!***



Your first flight will be a snap if you read and follow this tutorial

Ready for Pushback ... 2nd Generation

747 *Classic* Flight Handbook



Inaugural Flight

This should be looked at as a tutorial that will walk you through some of the main things you will need to know in order to fly this aircraft. You will not be taken through every small detail or checklist item but it will teach the basics of functions we have incorporated into this very complex simulation. It is important that you learn how to get external power, APU, hydraulics and pneumatics functioning before attempting to start the engines. Flying this aircraft requires that you use correct numbers for the takeoff, climb out, cruise and descent.

Manuals included with this simulation go into great depth and should be read and digested so that you will get a good understanding of how the systems work and their purpose. This simulation will bring you closer to the real aircraft than any other simulation for FS2004.

Ready for Pushback ... 2nd Generation

747 *Classic* Flight Handbook

I felt strongly that with the features and complexity of "Ready for Pushback Second Generation" that there was a need for a simple "get acquainted flight". The hope is that this flight will get you acquainted with many of the important features that you will need to know about in all of your flights in order to get the very most out of this advanced simulation of a Classic B747.

Our flight today is from Seattle (KSEA) to Chicago (KORD) which is around 1,500 nm. We will be using the FS2004 Garmin Navigation System for simplicity on this flight. An appropriate flight plan has already been created and will be loaded this flight. Your aircraft has been refueled for the flight so we will not go through that phase. You are parked at the Gate in Seattle and you and your crew members have boarded the aircraft 1 hour prior to pushback time.

Let's take a look at our simple flight plan for this flight.

```
[flightplan]
AppVersion=9.0.30612
title=KSEA to KORD
description=KSEA, KORD
type=IFR
routetype=1
cruising_altitude=33000
departure_id=KSEA, N47* 25.89', W122* 18.48', +000429.00
departure_position=34R
destination_id=KORD, N41* 57.81', W87* 54.17', +000668.00
departure_name=Seattle-Tacoma Intl
destination_name=Chicago-O'Hare Intl
waypoint.0=, KSEA, , KSEA, A, N47* 25.89', W122* 18.48', +000429.00,
waypoint.1=K1, SEA, , SEA, V, N47* 26.11', W122* 18.58', +000340.00,
waypoint.2=K1, GEG, , GEG, V, N47* 33.90', W117* 37.61', +002760.00,
waypoint.3=K1, MLP, , MLP, V, N47* 27.41', W115* 38.76', +006099.99,
waypoint.4=K1, GTF, , GTF, V, N47* 27.00', W111* 24.73', +003672.99,
waypoint.5=K1, MLS, , MLS, V, N46* 22.93', W105* 57.21', +002641.99,
waypoint.6=K3, DPR, , DPR, V, N45* 4.69', W101* 42.90', +002530.00,
waypoint.7=K3, HON, , HON, V, N44* 26.40', W98* 18.66', +001300.00,
waypoint.8=K3, PQN, , PQN, V, N43* 59.17', W96* 17.79', +001777.99,
waypoint.9=K3, MCW, , MCW, V, N43* 5.68', W93* 19.79', +001210.00,
waypoint.10=K3, DBQ, , DBQ, V, N42* 24.09', W90* 42.55', +001060.00,
waypoint.11=K5, PLL, , PLL, V, N41* 57.94', W89* 31.45', +000840.00,
waypoint.12=K5, DPA, , DPA, V, N41* 53.42', W88* 21.01', +000800.00,
waypoint.13=, KORD, , KORD, A, N41* 57.81', W87* 54.17', +000668.00,
```

1,500 Nautical Miles in total

Since your first flight will be confusing and busy enough while you play the roll of a 3 man crew, we will not be using FS2004 ATC. Save that for a few flights down the road when you have all of the complex procedures mastered.

Ready for Pushback ... 2nd Generation

747 *Classic* Flight Handbook

COLD and DARK

When you enter the flight deck the aircraft is in a Cold and Dark State. In other words, everything is dead and we need to begin by bringing the aircraft to life.

Open the Electrical Panel and turn on the main battery switch.



The aircraft is now powered by battery power only and this will only last for a few minutes due to the heavy electrical loads placed on the systems.

It is important that we call for some help from the ground crew and we will do that in just a minute.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

Now you need hydraulic pressure for the braking system. An electric pump will supply the hydraulic pressure for this. Open the Hydraulic panel and turn on this switch in the top right corner.



You will now see hydraulic press available on HYD SYS 4 and your brakes will be functional.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

Connecting Ground Power (electrical) Carts to your aircraft.

Open the overhead panel and in the center of it locate the Intercom system.



Click on the GRD CREW CALL button. You will see 2 options appear above it. Select Request Electrical Power.

When that line illuminates, you have successfully asked the ground crew to plug 2 electrical carts into your aircraft. These electrical carts will charge the battery and supply electric to all systems of the aircraft.

The connection of the 2 ground carts requires about 2 minutes and can be monitored by you on the electrical panel.



The two top lights in each corner are not illuminated which indicates that ground carts have not yet been connected. In about 1 minute EXT PWR 1 AC CONN light will illuminate which is telling you that the ground crew has connected the first of the 2 carts.



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747 Classic Flight Handbook

In about another 60 seconds the second cart will be connected.



Notice that we have now closed the 2 GRD SERV switches below the upper 2 green lights. This illuminates the green lights. I have also closed the 4 BUS TIE switches at the bottom of the picture which allows the electrics from the external ground carts to supply current to the aircraft. The battery is also being charged at this point. The BUS TIE lights should not be illuminated now.

You can now take the required time to complete the remainder of your duties and get prepared for your flight.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

Since the systems on this aircraft are very complex I hope that you have also read over the section of the manual regarding the fuel panel. Some of that new knowledge is now required as we prepare to start the APU (Auxiliary Power Unit) which will take over from the EXT Ground Electrical carts.



You will require the Main No. 2 Fuel Boost Pumps to be switched on. Otherwise a DC Pump will start automatically to pump fuel to the APU

If I am losing any of you, please read the full manual again. I am only touching on the highlights in the session.

Okay let's get back to the electrical panel again and start the APU.



Move the APU ignition switch from OFF to ON. The blue APU door light will illuminate. You can not start the APU until the APU door is fully opened and the blue light is OFF.

Now you can move the APU ignition switch to the START position. When the APU RPM reaches about 50% the engine will light and the Start switch will return automatically to the ON position.

When the APU has spooled up to 100% RPM you can configure it to take over the work of the 2 external power carts.



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747 Classic Flight Handbook

Now to bring the APU on line:



Notice that AUX PWR lights are now illuminated. We need to start by closing the APU GEN switches. When you do this the APU takes over from the ground carts. The ground carts will be automatically disconnected as only one source can supply electrics.



When both sides are on line you can then go back to the Overhead panel and request the ground crew to disconnect the ground carts,

Open the Bleed Air Valve on the APU panel. This supplies air pressure to the aircraft from the APU.

The aircraft is now self contained and is supplying both electrics and air for all functions. We no longer have a need to rely on any outside sources and the battery will not die as the APU is now supplying a charge.

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747 Classic Flight Handbook

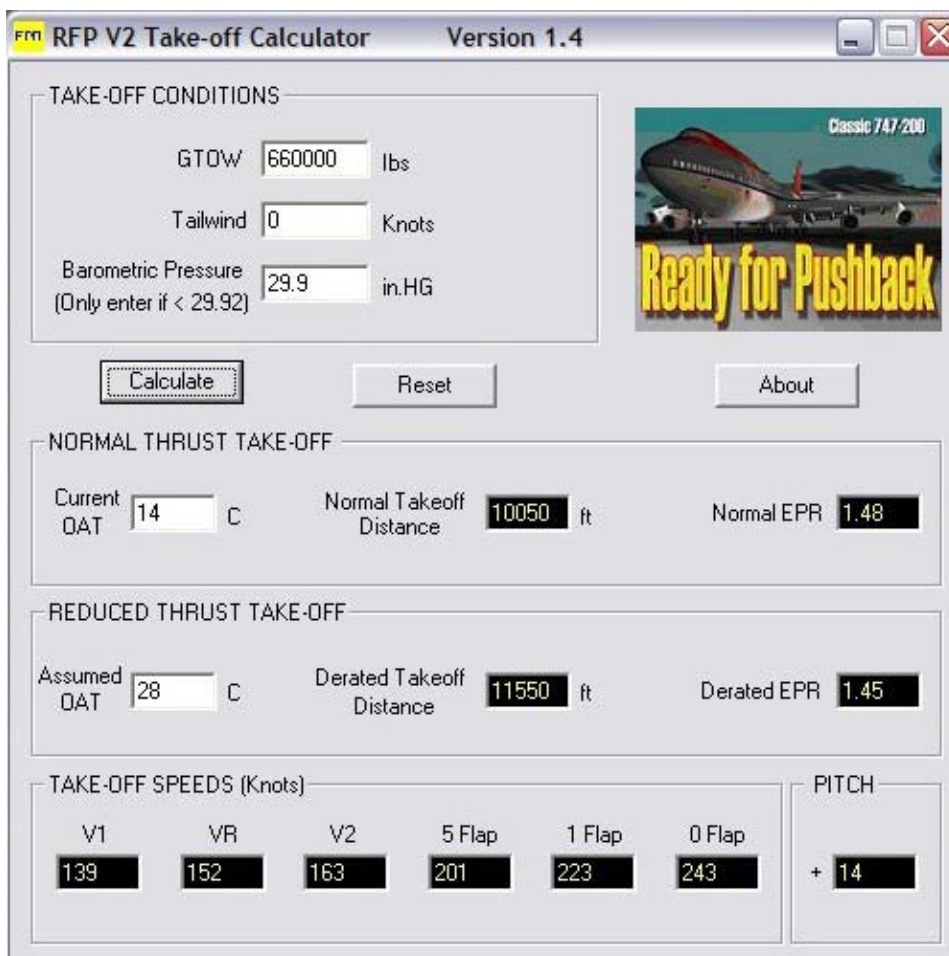
Planning the Takeoff

With a quarter of million pounds of thrust at your finger tips, a little planning must be done for a successful and realistic takeoff and climb out.

There are some facts about your planned flight that you need to know in advance.

ATIS can give you the details that you require so tune ATIS first. ATIS will display this required information such as winds, barometric pressure and Outside Air Temperature (OAT).

Load the RFP Takeoff Calculator



TAKE-OFF CONDITIONS

GTOW lbs

Tailwind Knots

Barometric Pressure (Only enter if < 29.92) in.HG

NORMAL THRUST TAKE-OFF

Current OAT C Normal Takeoff Distance ft Normal EPR

REDUCED THRUST TAKE-OFF

Assumed OAT C Derated Takeoff Distance ft Derated EPR

TAKE-OFF SPEEDS (Knots)

V1	VR	V2	5 Flap	1 Flap	0 Flap
139	152	163	201	223	243

PITCH

+

If you read the full documentation on the use of the Takeoff Calculator you will be able to understand its purpose and function. We have started by entering the GTOW. There is a headwind so nothing is changed in Tailwind field. The actual Barometric Pressure is lower than 29.92 so we enter 29.90

Next we need to find what a normal take off would look like so we enter the current OAT of 14°C in the normal thrust takeoff area. When the Calculate button is pressed we see that we will require 10,050 feet of runway at an EPR of 1.48

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Remember that we have 11,894 feet of runway so a lot is going to waste. In the Reduced Thrust Takeoff area we will try some Assumed Temperature field. Notice that at 28°C we will still only use 11,550 feet of our runway feet and we will only need an EPR of 1.45

The aircraft will burn less fuel, will have lower maintenance cost and will be easier to fly at this lower EPR value for the takeoff. We still have ample runway length left over.

That is called an Assumed Temperature Takeoff. These are considered on every takeoff and used when possible.

Note that the Takeoff Calculator is also displaying V-Speed for takeoff calls and Flap Retraction.

TAKE-OFF DATA FORM											
Gross Weight _____											
EPR/N ₁	<u>1.48</u>										
FLT T/O	<u>1.45</u>										
CLIMB	<u>1.31</u>										
T/O DISTANCE											
REQ'D	<u>11550</u>										
AVAIL	<u>11894</u>										
FLAP	<u>10</u>										
STAB TRIM	_____										
NU/ND	_____										
V ₁	<u>139</u>										
V _r	<u>152</u>										
V ₂	<u>163</u>										
<table border="1"><thead><tr><th>SPEED</th><th>FLAP</th></tr></thead><tbody><tr><td></td><td>10</td></tr><tr><td><u>210</u></td><td>5</td></tr><tr><td><u>223</u></td><td>1</td></tr><tr><td><u>243</u></td><td>0</td></tr></tbody></table>		SPEED	FLAP		10	<u>210</u>	5	<u>223</u>	1	<u>243</u>	0
SPEED	FLAP										
	10										
<u>210</u>	5										
<u>223</u>	1										
<u>243</u>	0										
TOCA	_____										
TRANS ALT	<u>18000</u>										

You will now use this information to configure the FFRATS and Speed Bugs for your takeoff.

NOTE: - This method achieves a takeoff thrust less than the rated takeoff thrust by using an assumed temperature that is higher than the actual temperature. FLEX data (FLEX temperature and FLEX EPR) are computed. FLEX thrust is not to be confused with the term "derated thrust" which refers to a certified engine rating.

Ready for Pushback ... 2nd Generation

747 *Classic* Flight Handbook



Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook



To get to the FFRATS section, open the Radio Stack.

The FFRATS panel is located in the lower left. Move the rotary selector switch to the TOD (takeoff dry) position.

Select EPR as your A/T Mode

Now move the toggle switch on the left to the DECR position until the EPR DECR reads .05 which derates the take off from the default 1.50 EPR to the required 1.45 EPR

You can now close the Radio Stack and the information for the assumed temperature takeoff has been dialed into the Full Flight Regime Auto Throttle System (FFRATS).

This would also be a good time to set those speed bugs on the Airspeed Indicator.



Click on the lower right corner of the Air Speed Indicator. A small box will open that allows you to enter the speed bug settings. Airlines vary in their procedures as to which bug is set to what item. Some airlines do not make a flap 5 call but most do. Some vary in their use of the salmon colored speed bug. You can make your own decision on this and I can only demonstrate the method that I have chosen to use.

When you ran the Takeoff Calculator it gave you a list of the V-Speed settings and this is where you put them to use.

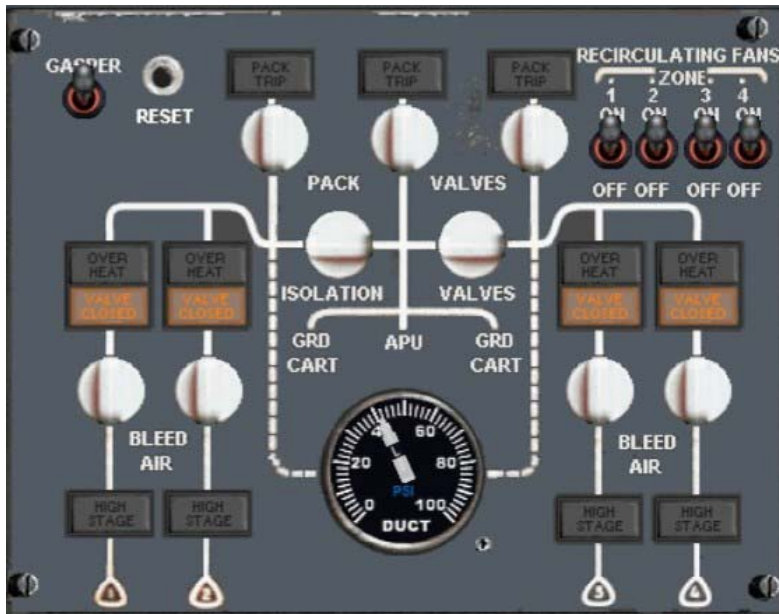
1. Bug 1 = V1
2. Bug 2 = VR
3. Bug 3 = V2
4. Bug 4 = Flaps 5
5. Bug 5 = Flaps 1

I then set the salmon A/T bug to Flaps up

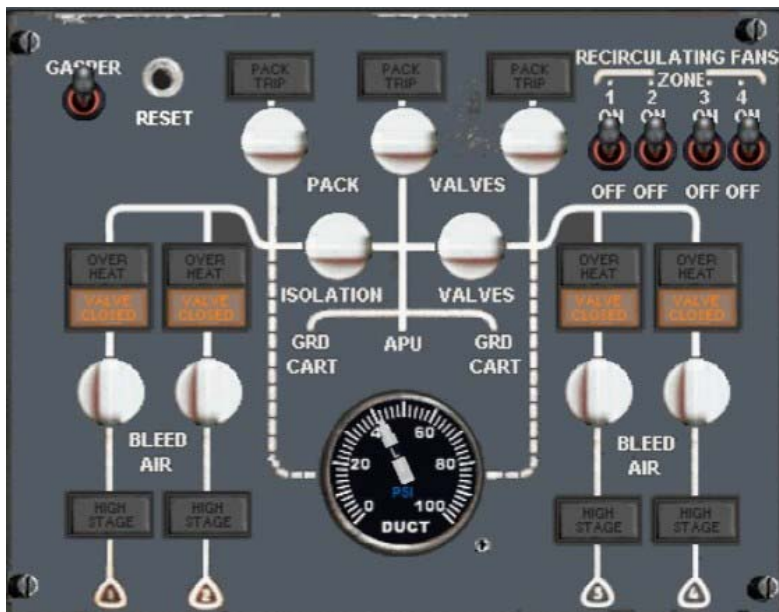
Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

It is also important to check that bleed air is available for an engine start. This means opening the Hydraulic Panel.



This is the configuration you will need prior to engine start. During the engine start the pack valves can be closed to make sure that you have enough air directed to the engines.



Ready for Pushback ... 2nd Generation

747 *Classic* Flight Handbook

So to this point we have covered the basics to get you to the actual pushback and engine start phase. Engines are generally started during or after pushback and our configuration that I have taken you through would require No. 4 to be started first. No. 4 starting first will take over the job of supplying hydraulics, bleed air for pneumatics and even electrics at this point.

I will leave the method of pushback up to you but of course many will use the SHIFT + P routine from FS2004 for this chore.

Now that you have done that it is time to begin the engine start process.

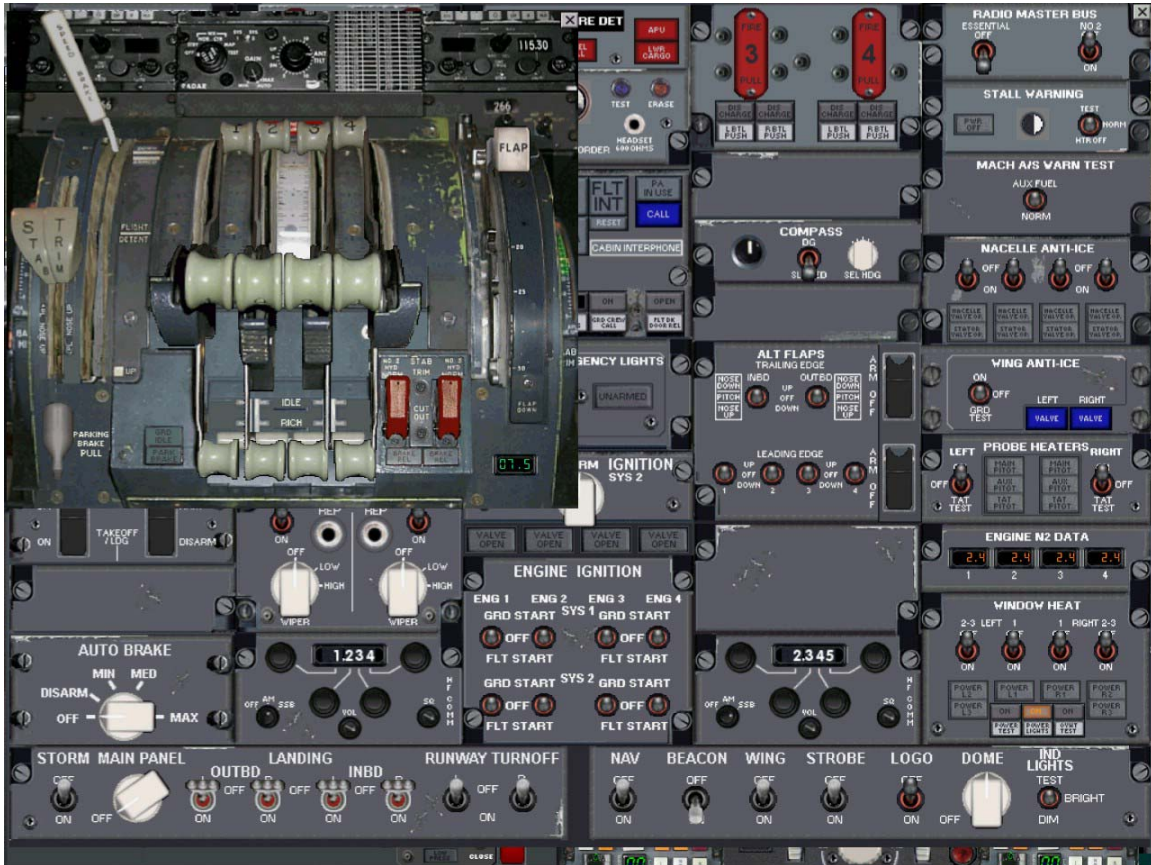
The Fuel Panel needs to be properly configured for an engine start. This screen shot shows the proper position for the Cross Feeds and Boost Pumps.



Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

We will require the overhead panel open next. Also after the overhead panel has been opened, press SHIFT + 6 which will open the console on top of the overhead panel. With your mouse drag the console to the upper left corner so it does not block the ignition switches or the N2 data read-outs on the right side. It should look something like this.



Ready for Pushback ... 2nd Generation

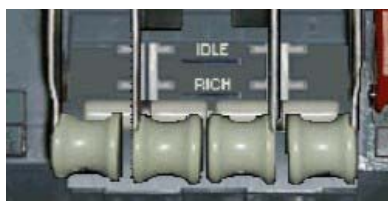
747 Classic Flight Handbook

These are the three sections that we will need to access during the engine start.



First are the ignition switches. These switches will only function properly if every thing else has been properly configured like electrics, pneumatics, hydraulics etc. There is no short cut to doing it properly.

The auto start CTRL + E function built into FS2004 will not start these engines so don't even waste your time attempting to do it.



The fuel valves will also be required. They are partially hidden by the flight engineers throttle levers but are accessible.



The N2 engine data must also be monitored. The fuel valve to the appropriate engine must be opened when N2 has reached 20% and this is the only place where that information is available.

So now that you have all of the required tools available we are ready to get those engines up and running.

Turn on the Beacon to warn the ground crew that you are about to start the engines and they can move to a safe place.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

Start No. 4



Move No. 4 Ignition switch to the GRD START position.

The green Valve light will illuminate and the engine will begin to spool up. The bleed air being supplied by the APU is what is turning the engine at this time.

Monitor the Engine N2 data on the right side of the overhead panel. When N2 for No. 4 shows 20% it is time to open the fuel valve.

Notice there 2 positions available for the fuel valve.

- IDLE – Used for a warm engine
- RICH – Used for a cold engine



Once the engine has started the ignition switch will return to the OFF position and the green valve light will turn off.

Repeat the same process for the other 3 engines in the order of 1, 2 and 3

With a little practice you could probably start the engines on a real 747 Classic after following this procedure.

If all 4 engines are now running – **Congratulations.**

If not, go back to the beginning and read this again.



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747 *Classic* Flight Handbook

Now that the engines are running we can bring the generators on line to power the aircraft.

We need to open the Electrical panel again to do this.

Close the Constant speed drive, close the fields, and close the generators. It should look like this.



The engines are also supplying bleed air and hydraulic pressure.

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747 Classic Flight Handbook

Make sure the hydraulics look like this



The APU is no longer required and it should now be shutdown.

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It is TAXI TIME now.

There is not much that I need to say regarding this part of the flight as I am sure you all know how to taxi out to the active runway and that you some idea of where the active runway is.

Taxi speed in a Classic 742 should be below 25 knots and turns are performed at 10 knots or less.

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747 Classic Flight Handbook

For taxi and takeoff the fuel panel cross feeds and boost pumps need to be configured as shown.



Proceed with your taxi.

When holding short make sure the lights, flaps 10 and other systems are correctly set for your flight.

If you remember earlier we set up the FFRATS for our takeoff EPR. It is now time to configure the main panel for the use of the EPR limiter. Using the EPR limiter will make sure that you automatically set the correct power on takeoff.



The top row of gauges are the EPR Gauges. Click on the knob in the lower right corner which activates the auto EPR Limiter. Click on all 4 of them. The red pointers will advance to the 1.44 position showing the target EPR required for this takeoff.

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747 Classic Flight Handbook

FFRATS on the Tape Gauge only:



- Press the small button at the bottom of the AUTO EPRL Gauge. This will light the Green light at the top of the gauge and indicate that FFRATS is ready to operate. You will note that the 4 amber indicators are set to 1.44 on the EPR scale. This is the EPR calculated by the FFRATS for takeoff.

- Also note the EPR indicator to the upper left of the Speed Gauge, and on the AP Annunciator



Next we need to set the ignition switches on the overhead panel to the FLT START position. If an engine should fail on takeoff (possible as failures are simulated in this simulation) an auto relight will be attempted.



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747 *Classic* Flight Handbook

Taxi onto the active runway for your takeoff.

Stop

Set the Auto throttle (A/T) switch on the auto pilot to the ON position. This completes the FFRATS EPR Limiter settings.



When ready advance the throttles to maximum.

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747 Classic Flight Handbook

Monitor V-Speeds



At the second bug you rotate with a pitch of 17° and your goal is maintain a speed during this phase of $V_2 + 10$ knots (154 knots) by using pitch.

When your altitude AGL reaches about 2,500 feet open the radio stack and access the FFRATS panel again. This time move the mode selector to the CLB position that will lower the EPR numbers for the engines.

Now we want to accelerate through flap retraction speeds. To do this simply lower the nose a little and the aircraft will pick up speed. Monitor the speed bugs and as each flap retraction speed is reached you retract the flaps accordingly. During this process you would also begin to bring the nose up to slow down the acceleration and remember that below 10,000 feet you want to hold your speed at 250

knots. This is done by altering the rate of climb and not by changing the power.



After rotation you will want to hold at $V_2 + 10$ knots



At about 2,500 feet you need to open the radio stack and change the FFRATS to climb thrust mode. This will reduce the EPR on your limiter to the calculated climb thrust.

Now you lower the nose so the aircraft will accelerate to the required flap retraction speeds.

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At this bug you select Flaps 5



At this bug you select Flaps 1



At this bug you select Flaps Up

Now on the autopilot move the salmon bug to 250 knots. Allow the aircraft to accelerate slowly to 250 knots by adjusting pitch and adjust pitch to hold your speed at 250 knots while below 10,000 feet



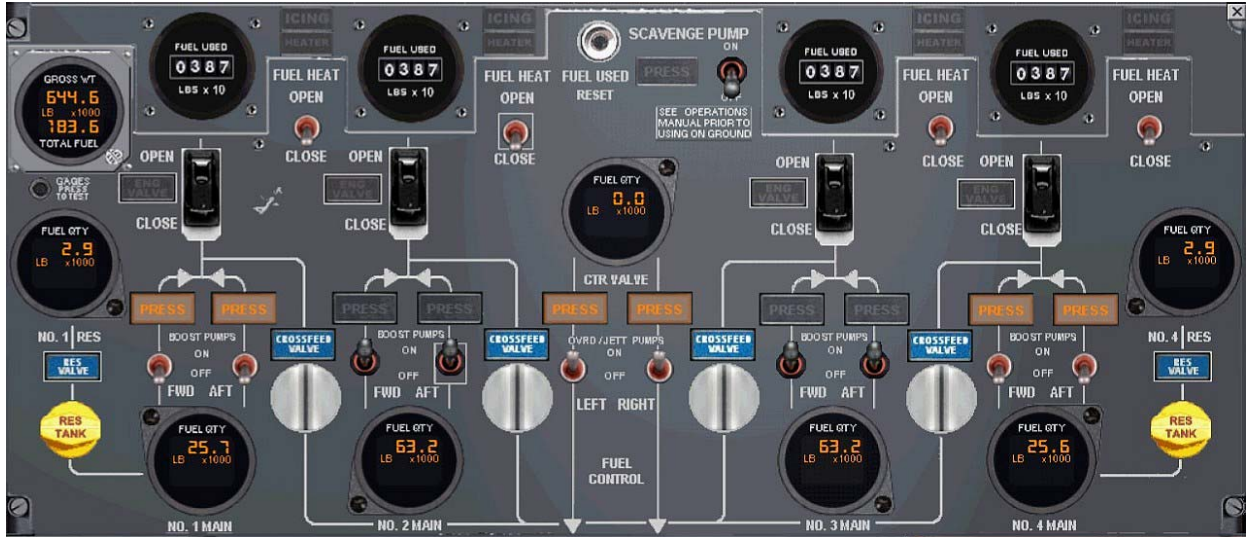
Note the speed indicator on the ASI is centered in the diamond which indicates that we are holding the 250 knots that we have set the bug at.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

Fuel Panel Configuration for climb

It will be required that you study the Fuel Panel section of the manual so that you have a good understanding of the various modes used during a flight and the reasons why. The last thing we need during a flight is an engine or 2 being starved for fuel.



With the amount of fuel that we have on board the aircraft, the above shows the configuration needed for this portion of the flight.

As we get into a cruise mode and fuel burns off, you will be required to reconfigure the fuel panel.

How the fuel panel works in Ready for Pushback is nearly 100% of the real aircraft and doing things properly and by the book are a must.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook



You can be in V/S climb mode at this time and adjusting the vertical climb rate to hold your airspeed at 250 knots.



When you reach 10,000 feet move the salmon speed bug to your climb speed of 317 knots.

Reduce your rate of climb so the aircraft can again accelerate to the required speed.

By monitoring the speed indicator approaching the diamond on the ASI, you will know when you are getting close. Adjust your rate of climb as you get close so that you do not over shoot the 317 knots. Normally when the line is in the lower half of the diamond, it will be time to take the next action.



Select the IAS Climb Mode.

If you have done this correctly within a few minutes the aircraft will be holding 317 knots and adjusting the rate of climb automatically without any interaction from you. The real aircraft can take up to 10 minutes to settle down but RFP should do it in about 3 minutes.

The pressure is off you at this time.

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

Navigation:

I am leaving the method of navigation entirely up to you. I did suggest earlier though that for this first flight you might want to simplify things and use the FS2004 GPS.

If that is the case, to activate the GPS while using Ready for Pushback is easy.



Notice that the Toggle switch on the left side is positioned DOWN in the GPS position.

The Navigation Mode switch on the right side of the Screen Shot is in the VOR/LOC position.

The reason that I am leaving the method of navigation up to you is because I know that we have no new comers to flight simulation here. This add-on package was clearly stated that it is not suited for the inexperienced flight simmer.

Here are a few tips regarding your climb to 33,000 feet or whatever altitude you chose to use.

Remember that your air speed during the climb above 10,000 feet is going to be holding at or near 317 knots per hour.

Monitor the Mach number in the window of the Air Speed Indicator. The maximum Mach number for a climb with this aircraft is mach 0.82

When you reach Mach 0.82 or just slightly before, open the FFRATS Panel on the radio stack and select the MACH mode. You may also opt to do this from the left side of the Glareshield where you see the EPR – MACH and SPEED BUTTON. Pressing the Mach button will disengage the EPR button and will also disengage the IAS Climb mode. When the IAS climb mode trips to off it will also trip the A/T switch to OFF.

You will now need to re-engage the A/T switch and select the climb mode to the V/S position. Dial in a vertical climb speed of about 300 feet per minute. If at any time during the remainder of the climb you notice the aircraft struggling to keep both a 300 fpm climb and holding Mach 0.82 you will need to level off and hold the current altitude for perhaps an hour. This is called “Step Climbing” and fuel must be burned off before attempting to climb again. Step climbs are a standard procedure to reach your optimum cruise altitude.

When you level off at your cruising altitude you will switch off the mach mode on the FFRATS and use the throttles manually to reach a cruise speed of Mach 0.84 at which time you should re-engage the mach hold mode.

The maximum cruising speed for this aircraft is Mach 0.84

Ready for Pushback ... 2nd Generation

747 Classic Flight Handbook

The Descent

Again I am leaving it up to you to decide when you should begin your descent but I would recommend in this case that it be about 160 nm from Chicago KORD. This should allow you ample time to do all the required chores that includes a little reading of this section.

First on the list is slowing the Aircraft to 290 knots.

- Select the SPEED mode on the FFRATS Panel of on the upper left of the Glareshield
- Double check that the A/T switch is still engaged
- Dial 290 knots into the A/T Speed Window

Allow time for the aircraft to slow to 290 knots and you can verify this by getting the speed line centered on the left side of the ADI.

Once you are slowed down to 290 knots you can begin a standard rate of descent. Make sure that your rate of descent is not too great that it increases your air speed too much.

The Approach

Again I am leaving it up to you to decide on the approach and how to get there as this is pretty standard stuff for all of you seasoned pilots.

The Autoland

At this time I want to go over the steps required to do an autoland in this aircraft.

This will show you how to do a perfect autoland, time and time again. If you follow these instructions exactly, you will learn to do it on your first attempt and then you can move on to do it at any airport that has a stable ILS equipped runway.

We will preset some things on the autopilot so we will not have to do it later. Nothing like being prepared is there?



- Set the heading to the runway heading you are using for today's landing
- Set course 1 to the runway course heading
- Set course 2 to the runway course heading
- Set the altitude to 4,000 feet
- Set Nav 1 radio to the ILS frequency

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- Set Nav 2 radio to the ORD frequency of 113.9 and the backup Nav 2 radio to the ILS frequency

Remember, it's okay to use the autothrottle because we are doing an approach below 10,000 feet and below 250 knots.

Fly correct procedures to navigate to your approach and remember to intercept from below the glideslope. If you are using correct charts or Classic S-Combo or FDC, you should be using correct speeds and flap extensions.

Now you have to be on your toes and paying attention to things as they happen quickly

- As soon as the CDI needle in the HSI comes to life –
- Set the mode selector to ILS position
- Repeat that, ILS mode, not VOR/NAV mode. There is a difference
- Reduce speed to the center speed bug position
- Open the radio stack and select NAV 2 radio to the secondary frequency of 110.30
- Both Nav 1 and Nav 2 should now be on the same frequency and displaying the same DME
- As soon as the Glideslope needle starts to move off the top peg on the scale, Select Flaps 25 and lower the gear.
- Open the overhead and set the autobrake to Medium
- Arm the spoilers
- By this time you should have turned onto the localizer.
- Before reaching 2,500 feet on the Radio Altimeter, set the mode selector to LAND
- The autopilot warning light should be flashing amber
- When you pass through 2,500 feet RA, set engage paddle B to the CMD position.
- Both engage paddles should now be in the CMD position; you're on the localizer and on the Glideslope.
- At 1,500 feet RA you should get the FLARE lights AMBER
- Select the approach screen mode
- If you have a yoke or stick with a hardware throttle, make sure it is set to idle position.

You are now going to do a great autoland

- At about 53 feet, depending on speed, you will get green flare lights
- At about 30 feet RA the throttles will cut to idle automatically
- On touchdown the spoilers should deploy, brakes will be on and you should use reverse thrust as required.

That's all there is to it.

You can now adapt the above procedure to any landing you do with success. You may have to practice this landing more than once but when you do get it, you will have it forever.

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Here are some suggestions for obtaining approach plates for airports used in the tutorial.

<http://www.navdata.at/>

This site has links to most every country which has an “aviation authority” having an internet site with published aeronautical charts.

For US only charts, here some URL links to airport, SID, STAR and IAP charts

<http://members.aol.com/ChrisChr2/ilgchart.html> (checked “GOOD” as of 2/20/04)

<http://edj.net/cgi-bin/echoplate.pl> A “pay” service, inexpensive and worth it if you fly in the US and need up-to-date charts.

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Cold And Dark – Annotated Tasks and Checklist

Introduction

Ok here you are, READY FOR PUSHBACK? Only in your dreams! Your 747-200 has been towed to the gate at from the maintenance hanger where it has undergone a major check. The carpets have been cleaned, upholstery cleaned or replaced, the cabin fixed and touched-up as needed. The engines have had an “oil change” [☺], the hydraulic fluid levels have been topped off and everything is in top operating condition for another hundred cycles or so.

You (acting as Pilot, First Officer **AND** Engineer) have just arrived at the aircraft. It is just after dawn and there is a chill in the air, but it will be a bright, crisply cool day. You have to bring the aircraft to life and prepare for flight. This is a complex procedure, but very simple and straight forward when you approach it step by step.

This information is provided to you so you can appreciate the actual workload of the flight crew, and to the extent provided in this software simulation, perform the same tasks step by step. Remember, not all of these systems actually function in this software.

Flight Planning and Setup

When your flight crew reports to the “office”, the “office” is the dispatch office, where you are provided a packet of information including

- aircraft weights and balances, passenger and cargo manifest,
- weather at the departure and destination airports,
- weather for major airports on his route in the event of an emergency landing,
- upper level winds and temps,
- the route which “dispatch” has planned based on weather conditions know at the time,
- fuel loading information, and
- other information so that he can complete the details of flight planning.

	Qty	Weight lbs
Upper Deck Passengers	33	7260
First Class Passengers	38	8360
Economy Class Passengers	329	72380
Forward Hold	-	6342
Bulk Hold	-	10095
AFT Hold	-	6452
Load		114399
Crew + Misc		4110
Load + ZFW		475999
Max Fuel		299001

Selected Aircraft: Ymax 747-200 United

Buttons: Select Previous List, Layout, Write CFG, Select New Aircraft, Exit

We do not have the advantage of our own airline dispatch office, so we will learn to take care of our own planning and information gathering.

Before starting MSFS, you should first load the aircraft, using the **Aircraft Loader** or **Cargo Loader** provided. Make sure you note the Zero Fuel Weight, (ZFW) the “empty” weight of the aircraft plus “payload” or the weight of cargo, baggage, passengers and crew. Be sure to save, as the loader updates the Aircraft config file. Refer to the appendix for Aircraft or Cargo Loader use details.

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Next on the agenda is your route of flight. Dispatch will have prepared the best route for you to follow taking into account weather, winds aloft and fuel economy. They will provide you with a "flight plan," i.e., the series of waypoints you will need to enter into the INS or the MSFS GPS flight plan.

Depending on the detail you enjoy in your flight sim experience, you might now pull out your HI Altitude maps, get the weather off the Internet, and plot your route. Or, you might simply now start MSFS and get moving.

The Navigation Section of this manual provides details on route planning using the INS and the MSFS Flight Planner (including using the GPS). Please refer to that section for hints, details, and ideas.

OK, start MSFS with your aircraft at the gate of your departure airport. You might want to try one of the Cold and Dark situations provided in the "Select a Flight" startup box of Flight Simulator. These situations provide 747-200 aircraft in various liveries, at the gate in various airports. The aircraft are shutdown and in the "Cold and Dark" state, ready for you to bring them to life.

You are now sitting in the cockpit of your -200. Go to the MSFS Flight Planner and do your flight plan. Refer to the **Navigation Section** of this manual, and to MSFS documentation for detailed instructions. When you have completed your flight plan, make sure to **SAVE** it, because this **FILES** your IFR flight plan with MSFS ATC, and is a requirement if you want IFR ATC in your flight.

Once you understand your flight plan, distances involved, and planned for diversion, you can use the Fuel Planner to determine the amount of fuel required for the flight, including contingencies and reserves.

To summarize, by now you should have:

- used the Aircraft or Cargo Loader to load the aircraft and determine the weights,
- used the Classic 747-200 Fuel Planner to determine the amount of fuel to be loaded,
- Used the RFP takeoff calculator to determine V-speeds and EPR settings
- started MSFS at your departure gate (or runway if you prefer),
- prepared and filed your flightplan (saved if you want IFR ATC),
- prepared the fuel loading requirements.

If you are flying with MSFS ATC, have filed a flight plan, you should now:

- 1. Get ATIS for your departure airport, note runway being used for takeoff, current temps and barometer settings, note these on a piece of paper.**
- 2. Contact ATC and Request IFR Clearance. ATC will acknowledge your flight plan, give you a transponder code and a frequency to call when ready to taxi. Frequencies and transponder codes are FILLED IN AUTOMATICALLY FOR YOU.**

Please be sure to refer to the AOM sections. Each section has details of how each specific aircraft system operates, as well as the function of most gauges and switches. It is a reference manual for you to use.

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How to use this Extended Checklist:

First, remember that there are THREE people performing these tasks, and that many of the tasks are done in parallel. You of course, will have to do them sequentially.

You will find that the "Checklist" is actually a "Task" list or a "to-do" list. If you start at the top, read carefully, and follow the instructions, you will be ready for the S-Combo "Checklists" ... so in essence, this task list is **WHAT TO DO**; the S-Combo Checklist is **DOUBLE CHECK TO MAKE SURE YOU DID IT**. **The AOM Sections following provide DETAIL on every task and procedure and you are invited to visit there often.**

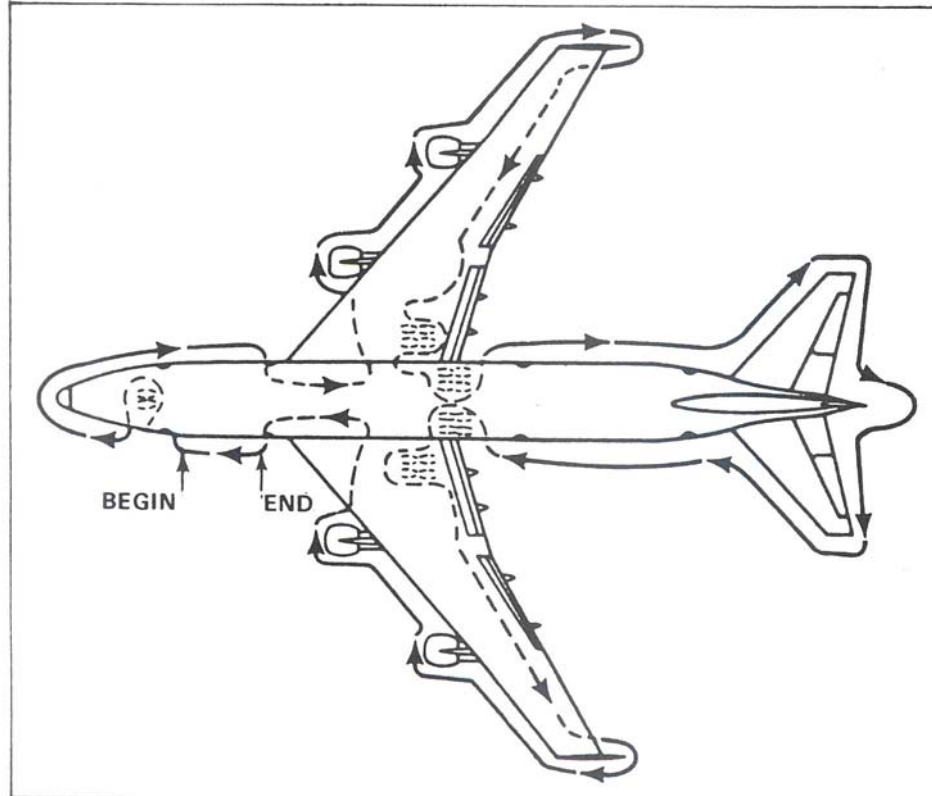
Of course, there are as many ways of approaching this, as there are people on the planet, but the flow of tasks here is from the original Boeing documentation. It is a suggested step-by-step process for you to follow.

If you are using S-Combo and ATC, instructions regarding when to use each of those features are provided in the appropriate sequence.

Preflight

Exterior Check – Preflight Walk-Around Pattern

The exterior check follows a prescribed walk-around pattern to provide a standard routine. It usually accomplished from memory and then reviewed to make sure nothing was missed. NOTE: Obviously, you cannot do these Walk-Around tasks; they are here for completeness of the manual. You can now use ACTIVE CAMERA to do your walk around. (Available separately)



EXTERIOR PREFLIGHT WALK-AROUND PATTERN

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Make sure you have started S-Combo and connected it to MSFS now.

Exterior Safety Check

Engineer Exterior Walk-Around

L H Static Ports.....	CLEAR	Check that the small holes in the static ports appear open. Watch for clear ice, especially after reversing in snow.
L H Stall Warning Vane	CHECKED	Check that the small airfoil and Crank appear intact.
L H Pitot/Static Masts	CHECKED	Covers should be off. Check to see that the masts are not encrusted with snow or foreign material and are not damaged.
Nose Gear and Doors.....	Checked	Check wheels and tires for damage and cuts. Note that there is some shock strut piston area visible. Check gear doors and integral glide slope antenna for visible damage. Check for obvious hydraulic fluid leakage from the nose gear steering mechanism.
R H Static Ports	CLEAR	Check that the small holes in the static ports appear open. Watch for clear ice, especially after reversing in snow.
R H Stall Warning Vane.....	CHECKED	Check that the small airfoil and Crank appear intact.
Oxygen Disc	IN PLACE	The green disc, just aft of the forward cargo door, should be intact.
R H Pitot/Static Masts.....	CHECKED	Covers should be off. Check to see that the masts are not encrusted with snow or foreign material and are not damaged.
Pack Inlet and Exit Doors	OPEN	Operative inlet and exit doors should be fully open.
Pack Access Doors	SECURE	Check that the latches are secure on the three large doors covering the three packs. Latches usually hand down when unlatched.
Leading Edge Flap Position.....	NOTED	On approaching the airplane, note the position of the leading and trailing edge. Both should be full up for the personnel safety and to allow unrestricted use of pneumatics for air conditioning. If both flaps are not full up, contact maintenance to provide ground watch while retracting the flaps whenever possible.



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Navigation Lights CHECKED

Beacons CHECKED

Recommended for all flights, required for night flights. The ground maintenance person can verify light operation

Engine Struts and Cowling CHECK

Pylon access doors are blow-out doors, check that all are in. Check for any damaged skin and that all surfaces are flush. Check to see if all fan reverser links are in place and that all fan cowl and main



cowl latches are in place. Check that there are no fluid leaks.

Engine Inlets CHECKED

Look for ingestion damage to the fan blades, serious oil leaks, and for general skin condition of the inlet.



Engine Exhausts CHECKED

Check turbine blades as visible and the general condition of the tail cone. Look for oil puddles and metal debris.



Trailing Edge Flap Position NOTED

Main Gear and Doors CHECKED

Check wheels and tires for damage and cuts. Wing and body gear shock struts must have at least two inches of shiny piston area visible. Check hydraulic lines and other cables for leakage and break-



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age. Check gear doors for any obvious damage or ground maintenance graffiti.

- Landing Gear Doors & Handles... CHECKED If any landing gear door is open, check that the release handle is in the full OPEN position and locked. Contact maintenance for help with the nose gear door handle if necessary
- APU Fire Bottle Disc..... IN PLACE Check that the disk is installed. It is in the left side of the aft fuselage, just forward of the APU. With a thermal discharge, the bottle squib test can still be normal.
- APU Exhaust Area..... CLEAR Be sure the area is clear of personnel, stands etc

NOTE: the following are done prior to power up to prevent accidents and injury to ground maintenance in the event that electric hydraulic pumps are left on by the previous crew, and the flap indicators are incorrect. These steps prepare for "power on."

Interior Safety Check

- Hydraulic Electric Pump OFF Check that the switch is OFF. If not off, contact maintenance to find out why.
- Hydraulic Air Pumps OFF Turn the four hydraulic AIR PUMP switches to OFF to prevent hydraulic pressure buildup when the pneumatic system is pressurized for air conditioning
- Alternate Flap Switches..... SET Verify that leading edge flap settings are correct for training edge flap setting. Recall exterior visual check. If everything is normal, make sure the ALT FLAPS switches are set to off.



- Flap Handle and Gauges..... CHECKED If flap handle and gauges do not agree, contact maintenance. If there is no power established on the airplane, do this check after power is established.
- Gear Handle Down DOWN If not down, contact maintenance.
- Maint Log and File Folder..... REVIEWED Review all the Inbound Maintenance Log entries, including the Continued Items Sheets. Check that required items are accomplished and that the

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items on the sheets are signed off. Check for sufficient spare forms to complete the trip: Aircraft Maintenance Log, Fuel Computation, Inflight Performance Data. Review the Cabin Log.

Aircraft Log, Checklists, Etc.....ABOARD Check that the Official Flight Log has spare paged, that the EPR computers are in the holder on the front leg of the Flight Engineer's panel, that the Flight Conduct Summary and all normal and abnormal checklists are aboard

Electrical Panel – Establishing Electrical Power

Main and APU Battery ON & CHECKED The BATTERY switch must be on to check the APU battery. Check the main battery with the



switch on also. Voltage should be above 27V with power on the airplane or above 24V with power off. NOTE: Never turn the battery switch off with the APU running.

Depending on your circumstances and airport location, there are a number of possibilities for adding power to your aircraft for “pre-engine-start” activities covered in this section. In this SIM, EXTERNAL POWER is ALWAYS AVAILABLE.. but you can choose to use it or not. Some stopover facilities might not have external power or external air and you will simply have to use the APU to provide electric power and air pressure to start the engines.

EXTERNAL POWER ESTABLISHED See the **Electrical Section of the AOM** for detailed instruction regarding connecting and disconnecting external power.

AND/OR

APU START See APU Start Box, refer to **APU Section of the AOM** for details

APU or External Power.....CHECKED & SET Voltage and frequency tolerances are 110 to 120V and 390 to 410 Hz

APU Generator CHECKED Close the FIELD switch and check that the FIELD OFF light goes out. Check voltage and frequency.

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Select generator switch to CLOSE and check that the GEN OPEN light goes out. Monitor loads. If APU Gen 1 is inop, have External Power 1 connected to power the lower cargo loading systems and doors on passenger and cargo airplanes.

APU Start

1. Battery Switch ON
2. Oil Qty above 2 ¼ Qts
3. Bleed Air Switch in Close position
4. Select APU Batt ON DC Meters
5. Place Master Switch to ON
6. Gen Open Lights ON (Located on AUX Panel)
7. Fuel Valve light ON
8. DC Pump Light ON
9. APU Door light ON
10. When APU Door light is OFF (be patient, this may take 30 seconds or more)
11. Place Master Switch to Start
12. RPM will start to increase
13. DC Volts are low
14. At 7% RPM, EGT will start to rise. It will rise to about 800.
15. At 50% RPM, DC Volts will be normal (28 Volts). This is the starter cut-out point and EGT will now drop to about 450
16. At 95% RPM, Start is complete.
17. Check APU GEN 1 and APU GEN 2 AMPS and VOLTAGES on the AC METERS
18. CLOSE the FIELD and GEN switches to bring on-line. (trips the EXT PWR 1 & 2 to OPEN if EXT PWR was connected)
19. IF EXT PWR was NOT connected, CLOSE the 4 BUS TIE BREAKERS to attach the APU Generators to the SYNC BUS.

APU Shutdown

1. Bleed Air Switch CLOSE
2. Remove Electrical Load
3. GEN OPEN Lights ON
4. EGT Decrease to Idle temp
5. Place Master Switch to STOP
6. Fault Light ON
7. Fuel Valve Light – Bright OFF
8. RPM Decrease
9. At 50% RPM – APU Door Light ON
10. Fault light OFF
11. APU Door light OFF
12. RPM Zero

External Power (if attached) CHECKED Check voltage and frequency. The AC CONN light must be on. Select the EXT PWR switch to CLOSE. The PWR ON BUS light should come on and the switch should hold in the CLOSE position.

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SSB Open LightLIT Check that the SSB OPEN light is lit if both EXT PWR sources are connected OR if both APU Generators are on line and connected to the sync bus.



Bus Tie Open Lights OUT Check that the four BUS TIE OPEN lights are out to ensure that all as busses are powered. If a BUS TIE OPEN light is illuminated, close the BUS TIE switch and check that the light goes out.



Gen Open Lights..... ON

Field Off Lights..... OUT

Gen Bearing Failure Lights..... OUT

CSD Pressure Lights ON These are the normal indications with the engines shut down. If any FIELD OFF light is illuminated, close the FIELD switch and check that the light goes out

Standby Power CHECKED & NORMAL Select the ESS AC BUS selector to OFF. Check that the ESS BUS OFF lights are illuminated.

Essential AC Power NORMAL Leave both Essential and Standby Power stitches in NORMAL

TR Units..... CHECKED Each transformer rectifier unit should indicate a positive current on the dc ammeter. The DC volt-meter should indicate 25-30v for each DC bus. Leave the DC meters selected to BATT



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DC Bus Isol Switches & Lights CLOSE&OUT Place the DC isolation switches to CLOSE. The OPEN lights should be out. This provides at least one backup TR for each dc bus.



Oxygen Pressure CHECKED Check the crew and passenger oxygen gauge;



pressure should be sufficient for the trip. The ON light should be out.

Galley Power Switches ON Turn the four GALLEY POWER switches ON and monitor EXT PWR/APU ammeters. The four TRIP OFF lights should be out.



Fueling

Usually ground crew fuels the aircraft according the instructions from the dispatch office. Fueling can happen at any point during pre-flight. Now would be a good time to attend to fuel matters. Please refer to the **Fuel Section** of the **AOM** for detail on fuel loading.

Pneumatics and Air Conditioning

Temperature Controls.....AUTO Set all ZONE controls approximately vertical in the AUTO mode. Check that all OVERHEAT lights are out.



Trim AirOPEN Select the TRIM AIR switch to OPEN

Bleed Air Switches.....OPEN
Isolation Valves.....OPEN Open the four engine BLEED AIR valves and two wing ISOLATION valves. The HIGH STAGE and VALVE CLOSED lights may be illuminated or out; all other lights should be out.

Recirculating Fans ON

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Gasper fan ON Normally, zone 2, 3, and 4 RECIRC fans and GASPER fans should be on for all passenger operations; off for cargo. Zone 1, the flight deck Recirculation fan is optional.



Pack ControlsAUTO Set all PACK CONTROL switches to AUTO.



Inlet and Exit DoorsFULL COOL
Bypass Valves ..11 O'CLOCK OR WARMER Check that each pack INLET and EXIT door indicates full COOL. The by-pass valve can indicate 11 o'clock.

Overhead Panel

Radio Master Switches ON The radio master bus switches assure power to the radios.



Pilots Indicator Lights Tested Set the WINDOW HEAT power switches to ON, then hold IND LIGHTS switch to TEST. Check that all warning lights are illuminated bright.



Overhead Panel Guards DOWN (closed) All overhead panel guarded switches, except ANTI-SKID and BODY GR STRG should be in the guards down position, including EMERGENCY LIGHTS.



AntiskidOFF Leave switch in OFF. This is a DUMMY Switch.



Body Gear SteeringARM Place the BODY GR STRG switch to ARM.

AutobrakeOFF

Engine Fire Handles IN Check that the yellow "lock flags" under the four handles are out of view and the eight DISCHARGE lights are out. DO NOT CLICK the handles since they will indicate a FIRE, shut engines, etc. Click only for MASTER FIRE WARNING

Wheel Well Fire DetectionTESTED Press the WHEEL WELL FIRE DET TEST switch. The WHEEL WELL light and both pilot's master fire lights should illuminate. The fire bell will always ring.



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Engine Ignition SwitchesOFF & NORMAL Check that all the ENGINE IGNITION switches are selected to OFF and the STANDBY IGNITION switch is selected to NORM.



Voice RecorderTESTED Green Band Indicator: Press the voice recorder test switch for a minimum of 5 seconds. The needle should remain in the green band at all times.

No Smoking ON

TransponderSET The transponder ID can be set, but there is no additional working functionality

Stall WarningTESTED Hold the STALL WARNING switch to test. Note that the PWR OFF light goes out, and the control column shakes. Return the switch to normal. The PWR OFF light should come on.



Mach/Airspeed WarningTESTED Hold the MACH A/S WARNING switch to TEST. Note that the aural “cricket” sound is generated.



Yaw DampersENGAGED Engages MSFS Yaw Damper



Anti-Ice.....OFF Selected the WING ANTI-ICE and NACALLE ANTI-ICE switches to off. The respective valve lights should extinguish.



Window Heat Power LightsOFF



Window Heat ON

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Probe Heaters Lights..... ON

Check that the MAIN pitot, AUX pitot and TAT probe lights are on. Uses MSFS



Pitot Heat function. There is only one PITOT HEAT supported in MSFS. Here a click on the left or right switch moves the left or right switch to TEST, a second click moves BOTH switches to ON. Each switch need to be individually shut off.

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Pilot's Instrument Panels

Flight Mode Annunciator LightsTESTED Check each pilot's mode annunciator light sepa-



rately. Press the space over 1 PTT and then over PTT 2 as indicated above, and these lights are shown: AMBER for 1 PTT, GREEN for PTT 2.

Reserve Brake Valve CHKD & CLOSED

Select the RESERVE BREAK switch to OPEN and check that the green OPEN light comes on. Return the switch to close and the light should go out. Also check that the LOW PRESS light is on or flashing.



Caution Panel NORMAL

All caution panel lights should be out except: four ENGINE OIL PRESSURE lights, four HYD SYS PRESS lights, ANTI-SKID (if the ANTI-SKID switch is OFF), PROBE HEATER

Flight Instruments CHKD& NO FLAGS

The only flag which you might find ON will be the GS flag in the ADI, indicating that there is no GLIDESLOPE signal being received at the time.

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Center Panel and Pedestal

Landing Gear and LE Flaps Lts... CHECKED

Landing Gear: the green light is illuminated. LE Flap: LE Flap should be UP and the Flap tape should indicate such.



Speed Brake DOWN DETENT

Throttles CLOSED

Check to be sure that all four throttles are fully closed

Start Levers CUTOFF

Stabilizer Trim GUARDS DOWN

FFRATS MODE PANEL SET

If using FFRATS for takeoff, set to EPR, dial TOD



Flight Engineer's Mid and Lower Panels

Jettison Switches and lights

..... OFF, CLOSE & OUT

Check that all the switches are in the OFF or CLOSE position and that all amber and blue lights are out.



Brake Source CHECKED &SYS-4

Select BRAKE SOURCE switch to SEC SYS-1 and note that the green light illuminates. Return switch to PRIM-SYS4 the green light should go out. The brake source LOW PRESS light should be illuminated. Switch should be left in PRIM SYS-4



Engine Hydraulic Pumps NORMAL

Place 4 ENG PUMP switches to NORMAL. The 8 PUMP PRESS lights should be illuminated and all other lights should be out.



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Reserve Fuel Valves	CLOSED	Close the reserve valves so that the tanks do not drain during refueling. Check that the RES VALVE blue lights are out	
Crossfeed Valves Set	SET	Normally, number two and three crossfeed valves should be closed; one and four valves open. Check that CROSSFEED VALVE blue lights are out. (Refer to the FUEL SECTION for more details.	
Fuel Pump Switches	OFF	Check that the ten BOOST PUMP switches are off.	
Engine Valve Switches	OPEN	Check that the four ENG VALVE switches are open. All ENG VALVE lights should be dim.	
Fuel Heat	OFF	Check that the four FUEL HEAT switches are at CLOSE and that the ICING lights are out. The HEATER light should be out.	
Fuel Used	ZEROED	Press the FUEL USED RESET switch until all four gauges read zero.	
Fluid Quantities...	CHECKED & RECORDED	Verify that the fuel is loaded, test the fuel and hydraulic gauges. Record the fuel, engine oil, and hydraulic oil gauge quantities.	

Pilot and First Officer Preflight

Radios

First Officer's Radio Check		This is a functional check to ensure proper operation of those radios required for flight.
INS	SET	See Navigation Section for detailed instructions
PA and Cabin Interphone	CHECKED	On passenger aircraft, make an announcement over the PA to test.
VHF Radios	CHECKED	Select an active frequency, like ATIS. Or using MSFS ATC, select ATIS or IFR flight plan Clearance.
Transponder	TESTED	If you use MSFS ATC, and have filed an IFR flight plan, you can request clearance, and the trans-

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- VORs CHECKED ponder will be automatically set for you. In this sim, STBY and TA/RA have no functions. If your current location has an active VOR transmitter, select the VOR frequency, the appropriate needle on the RMI may deflect in the direction of the VOR, depending on VOR location.
- DME CHECKED IF the VOR you have selected has a DME associated with it, in addition to RMI needle deflection, you may also see a distance indicator on both the RMI and the DME gauge.
- ADF CHECKED If your current location has an ADF, tune the frequency, set the ADF/VOR switch on the lower right of the RMI to ADF. The Needle should deflect in the direction of the ADF transmitter.



Pilot and First Officer Pre-start

- Radio Checklist..... declare The First Officer will declare the status of completion of the radio checklist as accomplished and appropriate to the flight
- INS Position and Waypoints declare Confirm that the correct current position is inserted, and that the present position is inserted as waypoint No. 1 and that waypoint 2 has been entered. OPTIONAL
- No Smoking, Seatbelts and Exit Lights
..... ON
- Exterior Lights.....SET Check all exterior light switches for desired lighting. NAV and LOGO should be on
- Compasses... SYNC'D & CROSSCHECKED DUMMY SWITCH, no function
- Altimeters..ON, SET and CROSSCHECKED You wrote down the Baro setting from ATIS, right?
- Clocks declare Check that the clocks are set to the correct GMT and the elapsed-time functions are zeroed.
- Rudder and Aileron TrimZERO Check to see that the trim of both is set to zero.
- Engineer's Preflight COMPLETE
- Fluid Service declare
- Takeoff Bugs..... declare
- INS Status.....CHECKED and NAV
- Shoulder Harness.....FASTENED
- ATIS and ATC Clearance declare



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Prestart Tasks are Complete, run S-COMBO Pre-Start Checklist Engineer's Start Check

Overhead Hatch Handle LOCKED

Electric Hydraulic Pump ON When convenient, the Flight Engineer should obtain clearance from the ground crew to pressurize the No. 4 hydraulic system. Place the ELEC PUMP HYD SYS 4 guarded switch in ON and verify that the switch remains in the ON position. Check that the hydraulic system No. 4 pressure gauge indicates at least 1800 psi.



(pushback) ADP Pump No. 1 & 4 AUTO When ready to pushback, set the No. 1 and No. 4 AIR PUMP (ADP) to CONTINUOUS. Check that the PRESS light is out and the RUN light is illuminated and that the HYD PRESS is normal. Then set the switch to AUTO and again check the lights and system pressure. The AUTO position provides hydraulic pressure for body gear steering and brakes during pushback until the No. 1 EDP can provide pressure.



(pushback) Brake Source SELECTED Set the NORMAL BRAKE SOURCE SELECT switch to SEC SYS-1 to utilize the ADP hydraulic source. Check that the green SEC SYS-1 light is illuminated when No. 1 system is selected. Both the amber LOW PRESS lights should be out.



External Power Disconnected Make sure you have disconnected the EXT PWR 1 and EXT PWR 2 if you had connected them originally.

APU ON Make sure APU is on and Bleed Air is OPEN

Fuel Pumps ON If sufficient electrical power is available, turn on all eight main tank boost pumps. Otherwise turn on one boost pump per tank. The engines will start without boost pumps, but this type of start causes unnecessary wear on the engine pump.

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- Packs..... declare Verbally announce if one pack is on or if all packs are off. With APU air, leave one pack on if duct pressure is adequate.
- Duct Pressure..... declare Verbally announce the indicated duct pressure. 40 psi is desired

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Fuel Quantity Gauges.....TESTED

Press the GAUGES PRESS TO TEST switch. All quantity gauges including TOTAL FUEL gauge should read all 8's. The 8's will remain for a few seconds and then the digital displays will return to their original indications.



Pilot and First Officer Start

Parking Brake declare

Call for "Push and Start" DONE

Call ground for push and start permission. When received, notify ground that you would like push and monitoring of start. Start sequence and process varies from airline to airline, with some starting an engine at the gate, and the remaining three during and after push, and all the variations in between. This checklist will have you start engine 4 during pushback, then 1, 2, and 3 during or after pushback.

Beacon..... ON

The rotating beacon is an indication to ground crew that the aircraft is about to move and that the engines are to be started.

Engineer's Start Check..... COMPLETE

The flight engineer verifies that all the tasks associated with the Engineer's pre-start and start checklist have been accomplished, and that the aircraft is "READY for PUSHBACK."

Start Checklist..... COMPLETE

Run the S-Combo "BEFORE PUSHBACK and BEFORE START CHECKS" now.

Ready for Pushback ... 2nd Generation

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Starting the Engines:

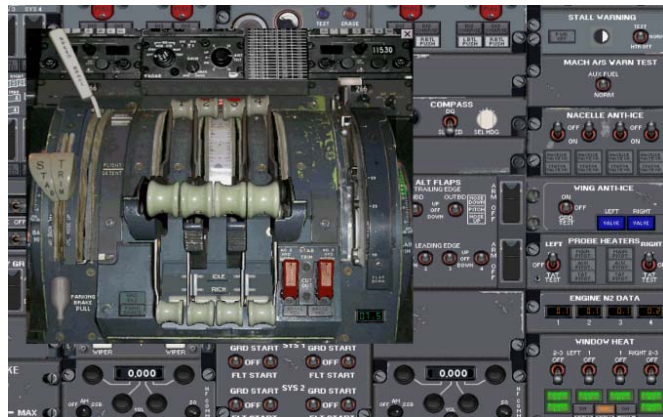
This section assumes you have accomplished the checklist above and particularly that the

- APU is started,
- EXTERNAL POWER has been disconnected,
- you have duct pressure,
- the fuel pumps are on
- ground maintenance has cleared you for start, indicating that there are no obstructions and all personnel and equipment have been removed from the proximity of the engines.

As noted above, start sequence is 4, then 1, 2, and 3. Start will occur during pushback and depending on pushback time, end either before or after pushback is complete. You can, of course, choose to start the engines when you please.

HINT:

Starting the engines is a very straightforward, step one, step two, etc. process. You will need two panels to accomplish the engine start: The Overhead (Shift 5) and the console, Shift 6.. We suggest you open the console and overhead windows, and arrange it like the following: Clicking on the lower right of the console will allow you to move it to the left, uncovering the START Switches and N2 data you will need. Setting up like this for start will ease the process since you will have to switch from Overhead to Console in sequence four times. Practice makes perfect in this situation.



Ok, let's light em up .. as they say.

Captain to Ramp Crew
..... "Brakes off, READY FOR PUSHBACK"

Set the parking brakes to off and start the pushback (SHIFT P, unless you have another pushback gauge installed ... in which case follow the instructions for pushback for that particular gauge.)

Captain: "Start No 4"

Use SYS1 switches for even numbered flights, and SYS2 for odd. Click above the ENG 4 GRD START switch. In two or three seconds, the VALVE OPEN light will illuminate indicating bleed air to engine 4. Switch to the Main Panel and open the console as described above.



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F/O: "Valve Open" Note green VALVE OPEN as above.

Engineer: "Pack Valves Closed" Make sure the three pack valves are closed

Engineer "N2 Rotation" Check the N2 gauge. You will see a steady increase in the numbers for the specific engine you are starting, as here you see the gauge reading about 19.6% N2 on our engine 4 start. You will also hear the engine spooling up.



Engineer "Oil Pressure" As the engine spools up and the engine driven oil pump begins to pump oil through the oil system, the ENG OIL PRESS 4 (since we are starting engine 4) will extinguish.



Engineer "N2 20%" As the tape reaches 20% the flight engineer indicates such to the crew.

Captain "Fuel Flow, Rotation, Light on 4" The captain moves the fuel control lever for engine 4 to IDLE, opening the fuel flow to the engine, and starting the ignition sequence. The engine is now started and will spool up very quickly to idle speed and stable EGT. *HINT: click twice in area above specific fuel lever, in line with the RICH indication. This will move the fuel lever from off to RICH then to IDLE*



F/O 30% Observes N2 rotation increasing

Engineer "46%, Pack 1 Valve Open" At 46% the engineer opens one of the pack valves to start the Air Conditioning system again, now that the pneumatic duct will be fed from bleed air from both engine 1 and the APU.

First Officer "Valve Closed on 4" Indicating that the VALVE OPEN light over the GND switch for the engine just started has extinguished. Note that the ENG 4 GND switch has moved to OFF. (this is automatic, as soon as the start sequence is complete).

Captain No. 4 Stabilized Note that the gauges for the EPR, N1, EGT, N2 and Fuel Flow have stabilized, similar to this:



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Captain “Start Number 1” Continue starting engines 1, 2 and 3 following the same pattern as described above. At some point during the start procedure, you might be called from the Ground Crew indicating that you should “Set the Brake”, in which case, set the parking brake ON. Engines may be started during the push or after the plane is positioned and brakes are set, depending on the duration and distance of the pushback

Run the S-Combo After Start Checks Now

Call ATC to get taxi clearance and instructions

Engineer's Taxi Check

Start Levers Idle Detent	Visually check that all four engine start levers are in the IDLE detent.
Nacelle Anti-Ice.....As Required	If nacelle anti-ice is required, check that the Nacelle Anti-Ice switches are on and that the NACELLE VALVE OPEN lights are on.
Generators.....ON & PARALLELLED	Check voltage and Frequency on all four generators first; tolerances are 110 to 120V and 395 to 405 Hz.
Split System BUS (SSB)..... CLOSED	
Galley Power ON	
APU Bleed Air.....CLOSE	
Pack Valves (one at a time).....OPEN	
Brake SourcePRIM SYS 4	
Hydraulic Air PumpsCHECKED & AUTO	Place each hydraulic AIR PUMP switch in CONTINUOUS (CONT) and verify that the RUN light illuminates and the ADP LOW PRESS light goes out. Return the switches to AUTO for flight and check that the RUN light goes out.
Hydraulic Pressure and Quantity. CHECKED	Check to make sure that ELEC PUMP HYD SYS 4 switch is set to OFF. Check the NORMAL BRAKE SOURCE SELECT switch, PRIM SYS 4 and brake LOW PRESS lights are out.

Ready for Pushback ... 2nd Generation

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Fuel Panel Check and Setup:

With Center Tank Fuel:.....

..... CENTER TANK TO ALL ENGINES

Use center tank fuel, balance mains and then tank to engine in that sequence. Other fuel feed may be used to adjust lateral imbalance before takeoff.

Center Empty & Inbds More than Outbds

..... INBOARDS TO ALL ENGINES

Inboards equal Outboards

..... TANK TO ENGINE

Refer to Fuel section for a detailed discussion of fuel panel setup and operation

Fuel Heat AS REQUIRED

Use fuel heat on all four engines for one minute whenever No 1 Tank temperature is 0 C or colder. When ground OAT is -30 C or colder, leave fuel heat on continuously during taxi.

APU STOP

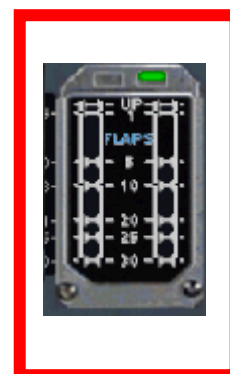
Cockpit Door LOCKED

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After Start Pre-Taxi Checklist

Electrical Power.....ESTABLISHED	Check to make sure that each engine generator is on-line
APU Bleed Air.....CLOSE	
APUSHUTDOWN	
Galley Power Bus Switches..... ON	
Fuel heat SwitchesAS REQUIRED	
Pack 2 and 3..... VALVES OPEN	
Air ConditioningCHECKED & SET	Make sure that PACK CONTROLS are on AUTO, the GASPER FAN switch is ON, the TRIM AIR switch is on, and that the temperatures are set for each of the 5 areas of the aircraft. Refer to the Air Conditioning section for detailed description.
HydraulicsSET	
Door Lights OUT	
Fuel HeatOFF	
Nacelle Anti Ice.....AS REQUIRED	
FlapsTAKEOFF FLAPS SET	
After Start Pre-Taxi Checklist COMPLETE	



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Taxi Checklist

Flaps(), INDICATE (), GREEN LIGHT	Declare takeoff flap handle setting, the gauge indication and check for the leading edge flap green light.
Yaw Dampers & Instruments CHECKED	During a right and left turn, check the RMI's and HSI's and turn needles all indicate the same direction.
Controls FREE	
Takeoff and Departure Briefing . COMPLETE	
Engineer's Taxi Check..... COMPLETE	
Taxi Checklist is COMPLETE	

Run the S-Combo Taxi Checklist during taxi

Engineer's Takeoff Check

Probe Heater's Lights OUT	
Main Fuel Tank Pumps..... EIGHT ON , TEN ON IF CENTER TANK FUELED	Recheck to make sure that boost pumps are on for all tanks containing fuel (center tank if >10000lbs)
Fuel Panel.....SET	Check that fuel panel and crossfeeds are set for current fuel loading situation. Refer to detail in Fuel section,
Fuel HeatOFF	
Engine Ignition FLIGHT START	Set FLIGHT START not more than 5 minutes before takeoff. Select the ignition switches used for engine start, SYS-1 or SYS2, each to FLIGHT START
Pack ValvesAS REQUIRED	If a normal thrust takeoff is being used, turn two packs off. Leave packs on as long as possible for both passenger comfort and to reduce engine stall margin. Turn packs off one at a time allowing several seconds between each pack.

Takeoff Checks

Transponder declare	Check that the transponder is on the proper code.
Cabin Notification and Lights..... declare	For passenger flights, confirm that passengers have been advised that takeoff is imminent.
Engineer's Check..... COMPLETE	

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SpeedbrakeDOWN DETENT

Stabilizer Trim.....declare

Wing Flaps and V-Speeds.....declare

Caution Panel LIGHTS OUT

On entering runway:

Landing Lights ON

Strobe Lights..... ON

Takeoff Checklist COMPLETE

Run the S-Combo Takeoff Checklist while entering the runway

Takeoff: Initial Procedures

Reset the fuel used indicators just prior to thrust application.

If a rolling takeoff is to be performed, the engines are brought to approximately 1.1 EPR as the aircraft is aligned with the runway center line and is advanced smoothly and uniformly to achieve the takeoff setting by 80 KIAS.

If a brakes-on take-off is required, ensure the aircraft is correctly aligned with the runway center-line by rolling ahead for a short distance, and then brake to a smooth stop. The pilot flying the airplane will advance the throttles to the vertical position, wait for the engines to spool up to approximately 1.1 EPR, check for symmetrical thrust, release the brakes, then continue to advance the throttles smoothly and uniformly to achieve the take-off setting by 80 KIAS.

NOTE:

The brakes on technique should be used whenever there is a crosswind or there are slippery runway conditions.

The Captain will hold his hand on the throttles until V1 to minimize reaction time if it is necessary to abort the take-off.

NOTE:

The following describes a manual takeoff procedure as in Tutorial 1, refer to **Autoflight Section** of the **AOM** to use a more automated FFRATS based takeoff.

Rotation

Take-off and initial climb performance depends on rotating at the proper speed and proper rate. Early, rapid or over rotation may cause the aft fuselage to make contact with the runway. Late, slow or under rotation increases the take-off ground roll.

Lift-off should occur at approximately 10° pitch attitude. The initial climb attitude should be limited to 18° maximum due to the cabin floor angle and flight deck visibility.

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Normal Climbout Procedure

When the aircraft is airborne in a positive climb, the Pilot not flying calls out "Positive Rate". The pilot flying calls out "Gear Up"

Accelerate to and climb at $v_2 + 10$ knots (18-degree pitch maximum) to TOCA.

A bank angle of 30° is permitted while flying at $v_2 + 10$ knots.

Providing there are no speed restrictions, at TOCA (min 600 feet AGL) reduce the pitch attitude to about 7° to 9° initially. Accelerate to the flap retraction speeds while maintaining a shallow but positive climb rate of about 500 fpm.

When the aircraft is clean, the pilot flying calls "CLIMB THRUST". The pilot not flying sets the climb thrust. Continue the climb at the 0-flap speed.

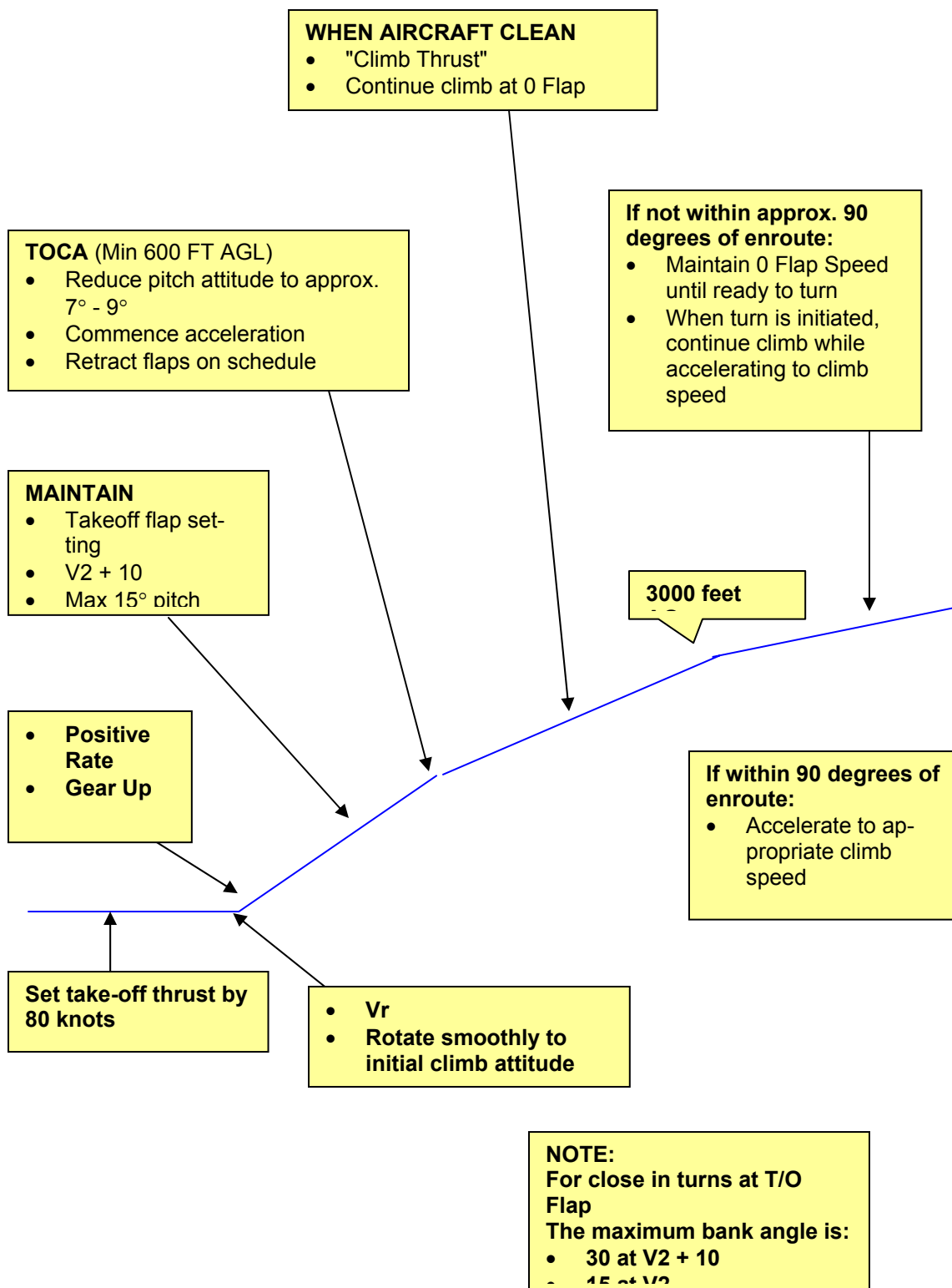
At 3000 feet AGL, and within 90° of being enroute, reduce pitch attitude and accelerate to appropriate speed while still climbing.

If not within 90° of being enroute, maintain 0 flap speed (Max 15° pitch attitude) until ready to turn, then reduce pitch attitude, commence both to turn and to accelerate to appropriate speed while still climbing.

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NORMAL TAKE-OFF AND CLIMB



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After Takeoff Checklist

Engineers Check	The flight engineer will accomplish the items at his station and will normally turn off the NO SMOKING sign. He will also visually check other items at the pilots' stations.
Engine Ignition AS REQUIRED	Leave ignition on if in heavy rain or turbulence, otherwise turn OFF.
No Smoking declare	
Gear and Handle UP and OFF	
Wing Flaps UP, INDICATE UP, LIGHTS OUT	
Pressurization CHECKED	
Air Conditioning SET	If one pack is on, turn on the second pack after the first thrust reduction as workload permits. Two packs can normally be used during climb.
Lights OFF	Check the logo, wing, and landing lights OFF above 10,000 feet. Strobes, beacon and nav lights should remain on through the duration of the flight.
After Takeoff Checklist COMPLETE	

Run the S-Combo After Takeoff Checklist now

Run the S-Combo Climb Checklist passing 10,000 feet

Descent and Landing

Prior to Descent

The second officer will determine the landing data. The PNF will cross check the landing weight, runway distance required, speeds and Go-Around EPR.

Pre-Descent Check

Approaching the descent point, the pilot flying will call ... "PRE-DESCENT CHECK"

Approach briefing COMPLETED Here the pilot reviews the approach as planned, including STAR (standard arrival plate) or radar vectored approach.

Landing Data REVIEWED AND SET Approach plate for landing reviewed, frequencies for ILS, VOR and/or ADF set and checked

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PressurizationSET

Shoulder Harness.....FASTENED

Pre-descent CheckCOMPLETE

Descent Procedure

Plan a clean descent at minimum thrust, without speed brakes. If a higher rate of descent is required, speed brakes to flight detent may be used, keeping in mind that buffeting may be experienced in proportion to the amount of extension. The landing gear should not be used for drag increase above 200 KIAS under normal flight conditions.

With autopilot engaged use the IAS/VS control at all times. The pitch control on the pedestal is not recommended for descent.

- Down to FL350 select 1000 fpm. Retard throttles to maintain M .84
- At FL350 retard throttles to idle. Select desired VS to maintain M .84
- Upon reaching 300 KIAS, select IAS on speed mode switch.
- Monitor the profile throughout the descent and adjust as required.
- Speed may be increased to a maximum of 340 KIAS or a minimum of 250 KIAS.
- When below 10,000 feet establish 250 KIAS or as directed by ATC.

Initial Approach

Caution: Speed brakes must not be used with flaps extended.

In order to conserve fuel, flap extension should not be commenced until required to ensure a stabilized approach.

The optimum airspeeds to fly are:

0 Flap - 0 flap speed + 20

1 Flap - 0 flap speed

10 Flap - 1 flap speed

In Range Check

The pilot flying calls for the In Range Check and the Before Landing Check.

Auto brake switchdeclare Use min for slippery conditions Med for normal and MAX for emergency only.



Fasten Seat Belt Switch ON

Engine IgnitionFLT START Set FLIGHT START Select the ignition switches used for engine start, SYS-1 or SYS2, each to FLIGHT START

Hydraulic Quantity and Pressure... NORMAL

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Landing Light Switches..... ON Set the landing lights to ON when descending through 10,000 ft.



Logo Lights ON Turn on at night for additional collision avoidance protection

RadiosSET

Speed BugsSET

Fuel HeatOFF

In Range CheckCOMPLETE

Run the S-Combo Descent Checklist

Before Landing Check

Landing Gear Lever DOWN

No Smoking Switch ON

Altimeters.....SET QNH

Landing GearDOWN, GREEN LIGHT Check lights to assure status.



Speed BrakesARMED

Wing Flaps (), INDICATE (), GREEN LIGHT Check that the flap handle is in the required landing position, that the flap gauge indicated flaps as selected, and that the leading edge light is on.

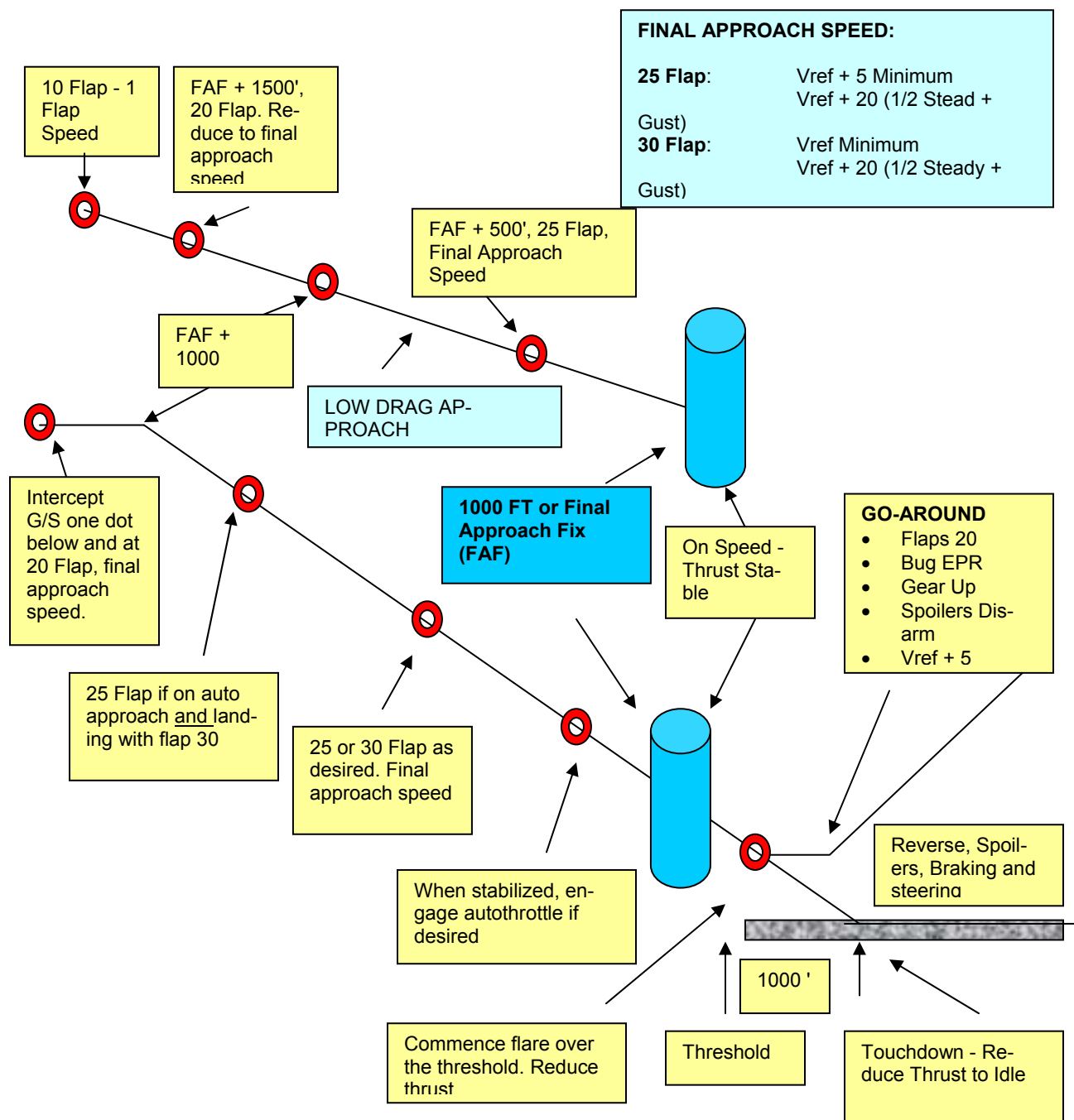


Landing ChecklistCOMPLETE

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Approach and Landing



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Final Approach

When established on final approach with maneuvering complete, set the bug to the speed desired by the pilot flying or requested by ATC.

When 20 Flap is called for, the pilot flying will call the final approach speed, as the aircraft will now be decelerating toward this speed. The final approach target speed is:

- 25 Flap Landing: VREF + 5 minimum and up to VREF + 1/2 the steady state wind + all the gust (maximum additive of 20 knots).
- 30 Flap Landing: VREF + 1/2 the steady state wind + all the gust (maximum additive of 20 knots)

Auto Coupled Approach

If an auto-coupled approach is to be flown and all autopilot systems are operative, always operate in the LAND Mode and select the 2 autopilots to CMD. The 2 CMD modes should not be selected until the airplane is established on the localizer and Glideslope and should be above 1,500 feet AGL.

Landing flap (25) is selected and speed reduced so as to be at the final approach speed at 1,500 feet AGL on a visual approach or at the Final Approach Fix (FAF) on an instrument approach.

Go-Around

PF calls "GO-AROUND", "FLAPS 20" while simultaneously rotating to the go-around attitude (approx. 12 degrees N.U.) advancing the throttles to Go Around EPR and pressing the G/A switch.

When aircraft is stabilized in climb, the PNF calls ... "POSITIVE RATE", PF calls "GEAR UP", "SPOILERS DISARM"

Climb at VREF + 5, when clear of obstacles, minimum 600 feet AGL (TOCA), Return to landing procedure.

Normal Land

Maintain final approach target speed until commencing flare.

If autopilot is in land mode and the flare light has not turned green by 40 feet AGL, PNF will call "NO FLARE"

The PNF will call "30 Feet" when the radio altimeter display that value.

Commence flare over the threshold, at which time the throttles are slowly retarded. Thrust is reduced to reach idle at touchdown. Do not allow the airplane to float just off the runway but fly the airplane onto the runway.

Flare should normally result in a touchdown about 1,000 feet from the threshold. The pitch attitude is increased about 2° during a normal flare. Body attitude is about 5° at touchdown.

If an autoland is performed, disengage the autopilot and auto throttle at main gear touchdown. The autopilot will not fly the airplane nose wheel onto the runway.

Ready for Pushback ... 2nd Generation

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Touchdown

The pilot not flying will call "SPOILERS UP" when they extend automatically

When the main gear is on the runway the pilot flying calls "REVERSE"

The PNF selects throttles.... Reverse Idle

When Interlocks release, select levers ... FULL REVERSE then slightly forward.

The target reverse setting is about 75% N1

The PNF calls out "120, 100, 80, and 60" as the aircraft decelerates. Reverse thrust should be at the idle detent by 60 knots.

Engine Shutdown for Taxi In

After clearing the active runway the Captain will call which engine(s) will be shutdown. Normally both inboards will be shutdown if conditions permit. Do not shutdown 2 engines in high ambient temperatures. If only one engine is to be shutdown it should be the inboard engine on the inside of the last turn to the gate.

Close the throttles for the engine(s) that are shutdown.

After Landing Checklist

Auto Brake SwitchOFF

IgnitionOFF

Landing LightsOFF

Wing LightsOFF

Strobe LightsOFF

SpoilerDOWN DETENT

Flap LeverUP

Stabilizer Trim3 UNITS SET

Engineer:

APU Master Switch..... ON (if required) If this airport and specific gate support normal ground service including Electrical and Air carts, there is no need to start the APU. However, if at an airport without such facilities, start the APU now.

Galley Power Bus Switches.....OFF

APU (if required)..... Start

Ready for Pushback ... 2nd Generation

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AntiskidOFF

Body Gear SteeringARM

Nacelle Anti-Ice (unless required)OFF

Transponder STBY

Run the S-Combo After Landing Checks while taxiing to the gate

Approaching the Ramp

Captain Calls "Brakes Check"

Brakes and Hydraulic Pressures
..... Green Band

When Stopped or "BLOCKS"

Throttles (4) IDLE

Parking Brake SET

Fasten Belt Switch OFF

Anti-Ice OFF

Probe Heat OFF

Window Heat OFF

APU or EXT Power ESTABLISHED

Bleed Air CLOSED
..... READY FOR SHUTDOWN

Hydraulic Air Pumps .. (unless required) OFF The HYD SYS 2 air pump must be kept running if the airplane is parked using the reserve brake.

Fuel Pumps OFF

Reserve Fuel Valves CLOSED

After Second Officer advises Ready for Shutdown,

Start Levers to be shutdown CUTOFF If APU is not running leave engine 4 running until connection of external power is established.

Beacon Light Switch OFF

Ready for Pushback ... 2nd Generation

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Advise signal man
.....Brakes Set, Engines OFF

Note: If Brakes are to be released to enhance cooling, ensure chocks are in place. Brakes must remain set if ramp is slippery or wind exceeds 25 kts.

Advance and retard throttles full travel to confirm freedom of movement.

With zero N2 IndicationBleed Air OPEN

Fuel Log COMPLETED

Termination Check

If the APU is not required, and there is no external electrical source or air source:

Emergency LightsOFF

Standby PowerOFF

Battery Switch.....OFF

Pack Valve SwitchesCLOSE

If you are at a destination where your airline does not have a “Maintenance Station”

Crew Oxygen RegulatorsOFF

INSsOFF

Engineer's Check:

Emergency LightsOFF

Radio Master SwitchesOFF

APU Bleed Air.....CLOSE Shut down the APU using normal procedures

Galley Power Switches.....OFF

Recirculating Fans.....OFF

Gasper Fan.....OFF

APU STOP

Standby Power SwitchOFF

Terminal Checklist COMPLETE

Run the S-Combo Parking Checklist