Rev #	Date	Author	Change	Version
001	19-DEC-2020	IV	Release Candidate	0.90
002	07-FEB-2021	IV	Reworked pictures and flight (EDLP-EDDM)	0.91
003	10-FEB-2021	IV	Amendment of Approach procedure in EDDM	0.99
004	14-FEB-2021	IV	Amendment of Approach procedure in EDDM, amended field elevation at departure airfield, final tweaks	0.99b
005	19-FEB-2021	MK	Final corrections	1.00
006	01-MAR-2021	MK	More final tweaks	1.00
007	09-MAR-2021	MK	Guess what, more tweaks	1.00
008	23-MAR-2021	MK	Tweaks after release	1.00
			-	

Please note there are many translations of this manual available in our forums:
https://forum.aerosoft.com/index.php?/forum/1067-manual-translations/

There is an extensive series of video's showing this tutorial online at:
https://forum.aerosoft.com/index.php?/forum/1061-come-fly-with-me-by-the-dude/

This is the most important manual of the six that are provided for this product. It explains how to fly the CRJ and how to use it in MSFS. Even if you are well acquainted with all CRJ's system it is still very worthwhile to fly this Step-by-Step guide at least once.

When you contact support one of the first things we will do is ask if you have flown the tutorial flight and exactly where thing in the text do not match what you see on screen.

It is a complex document and we strongly suggest you print it and make notes where needed.

CONTENTS

1 INTRODUCTION

This tutorial guides you through your first flight with the Digital Aviation / Aerosoft CRJ. All flight phases are going to be discussed and brief explanations will be provided. The 'systems manual' will provide more in-depth descriptions of the aircraft's systems.

We assume you have read and understood Vol 1 of the manuals before starting here.

This tutorial can be divided roughly into two parts: flight preparation and performing the flight.
The section on flight preparation describes all necessary preparing steps to perform the flight. The following section describes all necessary steps to perform the flight accordingly.

In case users like to skip parts of the preparation, we added 'navigation pages' which offer hyperlinks to later chapters. The navigation pages will furthermore brief your which cockpit state you need to load, which flight situation you are supposed to load and possibly further settings you need to make to continue with the tutorial.

When you seek support, we might ask if you have followed this guide and exactly at what point things on your screen do not match with what you expect from the text. Please be as exact as possible in that!

This tutorial flight takes us from Paderborn (EDLP / PAD) to Munich (EDDM / MUC). Lufthansa offers three flights a day, starting in March 2021. Usually CRJ900 carry out these flights, but for this tutorial we'll start the summer schedule early and with a Lufthansa CRJ700ER instead.

1.1 SCENERIES

The following table shows available scenery packages for MSFS for either airport.

Airport	**Freeware**	**Payware**
EDLP	Aerosoft Paderborn Freeware https://www.aerosoft.com/en/flight-simulation/news/1st-aerosoft-dlc-for-the-new-msfs-for-free	None available
EDDM	Standard scenery	Aerosoft / Sim-Wings Munich EDDM https://www.aerosoft.com/de/flugsimulation/kontinente-szenerien/europa/deutschland/3253/sim-wings-munich

2 FLIGHT PLANNING

Flight planning is a particularly important part of performing a flight. Hence it is recommended to invest some time for planning and preparation, especially if you aim for an immersive flight experience in your sim.

This tutorial flight will take you with a Lufthansa CRJ700ER from Paderborn (EDLP / PAD) to Munich (EDDM / MUC). We'll start Lufthansa's summer schedule a bit early, going off-blocks in Paderborn at 09.25h and on-blocks in Munich at 10.30h local time. Even though this is a rather short flight, please estimate a total of roughly 2 to 3 hours working through all steps of the tutorial.

Please use the 'pause' function in case working through certain steps of the tutorial (like reading passages in preparation for the next step) to keep the schedule.

2.1 DATE, TIME, AND WEATHER

We will schedule our flight to take place on FEB 05th 2021. As we want to leave the parking position in Paderborn at 09:25 please set the time in flight simulator to 08:30.

Of course, you can set up the flight in flight simulator manually, but the installer also provides a situation file, which can be loaded from the 'World Map' menu in MSFS.
The file is placed in directory: <MSFS-Content>\Community\aerosoft-crj\Data\Documentation

To familiarize with the weather conditions, we suggest setting up MSFS manually, using the following settings.

The weather should be loaded with the situation file, but please do check additionally. Anyway, the weather briefing is part of the flight preparation.

- Settings
  - Date: FEB 05th, 2021
  - Time: 08:30 local (07:30 UTC)
  - Snow Depth: 0
  - Aerosol Density: 3 m
  - Precipitation: 0 mm/h
  - Lightning: 0%
  - Temperature MSL: -02°C
  - ISA: -17°C
  - Pressure MSL: 1012.19 hPa
- Clouds:
  - Layer 1: Base 5.500ft, Tops 8.900ft, coverage 40, scatter 80
  - Layer 2: Base 29.500ft, Tops 31.500ft, coverage 20 scatter 90
  - Layer 2: Base 40.000ft, Tops 42.000ft, coverage 20 scatter 90
- Wind:
  - Layer 1: ground level, 055@08, gusts 055, frequency 60, speed 50%
  - Layer 2: 20.000 ft, 033@20, gusts 033, frequency 60, speed 50%
  - Layer 3: 42.000 ft, 015@35, gusts 015, frequency 60, speed 50%

2.2 ROUTE PLANNING AND FUEL PLANNING

Several tools are available for route planning like:

- Aerosoft's Professional Flight Planner X (https://www.aerosoft.com/en/flight-simulation/flight-simulator-2004/tools-missions/1771/professional-flight-planner-x)
- Aerosoft's NavDataPro Charts package (https://www.aerosoft.com/en/search?sSearch=NavDataPro+Charts+)
- SimBrief (https://www.simbrief.com/home/)

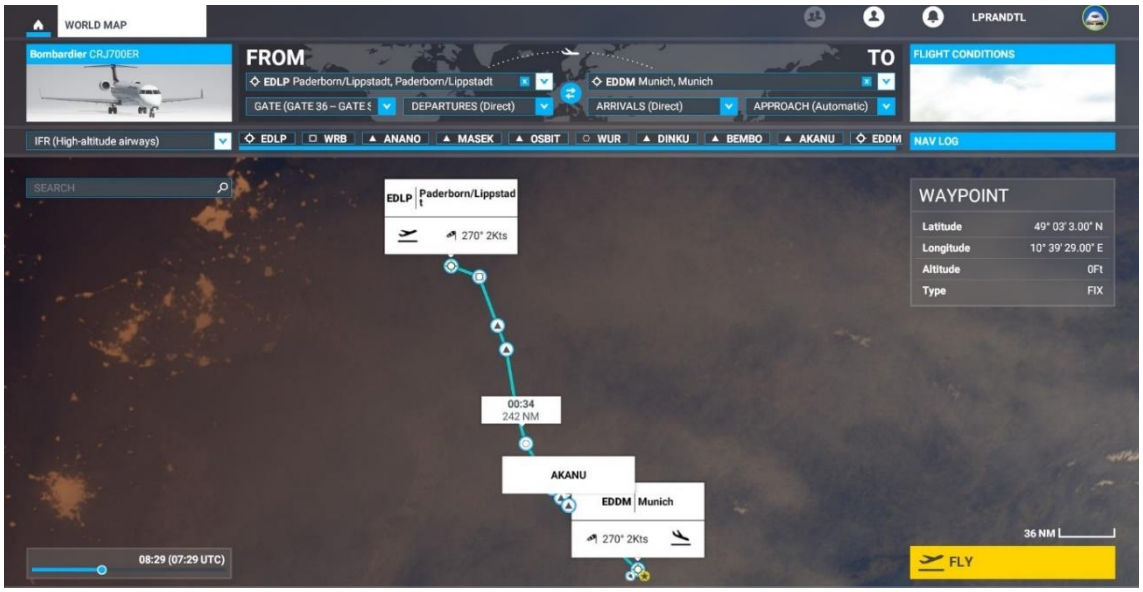
The flight planning for this tutorial flight was done with PFPX. Most likely you get slightly different results when recompiling this route meanwhile as new AIRAC cycles might include changes to airways, waypoints or whatsoever. These changes are supposed to be neglected for this tutorial.

EDLP WRB1X WRB UL126 DINKU L603 AKANU AKAN3A EDDM

We will depart Paderborn from runway 06 and follow Warburg WRB1X SID (Standard Instrument Departure) to Warburg, WRB VOR. Then we follow airway UL126 to DINKU waypoint, there we'll switch to airway L603 which we follow until waypoint AKANU. Here we start to follow AKAN3A STAR to Munich airport.

In case we cannot land in Munich (for example due to bad weather) we'd have to fly to an alternate. During flight planning the alternate is going to be selected taking several aspects such as distance to alternate, weather forecast into consideration. For this tutorial we will select EDDS. As the weather is going to be fine, and to keep things less complex, we will neglect alternating to Stuttgart for this tutorial.

In MSFS 'World Map' menu setting up the flight looks like this.



The following table shows all waypoints of the flight with information on course, distance an altitude at or between those waypoints.

Airway	**Waypoint**	**Name**	**Frequency**	**Course**	**Distance**	**Altitude**
	EDLP	Paderborn				
WRB1X	LP100	-		060	2.9	CLB
WRB1X	LP104	-		083	3.6	CLB
WRB1X	WRB	Warburg	113.70	123	15.4	CLB
	*TOC	Top of Climb		166	8.1	18,000
UL126	ANANO	Anano		166	25.6	18,000
	MASEK	Masek		167	16.4	18,000
	OSBIT	Osbit		178	40.2	18,000
	WUR	Würzburg	110.20	172	22.1	18,000
	DINKU	Dinku		158	33.6	18,000
L603	BEMBO	Bembo		144	8.5	18,000
L603	AKANU			145	7.0	18,000
	*TOD	Top of Descend		133	0	18,000
AKAN3A	LUPOX			133	10.7	18,000
AKAN3A	RENLO			133	12.3	13,000
AKAN3A	ROKIL			158	16.6	DES
ROK08 Transition and ILS08L	EDDM	Munich			34.5	DES
Total					257.5	

Before being able to estimate the fuel consumption, weight and balance needs to be taken into consideration.

2.3 WEIGHT AND BALANCE

After looking into the routing and weather, it is important to check payload and estimate the required fuel. The Quick reference handbook, QRH (Vol. 2) provides simplified flight planning charts, which allow to get a rough guess of the needed fuel and cruise altitude for a certain combination of aircraft weight and payload (called zero fuel weight, ZFW).

- Distance 258nm
- PAX 62
- FWD Cargo 368
- Aft Cargo 370
- ZFW 26’692kg

500	01:13	FL280 3.517 7.754	FL280 3.581 7.895	FL280 3.634 8.012
250	00:42	FL180 2.701 5.955	FL180 2.743 6.047	FL180 2.777 6.122
		22.500 49.604	25.000 55.115	27.500 60.627
				Zero Fuel Weight [kg] Zero Fuel Weight [lbs]

When looking into the table, we get a result, that 2,777kg / 6,122 lbs of fuel are needed to cover the 258nm flight from Paderborn to Munich.

3 LOADING AND CONFIGURING THE AIRCRAFT IN FLIGHT SIMULATOR

To prepare an aircraft for take-off and the following flight several checklists need to be worked through. The flight starts with the cockpit preparation. To start with the preparation, you need to load the CRJ700ER first.

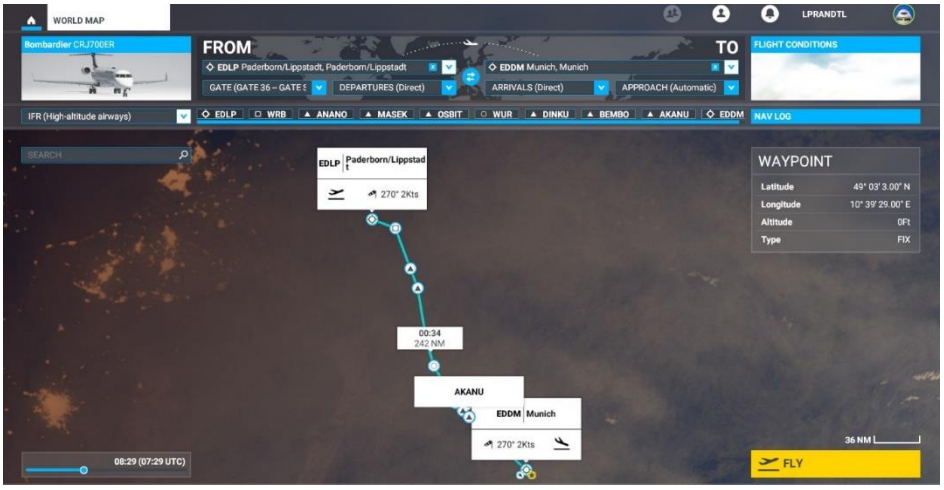
3.1 LOADING THE CRJ IN FLIGHT SIMULATOR

We will start your flight at Gate 1 at Paderborn airport. There are two ways to set up MSFS for this flight.

Either by loading the Preset “EDLP-EDDM” which will place the aircraft with all the correct settings and at the correct location.

Otherwise please configure MSFS accordingly to load the CRJ700ER in the Lufthansa livery at Paderborn airport, Gate 33.

In case you are using a third-party addon you may need to amend the gate accordingly.



3.2 AIRCRAFT CONFIGURATION

Initially the CRJ is going to be loaded with engines running and power supply established.
To be able to work through all the normal operations checklists from a cold and dark cockpit until shutdown in Munich, we need to change the cockpit state.

This allows to briefly introduce “the EFB”. the EFB is the included Electronic Flight Bag which serves several functions in the CRJ:

- Showing checklists
- Setting up and estimating aircraft performance related aspects like payload, fuel, V-speeds and take-off trim setting
- Configuring the aircraft (opening/closing doors, loading panel states)
- Performing maintenance like reconnecting a IDG
- Setting up options like units (kg vs. lbs), or control axis for nosewheel steering

Please refer to the respective chapter in the aircraft operating manual (Vol. 5) for a more thorough explanation. But as we need the EFB to set up the CRJ for this tutorial flight, we are going to look at some of the functions as well. Let us start with the options menu.

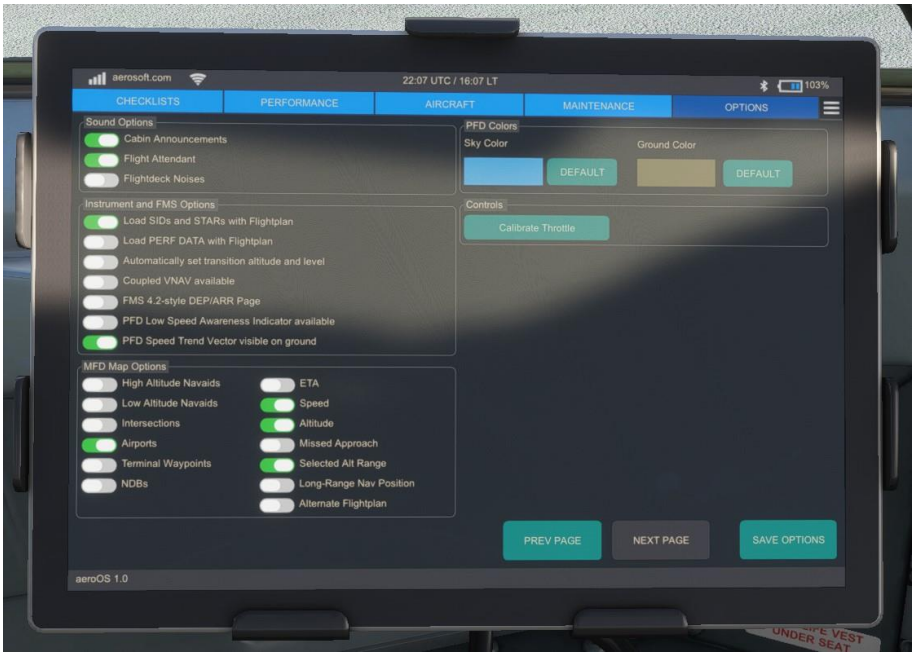
3.2.1 CONFIGURING THE CRJ WITH THE EFB – OPTIONS MENU

Please look at the EFB on the left-hand side of the captain's seat. In case the display is still dark, please click on the display to initiate EFB's starting sequence. This will take a short moment. Afterwards please click on the right-most tab reading OPTIONS. The options menu spreads over 2 pages - the first page should look like this (selected options might differ depending on the selected options).

The EFB allows you to configure the following options. Press NEXT PAGE / PREV PAGE to cycle through pages. Press SAVE OPTIONS to save selected options.

- ***Temperature units***
  Allows you to select the unit of the displayed temperatures – either in °C or F
- ***Weight units***
  Allows you to select in which unit weights are displayed and calculated – either in kg or lbs
- ***Barometer units / Synchronisation***
  Allows you to select the default unit in which barometric pressure is indicated – either in mbar or inhg. The synchronization option allows you to toggle whether barometric pressure settings are synchronised between the different altimeters or not.
- ***Flight director mode***
  Allows you to toggle between a single cue (arrow) or dual cue (cross) representation of the flight director.
- ***IRS align time***
  Allows you to select between different IRS alignment times.
  Realistic takes approx. 10 minutes
  Quick takes approx. 6 minutes
  Instant aligns the IRS as soon as the respective modes are selected and data in the FMS is entered.
- ***Flight number location on PLN page (non-LH liveries only)***
  The flight number is displayed on several pages of the FMS as well as the upper MFD. This option allows you to select which line select key allows entering the flight number (this option is not available for Lufthansa liveries).
- ***PFD / HGS throttle detent hint***
  Allows you to select if a small hint is displayed on the PFD / HGS in case a throttle detent (CLB, TOGA) is selected. Please see chapter on engines and FADEC for further information.

- ***PFD / MFD Display rendering***
  Allows to select whether the PFD and MFD/ND are rendered on the captains or first officer's side.
- ***Show VC displays while 2d displays are visible***
  Allows you to select if the VC displays are still displayed in the VC when the 2d view of the respective display is selected.
- ***Autopilot disconnect yoke sensibility***
  Allows you to select the sensitivity when the autopilot is disconnected when getting input from the users flight controls. This is also dependant on the null-zone-configuration of the user's joystick / yoke.

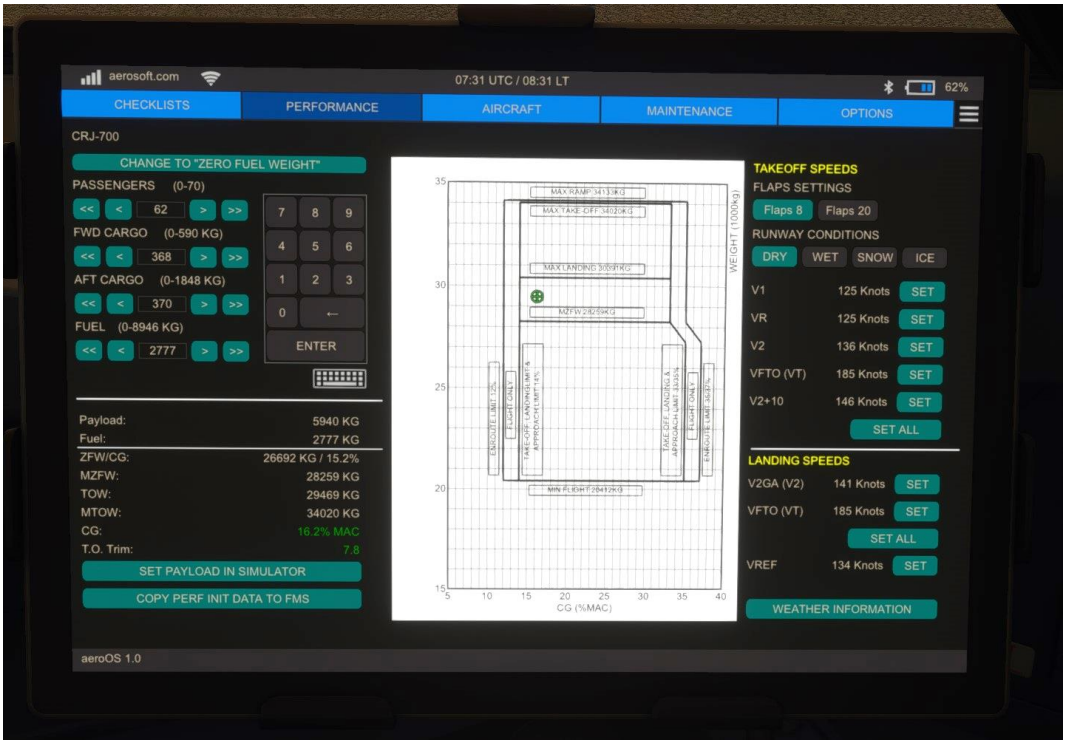


- ***Volumes***
  Allows you to adjust the sound volume for different sounds.
- ***Sound Options***
  Allows enabling / disabling certain sound options.
- ***HGS Scaling***
  Allows adjusting of scaling of HGS.
- ***FMS Options***
  Allows configuration of certain parameters of the FMS.
- ***PFD Colors***
  Allows adjusting of sky and ground colour used on the PFD.
- ***MFD Map Options***
  Allows default configuration for the MFD map options and which information are displayed by default or need to be activated manually from the FMS.
- ***Controls***
  Allows configuration of the nosewheel and throttle axis.

Please check that the options are set according to your preferences.

Before changing the panel state, we need to edit the loading of the CRJ. Please open the 'performance' option menu by clicking on the PERFORMANCE tab.

3.2.2 CONFIGURING THE CRJ WITH THE EFB – PERFORMANCE MENU



Please adjust the number of passengers, payload in the forward and aft cargo compartment as well as the loaded fuel according to the weight and balance section / as the picture above.

- Passengers 62
- Forward (FWD) Cargo 368kg
- Aft Cargo 370kg
- Fuel 2,777kg

This should result in the following weights and positions for the center of gravity (CG)

- Zero Fuel Weight / CG 26,692kg / 15.2%
- MZFW (Maximum Zero Fuel Weight) 28,259kg
- TOW (Take-off Weight) 29,469kg
- MTOW (Maximum Take-off Weight) 34,020kg
- CG (Center of Gravity) 16.2% MAC
- T.O. Trim (take-off trim setting) 7.8°

Press ‘SET PAYLOAD IN SIMULATOR’ to save settings.

On the right-hand side the take-off speeds are displayed depending on the flaps setting (08° for this flight) and runway condition (the runway is DRY).
You can either press ‘SET’ adjacent to each single speed or just press ‘SET ALL’ to set all V-speeds in one go.
The lower section with the landing speeds is not needed for the moment.

Now it is time to switch to the ‘aircraft’ menu to alter the panel state.

3.2.3 CONFIGURING THE CRJ WITH THE EFB – AIRCRAFT MENU

Please press the 'AIRCRAFT' tab to open the aircraft menu in the EFB.

Before switching the panel state to start with a cold & dark cockpit, please check the default state in the lower right-hand corner. The default state is the panel state which is loaded with the CRJ once the aircraft is selected in your flight simulator. Please make sure that it is set according to your preference (according to my experience 'turnaround' provides sufficient immersion as power supply is established but the engines are still off.

When done please load the panel state COLD & DARK by clicking on the respective button in the upper right corner.

The CRJ's cockpit should become literally cold & dark and the CRJ is now ready to start a new flight 'from scratch'.

Afterwards make sure, by clicking the respective buttons, that

- Wheel chocks ..... are in place.
- Guard rails ..... are up (stairs).
- Passenger door ..... is open.
- Forward cargo door ..... is open.
- Aft cargo door ..... is open.
- Ground air cart ..... is removed.
- Ground power cart ..... is removed.
- Service door ..... is open.

4 CONDUCTING THE FLIGHT

Conducting a flight always means to work through a lot of checklists. The checklists are divided into 5 parts:

- Prior to start – prior to engine start-up
- Prior to take-off
- After take-off
- Prior to landing
- After landing

There is no explicit checklist for cruise flight.

Please be aware that apart from checklist items there are also procedures and Standard Operating Procedures (SOPs) which describe how a flight is supposed to be conducted. The procedures are provided by the manufacturer as well as the operator of the aircraft. Hence differences between procedures are possible and those are often the reason for discussions in internet forums. Please be aware of that as people tend to use their own sources of information which might differ from how it is explained here.

In case you encounter any problems please stick to the procedures described in the products manuals and check if you continue to observe any problems.

4.1 PRIOR TO START

4.1.1 SAFETY CHECK

1. CIRCUIT BREAKERS ..... CLOSED

Back side of the cockpit.

As a pulled circuit breaker would deactivate the respective system by disconnecting the power supply, the circuit breaker panels are to be checked for pulled circuit breakers. As the circuit breakers are not simulated you may skip this item. In a real aircraft, you might find some CBs pulled to deactivate aircraft systems which would be indicated in the tech log, the deferred item list and the pulled CB would have a red collar.

2.N/W STRG SWITCH..... OFF

Pilots side panel

Two modes are available: ARMED and OFF. In OFF mode, the actuators of the nose wheel steering are deactivated. With deactivated actuators, the nose wheel steering cannot be controlled from the cockpit. This mode is necessary during pushback to prevent the pushback truck damaging the actuators or hydraulic hoses.

3. HYDRAULIC PUMPS.....OFF

Overhead Panel

All hydraulic pumps are to be switched off, to prevent sudden movements of the control surfaces and hence injuries to other persons or collisions of control surfaces with any obstacles (like ladders, catering trucks, gates, fuel trucks, whatsoever).

Note that in MSFS multi-position switches (like ON – OFF – AUTO) need to be set using the scroll-wheel.

4. LDG GEAR LEVER.....DN / DOWN

Upper pedestal

The gear lever needs to be in the DN position to prevent sudden starting of the gear retraction sequence when the hydraulic is activated.

5.FLIGHT SPOILER LEVER.....0

Lower pedestal

The spoilers are to be retracted for similar reasons as described in the previous two checklist items.

6. SLATS / FLAPS LEVER.....SET (TO ACTUAL FLAP POS.)

Lower pedestal

As well as the flaps are to be retracted. In case the flaps are extended the flaps position and the position of the flap lever need to agree. Again, this step is to prevent sudden movements when the hydraulics are activated.

7. RADAR.....OFF

Not simulated in MFS - Central pedestal

The radar is supposed to be off on ground to prevent any ground personnel being injured by the radar beam.

8.ADG MANUAL RELEASE.....STOWED

Lower pedestal

The air driven generator (ADG) is a backup emergency generator. Basically, it is a kind of propeller which can be extended into the airflow. There it starts to turn and hence generate power. Of course, a certain airspeed is needed that the ADG can provide sufficient power. The ADG is supposed to be stowed away before conducting a flight.

9. EMER FLAP SWITCH.....NORMAL

Lower pedestal

In case the flaps do not react on movement of the flap lever the emergency flap switch provides a backup. This switch is supposed to be in the normal position.

10. BATTERY MASTER SWITCH .....ON

Overhead panel

Now the aircraft is about to be powered up by switching on the master battery.

11. APU / AC ELECTRICS .....AS REQUIRED / ESTABLISHED

Overhead Panel

The APU remains off until the fire test is completed.

12. AHRS / IRS.....NAV

Lower Pedestal

The Inertial Reference System, IRS can determine aircraft movements. To enable the IRS following a route it needs a starting point. Hence during the initialization sequence the start position needs to be entered. This step is performed during FMS setup later and is the reason why you often see coordinates on the plates displaying the gate / parking position.

Please note that the Yaw dampers only engage, when the IRS is initialized properly.

13. EMERGENCY EQUIPMENT .....CHECKED

not simulated

All aircraft have emergency equipment on board. For example, the oxygen masks, swim vests, possibly a rope to leave the cockpit in emergency and much more comprises the emergency equipment. Depending on the aircraft operator differences are possible. As a check of emergency equipment is kind of superfluous for flight simming this is a suitable time to check if everything is available to conduct the flight.

14. GEAR AND SAFETY PINS .....ON BOARD

not simulated

In a real aircraft safety pins prevent the gear from retracting, as long as the pins are inserted. Of course, safety pins are not available in flightsim.

15. AIRPLANE DOCUMENTS .....CHECKED

not simulated

Normally you would now check all documents needed during the flight like the flight plan, load manifest etc. pp.

16. HYDRAULIC 3A PUMP.....AS REQUIRED

Overhead Panel

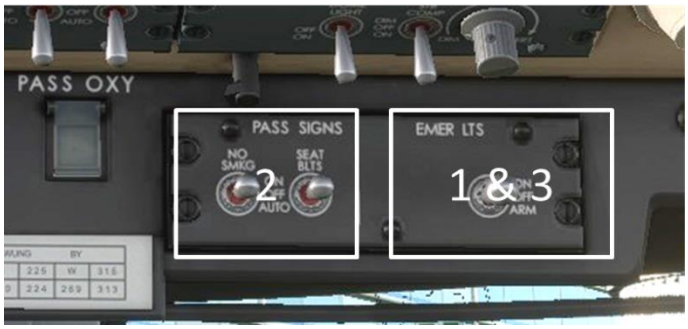
The CRJs hydraulic system is comprised of 3 subsystems with two pumps each (1A, 1B, 2A, 2B, 3A, 3B). The main hydraulic pumps of system 1 and 2 are engine driven pumps, while the system 1 and 2 backup as well as system 3 pumps are electric pumps powered by alternating current (AC). Hence you need to switch on the pumps of system 3 when you need hydraulic pressure with the engines still off. The second pump of system three (3B) is a backup pump. For this tutorial flight please leave the 3A pump OFF for now.

17. FMS INITIALIZATION.....COMPLETE

Centre Pedestal / FMS

For better handling of this tutorial the FMS initialization is done at a later stage – as soon as you feel more comfortable managing the CRJ please activate the FMS at this stage to check the STATUS page and perform the POS INIT. Especially when you set the IRS alignment time to the real value you want to initiate the POS INIT now.

4.1.2 CABIN INSPECTION



1. EMER LTS Switch .....ON
Overhead Panel
Check that EMER LTS ON message appears on EICAS.

2. NO SMOKING and SEAT BELT SIGNS .....AUTO
Overhead Panel
Check that no smoking and seat belt signs are switched to auto.

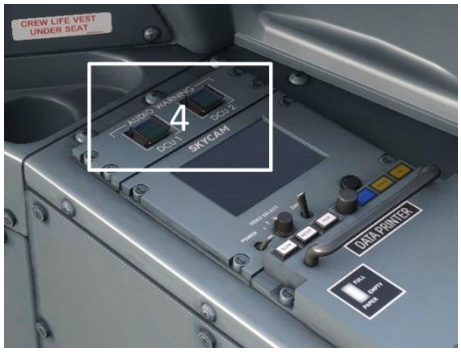
3. EMER LTS Switch .....OFF
Overhead Panel
Check that EMER LTS ON message disappears on EICAS while the EMER LTS OFF message appears.

4.1.4 ORIGINATING CHECK

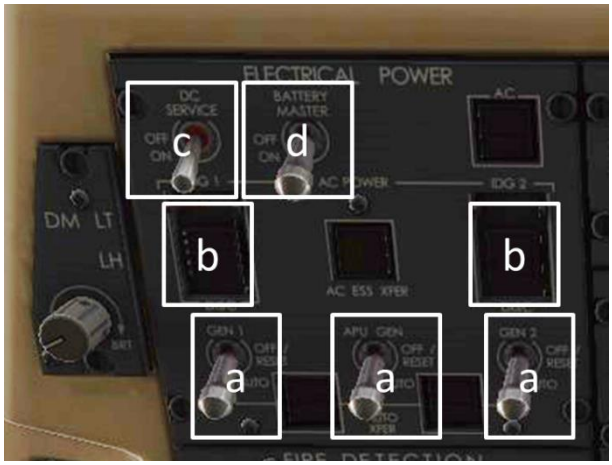
1. INTERNAL & EXTERNAL PREFLIGHT CHECKS .....COMPLETE
not simulated.

2. PEDALS, SEAT AND HARNESS.....ADJUSTED
not simulated

3. CREW OXYGEN AND MASKS.....CHECKED / QUANTITY
only first flight of the day
Press the designated area to check functionality of your quick donning mask (and listen to the test result).



4. AUDIO WARNING PANEL.....CHECKED
Audio Warning Panel (copilot's side panel)
Check that both pushbuttons are safe-guarded and no lights are illuminated.



5. ELECTRICAL POWER PANEL.....CHECKED
Overhead Panel

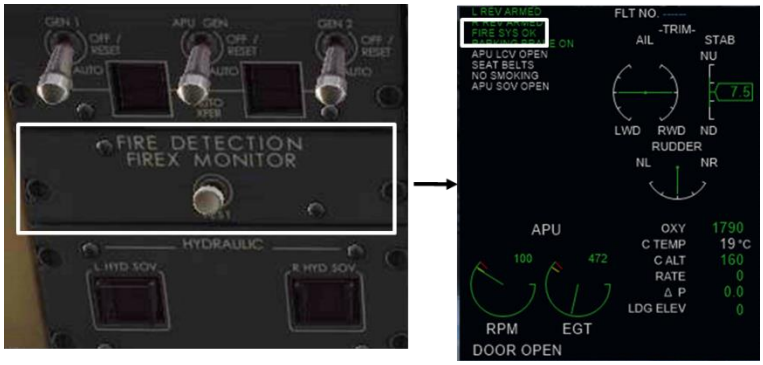
(a). All GEN switches .....AUTO

(b). IDG Disc switches.....Guarded

(c). DC service switch .....OFF

(d). BATTERY Master .....ON

Ensure that the battery switch is on and either an external power source is available and connected or the APU is running and connected



6. FIRE DETECTION / FIRE MONITOR TEST .....COMPLETE
Overhead Panel
Fire Test Routine – only first flight of the day

a). press fire detection monitor test switch for 2 seconds

b). FIRE SYS OK advisory (green) illuminates on EICAS

7. EXTERNAL LIGHTS PANEL.....CHECKED

Overhead Panel

Please check that the light switches are selected accordingly:

a)	**NAV switch**	**ON**
b)	**Beacon**	**OFF**
c)	**Strobe**	**OFF**
d)	**Logo Lights**	**ON**
e)	**WING INSP**	**OFF**
f)	**Landing Lights**	**OFF**
g)	**RECOG Taxi lights**	**OFF**

8. FUEL PANEL.....CHECKED

Overhead Panel

Ensure that fuel pumps are switched off, which is indicated by all lights being off

9. BLEED AIR PANEL.....CHECKED

Overhead Panel

a)	**Wing A/I Cross Bleed switch**	**Normal**
b)	**BLEED VALVES switch**	**AUTO**
c)	**ISOL switch**	**OPEN**

The ISOL switch is only active, when the bleed valve switch is set to MANUAL. As soon as set to CLSD, only the left pack is supplied with bleed air (accordingly only the cockpit is supplied by the air condition). So leave it to OPEN so in case you need to switch to MANUAL the cockpit and the cabin are supplied with air conditioned air.

d) **BLEED SOURCE switch** **Both Engines**

The Bleed Source Switch is only active when the bleed valve switch is set to Manual – otherwise the CRJ adjusts the bleed system automatically.

10. APU PANEL.....AS REQUIRED

Overhead Panel

As the engines need bleed air for start-up, we later need the APU anyway and as virtual fuel virtually doesn't cost anything we'll power up the APU now.

Note: To prevent BLEED MISCONFIG caution messages during APU start, ensure that the wing and cowl anti-ice switches are OFF prior to APU START.

APU START SEQUENCE

(a). APU, PWR Fuel switch **ON**

Overhead Panel Check that the APU SOV (Shutoff Valve) OPEN message appears on the EICAS. Afterwards the APU IN BITE message appears momentarily. Now the APU RPM and EGT appear on the EICAS, followed by the APU DOOR status message. The APU IN BITE message disappears now.

(b). APU, START/STOP Switch **Start**

Overhead Panel Press the APU, START/STOP button to initiate the start sequence. This will be followed by a APU START message on the EICAS, then the APU spools up. Before reaching 60% the START light and APU START message disappear. Roughly 2 seconds after reaching 99% the AVAIL light will illuminate indicating the power and bleed air is now available through the APU.

(c). DC and AC electrical power **Check**

Overhead Panel

Check that the APU Gen switch is set to AUTO and AUTO Transfer lights are extinguished. The DC Services switch stays set to OFF for the remainder of the tutorial flight.

(d) BLEED SOURCE switch **As required**

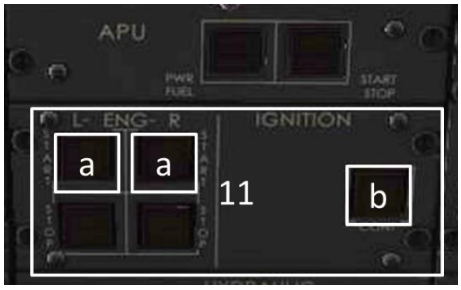
Overhead Leave the switch in the 'Both engines' position. As long as the Bleed valve switch is in the AUTO position the position of the BLEED SOURCE switch is overridden automatically.

(e).BLEED VALVES switch **As required**

Overhead Panel

Set to AUTO .....

END OF APU START SEQUENCE



11. START PANEL.....CHECKED

Overhead Panel

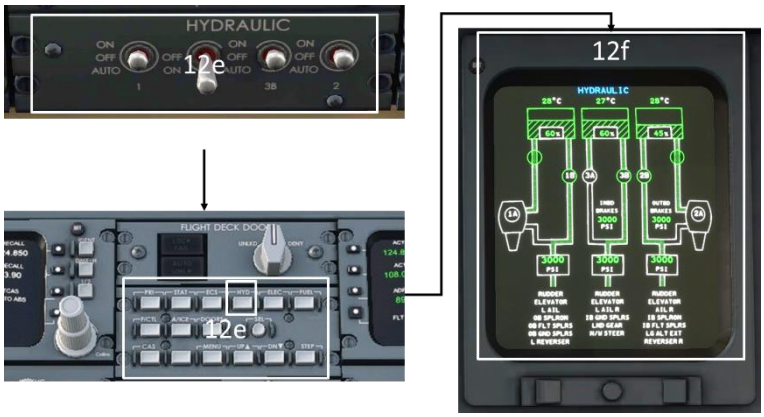
As the engines are not to be started yet check that the start switches are in the off position and secured.

(a). L and R ENG START switches .....OFF

Check that the L and R START lights are out.

(b). IGNITION, CONT switch.....OFF

Check that the switch for continuous ignition is off.



12. HYDRAULIC PANEL .....CHECKED
Overhead Panel & EICAS & pedestal

The hydraulic system is still unpressurized, so please check that all hydraulic pumps are still switched off.

(a). HYDRAULIC switches **All OFF**

(b). EICAS HYD synoptic page **Select**

(c). STAB TRIM switches **Disengage**
Not simulated – please skip this item.

(d). Fluid quantities **Check**
Check for sufficient hydraulic fluid quantity
(Normal hydraulic fluid quantity is 45-85%).

(e). PUMP 1, 3B and 2 switches.....ON
Assure that all control surfaces are clear before powering up the hydraulic system. Check that all pressures and quantities are normal.

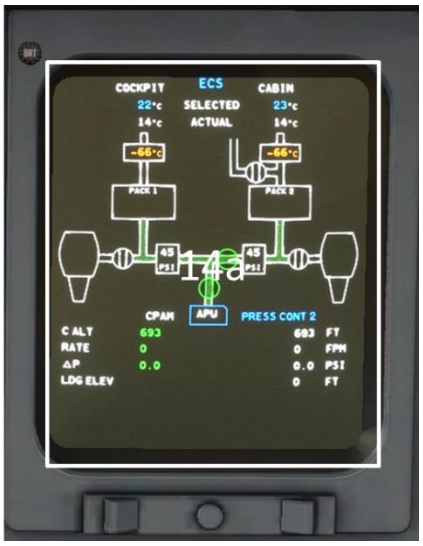
(f). EICAS STAT synoptic page .....Select

(g). STAB TRIM switches.....engage
Not simulated – please skip this item.

(h). PUMP 1, 3B and 2 switches.....AUTO
Setting the hydraulic pump switches to AUTO prepares them to being activated as soon as the engines are started.

(I). PUMP 3A switch .....ON
The hydraulic 3A pump switch only offers a ON and a OFF position, so please set it to ON.

13. ELT SWITCH .....ARM / RESET
Overhead Panel
The emergency locator transmitter (ELT) transmits the aircrafts position as soon as activated, such as in case of a crash. Ensure that it is set to the ARM position.



14. CABIN PRESS PANEL .....CHECKED
Overhead Panel, pedestal and EICAS

The cabin pressurization pretty much works automatically. You are only supposed to adjust the elevation of the landing airport. In case some issue arises after take-off you possibly need to return to your origin airport. Hence you first dial in the elevation of your originating airport. The landing field elevation is going to be dialled in during the descend preparation.

(a). EICAS, ECS synoptic page **Select**
Please proceed to the EICAS selector panel on the pedestal to select the ECS page

(b). MAN ALT switch **Center position**
Check that the cabin differential pressure as well as cabin climb rate is zero and cabin altitude roughly equals field altitude (Field elevation is 699 ft →set to 700ft)

(c). EMER DEPRESS switch **Off / Guarded**
Check that no light is illuminated, and the button is guarded

(d). PRESS CONTROL switch **Off / flushed**
Check that the button is not illuminated

(e). MAN RATE switch **Full DECR**
The setting to full decrease of the manual cabin climb rate switch leads to all valves opening as soon as the system is switched to manual control. In case the system goes haywire while on ground, the cabin is prevented from being pressurized which may harm ground personnel (like popping doors / hatches).

15. AIR CONDITIONING PANEL .....CHECKED
(pack switches pushed and recirc fans ON)
Overhead Panel and EICAS

Now check if the air-condition and bleed system is setup correctly. The pack switches are supposed to be pushed and the EICAS is supposed to indicate FAULT for the pack switches as the engines are still off and hence provide no bleed air.
The recirculation fans ensure that the air-conditioned air is dispersed throughout the entire aircraft.

(a). PACK switches **AUTO**
The packs are basically the aircrafts air-condition. By setting them to Auto they start to regulate the temperature in the aircraft according to the temperature setting by heating up external air with bleed air drawn from the engines. These airstreams are not mixed though. Drawing bleed air from the engine reduces the engines power. Hence operators try to optimize the ratio of external air which needs to be preheated and recirculating air already in the cabin.

(b). RECIRC FAN switch **ON**
To be able to recirculate cabin air recirculation fans are needed. Please switch them ON now.

(c). Temperature control mode **AUTO**
Temperature for the cockpit and passenger compartment is set using the turning knobs on the overhead panel. Two temperature-control-subsystems automatically regulate the temperature in the cockpit and passenger compartment according to this setting. In case those subsystems fail a manual mode is available which is activated by pressing the respective MAN pushbuttons. Illuminated lights indicate that a subsystem is set to manual mode – so please ensure that both pushbuttons are extinguished.

(d). RAM AIR switch **Off / Guarded**
Ram air ventilation is used when both packs fail. As this would be a no-go-item if happening before departure please check that RAM AIR OPEN light is out, and the pushbutton is guarded.

(**e). WING and COWL Anti-ice switches** **Off**
Please check that no anti-ice system is activated and hence then wing, and cowl-anti-ice switches are off.

16.ICE DETECTOR TESTS .....COMPLETE
Only first flight of the day
Overhead Panel

During preparation of the first flight of the day the ice detectors are to be tested. Push and hold the ICE DET / TEST button for 5 seconds. This starts the test sequence, which is finished with the "ADS HEAT TEST OK" message appearing on the EICAS.

(a). EICAS, PRI and STAT pages.....SELECT
Please proceed to the EICAS selector panel on the pedestal to select the ECS page

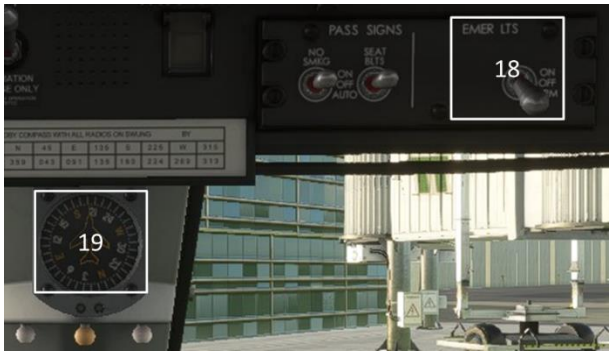
(b). DET TEST switch.....SELECT AND HOLD
Ensure that ICE light is on, ICE caution message is on, ADS HEAT TEST OK advisory message is on

(c).DET TEST switch .....RELEASE
Assure that after releasing the DET TEST switch the ICE light extinguishes, the ICE caution message and ADS HEAT TEST OK messages disappear

17. WSHLD SWITCHES .....LOW

Overhead Glare Panel

Now activate the windshield heating (L and R probe switches) to prevent icing or fogging of the windshield.



18. EMER LTS SWITCH .....ARM

Overhead Glare Panel

As soon as passengers are on board the emergency lights must be available in case of an emergency. Boarding is supposed to start soon, so please arm the emergency lights.

19. STANDBY COMPASS.....CHECKED

Overhead Glare Panel

Please check that the indicated heading on the standby compass agrees with the actual aircraft's heading.

20. STALL TEST.....COMPLETE

only first flight of the day

Pilot Side Panel

(a). STALL PTCT, PUSHER switches .....ON

Make sure that the Stall system is activated, and the switch set to ON.

(b). STALL switch (either).....Select momentarily

Open the protective cover over the stall switch with a mouse click. Then press the pushbutton and keep it pressed – this initiates the stall test sequence. Please check that the test follows the sequence below:

1. The pilot's stick shaker is activated.
2. CONT, ON light is on.
3. CONT IGNITION message appears.
4. The co-pilot’s stick shaker is activated.
5. Stick pusher is activated and STALL switches flash.
6. After releasing the pushbutton – the following steps should follow.
7. Stick pusher is de-activated and STALL switches are out.
8. The pilot's stick shaker stops.
9. The co-pilot’s stick shaker stops.
10. CONT, ON light goes out.
11. CONT IGNITION message disappears.

21. N/W STRG SWITCH.....OFF

Pilot Side Panel

To prevent damage of the nosewheel steering mechanism during pushback, the nosewheel steering needs to be switched OFF.

22. CLOCKS.....SET

Main Panel

Adjust the clock / ensure that time / date is correct (nothing to actually worry about).

23. EFIS Control panels.....checked

Side Panels

Adjust the EFIS displays according to your needs. We suggest: MAP mode and 25 nm range.

(a). Display control switches .....MAP

(b). Air data reference switches FMS1

(c). BARO switch.....Set

Adjust barometer setting to 29,89 in. Hg / 1012,2 mbar. You may also press “B” in case you still use the standard key assignment in your flightsimulator to calibrate the altimeters.

(d). Display reversionary selector.....NORM

24. Instrument panels.....checked
Main Panels

Check that display brightness is adjusted according to your needs.

(a). Primary flight display ..... CHECK
Check that no annunciators are displayed. Cross-check ADI's and RMI's.

(b). Altimeter readout ..... CROSS-CHECK
Check that on both sides (pilot's an copilot's) the same altitude is displayed/indicated.

(c). Multifunction display ..... CHECK
Check that no flags are displayed.

(**d). Cockpit voice recorder..... TEST**
Press and hold Voice Recorder TEST switch for 5 seconds and verify that the green light appears.

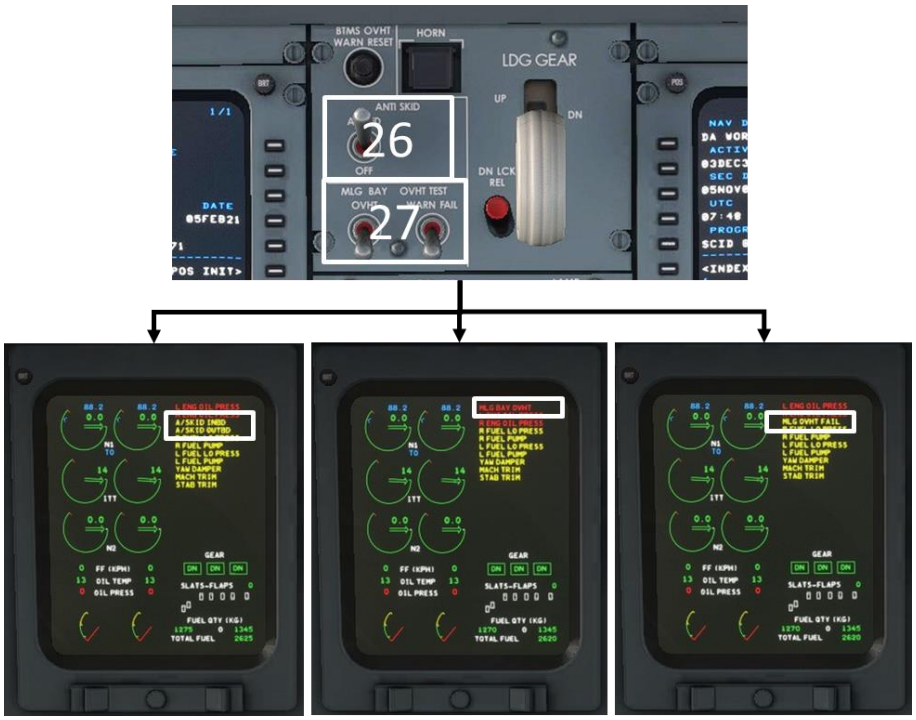
25. EICAS and Standby instrument.....checked
Main Panels

Check the EICAS and standby instruments if you notice any fault flags which are not plausible.

(a). EICAS primary display..... CHECK
Check that no caution messages or flags are displayed, and all other indications are normal.

(b). Stdby altimeters / airspeed indicator ..... CROSS-CHECK
Check that all altimeters display the same altitude.

(c). EICAS secondary display ..... CHECK
Check that no caution messages or flags are displayed, and all other indications are normal.



26. ANTI SKID TEST.....COMPLETE
Only first flight of the day.
Overhead Glare Panel

Initiate the anti-skid test sequence:

(a). ANTI SKID switch..... ARMED
Ensure no A/SKID INBD or A/SKID OUTBD caution messages are displayed.

(b). ANTI SKID switch..... OFF
Ensure A/SKID INBD and A/SKID OUTBD caution messages are displayed.

(c). ANTI SKID switch..... ARMED
Ensure A/SKID INBD and A/SKID OUTBD caution messages are extinguished.

27. MLG BAY OVHT TEST .....COMPLETE
Only first flight of the day
Upper pedestal

Used to simulate an overheat condition in the main landing gear bay.

(a). MLG BAY OVHT switch..... Select OVHT and hold

(b). MLG TEST WARN FAIL switch..... WARN FAIL

28. Upper pedestal .....checked

Lower Pedestal

(a). FMS .....As Required
We'll deal with the FMS later on.

(b). Brake temperature.....CHECK
Check that a normal temperature is indicated (green).

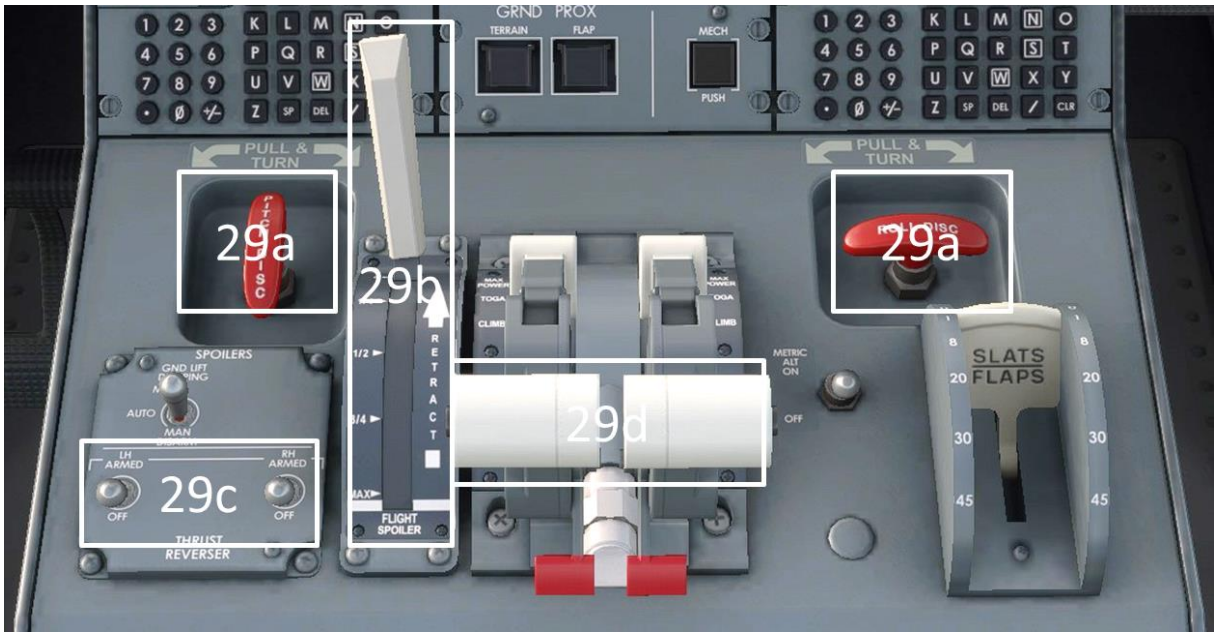
(c). MUTE HORN switch.....Guarded
MUTE HORN light needs to be out.

(d). LDG GEAR lever.....DN
Verify the gear lever is down.

(e). ENGINES, SYNC switches .....N_1 or N_2
Please set the engine synchronizing switch to N_1. The FADEC will synchronize both engines either by rpm of the fan (N_1) or the core engine (N_2). This is done for noise reduction.

(f). IND LTS switch .....As Required
Choose between either BRT or DIM according to your needs.

(g). GRND PROX switches .....CHECKED
Ensure that TERRAIN and FLAP switch are guarded and no lights are on.



29. Thrust lever quadrant.....checked

Pedestal

The throttle levers are to be set to idle and reverse thrust deactivated / stowed.

(a). PITCH and ROLL DISC handles .....IN / STOWED
Check that the Pitch and roll trim disconnect handles are stowed.

(b). GND LIFT DUMPING switch.....CHECK / AUTO
Check that the GND LIFT DUMPING switch is set to AUTO so that the ground spoilers are deployed automatically after touchdown.

(c). LH and RH THRUST REVERSER
switches.....ARMED
L and R REV ARMED advisory messages are on,

(d). Thrust Levers .....CHECK / SHUT OFF
Check that the thrust levers are still set to shut off.

30. Avionics / Radio Tuning Panels.....checked
Pedestal

(a). Radio Tuning Panels,

(a1). Display Control Panel,
TCAS switch.....Select
When the TCAS is switched on for the first time, it goes through a test sequence, hence the TCAS TEST message appears on the MFD. Verify that the threat symbols and VSI indications (vertical advisorys to either climb or descend to prevent a conflict/crash) are displayed.

(a2). ALT line select key.....Select
Turn on the altitude reporting mode. The ATC page indicates ALT ON. The displayed altitude is based on standard atmospheric pressure (29,92 in. Hg)

(b). RTU & FMS TUNE INHIBIT switches.....Off / Flushed
The radio tuning unit, RTU, inhibit switches enable the flight crew to deactivate a failed RTU and enable cross-side tuning. Hence there are two switches for either RTU.
Furthermore there is a FMS tune inhibit switch which inhibits the autotune function of the FMS.

(c). Back-up Mode selector switch.....STBY
Check the back-up tuning unit indicates the same frequencies as COM1 and NAV1.

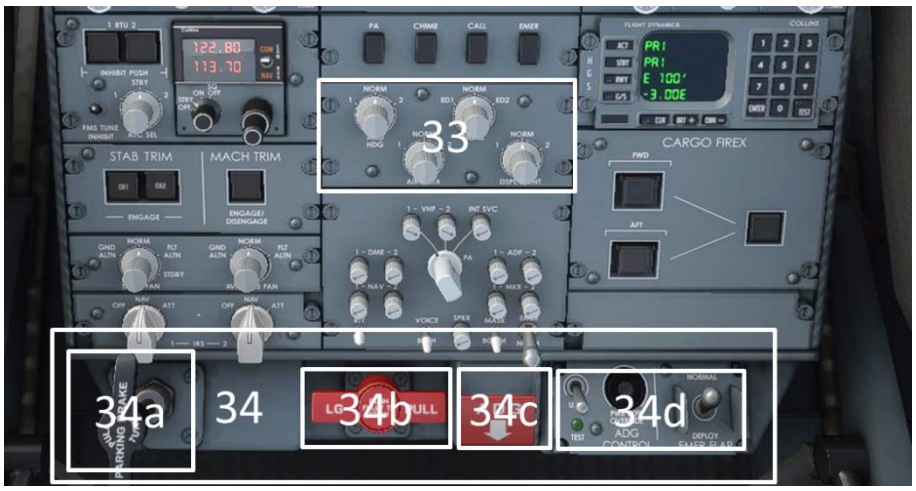
(d). DSPLAY FAN switch .....NORM
Set the Display fan switch to NORM,

(e). IRS switch .....NAV
Ensure that the IRS switches are set to NAV.

31.Trims .....Checked
Pedestal

> **(a). STAB TRIM and MACH TRIM switches .....Engage**
> Engage STAB TRIM and MACH TRIM and check that caution messages are out,
>
> (**b).AIL and RUD trim .....Select**
> Verify free movement in both directions, then set trim to neutral again,

32. YAW DAMPER.....ENGAGE
Lower Pedestal
Please switch on the yaw damper on the lower pedestal panel



33. SOURCE SELECT PANEL .....NORM
Lower pedestal
Please check that all selectors on the source selector panel are set to normal.

34. Lower pedestal.....Checked
Lower pedestal

> **(a). PARKING BRAKE.....SET**
> Check that the parking brake is set.
>
> **(b). LANDING GEAR MANUAL RELEASE HANDLE.....STOWED**
> Every aircraft has a manual release for the landing gear. Check that the CRJ's is stowed.
>
> **(c). ADG manual deploy handle.....Stowed**
> Recheck that the ADG handle is stowed as well.
>
> **(d). EMER FLAP switch .....NORMAL**
> Recheck that the EMER FLAP switch is set to normal.

4.1.4 BEFORE START CHECK

Nearly all preparation work is completed, and we are about to start the engines. The Before Start Checklist is the last checklist which ensures that the aircraft is set up properly for the engine start.

Before starting the engines and check the EFB, that all doors are closed:

- Wheel chocks ..... are removed
  (check that parking brake is set)
- Guard rails ..... N/A
- Passenger door ..... is closed
- Forward cargo door ..... is closed
- Aft cargo door ..... is closed
- Ground air cart ..... is removed
- Ground power cart ..... is removed
- Service door ..... is closed

Make sure that ATIS and start-up clearance by ATC is received (not an issue for this tutorial – as the weather was pre-defined and we are not using ATC instructions. In case you use real weather and intend to use ATC please make sure you listened to ATIS and received a taxi clearance to your assigned take-off runway).

1. PASS SIGNS ..... ON

Overhead Glare Panel

Ensure that all passenger signs (seat belts and no smoking) are switched on.

2. LDG ELEV ..... SET

Overhead Panel

Please dial in the landing elevation of your departure field (700 ft).
In case you have to return after your take-off the correct altitude is already set.

3. BOOST PUMPS ..... ON / CHECKED

Overhead Panel

Monitor center tank quantity for not less than 10 minutes.
Center tank fuel quantity must not increase by more than 68 kg (150 lbs) after both boost pumps are selected on. Switch on the fuel / boost pumps and monitor the fuel quantity.

4. ALTIMETERS ..... SET

Main Panel

Cross-check that the altimeters are set to the pressure (QNH) at the departure airport.

5. FMS / IRS ..... SET

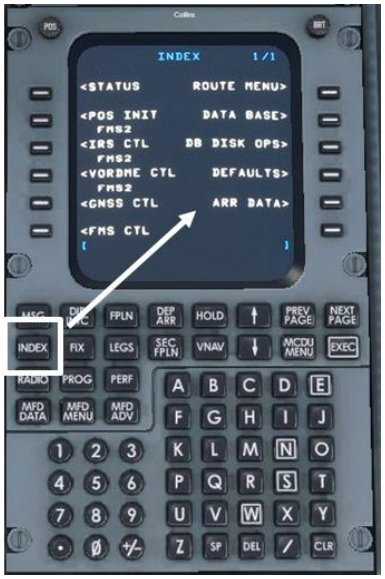
Pedestal

Now we are about to initialize the FMS, enter the route as well as departure route (SID) and arrival route (STAR).

4.1.5 FMS INITIALIZATION SEQUENCE & SETUP

Centre Pedestal / FMS

Handling of the Flight Management System, FMS, follows a certain procedure / logic as well. In general, the first thing is to start the FMC. The initial position set up on the POS INIT page as well as entering the route on the FPLN page is going to follow later.



1. Start FMS – MCDU Index page
   To ensure the same starting point, please press the INDEX function key to open the INDEX page.

2. Initialize - STATUS pages
   After switching the FMC on and a certain self-test procedure the status pages are displayed. There are two pages of status pages with the following information. Please review the first page:
   - An identification-number for the installed database (should read WORLD).
   - The dates to indicate in which timeframe the active database is valid.
   - The dates to indicate in which timeframe the secondary (SEC) database is valid.
   - The FMC's time (in UTC) and date.
   - The software-part number of the FMC's installed software.
     (not relevant for flight simulation – will read SCID 822-0868-071).
   - An option to switch to the position init page (POS INIT).

Now switch to the second page by pressing the NEXT PAGE button.

Now review the second status:

- The Aircraft MODEL name
- Aircraft VARIANT
- Maximum Take-off Weight (MTOW)
- ENGINES type name/number
- The PERF DATA BASE identifier for the performance database installed in the FMS.

Please press PRV PAGE to return to page 1 (or NEXT PAGE again – you will start with the first page as soon you cycled through all sub-pages.

Then press POS INIT on LSK6R to open the POS INIT page.

3. POS INIT
   On the Position Initialization page the current position of the aircraft is entered into the FMS, so that the FMS knows where the aircraft is located. It comprises:

   1. FMS POS
      The saved aircrafts position in latitude and longitude.

   2. AIRPORT
      Available on ground – you can enter an airport (ICAO format) and the FMS provides/displays the known lat/long for the respective airport. This function is used during setting up the position
      Please enter EDLP into the scratchpad and press LSK 2L to copy this entry into this line. The display should read about N51°36.8 E008°37.0.
      This line might vary a bit depending on the position and scenery you are using.

   3. PILOT/REF WPT
      This line is used to enter a specific waypoint to read out its position and use during set up of the position.
      This feature is not used with this tutorial.

   4. GATE
      As soon as an airport is available this line lets you enter a specific gate. The gates position is saved in the FMS and may be used during set up of the aircraft's position.
      There are no saved gate position for EDLP.

4. SET POS
   As long as no specific position (in latitude / longitude) is provided, this line shows dashes and boxes. Please press LSK 2R to copy the airports position into the scratchpad. Then press LSK 5R to copy this position into the SET POS line.

The aircrafts position is now saved in the FMS and the FMS now knows that you are located at Paderborn (EDLP).

The second and third POS INIT page shows the latitude and longitude currently used by the FMS, the respective GPS systems (GNSS 1 & 2) and inertial reference system (IRS 1& 2). These are for review only and not further used in this tutorial.

Please press LSK6R to open the flight plan (FPLN) page

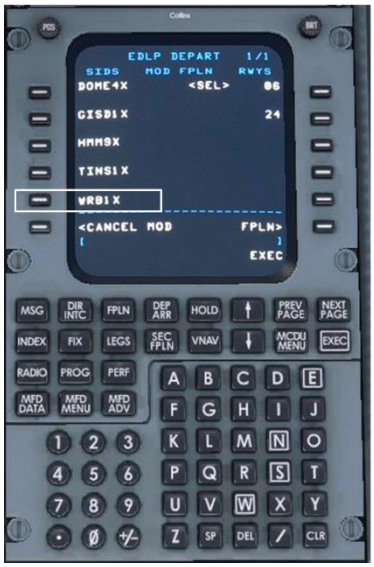
5. FPLAN

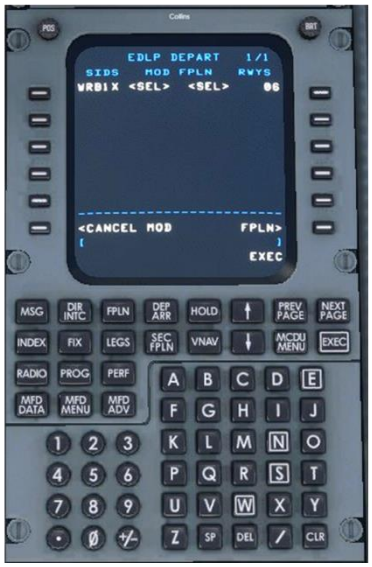
The flight plan (FPLN) page displays the currently active route which you may alter or enter a new route entirely.
To create a route you normally enter four items:
The originating (ORIGIN) airports ICAO identifier (EDLP).
The destination (DEST) airports ICAO identifier (EDDM).
The alternate (ALTN) airports ICAO identifier (EDDS).
The FPLN page may have several pages – the first page always displays the basic information while the route with airways and intersections is displayed / entered from page two on.
Nevertheless it is important to understand that the FPLN page is linked closely to the departure / arrival (DEP/ARR) page as well as the LEGS page and you will need to switch between these pages while setting up the FMS.

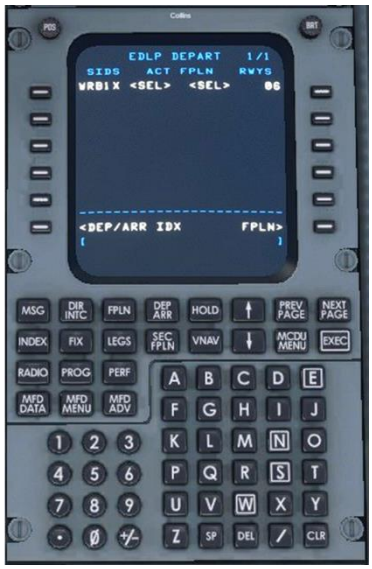
To enter the current route, please enter EDLP into the scratchpad and press LSK 1L to copy into the originating airport field.
Please enter EDDM into the scratchpad and press LSK 1R to copy into the arrival airport field.
Now enter 06 into the scratchpad.
Press LSK 3R to select 06 as the originating runway and press the EXEC button to save the route.
Now please enter EDDS and press LSK 2R to copy into the alternate airport field.
Please enter LH2177 into the scratchpad and then press LSK 5R to copy it into the flight number field.
Press the EXEC button again to save the new data entered.

The page should look like this now:

Afterwards please select the DEP/ARR page to enter the SID







6. DEP / ARR Index Page
   Select the DEP/ARR button to open the departure / arrival page.
   After loading the page will only display two rows, which allow you to select departure and arrival routes for the selected departure and arrival airport.

   Now press LSK 1L to open the available departure routes for EDLP.
   The runway is already selected so please proceed with selection of the departure route (SID).
   The list of available departure routes is already reduced to all SIDs available for runway 06.
   Please press LSK 5L to select WRB1X SID.
   To finalize entering the SID, press the EXEC button.

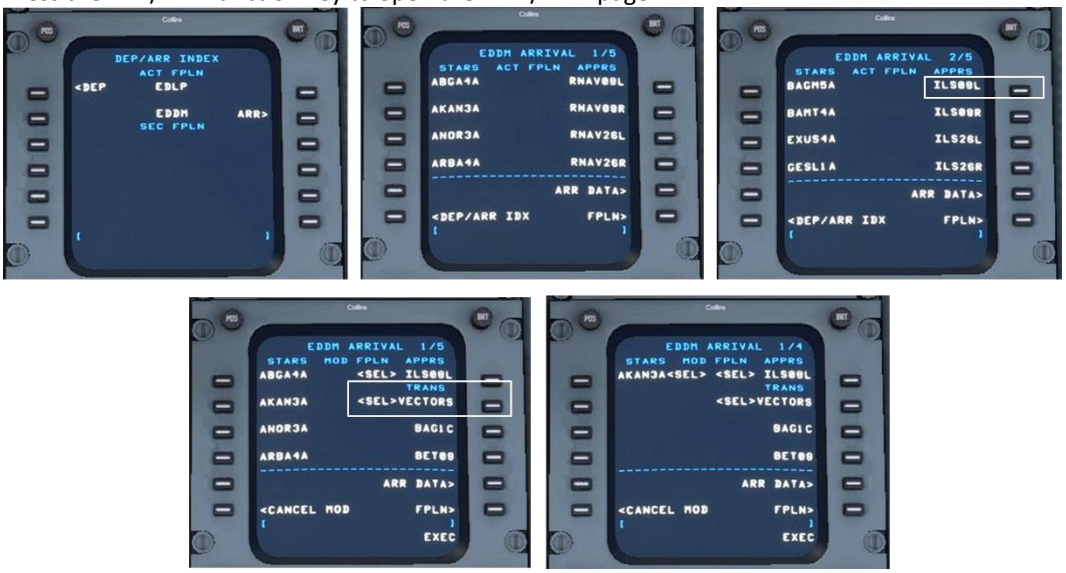
7. FPLN page (cont'd)
   The FPLN page now shows the entered SID and you may proceed to enter the following route.
   Please go to page two by pressing the NXT PAGE button once.
   Now you see the entered SID ending at WRB VOR.
   Please do remember the route string we used earlier:
   EDLP WRB1X WRB UL126 DINKU L603 AKANU AKAN3A EDDM
   Route strings read in a similar manner as you maybe provide route descriptions when travelling by car via interstates / highways. You name the interstate / highway and the intersection where you change interstates. The segment WRB UL126 DINKU of the route string tells us, that we start at Warburg, WRB VOR to travel on airway UL126 and leave UL126 at waypoint DINKU. You may enter this in a similar way into the FMS by entering UL126 into the scratchpad and press LSK 2L to add the airway first (WRB is the SIDs endpoint, so it is already there).
   Then enter DINKU and press LSK 2R to tell the FMS where we leave airway UL126. The FMS will now automatically add all the waypoints and VORs in between.
   (Please bear in mind that you need the same navdata revision for your CRJs navdata and the tool you are computing the route with.)
   At DINKU we switch to airway L603 which we follow to waypoint AKANU. Please enter L603 into the scratchpad and then press LSK 3L to add it to the route. Afterwards please enter AKANU into the scratchpad and press LSK 3R to tell the FMS that we leave L603 at AKANU.

   To ensure that the routing is saved for the moment, press the EXEC button.
   Now we can enter the STAR – on longer flights you might want to enter the STAR later during the flight as weather might change and the landing runway might change accordingly. Most CRJ flights are short-haul flights, so you may enter the STAR already before departure.

   So please open the DEP/ARR page again to enter the STAR.

8. DEP / ARR page

Press the DEP/ARR function key to open the DEP / ARR page.



Please select LSK 2R to open the available approach routes in EDDM.
Please press NEXT PAGE to see the further available approaches to Munich.
Please select LSK 1R to select the ILS approach to runway 08L (ILS08L).
Normally we'd select a transition now, but for this flight, we simply select 'VECTORS'.
Please press LSK 2L to select AKAN3A STAR (no transition / vectors).

Now please verify the route on the LEGS page.
Press the LEGS button to open the LEGS page.

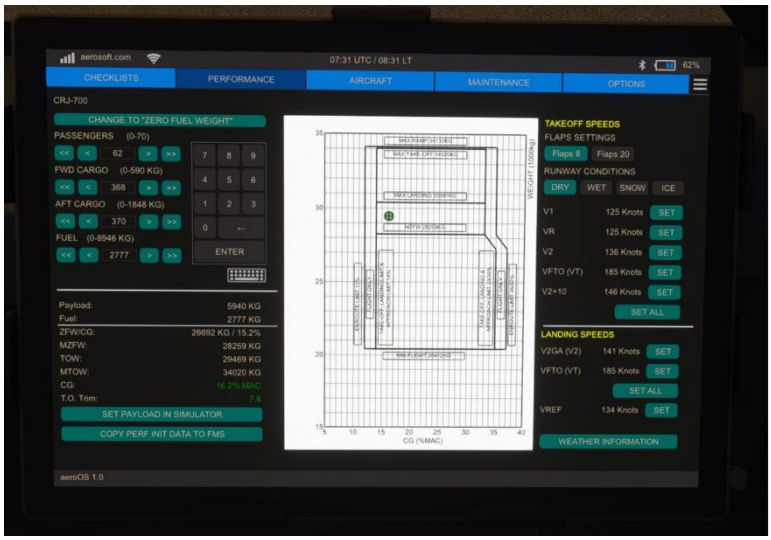
9. LEGS page
   The entire route spreads over 7 pages on the LEGS page.
   Please check that all waypoints from the route planning are also entered in the FMS and the headings and altitude restrictions comply.
   You are going to notice, that there is one discontinuity in the route (page 3).

Currently the STAR is disconnected from the route by a discontinuity. To remove the discontinuity, proceed to LEGS page 3 of 7.
The press LSK 5L to load waypoint LUPOX into the scratchpad. Then press LSK 3L next to the discontinuity and press EXEC.
Normally a transition would be flown, when approaching Munich, but in case there is less traffic, pilots sometimes get a shortcut, and we'll simulate such a situation. According to the routing the CRJ would fly from ROKIL waypoint to MIQ NDB and then to DM431 waypoint. In case pilots get a shortcut they usually can proceed from ROKIL directly to DM431. Thus, we need to remove MIQ NDB.
Press the NEXT PAGE button to open page 4/6 and then press the DEL button to prepare to remove MIQ from the LEGS page.
Now press LSK 1L next to MIQ to remove MIQ NDB, then press EXEC. Now MIQ is removed and the CRJ proceeds from ROKIL directly to DM431.

Now we look at the altitude constraints. The STAR contains one altitude constraint, which requires us to pass RENLO waypoint at or below 13,000 ft and at 280 kts (or less). To ease managing the approach, I suggest adding another altitude constraint manually. Please open LEGS page 3 and make sure that waypoint ROKIL is visible. The enter /8000 into the scratchpad and then press LSK 5R to add the altitude constraint to ROKIL waypoint. Press EXEC to confirm.

Please check on the navigation display that the route is drawn without any interruptions.

1. To check your routing on the Navigation display, switch the MFD to PLAN mode.
2. Then press MFD ADV on the FMS and begin to cycle through all waypoints by pressing LSK 2L (NEXT WPT).
   Check the FMS Manual (Vol. 5 – Section “CHECKING & MODIFYING A ROUTE: LEGS PAGE, DISCOS AND WAYPOINT FORMATS” for further help on modifying the route.
3. No faults, no weird turns in your route? Great … Now you are ready to set up the performance page.



4. PERF Menu
   There are two ways available to open the PERF INIT page.
   In case you open the FPLN page LSK 6R lets you open the PERF INIT page or you directly press the PERF button on the FMS.
   You can either copy most performance data from the EFB (press COPY PERF INIT DATA TO FMS) or enter all information manually. If you want to obtain the current amount of fuel in the tanks, you can check the lower right corner of the MFD (see picture above).
   The table below shows all information which needs to be entered into the FMS as well as the respective LSK.

Field	**LSK**	**Value**
Pass	2L	62
Cargo	3L	738
Fuel	4L	2,777
CRZ ALT	1R	18,000
ALTN CRZ ALT	2R	10,000

The next step is to review the following performance pages which contain different performance information.

5. VNAV Profile
   The VNAV pages contain information on the basis / performance calculations and hence which profile you need to follow / fly (remember, there is no VNAV autopilot function and no auto throttle).

   The standard profiles are defined as follows:

   1. Climb (250 / 290 / 0.74)
      Throttle is set to climb detent and the aircraft's pitch is controlled in a way (most likely by autopilot using Speed mode) so that the aircraft flies 250 kts until reaching 10.000ft, then accelerates to 290 kts and continues to climb with 290 kts until reaching an altitude where 290 kts equal Mach 0.74. From here on climb is continued with Mach 0.74.
   2. Cruise (300 kts / 0.74)
      Cruise is flown at 300 kts or Mach 0.74, whichever is slower. At higher altitudes 300 kts are most likely going to exceed Mach 0.74.
   3. Descend (250 / 290 / 0.74 / 3.0°)
      Things are somewhat similar during descend. The FMS calculates the needed descend rate through the speed and descend angle. The standard values are a 3.0° angle and descending with Mach 0.74 until it equals 290 kts, then continue with 290 kts until 10.000ft. Below 10.000ft descend is continued with 250 kts.

6. Radios and Nav aids .....Set for departure
Pedestal.
Please tune the navaids as required to follow the departure route. For this tutorial, please use the following frequencies:
Please set NAV 1 to Warburg, WRB VOR, 113,70MHz.
Please set Course 1 to 123.
Please set NAV 2 to Paderborn-Lippstadt PAD DME, 108,50MHz.
Further please activate the bearing pointers, so that one bearing pointer points towards VOR1 (WRB VOR) and the other one points towards VOR2 (PAD VOR).

7. take-off briefing .....Complete
Charts
Please take a look at the departure chart (SID) and review the departure route.
Directly after liftoff we follow the runway track until we are 2.7nm away (out) of Paderborn PAD DME. At this point we are supposed to fly at 1.700’ or above. When passing D2.7 PAD DME we turn right onto radial 303 inbound Warburg, WRB VOR (which means you turn to heading 123° flying towards WRB VOR).
Now the aircraft is prepared to start the engines and get going.

4.1.5 CLEARED TO START CHECK

After receiving the engine start up clearance the engines may now be started. Before actually starting the engines, you need to check several items to ensure that the aircraft is properly prepared for engine start.

1. APU / AC ELECTRICS .....ON / CHECKED

Overhead Panel

Please check that the APU is running, electrical power is supplied by the APU, and the APU also supplies bleed air (see APU start up sequence for details).

2. PAPERS.....ON BOARD

For a real-world flight you would now make sure that the load manifest is on board and all necessary papers are available.

3. TAKE-OFF DATA.....SET

Glareshield & Side Panel

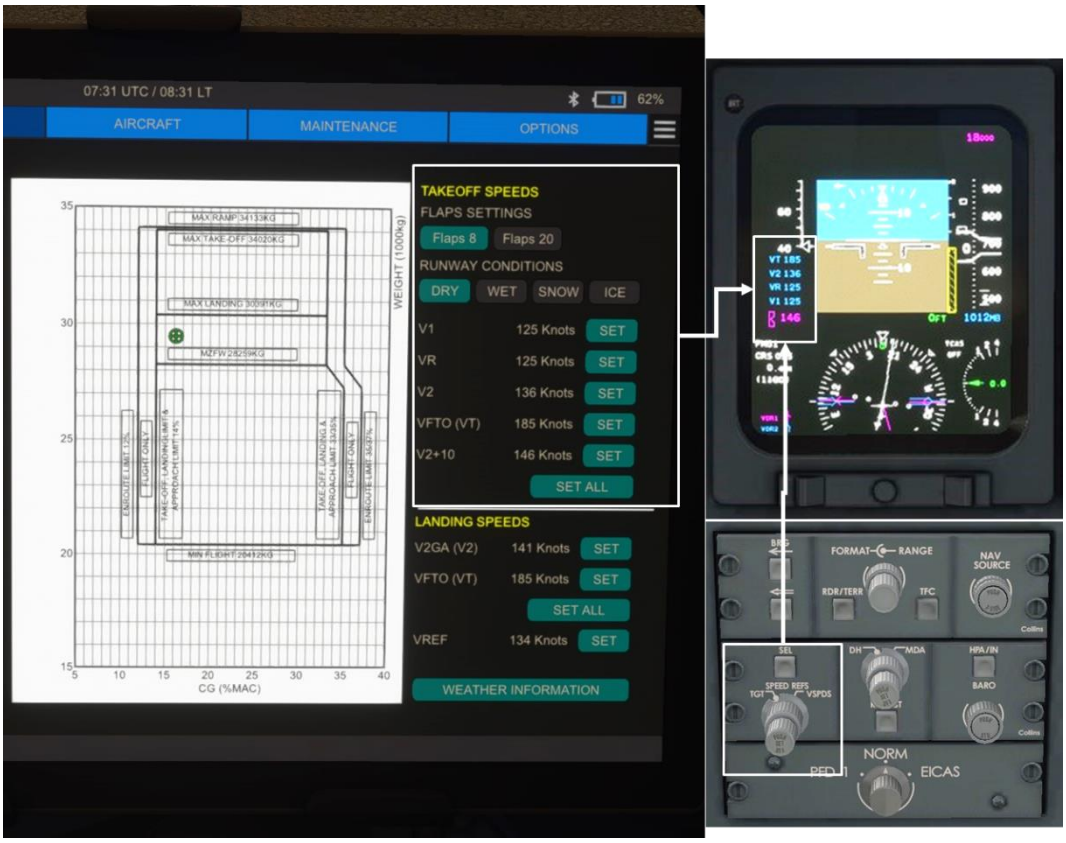
Please check that the first cleared altitude is dialled in (cruise altitude for this tutorial – thus 18,000ft), the heading bug is set according to the runway's heading (060°), check the nav radios are properly tuned and set the V-speed bugs.

To obtain the V-speeds you can either check the QRH or have the EFB provide the V-speeds.

Using the QRH you first need to get the current aircraft's weight. Its zero-fuel weight is 26.692 kg and we loaded 2,777 of fuel which totals up to 29,469kg. Search for the speed card for a weight as close as possible.

Much easier is it to have the EFB supply the V-speeds via the performance menu.

Check the flaps setting (08° for the departure from EDLP) and runway condition and press the SET ALL button to set all V-speeds at once.



4. DOORS ..... CLOSED / LOCKED

EICAS

Before starting the engines you also need to check that the doors are closed, and the respective messages are extinguished.

Check that all doors are closed, the status shown on the DOORS page complies with the shown status in the EFB, and that the power cart is disconnected, and the **chocks are removed**.

5. BEACON .....ON

Overhead Panel

Please switch on the beacon light to inform ground personnel as well that the engines are to be started.

6. FUEL PUMPS AND QUANTITY .....ON (QTY)

Overhead Panel

Switch on the fuel pumps and recheck the proper amount of fuel, fuel distribution, fuel temperature and pressure.

7. HYDRAULIC PUMPS.....AUTO / ON

Overhead Panel

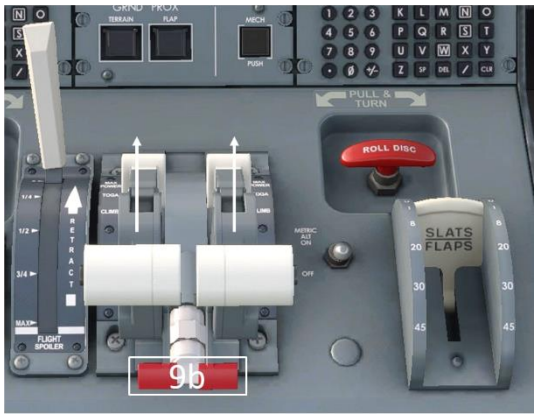
Check that the hydraulic pumps are switched on or set to AUTO respectively.

8. PARKING BRAKE .....AS REQUIRED

Lower Pedestal

As the engines are normally started during pushback ensure that the parking brake is released. In case you plan to start the engines while the aircraft is not moving ('drive-through' parking position or already positioned on the taxiway), please set the parking brake. Use either the parking brake handle on the lower pedestal, the key assignment in your flight-sim (Ctrl + "." For example) or your joystick button assignment.

NOTE: For a push-back, please check that the parking brake is released and nosewheel steering is turned off. Audio and visual communications with the ground crew must be maintained at all times during push-back.



9. ENGINES.....START
Lower Pedestal & Overhead Panel

START OF ENGINE START SEQUENCE
Select **R**ight Engine (No.2) start switch Bleed air is transferred into the engines starting system and it starts to rotate (see N_2), At N_2 ~20% set thrust lever to idle This initiate the fuel injection – hence the ITT rises quickly. Monitor that no limitations are exceeded until the engine is stabilized at idle. To do so, press the red lock switches with the left mouse button to unlock and then advance the respective throttle lever to idle.
END OF ENGINE START SEQUENCE

DO NOT START THE OTHER ENGINE YET.
In case this is the first flight of the day please perform the fuel feed check valve test:

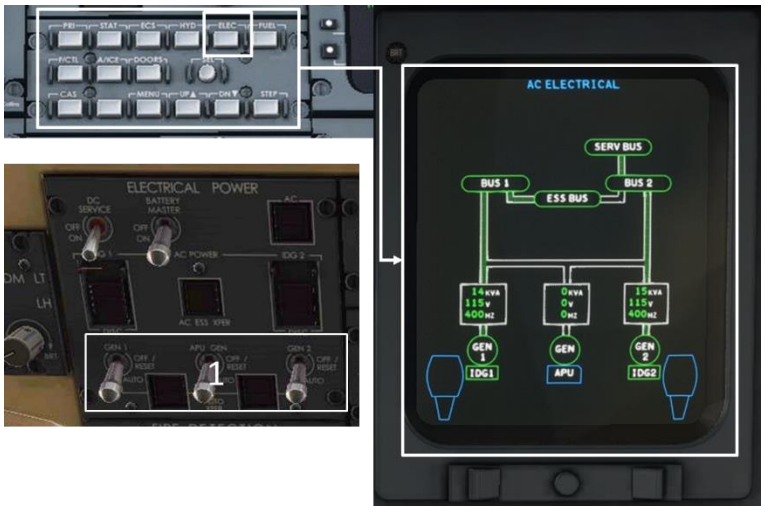
10. FUEL FEED CHECK VALVE TEST .....COMPLETE
First flight of the day
Overhead Panel & Lower Pedestal

START OF FUEL FEED CHECK VALVE TEST
Open the fuel page on the EICAS. Switch OFF fuel pumps on both sides. the message “RIGHT FUEL LO PRESS” should appear. Switch on the fuel boost pumps again.
END OF FUEL FEED CHECK VALVE TEST

Now you may start the **L**eft engine (No. 1). Please keep in mind that now you must shut down engine 2 first to complete the test procedure! With the engines up and running some more items are to be checked to prepare for taxi and finally take-off. So please do not advance the thrust levers or start taxiing yet and go through the After Start Checklist.

4.1.6 AFTER START CHECK

Note: Do not accelerate engine until oil pressure is in the normal operating range



1. GEN 1 AND GEN 2.....AUTO

Overhead Panel

Check that electrical power is now provided by both engines and respectively the generators for engine 1 and 2 are set to AUTO. To verify open the ELEC EICAS page by pressing the ELEC button on the EICAS selector panel and check that the engines supply electrical power to the aircraft's busses.

Afterwards switch back to STAT page.

2. BLEED VALVES AND PACKS.....AUTO / ON

Overhead Panel

Similar to the electrical power, bleed air is now supposed to be provided by the engines. Hence check that the bleed valves are set to AUTO and the packs (air-condition units) are set to ON. Furthermore, confirm the bleed source switch is still set to both engines.

3. ANTI-ICE.....AS REQUIRED

Overhead Panel

With a temperature of 18°C icing is not to be expected so Anti-Ice may stay turned OFF.

4. PROBES.....ON

Overhead Panel

Please make sure that the probe (I.e. pitot tubes) heating is ON.

5. ELECTRICS .....CHECKED
Overhead Panel
Please check that electrical power is now provided by the engine's generators.

6. RUDDER .....CHECKED
Pedestal
Check that rudder trim is set to zero.

7. N/W STRG .....ARMED
Pilots side panel
Please reactivate the nosewheel steering in case it was deactivated for pushback.

With the power and bleed air supply begin established through the engines, the APU can now be shut off.

APU SHUTOFF SEQUENCE	
(a).APU, START/STOP Switch	**Stop**
Overhead Panel Press the APU, START/STOP button to initiate the shutdown sequence. Shortly after pressing the START/STOP button the APU is going to spool down.	
(b). DC and AC electrical power	**Check**
Overhead Panel Check that power supply is still established.	
(d) BLEED SOURCE switch	**As required**
Overhead Leave the switch in the 'Both engines' position. As long as the Bleed valve switch is in the AUTO position the position of the BLEED SOURCE switch is overridden automatically.	
(e).BLEED VALVES switch	**As required**
Overhead Panel Set to AUTO	.....
(a). APU, PWR Fuel switch	**OFF**
Overhead Panel As soon as the APU is shut down and RPM reached 0, press the APU, PWR Fuel switch to close the APU shutoff valve as valve, which is going to disappear from the EICAS messages accordingly.	

4.2 READY TO TAXI

4.2.1 TAXI CHECK

Now the final steps are to be prepared before taxiing to the runway.

Note: At airports where runway structural repair or debris is known to exist, use thrust reversers with extreme caution to preclude the possibility of foreign object damage (fod) from occurring

1. FLAPS ..... ___ ° INDICATING

Lower Pedestal

Please set the flaps to 08°.

2. FLIGHT CONTROLS..... CHECKED

Main Panel & EICAS

Now check the flight control's functionality by comparing the shown deflection on the F/CTL page of the EICAS and movement of the yoke within its full range.

START OF FLIGHT CONTROLS TEST
Move the yoke fully to the left and then to the right and check that movement is 'undisturbed' and the full deflection of the ailerons is displayed on the EICAS. Move the yoke fully forward and then backward and check that movement is 'undisturbed' and the full deflection of the elevators is displayed on the EICAS.
END OF FLIGHT CONTROLS TEST

3. TRIMS ..... GREEN AND ____°

Lower Pedestal

According to the EFB the elevator trim needs to be set to 7.8.

Please use either the rocker switches you find on the yoke, the standard flightsim key assignments (mostly POS1 and END key) or the buttons you assigned on your joystick / yoke.

4. THRUST REVERSERS ..... ARMED

Upper Pedestal

Make sure that the thrust reversers are armed in case of an aborted take-off.

5. FLIGHT INSTRUMENTS.....CHECKED

Main Panel

Check that no flags are displayed on the flight instruments to indicate failures.

6. FMS.....AS REQUIRED / AUTOTUNE

Upper pedestal

The FMS offers an autotune function which automatically tunes suitable Nav stations on NAV 1 and NAV 2. In case the FMS develops a failure during departure this might influence the tuned navigation stations. As the CRJ does not simulate non normal procedures you don't need to expect a FMS failure. Anyway, previously tuned stations will be lost once set to autotune so please decide for yourself which way you prefer.
In case you don't want to use the autotune function yet, make sure to activate it after passing 10,000ft the latest. In case you want to activate autotune now, please open the FMS "RADIO" page and make sure that next to NAV 1 and NAV 2 (LSK 4L and 4R) "AUTO" is highlighted.

Furthermore check that the NAV Source is set to FMS. Otherwise, the autopilot WILL NOT follow the FMS flight plan.

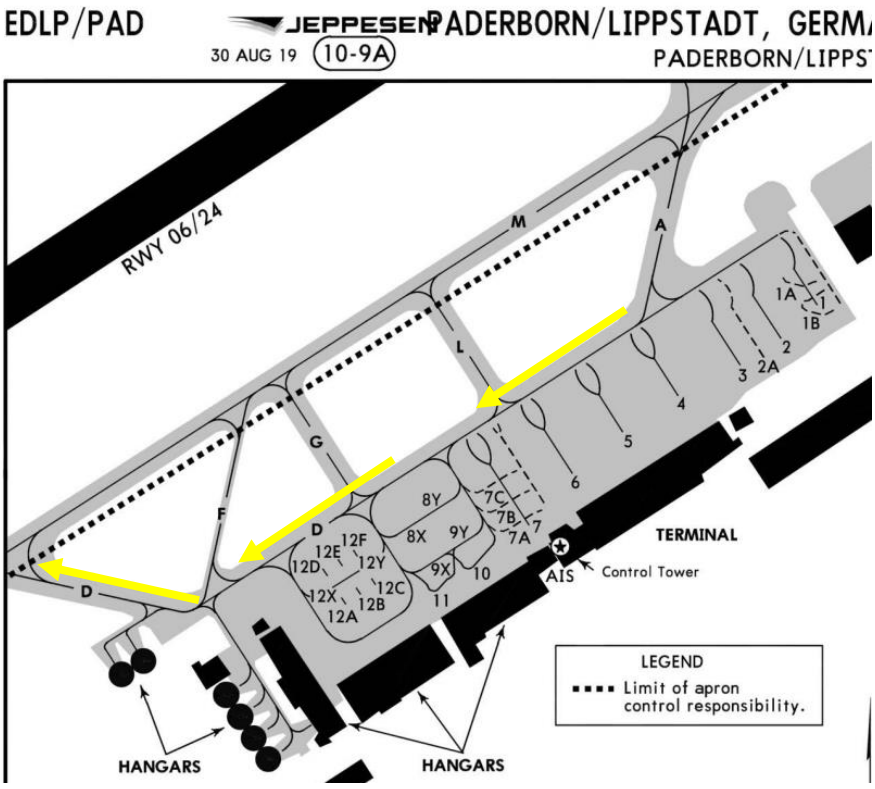
7. BRAKE TEMP .....Checked

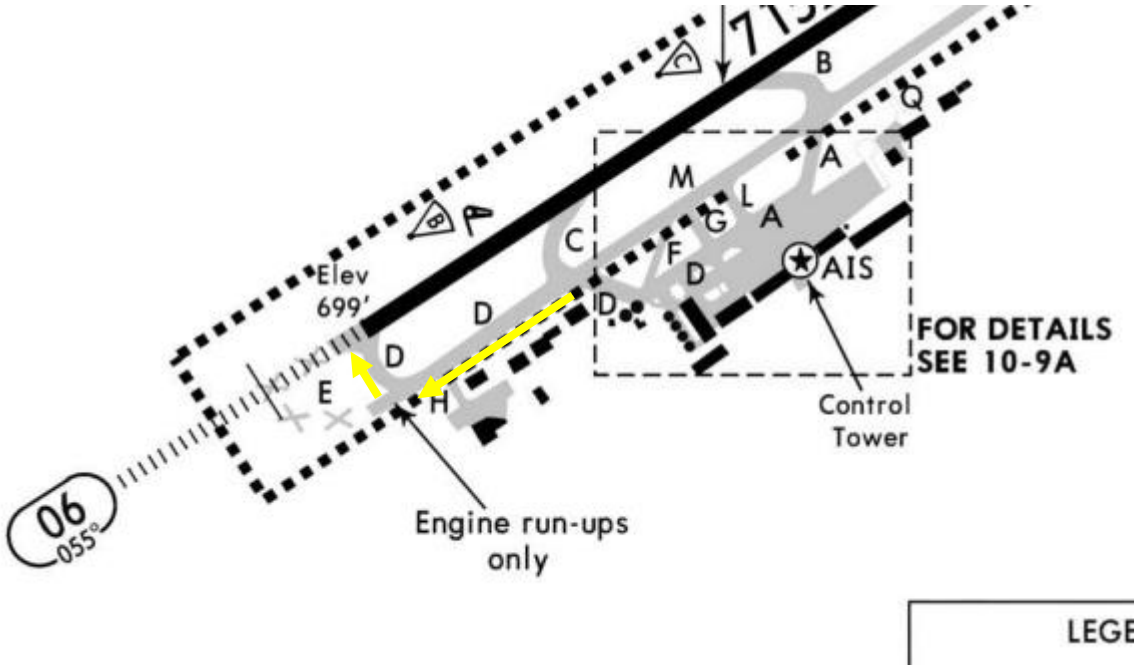
EICAS

Before starting taxiing check that the brake temperature within limits (BRAKE OVHT nor IB or OB BRAKE PRESS message is not indicated on the EICAS) and the pressure is within limits (can be checked on the HYD page – pressure should read between 1800 und 3200PSI). See item 28b of the Originating Checklist for information where to find the Brake Temp indication.

Now the aircraft is ready for taxiing. Please slowly advance the thrust levers but do not exceed a N_1 of 40% (this is usually the maximum setting allowed on airports but recheck the charts to make sure). As soon as the aircraft starts to move please reduce thrust as necessary.

After pushback, we are going to follow taxiway 'D' until the holding point at runway 06 (see the yellow arrows I in the following two pictures)





Aim for a taxi speed of 10 to max 15 knots on ground and 5 to max 10 knots during turns. For tight turns reduce to 5 knots. Starting at gate 1/4 please follow taxiways A, and D to runway 06.

The ground speed is indicated on the Navigation Display.

A N_1 slightly below 30% should suffice for a taxi speed of approx. 15 knots.

As soon as you reach the holding point, you need to request take-off clearance. After receiving the take-off clearance, please perform the 'Before take-off check' to ensure the aircraft is ready for take-off.

4.3 READY FOR TAKE-OFF

4.3.1 BEFORE TAKE-OFF CHECK

1. LIGHTS AND STROBES .....AS REQUIRED
Overhead Panel
Please check that Beacon, Strobe, Logo, Taxi and Landing lights are switched ON.

2. FUEL, XFLOW.....MAN AND OFF
Overhead Panel
Make sure that Crossfeed is switched to Manual and the Crossfeed switches left and right are OFF.

3. IGNITION / ANTI-ICE.....AS REQUIRED
Overhead Panel
As said previously icing conditions are not expected during this tutorial so anti-ice is supposed to be switched OFF.
Nevertheless please do activate the Continuous ignition (and press the CONT ignition pushbutton and make sure the pushbutton's light illuminates).

4. FLIGHT ATTENDANT .....ADVISED
N/A
In a real-world flight you'd now inform the cabin crew to be prepared for take-off.

5. TRANSPONDER / TCAS .....ON / AS REQUIRED
Lower Pedestal
Please activate the transponder no. 1 by turning the ATC selector to "1".

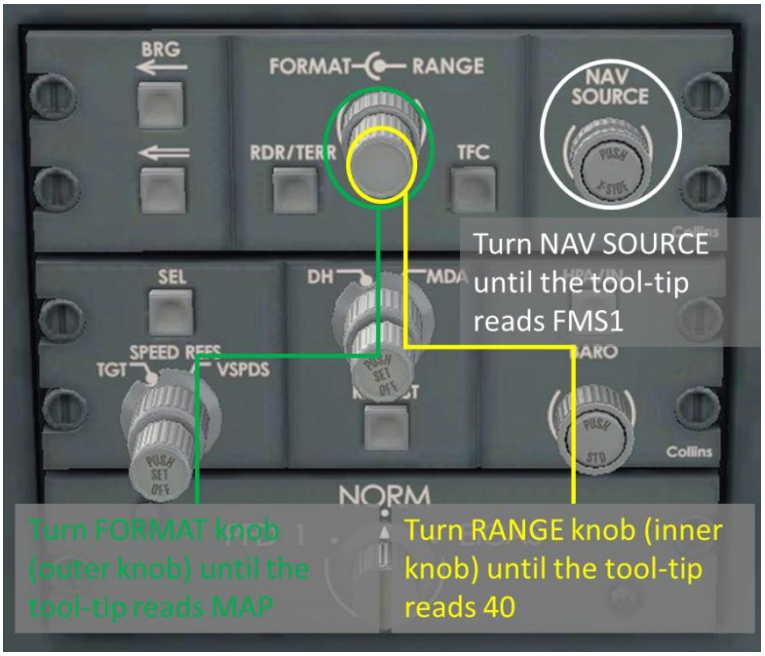
6. RADAR / TERRAIN DISPLAY.....AS REQUIRED
Not simulated in MFS - Side Panel
In MFS either radar is currently not functional.
Depending on the current weather conditions and surrounding terrain of the airport you would need to decide if the weather or terrain radar is more important.

7. CAS .....CHECKED AND CLEARED

Main Panel

Check that the crew advisory system displays no error messages.
All error and caution messages are displayed on the EICAS displays (the two central displays) in red (warning) or amber (caution). Check that none are displayed.

Please do now check / verify that the nav source (pilot side panel) is set to the FMS and the Navigation Display is in Map or Plan mode and hence the programmed route is displayed.



Furthermore, please check that the cruising altitude is dialled in on the altitude selector. Normally you'd first dial in the altitude you were cleared for by ATC but to ease things for this tutorial we are going to neglect this little deviation from real operation.

The CRJs engines are FADEC (full authority digital electronic control) managed. The FADEC computes appropriate N_1 settings depending on Mach number, ambient temperature, and pressure altitude.
Gates assist to select certain modes for which the FADEC computes the appropriate N_1 values. The thrust levers may be locked in five gates (detents):

- Fuel Shut-Off; Shuts off fuel supply to the engines.
- Idle; For idle (also flight idle) thrust.
- Climb; Continuous climb thrust.
- Take-off / Go-around: Take-off or go-around power.
- Max Thrust; Either engine is able to provide a power reserve in case of engine failure. Maximum thrust is raised from 13,500 lbs to 14,100 lbs.

Remember that THE EFB offers the option to show the detent in the PFD so you do not need to look at the throttles to know where they are.

For take-off slowly advance the throttles to approx. 60% N_1. The engines will take some time to spool up and stabilize at 60%. Make sure that no limits (EGT, vibration) are exceeded, and the engines stabilize at 60%.

Afterwards advance the throttle until locked in the take-off / go-around detent. Take-off thrust is computed and selected automatically.

4.3.2 NORMAL TAKE-OFF SEQUENCE AND CALLOUTS

The following graphic shows the sequence of a normal take-off including the respective callouts. PF is the pilot flying and PM is the pilot monitoring (formally PNF, pilot nonflying).

We would like to provide some further information though.

As mentioned before, check that the nav source is set to FMS so that the flight directors and autopilots NAV mode is going to follow the previously programmed route.

First, you distinguish between lateral and vertical modes. The vertical modes comprise altitude hold, vertical speed, and speed mode. Altitude hold commands the autopilot to hold the current altitude – the autopilot can switch from another vertical mode to altitude hold. After describing the other two modes this will make more sense. Vertical speed mode commands the autopilot to hold a predefined/commanded vertical speed (say +2,000 feet per minute). In case the autopilot approaches a pre-selected altitude with activated vertical speed mode, the autopilot will switch from vertical speed mode to altitude hold.
In "SPD mode" the autopilot will adjust the aircraft's pitch to achieve and hold a pre-selected speed. The thrust setting is not considered – so the pitch and hence the vertical speed will depend on the commanded speed and selected thrust.

This mode is not to be misunderstood as some sort of auto thrust. The CRJ700ER has no auto thrust system and will not adjust thrust to hold a certain speed.

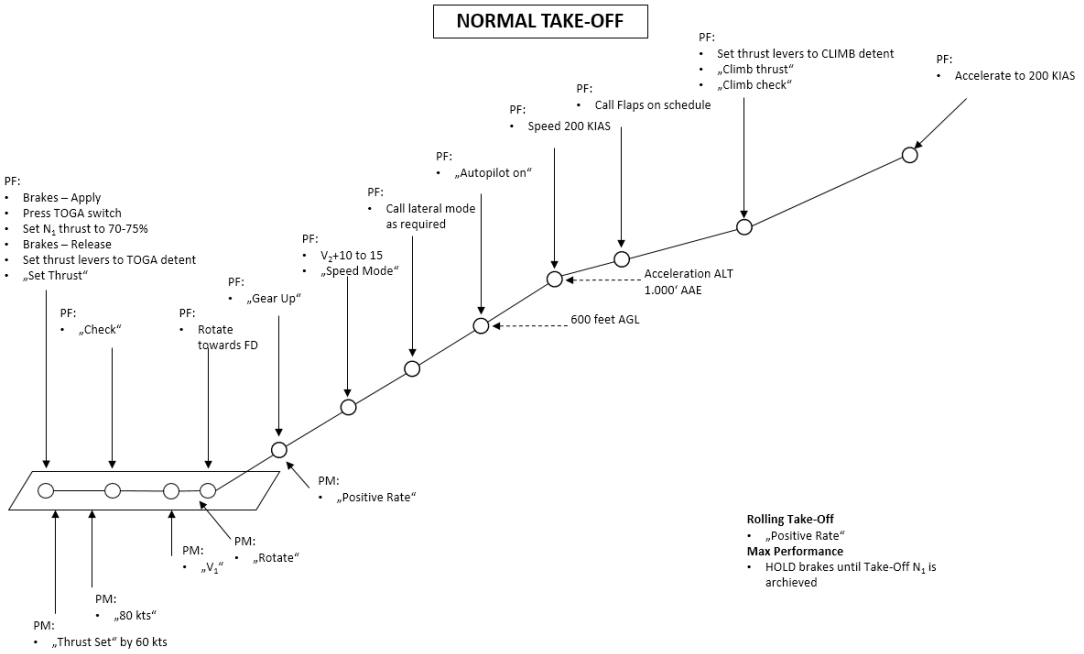
Nevertheless, the SPD mode is rather helpful – especially when working with the already mentioned fixed throttle lever gates / detents. The CRJ offers a CLB detent – with the thrust levers moved to the CLB detent the FADEC will automatically compute the respective maximum climb thrust. By activating the SPD mode and selecting the speed settings according to the current flight phase / requirements in conjunction with the thrust levers in the CLB detent you will experience a huge relief in workload.

Now let us look at the lateral modes. These are basically NAV and HDG mode (there are some more modes but these are not important for the moment). The HDG mode makes the autopilot follow a commanded heading. The heading is displayed in the HDG window and displayed as a bug on the navigation display / HSI. The NAV mode on the other hand will either follow a radial to or from a VOR or follow a programmed route. The autopilot distinguishes the source depending on the setting of the navigation source selector of the side panel. That is why it is especially important to reassure that the NAV selector is set to FMS as the source to make the autopilot follow the programmed route.

As a last step we would like to explain the difference between the flight director and the autopilot. The flight director basically tells – dependant on the selected modes – where to fly the aircraft to follow the selected modes. Assuming you selected NAV (nav source = FMS) and SPD mode (220 kts) the flight director will direct the flight path which needs to be flown to follow the programmed route flying at 220 kts. Nothing is happening on its own yet. This is the autopilot's job. It will basically command the needed deflections of the flight controls to follow the commanded flight path. The flight director will show where to go, and the autopilot will make the aircraft go there ☺

It makes sense to first activate the flight director and make sure that the commanded flight path makes sense and the deviation to the current aircraft's attitude is as small as possible. Otherwise, you might experience very abrupt changes due to autopilot commands.

Back to the tutorial flight.



After lift-off make sure that the aircraft is in a stable climb and it does not accelerate too fast. Ideally the aircraft climbs steady with 150 kts (V_2 + 10 kts). Then activate the SPD mode – do not activate the autopilot yet – and try to follow the vertical commands of the flight director. Afterwards activate NAV mode – please still do not activate the autopilot yet and try to follow the flight director’s lateral commands as well. When the flight director is centred you may now activate the autopilot. Ideally, you would be passing 600 ft above ground now – practically you are most likely at a higher altitude.

As soon as the aircraft is stabilized in climb at 150 kts, please select 180 kts and let the aircraft speed up. When the aircraft accelerates again and passes 180 kts retract the flaps to 8°. Then speed up to 200 kts by dialling in 200 kts in the speed window. As soon as you reach 200 kts, fully retract the flaps and then speed up to 250 kts. Try not to chase speeds – in case you are off by a few knots, do not care. Following the correct sequence of steps is more important – over time you will get faster and more precise.

The aircraft is now flown by the autopilot and in a so-called clean configuration (no flaps, no gear extended). Now it is time to go through the climb checklist.

4.3.3 CLIMB CHECK

1. FUEL, XLFOW.....AUTO
Overhead Panel
Set the crossfeed valve to AUTO (lights out).

2. BLEEDS AND APU .....SET
Overhead Panel
The APU is supposed to be shut off and APU bleed disconnected.

3. LIGHTS AND PASS SIGNS.....AS REQUIRED
Overhead Panel
Switch off the taxi-light, when climbing through 10,000ft you may switch off the seatbelt signs. Depending on the airline the no smoking signs stay illuminated throughout the entire flight.

4. THRUST REVERSERS .....OFF
Upper Pedestal
The thrust reverser arm switches are set to OFF again.

5. CAS .....CHECKED AND CLEARED

Main Panel

Check the CAS for any advisories or error messages – normally none should be indicated. In case you didn't activate the FMS radio autotune function activate it now by opening the RADIO page of the FMS and pressing LSK and LSK respectively to activate autotuning for NAV 1 and 2. The indicators for AUTO-tuning at LSK 4L and 4R should illuminate blue. If not press LSK 4L and LSK 4R once to switch to autotuning.

As soon as the CRJ passes 10,000ft please speed up to 290 knots by dialling in 290 knots on the glare shield / autopilot control panel. The autopilot is still in SPD mode and will slow climb until 290 knots are held and then increase climb rate again.

When you are passing transition altitude (18,000ft in the US, much lower in Europe) the altimeter is to be set to 29.92 in. HG / 1013 hPa respectively. Please press the baro button to set to standard pressure.

Turn the knob to adjust altimeter baro setting. Press it to set standard pressure (29,92 in Hg / 1013 mbar)

For this tutorial flight the cruising altitude is 18,000ft. On longer flights at higher altitudes, you are going to notice that the CRJ climbs rather fast in the beginning, but after passing around 20.000ft to 25.000ft you'll notice that climb speeds slow down.

Maintain 290 knots until reaching cruising altitude. Then speed up to your cruise speed of 300 knots and reduce thrust accordingly.

4.4 ENROUTE

A few miles after passing Warburg, WRB VOR, you are supposed to reach the cruising altitude. There is no cruise checklist and cruise flight is supposed to be rather uneventful. As this CRJ is not equipped with an auto throttle you need to keep an eye on your cruise speed of 300 knots.

Continuously check the power setting and cruise speed – at 18,000ft the CRJ normally cruises at 300 knots. Depending on several things like weight, wind, pressure, temperature the needed power setting may vary slightly. Aim for approx. 74% N_1 a fuel flow of roughly 830kg per engine per hour, for a cruise speed of 300 knots.

Bear in mind that with wind changes or after turns on a different leg a slight power adjustment may be necessary. Furthermore, keep an eye on fuel consumption and remaining fuel.

As soon as the CRJ is established in cruise flight you already need to prepare the descend into Munich. The top of descend (TOD) is calculated by the CRJ's FMS a few miles after passing waypoint AKANU. Make sure, that the VNAV information are displayed by selecting MFD MENU and the pressing LSK 6L twice so that VNAV is highlighted in green. Now the VNAV information are displayed on the ND/MFD.

There are three ways to estimate the top of descend (the point along your route when you want to start the descend):

1.) Use the following rule of thumb (rather inaccurate): remove the last three digits of your current altitude (expressed in thousands of feet), multiply the resulting value by three and add 10 to get the distance the aircraft covers during descend there is the distance the aircraft covers during descend. Here is an example: cruising altitude is 18,000 feet. Step 1: Remove the last three digits 18,000 -> 18, Step 2: Multiply by three -> 18 x 3 =54 miles, Step 3: add 10 -> 54 + 10 =64 miles.

2.) Check the Quick Reference Handbook, QRH, for the descend chart and derive the needed distance about your current gross-weight and cruise altitude.

3.) The CRJ's FMS offers an advisory VNAV. After reaching your cruise altitude the FMS computes the Top-Of-Descend based on the data entered in the PERF section. The TOD is drawn along the flight route as a green circle and the DIR/INT page shows information on the required descend rates based on the programmed speeds.
The standard profile for descends is: M0.74 / 290 kts / 250 kts. Start your descend with 290 kts, and after passing 10,000ft continue to descend with 250 kts.

Top of Descent (TOD)

The Top of Descent indicates the point along the flightroute where the descent needs to be initiated to meet the altitude constraints / catch the approach for the selected runway.

The TOD is drawn as a green circle with a ‚TOD' flag.

Make sure that the VNAV information is displayed by selecting VNAV on the FMS MFD MENU.

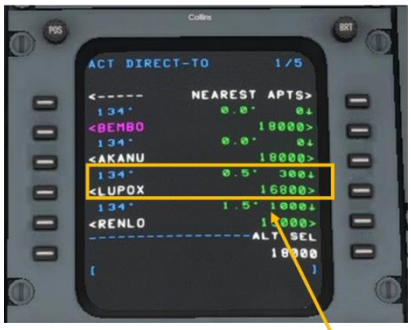
The CRJ offers two suitable autopilot modes for the descend:

- Vertical Speed mode (preferred method)
- Speed Mode (rather not used in real-life)

4.4.1 DESCENDING USING AUTOPILOT'S VERTICAL SPEED MODE (PREFERRED METHOD)

Based on the altitude constraints entered for the flightplan (you can view and edit them on the LEGS page), the FMS computes the TOD (Top-Of-Descend), as well as the required rates of descend along the flightplan's legs to meet the altitude constraints in accordance with the speed profile entered in the VNAV section of the FMS.

When using Vertical Speed mode the main question is which rate of descend to use for each leg. The DIR/INTC page of the FMS helps in this regard.



Adjusting descent

Use the snowflake on the PFD as well as the information on sinkrates per segment displayed on the DIR/INT page of the FMS.

The snowflake is drawn on the right side of the EHSI and can be used similar to the glideslope indicator.

The DIR/INT page indicates the following information per segment:

- Waypoint name
- Descent angle
- Required rate of descent / climb
- Altitude at waypoint

While passing AKANU waypoint, reset the altitude to 10,000ft. Even though we'll need to descend further this provides a reminder to prevent sinking through 10,000ft while still travelling at over 250 KIAS.
Approximately 10nm before reaching the top of descend (TOD) activate the Vertical Speed VS mode of the autopilot. But make sure to select 0 fpm for now.
Shortly before reaching the top of descend (TOD), the 'snowflake' is going to appear on the PFD as well as the distance shown on the MFD is nearing 0nm.

When you arrive at the top of descend (TOD), dial in the sink rate displayed on the DIR/INT page. Also check the sink rate for the next waypoint as well as the snowflake and adjust accordingly to smoothen possible 'jumps' in sink rates.

Very soon after the CRJ started descending it is going to pick up speed. Adjust the throttles accordingly to stick to the speed regimen M0.74 / 290 kts / 250 kts.

Now dial in Munich ATIS 123,130MHz on COM 2 to receive the latest weather information for Munich. Check the audio control panel, that both COM channels are being received.

Adjust the sink rate according to the altitude constraints along the waypoints of the STAR and remember to adjust thrust to maintain speed.

After starting the descend already work through the descend checklist.

Make sure to pass RENLO waypoint at 13,000ft or below and proceed with the descend check. The constraint at RENLO tells us to pass with maximum 280 kts but for this tutorial flight we received a clearance to proceed with 290 kts.

Directly after starting your descend, work through the descend checklist.

4.4.2 DESCENDING USING AUTOPILOT'S SPEED MODE

You can also use the speed mode to control your descend – the same altitude constraints and speed limits apply as well as the same top of descend (TOD) of course. Only controlling the descend is a bit different.

Reset the altitude to the desired new altitude and activate speed mode. Make sure that the throttles are not moved before reaching the top of descend. When passing the TOD decrease the throttle – the CRJ is going to lose speed and in order to hold the pre-selected speed it starts to descend. With increasing or decreasing you can now control the rate of descend while the speed is kept by the autopilot.

Even though it is not used in real life I found this procedure rather useful in-flight simulation as it takes out one parameter to watch during the descend (speed) and just one parameter to adjust in order to control speed and rate of descend.

4.5 PRIOR TO LANDING

4.5.1 DESCEND CHECK

1. LDG ELEV.....SET
Overhead Panel
Dial in the landing field elevation (1,500 ft). This enables the cabin pressurization system to minimize the pressure difference after landing.

2. FUEL.....CHECKED
Overhead Panel
Check that the fuel pumps are switched on, crossfeed is switched off (for this tutorial flight – otherwise as appropriate) and sufficient fuel is left.

3. TCAS.....AS REQUIRED
Lower Pedestal
Check that the squawk is set correctly and TCAS is set to down.

4. RADAR .....AS REQUIRED
Not simulated in MFS - side panel
Check that the weather radar is switched off by turning the mode selector on the pedestal to OFF.

5. TERRAIN DISPLAY .....AS REQUIRED

side panel

The terrain – especially during go-around– may be an important depending on the airport, but not at EDDM, so please leave it off.

6. CAS .....CHECKED AND CLEARED

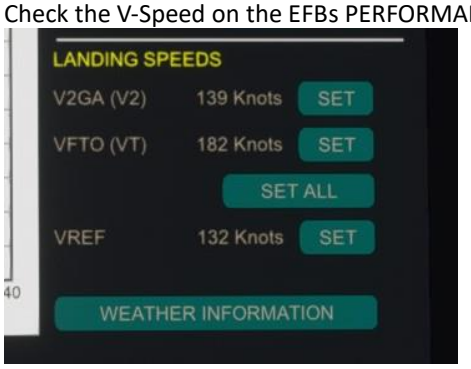
Main Panel

Check the EICAS for any advisories or error messages.

7. LANDING DATA.....SET

Lower Pedestal & Side Panel

Please tune NAV1 to the Localizer frequency IMNE (109,50 MHz) and the course to 080°.
Please tune NAV2 to DMN DME (116,00 MHz).
Please set the decision height knob to Minimum Decision Altitude, MDA and tune to 1670'.
Adjust the heading bug to 080°..
Check the V-Speed on the EFBs PERFORMANCE page (V_{Ref} = 132 kts) and press SET ALL.



8. APPROACH BRIEFING .....COMPLETE

Approach charts

Normally you would go through the approach briefing with your co-pilot now to review the flight route, constraints and missed approach procedure. Most likely you will not have a co-pilot but anyway it makes sense to review those items. When passing transition altitude (18,000ft) please proceed with the approach checklist and have it completed before reaching 10,000ft.

After passing RENLO waypoint proceed to descend – soon the altitude warning will sound to highlight you are approaching the pre-selected 10,000ft. Make sure to slow down to 250 kts while not descending through 10,<000 ft. As soon as you reach 250 kts proceed the descend by selecting 5,000 ft altitude (at this altitude the ILS is going to be intercepted) and selecting to vertical speed VS mode again. Adjust sink rate and thrust as necessary to maintain the descend path and speed constraints.

Make sure to work through the approach checklist before reaching DM421 waypoint.

4.5.2 APPROACH CHECK

1. ALTIMETERS .....___ . ___ SET

Main Panel

Now adjust the altimeters to the arrival airports altimeter setting (29.89 in Hg / 1012.19 hPa).

2. APU AND BLEEDS .....SET

Overhead Panel

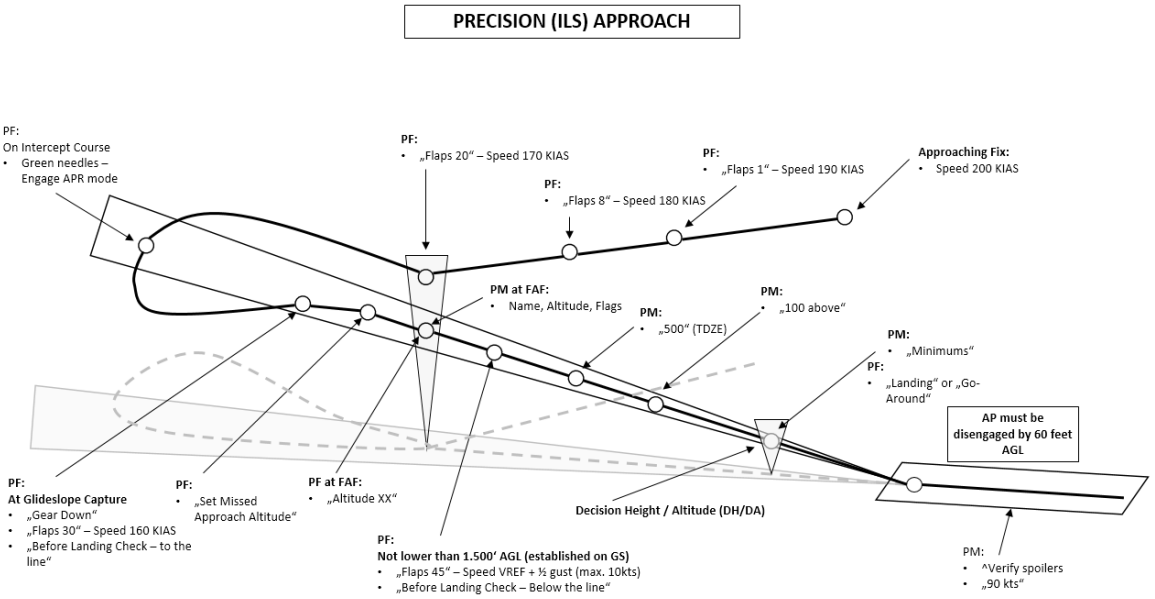
Check that bleed air is provided by the engines and the APU is off.

3. LIGHTS AND PASS SIGNS.....AS REQUIRED

Overhead Panel

Check that the landing lights, no smoking signs, seatbelt signs and logo lights are switched on.

Prepare for the approach and landing and review the approach charts and following description on the sequence of events. The following graphic shows the usual sequence of events during an ILS approach. Please take your time (and pause the flight simulator) to review the graphic and read the following explanations, as well as taking your time to go through the checklists at each segment. In case you feel more confident handling the CRJ you may of course not make use of the pause function – we would recommend it for the first flight though.



Please press pause now to take your time and read the approach description as a lot of things need to be taken care of during the approach.

When passing ROKIL waypoint you should also pass 8,000ft altitude. Proceed with the descend until reaching 5,000 ft. Then make sure that the CRJ reaches 5,000 ft before reaching waypoint DM431. When passing 210 kts extend flaps 1, when passing 190 kts extend flaps 08° and when reaching 180 kts, extend flaps to 20°. Adjust thrust as necessary to ensure that the CRJ travels at 5,000ft with 180 kts and flaps 20 before reaching MAGAT waypoint to be ready to intercept the ILS.

Make sure that the ILS signal is received and after turning towards MAGAT waypoint activate APPR mode. The autopilot is going to intercept the ILS.

Be careful: the CRJs autopilot is going to follow the ILS signal not watching speed, so you need to monitor the speed closely, especially when the CRJ starts intercepting the glideslope.

When passing 4,000ft extend the gear and flaps to 30° and 45° respectively. Adjust thrust as necessary to keep the speed at V_{Ref} + ½ gust (as no gusts are present, this results in 132 kts).

Make sure to work through the “Before Landing Checklist” now.

4.5.3 BEFORE LANDING CHECK

1. FLIGHT ATTENDANT .....ADVISED
N/A
Please advise your flight crew, to take their seats ;-).

2. PASS SIGNS .....ON
Overhead Panel
Make sure the passenger signs are switched ON.

3. THRUST REVERSERS .....ARMED
Upper Pedestal
Make sure that the thrust reversers are ARMED and the respective switches set to ARMED.

4. LDG GEAR.....DN / DOWN
Main Panel
Check that the gear lever is down, and three greens are indicated. Now please check that the missed approach altitude (5,000ft) is dialled in. When passing D2.7 IMNE, please check your altitude – it should read 2,320ft.

5. FLAPS.....___ ° INDICATING
Lower Pedestal
Check that the flaps are extended to 45°

At 200 ft above ground you need to have the runway in sight. Otherwise, a go-around is necessary, which is not supposed to happen for this tutorial flight.

Just a quick comment on landing attitude of the CRJ – the CRJ normally has a slightly positive or even occasionally neutral pitch attitude during landing. Hence it is important to increase pitch during flare to prevent landing on the nose wheel.

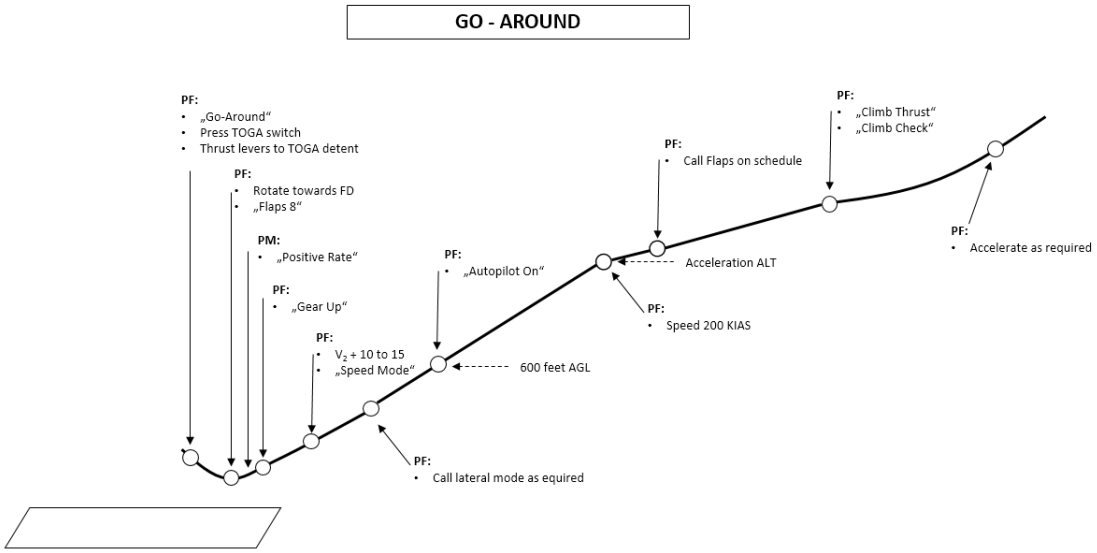
When the 50ft-call of the GPWS is sounded prepare to pull back the yoke a bit – at 20' above the runway actually perform the 'break' and pull back the yoke to increase pitch and assure landing on the main wheels.

Do not apply reverse thrust until **all** wheels are on the ground. Use the wheel brakes directly after that. Reversers are stowed at 60 knots. If you are landing on a long runway and can take an exit near the end, consider doing a quick brake test and then let the reversers do the braking. This will save wear on the brakes and wheels.

Nevertheless, in case a go-around should be necessary the following chapter describes the procedure.

4.5.5 GO-AROUND PROCEDURE

As you can deduct from the sections headline there is no go-around checklist, instead it is a sequence of work steps, which are illustrated in the following graphic as well:



1. RADIOS AND NAV AIDS .....SET FOR GO AROUND
Lower Pedestal
First of all check that all navigation radios are set according to the needs for your go-around-procedure.

Caution: A go-around manoeuvre should not be attempted after the thrust reverser have been deployed

NOTE: The minimum fuel quantity for go-around is 272 kg (600 lbs) per wing (with the airplane level) and assuming a maximum airplane climb attitude of 10° nose up

The normal condition when starting go-around is:
Gear – down, Flaps 45°

1. THRUST LEVERS / TOGA SWITCH .....ADVANCE TO TOGA / PRESS
Advance thrust levers to the TOGA detent, simultaneously press TOGA switch.

2. AIRPLANE.....ROTATE
smoothly towards the flight director command bar. This means to increase pitch so the aircraft starts to climb. But you need to keep an eye on airspeed to prevent a stall.

3. FLAPS 8
Please retract flaps to 8°.

4. PITCH ATTITUDE .....ADJUST
to achieve an airspeed of V_{2GA}+10 or higher as flaps are retracted to 8°.

When a positive rate of climb is achieved:

5. LANDING GEAR .....RETRACT / UP
As soon as you notice a positive rate of climb retract the gear as well.

6. AIRSPEED .....MAINTAIN
V_{2GA}+10 or higher
As said previously you need to watch airspeed – similar to climb out after take-off you aim for a certain speed (in this case go-around-speed plus 10 kts or higher) and adjust pitch to hold that speed.

7. NORMAL CLIMB OUT PROCEDURES .....ACCOMPLISH
Now you are back in the regular sequence of events of a climb.

4.6 AFTER LANDING

As soon as the reversers are stowed and you vacated the runway, take your time, stop the aircraft, apply parking brakes and then go through the after landing checklist.

4.6.1 AFTER LANDING CHECK

1. APU.....AS REQUIRED

Overhead Panel

Start the APU to have a source for electrical power and bleed air available upon switching off the engines. APU Start Sequence is described on the following page.

APU START SEQUENCE
(a). APU, PWR Fuel switch.....ON *Overhead Panel* Check that the APU SOV (Shutoff Valve) OPEN message appears on the EICAS. Afterwards the APU IN BITE message is appears momentarily. Now the APU RPM and EGT appear on the EICAS, followed by the APU DOOR status message. The APU IN BITE message disappears now. **(b). APU, START/STOP Switch .....Start** *Overhead Panel* Press the APU, START/STOP button to initiate the start sequence. This will be followed by a APU START message on the EICAS, then the APU spools up. Before reaching 60% the START light and APU START message disappear. Roughly 2 seconds after reaching 99% the AVAIL light will illuminate indicating the power and bleed air is now available through the APU. **(c). DC and AC electrical power .....Check** *Overhead Panel* Check that the APU Gen switch is set to AUTO and AUTO Transfer lights are extinguished. BLEED SOURCE switch .....As required *Overhead* Please set to APU so that bleed air is supplied by the APU **(e). BLEED VALVES switch .....As required** *Overhead Panel* Set to AUTO .....
END OF APU START SEQUENCE

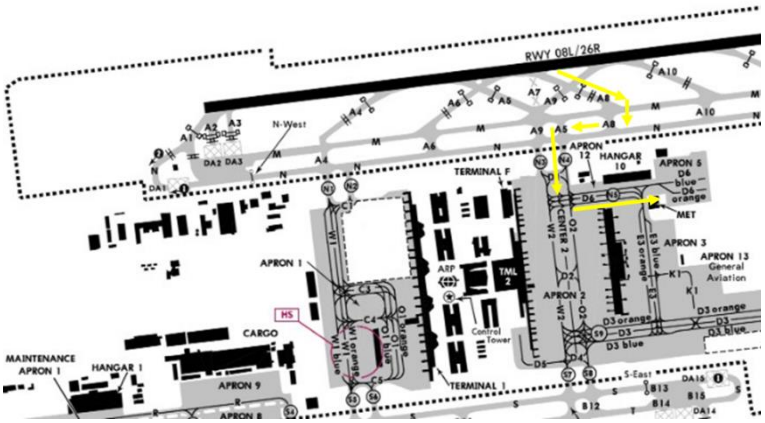
2. TRANSPONDER / RADAR ..... STBY / OFF
Not simulated in MFS - Lower Pedestal
Switch off the terrain display and set the transponder to stdby.

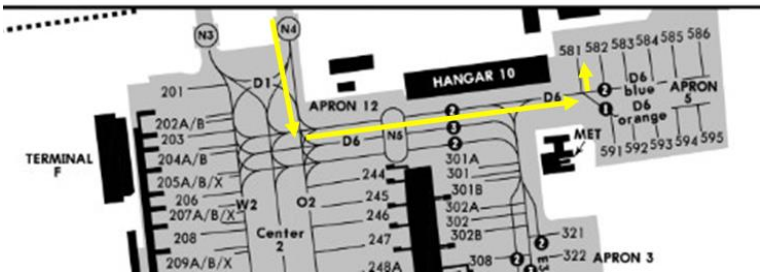
3. FLAPS ..... UP
Lower Pedestal
Set the flap lever to UP to retract the flaps.

4. LIGHTS AND STROBES ..... AS REQUIRED
Overhead Panel
Switch Off the strobes and landing lights and switch on the taxi lights.

5. PROBES ..... OFF
Overhead Panel
Switch off the probe heat.

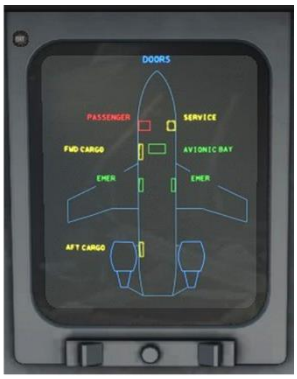
Now you can request taxi clearance. Taxi to parking position 581 via taxiways A8, M, A8, N, N4, D6.





As soon as you arrived at the parking position, set the parking brake and proceed through the shutdown check to shut off the engines and prepare the aircraft for disembarking.

the EFB will help, setting the chocks as well as opening the doors – open the AIRCRAFT page and click on the respective icons to active the chocks, power card and open the doors.



4.6.2 SHUTDOWN CHECK

Note: Thrust reversers must be stowed prior to engine shutdown

Caution: Inform ground crew of 'hot' brakes condition as soon as possible

As soon as you have arrived at the gate and the aircraft is parked at the final parking position you may work through the shutdown checklist.

1. CHOCKS AND BRAKES.....AS REQUIRED
FMS
Set the parking brake and then activate the chocks through the EFB. As soon as the chocks are set, deactivate the parking brake.

2. ELECTRICS .....SET
Overhead Panel
Make sure that the APU is running and the APU generator is activated.
Otherwise make sure that external power is connected.

3. FUEL AND CHECK VALVE TEST .....COMPLETE
Overhead Panel & EICAS
Complete fuel check valve Test for engine 1 – see chapter '4.1.5 CLEARED TO START CHECK' during preparation.

4. THRUST LEVERS.....SHUT OFF
Lower Pedestals
Set the thrust levers to the shut off detent – use the mouse button to unlock the lock switches and then shut off the engines by moving the throttle lever to the shut off position.

5. SEAT BELTS .....OFF
Overhead Panel
As soon as the N_2 is below 20% you may switch off the seatbelt sign.

6. ANTI ICE .....OFF
Overhead Panel
Make sure that all anti ice switches as well as window heat switches are set to OFF.

7. FUEL PUMPS .....OFF
Overhead Panel
Switch off the fuel pumps.

8. HYDRAULIC 3A PUMP.....AS REQUIRED
Overhead Panel
Please switch it OFF.

9. BEACON .....OFF

Overhead Panel
Now you can also switch off the beacon light

10. N/W STRG switch ..... OFF
Pilots side panel
As the nosewheel steering is not needed anymore, you can switch it off now.

As soon as all passengers disembarked, you may power off the aircraft.

TERMINATING CHECK

Apart from the previous checklists I won't add explanations per checklist item in this checklist as basically everything is switched OFF to shut down the aircraft.

1. Chocks and Brakes ..... In / OFF
N/A

2. IRS..... OFF
Pedestal

3. Thrust levers ..... OFF
Lower Pedestal

4. EMER LTS SWITCH ..... OFF
Overhead Panel

5. WSHLD SWITCH..... OFF
Overhead Panel

6. AFT CARGO SWITCH ..... OFF
Overhead Panel

7. HYDRAULIC PUMPS..... OFF
Overhead Panel

8. EXTERNAL LTS SWITCHES..... OFF
Overhead Panel

9. APU START / STOP..... OFF
Overhead Panel

10. APU PWR FUEL..... OFF
Overhead Panel

11. DC SERVICE SWITCH ..... OFF
Overhead Panel

12. BATTERY MASTER SWITCH ..... OFF
Overhead Panel

13. DOME LIGHT SWITCH ..... OFF
Overhead Panel

14. BOARDING LIGHTS ..... OFF
Overhead Panel

Congratulations – you just finished your first flight with the CRJ.

5 APPENDIX

5.1 TAKE-OFF AND LANDING DATA CARD

CRJ 700 TAKE-OFF AND LANDING DATA CARD		
TAKE-OFF		
Airport EDLP	Field Elev. 699 ft	QNH 29,89 inHG / 1012,19 mbar
RWY. 06	C.G. & Trim 16,2 / 7,8	Temp. -02°C
V_1 125	V_R 125	V_2 136
Flaps 20 → Flaps 8 141	Flaps 8 → Flaps 1 149	Flaps 1 → Flaps 0 170
Max. Landing Weight **CRJ700ER**: 30.391kg / 67.000lbs .....**CRJ900ER**: 33.340kg / 73.500lbs		
Airport EDDM	Field Elev. 1487 ft	QNH 29,89 inHg / 1012,19 mbar
RWY. ILS 08L	C.G. & Trim N/A	Temp. -02°C
V_{Ref} 132	V_{2GA} 139	
Flaps 20 → Flaps 8 138	Flaps 8 → Flaps 1 146	Flaps 1 → Flaps 0 166

5.2 QRH – SPEED CARD TAKE-OFF 65'000 LBS (29'484 KG)

65'000lbs / 29'484 kgs						
Landing						
Flaps	**0°**	**1°**	**8°**	**20°**	**30°**	**45°**
Min Maneuvering	**183**	**167**	**161**	**155**	**151**	143
V_{REF}	173	157	151	145	141	**133**

Takeoff										
Add 1 kt to V_1 & V_R for Wing & Cowl A/I ON										
Flaps		**8°**				**20°**				
Press. Alt.		**0**	**2'000**	**4'000**	**6'000**	**8'000**	**0**	**2'000**	**4'000**	**6'000**	**8'000**
V_1	≤ 10°C	123	124	125	126	127	117	119	119	120	121
	20°C	123	124	125	126	128	117	118	119	121	122
	30°C	123	125	126	127	129	117	119	120	121	123
	40°C	125	126	128	38° / 129	34° / 129	119	120	121	38° / 122	34° / 123
	MAX TEMP	50° / 127	46° / 128	42° / 128			50° / 121	46° / 122	42° / 121		
V_R	≤ 10°C	124	124	125	126	127	118	119	119	120	121
	20°C	124	125	125	126	128	118	119	119	121	122
	30°C	124	125	126	127	129	118	119	120	121	123
	40°C	125	126	128	38° / 129	34° / 129	119	120	121	38° / 122	34° / 123
	MAX TEMP	50° / 127	46° / 128	42° / 128			50° / 121	46° / 122	42° / 121		
V_2 / V_{2GA}		**135 / 140**					**129**				
Flap Retraction		**147 (Flaps 1)**			**170 (Flaps 0)**		**141 (Flaps 8)**		**149 (Flaps 1)**		**170 (Flaps 0)**

Additional speeds											
Approximate Single Engine Drift down Altitude - FL310											
Altitude (FL)	**<10'000**	**210**	**230**	**250**	**270**	**290**	**310**	**330**	**350**	**370**	**390**
V_{FTO} / V_{ENR}	185	189	192	196	198	201	204	207	210	213	217
V_{MD}/Min Hold	206	216	219	222	224	227	229	232	231	227	-

5.3 QRH – TAKE-OFF STAB TRIM CHART – FLAPS 20

STABILIZER TRIM TAKE-OFF SETTING - FLAPS 20

C.G [%MAC]	Trim Setting [Units]								
	22'680kg	**24'267kg**	**25'855kg**	**26'000kg**	**27'259kg**	**28'259kg**	**30'000kg**	**32'000kg**	**34'000kg**
	50'000lbs	**53'500lbs**	**57'000lbs**	**61'300lbs**	**62'300lbs**	**65'000lbs**	**69'000lbs**	**72'000lbs**	**75'000lbs**
14	5,8	6,3	6,7	6,8	7,9	7,9	8,6	9,3	9,7
15	5,6	6,1	6,5	6,6	7,6	7,6	8,4	9,0	9,4
17	5,3	5,8	6,2	6,2	7,2	7,2	8,0	8,5	8,9
19	5,0	5,5	5,8	5,9	6,8	6,8	7,5	8,0	8,4
21	4,7	5,1	5,5	5,5	6,4	6,4	7,1	7,5	7,9
23	4,4	4,8	5,1	5,2	6,0	6,0	6,6	7,7	7,4
25	4,1	4,4	4,7	4,8	5,6	5,6	6,2	6,6	6,8
27	3,8	4,1	4,4	4,4	5,2	5,2	5,7	6,1	6,3
29	3,6	3,7	4	4,1	4,7	4,7	5,3	5,6	5,8
31	3,6	3,6	3,7	3,7	4,3	4,3	4,8	5,1	5,3
33	3,6	3,6	3,6	3,6	3,9	3,9	4,4	4,6	4,8
35	3,6	3,6	3,6	3,6	3,6	-	-	-	-

5.4 QRH – SPEED CARD LANDING 62’000 LBS (28’123 KG)

62'000lbs / 28'123 kgs						
Landing						
Flaps	**0°**	**1°**	**8°**	**20°**	**30°**	**45°**
Min Maneuvering	**179**	**163**	**157**	**151**	**147**	139
V_{REF}	169	153	147	14	137	**129**

Takeoff										
Add 1 kt to V_1 & V_R for Wing & Cowl A/I ON										
Flaps		**8°**				**20°**				
Press. Alt.		**0**	**2'000**	**4'000**	**6'000**	**8'000**	**0**	**2'000**	**4'000**	**6'000**	**8'000**
V_1	≤ 10°C	120	121	122	123	124	114	115	116	117	118
	20°C	120	121	122	123	124	114	115	116	117	118
	30°C	120	121	123	124	125	114	116	117	118	119
	40°C	122	123	124	38° / 125	34° / 125	116	117	118	38° / 119	34° / 119
	MAX TEMP	50° / 123	46° / 125	42° / 124			50° / 117	46° / 118	42° / 118		
V_R	≤ 10°C	120	121	122	123	124	114	115	116	117	118
	20°C	121	121	122	123	124	115	115	116	117	118
	30°C	121	122	123	124	125	115	116	117	118	119
	40°C	121	123	124	38° / 125	34° / 125	116	117	118	38° / 119	34° / 119
	MAX TEMP	50° / 123	46° / 125	42° / 124			50° / 117	46° / 118	42° / 118		
V_2 / V_{2GA}		**133 / 137**					**126**				
Flap Retraction		**145 (Flaps 1)**			**166 (Flaps 0)**		**138 (Flaps 8)**		**146 (Flaps 1)**		**166 (Flaps 0)**

Additional speeds											
Approximate Single Engine Drift down Altitude - FL310											
Altitude (FL)	**<10'000**	**210**	**230**	**250**	**270**	**290**	**310**	**330**	**350**	**370**	**390**
V_{FTO} / V_{ENR}	181	184	188	192	194	196	199	202	205	208	211
V_{MD}/Min Hold	199	210	212	215	218	220	223	225	227	224	219