Rev #	Date	Author	Change	Version
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002	14 Dec 2020	MK	Created for initial distribution	0.90b
003	15-Dec-2020	MK (et al.)	Spellcheck, some tweaks	0.91
004	15-Dec-2020	MK	Added sections on settings, mouse wheel and keys	0.91b
005	15-Dec-2020	MK	Key input options deleted	0.91c
006	18_Dec-2020	MK	Finalizing	0.99
007	02-Feb-2021	MK	Power<>Thrust correction	0.99b
008	17-Feb-2021	MK	Meter <> Feet correction	0.99c
009	18-Feb-2021	MK	More tweaks and Release Candidate	1.00
010	10-Mar-2021	MK	Adding info on CG slider	1.00
011	23-Mar-2021	MK	After release tweaks	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/

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INTRODUCTION

Thank you very much for purchasing Digital Aviation & Aerosoft CRJ package.

The CRJ is a typical regional jet to connect smaller airports or remote areas with the bigger hubs. Hence the CRJ can get fast up to cruise altitude and stay there long but is not designed for world record cruise speeds.

The CRJ's history goes back into the 80's, when first studies were made regarding options to create a regional jet out of the Challenger 600 business jet. Near the end of the 80's Lufthansa pushed the idea again and the project was actually started in 1989 with the maiden flight in 1991 and certification in 1992: the CRJ100 was born. The CRJ200 was developed later based on the CRJ100 and equipped with better engines. Both versions carry 50 passengers.

When the CRJ700 was developed, the fuselage was stretched further to accommodate 70 passengers. Accordingly, the wings needed to be modified, and furthermore new winglets and new engines were attached. Its maiden flight was in May of 1999. On basis of the CRJ700 the CRJ900 was developed. The fuselage was stretched again to accommodate 90 passengers.

In 2007 another program was started to stretch the CRJ900 even more and the CRJ1000 was born. It received certification in 2010 and can accommodate up to 100 passengers. The youngest model is the CRJ550 which is a modified version of the CRJ700 and was introduced in 2019 to comply with scope clauses in US pilot contracts. Basically, it is a CRJ700 with a reduced number of a maximum of 50 seats.

These days Mitsubishi owns this range of aircraft after buying it from Bombardier.

Meanwhile, four different packages are available for purchase which differ regarding compatible flightsimulator, included models and pricing.

Package	**Flightsim**	**CRJ550**	**CRJ700**	**CRJ900**	**CRJ1000**
CRJ700/900	FSX, P3D (32 bit)	no	yes	yes	No
CRJ Professional 550/700/900/1000	P3D (64 bit)	yes	yes	yes	Yes
CRJ550/700 base package	MSFS	yes	yes	no	No
CRJ900/1000 expansion package*	MSFS	no	no	yes	Yes

* Requires CRJ550/700 base package.

All packages comprise the respective models with flight dynamics modelled according to the respective flight performance data and of course 3d representations as close as possible in FS to the real thing. Accurate systems programming reflects behaviour of the real CRJ within normal operations.

CREDITS

- Programming: Hans Hartmann (Digital Aviation)
- 3D Modelling, Texturing: Stefan Hoffmann (Aerosoft)
- Flight dynamics: Alexander Metzger (Digital Aviation)
- Sound: Turbine Sound Studios, Aerosoft, Digital Aviation, Asobo
- Documentation: Ingo Voigt (Digital Aviation), Mathijs Kok, Alexander Metzger
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- Marketing: Vanessa Quandt (Aerosoft)
- Additional Liveries: Holger Sobl
- Video: Jeroen Doorman (Jerdoo)

The beta testers of this product deserves special mention. In this development, we experimented extensively with involving them directly in the production, they often tested code minutes after it was written, gave feedback and got new code send back to test again. This made development fast and to use a modern term, agile.

We specifically like to thank the following people for their patience and assistance: Frank Docter, Jeroen Doorman, Emanuel Hagen, Holger Sobl, Jonas Scholtz and Brandon Promeneur. Friends, advisors, and a source of inspiration. We would like to mention the late Captain Andreas Kraft for all his help and expertise.

A special mentioning should go to Microsoft and Asobo. Without their assistance this product would simply not exist at this moment. Often, we got help from them late in the evening or in weekends. These are people who care for their product.

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INSTALLING & REMOVING

Installing the product correctly is the first step to getting airborne. Please follow the steps below to avoid problems.

Please note that the first time you load the aircraft there will be an initial conversion. This will take up to 8 minutes (!) even on fast computers. Your system might seem unresponsive during this period. Lean back, get a cup of coffee, and do not worry. This might also happen after some updates.

DOWNLOAD

The downloaded file can be unpacked to any location on your system. We **strongly** recommend using these steps to install:

1. Update all your Windows Store apps.
2. Reboot your computer.
3. Log in with administrative rights.
4. Disable the anti-virus software temporary.
5. Install the product.
6. Enable the anti-virus software.
7. Defragment your disk (NOT if you are using an SSD).

DOWNLOAD FROM IN-GAME STORE

The downloaded file can be unpacked to any location on your system. We **strongly** recommend using these steps to install:

1. Update all your Windows Store apps.
2. Reboot your computer.
3. Log in with administrative rights.
4. Disable the anti-virus software temporary.
5. Start the simulator and install the software.
6. Enable the anti-virus software.
7. Defragment your disk (NOT if you are using an SSD)

BOXED

After inserting the DVD, the installer will start automatically (if not navigate to the DVD and start the setup.exe). We **strongly** recommend using these steps to install:

1. Update all your Windows Store apps.
2. Reboot your computer.
3. Log in with administrative rights.
4. Disable the anti-virus software temporary.
5. Insert the DVD.
6. Install the product.
7. Enable the anti-virus software.
8. Defragment your disk (NOT if you are using an SSD)

REMOVING

Never remove this product by manually removing the files but to use the Windows Software control panel applet or the Windows store applet if you bought it in the in-game store.

MSFS INSTALLATION PATH

This product follows the guidelines of Asobo / Microsoft for the installation in MSFS. The main installation path in MSFS is <MSFS-directory>\Community\aerosoft-aircraft-crj-pro. All the files of this product are in that single folder. Whenever the installation path is mentioned, the manuals refer to this folder.

MANUALS

The documentation for the CRJ includes these documents:

- **Vol1: AOM part I – General Information**. You are reading this manual now. Contains information on installation, where to find support, manual structuring, some basic information on the CRJ, a transition guide for experienced users, an introduction to loading the CRJ, the external model, its cockpit, keyboard commands, tools coming along with the CRJ, and some flight suggestions apart from the tutorial.
- **Vol2: Quick Reference Handbook, QRH.** Contains information on procedures, limitations, and aircraft performance.
- **Vol3: Tutorial**. Tutorial flight which takes you from Paderborn to Paris guiding you through a flight from preparation to shut down.
- **Vol4: Normal Ops Checklist.** Short checklists on two pages – for experienced pilots
- **Vol5: AOM part II - Systems Manual.** Introduction and explanation on the CRJ's systems.
- **Vol6: Flight Management System.** Detailed description of the FMS.

This product has its origins in FSX and P3D, so possibly you may find references to settings in FSX or P3D. Usually you find those in MSFS as well, but in case you have a problem you cannot solve and the manual does not answer, just contact us and we will assist!

Also note that the readme.txt always contains the information on the latest updates. Before contacting support do make sure you installed the latest version!

CONTACT SUPPORT

Support for this product is done by Aerosoft. We prefer to do support on the support forum for one simple reason, it is fast and efficient because customers help customers when we are sleeping. **It is also the difference between one support person reading the question and 500 people, some of who know a LOT about the aircraft.**

- CRJ Support Forums: https://forum.aerosoft.com/index.php?/forum/1025-aerosoft-crj/
  Please use the correct forum section, if you can't find your posts we have probably moved it to the correct section.
- If you prefer personal support, you can open a ticket here:
  https://helpdesk.aerosoft.com/portal/en/home
  Please note that personal support can be slow when things are busy (shortly after a major release for example). We try to get back to you in 24 hours, but if you want an answer fast, go to the forums.
  Forums have priority for us over emails.

We feel strongly about support. Buying one of our products gives you the right to waste our time with questions you feel might be silly. They are not. We provide support in English, German, Dutch, French, Spanish and Portuguese.

NAVIGATION DATABASE

With this CRJ comes a complete copy of the NavDataPro navigation database. This database contains the data current in March 2021 and is the worlds most used navigation database in aircraft. The database is fully updateable; check its product page on at www.aerosoft.com/en/search?sSearch=navdatapro

The CRJ is fully compatible with the well-known Navigraph database. Although these databases come from a different source and have some differences, they are basically the same and you should not see any differences between the two.

Please note that the navigation systems will NOT show any airport that does not have a runway long enough (4500 feet) for the CRJ to use.

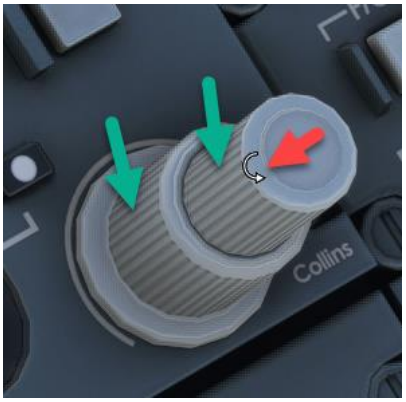
VERSION NUMBERS

- The release version number will be **1**.0.0.0
- A service pack will show in the tens, 1.**1**.0.0 (first service pack) -> new full build
- A hotfix will show in in the hundreds 1.1.**1**.0 (first hotfix to be put on service pack 1)

When there are many hotfixes, we will also make full new builds. If you are ever in doubt which version you have, check the readme that you can find in <MSFS-directory>\Community\aerosoft-aircraft-crj-pro\Documentation

WHY YOU NEED A MOUSE WITH A MOUSE WHEEL

MFS does not know left and right mouse click as FSX and P3D did. So, to operate switches that have three settings you need to put the mouse cursor on it and use the mouse wheel to operate the switch. This also works for rotary controls, though these can also be controlled with the left mouse key on the left or right side of the control knob. You will see an arrow indicating what way the knob will turn, see the red arrow). Note that many rotary controls have more than one knob on the same axis (see the green arrows). These control different things.



SIMULATOR SETTINGS

There are no specific simulator settings that affect the CRJ specifically except for the need to select the MODERN in the OPTIONS | GENERAL | FLIGHT MODEL menu. However, a smooth experience is important and certainly in the first few hours we would advise you to avoid extreme settings so you can focus on the aircraft.

If you want to learn more about the simulator and how to use it, we advise you to check out the great book **'A Guide to Flight Simulator'** you can find on Aerosoft.com. Highly recommended.

THE CRJ

As we already discussed the CRJ's history during the introduction this chapter provides some basic facts on the CRJ.

BASIC FACTS

METRIC UNITS

	CRJ550	**CRJ700**	**CRJ900**	**CRJ1000**
Length	32,3 m	32,3 m	36,2 m	39,1 m
Wingspan	23,2 m	23,2 m	24,9 m	26,2 m
Height	7,6 m	7,6 m	7,5 m	7,5 m
Dry Operating Weight		20‘290 kg	22‘131 kg	
Maximum zero fuel weight (MZFW)	26‘762 kg	28‘259 kg	31‘751 kg	35’154 kg
Maximum Payload	7’051 kg	8‘190 kg	9‘907 kg	11’966 kg
Cargo Weight	2‘438 kg	2‘438 kg	2‘756 kg	3’257 kg
Maximum Ramp Weight	29‘937 kg	34‘133 kg	37‘735 kg	41’867 kg
Maximum take-off weight (MTOW)	29‘484 kg	34‘019 kg	37‘421 kg	41’640 kg
Maximum landing weight (MLW)	27‘670 kg	30‘391 kg	33‘340 kg	36’968 kg
Maximum Seat Capability	50	70	90	100
Maximum range	1‘852 km	2‘553 km	2‘439 km	3’056 km
Max. Cruise Speed	473 kts / 0.825 Mach	473 kts / 0.825 Mach	470 kts / 0,82 Mach	470 kts / 0,82 Mach
Takeoff field length (ISA, Sea Level, Max. Takeoff Weight)	1‘436 m	1‘478 m	1‘847 m	2.120 m
Landing field length (ISA, Sea Level, Max. Landing Weight)	1‘236 m	1‘408 m	1‘603 m	1’750 m

IMPERIAL UNITS

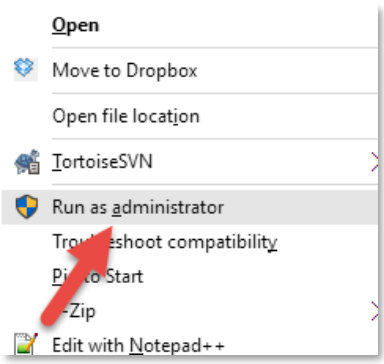
	CRJ550	**CRJ700**	**CRJ900**	**CRJ1000**
Length	106 ft 1 in.	106 ft 1 in.	118 ft 11 in.	128 ft 5 in.
Wingspan	76 ft 3 in.	76 ft 3 in.	81 ft 7 in.	85 ft 11 in.
Height	24 ft 10 in.	24 ft 10 in.	24 ft 7 in	24 ft 6 in.
Dry Operating Weight		44‘731lbs	48‘790lbs	
Maximum zero fuel weight (MZFW)	59‘000lbs	62‘300lbs	70‘000lbs	77’500lbs
Maximum Payload	15‘545lbs	18‘055lbs	21‘840lbs	26’380lbs
Cargo Weight	5‘375lbs	5‘375lbs	6‘075lbs	7’180lbs
Maximum Ramp Weight	66‘000lbs	75‘250lbs	82‘750lbs	92’300lbs
Maximum take-off weight (MTOW)	65‘000lbs	75‘000lbs	82‘500lbs	91’800lbs
Maximum landing weight (MLW)	61‘000lbs	67‘000lbs	73‘500lbs	81’500lbs
Maximum Seat Capability	50	70	90	100
Maximum range	1‘000 nm	1‘378 nm	1‘317 nm	1‘900 nm
Max. Cruise Speed	473 kts / 0.825 Mach	473 kts / 0.825 Mach	470 kts / 0.82 Mach	470 kts / 0.82 Mach
Takeoff field length (ISA, Sea Level, Max. Takeoff Weight)	4‘7116 ft	4’849 ft	6‘060 ft	6‘955 ft
Landing field length (ISA, Sea Level, Max. Landing Weight)	4‘710 ft	5‘040 ft	5‘260 ft	5‘740 ft

THE CRJ IN FLIGHTSIMULATOR

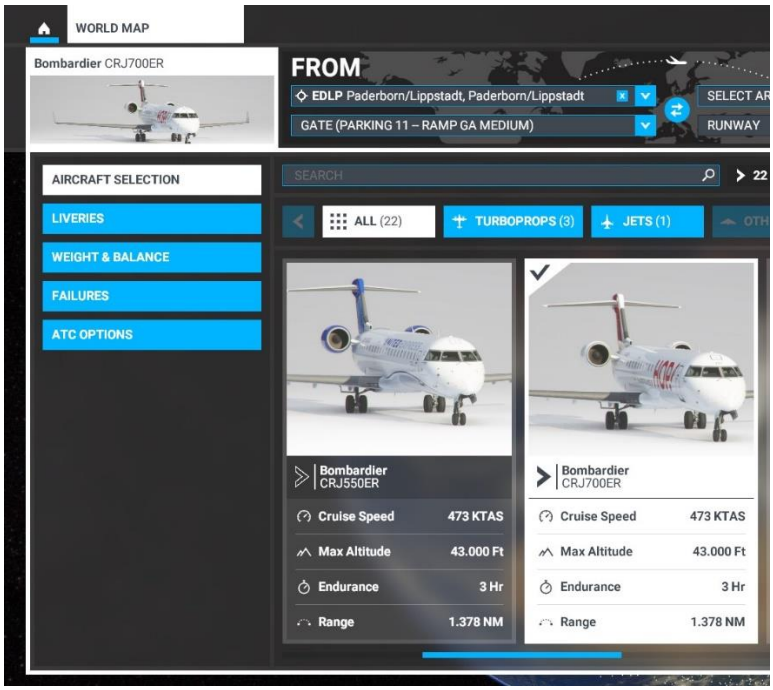
The following chapter describes how to load the CRJ in flight simulator, which animations (like opening doors, cargo hatches) are available, a brief tour of the virtual cockpit with a short overview of available panels and pre-defined views, closing with the concept of operation (i.e. how do switches, pushbuttons, etc. work in your flight sim).

LOADING THE CRJ

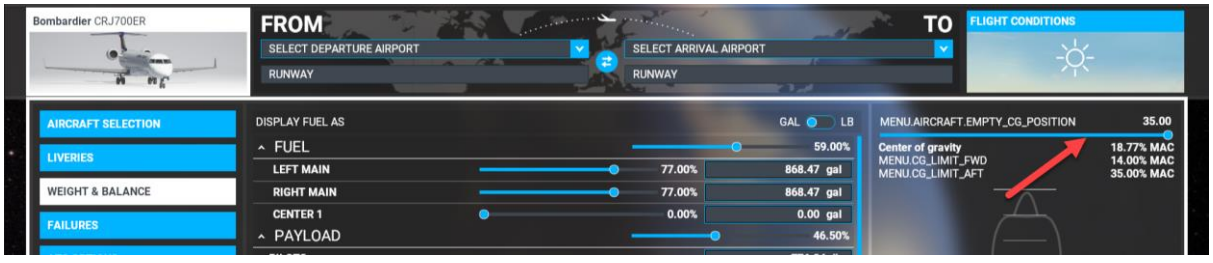
It is important that your simulator is running with Administrative rights to avoid problems. This is especially important when your simulator is installed in the default location (Program Files). If you are not logged in with administrative rights, you can still have the simulator running with Administrative rights by right clicking and selecting [Run as administrator].



To load the CRJ in MSFS go to the 'World Map' menu, open the aircraft menu. The CRJ is found in the 'Airliners' section.



Note that under Weight and Balance in this screen the indicated slider needs to be fully right.



THE VIRTUAL COCKPIT OVERVIEW

To prevent pilots searching the entire cockpit for a certain knob, the cockpit is divided into several logical panels. The following picture shows a view of the entire virtual cockpit and numbers indicate the respective panels. Note that elements described in grey are not simulated.

1.Overhead	2.Glareshield/Autopilot	3. Centre Instrument Panel
4. Captain Instrument Panel	5. Captain Side Panel/Side console	6. First Officer Instrument Panel
7. FO Side Panel/Side Console	8. Upper Pedestal	9. Lower Pedestal

OVERHEAD PANEL

1. Electrical Power	2. Fire Detection Test System	3. Hydraulic Shutoff Valves (SOV)
4. External Lighting Controls	5. Fuel Controls	6. Pneumatic Controls
7. Auxiliary Power Unit Controls	8. Engine Start Panel	9. Hydraulic Controls
10. Emergency Locator Transmitter	11. Cabin Pressure Controls	12. Air Conditioning Controls
13. Anti-Ice Controls	14. Internal Lighting Controls	

GLARESHIELD / AUTOPILOT PANEL

1. Standby / Whiskey Compass. Traditional compass, normally only used to check alignment of electronic compasses.	2. Seat Position Sight Gauge. Used to position the seats so your eyes are always in the same location. The grey ball should hide one of the gold balls.
3. Warning / Annunciator Lights Captains Side	4. Navigation / Flight Director / Autopilot Panel
5. Warning / Annunciator Lights First Officers Side	

WARNING / ANNUNCIATOR LIGHTS PILOTS SIDE

1. ROLL SEL and PLT / CPLT ROLL. The ROLL SEL light comes on, to indicate that roll priority selection is necessary.	2. Master Warning Light. The red Master Warning Light is illuminated and an aural warning sounds, in case an EICAS warning message is triggered.
3. Master Caution Light. The amber Master Caution Light is illuminated and an aural warning sounds, in case an EICAS caution message is triggered.	4. Stall Warning Light / Switch. Illuminates in case a stall warning is triggered. After opening the switch protection, the stall warning switch may be pressed to trigger the stall warning test sequence.
5. Pull Up / GND PROX Warning Light. The Ground Proximity Warning System, GPWS, may trigger the Pull Up / GND PROX warning light depending on the current mode.	6. LH ENG FIRE Switch. The LH/RH ENG FIRE Switch illuminates in case an engine fire is detected. Pushing the switch cuts engine fuel, bleed air and closes the hydraulic shutoff valves.
7. BOTTLE 1 and 2 ARMED PUSH TO DISCH The CRJ is equipped with 2 squibs which contain halon to at least try and extinguish an engine fire. After pressing	

the ENG FIRE switch the squib is armed and the BOTTLE 1 and 2 ARMED PUSH TO DISCH switch illuminates.	

AUTOPILOT PANEL

1. Course 1 Selector	2. Flight Director Switch	3. Auto Pilot Engage Switch
4. Auto Pilot Disengage Switch	5. XFR Mode Switch	6. Turbulence Mode Switch
7. Speed Mode Selector	8. Speed Selector	9. Approach Mode Selector
10. B/C Mode Switch	11. Heading Mode Selector	12. Heading Selector
13. NAV Mode Selector	14. Half Bank Mode Switch	15. Altitude Mode Selector
16. Altitude Selector	17. Vertical Speed Mode Selector	18. Vertical Speed Selector
19. Course 2 Selector	20. Flight Director Switch	

CENTER INSTRUMENT PANEL

1. LEFT EICAS Display (Engine Indicating and Crew Alerting System) shows Engine, Gear, Flaps, Warnings and Cautions	2. Integrated Standby Instrument Panel Backup instrument for the attitude direction indicator, speed indicator and altitude indicator.
3. RIGHT EICAS Display (Engine Indicating and Crew Alerting System) shows information on other aircraft systems. Also, can show Advisory and Status messages.	

CAPTAINS INSTRUMENT PANELS

1. Nose wheel Steering Switch	2. Cockpit Light Controls	3. Windshield Wiper Switch
4. Stall Protection Pusher Switch. Arms the stick pusher.	5. Clock / Stopwatch	6. Bearing Selector Switch. Upper switches between OFF, NAV1 and ADF1. Lower switches between OFF, NAV2 and ADF2.
7. Format and Range Selector. Controls MFD format (PLAN, MAP HSI, weather radar, TCAS) and range.	8. Navigation Source Selector. Switches navigation source between FMS1, FMS2, NAV1, NAV2.	9. Vertical Speed Selector. Used to set V-Speeds (V1, V2, VR, VT).
10. Decision Height / Minimum Descent Altitude selector. Enables to select whether the decision height (DH) or minimum descent altitude (MDA) is indicated and adjust the value.	11. Barometric selector. Allows selection in Hg or mbar and adjust the value.	12. Revisionary Panel. Used to switch the MFD to PFD, NORM (navigation information) or EICAS mode.
13. Primary Flight Display, PFD Combines several instruments in one: attitude direction indicator, airspeed indicator, altimeter, vertical speed indicator, horizontal situation indicator, V-Speed bugs.	14. Multi-Function-Display, MFD Offers several display modes (Map, Plan, Horizontal Situation Indicator, Weather radar, TCAS) and may be switched to different navigation sources (FMS, VOR)	15. Voice Recorder Control Panel

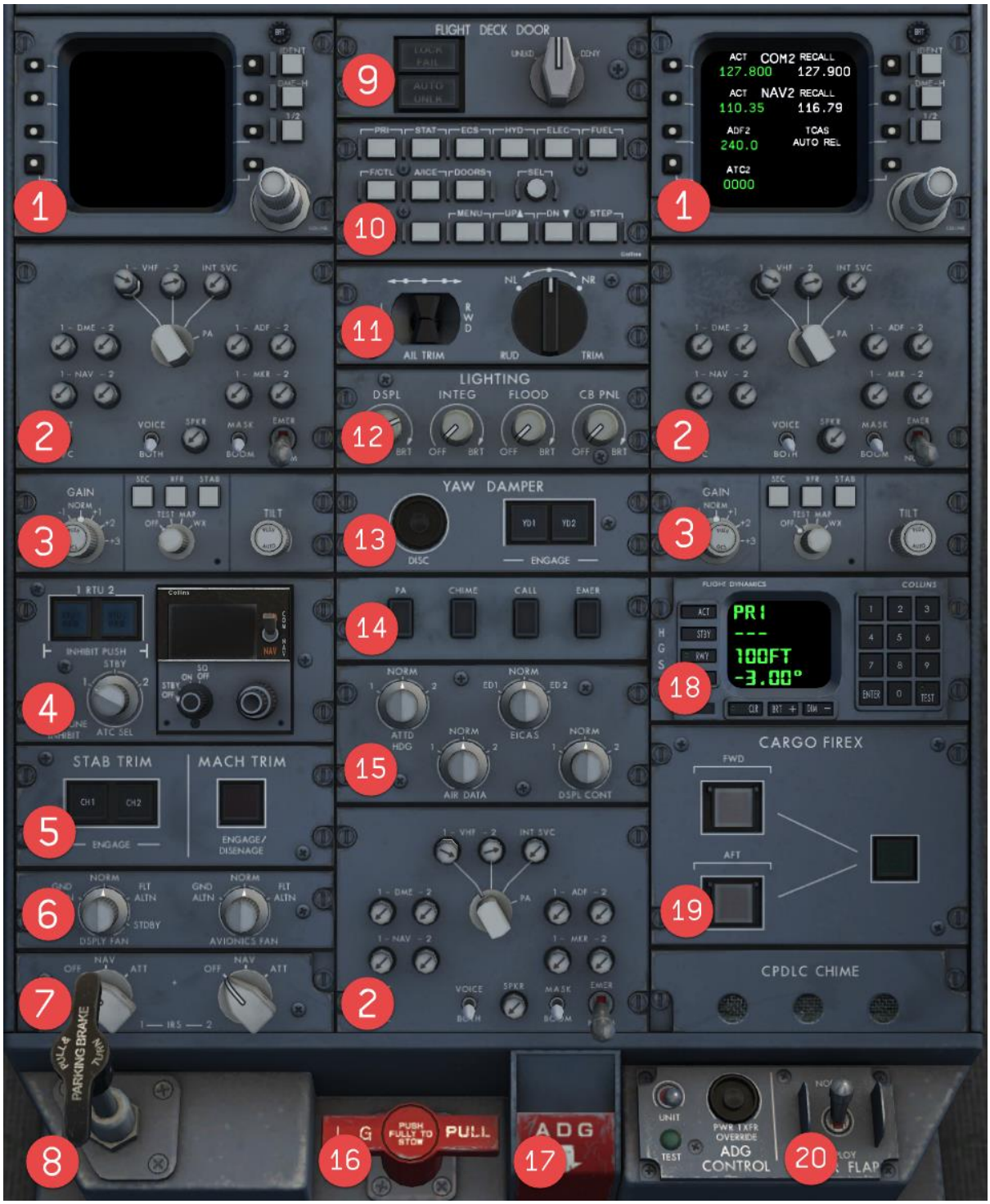
CAPTAIN SIDE CONTROL

1. Skycam. Used to monitor different cameras, for example to see who is at the cockpit door.	2. Steering Tiller. Used to steer the nose wheel on the ground at low speed.
3. Oxygen Mask: Click to test the flow of Oxygen.	

UPPER PEDESTAL

1. Captain side Flight Management System	2. First Officer side Flight Management System
3. Brake Temperature Monitor System. Used to reset the system and silence the horn.	4. Anti-Skid Switch. Arms or deactivates the anti-skid system.
5. MLG BAY Test switches. Test switches for Main Landing Gear Bay Overheat	6. Gear Lever.
7. Engine Synchronization Switch. The left and right engine's rpm may be synchronized automatically for cabin noise reduction.	8. Ground Proximity Warning Switch. Illuminate depending on the activated GPWS mode pressing the switch silences the associated warning.
9. Pitch Disconnect. Disconnects the control wheels in case one yoke is jammed.	10. Spoiler Switch. To arm automatic extension of the ground spoilers after touchdown.
11. Reverser Switches. Arms the reversers so that they may be deployed during landing roll.	12. Spoiler lever. To extend and retract the spoilers.
13. Thrust Lever. To control thrust (from fuel shutoff to full thrust).	14. Roll Disc Handle. Disconnects the control wheels in case one yoke is jammed.
15. Flap Lever. Used to extend and retract the flaps.	

LOWER PEDESTAL



1. Radio Tuning Units. Used to tune communication, navigation stations as well as the transponder. The TCAS mode is also set here.	2. Audio Control Panels. Used to control sound volume for several audio sources like navigation station aural identifiers.
3. Weather Radar Controls.	4. Backup Tuning Unit and ATC Selector Switch. Used to select the active transponder and a backup tuning unit in case the RTU fails.
5. Stab / Mach trim Switches. Controls for the Mach and stabilizer trim.	6. Avionics Fan Controls.
7. Inertial Navigation System Controls, IRS Switches. Selector knobs for the modes of the IRS system	8. Parking Brake Lever. To set and release the parking brake.
9. Flight Deck Door Control. Controls for the flight deck door to deny or allow access to the cockpit.	10. EICAS Control Panel. Panel to select different EICAS pages.
11. Aileron and Rudder Trim Controls.	12. Cockpit Lightings Controls.
13. Yaw damper switches. Used to activate / deactivate the yaw dampers.	14. Intercom Control Panel. Used on the real plane to control communication within the aircraft like passenger addressing, crew calls, emergency calls and sounding a chime.
15. Source Selector Panel. The source selector panel allows to select air data sources as well as switching the displays to different modes in case a display fails.	16. Landing Gear Alternate Extension. In case the gear does not extend when selecting gear down via the gear lever, the alternate gear extension lever may be used to extend the gear.
17. Air Driven Generator Controls. In case the CRJ's engine and the APU fail a little propeller might be extended which produces sufficient electrical power to supply the most important aircraft systems.	18. Head-up Guidance System Controls.
19. Cargo Fire Panel. Controls for fire extinguishing systems for the cargo areas.	20. Emergency Flap Lever. In case controlling the flaps via the flap lever is not working the CRJ provides an emergency flap control.

CLICKSPOTS

There are a few clickspots in the cockpit that are not immediately obvious. To lower and power up the the Heads Up Display unit click its hinge. Click it again to move the HUD up.

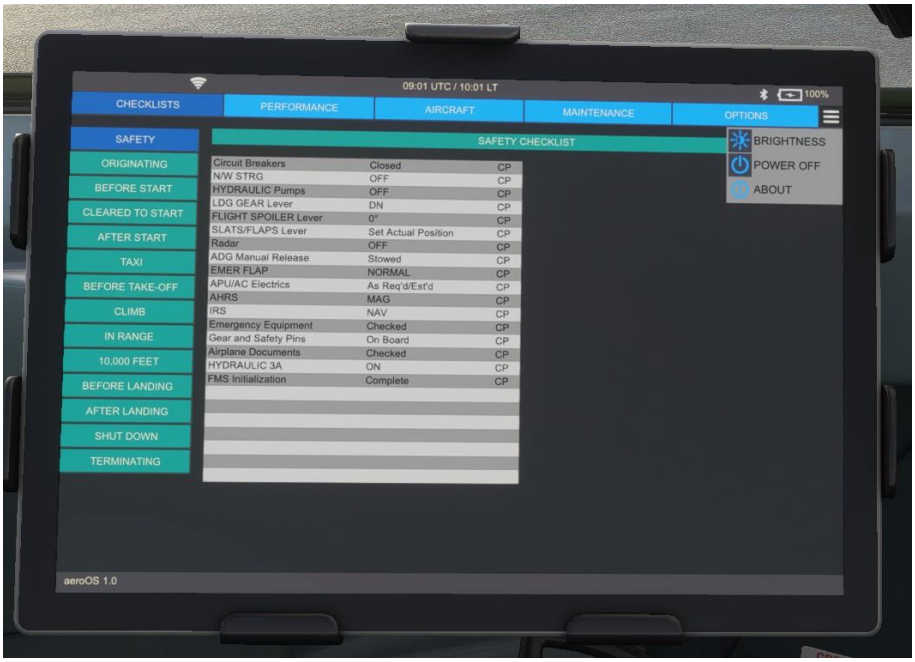
To hide the yoke click the speed placard, click it again to show the yoke again.

Do keep in mind that you can undock (and enlarge) every display (except the EFB at this moment) by clicking on it while holding [RIGHT ALT] pressed!

THE ELECTRONIC FLIGHT BAG (EFB)

The EFB is a tablet computer mounted on the side of the cockpit. It runs from its internal battery and is recharged when the aircraft systems are on. The EFB allows you to run checklists, configure weight and balance of your CRJ, load panel states and even more.

To power-up the EFB simply click the display – after a few seconds you are going to see main screen.
In case you would like to adjust brightness or even switch off the display, simply press on the button with the three lines in the top right corner to open a small menu on the main screen.

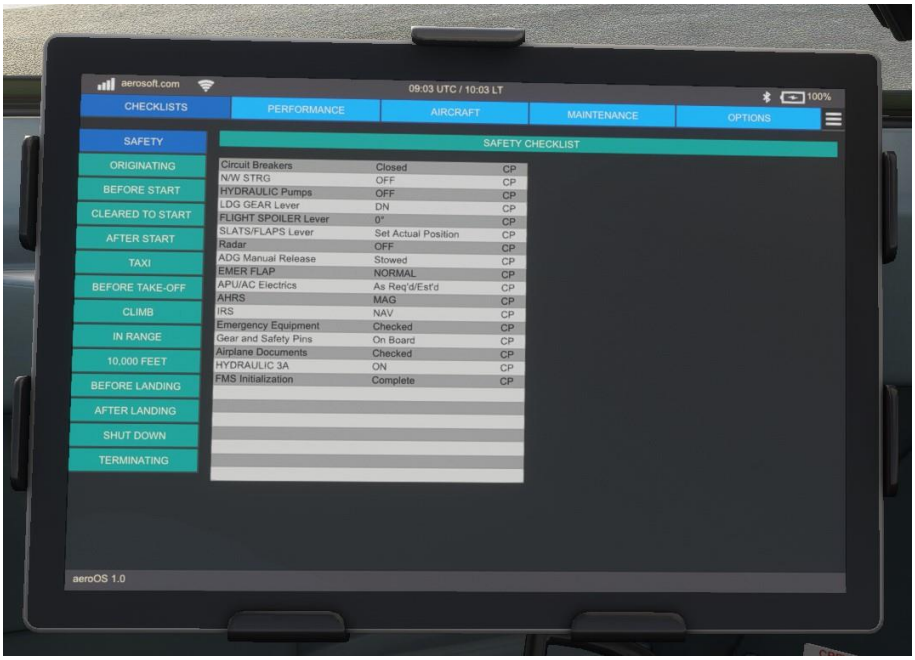


Navigate through the different menus by clicking on the respective tab:

- **Checklists**
  Allows you to display all relevant checklists for routine flight operations.
- **Performance**
  Here you can adjust your CRJ's weight, balance and V-Speeds.
- **Aircraft**
  The aircraft menu allows loading pre-configured panel states as well as opening / closing doors and activating / de-activating external support like a power-cart.
- **Maintenance**
  The maintenance menu enables you to rectify things like re-connecting IDGs, cooling of wheel brakes, stowing O_2-masks and of the ADG.
- **Options**
  There are 2 pages of options available to configure your flight control setup (like throttles), customizing of cockpit displays and so on

CHECKLISTS

Working properly and step by step through all checklists ensures a safe flight. To reduce paper load in real life's cockpit this task was shifted to the EFB as well. Accordingly, the EFB can display all the relevant checklists – the list of available checklists is display on the left, whereas the checklist itself is displayed on the right part of the display.



PERFORMANCE

The performance page controls weight & balance of the CRJ and indicates the V-Speeds in respect to the current weight as well as flaps setting and runway condition.
The screen is divided into three parts – on the left-hand side you can adjust payload, fuel and check the current weights like Zero-Fuel, Take-Off-Weight in regard to the maximum weights. Furthermore, the current value for the position of the center of gravity is indicated as well as the relevant elevator trim setting for takeoff.
The middle part shows the weight and center of gravity regarding to the maximum values. Make sure to always stay within the boundaries.
On the right-hand-side you can select the flaps takeoff setting (8° and 20°) and select the applicable runway condition (dry, wet, snow or ice). The EFB is then going to calculate the respective V-Speeds. Clicking the "SET" button transfers the value to the PFD (Primary Flight Display).

To adjust payload or fuel simply press the </> or <</>> button or click on the displayed value and re-adjust using the displayed keypad.

Passengers

<<	decreases the number of passengers by 10
<	decreases the number of passengers by 1
>	increases the number of passengers by 1
>>	increases the number of passengers by 10

Fwd / Aft Cargo:

<<	decreases cargo weight by 100kg/lbs
<	decreases cargo weight by 10kg/lbs
>	increases cargo weight by 100kg/lbs
>>	increases cargo weight by 10kg/lbs

Fuel

<<	decreases fuel weight by 1.000kg/lbs
<	decreases fuel weight by 100kg/lbs
>	increases fuel weight by 100kg/lbs
>>	increases fuel weight by 1.000kg/lbs

Set Payload and Fuel sends the weights to FS.
Copy Data to PERF INIT copies the weights to the PERF INIT page of the active, modified and secondary flight plans in the FMS.

The changes do not need to be confirmed with EXEC.

AIRCRAFT

The aircraft tab allows you to load pre-configured panel states as well as opening / closing of doors, and activating / de-activating ground support equipment.

Aircraft and Ground Support configuration	**Panel states**
• ***Guard rails*** Click to extend or retract guard rails of passenger door. Depending on parking position (gate vs. no-gate position) • ***Wheel chocks*** Removes / puts the wheel chocks in place • ***Cabin Lights*** Activates / de-activates cabin lights (illuminates cabin windows when looking at the CRJ from the outside) • ***Passenger Door*** Opens / closes the passenger door • ***Forward Cargo*** Opens / closes forward cargo hatch • ***Aft Cargo*** Opens / closes aft cargo hatch • ***Ground Air Cart*** Activates / De-activates ground-air cart – supplies air conditioned air • ***Ground power Cart*** Activates / De-activates the power-cart – supplies external electrical power • ***Service Door*** Opens / closes service door	• ***Cold and Dark*** Everything is switched off and closed, no ground-support-equipment connected • ***Turnaround*** power supply established (power-cart), main door open, APU still off • ***Ready for startup*** power supply established, APU running, doors closed • ***Ready for Taxi*** Engines running, doors closed • **Default State** Indicated the state, the flightsim automatically loads, when the CRJ is loaded in flight simulator. Pressing the 'default state' button cycles through the different pre-defined states. The shown panel state is the selected default panel state.

MAINTENANCE

Use the maintenance tab to reconnect or stow equipment that was needed during the flight.

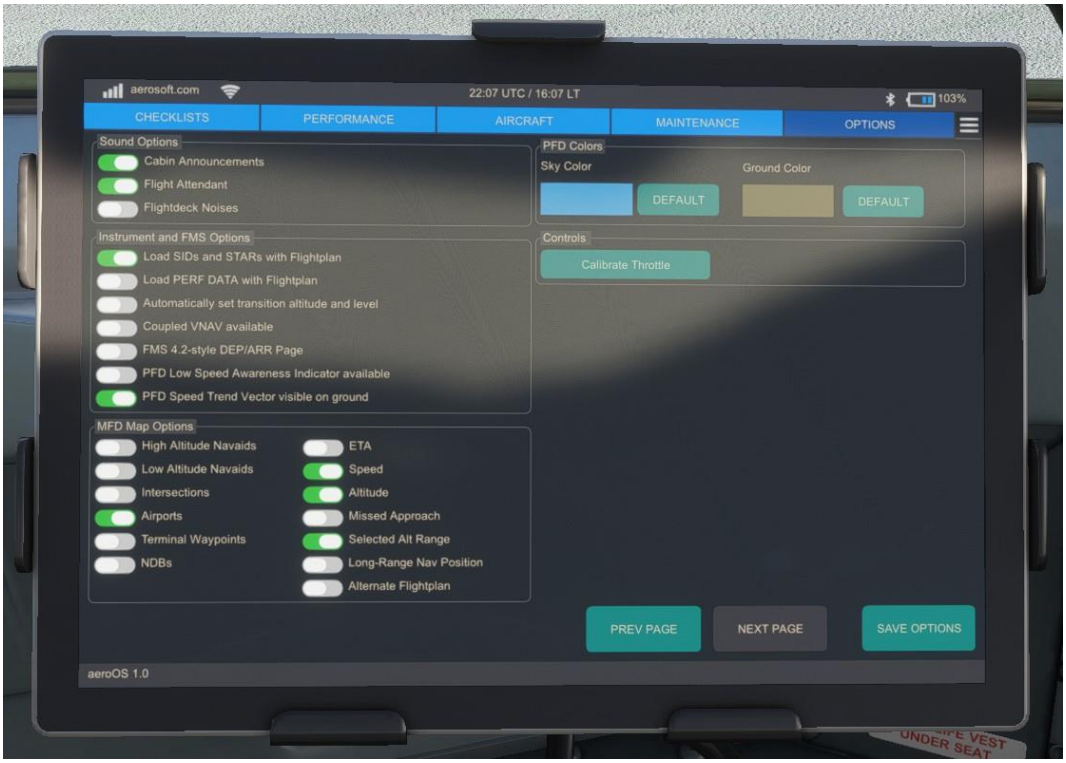
- ***Stow ADG***
  In case the Air Driven Generator, ADG, was released during a flight, it can be stowed again by clicking on the “Stow ADG” button
- ***Stow Passenger Oxygen Masks***
  If the cabin depressurized or the oxygen masks were release manually, they can be stowed again by clicking on the “Stow Passenger Oxygen Masks” button
- ***Reconnect IDG1***
  In case either Integrated Drive Generator, IDG, was disconnected in flight, it can be re-connected on ground by clicking this button
- ***Reconnect IDG2***
  In case either Integrated Drive Generator, IDG, was disconnected in flight, it can be re-connected on ground by clicking this button
- ***Reset Brake Temperature***
  If the brakes got too hot during a landing or an aborted take-off, they can be ‘cooled’ (the temperature is simply reset to a normal range after clicking the button)

OPTIONS

Use the options tab to select and adjust several options. The available options spread over two pages.

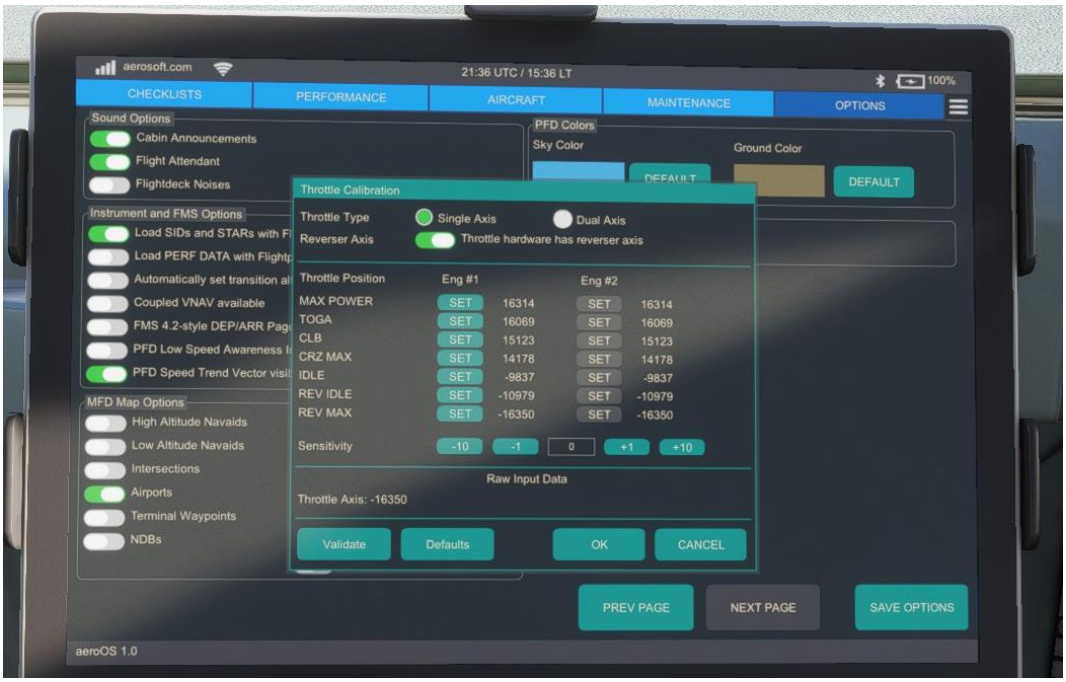
- ***Temperature Units***
  Select if temperatures are shown in °C or F
- ***Weight Units***
  Select if weights are displayed in lbs or kg
- ***Barometer Units / Synchronization***
  Toggle if barometric pressure is indicated either in In. Hg or mbar and whether the altimeters barometric setting is synchronized or not
- ***Flight Director Mode***
  Toggle between a single cue or dual cue flight director, this is a cosmetic change only
- ***IRS Align Time***
  Adjusts the IRS alignment time – toggles between instant, fast or realistic.

- ***Flight Number Location on FPLN Page (non-LH liveries only)***
  You can select where the flight number is entered on the FPLN page. This option is only available for non-Lufthansa liveries
- ***PFD/HGS Throttle Detent Hint***
  If activated a small hint is shown on the PFD / HGS which throttle detent is selected (CLB / TO …)
- ***PFD/MFD Display Rendering***
  Allows you to select if the PFD/MFD are either rendered on the captains or the co-pilots side
- ***Show VC Displays while 2D Displays are visible***
  Toggles if the VC displays are still visible or not in case a 2d view of a VC display is opened
- ***Autopilot Disconnect Yoke Sensitivity***
  Allows you to adjust autopilot's sensitivity to joystick input and when it disconnects.



- ***Sound Options***
  Depending on your preferences you can activate / deactivate several sounds and announcements to enhance the immersion of the flightsim experience
  - ***Cabin Announcements***
    Cabin Crew announcements during certain phases of a flight (like preparation, taxi, climb, descent)
  - ***Flight Attendant***
    Sounds to replicate the interaction between cabin and cockpit crew
  - ***Flight deck Noises***
    Sounds to replicate the interaction of cockpit crew
- ***Instrument and FMS Options***
  These options enable you to toggle certain options on how the FMS deals with SIDs and STARs, loading performance data with a flightplan and automatically setting transition altitude and levels
  - ***Load SIDs and STARs with Flightplan***
  - ***Load PERF DATA with Flightplan***
  - ***Automatically set transition altitude and level***
  - ***Coupled VNAV available***
  - FMS 4.2 Style DEP/ARR Page
  - PFD Low Speed Awareness Indicator available
  - PFD Speed Trend Vector visible on ground
- ***MFD Map Options***
  Use the following options to toggle default display of navaids, airports and further information on the navigation display
- ***PFD Colors***
  Use this option to change the colors of your primary flight display, PFD
- ***Controls***
  In this section you can calibrate the throttle axis in your flight simulator, to ensure the throttle detents and reverser are fully usable.

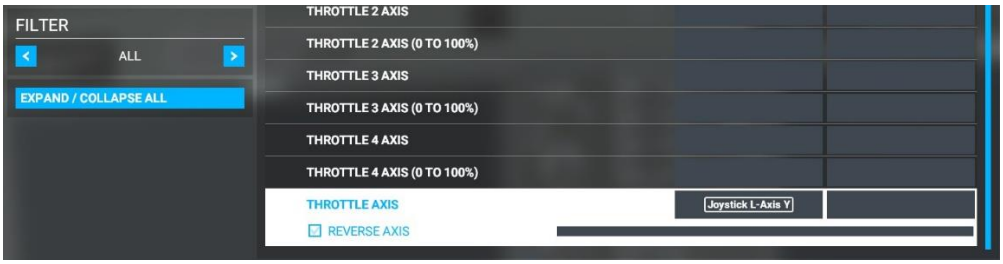
CALIBRATING THE THROTTLE AXIS



In case you are using a joystick, or a throttle unit with a throttle axis to control thrust, you need to calibrate the throttle axis through the EFB. Otherwise throttle movement might be jerky, or you are not able to use all available throttle detents or similar.

To calibrate the throttle, click on the ‘Calibrate Throttle’ button. This opens another menu - please perform the following steps for calibration:

1. First make sure that the throttle axis is not set to ‘revert axis’ in MSFS control options



   Then go back to the EFB menu.
2. Select whether you have two throttle axes available to control thrust of each engine separately or just one to control thrust of both engines (depends on the joystick / hardware you are using). Press either on ‘Single Axis’ for one throttle axis, or ‘Dual Axis’ in case you have two throttle axes available
3. Please select if your throttle axis has a reserved area for reverse thrust
4. Perform the following steps for each axis in case you have a dual axis setup
   Please bear in mind, that the last four positions are going to be somewhat close together to leave enough room for travelling of thrust levers during cruise
   a. Start with full thrust – fully forward the throttle and press the ‘SET’ button for ‘MAX THRUST’ to save the axis position
   b. Pull back the throttle a little bit and press ‘SET’ to save the axis position for ‘TOGA’
   c. Pull back the throttle a little bit and press ‘SET’ to save the axis position for ‘CLB’
   d. Pull back the throttle a little bit and press ‘SET’ to save the axis position for ‘CRZ MAX’
      The remaining travel room between this setting and idle, is the room you have available to

manually adjust thrust. Select throttle positions that are comfortable for you. Nonetheless, these can always be readjusted in the future.

e. Pull back the throttle to idle and press 'SET' to save the axis position for 'IDLE'.
f. In case your throttle axis provides an area for reverse thrust, please apply a little bit of reserve thrust and press the 'SET' button to save the axis position for 'REV IDLE' (idle reverse thrust)
g. Now fully apply reverse thrust and press the 'SET' button to save the axis position for 'REV MAX' (maximum reverse thrust)

ADDITIONAL LIVERIES

In case you want to install additional liveries / repaints for the CRJ, you can find a list of available repaints on the Aerosoft support forum:

https://forum.aerosoft.com/index.php?/files/category/133-liveries/

You need to be logged in to the forums to be able to download any files. Usually, installation instructions come with the file.

If you make any liveries please upload them to our forums!

APPENDIX 1: TRANSITIONING TO THE MITSUBISHI CRJ

(By Alexander Metzger)

For those simulator pilots who transition from larger airliners, like an Airbus 320 or a Boeing 737, we would like to provide you with important information on the specific differences flying the Canadair Regional Jet (CRJ).

The aim of the development team was to properly transpose the real plane into a simulation that is enjoyable to beginners and advanced simulation pilots. This document is focused on the differences of the CRJ700 and CRJ900 in comparison to other airlines you may be familiar with. We encourage you to read the other manuals so that you will be familiar with the cockpit and the systems that have been simulated at an extremely high level of detail.

GEOMETRY

On the first look from outside, it is obvious that the CRJ has been realized with a different concept of engine arrangement in the back of the aircraft. As engines are relatively heavy, consequently the wing position, about the fuselage length, is also much more rearward, to assure that the centre of gravity of the empty or fully loaded aircraft is within the limits of the wing chord to assure a stable flight behaviour.

Loading the aircraft properly is therefore vital for sufficient control of the elevator which has less of an arm for pitch control than on a classical arrangement. Please refer to the trim tables to be properly trimmed for take-off depending on weight and centre of gravity index.

The big advantage of positioning the engines at the rear end of the fuselage is a lighter wing construction – no need to carry the heavy engines – and having the whole surface and shape available to produce the required lift in respect to aircraft weight. This wing is optimized for high speeds and supported by slats and flaps for the slower flying regime during take-off and approach/landing.

There is also a very noticeable difference while flying an aircraft with that engine arrangement when applying thrust changes. On the CRJ the engine thrust is pushing at a position higher than the centre of gravity and above the wing. This results in a pitch down moment when increasing thrust and consequently a pitch up moment when pulling engine levers to idle. While in cruise, the autopilot would eliminate this with trim commands, it is specifically important to bear this in mind during the final landing phase, especially the flare onto the runway. You need extraordinarily little pull on the yoke when you slow the descent and retard the throttles before touch down.

Do not retard the throttles to idle 50 ft. or even higher, as this will lead to a pitch up of the CRJ and fast loss of speed too high above the runway and requires a corrective nose down push to avoid a hard landing.

Opposite to the landing, the full thrust during take-off pushes the nose down and you need pull the yoke substantially to initiate the rotation. The pitch down attitude, characteristic for these two planes while on ground, is not helping either to get airborne. Therefore, pull firmly, rotate with about 3°/s to 15-18° pitch and trim for the initial climb speed.

A specialty of the CRJ is its automatic trim movement when flying manually and extending or retracting flaps between the positions UP-1-8-20°. This automatic trim travel supports the pilot hand-flying the aircraft when there is a need to compensate the impact from changing flaps configuration with intense lift changes that require pitch control.

SYSTEMS

Regional jets are typically doing many flights per day and so does the crew. Mitsubishi has therefore automated many systems to release the pilots from routine procedures. Examples are the two buttons only start-up of the APU with automatic bleed air assignment. Similarly, the main engines single button start-up and thereafter fully controlled by the Full Authority Digital Engine Control (FADEC) system.

Fixed throttle detents for the take-off and climb help setting the correct thrust for these conditions of flight. On the other hand, the CRJs do not have an auto-throttle system and therefore the pilot flying needs to manage thrust in cruise and descent. It also has only advisory vertical navigation (VNAV) capability and therefore decent planning is in the pilot's hand and experience.

In return, there is no need to worry about switching bleed air for controlling cabin pressure or during anti-ice operations. But due to the smaller engines, the loss of thrust from using bleed air for heating the wings leading edge is more noticeable than on a larger aircraft. The climb performance is significantly reduced despite the setting for N_1 targets are a bit higher.

Further, do not be surprised by the increase of N_1 and consequent thrust increase during a descent with idle thrust when switching on anti-ice. The engines need to turn faster to maintain cabin pressure while hot air from the turbine is deviated and guided to the engine cowlings and wing leading edges. This can ruin your planned descent path by picking up more speed and requiring lower rates of descent and it is better to anticipate icing early in the planning of the descent schedule than being forced to use spoilers to obtain required rate of descent and not exceeding speed limits.

The two screens in the centre of the panel provide you with a wealth of information on system status, error awareness or alerts. They also have dedicated screens for the controls and the monitoring role of the pilots during the start-up of the systems all the way to the engines. We have modelled these pages with great care and realism. Details can be found in the provided systems documentation and also in the tutorial flights.

FLIGHT CHARACTERISTICS

Beyond the above-mentioned specifics of a tail driven aircraft, the CRJ is very stable in flight with easy roll and pitch response in the speed range that may be typically flown by hand.

At cruise speed the response is very direct and minimal yoke input is required. The lower weights versus the bigger aircraft you may know make it also more receptive to air turbulence.

In the lower range of the speed band, the controls are becoming less sensitive, but remain more on the sportive side as it is a light aircraft with significant less inertia on roll versus an aircraft with wing mounted engines.

Due to the slats and efficient flaps, you typically have a high margin to stall speed and that enables low landing speeds and short runways. Pitch attitude during descent and on final is often negative and becoming slightly positive at reference speed providing a good forward view.

As soon as pitch establishes around +2° during the approach, it is time to select the next flaps setting.

The landing gear has very little drag and hardly any pitch effect. Slats and flaps shall be used to slow down the aircraft and the flight spoiler may assist when you have left little time to adjust speed – but don't expect miracles from them, especially on the CRJ900.

In flare, level pitch will not cause a nose gear first touchdown as it is shorter than the main gear. The low wing has a significant ground effect and the CRJ tends to float forever if you come in just a bit too fast for the landing weight. You need to set down the nose gear gently and pay specific attention when you use reverse thrust immediately after ground contact.

On outbound taxi, the CRJ starts rolling with a little thrust push initially and maintains taxi speed close to idle. On inbound taxi, you may need to use the brakes from time to time to avoid exceeding apron speed limits.

AVIONICS AND FLIGHT MANAGEMENT SYSTEM (FMC)

Every major aircraft producer favours his avionics provider and even when you are used to a Dash 8-400 built by the same manufacturer Mitsubishi as the CRJ, you need to get familiar with the display and the programming technique of the FMS used on the CRJ700 and CRJ900.

Please refer to the information provided in the systems description and the procedures as part of the tutorial flights. Two main screens directly located in front of you provide you with a wealth of information on your flight situation from an aerodynamic point of view and from a navigational perspective. Again, please familiarize yourself with the many options of displaying data and graphical awareness displays for navigation and route following.

We would like to encourage you to properly fly the CRJ700 and CRJ900 by investing some time to build a knowledge base for proper operation.

APPENDIX 2: CRJ900 FLIGHT FROM DÜSSELDORF (DUS) TO BASEL (BSL)

This is a description of Germanwings flight 4U9712 according to the schedule as published on their webpage for Saturday March 7, 2015. We will be flying one of their Mitsubishi CRJ900 registered under D-ACNN belonging to Eurowings (now Lufthansa CityLine) which will execute this flight as operator. The planned departure time is 07:00 am and the arrival should be 70 minutes later at 8:10 am.

We will start with our flight planning. Have a safe flight!

Please note this section is written around the CRJ 900, but as most of the information is the same for all models, we decided to leave it in this manual.

Vol 3 of the manual includes a more in-depth step by step flight. If you are not familiar with a CRJ we strongly advise you to start with that one.

FLIGHT PLANNING

ROUTING

Departure airport: Düsseldorf (IATA: DUS – ICAO: EDDL)
Destination airport: Basel (IATA: BSL – ICAO: LFSB)
Alternate airport: Zurich (IATA: ZRH – ICAO: LSZH)

For European flights, VATroute https://www.vatroute.net/ is a good and simple flight planning page to obtain a typical route. The query result for EDDL-LFSB at our predicted flight reads like this:

FL196-FL315 MODRU Z283 SUMAS UZ283 RITAX UT27 GTQ UN852 ARPUS

We select flight level 290 (FL290) and the route distance has been calculated to 280 nautical miles (NM). An additional 20 NM are added to cover departure and arrival routes. As alternate airport, we selected Zurich (LSZH). The distance from LFSB is 45 NM plus 20 NM for the arrival route. We do expect taking off from runway 23L and following the Standard Instrument Departure route (SID) called MODRU 1T.

WEATHER

This is a typical spring morning with refreshing 3 °C, light clouds and a moderate, south-easterly wind on ground.

Based on this data we expect to be taking off from runway 23L. For flight planning we conclude an average wind component of eleven knots from 032 degrees (11/032) at FL290 and a headwind component of -22 knots (tailwind) according to the weather forecast at cruise altitude.

WEIGHT AND FUEL

For this flight, we will be using the following data:

	Weight in kg	Weight in pounds	Comment
Dry Operating Weight (DOW)	22'471 kg	49'540 lbs.	
Passengers: 72 Adult	72 * 84 = 6'048 kg	72 * 185 = 13'320 lbs.	
Luggage in front compartment	462 kg	1'020 lbs.	
Cargo in rear compartment	339 kg	748 lbs.	
Zero Fuel Weight (ZFW)	29'315 kg	6'4627 lbs.	
Weight check against max. ZFW	31'752 kg	70'000 lbs.	< MZFW OK
Fuel	2'700 kg	6'000 lbs.	See next page
Take-off weight (TOW)	32'015 kg	70'672 lbs.	
Weight check against max. TOW	37'422 kg	82'500 lbs.	< MTOW OK

Detailed calculation for fueling:

		Weight in kg	Weight in pounds
Distance to destination	340 nm		
Take-off weight (TOW)		32'000 kg	7'0570 lbs.
Flight level to destination	FL290		
ISA deviation	-10 °C		
Headwind component	-22 knots		
Contingency	5%	104 kg (minimum)	230 lbs. (minimum)
Distance to alternate	45 nm		
Flight level to alternate	FL150		
Reserve		750 kg	1'655 lbs.
Taxi		100 kg	220 lbs.
Minimum fuel		2'627 kg	5'791 lbs.
Block fuel		2'700 kg	6'000 lbs.
Center of Gravity (CoG)	22.4% MAC*		

* MAC means Mean Aerodynamic Chord

TAKE-OFF DATA

Based on the above determined take-off weight of 31'715 kg (69'917 lbs.) we will now define the critical speeds for departure. EDDL runway 23L is long enough (9'843 x 148 ft. / 3000 x 45 m) so that there is no restriction and we can use the speeds from the speed card for 70'000 lbs. (31'751 kg) that can be found in the Quick Reference Guide. Or for those lazy RW pilots under us we go directly to the EFB and get our speeds from there. You can even insert them automatically, inputting these speeds manually is a real chore.

We will be setting flaps to 8 degrees for the take-off and our departure airport altitude is close to sea level. Outside temperature is less than 10 °C. This concludes in the following speed selection (the EFB sometimes calculates slightly different values due to more accurate weight info):

- V_1 = 138 knots as maximum speed to abort the take-off.
- V_R = 138 knots for safe lift-off speed
- V_2 = 149 knots as safe speed in the case of an engine failure
- V_2 + 10 = 159 knots as speed for the initial climb phase up to 3'000 ft. above aerodrome level (AAL), also used as acceleration altitude

DEPARTURE FROM DUSSELDORF AIRPORT

AIRCRAFT PREPARATION

After completion of the flight preparation, it is time to get started. Just load the flight 'CRJ Tutorial Flight DUS-BSL' in MFS and make sure to select Ready for Engine Start via the AIRCRAFT STATE menu in the EFB. You are located at apron position V53 at Düsseldorf airport. It is 5:30 Coordinated Universal Time (UTC) or 6:30 local time (LT). Our CRJ900 is prepared per the above-described flight planning with the requested fuel and passenger/freight boarding/loading completed.

Next item as pilot flying (PF) is to finalize cockpit preparation and put the aircraft and the crew into a "Request for start-up and push-back" situation.

- Programming of Flight Management Systems (FMS)
- Check of avionic parameters
  - HDG-bug on runway heading
  - Transponder set to 2-3-5-6 and on standby mode
  - Departure route is displayed
  - Approved initial flight level 5'000 ft on SID MODRU 1T
  - Barometric pressure to QNH 1009
  - Approved flight plan is complete and active
- Check on aircraft
  - Fuel according plan
  - Hydraulic pumps on - system under pressure
  - Elevator trim set according weight and centre of gravity actual set to 6.4 trim units
  - All doors closed
  - Auxiliary Power Unit (APU) supplies bleed air and current
  - Parking brake is set
  - Navigation (NAV) lights and Beacon (BCN) light are on
  - Passenger signs "Fasten Seatbelts" and "No Smoking" are on
- Running „Before Start Checklist"

ENGINE START AND PUSHBACK ON APRON POSITION

The start-up of the engines is executed in a semi-automatic procedure and supervised by the Full Authority Digital Engine Control (FADEC) system and the pilots.

- Throttle lever in CUT OFF position
- Press ENG START button – typically the right engine first, thereafter the left one
  - N_2 spooling up to above 20%, check ITT <120°C
  - Throttle lever into IDLE position
  - Kerosene is injected and ignited
  - N_2 climbing further and N_1 to follow
  - ITT must be watched – Limit is shown in EICAS display
- Engine start completed and checked
  - N_1 stable at 20 to 22%
  - Consumption at 250-300 kg/h
  - ITT at 620°C
  - Generators automatically connected and deliver current – Check ELEC page

    - Ventilation and air conditioning active
- Running the „After Start Checklist“
- Pushback facing North-East
- Pushback completed
- Request “Taxi Clearance to runway 23L”

TAXIING TO RUNWAY 23L

Hint: If you have assigned the front wheel steering via a separate axis assignment on your available hardware control, this will allow you to steer the CRJ on ground in a realistic way. In addition, this will allow you to execute the flight controls check in a realistic way during taxi time. If you have not, you need to do the check during standstill which is the preferred SOP anyway.

Before taxiing out you will be setting flaps to position 8° and check the functionality of the controls. This is done by moving all three control axes to their endpoints and check their movements in the EICAS display.

The intention to start moving is acknowledged by turning on the TAXI LIGHT. The CRJ starts rolling with just a bit of thrust to overcome the inertia and can easily be controlled. If light on weight it may be necessary to softly brake to avoid exceeding speed limits. Typically, 7 to 10 kts are used on apron areas and 20 to 30 kts on a free taxiway. This depends very much on weather, taxiway conditions and other traffic. And any instructions from ground control.

Before reaching the holding point of the departure runway the “Taxi Checklist” must be completed and only when everything is normal you signal your readiness by switching the transponder code to ON. Some airports do request to be ON when rolling on the Apron but latest at lining up on departure runway.

TAKE-OFF ON RWY 23L

After having received clearance to “Line up and wait”, the last preparations for the take-off need to be made:

- Alert the flight attendants – "Cabin crew prepare for departure"
- Check identical values for HDG-bug and runway direction – should be 232°
- Running “Before Take-off Checklist”

After having received clearance for taking off you switch on the landing lights and by that signals to the tower that the take-off is imminent. First move the throttles forward to achieve about 70% N_1 and check that both engines are very close N_1%. By that you assure that both engines are delivering similar thrust. Only then you guide the throttles beyond CLB-dent into the TOGA-dent and monitor that the target N_1% is matched while ITT temperature limit is not exceeded. Any malfunction leads to immediate take-off abortion by the pilot in charge.

Background information: Taking off in an aircraft is a relatively strict process serving safety of flight and noise abatement procedures. You may divide into the take-off run up to V_1, the rotation at V_R and the initial climb at minimum V_2 + 10. All these V-Speeds have been defined during flight preparation as per earlier chapters. See previous chapter of this tutorial.

Rotation at V_R shall not exceed 3 degree/second, so that the tail will not touch the ground (tail strike). Pitch attitude will be set to 15 to 18 ° and the trim may be adjusted to match and the gear will be retracted. By that an optimal rate of climb with a built-in safety margin in case of engine failure and minimal speed can be achieved.

At 1'500 ft. above aerodrome level (AAL) engine thrust is reduced for noise abatement.

At 3'000 ft. above AAL the acceleration towards the maximum allowed speed of 250 kts will be initiated. This is executed by an aligned process of flaps lift and flaps drag reduction with synchronous reduction of engine thrust and climb rate to achieve the desired acceleration. You may control the aircraft manually or let the autopilot have the controls.

REGULAR TAKE-OFF SEQUENCE (WITHOUT SPEED LIMIT ON DEPARTURE ROUTE) FOR THIS FLIGHT:

1.	Positive rate of climb	Gear retraction and maintain V_2+10 as minimum.
2.	400 ft.	HDG or NAV to be activated
3.	600 ft.	Activate autopilot with active HDG or NAV mode
		IAS HOLD mode to be engaged – current speed will be set as target
4.	1'500 ft.	Pull back throttles to CLB dent and keep minimum V_2 + 10
5.	3'000 ft.	Target speed set to 210 kts (maximum speed for flaps 8°)
6.	> 161 kts	Flaps retraction to position 1
7.	> 180 kts	Flaps retraction to position 0
8.	Flaps are 0	Target speed set to 250 kts (maximum speed <FL100)
9.	Climb Check	"After Take-off Checklist" to be completed

CLIMB AND CRUISE

After the busy phase is over and the autopilot follows the horizontal navigation, the route, it is our turn to make sure that all marked speed and altitude restrictions will be followed. We also change to standard barometric pressure at the transition Altitude (TA) – in Germany this is at 5'000 ft.

Background information: Different to flying in the US, the European altitude control requires changing at 3'000 to 5'000ft and in mountainous areas higher to meet minimum altitudes above terrain. As of that TL the flight level will be assigned as FL50 equal to 5'000 ft. at standard barometric pressure 1013 mbar (29.92 in HG) and mentioned by the controller.

The CRJ has no automatic vertical navigation control and it is the task of the pilot flying to concur with possible restrictions by setting i.e. the next allowed flight level. Our SID includes the following description and limitations:

MODRU ONE TANGO
On track 232° DY to 3.4 DME DUS/3.6 DME IDNE;
RT, on track 321° to UBORO;
LT, NETEX; LT on track 200° to MODRU.
Climb with 7% (425ft/NM) or more until passing 3000.
GPS/FMS RNAV: [A600+] - DL243[K210-; R] -
UBORO[L] - NETEX[K250-] - MODRU[F210+].

With the following meaning:

- NETEX[K210-] the speed until NETEX is limited to 210 kts, even if you may have exceeded FL100
- MODRU[F210+] means that we should be crossing MODRU at FL210 or higher

Background information: The CRJ has a built-in autopilot modus that can control the climb or descent speed by changing the pitch attitude and by that the rate of climb or descent to match a given target speed. For best performance, thrust lever need to be at least in CLB and the FADEC will set an optimal climb thrust according to a database that relates to altitude and outside temperature. The typically used speed profile is 250/290/0.74 and this profile is the base for our flight calculation. Alternatively, you may choose to fly faster, i.e. catch up with a delay. This would be 250/300/0.77 or even 250/320/0.80. Naturally these are less economical.

The first number in this list of speeds is the speed below FL100, which is unified around the world but maybe lifted by the controller, if current traffic allows.

The second number is the speed for climb and cruise above FL100. With increased flight altitude, there is a limit for aircraft not only from "indicated Airspeed" but also from the Mach number that shall not be exceeded. The mentioned speed profiles keep a safety margin from these structural limits of the aircraft. At about FL270, you reach an interception of IAS =290 and Mach =0.74 and you need to follow the speed control by Mach. The speed selection button has a centre push button to switch between IAS and Mach.

Passing FL100 we switch off the landing lights and could change the IAS HOLD to the desired 290 kts for the following climb to FL290. But since the SID contains a speed restriction of maximum 250 kts until waypoint NETEX, we need to wait until we have that passed. Since our weather is not predicting any special turbulence, we switch off the "Fasten Seat Belt" sign.

Just before we reach FL290 we are matching up with Mach 0.74 and change to Mach speed control.

At 1'000 ft. prior to target FL an alert will draw our attention to monitor the levelling off to horizontal cruise flight. Since this requires less thrust from the engines, we need to pull out the thrust lever and adjust the N_1 manually so that the speed stays at Mach 0.74. From experience, we know that the expected N_1 is about 81 to 82 % and we adjust to keep a speed of Mach 0.74 consistently.

Cruising is the quietest flight chapter and except for scanning other traffic and ATC handover we just monitor engine parameters and climate control.

ARRIVAL TO BASEL AIRPORT

DESCENT AND ENTRY INTO AIRPORT SPACE

The descent to our destination airport has two distinctive parts. First part is the descent into lower airspace with the reduction of speed down to 250 knots below FL100. Thereafter follows the arrival according to the published Standard Arrival Route (STAR) or according to vectors given by the approach controller. We follow the process flying the STAR route which needs to be selected first.

Slight winds from southeast suggest that runway 15 is in use. The approach will be done following the Instrument Landing System (ILS) starting at the Initial Approach Fix (IAF) called ALTIK at 5'000 ft. This is linked to our last waypoint by the STAR called ARPUS8K. Now the route to our landing runway is defined.

Background information: The arrival to the destination airport will be explained by the pilot flying (PF) in great detail during the approach briefing. The Pilot Monitoring (PM) is checking the process. Every step will be indicated and any specialties will be clarified. This may cover speed restriction and minimum altitudes, obstacles and noise abatement requirements. Further the setup of the navigation instruments like VORs (VHF Omnidirectional Range) in both NAV devices and in the ADF (Automatic Direction Finder), if an NDB (Non-Directional Bearing) is available. Final item is the process to execute a missed approach, stating the route which typically ends at a holding at a waypoint, from which a new approach can be executed.

Route preparation:

- ILS Y RWY 15 with IAF ALTIK at minimum 5000 ft.
- 12 DME Arc BLM with frequency 117.45 set in VOR2
- ILS with frequency 111.55, identifier MH set in VOR1 and course 153°
- Threshold elevation 864 ft. entered as LDG ELEV as 860
- MDA/DA of 1070 ft for an ILS cat 1 approach
- Missed Approach straight ahead crossing ADF BS 376 set, followed by a right turn with maximum 220 knots intercepting BLM outbound radial 230°. Thereafter 15 DME Arc BLM to ALTIK hold
- Landing configuration flaps 45° und VRef=136 kts

DESCENT CHECK

Entry into airport space:

- > 10'000 ft. > Setting target speed to 250 kts (maximum speed <FL100) and reducing accordingly
- 10'000 ft > Landing lights on
- 15 min before landing > Passenger signs on
- 7 min before landing > Cabin crew information „Cabin crew prepare for landing "
- 6'000 ft. > Actual barometric pressure set in all altimeters
- Approach Check > Running „Approach Checklist "

Basel airport is in the 3-country triangle of France, Germany and Switzerland with the cities of Mulhouse and Basel and the Jura mountains in the south. Due to this location, the arrival route is quite complex. Adhering to an altitude minimum of 4'000 ft and a speed of maximum 185 kts, because of tight turns on the entry to the DME (Distance Measurement Equipment) arc and the final 90° turn on ILS localizer (LOC), requires a good control of the aircraft. Therefore, you need to reduce speed to 200 kts and flaps 1° and 185 kts with flaps 8° is necessary. A simpler arrival can be done by using vectors, i.e. outbound VOR/DME GROSTENQUIN GTQ 111.25 MHz set in NAV1 and descending to 4'000 ft. at 10.4 NM before VOR/DME Basel MULHOUSE BLM 117.45 MHz set in NAV2 and once close to BLM switch to standby ILS/DME MH 111.55 MHz on NAV 1.

FINAL APPROACH DIRECTION RWY 15

The maximum required 185 kts at 4'000 ft can be flown with flaps 8° and normally we fly around 180 kts to have a little margin to the maximum speed. We capture the glideslope at 9.5 NM distance and 4'000 ft. We keep 180 kts and select flaps 20°. 6NM before the threshold we drop the gear and reduce speed further. Consequently flaps 30° and 45° are set so that we achieve landing configuration at 1'000 ft above runway elevation and the speed should read V_{Ref} + 5 = 139 kts. Typically, you need about 58% N_1 thrust. Running the "Before Landing Checklists" and switching off the autopilot when we are cleared to land.

LANDING

During the last 1'000 ft., we are concentrated on keeping the speed and the correct position in reference to the flight director (FD) indication. If the deviation from the ILS LOC/GS happens to be more than 1 dot, the landing must be aborted and the above discussed Missed Approach Procedure (MAP) must be executed. Crosswind influences must be equalized precisely and with strong headwinds the value for Vref needs to be increased by half the headwind. This is done to increase the safety margin.

At 50 ft. above runway – well indicated at the RA display – we pull the thrust lever to idle and reduce the vertical speed with a soft pull on the yoke. Once the main wheels have touched the ground, the spoilers are automatically deployed and the pilot pulls the throttle into reverse position. Drop the nose softly to get the front wheel on ground and only then use wheel brakes for further speed reduction. At 70 kts you cut reversers by setting the throttle lever back to idle position and take the next exit left to your parking position. Crossing the hold line, you configure the aircraft for taxiing to position:

- Landing lights to off, taxi light remains on
- Strobes to off
- Flaps to be retracted
- Transponder set on "Standby"
- Probes heat to off
- Depending on gate or apron position and local prescription we may switch on the APU to assure air conditioning and electric supplies once we switch off the engines
- Turning into position we switch off the taxi lights (danger of blinding ground personnel)

PARKING AND SECURING THE AIRCRAFT

After arrival at the parking position:

- Parking brakes set to on
- Cut the engines
- Fuel pumps switched off
- Seatbelt signs switched off
- NAV lights stay typically on
- Beacon set to off
- Nose wheel steering to off

De-boarding of passengers and recording of flight data

RELEVANT LIDO CHARTS FOR FLIGHT 4U9712 EDDL-LFSB

Effective 02-MAR-2017
23-FEB-2017

Germany **Dusseldorf**

DUS-EDDL 5-70 **SIDs RWY 23L NW (RNAV Overlay)**

SIDPT

LIMA 2T / MEVEL 2T / MODRU 1T / NETEX 5T
RWY 23L (232°)

Remain on TWR frequency until passing 2000

	GS	120	150	180	210	240	270
7.0%	ft/MIN	900	1100	1300	1500	1800	2000

DESIGNATOR	ROUTING	ALTITUDES
	Runway 23L	
LIMA 2T **LMA 2T** 7.0% to 3000 **128.500** ①	at D1 **DUS** / D1.2 **IDNE** or MNM **600**, whichever is later, **RT** intercept QDM 297 **LMA** to **LMA** **FMS** DL236 [R] - LMA	DL236 MNM **600** initial climb **5000**
MEVEL 2T **128.500** ②	at D1 **DUS** / D1.2 **IDNE** or MNM **600**, whichever is later, **RT** intercept R003 **NVO** (MAX 190KT until established) - at D6 **DUS** (D33.3 **NVO**) **LT** 359° to ERKUM - **RT** 053° via LUSIX to MEVEL **FMS** DL230 or MNM 600 WEL [R] - DL246 [K190-] - DL248 [L] - ERKUM [R] - LUSIX - MEVEL	initial climb **5000**
MODRU 1T 7.0% to 3000 **128.500** ①③	QDM 232 **DY** - at D3.4 **DUS** / D3.6 **IDNE RT** 321° (MAX 210KT until established) - at UBORO **LT** to NETEX (MAX 250KT until established) - **LT** 200° to MODRU **FMS** [A600+] - DL243 [K210- ;R] - UBORO [L]- NETEX [K250-] - MODRU	MODRU MNM **FL210** MODRU MNM **FL210** initial climb **5000**
NETEX 5T 7.0% to 3000 **128.500** ①	at D1.0 **DUS** / D1.2 **IDNE** or MNM **600**, whichever is later, **RT** intercept QDM 297 **LMA** - at D13.4 **DUS** / D13.3 **IDNE LT** intercept QDR 240 **LMA** to NETEX **FMS** DL236 [R] - LMA [L] - NETEX	DL236 MNM **600** initial climb **5000**

① Climb gradient due to airspace structure. If unable to comply, advise DLV on start-up request.
② After passing D6 DUS (D33.3 NVO) BRNAV equipment required
③ After passing D3.4 DUS / D3.6 IDNE BRNAV equipment required

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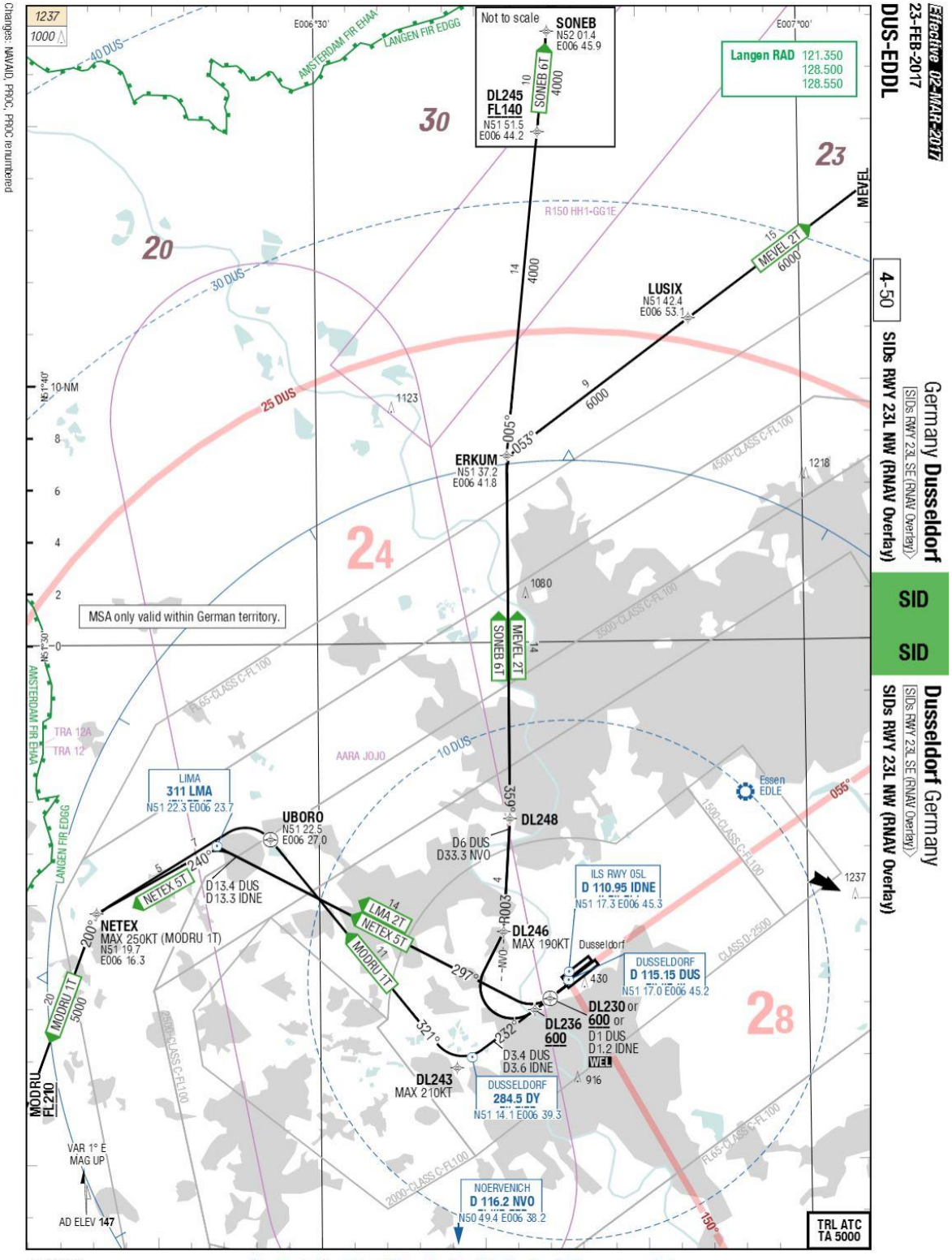
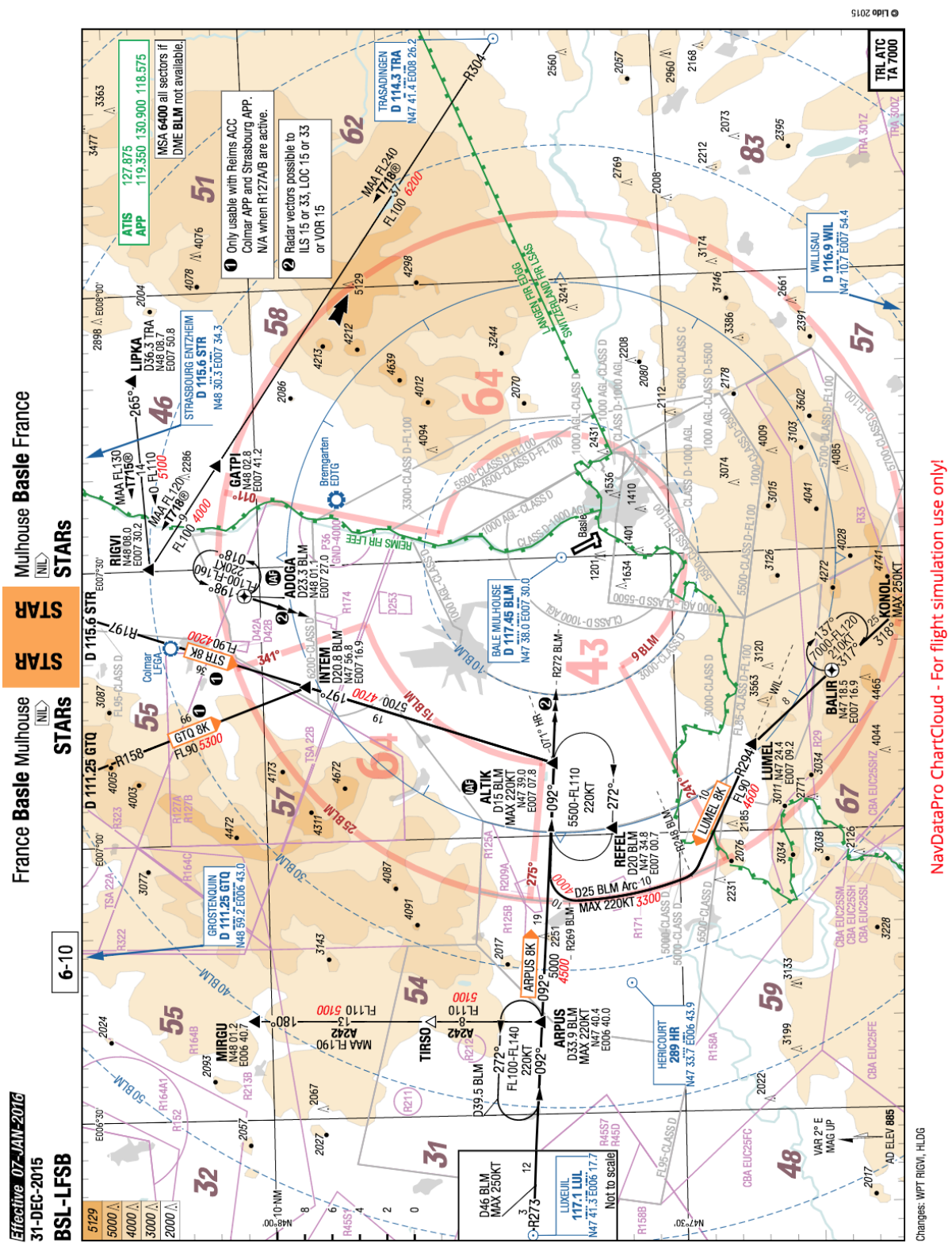
Changes: PROC, PROC renumbered, Note

NavDataPro ChartCloud - For flight simulation use only!



NavDataPro ChartCloud - For flight simulation use only!



France Basle Mulhouse
STARs
STAR
Mulhouse Basle France
STARs
6-10
Effective 07-JAN-2016
31-DEC-2015
BSL-LFSB
ATIS 127.875
APP 119.350 130.900 118.575
MSA 6400 all sectors if DME BLM not available.
1 Only usable with Reims ACC Colmar APP and Strasbourg APP. N/A when R127A/B are active.
2 Radar vectors possible to ILS 15 or 33, LOC 15 or 33 or VOR 15
TRL ATC TA 7000
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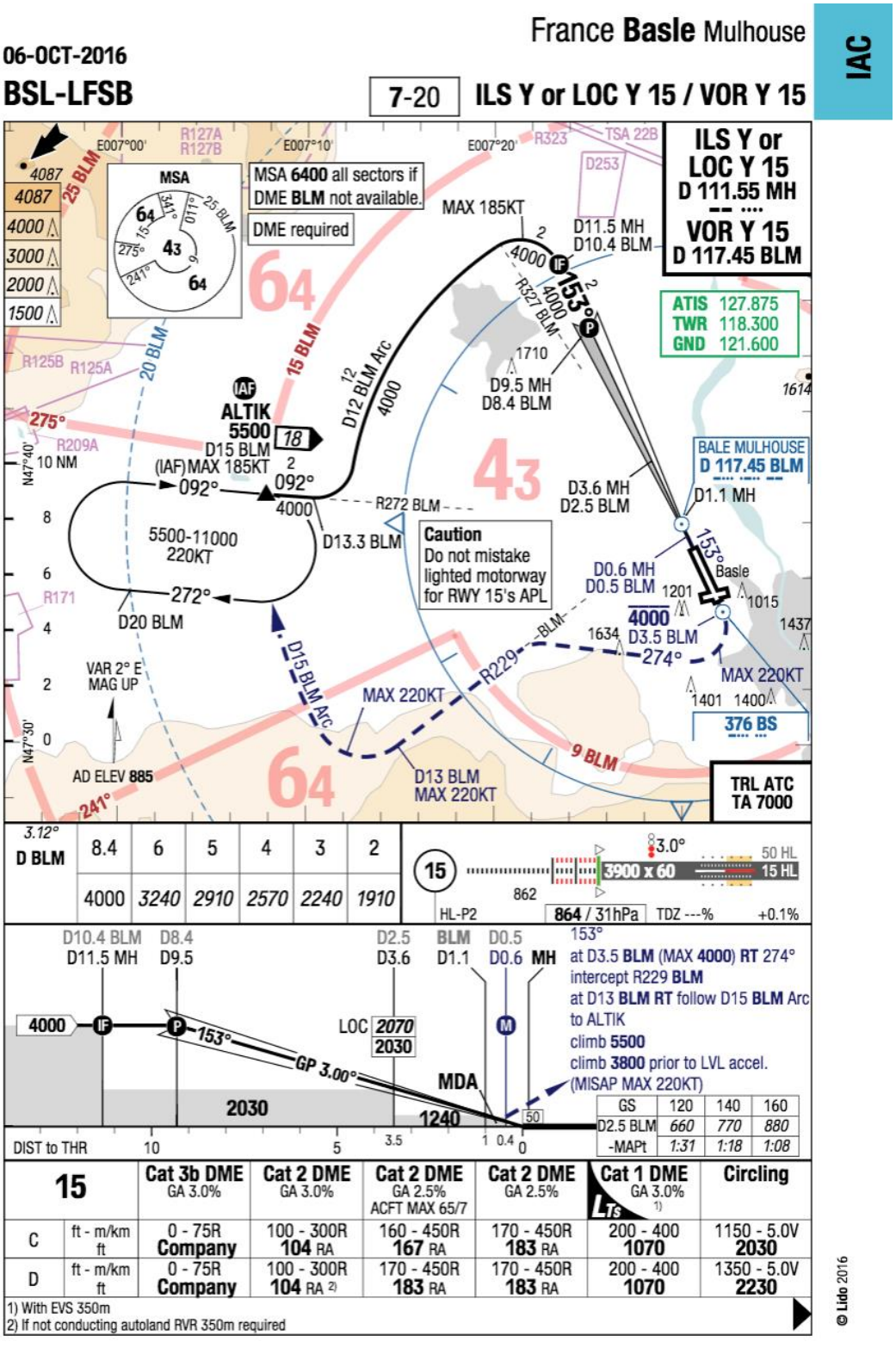
Changes: WPT RIGVI, HLDG
NavDataPro ChartCloud - For flight simulation use only!



Changes: Reprint

NavDataPro ChartCloud - For flight simulation use only!

APPENDIX 3: ROUTE SUGGESTIONS

During preparation of the tutorial, we considered several different routes flown by the CRJ in real life. The intention was to find a scenic route which is not too short (more stress when climb and descend follow nearly instantly on to each other) and not too long (overall time it takes to work through the tutorial).

We did not want these ideas go to waste and hence include the routes as suggestions for further flights after going through the tutorials. Please bear in mind that flight plans are changed on a regular basis and some flights might not be operated according to the following table.

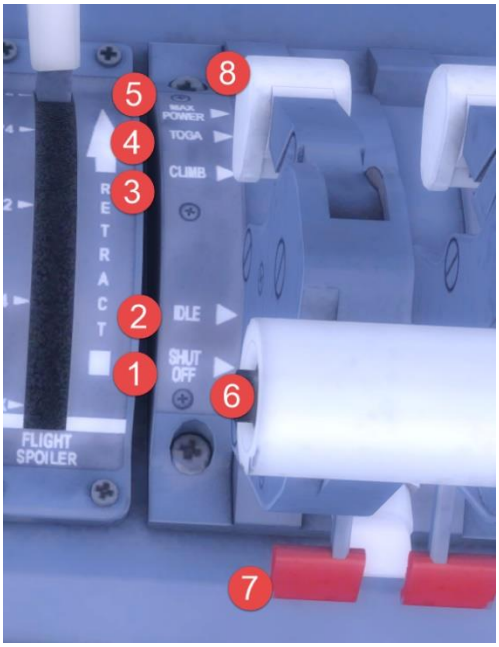
Departure	**Arrival**	**Airline / Flight No**	**CRJ Type**
Hamburg 09:50 (HAM / EDDH)	Copenhagen 10:40 (CPH / EKCH)	Scandinavian SK646	CRJ900
Copenhagen 08:10 (CPH / EKCH)	Gothenburg 08:55 (GOT / ESGG)	Scandinavian SK434	CRJ900
Munster-Osnabruck 06:35 (FMO / EDDG)	Frankfurt 07:25 (FRA / EDDF)	Lufthansa LH063	CRJ900
Dusseldorf 07:10 (DUS / EDDL)	Basel-Mulhouse 08:20 (BSL / LFSB)	Lufthansa / Germanwings 4U9712	CRJ900
Munich10:45 (MUC / EDDM)	Marseille 12:20 (MRS / LFML)	Lufthansa LH4362	CRJ900
Copenhagen 18:05 (CPH / EKCH)	Aberdeen 18:50 (ABZ / EGPD)	Scandinavian SK1521	CRJ900
Copenhagen 15:00 (CPH / EKCH)	Berlin Tegel 15:55 (TXL / EDDT)	Scandinavian SK0679	CRJ900
Copenhagen 14:05 (CPH / EKCH)	Bergen 15:25 (BGO / ENBR)	Scandinavian SK2868	CRJ900
San Francisco 12:50 (SFO / KSFO)	Jackson Hole 15:57 (JAC / KJAC)	United Airlines UA5490	CRJ700
Seattle 20:15 (SEA / KSEA)	Santa Barbara 22:42 (SBA / KSBA)	Alaska Airlines AS3444	CRJ700
Santiago de Compostela 09:00 (SCQ / LEST)	Tenerife Norte 12:40 (TFN / GCXO)	Iberia Regional / Air Nostrum IB8561	CRJ1000
Nice 14:00 (NCE / LFMN)	Nantes 15:25 (NTE / LFRS	Air France / Hop! A53362	CRJ1000

APPENDIX 4: SPEED CONTROL AND AUTO THROTTLE

During the testing phase, it was obvious many people had issues with the way speed is controlled in the CRJ and how to activate the Auto Throttle. To start with the latter, there is none. Do not let the SPEED button on the glare shield fool you. We will explain the functionality later.

THROTTLES

On the throttle, you will see several markings



1. SHUT OFF (FUEL SHUT-OFF)
   To move the throttle from IDLE to SHUT OFF, lift the red lever and retard the throttle. The Idle / Shutoff Release latches (7) are there to prevent you from shutting down the engines in flight.
2. IDLE (TRUST SETTING)
   The range between IDLE and CLIMB is the throttle range you will normally use.
3. CLIMB (THRUST SETTING)
   The Climb thrust setting is the highest possible continuous thrust setting allowed (though ITT limitations do still apply).
4. TOGA (TAKE-OFF AND GO-AROUND THRUST SETTING)
   The TOGA setting is used for most take-offs and for go-arounds. TOGA can only be used for 10 minutes continuously.
5. MAX THRUST
   The MAX THRUST setting is only used when maximum thrust output is needed.

The Take-Off / Go-Around Switches (6) will activate the take-off / go-around mode of the flight director.
The Thrust Reverse Levers (8) are pulled up (with throttle in idle) to deploy the thrust reversers. At minimum thrust reverse range there is little or no reverse thrust but all forward trust is removed, at higher settings actual reverse thrust is generated.

GLARESHIELD SPEED CONTROLS

On the glare shield, there is a SPEED button and a SPEED rotary control. This is what confuses many people. The Speed Mode System is only active during climb and descend. It does NOT control the thrust output of the engines but adapts the pitch of the aircraft to maintain the set speed.

1. The SPEED button is pressed to set and select the three modes:
   a. CLB (Climb) / DES (Descend)
      When selected, the current speed is used as the speed to maintain and the CLB or DES mode is selected automatically depending on the Vertical Speed.
      In CLB mode the aircraft will never descend, in DES mode it will never climb.
   b. IAS (Indicated Air Speed)
      When selected the current IAS/MACH is held, no matter if descent or climb is required.
2. The button on the rotary Speed control toggles between IAS and MACH.
3. The rotary control is used to change the set speed after a mode is selected.

APPENDIX 5: MFS KEY COMMANDS

Please note that not all these key commands will work with the CRJ, when we make our own code and do not sue the default systems of the sim the key command will not work. There does not seem to a complete list of key commands in the documentation of MSFS so we provide you with one here.

MENU

- Toggle active PAUSE – PAUSE
- Toggle basic control panel – CTRL + c
- Clear search – DEL
- Toggle PAUSE – ESC
- Select 1 – ALT + F1
- Select 2 – ALT + F2
- Select 3 – ALT + F3
- Select 4 – ALT + F4
- Display checklist – SHIFT + c
- Next toolbar panel – .
- Previous toolbar panel – /
- Back to main menu – END
- Close menu – BACKSPACE
- Fly – ENTER
- Change aircraft – F11
- Liveries – F12
- See specifications – F10
- Help menu – Tab
- Restart free flight – HOME
- Restart activity – HOME

MISCELLANEOUS

- Toggle Fuel Pump – ALT + p
- Toggle Marker Sound – CTRL + 3
- Minus – CTRL + NUM MINUS
- PLUS – CTRL + NUM PLUS
- Toggle Pushback – SHIFT + p
- Request Fuel – SHIFT + f
- Display Navigation log – n
- Display Map – v
- Sim Rate – r
- Skip RTC – BACKSPACE
- New Ui Window Mode – Right ALT
- Toggle Control to Copilot – CTRL + ALT + X

INSTRUMENTS AND SYSTEMS

- Toggle Anti Ice – h
- Toggle Pitot heat – SHIFT + h
- Toggle master Alternator – ALT + a
- Toggle master Battery – ALT + b
- Toggle master Battery and Alternator – SHIFT + m
- Decrease cowl flap – SHIFT + CTRL + c
- Select Engine – e
- Auto start engine – CTRL + e
- Engine Stop – SHIFT + CTRL + e
- Increase Cowl flap – SHIFT + CTRL + v
- Magneto – m
- Magnetos both – SHIFT + ALT + F
- Magnetos left – SHIFT + ALT + s
- Magnetos off – SHIFT + ALT + q
- Magnetos right – SHIFT + ALT + d
- Magnetos start – SHIFT + ALT + g
- Toggle master ignition switch – ALT + i

FLIGHT INSTRUMENTS

- Select airspeed bug – SHIFT + CTRL + r
- Select Altitude bug – SHIFT + CTRL + z
- Toggle Auto rudder – SHIFT + CTRL + u
- Set Altimeter – b
- Decrease heading bug – CTRL + DEL
- Increase heading bug – CTRL + Insert
- Select heading bug – SHIFT + CTRL + h
- Set heading indicator – d
- Toggle Alternate Static – ALT + s

FUEL

- Toggle fuel dump – SHIFT + CTRL + d
- Fuel Selector 1 all – ALT + w
- Fuel Selector 1 off – CTRL + ALT + w
- Toggle all fuel valve – ALT + v

INSTRUMENT VIEWS

- Previous instrument view – SHIFT + a
- Next instrument view – a
- Toggle instrument view 10 – CTRL + 0
- Toggle instrument view 1 – CTRL + 1
- Toggle instrument view 2 – CTRL + 2
- Toggle instrument view 3 – CTRL + 3
- Toggle instrument view 4 – CTRL + 4
- Toggle instrument view 5 – CTRL + 5
- Toggle instrument view 6 – CTRL + 6
- Toggle instrument view 7 – CTRL + 7
- Toggle instrument view 8 – CTRL + 8
- Toggle instrument view 9 – CTRL + 9
- Select next POI – PageUp
- Reset Smart Cam – CTRL + f
- Set custom Smart Cam target – t
- Next Smart Cam target – PageUp + CTRL
- Camera AI Player – HOME + CTRL
- Previous Smart Cam target – PageDown + CTRL
- Toggle follow Smart Cam target – PageDown
- Unset custom Smart Cam target – SHIFT + t

CAMERA – SLEW MODE

- Slew translate up (slow) – F3
- Slew translate up (fast) F4
- Slew translate backward – NUM 2
- Slew translate forward – NUM 8
- Slew translate down (Fast) – F1
- Slew translate down (slow) – a
- Slew Y axis translation freeze – F2
- Slew roll left – NUM 7
- Slew roll right – NUM 9
- Slew X Axis translation freeze – NUM 5
- Slew Yaw left – NUM 1
- Slew Yaw right – NUM 3
- Slew translate left – NUM 4
- Slew pitch down (fast) – F8
- Slew Pitch freeze – F6
- Slew pitch down – NUM 0
- Slew pitch up – 9
- Slew pitch up (fast) F5
- slew pitch up (slow) F7
- Slew translate right – NUM 6
- Toggle slew mode – y

CAMERA MODE SWITCHES

- Cockpit/External view mode – END
- Toggle Drone – Insert

COCKPIT CAMERA

- Load Custom Camera 0 – ALT + 0
- Load Custom Camera 1 – ALT + 1
- Load Custom Camera 2 – ALT + 2
- Load Custom Camera 3 – ALT + 3
- Load Custom Camera 4 – ALT + 4
- Load Custom Camera 5 – ALT + 5
- Load Custom Camera 6 – ALT + 6
- Load Custom Camera 7 – ALT + 7
- Load Custom Camera 8 – ALT + 8
- Load Custom Camera 9- ALT + 9
- Load next custom camera – k
- Load previous custom camera – SHIFT + k
- Save custom camera 0 – CTRL + ALT + 0
- Save custom camera 1 – CTRL + ALT + 1
- Save custom camera 2 – CTRL + ALT + 2
- Save custom camera 3 – CTRL + ALT + 3
- Save custom camera 4 – CTRL + ALT + 4
- Save custom camera 5 – CTRL + ALT + 5
- Save custom camera 6 – CTRL + ALT + 6
- Save custom camera 7 – CTRL + ALT + 7
- Save custom camera 8 – CTRL + ALT + 8
- Save custom camera 9 – CTRL + ALT + 9
- Decrease cockpit view height – Down
- Increase cockpit view height – Up
- Translate cockpit view backward – Right ALT + Down
- Translate Cockpit view forward – Right ALT + Up
- Translate Cockpit view left – Left
- Translate Cockpit view right – Right
- Cockpit look down – SHIFT + Down
- Cockpit look left – SHIFT + Left
- Cockpit look right – SHIFT + Right
- Cockpit look up – SHIFT + up
- Cockpit quick view up – CTRL + Up
- Cockpit quick view rear – CTRL + Down
- Cockpit quick view right – CTRL + Right
- Cockpit quick view left – CTRL + Left
- Cockpit quick view cycle – q
- Reset cockpit view – CTRL + Space
- Cockpit view upper – Space
- Reset zoom Cockpit view – –
- Toggle smart camera – s
- Zoom cockpit view – =

DRONE CAMERA

- Toggle drone depth of field – F1
- Toggle foreground blur – F5
- Drone top-down view – CTRL + Space
- Attach drone to next target – CTRL + Page Up
- Attach drone to previous target – CTRL + Page Down
- Toggle drone auto exposure – CTRL + F4
- Toggle drone auto focus – F4
- Decrease drone rotation speed – F3
- Decrease drone translation speed – F1
- Decrease drone depth of field – F2
- Increase drone depth of field – F3
- Decrease drone exposure – CTRL + F2
- Increase drone exposure – CTRL + F3
- Increase drone rotation speed – F4
- Increase drone translation speed – F2
- Lock drone to next target – t
- Lock drone to previous target – SHIFT + t
- Translate drone backward – s
- Translate drone down – f
- Translate drone forward – w
- Translate drone left – a
- Translate drone right – d
- Translate drone up – r
- Reset Drone roll – space
- Reset drone target offset – NUM 5
- Pitch drone down – NUM 2
- Roll drone right – NUM 9
- Pitch drone up – NUM 8
- Yaw drone left – NUM 4
- Yaw drone right – NUM 6
- Roll drone left – NUM 7
- Toggle drone follow mode – Tab
- Toggle drone lock mode – CTRL + Tab
- Increase drone zoom – NUM PLUS
- Decrease drone zoom – NUM MINUS
- Toggle Plane Controls – c

EXTERNAL CAMERA

- Reset External view – CTRL + Space
- External quick view left – CTRL + Left
- External quick view rear – CTRL + Down
- External quick view right – CTRL + Right
- External quick view top – CTRL + Up
- Reset Zoom External view – –
- Zoom external view – =

FIXED CAMERA

- Toggle fixed camera 10 – CTRL + SHIFT + 0
- Toggle fixed camera 1 – CTRL + SHIFT + 1
- Toggle fixed camera 2 – CTRL + SHIFT + 2
- Toggle fixed camera 3 – CTRL + SHIFT + 3
- Toggle fixed camera 4 – CTRL + SHIFT + 4
- Toggle fixed camera 5 – CTRL + SHIFT + 5
- Toggle fixed camera 6 – CTRL + SHIFT + 6
- Toggle fixed camera 7 – CTRL + SHIFT + 7
- Toggle fixed camera 8 – CTRL + SHIFT + 8
- Toggle fixed camera 9 – CTRL + SHIFT + 9
- Reset fixed camera – f
- Previous fixed camera – SHIFT + a
- Next fixed camera – a

AUTOPILOT

- Autopilot Airspeed Hold – ALT + r
- Decrease autopilot reference Altitude – CTRL + PageDown
- Increase autopilot reference Altitude – CTRL + PageUp
- Toggle autopilot approach hold – CTRL + a
- Toggle autopilot attitude hold – CTRL + t
- Toggle autopilot localizer hold – CTRL + o
- Toggle autopilot mach hold – CTRL + m
- Toggle autopilot master – z
- Autopilot N1 hold – CTRL + s
- Decrease autopilot N1 reference – CTRL + END
- Increase autopilot N1 reference – CTRL + HOME
- Autopilot Nav1 Hold – CTRL + n
- Decrease autopilot reference airspeed – SHIFT + CTRL + DEL
- Increase autopilot reference airspeed – SHIFT + CTRL + Insert
- Decrease autopilot reference vs – CTRL + END
- Increase autopilot reference vs – CTRL + HOME
- Toggle autopilot wing leveler – CTRL + v
- Autopilot Off – SHIFT + ALT + z
- Autopilot On – ALT + z
- Arm Auto Throttle – SHIFT + r
- Auto Throttle to GA – SHIFT + CTRL + g
- Toggle avionics master – PageUp
- Toggle flight director – CTRL + f
- Toggle Yaw Damper – CTRL + d

BRAKES

- Brakes – NUM Decimal
- Left Brake – NUM Multiply
- Right Brake – NUM MINUS
- Toggle Parking Brakes – CTRL + NUM Decimal

FLIGHT CONTROL SURFACES

- Aileron left (roll left) – NUM 4
- Aileron right (roll right) – NUM 6
- CENTER ailerons & rudder – NUM 5
- Elevator down – NUM 8
- Elevator up – NUM 2
- Toggle water rudder – CTRL + w
- Rudder left – NUM 0
- Rudder Right – ENTER

SECONDARY CONTROL SURFACES

- Decrease flaps – F6
- Extend flaps – F8
- Increase flaps – F7
- Retract flaps – F5
- Toggle spoilers – NUM Divide

CONTROL TRIMMING SURFACES

- Aileron Trim Left – CTRL + NUM 4
- Aileron Trim Right – CTRL + NUM 6
- Rudder Trim Left – CTRL + NUM 0
- Rudder Trim Right – CTRL + ENTER
- Elevator Trim Down (nose down) – NUM 7
- Elevator Trim up (Nose up) – NUM 1

LANDING GEAR

- Toggle landing gear – g
- Gear down – CTRL – g
- Toggle tail wheel lock – SHIFT + g

EXTERIOR LIGHTS

- Toggle landing lights – CTRL – l
- Landing lights down – SHIFT + CTRL + NUM 2
- Landing light HOME – SHIFT + CTRL + NUM 5
- Landing light left – SHIFT + CTRL + NUM 4
- Landing light right – SHIFT + CTRL + NUM 6
- Landing light up – SHIFT + CTRL + NUM 8
- Toggle strobes – o
- Toggle beacon light – ALT + h
- Toggle Nav light – ALT + n
- Toggle taxi lights – ALT + j

INTERIOR LIGHTS

- Toggle flashlight – ALT + l
- Toggle lights – l

THRUST MANAGEMENT MIXTURE

- Decrease mixture – SHIFT + CTRL + F2
- Increase mixture – SHIFT + CTRL + F3
- set mixture lean – SHIFT + CTRL + F1
- set mixture rich – SHIFT + CTRL + F4

THRUST MANAGEMENT PROPELLER

- Decrease propeller pitch – CTRL + F2
- Propeller pitch Hi – CTRL + F4
- Increase propeller pitch – CTRL + F3
- Propeller pitch lo – CTRL + F1

THROTTLE

- Throttle cut – F1
- Decrease Throttle – F2
- Increase Throttle – F3

RADIO

- ADF – SHIFT + CTRL + a
- Com Radio – c
- Set Com1 Standby – SHIFT + ALT + x
- Com1 switch to standby – ALT + u
- DME – f
- Decrease Nav1 Frequency – SHIFT + CTRL + PageDown
- Increase Nav1 Frequency – SHIFT + CTRL + PageUp
- Nav1 Swap – SHIFT + CTRL + n
- Nav Radio – n
- Decrease Vor1 OBS – SHIFT + CTRL + END
- Increase VOR1 OBS – SHIFT + CTRL + HOME
- VOR OBS – SHIFT + v
- Transponder – t
- Set transponder – SHIFT + ALT + w
- Display ATC – Scroll Lock
- ATC Panel Choice 0 – 0
- ATC Panel Choice 1 – 1
- ATC Panel Choice 2 – 2
- ATC Panel Choice 3 – 3
- ATC Panel Choice 4 – 4
- ATC Panel Choice 5 – 5
- ATC Panel Choice 6 – 6
- ATC Panel Choice 7 – 7
- ATC Panel Choice 8 – 8
- ATC Panel Choice 9 – 9
- Frequency Swap – x
- Increase wheel speed – SHIFT