

SUKHOI SUPERJET 100

For MSFS-2004 - R1.1

This aircraft is part of **AEROPROYECTO** "Years of Work"

By Edgar Guinart López



***** Dedicated to the noble and laborious people of Russia *****

This project was made with tons of effort, and was possible thanks to the invaluable help of many collaborators. Please, if you want help to develop the future versions of this project you can email me any useful thing about real SSJ-100

Thanks!

To my friend **Ramsel**: For his enthusiasm and cooperation in all time, despite the distance between us.

To my friends **Adrián**, **Ricardito** and **Veguita**: For the invaluable help with images, documentation, advises, and all kind of useful stuff.

To my friend **Mely**: The best virtual and test pilot that I know. Not only make test flights in my SSJ-100, in many of my previous projects too. The guy is a flying machine!

To **Igor Bayrachniy**: He sends me most of the real SSJ-100 manuals. It was a huge help because previously I get almost nothing about.

To my beautiful wife **Edesa**: For her endless support, and amazing coffees!



About AEROPROYECTO

AEROPROYECTO is not a group of developers, programmers or designers. AEROPROYECTO is only a name to group my FS aircrafts, making its identification and localization easy for the flight simmers. I'm developing aircrafts since 1999 for FS98, however few years before I feel the need to create a common name for all my projects.

All the realization of AEROPROYECTO aircrafts, and most of its components, are made or adapted by me. When I had to include issues developed by thirds, the proper references was add. Projects like this are a massive work for me, but it is just a hobby so I take my time. Besides, the disinterested help of many enthusiastic people around the world have an important part in the materialization of my successful projects. So, thanks to all these good people.

At this time all the AEROPROYECTO aircraft was released for free, and uploaded to flight simmers servers like flightsim.com or avsim.ru

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Version

This is the 1.1 version of the AEROPROYECTO SSJ-100 project.

- Many more systems were developed, including a TCAS and an FMC.
- A new FBW (Flight by wire) system was included.
- The flaps system was changed for better flight performances and realism.
- The general flight performances were adjusted, including new and more realistic engines performances
- A new thrust system operating by the keyboard is included. The usage with the joy Z lever is limited. More information about this system can be found in Throttles section.
- The 2D panels are based on a resolution 1600x1200 pixels background images, much better than the previous version. Seven images were included to simulate the 360 degrees cockpit views; however these images had a low quality due the lack of better ones.
- Wings vortex effect has been added at high Gs. You can found this effect in the provided Effects folder.
- A section with some aids was included. A tool for right management of the doors, keyboard flight and Spoiler's assistance is explained in the Special Features and Aids section.
- Some new features were included on the 3D model like animated wipers, new taxi lights, new texture for the APU exhaust, and more.

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Special Features and Aids

Doors control

Once you load the 2D cockpit the usage of the keys for opening the cargo and service doors don't work properly. To solve this problem I create a coupled of buttons to open and close all the aircraft doors. The first button (PAX DOORS OPEN) opens the left doors and the cockpit windows. The second button (BAG DOORS OPEN) opens the right doors and the cargo hatches. These buttons only works on ground, or if the doors are open on air; this prevents an accidental aperture in fly by clicking. The normal state of this two buttons is in gray color (doors closed), the orange color announce open doors.

Keyboard flight

The Fly-By-Wire of this SSJ-100 works well when you fly with a yoke because the system is engaged when the both signals, X and Y, are close to the center position, it means near cero. However, flying with keyboard don't convey to same results because the elevators can't be center like ailerons, or rudder. To solve this issue I create a button that permits the right control of the flight to those people that prefer to use the keyboard. Keep this function active during the whole flight and center whenever you reach the desired bank and/or pitch positions.

Spoilers assistance

I can't get the full control of the spoilers in FS9 with XML. Only cero, middle and full positions can be setting by hand in this version of SSJ-100. Controlling this feature is quite difficult with keyboard and in descending stages the problem can be a pain in your "hands". This button triggers a function that helps the pilot to control the speed of aircraft in the air. The activation of this feature doesn't imply that you can use the spoiler. Despite the activation of this function, when you set manually the middle or the full position of the spoilers this feature go down until you return back the handle to cero or Ground Armed positions. I strongly recommend you arming this function at the very beginning of the flight.

Fight Management Computer: FMC

Few words about

This FMC was made in XML language; it means that any interaction with external databases files, like SID/STAR, is almost impossible. All the databases uses here are the same of the FS9 defaults. Any difference in the version, or updates, of the FS9 databases will interfere with its functionality. The SID/STARS databases are the most delicate case in this way due its importance on how the aircrafts depart and arrive to the airports. However SID databases doesn't exist on FS9, and STAR databases are very limited and were not programmed for usage on FMC systems. That's the reason why this FMC have its own way to construct the SID and STAR procedures: using the runway heading and altitude. It means that SID and STAR available on this FMC are most like vectors, so it must be chosen wisely, especially when destination is close to hilly grounds. The details of the construction of this SID and STAR vectors will be explained forward. For the same reason transitions procedures are not included either; you must program the transitions like any other route leg. Although in this FMC not all the functions are ready, the most important issues work. Finally, you cannot add navaids that aren't part of a waypoint to your route. FS9 have navaids that are not included in any airway so, searching for it results in the same navaids twice, like navaid and as a waypoint. My best shot to avoid this situation was to exclude these navaids of the search engine in this version.

Starting the FMC

The FMC starts on FMS1 at MCDU MENU, otherwise nothing will function properly. Once there the FMS1 INIT/REF INDEX page will be displayed, indicating that the system is ready to use. The other options on the MCDU MENU doesn't work.



Entering departure and destination

Pressing RTE key will prompt the page of the route definition, ACT RTE. Like any others FMCs this one will set departure and arrival airports typing its four digits ICAO names, such as MUHA in Habana, on scratch pad. Then move this data to the desired field, using the lateral keys.

Once two fields have being filled, the message ACTIVATE> will appear on right/down corner, suggesting you to activate the flight plan. Pressing this key activates the flight plan and creates a Direct-To route. You can check this on the ACT RTE LEGS page, by pressing LEGS key. These two points, destination and arrival, can be changed at will but activating the new route will replace the old one. All the waypoints on the old route will be lost too.



Setting SID and STAR

Like I mentioned above, SID and STAR will be auto generated by the FMC using the available data at departure and arrival airports. This page is invoked with DEP/ARR key. All departures will set at 8 nm of the center of the runway, toward the selected runway direction. This point will be id as DEPO. The arrivals are more complex because it's necessary to accommodate the aircraft before the final approach, depending on the desired or mandatory direction of the arriving. All arrivals have two initial points for accommodation, one for left traffic, and one for right traffic. These points are in an angle of 45 degrees to the final approach point, and at 5 nm of this. The final approach point is the same for all arrivals, left or right, and it's at 8 nm of the center of the runway. These points will be ids as ARRO and ARR1. Once again, be careful choosing left or right traffics to approach, the FMC can't "see" if any obstacle, like mountains, is on the way! You must check the route on the NAV mode of the map to avoid troubles. Remember, transitions are not included in this FMC so, if you want to hold existing airways, you must use available waypoints. These SID/STAR points can't be erased once created, only can be changed by others. If more than one runway is available a counter will showing as 1/N, on the upper right corner. The different runways can be switching by PREV/NEXT keys.



Manage waypoints and checking the legs

ACT RTE LEGS page permits to add or delete waypoint to actual route. There is a Direct-To function that permits bypassing waypoints without erase it. Don't attempt to delete the origin, destination and DEP or ARR points, nothing will happens. In fact when you are going to create new waypoints you must begin by the ARRO point because is between DEPO and ARRO waypoints that you can insert the new ones. Entering a new waypoint is a two step processes. First, enter the waypoint name, like UCA in Cuba; the name appears on the scratch pad. Second, hit the ARRO side key to insert the waypoint. Before the insertion took place, a page list of different waypoints with the same name will appear on screen. For example, UCA is a name of two different waypoints. This list has two columns, the left one with the region followed by the type on the waypoint, and the right one with more data about distance, heading, frequency, etc. To search between the waypoint you must use the left keys, and to neglect or accept the insertion you must use the <CANCEL INSERT> bottom side keys. The waypoint will be added to the route and the whole list will be rearranged. Deleting waypoints is a simple process with no undo. Just press CLR key (CLR message appear on scratch pad) and then hit aside key of desired waypoint to delete. The point will disappear and the whole list will be rearranged.



You have a possibility of bypassing waypoints without deleting it from the list. Pressing the aside key of a waypoint will trigger the **<CANCEL DIRECT TO>** menu, which waits for your choice. If you execute **DIRECT TO** the selected waypoint will be the active point, and the aircraft will fly to intercept the segment that conduce to it. The active point is the point that the aircraft follow when LNAV is on. This point is indicated on the route list with a white arrow like this **>**. The first natural active point is DEPO. The active waypoint will jump automatically when the aircraft reach it, then the next becomes active and so on until the final point of the route is reached, that means the destination runway. You can change the active point many times as you wish, but be careful the aircraft will follow the active point without delay! Direct-To function is executed if the Navigation Display is in ARC mode; otherwise hitting the lateral keys on LEGS will perform the waypoint-following on the MFD map, in order to check the proper construction of the flight plan.



Finally, whenever you add or delete a waypoint, including changing DEPs and ARRs, a "route discontinuity" will occur, and the yellow message **ROUTE DISCONTINUITY>** will

appear at the bottom line. This discontinuity stops the activation process at the last waypoint changed and the aircraft will fly on circles around it until you terminate the discontinuity. Of course you must anticipate this; any time you make changes in the route, including SID and STAR changes, you must terminate the discontinuity hitting the aside key of the message. You can add many waypoints as you want, but I recommend you to insert only necessary ones, a more complex route is harder to manage. The legs can be paged by PREV/NEXT keys.



Planning fuel quantity and cruising altitude.

Once you have set the flight plan, the FMC calculates the fuel needed based on the distance through legs and a normal fuel flow at cruise altitudes between 25000 and 41000 feet. This fuel calculations not include the extra, holding or alternate airport fuel, is just the Block Fuel. It means the fuel between engines start and stop. This setting is on the PERF INIT page that you can find on the INIT REF menu. Like other functions, BLOCK can be set by the user, following the standard procedure for enter data, or just hitting the lateral key with the scratch pad empty. In this case the entering value was previously calculated by the computer. Entering RESERVES and TAXI fuel quantity is necessary to obtain the total fuel to load. RESERVES must be filled considering company policies, plus alternate destination. For example 30 flight reserve plus 15 min of holding is about 1.5 tons of fuel. TAXI is always about 0.5 tons. The other important field on this page is the CRZ ALT. Setting this data prepares the AP altitude for the cruise, or the first authorized by the ATC. FMC don't permits entering altitudes above the maximum based on aircraft weight. Other fields in this page are automatically filled or are inoperative yet.



Setting reference speeds and temperature for takeoff

As previous page, TAKEOFF REF will be finding on the menu INIT REF. On this page you can set the reference speed that helps the pilot to takeoff. V1, VR and V2 can be set manually or, like the BLOCK case, you can hit the lateral keys with the scratch pad empty for getting the values calculated by the computer, which I recommend. V2 depends of VR and will be calculated automatically. These settings will be showed in the PFD at the takeoff. The other important field to fill here is the FLX TO. This setting is in temperature degrees, and must match the outside temperature at takeoff, protecting the engine and performing a quiet takeoff. However, if the runway is very short, or very high, you must set a lower temperature in order to get more power. If you hit the lateral key with the scratch pad empty, 15 degrees will be set. If you forget to fill this field 0 degrees will be set, giving all the power of the engines for NTO configuration. This features only works on NTO regime; in APR doesn't matter.



Descending to destination

Descending to destination can be performed with the assistance of the FMC. The stage pages, CLB, CRZ, DES, APPR and GO AROUND will be finding on VNAV key. The stages will be rolling by PREV/NEXT keys. These pages are mostly informative in this version, but, except on APPR page, the desired new altitude on the AP can be changed at will on CRZ ALT field. When the DES RATE message begins, a message DESCEND NOW> appears on DES page. Hitting the lateral key of this message will set the AP altitude to destination airport, beginning to descend automatically. This is the normal VNAV procedure of this FMC but, once again, you can set the altitude that you desire in the CRZ ALT field. Once selected the arrival runway altitude, or below, the VNAV function glide the aircraft to the first approach point ARRO, at about 3000 feet over ground. When the active point jump to ARR1 the aircraft will fly at current altitude, permitting to slow down the speed and subsequent flaps and gear deploy. Once reaching this ARR1 point the aircraft continue descending to destination, using the VNAV final glide path, which is not a precision procedure. For a precision landing procedure you must use ILS via APR instead the VNAV function. However, I made tens of successful landings using only the VNAV final glide path.



Rest of functional pages

Many more pages with useful data can be found on this FMC, but I let you to discover it, otherwise this document will growth more than necessary. The pages explained before has the most complex, or mandatory, functions for the best functioning of the flight.

Operational Manual

Autopilot and Auto-throttle

The SSJ-100 autopilot is quite similar to the Airbus series but its configurations are displayed on the up zone of the PFD (Principal Flight Display). However it's functioning is most like Boeing. At this point I assume that you are familiarized with those philosophies in order to simplify this document.

The AP is divided in four columns: Speed, Lateral Navigation, AP Masters, and Vertical Navigation from left to right. Speed section has a Speed knob to select the desired speed and switch between SPEED mode and THRUST mode. SPEED mode only works in the CLIMB position of the throttle. CAS/MACH button switch the speed format displayed in the PFD when the SPEED mode is set, in THRUST mode the speed format change automatically. AUTO button force the computer to select the optimal vertical speed according to the thrust delivered by the engines when climbing, avoiding the stall.



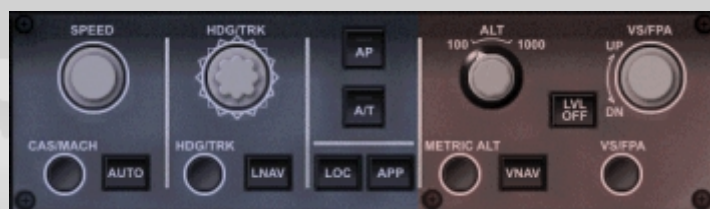
Lateral Navigation section has a HDG/TRK knob to select the course or the radial to follow. This knob acts like a button too for engage heading or radial navigation modes, both functions depends of the HDG/TRK button selection explained below. Only the NAV1 can be tracked in this version, the NAV2 only works to follow the selected VOR2 station. The HDG/TRK button switch between heading and radial navigation modes, this selection is showed in the PFD. The LNAV button overrides computer lateral navigation mode that only works if a flight plan is already active. All lateral navigation functions will be disconnected if the yoke is moved more than 40% in X direction (left/right).



AP Masters section has an AP (Autopilot) button to turn on/off any armed Auto Pilot function. AP button will be disarmed if the yoke is moved more than 40% in Y direction (up/down). A/T (Auto-throttle) button engages or disarm auto throttle function. The A/T button is automatically turned on when the throttles reach NTO position and turned off when the throttles return to IDLE. There are other two buttons, LOC to engage localizer and APP to engage localizer and glide slope together. LOC system is not functionally, for approach use APP only.



Vertical Navigation section has an ALT knob to select the desired altitude; it also permits to choose between two incremental scales 100 or 1000, but this last function is not ready yet. METRIC ALT button show/hide metric altimeter in the PFD display. LVL OFF button permits banking on AP regime; moving yoke more than 40% in X direction (left/right) will trigger this function too. VS/FPA knob sets the desired vertical speed mode or flight path angle mode, depending of the VS/FPA button state, but this last function is not available yet. VNAV button overrides computer vertical navigation mode that only works if a flight plan is already active. The VNAV also forces on AUTO mode. When flying in VNAV regime you can select the desired altitude with the ALT knob, but the rate of climb/descend for the whole route will be defined by the FMC.



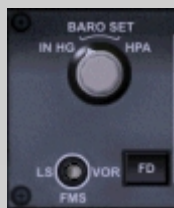
Navigation Display panel

This panel controls the Navigation Display that is showed at Multifunctional Display (center). It had four buttons that shows or hides various map items, CSTR, WPT, NAV AID and ARPT. RANGE is the knob to select different map zoom levels. MODE switches between the two map modes present in this version; ARC mode and NAV mode. ARC is by default the flying mode. NAV permits the following of the whole planned route waypoints and is performed using lateral keys on the FMC RTE list. WXR/TERR works only for TERR mode. In ARC mode only coast lines will be shown, in NAV mode all terrain details will be shown. TCAS shows traffics on air, on ground works automatically in standby mode for you, but you can see the other traffics anyway. TCAS only works on ARC mode. The other two switches put the selected NAV/ADF needle on the HSI display, bottom in the PFD.



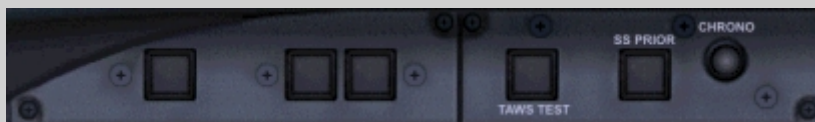
Barometer panel

The knob selects the desired pressure in IN HG or HPA and had an additional feature: clicking in the center can sets the actual FS9 pressure. The switch below puts the HSI needle in function of NAV1 (ILS), FMS (if flight plan is active) or NAV2. The FD button triggers the Flight Director function.



Other buttons in the frontal panel

The two center buttons are the Over-speed alarm and Stall alarm. SSPRIOR, CHRONOS and TAWS TEST buttons doesn't work in this version.



Watch and secondary altitude indicator zone

Backup altitude indicator is limited. On the Watch the CHR works in four positions: normal, chronometer ready, running, and stopped. TIME/DATE button switches UTC and date (day/month). The ET button sets and resets the enroute time chronometer. On plate, with speeds references, a hidden link will shows/hides the brake panel. The handle controls the gears position. AUTO BRAKE had four buttons to set the automatic brake action: LOW, MID, MAX and RTO. LOW, MID and MAX are used on landings, and RTO on rejected takeoff, when the throttles returns to IDLE. The other buttons on this panel are not available in this version.



Light and Wipers Panels

Except the WING and EMER LT the rest of lights works, however the two knobs for bright doesn't have any function. The cabin light is, temporally, on the ANN BRT position and keep lighten in dark cabin for ease localization. The windshield wipers animate the wipers on 2D panel and in 3D external model.



ANTI-ICE panel

Except WINDOW PROOF, the rests of heaters works. This knobs start in AUTO position as it's normal position.



AIR panel

CKPT and CAB knobs set the desired cockpit and passenger cabin temperature. Recirculation button doesn't work in this version; this function works automatically when any source of air is working. L AIR AUTO and R AIR AUTO are the valves for extract air of the engines stages, these buttons are in not OFF position when the panel is loaded. However you can turn on/off at will. APU BLEED button is the air bleed valve switch for the APU; this button starts in on position too and can be switched at will. This air bleed valve provides the air supply for start the engines. The RAM AIR is not working in this version.



CAB PRESSURE panel

None of these buttons works in this version, but the pressurization of the aircraft works automatically in conjunction with the AIR sources. The aircraft will also lose its cabin pressure if by accident you open the doors in flight or turn off all of the air sources.



ELEC panel (electrical)

In this version the four batteries works as one. They can be disconnected, but at the beginning are on. The batteries will discharge depending of the electrical load. The only way to re-charge the batteries, in order to start APU or engines, is turning on the EXT PWR button. That grants non-limited electrical power aboard, connecting the ground power

plant. However if the aircraft is moved, or the parking brake is released, the ground power plant will disconnect. The APU GEN engages the electrical generator to the APU, but this action must be performed manually. The APU generator is the primary source of electrical power. L GEN and R GEN engages the same generators on each engine, this action must be performed manually, once the engine is started. GALLEY doesn't work in this version and INV occurs automatically.



BAT VOLTAGE panel

This section only has a knob to select one of the four batteries and shown it's charge on red screen.



APU panel

The MASTER SW energizes the APU system. When this switch is turned off all APU function will shutdown, except the bleed valve. This is the right way to perform the APU shutdown. START/STOP button start or stop (case of wrong start) the APU engine.



FUEL panel

XFEED button open/close the valve that permits the flow of fuel from left wing tanks to the right engine and vice versa. This process only occur if a differential pumped fuel exists, that means, if all pumps of one of the sides are off. If cross feed valve is off each engine get fuel of the same side wing fuel tank. Both main fuel pumps are turned on with the MAIN buttons, same thing for AUX buttons. Both MAIN and AUX buttons must be on before starting the engines. The ADD buttons is a backup fuel pump that runs with direct current (DC) and only must be turned on in case of failure of both MAIN and AUX fuel pumps of the same side. The APU is connected to the left lines of fuel, so only left pumps must be on before start the APU, however if you turn ON the XFEED button the APU will get fuel of the right side. The engines and the APU need, at least, one fuel pump active to start. The APU need fuel pumps active to keep running, but the engines will work by gravity fuel flow at positive G forces.



HYD panel (hydraulic)

HS1, HS2, HS3 and PTU are hydraulic systems that supply all the demands in the aircraft. HS1 and HS3 are power up by both engines and are reinforced by electrical ones. HS2 is power up by ELEC2A and ELEC2B two electrical pumps. PTU is the electrical pump that reinforces the gears retraction in case of main engines failures. In all cases ELEC knobs starts in AUTO position but can be set manually at will. PTU button acts automatically as a backup in case of failures of any hydraulic pumps but can be forced manually too.



Multifunctional Display control panel

The only section that works, in this version, is the middle section. There are the buttons that show/hide the multiple systems state on the Multifunctional Display (MFD). ENG/APU button displays more engines indicators and the APU indicators. The principal engines indicators are showed on the EICAS Display. AIR button displays the air system. HYD button displays the hydraulic system. ELEC button displays the main electrical circuit. FUEL button displays all the fuel system. Doors button displays all the doors state. PCTL/BRK button displays some features about yoke, control surfaces and brake states. CLEAR button hides the current displayed system and only left the Navigation Display. The rest of buttons doesn't work in this version.



Audio panel

VHF1 and VHF2 toggle the audio of COMM1 and COMM2, in order. MKR toggle audio of approach markers. 1-VOR-2 toggle audio ID of 1-2 VOR. 1-ADF-2 toggle audio ID of the 1-2 ADF. The rest of buttons doesn't work. Both audio panels are the same.



Radio panel

The double knob selects the desired radio frequency; the outer knob is for gross selection and the inner one for fine selection (fraction). In case of the ADF stations the outer knob selects the first two digits of the frequency and the inner knob the last ones. VHF1 and VHF2 buttons displays COMM1 and COMM2 frequency on the radio displays, main-standby. NAV buttons sets ready the radio for work with nav aids frequencies, but in this version this action is performed automatically when you press any of the nav aids buttons, in order to save time. VOR and ILS buttons displays NAV2 and NAV1 in order, the twist order isn't an error! The two ADF buttons is an improvement of mine that grants the use of the two ADF receptors. On/off switch is the master of the radio. The rest of the buttons are not functional in this version. Both radios are the same.



Spoilers

The spoilers are formed by two main groups of surfaces over each wing, the airbrakes and the spoilers. When the aircraft is on air only the airbrakes (outer surfaces) will deploy depending of lever position. This is very useful to keep proper speed at descend. The half position can only be set with the mouse; total extension can be set with both mouse and keyboard. When the aircraft is on ground all spoiler surfaces, outer and inner, will deploy. GND SP ARMED position is used for takeoff and landing procedures or simply for taxing. This position can only be set with the mouse, which grants deflection of all brake surfaces on ground if the airspeed exceeds 30 knots and the throttles are IDLE.



Flaps and Slats

The flaps and slats work together depending of lever position. In this version, the first position of flap lever has two configurations: 1 or 1 + F. In this position the slats goes to 18

degrees and the flaps goes to 3 or 9 degrees automatically, depending of the airspeed. In this position, when the speed is increasing and over 210 KIAS, the flaps setting goes to FLAP 1, when the speed is decreasing and below 210 KIAS this setting goes to FLAP 1+F. The 2, 3 or 4 (Full) lever positions drive the flaps on 16, 25 and 36 degrees in order. Near 250 KIAS the flaps will be fully retracted.



The flaps positions 1, 1+F and 2 define the approach stage. The flaps positions 3 or 4 define the landing stage. Depending of flight stages, the A/T in THRUST mode will set the proper speeds for these stages. If for any reason the flaps are stuck, the computer will not set the proper speed. Then you must pass the control of the A/T speed to SPEED mode. See Autopilot and Auto-throttle section above.

The flaps setting for takeoff is FLAP 2, whatever the aircraft weight is. The flaps setting for landing is 3 or 4, for any aircraft weight. In landing stage Flaps 4 (FULL FLAPS) provides a better attitude for the landing, Flaps 3 provides a better performance in case of engine failure.

ENG MASTER panel

Both, left and right handles, unleash the start procedure of the engines or stop it (right click, for security). This process only works depending of the position of the knob ENG START. On CRANK position only dry start will be performed, IGNITION position is for the start. If the starting process has begun and the knob is set in OFF the process will be interrupt. This knob must be turned to OFF position after finished the start procedure, otherwise an alarm will be displayed on EICAS display. L MAN and R MAN are to perform the starting process if by the normal way doesn't work. Those buttons had lights for indicate that the starting is running.



CKPT DOOR panel

This switch will lock the cockpit door; otherwise an alarm will be displayed on the EICAS display.



Trimmer's panel

RUD RESET button sets the rudder trimmer in null position. STAB handle sets the elevator trimmer. TRIM handle sets the ailerons trimmers. RUD knob sets the rudder trimmer. All this procedure only works on ground or if the FBW system is off, otherwise will be driven by the FBW.



Throttles

The throttles had stuck on certain positions like CLIMB, NTO (Normal Takeoff) and APR (Automatic Power Reserve), sending to the computer the signal to calculate the proper thrust or speeds for each flight stages. The segment between IDLE and CLIMB is only for taxing. NTO sets the thrust for takeoff, which depends of the FLX TO setting on FMC. APR sets the max thrust of engines for quick takeoff and go-around, bypassing the FLX TO configuration. CLIMB performs the thrust for the rest of the stages until touchdown. The data for climb, cruise, descend, approach, final and landing stages is defined in the FMC. Beside, the flaps and the vertical speed modify that data. For example: Landing stage begins when the flaps are deployed up to 2 steep and the vertical speed is under 1000 ft/min. If the v/s is over 1000 ft/min, with the same flaps configuration, then the FMC intend climb stage. The flap position 3 or 4 set the landing stage.

The FMC speeds definition, with no flaps, is like follow: Below an altitude of 10000 feet, or bellow a height of 6000 feet AGL, the FMC set 250 IAS (Climb) if the v/s is over 1000 ft/min, otherwise is 230 IAS (Approach). Over this altitude/height, and under 32000 feet the targeted FMC default speed is 280 IAS. Over this altitude is 0.78 Mach. On final stage the FMC speed is unique, about 170 IAS. On landing stage the FMC speed moves depending on the aircraft weight and the air density.

The usage of this throttle system has some details to be attended in order to get the best performance. The yoke Z lever only provides motion between IDLE and CLIMB marcs for taxing, and reverse in some yokes. When any of the upper thrust positions are selected the Z lever can be used for retarding to IDLE, and disconnecting the AT. The only way to move between thrust positions is by keyboard, using the assigned keys for throttles. It is very simple with some practice. However I had two advises for users with Z lever Yokes. The best practice to takeoff is push the Z lever to full, once aircraft is moving for a few seconds press two times any accelerating key (F3,F4...) until NTO or APR is selected. Don't move the Z lever in the whole flight, if you want to move between thrust positions use the keys.

For landing, the best choice is retarding the Z lever to zero, this action disconnects the AT and sets IDLE, laying the system ready for reverse.



Whenever the throttles reach the takeoff positions the AT is engaged automatically. If the throttles return to IDLE position the AT is disengaged.

Resume

The rest of the systems not mentioned above are not functional in this 1.1 version, I´m still working on that.

Aircraft Generals

Speeds

Maximum operating limit speed VMO: 570 km/h (308 knots) CAS.

Maximum operating limit Mach number MMO: 0.81 M.

Typical cruise speed: 0.78 Mach (830 km/h)

Stalling speed: 195 km/h (105 knots) CAS.

Design Diving Speed VD: 660 km/h (356 knots) CAS.

Design Diving Mach number MD: 0.88 M.

The maximum flaps extended speeds (VFE) for 16°: 372 km/h (200 knots) CAS.

The maximum flaps extended speeds (VFE) for 36°: 334 km/h (180 knots) CAS.

Landing gear extension speed (VLO extend): 400 km/h (216 knots) CAS.

Landing gear retraction speed (VLO retract): 400 km/h (216 knots) CAS.

Landing gear extended speed (VLE): 475 km/h (256 knots) CAS.

The design speed for spoilers' extension (VDD): 660 km/h (356 knots) CAS.

The design speed for flight speed brakes extension (VSP): 420 km/h (227 knots) CAS.

Climbing Speed Reference

250 KCAS -1,500 feet to 10,000 feet

Accelerate to 280 KCAS

280 KCAS to 32,480 feet

0.78 Mach at 32,480 feet and above.

Landing Speed Reference

250 KCAS under 10,000 feet

190 KCAS traffic and initial approach

135 KCAS final approach

Limit Maneuver Load Factors

Flight configuration: Positive: +2.50g; Negative: -1.00g.

Capacity

Flight Crew 2

Minimum Cabin Crew 2

Passengers 98 (up to 108)

Engines

Type 2 PowerJet SaM146 turbofans

Thrust 15,400 (68.5 kN) to 16,100 (71.6 kN) at NTO

17,500 (77.9 kN) to 17,800 (79.2 kN) with APR

Flat Rating 86° F (ISA + 15° C)

Range

SSJ-100/95B (98 pax @ 32" pitch) 1,645 nm 3,048 km

SSJ-100/95LR (98 pax @ 32" pitch) 2,470 nm 4,578 km (Not present in this version)

(Pax with bags @ 220 lb (100 kg), LRC, ISA, zero wind, typical reserve policy.)

Airfield Performance

SSJ-100/95B

Takeoff field length (MTOW) 5,679 ft 1,731 m

Landing field length (MLW) 5,348 ft 1,630 m

SSJ-100/95LR (Not present in this version)

Takeoff field length (MTOW) 6,732 ft 2,052 m

Landing field length (MLW) 5,348 ft 1,630 m

Ceiling

Maximum operating altitude 40,000 ft 12,192 m

Configurations

Standard Dual Class 87 pax (12C/75Y @ 38"/31" pitch)

Standard Single Class 98 pax (98Y @ 32" pitch)

External Dimensions

Overall length 98 ft 2 in 29.94 m

Tail height 33 ft 8 in 10.28 m

Wingspan 91 ft 2 in 27.80 m

Internal Dimensions

Cabin length 67 ft 11 in 20.42 m

Cabin aisle height 6 ft 11 in 2.12 m

Cabin width (floor level) 9 ft 11 in 3.00 m

Cabin width (centerline) 10 ft 7 in 3.24 m

Cabin aisle width 20.0 in 0.51 m

Seat width 18.1 in 0.46 m

Overhead bin volume per pax 2.1 ft³ 0.06 m³

Cargo volume per pax 7.8 ft³ 0.22 m³

Doors

Passenger Door (LH, fwd)

Height 6 ft 0 in 1.83 m

Width 2 ft 9 in 0.86 m

Passenger Door (LH, aft) & Service Doors (RH, fwd; RH, aft)

Height 5 ft 4 in 1.65 m

Width 2 ft 5 in 0.76 m

Cargo Doors (RH, fwd; RH, aft)

Height 2 ft 11 in 0.89 m

Width 4 ft 0 in 1.22 m

Weights

Maximum Takeoff Weight (MTOW)

SSJ-100/95B 101,150 lb 45,880 kg (SSJ-100/95LR 109,019 lb 49,450 kg)

Maximum Landing Weight (MLW)

SSJ-100/95B/95LR 90,390 lb 41,000 kg

Maximum Zero Fuel Weight (MZFW)

SSJ-100/95B/95LR 88,185 lb 40,000 kg

Maximum Fuel Capacity

SSJ-100/95B/95LR 4,175 US gal 15,805 l

General Check List

Check list table

BEFORE START		APPROACH	
Cockpit prep.	Complete	Briefing	Perform
Gear pins and covers	Removed	ECAM status	Check
Signs	On/Auto	Seat belts	On
Fuel quantity	Check	Barometer ref.	Set
Flight plan	Set		
Barometer ref.	Set		
Windows & doors	Close	LANDING	
Beacon	On	Cabin crew	Advised
THR. levers	Idle	A/THR	As req.
Parking brakes	As req.	ECAM memo	Nothing RED
		- Landing gear down	
		- Signs ON	
		- Cabin secured	
		- Spoiler ARMED	
		- Flaps set	
		- Auto brake set	
AFTER START			
Anti Ice	As req.		
ECAM status	Check		
Rudder trim.	Zero		
BEFORE TAKEOFF		AFTER LANDING	
Flight controls	Check	Flaps	Retracted
Flight Inst.	Check	Spoilers	Disarmed
Briefing	Perform	APU	Start
Flap setting	Conf		
V1, VR & V2	Check	PARKING	
ATC	Set	APU bleed	On
ECAM memo	Nothing RED	Engines	Off
- Auto brake RTO		Seat belts	Off
- Signs ON		Ext. lights	As req.
- Cabin secured		Parking brakes	As req.
- Spoilers ARMED			
- Flaps TO		SECURING AIRCRAFT	
		APU bleed	Off
AFTER TO / CLIMB		No smoking	Off
Landing gear	Up	APU & bat.	Off
Flaps	Retracted	Fuel pumps	Off
Barometer ref.	Set		

Quick Operational Guide

Introduction

The intention of this chapter is to guide the flight simmer to perform a successful flight with this aircraft. This guide is like a Normal Procedures but a little different and with some flying tips. Note that this version is just my best shoot for a realistic product, so some tricks and shortcuts were added trying to match the performance of the real SSJ-100. This guide was made based on the results of my successful flights, more than 200 without counting hundreds of test flights. Even if you are an experienced flight simmer I suggest you to read this guide.

Loading aircraft

- The aircraft will reload all XML programs at beginning but you must assure of this opening all panels at beginning.
- You must calibrate your yoke! The FBW system of this aircraft is very sensitive. As well the AP is disconnecting if the yoke is moved beyond certain number of degrees.

Planning the flight

- Set the FMC needed data for the flight and planning the route to destination This FMC only can set one route so, if you need to go around to alternative destination, you must re-enter your new route to the new destination.
- The FMC calculate the quantity of fuel needed BLOCK-TO-BLOCK, depending on length of the route through it legs. Remember to include the fuel for alternate airport in RESERVE quantity. The fuel data can be checked on FUEL pages on FMC and MFD.

Before start

- Secure the aircraft putting the parking brakes and setting throttles on IDLE
- Turn ON the cabin lights (Night time)
- Set ON the navigation lights
- Engage the external power plant switch
- Check fire extinguish system on TEST buttons
- Check anti-ice and hydraulic knobs on AUTO position
- Check hydraulics in HYD sheet on MFD
- Check flaps and spoilers fully retracted
- Set throttles to IDLE
- Set ON cabin signal (No smoke and seat belt)
- Check closed doors and windows in DOOR sheet on MFD
- Check fuel in FUEL sheet on MFD
- Set AUTO CKPT DOOR switch

Starting APU

- Turn on the left fuel pump MAIN and AUX
- Check pumps displaying FUEL sheet on MFD
- Set ON APU master switch (That opens the APU door)
- Set ON START/STOP APU switch

- Check APU starting in ENG/APU sheet on MFD
- Engage APU generator
- Check APU BLEED is ON

Starting engines

- Set ON beacon lights
- Release parking brakes and perform push back as needed
- Turn on the right fuel pump MAIN and AUX
- Check pumps in FUEL sheet on MFD
- Set IGNITION the engine starting knob
- Push R engine valve
- Check right engine starting in ENG/APU sheet on MFD and EICAS display
- Engage right engine generator
- Push L engine valve
- Check left engine starting in ENG/APU sheet on MFD and EICAS display
- Engage left engine generator
- Set OFF the engine starting knob
- Turn off APU master switch (That closes the APU door)
- Turn off APU BLEED
- Check external power plant switch off
- Check electrical system in ELEC sheet on MFD
- Check air system in AIR sheet on MFD

Rolling out (taxing)

- Set TAX on taxi lights, set turn lights as desired
- Check "black cockpit" All signals must be off, except cabin signals
- Set flaps to FLAP 2 Position (For all of takeoff weight)
- Set spoilers to GND SP ARMED
- Check brakes, tires, yoke and control surfaces at PCTL/BRK sheet in MFD
- Deliver some gas until the aircraft move on (Don't reach CLB position)
- Set autopilot initial altitude

Line up, run and takeoff

- Set ON strobe, landing and wing lights, put taxi lights on TO
- Set LNAV and VNAV on, and check green signs on PFD (Autopilot Section)
- ARM auto-brake RTO button
- Check "Nothing red" on EICAS
- Display radar screen on MFD
- Set TCAS on (Standby on ground)
- Set the radar scope as you desire
- Deliver gas at about 50% of N1
- At about 30 knots, push throttles to NTO steep (APR for emergency only)
- Check A/T is engage (Green light must beam)
- Check green "NTO" or "APR" signs on PFD (Autopilot section)
- Check clear red "NO TAKEOFF" alarm on EICAS
- Check engines performance on EICAS
- Check V1, VR and V2 values on PFD (Below airspeed strip)

- Near VR rotate the aircraft between 10 – 15 degrees of pitch
- When positive climb, retract the landing gears
- Check landing gears state on EICAS
- Relax the yoke pressure to null (The aircraft maintain the pitch)
- Keep the speed near the green dot varying the pitch
- At about 1500 feet over ground retard the throttles to CLIMB (Signal will suggest CLIMB on PFD)
- Check green “THRUST” signs on PFD (Autopilot section)
- Check AP speed reference on 250 IAS
- Retract the flaps to 0
- Check flaps status on EICAS
- Reduce the pitch at will to keep the acceleration

Climbing

- Check initial altitude setting or change it as desired
- Relax the yoke pressure
- Disarm auto-brake RTO button
- Set spoilers to RET position
- Check LNAV and VNAV signs on PFD (Autopilot Section)
- Set AP engage (Green light must beam)
- Check the interception of horizontal flight path
- Check the auto climb performance (Green A appear over VS strip on PFD)
- Set autopilot cruise altitude
- Over 10000 feet, set OFF landing, wing, taxi and turn lights if connected
- Over 10500 feet, check AP speed reference on 280 IAS
- Over 32500 feet, check AP speed reference on 0.78 Mach

Cruising

- Check establish at final altitude
- Check establish at normal cruise speed of 0.78 Mach
- To change the altitude just set the new one use ALT knob or LNAV pages on FMC
- To change the velocity set the new one on AP
- To change the curse use HDG/TRACK knob

Descending

- With an active flight plan, blinking message “DESC. RATE” will show on MFD
- Chose the best descend rate (Better between 2400-2600 ft/min)
- Set inferior or destination altitude on AP or in DES page of FMC
- Compare the automatic vertical speed with “Desc. Rate” value
- Use spoilers at will to maintain the target speed (Avoid full spoilers)
- Watch high-speed under 10000 feet (Limit 250 KIAS)
- Set ON strobe, landing and wing lights, set taxi lights on TO position

Approaching

- When ready for landing, set FLAPS 1 and check state on EICAS
- Check the AT speed reference of 180 IAS (approach speed)
- Below 210 IAS check FLAPS 1 + F on EICAS (Automatic setting)

- ARM auto-brake as needed (Avoid MAX configuration if not necessary)
- Set spoiler on GND SP ARMED
- Below 200 IAS, set FLAPS 2 and extend the landing gears
- Check flaps and landing gears state on EICAS
- Below 190 IAS set FLAPS 3 (Check state on EICAS)
- Below 180 IAS set FLAPS FULL, if both engines running (Check state on EICAS)

Landing

- Near the ground pull out gently (AP will disconnected and an alarm will sound)
- Descend softly and wait for RETARD sign on PFD (Autopilot section)
- With RETARD blinking, retard the throttles to IDLE, and perform the touchdown
- After touchdown, set full reverse (Check state on EICAS)
- Below 60 KIAS stop reverse action
- Use brakes to taxiing speed
- Fully retract the flaps (Check state on EICAS)
- Set spoilers to RET position (Check state on EICAS)

Taxing to ramp

- Out of runway set OFF strobe, landing and wing lights, set taxi lights on TAX, set turn lights as desired
- Perform steepers for start the APU
- After stop, set parking brakes
- Engage the external power plant switch
- Set OFF electrical systems like radios
- Pull both engine valves to stop (right click)
- Check full stop engines on EICAS
- Set OFF beacon lights
- Set OFF turn lights if connected
- Set OFF both engine generators
- Set OFF all fuel pumps (unless the APU is running)
- Set OFF cabin signals (No smoke and seat belt)
- Open all doors (Check the DOOR sheet on MFD)
- With empty aircraft, turn off APU and running fuel pumps
- Check full stop APU the ENG/APU sheet on MFD
- Set UNLK CKPT DOOR switch
- Turn off remaining switches and systems
- Check "black cockpit", before abandon the aircraft

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