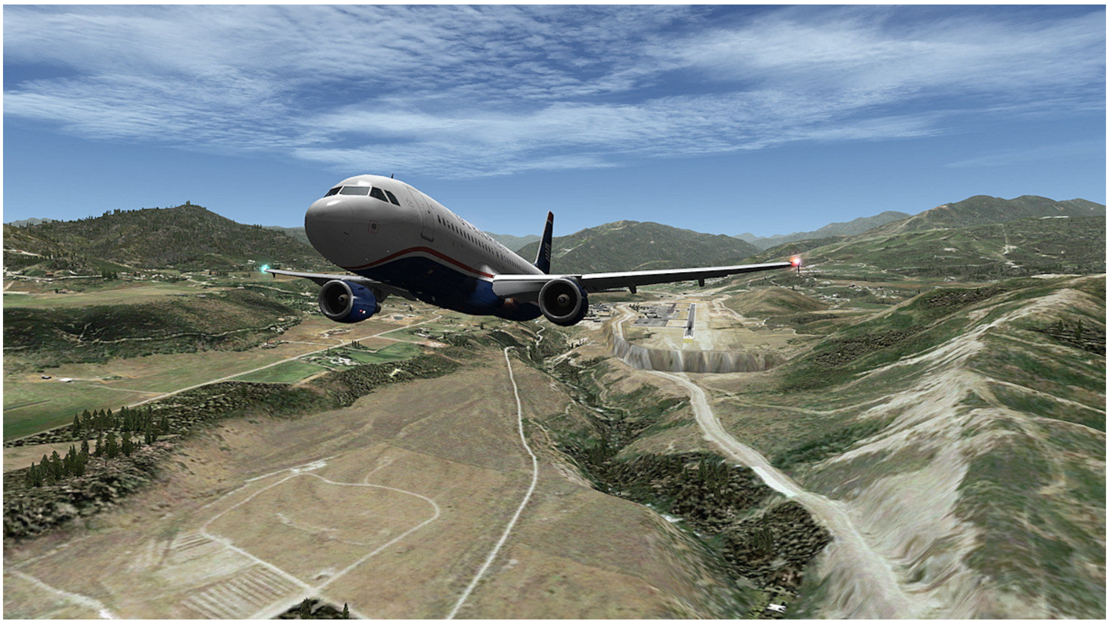
PROJECT AIRBUS A320 FD
SPECIAL VERSION v3

CFM & IAE engines
To use with FSX SP2 or Acceleration pack only

With adaptation Stefan Liebe's Panel
callout gauge by Doug Dawson,
adapted by permission by François Doré v 3.0 – July 2012
Panel version 3.05 16 june 2012

User Manual



CHECKLIST
FUEL kg
F. USED 1
55
FOB
11280
F. USED 2
49
LEFT
CTR
RIGHT
358
350
4448
1325
4448
350
24 °C 24
24 °C 24
TAT: 24°C
SAT: 24°C
ZULU: 11:32
LOCAL: 06:32
G.W.: 65716 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

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Special thanks to Derek Mayer of Project Airbus Team. **Project Airbus site**

Stefan Liebe Panel A32X Copyright

The Original Panel used in this aircraft (folders « \PA320FD_CFM\Panel\A320_FD.cab » « \PA320FD_IAE\Panel\A320_FD.cab ») is my adaptation of the A32X panel by Stefan Liebe. I have got Stefan Liebe Authorization to make these changes. The original A32X panel is **copyrighted by Stefan Liebe**.

I thank Stefan Liebe for his friendliness to authorize me to change and to add some code in his xml files to allow them to operate with The Project Airbus Aircraft. All other modifications has been realised by François Doré.

Do not use this A320 panel with another aircraft, because xml files work only with this version of the Project Airbus A320 aircraft !

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The Original CALLOUT_SOUND.DLL is **copyrighted by Doug Dawson**.
If you want to use the CALLOUT_SOUND.dll VERSION 3.8.2.0 you need the permission of Doug Dawson !
Many thanks to Doug for allowing me to use his gauge

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I thank Nicolas chung for the authorization it gave me to join its high quality textures in this pack !

You can't modified or edited in any manner without the permission of the authors concerned in writing via an Email.

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Vertical navigation gauge (FD_Vnav.xml) and Fuel Management gauge (FD_Fuel_System.xml) and any amendments to the panel of Stefan Liebe (TCAS and terrain radar on the ND, "Flight Plan" and "Destination Airport " pages, " BLEED circuit ,"Cold & Dark startup, fault management engines, new Autopilot.xml features, new SFCC management and many others features..... are copyrighted François Doré.

The Checklist and the reference file, for the kneeboard tablet has been realized by **Jean-Pierre Varnier.** With many thanks.

The engines startup procedure and Bleed circuit has been realized under the technical direction of **Jean-Louis Fonta**, that I am very grateful.

I warmly thank all the members of the french forum http://www.pilote-virtuel.com/ for their help to debug this aircraft

Please, Excuse me for my bad english

If you have any questions, please contact me **François Doré** Fdd_fr@yahoo.fr

2 Overview and installation

2.1 Overview and new features of the v3

After performing a special version of Project Airbus A321 with a new version of my panel V3, I have decided to upgrade the A318, A319 and A320 V2 that I have realised some months ago with this new version of the panel.
This aircraft, originally designed for FS9, works now perfectly only with FSX SP2 or Acceleration pack
For those who have already the A320 V2, there isn't an update pack. In gact, this more simple to uninstall the v2 to install this new version. So you will must delete the old v2, but if you had installed some texture on the v2, think to make a backup of them, for to re-install in the new version of the aircraft. You will must to dipatch your textures between the CFM and IAE folders (and edit each aircraft.cfg).

I tried to make this manual universal, but of course, users who use the V2 will find information already known. However, I suggest you read it in all cases because there are many changes between two versions
The aircraft is equipped with a 3D virtual cockpit and 2D cockpit traditional. Instrumentation is a mixture of components for the Airbus A321 original FSX, Project Airbus Panels and Stefan Liebe's Panel that I totally reworked. The challenge was to adapt the Panel A32X Stefan Liebe, which was not compatible with basic A3xx From Project Airbus and correct some minor bugs while adding new features.
Stefan Liebe made a number of functional elements in the cockpit as TOGA mode (Take Off and Go Around) with a button on the throttle panel and the 4-position autobrake (gear panel in 2D window and VC). He completed the instrumentation.

If you've used one of the Special Project Airbus version 2 that I realized,

Here the novelty brought by my panel in version 3:
- 100 % Cold & Dark mode status at launch of a flight
- Real engines startup procedure, the most faithful to reality
- BLEED air valves system management when starting with realistic animation on the ECAM page
- Realistic fuel management (dedicated gauge) with feed that starts with center tanks and ending with the wings tanks
- "Fuel CROSSFEED" function, with all valves and pumps of the fuel system working, management of the reserve with audible and visual low level alarm.
- Fire engine complete management with alarm and procedure
- Management of various engines failures and APU fire
- Adding on the ECAM, the position of the throttle in % displayed with TOGA, FLEX, CL and IDLE information
- Added alarms messages on the upper primary ECAM
- Management of Fly By Wire function with 2 modes : NORMAL LAW and DIRECT LAW
- Improved information displayed on the ND in ARC mode and NAV mode, with TCAS, airport name or ICAO code according to the scale, name of each waypoint on the line symbolizing the route of the flight plan, better display of symbols in these modes according scale.
- Filtering the display of the airport is showing that those with a control tower and a runway (it's a liner!)
- Improvements of SFCC that manages now the flaps 2 and 3 position at takeoff.
- Improvements Autoflare (Autolanding) wih best rounding and A320 adaptation
- Fixed bug of the autopilot that could occur when loading a flight at high altitude
- Fixed bug with display of the lack of identification of second VOR bottom right of ND
- Improved initialization of the aircraft when resuming a saved flight
- Changing the voltage of the APU, and some errors in the aircraft.cfg.
- Highly detailed kneeboard checklist for startup procedure (Jean-Pierre Varnier realization)
- And various minor bugs fix in response to user feedback
- VC day lighting is now operate by a dedicated switch and totally independant of the default cabin lighting

If you've never used one of the Special Project Airbus version 2 that I realized,

Here, the new functions brought by the « Special Version 2 » aircrafts series :
- The stephan Liebe's panel, with a complete « Checklist » interactive page on secondary lowers ECAM , and primary ECAM with more informations (alarms ad information messages).
- automatic slats and flaps management at takeoff, (Airbus SFCC system)
- Autoflare (ILS autolanding),
- All secondary lower ECAM pages activated
- I have created a vertical navigation gauge (VNAV), which manage the climb of the aircraft, under autopilot control, according the weight of the aircraft. This gauge can works in one time or in several time to follow ATC orders for example.
- New ND postion (knob selector on PLN position) which show radar terrain with TCAS function
- Ehanced stefan Liebe's Autoflare gauge, with best final landing rouding
- Corrected Stefan Liebe's SFCC gauge, because some bugs appear for some users
- New « Flight Plan » Page on ND, wth all waypoints informations (ident, heading, remaining distance in real time
- New « Destination » page on ND, with all informations about your destination airport , Remaining distance , Elevation, Approach, ATIS, Tower, and ILS frequencies,runways numbers and headings ....
- Minimal Fly By wire management.
- Min and max speed displayed on ASI according flaps configuration and aircraft weight, V1, Vr and Vref speed ...
- add few minors things….
- and you must add all the previous chapter about the new feature of the V3 version

2.2 Aircraft Installation

Nota : If you have already installed one of my planes "Project Airbus v2 Special Version" (PA318FD, or PA319FD PA320FD), you must keep the folder and files of CALLOUT_1. This A320 package comes with its new folder calls "CALLOUT_FD"; To the future, all my aircrafts specifics sounds will be in this folder, and It contains a "version.txt" file to know the newer. All the V3 use this new folder.

Unzip the PA320FD_V3.zip file in a temp folder.

You must have the following folders :

- **\PA320FD_V3**
  - **---\Effects**
  - **---\Gauges**
  - **---\SimObjects**
    - **\Airplanes**
      - **\PA320FD_CFM**
      - **\PA320FD_IAE**
  - **---\Sound**
    - **\CALLOUT_FD**

1. Copy the contents of the "\ Effects \" folder (a list of ". Fx" files) in the "\ Effects \" FSX folder. If Windows ever asks you to overwrite existing files, say yes, because you'll have the latest versions of these files.

2. Copy the contents of the « \Gauges\ » folder (« callout_sound.dll » file) in FSX « \Gauges\ » folder

3. « \Sound\ » folder include a sub folder called « \CALLOUT_FD » : Copy this complete folder in the FSX « \Sound\ » folder. If you have already this folder, check its version ; There is a « version.txt » file inside, that shows the version ; The version of this package is the version 3.0 : Install or keep the newest version ; it is compatible with older versions..

4. « \SimObjects\ » folder has a sub folder called « \Airplanes\ » which content 2 sub folders : « \PA320FD_CFM\ » and« \PA320FD_IAE\ » . **The 2 engine versions are in two separate folders** because their engines data are differents in the « Aircraft.cfg » files.
   Copy « PA320FD_CFM » & « PA320FD_IAE » folders in the «… \SimObjects\Airplanes\ » FSX original folder.

Nota : If you have a message that you already have files and Windows asks if you want to replace them, answer yes. Start FSX, it will ask you to accept the new gauge "Calloutsound.dll" (unless it was already installed on your machine): Accept !

That's all

Small bonus :

- Aircraft comes with the AES configuration file (Aeroport Ehanced Services) for those who use it.
- You will find in the aircraft folder a folder called « Ezdok Camera & vibs » ; there are in this folder some sepcific cameras and vibrations files for this aircraft if you use Ezdok Camera software..

- **AES is COPYRIGHTED by AEROSOFT**
- **Ezdok Camera is COPYRIGHTED by EZDOK SOFTWARE**

2.3 New textures installation

You will find on internet many high quality textures for the Project Airbus A320 in IAE or CFM version :

Site of Project Airbus: http://www.pafs.wf/downloads
Site of Avsim (requires creating a free account): http://www.library.avsim.net/
Site of FlightSim (need to create a free account): http://www.FlightSim.com
And many more ....

They can come in two forms:

- With the Project Airbus complete aircraft
- Or just the texture only.

Whatever the case, unzip the archive (usually a. Zip) to a temporary folder. And just copy the folder containing the texture.
This folder must imperatively be called Texture.xxxxx) If it is called "Texture" simply, it will rename the file in texture.xxxx imperatively. Indeed, the plane already contains a folder "texture" that contains the virtual cockpit textures. If you crush it, the VC of all your A320 will be black.

Your new folder texture.xxxx is to place either in the ... \ SimObjects \ Airplanes \ PA320FD_CFM \ if it is a CFM engine repaint , or in the folder ... \ SimObjects \ Airplanes \ PA320FD_IAE \ if this is a texture version of the A320 IAE engine. You will inevitably find this information in a text file that must accompany your texture. Please, note that there is 2 aircraft version by engines : model 100 and model 200

Do not copy any other file, just the folder containing texture of the plane! All other files in my version are specific and fon not replace them ! If you replace any files of my aircraft, it will not works !!

Install your texture in the correct folder:

\ PA320FD_CFM \ for CFM texture
\ PA320FD_IAE for IAE texture

and only edit the concerned aircraft. cfg file!

Once your new texture folder in the right place, check that it contains a file called "texture.cfg". If this is not the case, get in one in the original textures that I provided with the aircraft pack. Each texture folder must be contains the file "texture.cfg". Copy and paste this file in your new texture's folder; If you do not do this, you will not have the Virtual Cockpit textures in your new plane, the cockpit will be black! (Because the original Project Airbus had only 2D Cockpit).

Then you have to declare your new texture in the "aircraft.cfg" file found in the root folder of the engine version concerned(PA320FD_CFM or PA320FD_IAE) by adding a section [fltsim.xx]

Although generally there is a text file that comes with the new texture, containing a section [fltsim.xx] to be paste in your aircraft.cfg, it may be incomplete or behaved incompatibilities with my version (there several versions of the Project Airbus A320).

So to avoid any problem, you will find on the next page, a typical section of each model (CFM or IAE) **you'll just have to copy and paste into the aircraft.cfg file**, completing only the fields indicated in red, finding information in the text file supplied with the texture.

You can find Some informations by searching on internet, such as ATC_PAKING_CODE which is the ICAO code of the airline company of your texture.
It is very often absent from textures text files and it's a shame, because if you use addons airport well done, their designers have been careful to attribute their doors and terminals, according to reality, thanks to this code, the FSX ATC will send you park at the door module of your company.

[Fltsim.xx] Section of the aircraft.cfg file CFM version :

Copy and paste the following section in your CFM aircraft.cfg and re-write only the red lines with the text file of your texture or with internet search (ICAO 3 letters of the airline company for example).
I have indicated in bold characters the informations of my Air France texture for example.

Leave as is everything in bold black !!!

[fltsim.xx]
title= **PA320_CFM –** A name for your texture model : example : **Air France**
sim= **pa320-cfm56-2**
model= **CFM-200** or **CFM-100** there is 2 exteriors model of the PA 320. This information is in the .txt file
panel=
sound=**CFM**
texture= The name of your texture folder : example if your folder calls « texture. : AF-FGJVB », you must write only : : **AF-FGJVB**
atc_id= The registration of your aircraft ; example **: : F-GJVB**
atc_airline= Callsign of the airline company (ATC Callsign) ; example : **AIR FRANCE**
atc_flight_number=A flight number ; example : **451**
atc_heavy=**0**
atc_parking_types=**GATE,RAMP**
atc_parking_codes= ICAO code (3 letters) of the airline company (you can find it on the net) ; example : **AFR**
ui_manufacturer=**Airbus**
ui_type=Aircraft model ; example : **A320-211 F-GJVB CFM**
ui_variation=Name of the airline company ; example : **AIR FRANCE**
ui_typerole=**Commercial Airliner**
ui_createdby=**Project Airbus**
visual_damage=**1**
kb_checklists=**AirbusA320_check**
kb_reference=**AirbusA320_ref**
description= **Project Airbus A320. Original Aircraft by Project Airbus Team:\n\nVisual Model by Andy Warden & Derek Mayern\nFlight Model by Peter Binamira\nBase Texture by Demetris Themistocleous & Alessandro Savarese\n\nCopyright Project Airbus 2009\n** realisateur de la the texture**: Livery by Nicholas Chung**

Section [Fltsim.xx] de l’aircraft.cfg pour version version IAE :

[fltsim.xx]
title= **PA320_IAE –** A name for your texture model : example : **British Airways G-EUUZ IAE**
sim= **pa320-v2527**
model= **IAE-100** ou **IAE-200 100** there is 2 exteriors model of the PA 320. This information is in the .txt file
panel=
sound=**IAE**
texture= The name of your texture folder : i.e if your folder calls « texture. usN837aw », you must write only : **usN837aw**
atc_id= The registration of your aircraft ; example **: G-EUUZ**
atc_airline= Callsign of the airline company (ATC Callsign) ; example : **SPEEDBIRD**
atc_flight_number=A flight number ; example : **451**
atc_heavy=**0**
atc_parking_types=**GATE,RAMP**
atc_parking_codes= ICAO code (3 letters) of the airline company (you can find it on the net) ; example : **BAW**
ui_manufacturer=**Airbus**
ui_type=Aircraft model ; example : **A320-214 IAE**
ui_variation=Name of the airline company ; example : **BRITISH AIRWAYS**
ui_typerole=**Commercial Airliner**
ui_createdby=**Project Airbus**
visual_damage=**1**
kb_checklists=**AirbusA320_check**
kb_reference=**AirbusA320_ref**
description= **Project Airbus A320. Original Aircraft by Project Airbus Team:\n\nVisual Model by Andy Warden & Derek Mayern\nFlight Model by Peter Binamira\nBase Texture by Demetris Themistocleous & Alessandro Savarese\n\nCopyright Project Airbus 2009\n** Name of the painter : e.g **: Livery by Nicholas Chung**

3 Must be read before to fly !!!!

Before taking the control of this special version of the Project Airbus A320, you simply must get knowledge of the following:

- **The « Push-Pull » buttons of the Autopilot (Speed, ALT et HDG) must be engaged or disengaged by right click mouse ; By cons, their settings (+/-) is still with the left mouse button.**

- You must adjust **FSX realism setting** about indicated speed to **"Display Indicated airspeed"** : **See picture 65, page 42, chapter 5.4**. If not, **Autopilot will not properly works !!.**

- I have tried to program the manual engines startup procedure the nearest of the reality, so read carefully the **chapter 5.1**, to know what is going. For the beginners , I kept the FSX automatic startup (CTRL+E keys) , but I have created for this automatic mode all the animations for the Bleed page and for all the switches and selectors ; So, look at this.

- Your flight will begin by « Cold & Dark » situation. You must activate all the systems and also the flights controls (Fly By Wire system with choice of 2 operating modes). If you don't, no flight controls will not work !

- This Airbus has the **Fly By Wire** (FBW) function. Please refer to **Chapter 5.6** for information regarding the consequences of this mode, because there are two oprating modes,(NORMAL LAW & DIRECT LAW) and manual drive of the aircraft is greatly changed in NORMAL LAW.

- The speed management of the aircraft is linked to a "**transition altitude" of 25,000 feet**. Below this altitude, the autopilot can operates in IAS or MACH mode. Above this altitude, the display mode switches in MACH. From this moment, the aircraft's climb will be at constant MACH , because autopilot automatically recalibrates the speed according to the alitude. By default Refer to **Chapter 5.4**, regarding the operation of the autopilot

- The **vertical speed** of the autopilot is **set to 0**, which means that if you change altitude, You will must set the VS (vertical speed) at every change of altitude, unless you use the VNAV function. This is in order to be as faithful as possible to the real control of the aircraft and also to avoid any malfunction with the vertical navigation gauge that I made for this aircraft.

- The **TOGA** mode (TakeOff & Go Around) is available on this aircraft. In case of use of TOGA, the vertical speed does not come into play; The aircraft will climb at a fixed incidence (Pitch) of 12 degrees.

- The automatic management of Airbus flaps & slats , called "**SFCC**" is supported on this aircraft (and extended to flaps positions 2 and 3 on this version); Please refer to **Chapter 5.5** to be aware of how works this system.

- I have added to this aircraft a "**day lighting**" of the **Virtual Cockpit**, for some reasons. This function requires special handling in some cases, please refer to **Chapter 6** for more information about the use of this day lighting.

- The aircraft is equipped with an **Autolanding system** (Autoflare) It cannot do miracles and it has limitations; Please refer to **Chapter 5.7** for the operation of the Autolanding.

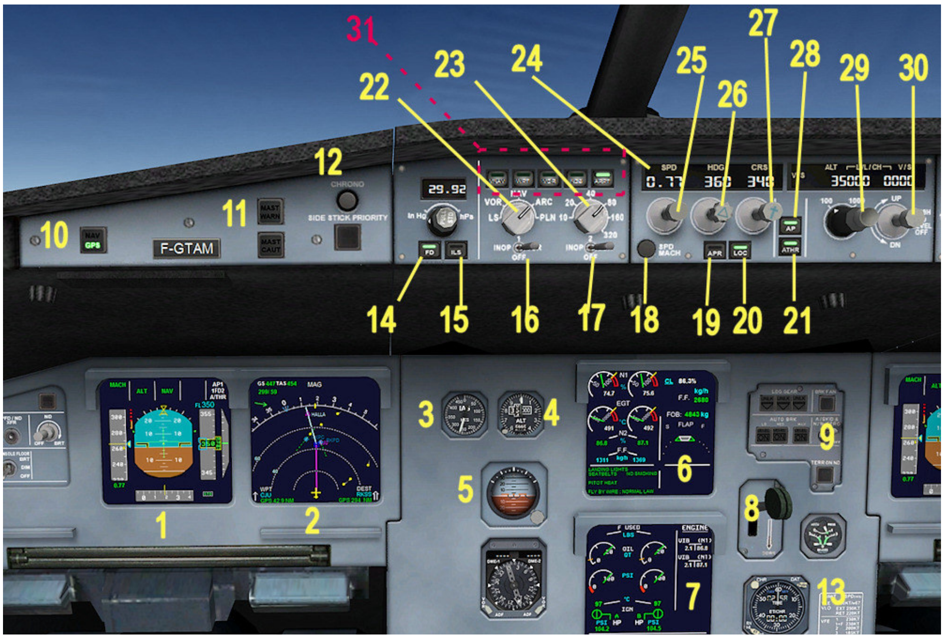
- The aircraft is set to be succeptible to be subject to **icing problems** of engines, wings and pitot probes, following weather forecasts conditions; So make sure to enable the right heating systems if these conditions arise.

- Exept for the VNAV mode, You mus have a vertical speed appropriate to the aircraft's weight, its altitude and its speed. At takeoff, you must not exceed a vertical speed of 2000ft/mn as the aircraft as not reached a speed of 220/230 IAS (adjust the trim). While you climb, you must decrease vertical speed (engines lost power with altitude). By cons, in descent, if you are at high altitude, you can start by a high descent rate, but the closer you are the ground, more you decrease you descent's rate to avoid overspeed.(see **chapter 7** or Reference file in the aircraft folder or you can read it with the FSX Kneeboard).

4 Instrument panel & new functions

In VC (Virtual Cockpit), each panel can be a popup window by click mouse

4.1 Overview of the dashboard

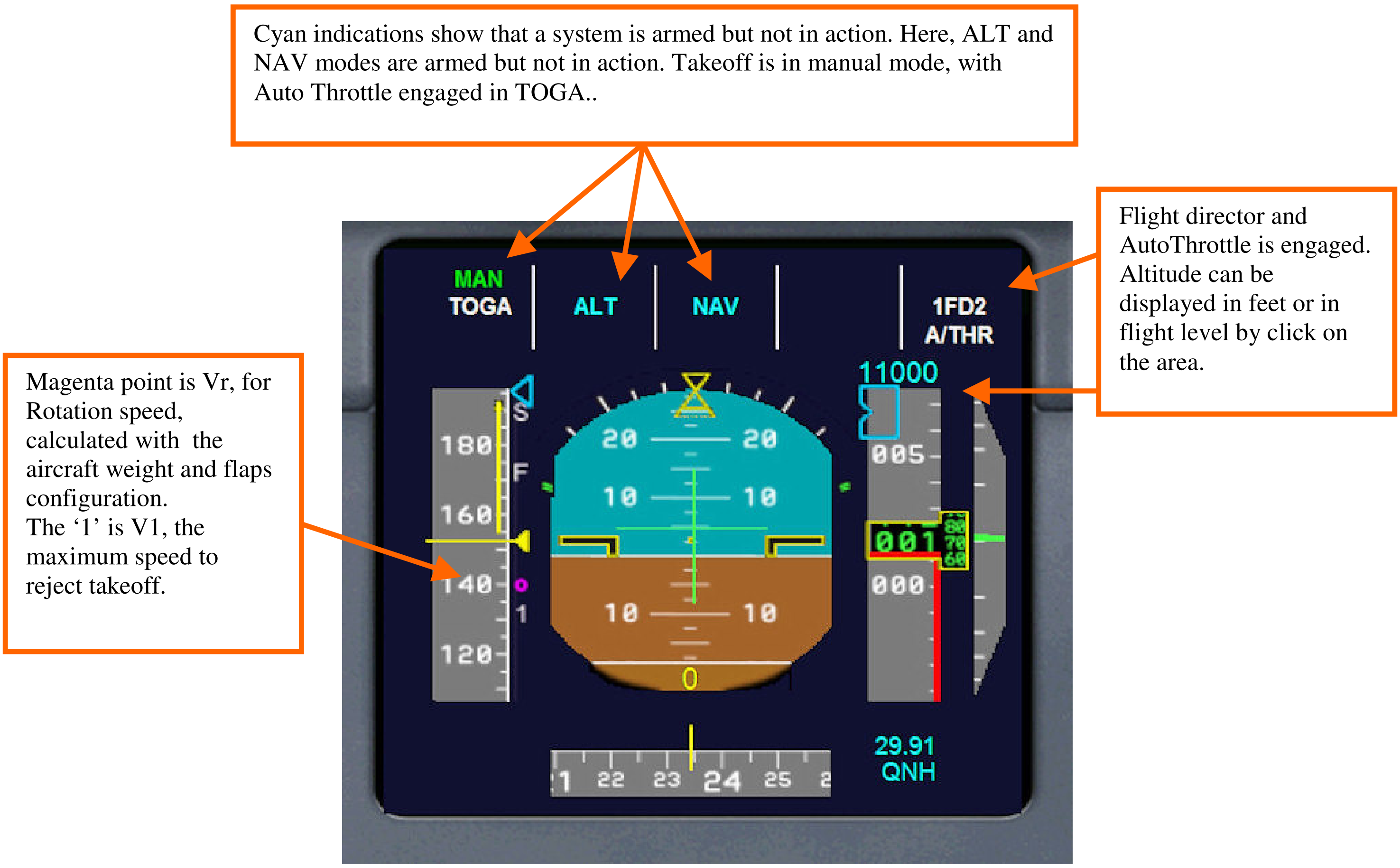


Picture 0 –Virtual Cokpit view

1 PFD (Primary Flight Display) : Main screen of the attitude aircraft, flight parameters(speed, altitude, attitude etc …)
2 ND (Navigation Display) : Radar screen with all navigation informations . There are 5 display modes
3 Backup speed indicator
4 Backup altitude indicator
5 Backup attitude indicator
6 Primary ECAM : Engines parameters, flaps position and messages areas
7 Secondary ECAM : Multipages information screen about all the aircraft systems.
8 Main control of the landing gear
9 Landing gear indicator and Autobrake selector
10 Autopilot selector button : select if follow GPS or Radio NAV1
11 Master warning and Master Caution indicator with reset button
12 Stopwatch button
13 stopwatch
14 Flight director switch
15 ILS mode switch
16 VOR – ADF selector for NAV1
17 VOR – ADF selector for NAV2
18 MACH/IAS selector switch
19 Approach swith for ILS mode (slope)
20 Localizer switch (engage the autopilot to follow GPS or NAV 1 according the position of the button #10)
21 Autothrottle swicth (A/THR mode)
22 Rotary selector for the ND : ILS , VOR, NAV , ARC ,PLN mode
23 Rotary selector for the display scale on the the ND
24 Display the target speed of the autopilot (IAS or Mach)
25 Autopilot speed selector (-/+ by left click / wheel mouse) and engage or disengage the Speed mode **by right click mouse**.
26 Heading autopilot selector (-/+ by left click / wheel mouse) and engage or disengage the HDG mode **by right click mouse**
27 Course selector for the runway heading.
28 Main switch for the Autopilot (on/off)
29 Autopilot target altitude selector (-/+ by left click / wheel mouse) and engage or disengage the ALT mode **by right click mouse,** with a scale selector (100 or 1000ft step).
30 Autopilot target vertical speed selector (-/+)
31 display option switches for the ND and VNAV switch (see picture 6, page 13).

4.2 Primary Flight Display or PFD

I have added new features indications on the PFD , as the gauge which manages vertical navigation (the aircraft climb on autopilot mode).
Here is the display of the PFD, taking off, after arming the NAV and ALT modes, with engines thrust in TOGA mode.



Cyan indications show that a system is armed but not in action. Here, ALT and NAV modes are armed but not in action. Takeoff is in manual mode, with Auto Throttle engaged in TOGA..

Flight director and AutoThrottle is engaged. Altitude can be displayed in feet or in flight level by click on the area.

Magenta point is Vr, for Rotation speed, calculated with the aircraft weight and flaps configuration.
The ‘1’ is V1, the maximum speed to reject takeoff.

Picture 1- PFD - manual takeoff

PFD new features

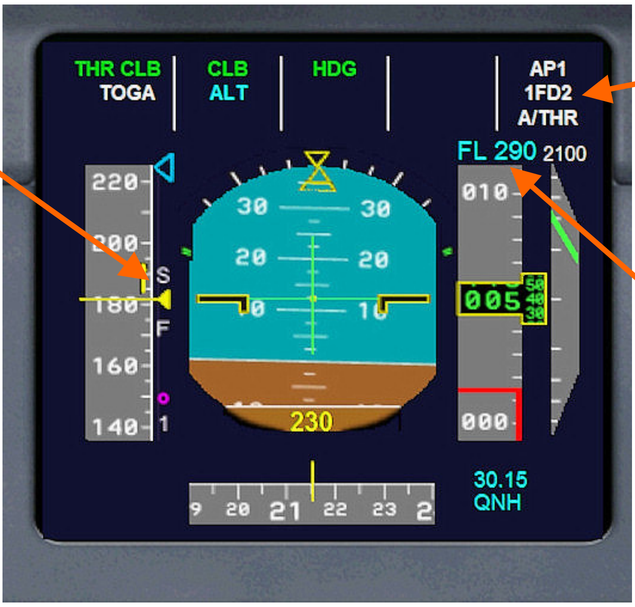
- Now shows max and min speed on ASI (according flaps configuration and weight for min speed and altitude for max speed)
- Shows min & max speed for each flaps position
- Shows V1 et Vr information for Take Off (‘1’ is V1 Magenta dot is Vr).
- Shows Vref for landing in Full Flaps configuration (green dot)
- Shows the management state of my vertical navigation gauge (THR /CLB)
- Shows Cat, frequency et DME of ILS
- Shows « Decision Height », set by defaut at 200ft, with adjust value by mouse clicks
- Shows when TOGA mode is engaged (TOGA button in popup throttle panel or programing key)
- AP target Altitude can be display in feet (default) or Flight Level if the aircraft is above 5000ft by click on the area..
- Shows yellow vector acceleration on ASI

Green indications show that systems are activated. In this screenshot, aircraft has just taken off in TOGA mode and VNAV mode (THR CLB indication, see **chapter 5.3** for informations about VNAV mode), with Autopilot activated in HDG mode ..

« S » & « F » in white color are the minimum retractation speeds landmarks for slats & flaps..

AP1 shows that autopilot is engaged
1FD2 is the flight director
A/THR is the Auto Throttle mode

Altitude reading is in feet by default. So, you can click on the value to display value in Flight level (FL) , only if the selected altitude is above 5000ft.

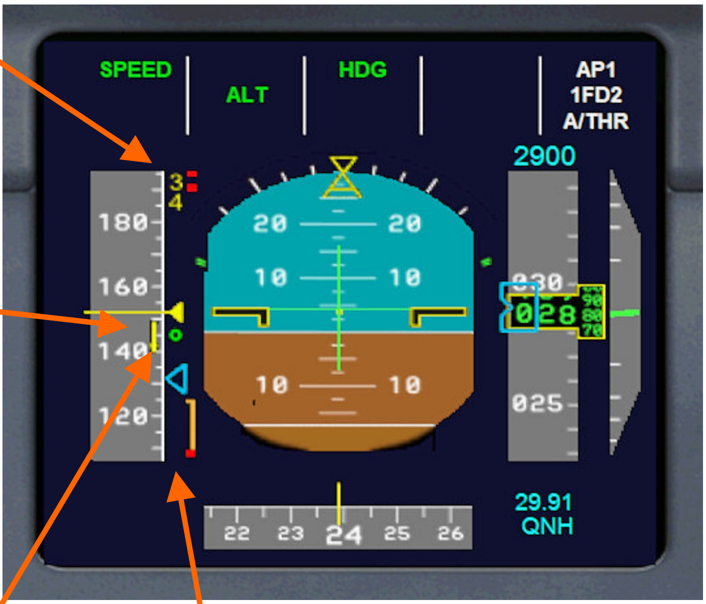

THR CLB
TOGA
CLB
ALT
HDG
AP1
1FD2
A/THR
FL 290 2100
220
200
180
160
140
S
F
1
30
20
10
230
010
005
000
30.15
QNH
9 20 21 22 23 2

Picture 2 PFD at takeoff with VNAV mode and AutoThrottle

You can display PFD, ND and ECAMs screens in popup window by clicking on it in the virtual cockpit e.

Yellow color indication is the Maximum speed landmark for each flaps position when you are in approach or landing. This lansmarks appears when you set from first flaps position.

Yellow vector for body acceleration.(force and direction).


SPEED
ALT
HDG
AP1
1FD2
A/THR
2900
3
4
180
160
140
120
20
10
030
028
025
29.91
QNH
22 23 24 25 26

Picture 3 – PFD at landing

This green dot is the Vref, the optimal and safety landing speed, calculated with aircraft's weight. It appears when the flaps are in Full extended configuration.

Minimum speedbar, according with the flaps configuration and total weight of the aircraft at this moment. Orange area is the risk area, and red area is the stall speed.

You'll find out more about the new features of the PFD to reading the chapters 5.3 (VNAV) and 5.7 (Autoflare)

4.3 ND (Navigation Display)

ND displays navigation informations. It has multiple display modes (ILS,VOR, NAV, ARC, PLN).
Distance scale can be adjusted by the scale map selector.
For example, here is the ARC mode, with a GPS flightplan.

Ground speed and True Air Speed indications

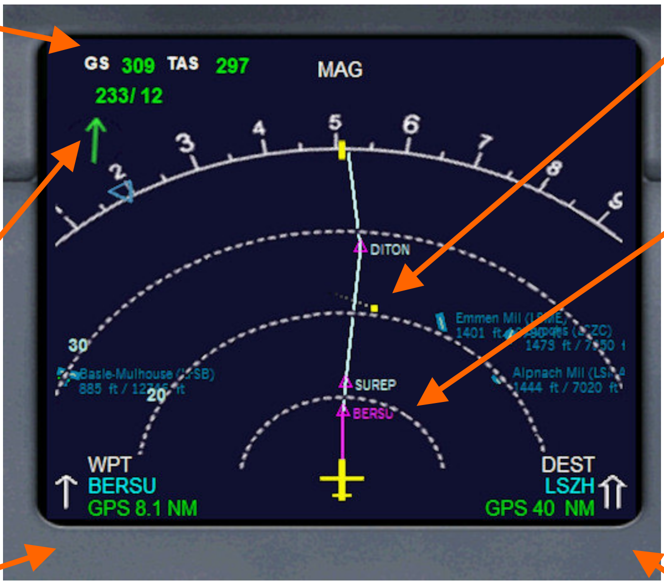
Wind direction & speed

In GPS mode, this is the next waypoint with its ID, and the remaining distance to be traveled to this waypoint. If you click here, you will **activate Flight Plan information page** (see page 16 of **the chapter 4.3** for more information).
If you are in NAV mode, this is the VOR 1 or ADF information will be displayed.

Ai aircraft representation with a scale of 40Nm and more.

Flight plan trace. magenta line is the active leg. Each flight plan waypoint is named on the route.

In GPS drive, this is the last waypoint, your airport destination (with ICAO ID), with the remaining distance. If you click on this area, you will display a **page about Airport destination informations** (Elevation, runways, frequencies…). see page 16 of the **chapter 4.3** for more information).
If you are in NAV mode, this is the VOR 2 or ADF information will be


GS 309 TAS 297
MAG
233/ 12
2
3
4
5
6
7
8
9
30
20
DITON
SUREP
BERSU
Emmen Mil (LSME)
1401 ft
1473 ft / 7150 ft
Basle-Mulhouse (LFSB)
885 ft / 12
Alpnach Mil (LSMA)
1444 ft / 7020 ft
WPT
BERSU
GPS 8.1 NM
DEST
LSZH
GPS 40 NM

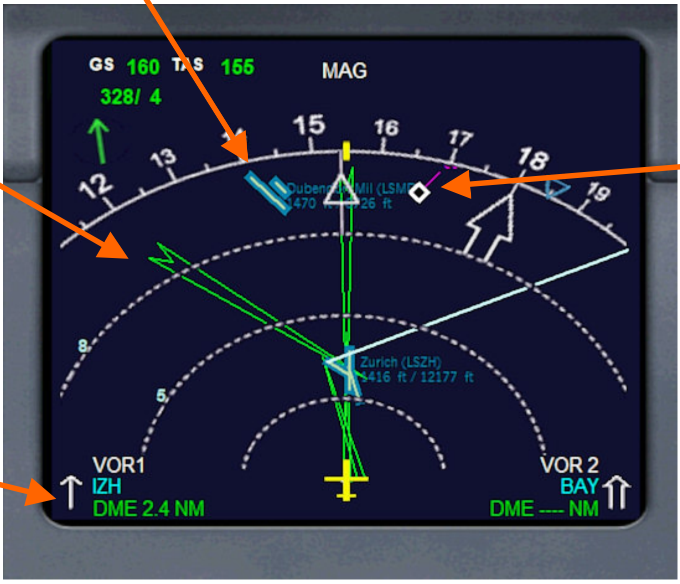
Picture 4 ND in ARC mode - 40 Nm scale

Airport (Name and ICAO code, elevation, and runways

Runways ILS Flags.

ILS Ident, here is a DME (with distance remaining).

Ai aircraft symbol (TCAS) for the 10 & 20 Nm ND scale.
Show information about the aircraft and the flight (out of screen here).


GS 160 TAS 155
MAG
328/ 4
12
13
14
15
16
17
18
19
8
5
Dubendorf Mil (LSMD)
1470
26 ft
Zurich (LSZH)
1416 ft / 12177 ft
VOR1
IZH
DME 2.4 NM
VOR 2
BAY
DME ---- NM

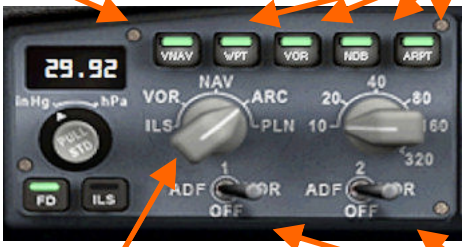
Picture 5 - ND in ARC mode in 10 Nm scale

You can adjust the density of displayed informations on the ND with ARP, NDB, VOR et WPT, switches and according the scale .

The ND differents modes can be set with the 2 selectors and the 4 right switches.

VNAV button is no realistic. In reality, its name is CSTR, but the true function isn't managed by this aircraft. So, I have used this button for my Vnav Gauge (and I renamed it (go to **chapter 5.3**, page 38 for more information about VNAV function).

- ARPT = For display airport
- NDB = For display NDB
- VOR = For display VOR
- WPT = For display waypoints



Scale map ND display selector.

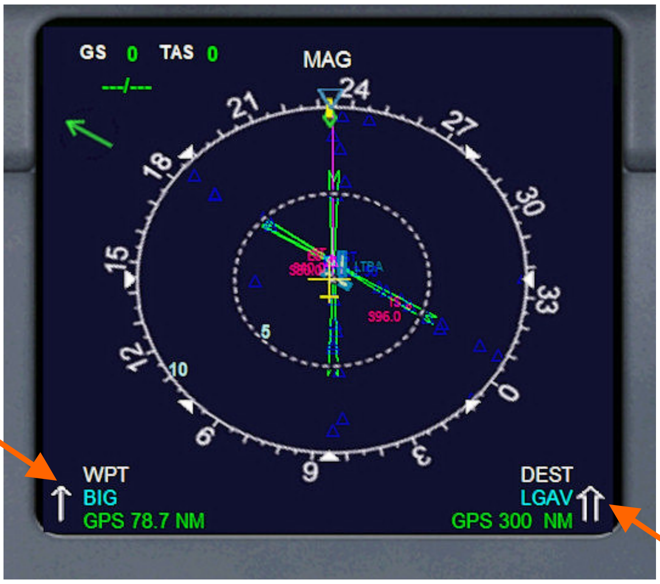
Picture 6 – Scale map ND display selector

ND display selector. **Note :** This aircraft use the Virtual cokpit file of the Airbus A321 of FSX. In this version, I have edited and modified this file (*Airbus_A321_interior.mdl*) which is located in the models folders (IAE and CFM) and I have activated the 5th position of this selector (PLN position) which not in used by default aircraft. Now, with this position, you can display a radar map, with terrain and also airbone traffic in real time. **See page 17** for more information.

The 2 selectors for the radio NAV1 & NAV2, to follow a VOR or a ADF. The ident is displayed in the bottom left & right of the ND.

The information does not appear in the same way according to the scale chosen, for an obvious problem of space and readability. For example, ILS flags tracks are represented by green cones, scale 10 or 20 Nm and a dotted green line beyond. Preferably, Display only the information you need at this time.

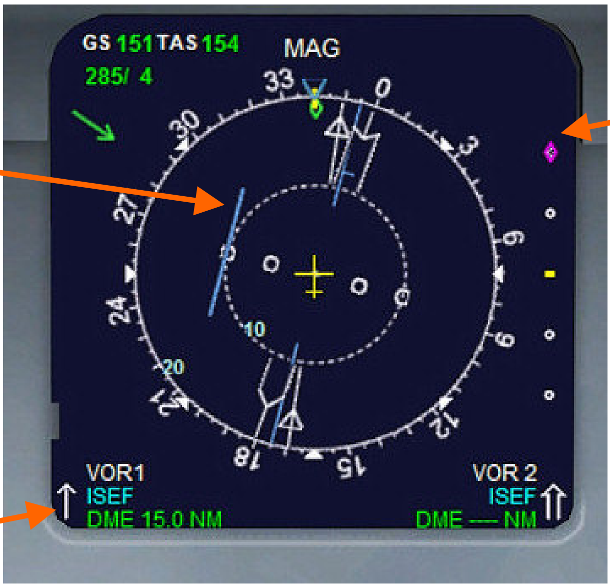
ND in NAV mode, at airport derparture, with ILS flags.



In GPS mode, this is the next waypoint with its ID, and the remaining distance to be traveled to this waypoint. If you click here, you will **activate Flight Plan information page** (see page 16 of the **chapter 4.3** for more information).

In GPS drive, this is the last waypoint, your airport destination (with ICAO ID), with the remaining distance. If you click on this area, you will display a **page about Airport destination informations** (Elevation, runways, frequencies…). see page 16 of the **chapter 4.3** for more information).

Picture 7 – ND in NAV mode


GS 151 TAS 154
285/ 4
MAG
33
0
3
6
9
12
15
18
21
24
27
30
10
20
VOR1
ISEF
DME 15.0 NM
VOR 2
ISEF
DME --- NM

Axis of the Runway , with respect to the position of the aircraft.
You must adjust the Course (CRS button) on the AP panel.

« Slope », indicator for vertical approach when ILS landing.

ILS identifier with distance if it is a DME

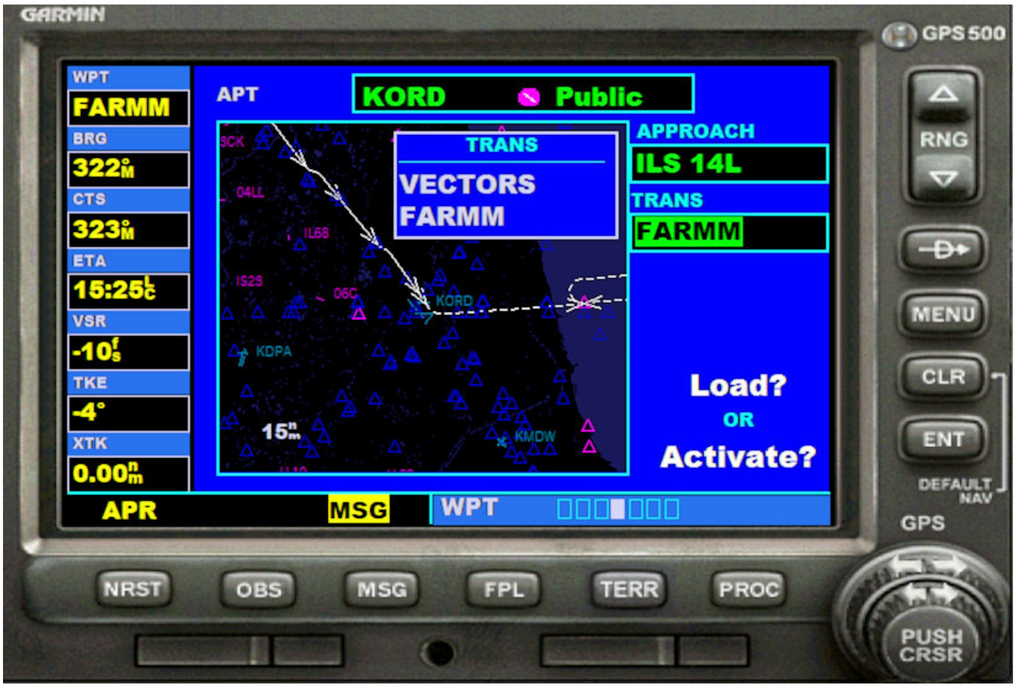
Picture 8 – ND in ILS mode

You can view now on the ND, all the information together (airports, beacons, waypoints etc ...).

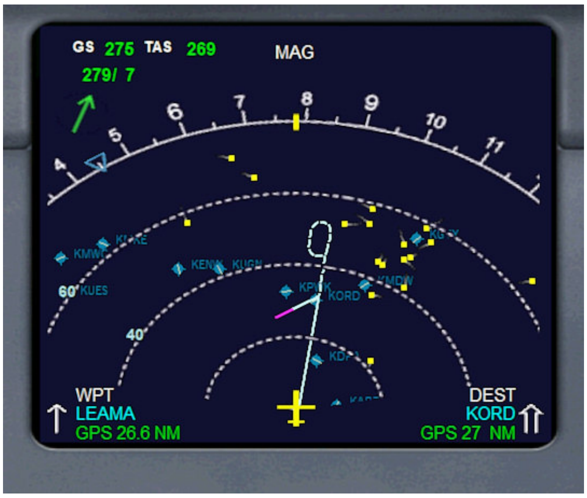
****

The display in the lower right and left of the NA informs the navigation mode. There is mention GPS, when the autopilot is managed by the GPS or there is the entry VOR1 or VOR2 or ADF when the autopilot is drived by radio NAV1 and/or NAV2.

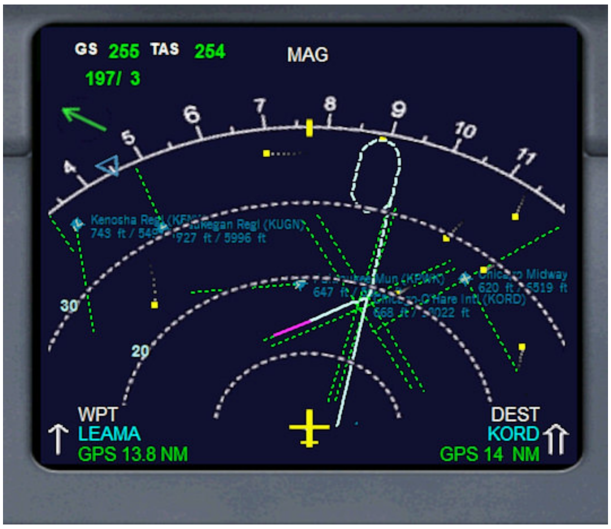
If you use the GPS approach procedures (refer to the FSX documentation included about GPS to know the use of these procedures), the plot of these procedures will be displayed on the ND..


GARMIN
GPS 500
WPT
FARMM
BRG
322°M
CTS
323°M
ETA
15:25LCL
VSR
-10fs
TKE
-4°
XTK
0.00nm
APR
MSG
WPT
APT
KORD
Public
TRANS
VECTORS
FARMM
APPROACH
ILS 14L
TRANS
FARMM
KORD
KDPA
KMDW
15nm
Load?
OR
Activate?
RNG
MENU
CLR
ENT
DEFAULT NAV
GPS
NRST
OBS
MSG
FPL
TERR
PROC
PUSH CRSR

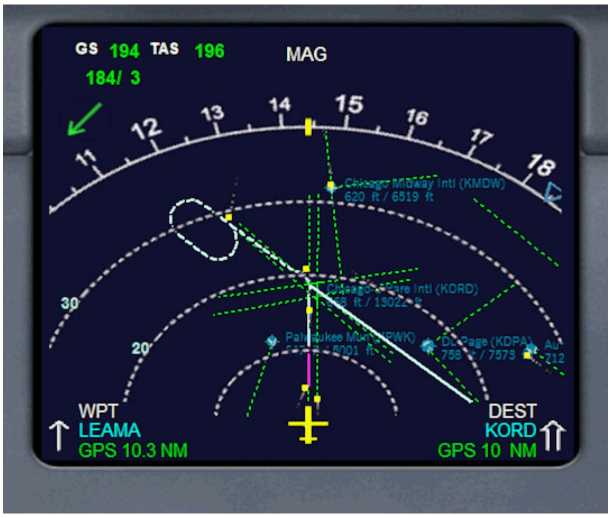
Picture 10 – Approach runway 14L of KORD activated


GS 275 TAS 269
279/ 7
MAG
WPT
LEAMA
GPS 26.6 NM
DEST
KORD
GPS 27 NM

Picture 11 – GPS Approach runway 14L activated ….


GS 255 TAS 254
197/ 3
MAG
WPT
LEAMA
GPS 13.8 NM
DEST
KORD
GPS 14 NM

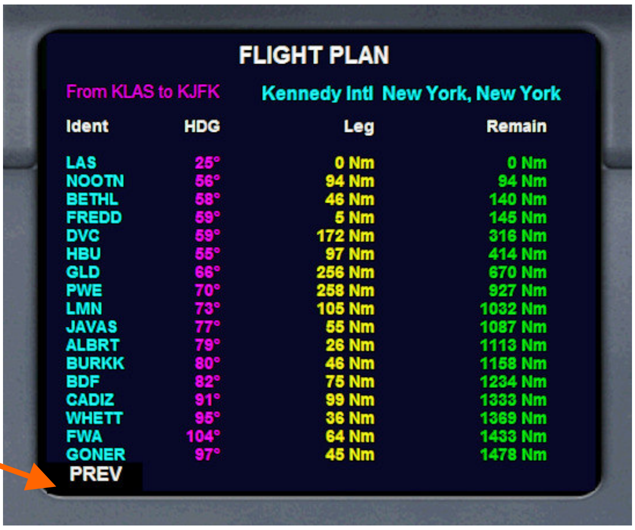
Picture 12 –…


GS 194 TAS 196
184/ 3
MAG
WPT
LEAMA
GPS 10.3 NM
DEST
KORD
GPS 10 NM

Picture 13 – runway 14L final approach

We will now talk about two display mode of the ND that do not exist on a real Airbus, but I have implemented in order to access usefull informations during a flight, without using the FSX GPS whose operations are inconvenient.

If you click on the bottom left area of the ND display, on the next waypoint area (page 12, picture 4), an information page about the flight plan will be displayed on the ND.



FLIGHT PLAN

From KLAS to KJFK   Kennedy Intl New York, New York

Ident	HDG	Leg	Remain
LAS	25°	0 Nm	0 Nm
NOOTN	56°	94 Nm	94 Nm
BETHL	58°	46 Nm	140 Nm
FREDD	59°	5 Nm	145 Nm
DVC	59°	172 Nm	316 Nm
HBU	55°	97 Nm	414 Nm
GLD	66°	256 Nm	670 Nm
PWE	70°	258 Nm	927 Nm
LMN	73°	105 Nm	1032 Nm
JAVAS	77°	55 Nm	1087 Nm
ALBRT	79°	26 Nm	1113 Nm
BURKK	80°	46 Nm	1158 Nm
BDF	82°	75 Nm	1234 Nm
CADIZ	91°	99 Nm	1333 Nm
WHETT	95°	36 Nm	1369 Nm
FWA	104°	64 Nm	1433 Nm
GONER	97°	45 Nm	1478 Nm

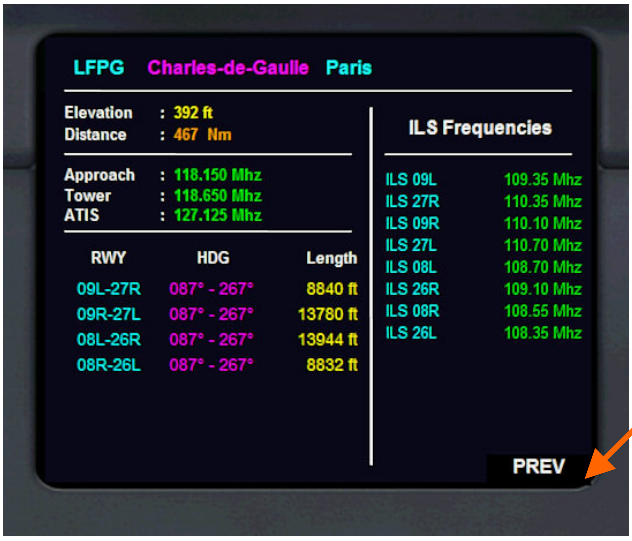
Click on « PREV » to comeback to previous page.

Picture 14 – Active flight plan view on the ND

It will then display the ICAO code for your departure and arrival airports, the name of the destination airport and the list of waypoints in your flight plan. If your flight plan waypoints behave over 17, they will not be displayed all at first. But as far as to flight as soon as a branch of the flight plan is completed, the corresponding line disappears and all lines are shifted upward; Thus, all the legs will emerge during the flight until final destination.
You can view this Flight Plan Page at any time of your flight, because it is updated continuously.
To return to previous page, click “PREV” on bottom left.

Once you reach the current waypoint (LEG and Remain = 0), the line disappears and the whole list back one step until the final destination as it is updated constantly. You can access this page at any time of your flight, and in any display mode of the ND. By clicking "PREV" in the bottom left will return to the previous display of ND.

By clicking on the display area of destination of ND (see bottom right picture 4, page 12), you access the information page of the destination airport and thus obtain essential informations about your destination airport as its elevation, its ramaining distance, radio frequencies, runways and their lenghts, ILS frequencies ....



LFPG   Charles-de-Gaulle   Paris

Elevation : 392 ft
Distance : 467 Nm

Approach : 118.150 Mhz
Tower : 118.650 Mhz
ATIS : 127.125 Mhz

RWY	HDG	Length
09L-27R	087° - 267°	8840 ft
09R-27L	087° - 267°	13780 ft
08L-26R	087° - 267°	13944 ft
08R-26L	087° - 267°	8832 ft

ILS Frequencies

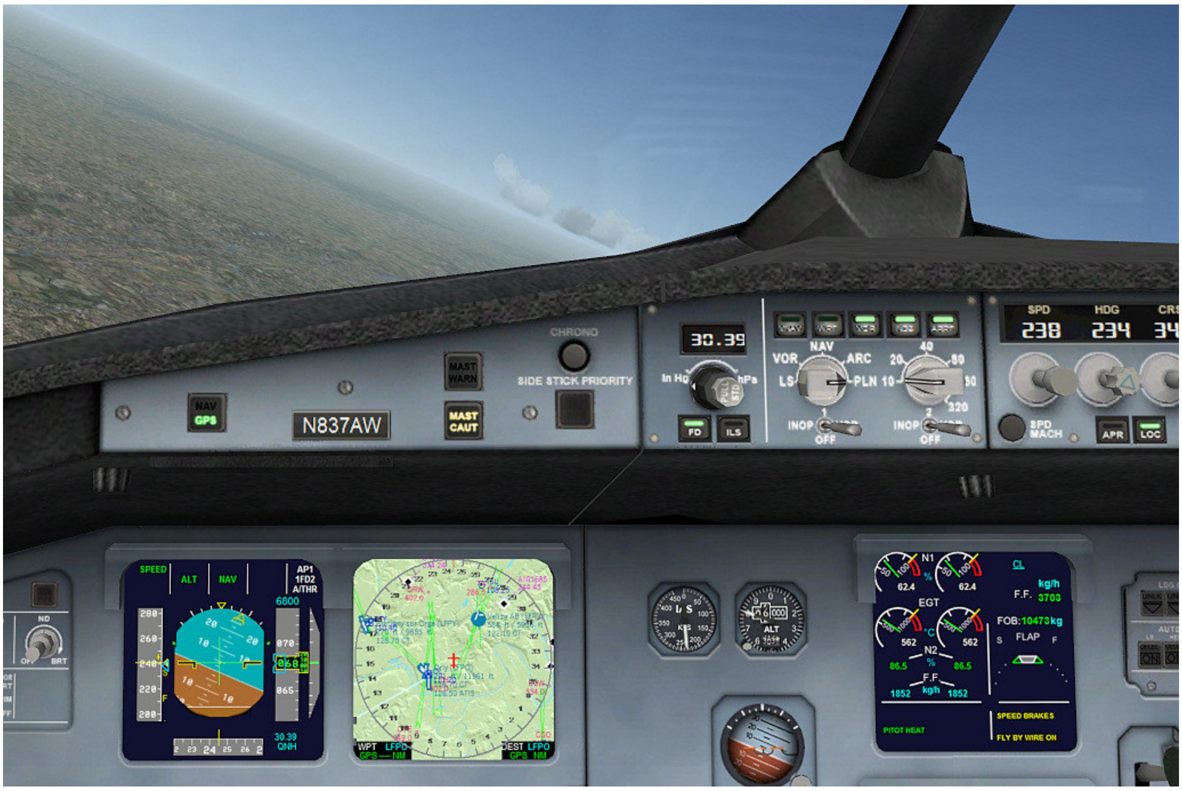
ILS 09L	109.35 Mhz
ILS 27R	110.35 Mhz
ILS 09R	110.10 Mhz
ILS 27L	110.70 Mhz
ILS 08L	108.70 Mhz
ILS 26R	109.10 Mhz
ILS 08R	108.55 Mhz
ILS 26L	108.35 Mhz

Click here to comeback to the previous ND page.

Picture 15 – ND Destination airport Information page

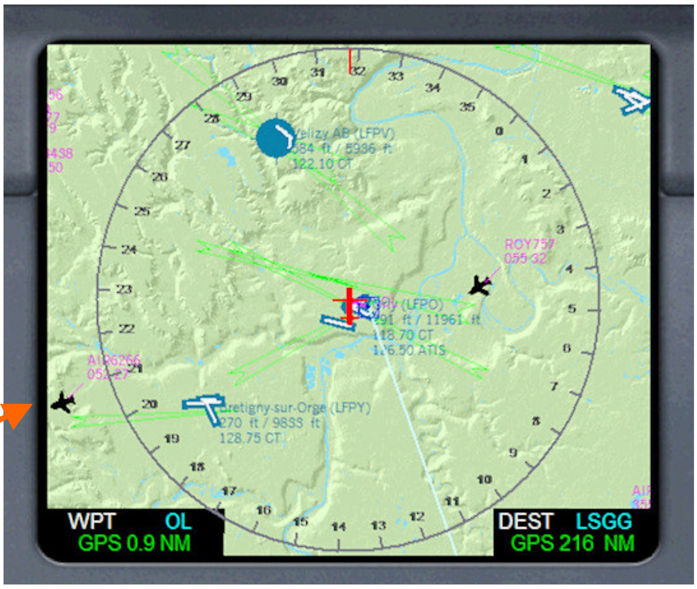
By clicking on the bottom right area, you comeback to the ND previous page.

You can now display the radar map on ND, with the ND selector knob on **PLN** position, and select the information to display with the ARPT,VOR,NDB,WPT switches.
For this, I modified the file “interior.mdl”, to run the fifth position selector.


N837AW
NAV GPS
MAST WARN
MAST CAUT
CHRONO
SIDE STICK PRIORITY
30.39
VOR
NAV
ARC
PLN
FD
ILS
SPD
HDG
238
234
APR
LOC
WPT LFPO
DEST LFPO

Picture 16 – ND Radar map terrain with the PLN position

You can select the scale with the selector knob. Detail of each information showed depend of the scale.
You can see AI traffic in real time, but the map is refreshed only when your aircraft moves.


Velizy AB (LFPV)
584 ft / 5936 ft
122.10 CT
ROY757
055 32
AI96266
052 27
Bretigny-sur-Orge (LFPY)
270 ft / 9833 ft
128.75 CT
WPT OL
GPS 0.9 NM
DEST LSGG
GPS 216 NM

Ai Aircraft with airlines name & flight number, alternate with destination and aircraft model. When scale is larger than 20 miles, only TCAS symbol of the aircraft appears.

Picture 17 – Radar terrain in Popup window

Caution : The radar map may be a « FPS killer », according to the level of detail that you have choosen, the density of your scenery and the density of AI traffic

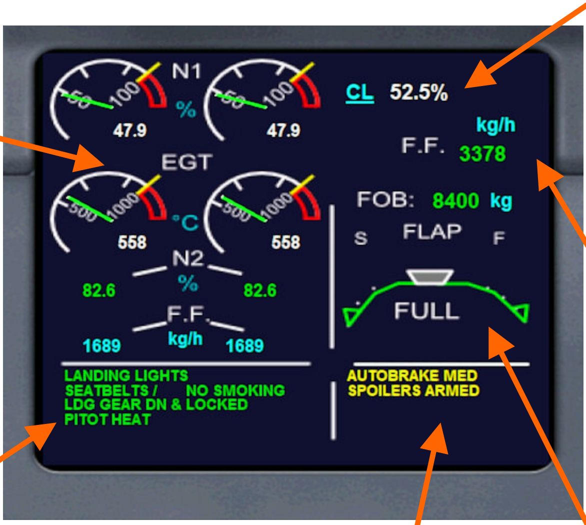
4.4 Primary upper ECAM

Primary ECAM shows engines datas, flaps configuration, fuel flows, and informations or warnings messages.

Engines Parameters :
N1 : Low Pressure compressor stage rotation
N2 : High Pressure compressor stage rotation
EGT : Turbines exhaust temperature
F.F : Fuel Flow

Throttle levers position:
-**IDLE** :
-**CL** : Middle thrust (climb and cruise)
-**FLX** : High thrust (climb and TO)
-**TOGA** : Full thrust

Percent value is the real throttle levers position.


N1
%
50
100
47.9
47.9
EGT
°C
500
1000
558
558
N2
%
82.6
82.6
F.F.
kg/h
1689
1689
CL
52.5%
kg/h
F.F.
3378
FOB:
8400
kg
S
FLAP
F
FULL

LANDING LIGHTS
SEATBELTS / NO SMOKING
LDG GEAR DN & LOCKED
PITOT HEAT

AUTOBRAKE MED
SPOILERS ARMED

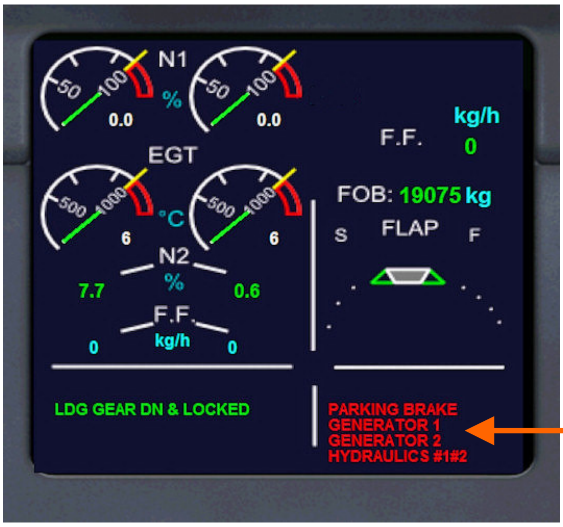
Total Fuel Flow Total : can be display in Lbs or kg by mouse click on this area.
FOB = Fuel On Board

Information message area.

Picture 18 – Primary upper ECAM

True position for slats and flaps

Area for caution messages (yellow) for spoilers, autobrake… and warnings messages (red) engines or system failure.


N1
%
50
100
0.0
0.0
EGT
°C
500
1000
6
6
N2
%
7.7
0.6
F.F.
kg/h
0
0
kg/h
F.F.
0
FOB:
19075
kg
S
FLAP
F

LDG GEAR DN & LOCKED

PARKING BRAKE
GENERATOR 1
GENERATOR 2
HYDRAULICS #1#2

Warning message before start engines.

Picture 19 – Primary upper ECAM when avionics is powered

Flaps and slats display is the real position on this Airbus

- 5 Flaps configuration :

	Position	**Use to…**
0		
1	= (Slats 18°)	Approach
1+F	= (Slats 18° + flaps 10°)	Approach and Take Off
2	= (Slats 22° + flaps 15°)	Approach and short or heavy Take Off
3	= (Slats 22° + flaps 20°)	Approach and short or heavy Take Off
F (full)	= (Slats 27° + flaps 35/40°)	Landing

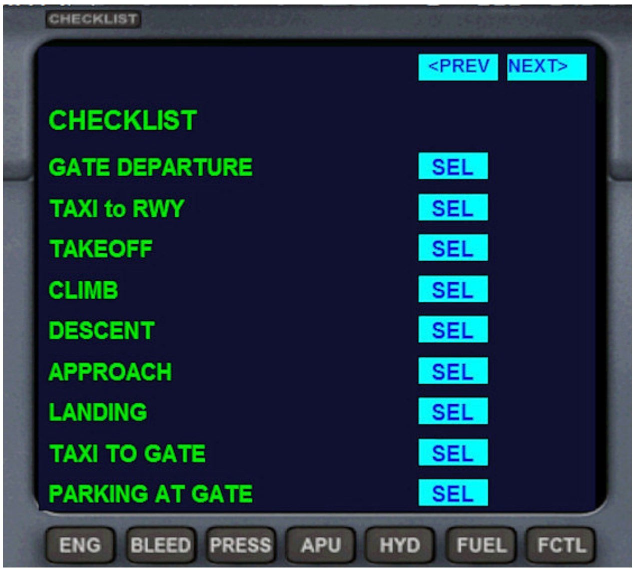
See chapter 5.5 about Airbus flaps & slats automatic management (SFCC)

4.5 Secondary lower ECAM

Secondary ECAM has multiple pages, to display the state of all the aircraft systems (hydraulics, pressurisation, fuel tanks levels, APU power, flight controls).

- ENG : Engines monitoring (Oil pressure, oil quantity, etc ….)
- BLEED : Bleed circuit is the air circuit that is under pressure, taken at the engines or APU and used for engines start, pressurization , de-ice wings and cabin temperature regulation.(see **chapter 4.7**)
- PRESS : This is the page for cabin pressurization. Only for information on this aircraft, because you have no possible action on this function.
- APU : Information page about APU
- HYD : Information page about hydraulics circuits, pumps and valves (engines and backup electric)
- FUEL : Information about fuel circuit (Tanks capacities, tank(s) in function or isolate, fuel engines pumps and valves status).
- FCTL : Information all flight controls (ailerons , elevators, spoilers, rudder ….)
- And to finish this presentation, Stefan Liebe has created a interactive Checklist function for each step of a flight. To access to this Checklist, you must clik on the secondary ECAM to display it as a popup window, and you will see in the upper left corner, a button calls « Checklist » : Click on it.

4.5.1 Stefan Liebe's Checklist Page :. The first page that appears gives all the checklist page for each flight step. Either you select a phase directly by clicking the SEL button or you can do in order with PREV and NEXT buttons.



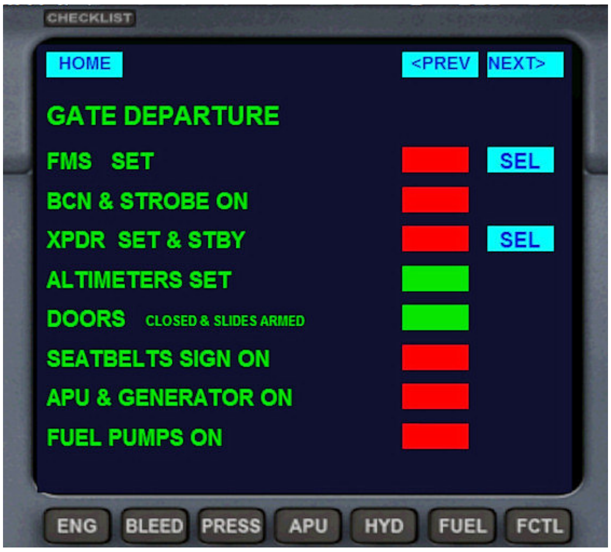
CHECKLIST

GATE DEPARTURE
TAXI to RWY
TAKEOFF
CLIMB
DESCENT
APPROACH
LANDING
TAXI TO GATE
PARKING AT GATE

Picture 20 – secondary ECAM Checklist main menu Page

Here is the *GATE DEPARTURE* page for example. Lines that contain the "SEL" button is a system not managed by the aircraft, so pressing the button will turn on the green light.

.



GATE DEPARTURE

FMS SET	🟥	SEL
BCN & STROBE ON	🟥	
XPDR SET & STBY	🟥	SEL
ALTIMETERS SET	🟩	
DOORS CLOSED & SLIDES ARMED	🟩	
SEATBELTS SIGN ON	🟥	
APU & GENERATOR ON	🟥	
FUEL PUMPS ON	🟥	

Picture 21 – Secondary ECAM - Gate Departure page

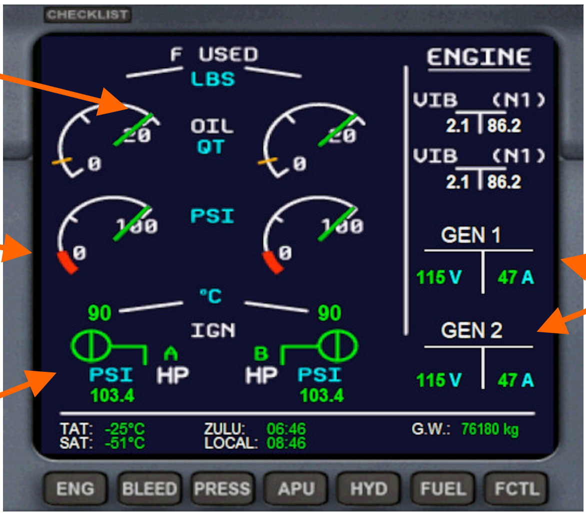
Click on PREV or NEXT to navigate page to page, or HOME to comeback to main menu.

4.5.2 ENG Page :

Engine oil quantity ; Monitoring leaks.

Engines lubrification oil pressure

Engines HP air pressure.


CHECKLIST
F USED
LBS
OIL
QT
20
0
PSI
100
0
°C
90
90
IGN
A
B
PSI
HP
HP
PSI
103.4
103.4
ENGINE
VIB (N1)
2.1 86.2
VIB (N1)
2.1 86.2
GEN 1
115 V
47 A
GEN 2
115 V
47 A
TAT: -25°C
SAT: -51°C
ZULU: 06:46
LOCAL: 08:46
G.W.: 76180 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

This area display the engines generators informations about voltage and amperage used.

Picture 22 – Secondary ECAM - Engines page

4.5.3 BLEED Page : BLEED circuit is the more important new feature of this version 3. I have created all the bleed circuit function and representation, the most realistic with A320. Bleed circuit is the air pressurized net which comes from APU and engines. It has several functions : It used to start engines, to the cabin pressurization cabine, to de-ice wings, and cabin temperature regulation.

The sheme is simple. Orange sheaths are isolate, without pressure ; Green sheaths are under pressure (from APU or engines).
The picture below show an example of the circuit ; You will find all the explanations about the Bleed circuit at chapter **5.1** « Engines startup procedure & Bleed circuit». Read it, please.

Triangle symbolizing wing and/or engine left deice.

Triangle symbolizing cabin pressurization .

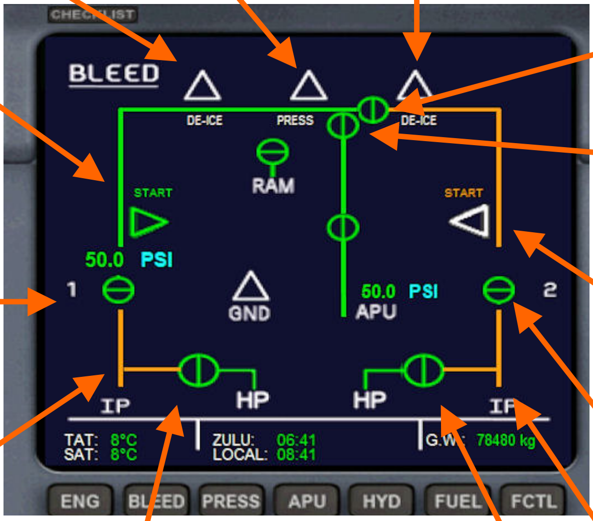
Triangle symbolizing wing and/or engine right deice..

Note : Triangles are green when the appropriate system is activated.

Triangle symbolizing the clearance state to start left engine:
- Green=Start is possible

Left engine Bleed valve. Here, it is closed.

IP sheaths, from left engine intermediate compressor stage.


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
50.0 PSI
1
GND
50.0 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:41
LOCAL: 08:41
G.W.: 78480 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

X-Bleed ; this is the valve which permit to comunicate between left and right circuit.(here is closed)

APU-Bleed ; open it when this is APU which give air pressurized (here, is open).

Triangle symbolizing the clearance state to start right engine:
- White=Start is not possible

Right engine bleed valve. Here, it is closed.

IP sheaths, from right engine intermediate compressor stage.

Picture 23 – Secondary ECAM BLEED page

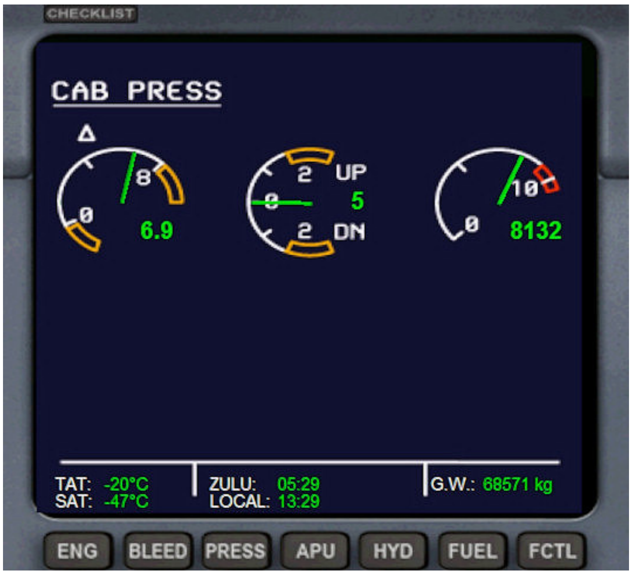
Nota :
bleed RAM is not simulated with this aircraft.
GND triangle is the ground APU
And is not simulated.

HP left and right Bleeds, opening circuits come from engines high pressure compressor stages.
these bleeds open automatically at 50% of N2 and close automatically at 54% of N2

All the controls of the bleed circuit is on the Overhead. See chapter 4.5

4.5.4 PRESS Page :

Pressurization page works only for informationYou have no controls for the cabin pressurization management.


CHECKLIST
CAB PRESS
Δ
8
0
6.9
2
UP
5
0
2
DN
10
0
8132
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

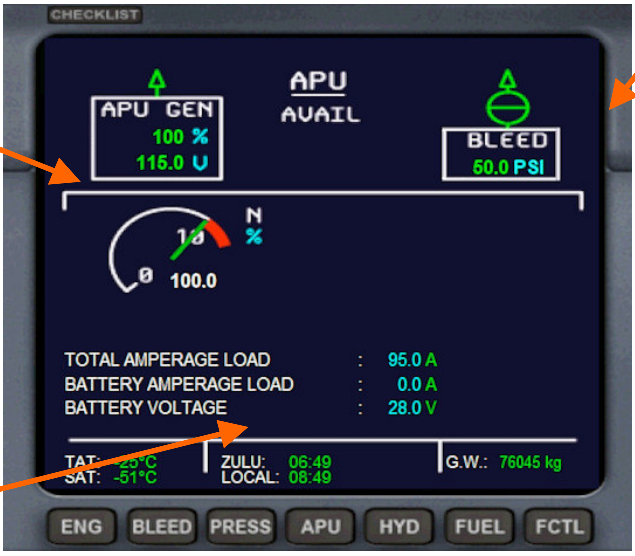
TAT: -20°C
SAT: -47°C
ZULU: 05:29
LOCAL: 13:29
G.W.: 68571 kg

Picture 24 – Secondary ECAM Pressurization page

You can see at the bottom of each page of the secondary Ecam some general informations :

- TAT is temp of aircraft body
- SAT is outdoor temp
- ZULU is GMT time
- LOCAL is local time
- G.W is the total weight of the aircraft at this moment. It can be displayed in kg or Lbs by clicking on the Fuel flow area of the primary ECAM (see picture 18, page 18)

4.5.5 APU Page :


CHECKLIST
APU GEN
100 %
115.0 V
APU
AVAIL
BLEED
50.0 PSI
N
%
10
0
100.0
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

TOTAL AMPERAGE LOAD : 95.0 A
BATTERY AMPERAGE LOAD : 0.0 A
BATTERY VOLTAGE : 28.0 V

TAT: -25°C
SAT: -51°C
ZULU: 06:49
LOCAL: 08:49
G.W.: 76045 kg

APU bleed air pressure, used for start left engine in the normal procedure, and for temperature regulation on ground.

APU run with its alternator in function.

Amperage load information. Here, « Battery Amperage load » is to 0 because this is the APU generator which gives electric power.
In flight, this is the engines generator which provides electric power.

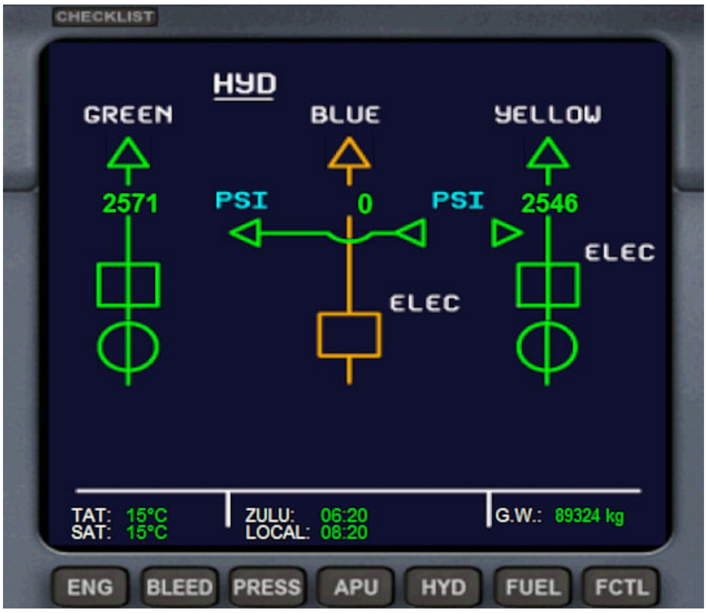
Picture 25 – APU page

4.5.6 HYD Page :

HYD page show the status of the 3 hydraulics circuits of the A320. :

- Green circuit, activated by left engine
- Blue circuit : this is a backup electric pump
- Yellow circuit, activated by right engine.

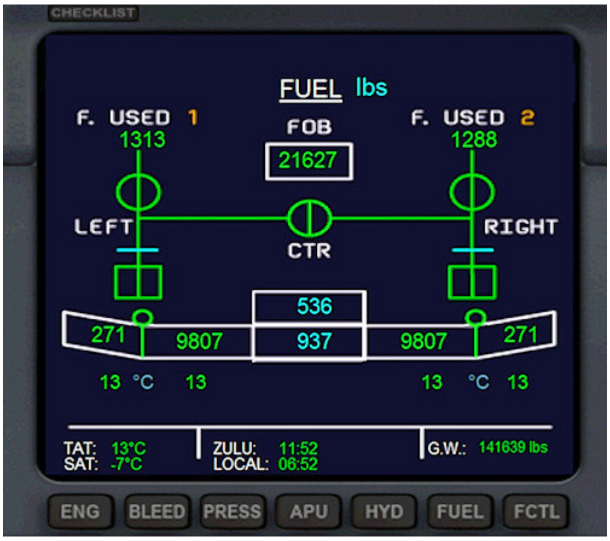
All the hydraulics controls are on the Overhead. Orange color show that there is no pressure in the circuit. If the 3 circuits are stopped, all the flights controls will do not work.


CHECKLIST
HYD
GREEN
BLUE
YELLOW
2571
PSI
0
PSI
2546
ELEC
ELEC
TAT: 15°C
SAT: 15°C
ZULU: 06:20
LOCAL: 08:20
G.W.: 89324 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 26 – Secondary ECAM - HYD page

4.5.7 FUEL Page :

- FUEL page display the aircraft fuel system (pumps, valves and tanks). Values can be displayed in Kg or Lbs, by clicking on the Fuel flow area of the primary ECAM (see picture 18, page 18)


CHECKLIST
FUEL lbs
F. USED 1
1313
FOB
21627
F. USED 2
1288
LEFT
CTR
RIGHT
536
271
9807
937
9807
271
13 °C 13
13 °C 13
TAT: 13°C
SAT: -7°C
ZULU: 11:52
LOCAL: 06:52
G.W.: 141639 lbs
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 27 – Secondary ECAM   FUEL page

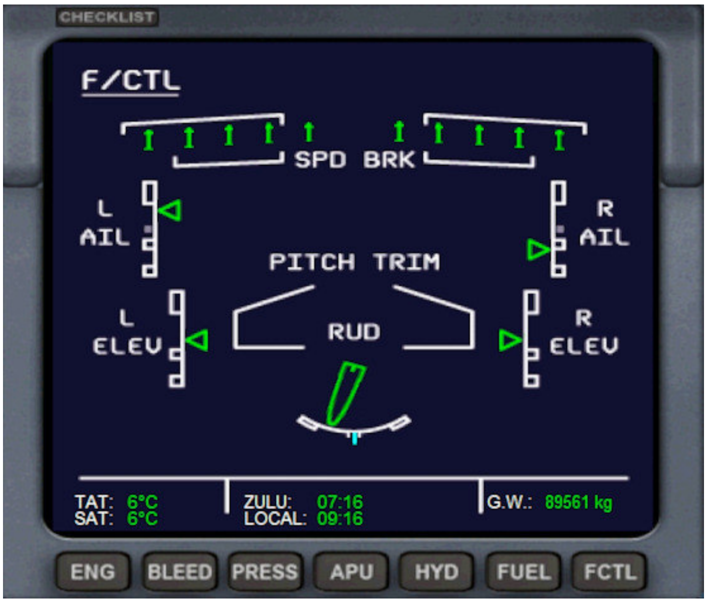
I have created for this aircraft a gauge which manage all the fuel system : See the **chapitre 4.7** for all informations about the fuel system.

If you have a fsx message which indicate that fuel level is low in the upper left of the screen, don't care to this message. My aircraft use a specific fuel gauge, and it a sound alarm and ecam message will show you if your fuel level is too low; See chapter 4.7.

4.5.8 FCTL Page:

the FCTL page monitor the flight controls of the aircraft :

- Spoilers (Speed brakes)
- Ailerons
- Elevons
- Rudder
- trim

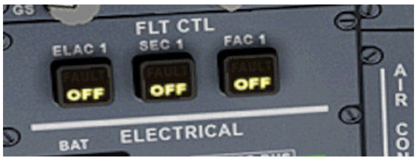

CHECKLIST
F/CTL
SPD BRK
L AIL
R AIL
PITCH TRIM
L ELEV
RUD
R ELEV
TAT: 6°C
SAT: 6°C
ZULU: 07:16
LOCAL: 09:16
G.W.: 89561 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 28 – Secondary ECAM - FCTL page

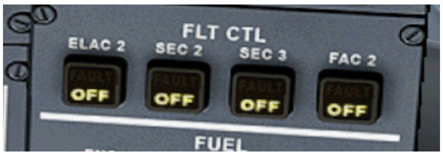
About flight controls, Airbus are specials : They are equipped with the famous Fly By Wire function. Fly By wire , is a flight control system, where several computers are placed between the pilot and the controls surfaces. This is a « drive assisted by computer ».

All the pilot's action are interpreted and controled by the computer with differents « LAWS » that garantee that the pilot's actions do not come out of the flight envelope.

Fly By Wire (FBW) controls are on each side of the overhead.


FLT CTL
ELAC 1
SEC 1
FAC 1
OFF
OFF
OFF
BAT
ELECTRICAL

Picture 29 – Left FBW controls


FLT CTL
ELAC 2
SEC 2
SEC 3
FAC 2
OFF
OFF
OFF
OFF
FUEL

Picture 30 – right FBW controls

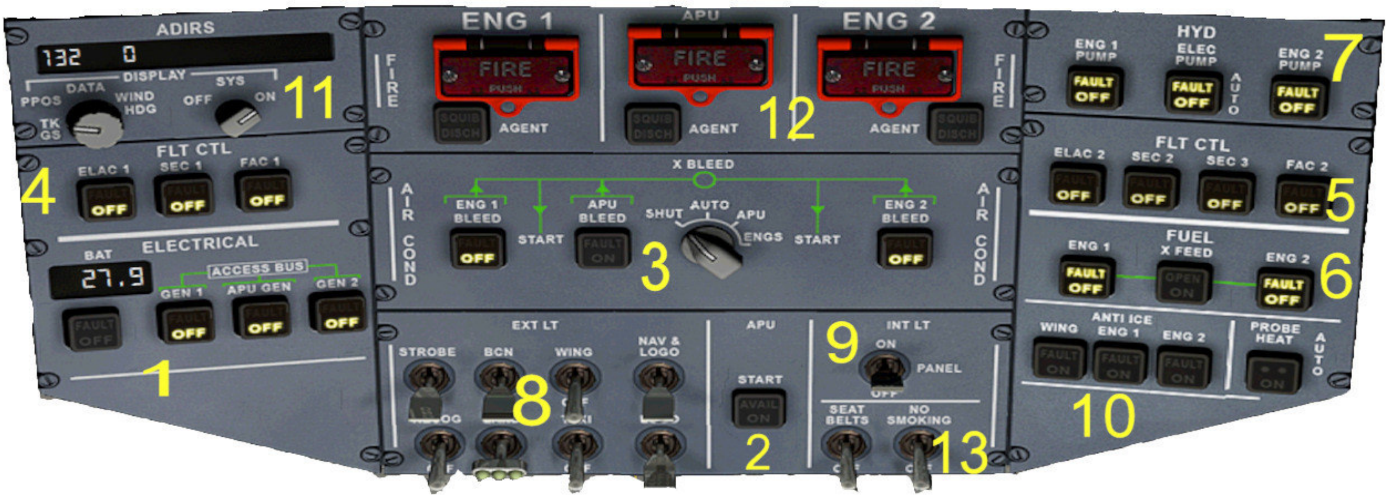
The Fly By Wire function is described with precision at the chapter 5.6.

4.6 Overhead

Overhead includes the main aircraft system controls. Here is the 2 view of the Overhead : In 2D cockpit and the virtual cockpit (VC) 3D view .

The 2 overhead representation are different, so I will go to show you the 2 views.

Here is the 2D panel view that you activate by key Shift+5 .


ADIRS
132 0
DATA
DISPLAY
SYS
PPOS
WIND
HDG
TK
GS
OFF
ON
11
ENG 1
APU
ENG 2
FIRE
PUSH
SQUIB
DISCH
AGENT
12
HYD
ENG 1
PUMP
ELEC
PUMP
ENG 2
PUMP
FAULT
OFF
AUTO
7
FLT CTL
ELAC 1
SEC 1
FAC 1
OFF
4
X BLEED
ENG 1
BLEED
APU
BLEED
SHUT
AUTO
APU
START
ENGS
ENG 2
BLEED
AIR COND
3
ELAC 2
SEC 2
SEC 3
FAC 2
5
BAT
ELECTRICAL
27.9
ACCESS BUS
GEN 1
APU GEN
GEN 2
1
FUEL
X FEED
OPEN
ON
6
EXT LT
STROBE
BCN
WING
NAV &
LOGO
8
APU
START
AVAIL
ON
2
9
INT LT
ON
PANEL
OFF
SEAT
BELTS
NO
SMOKING
13
ANTI ICE
WING
ENG 1
ENG 2
PROBE
HEAT
10

Picture 31 – Overhead 2D

1 Electrical area : you have the main battery switch and the 3 generators switches (engine left, APU, engine right).

2 APU ON/OFF switch

3 BLEED control panel, with engines left and right bleed switches, APU Bleed, X-Bleed selector(select the source of the pressurized air).

4 Set of 3 Switches for the Fly By Wire main level computer

5 Set of 4 Switches for the Fly By Wire secondary level computer.

6 Engines fuel pumps switches, and « Crossfeed » switch, that permit to connect the left and the right fuel circuit

7 Engines hydraulic pumps switches, and electric backup pump switch.

8 Set of the navigation lighting switches ; Note : The « Recog » switch is used for the VC day lighting and works only in this 2D panel, not in the VC.

9 Night panel and cockpit lighting switch

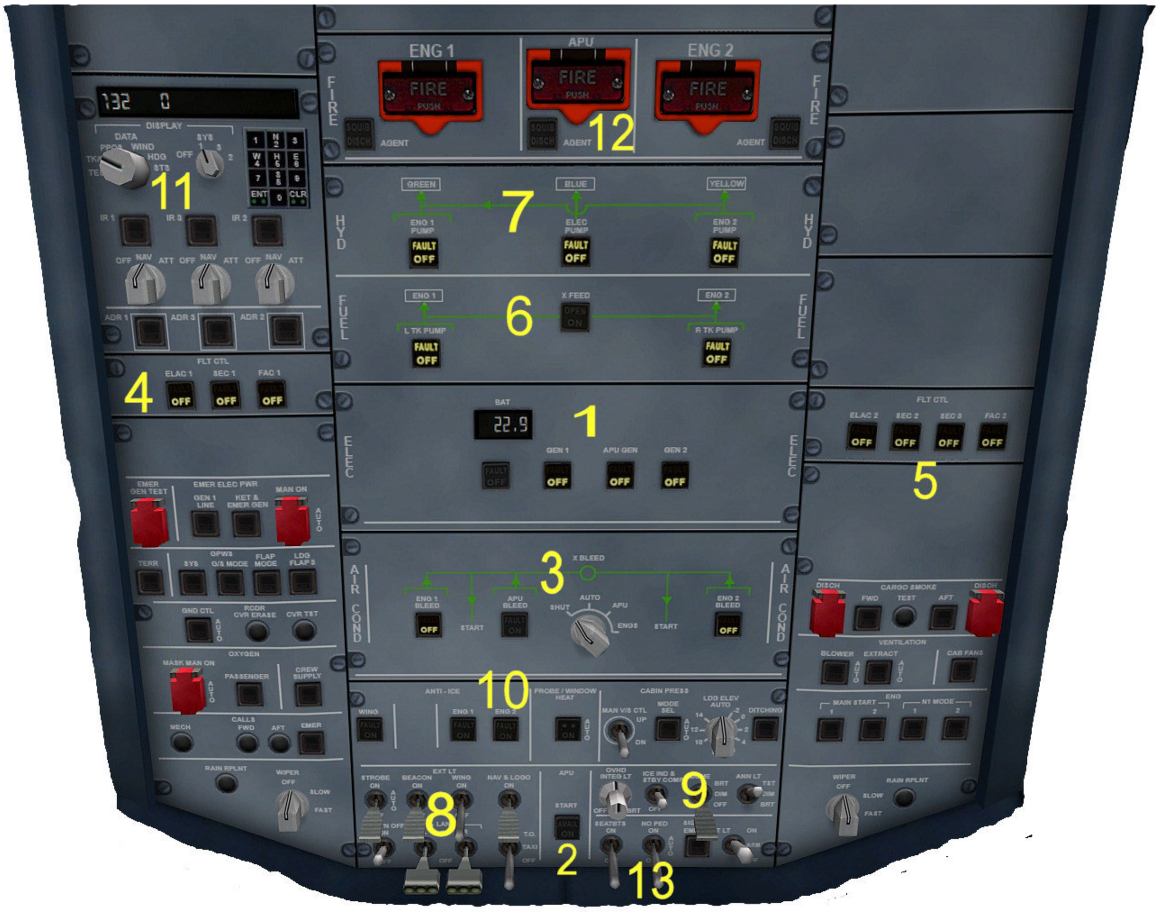
10 Set of De-ice switches, for engines, wings and pitot probes.

11 Inertial navigation system.

12 Fire luminous warning and extinguishers switches for engines and APU.

13 « Fasten your seatbelt » and « No smoking » switches.

And now, the 3D VC view of the Overhead :


ENG 1
APU
ENG 2
FIRE
PUSH
AGENT
12
11
DISPLAY
DATA
SYS
IR 1
IR 3
IR 2
ADR 1
ADR 3
ADR 2
HYD
GREEN
BLUE
YELLOW
7
ENG 1 PUMP
ELEC PUMP
ENG 2 PUMP
FAULT
OFF
FUEL
6
X FEED
L TK PUMP
R TK PUMP
FLT CTL
ELAC 1
SEC 1
FAC 1
4
ELAC 2
SEC 2
SEC 3
FAC 2
5
ELEC
BAT
22.9
1
GEN 1
APU GEN
GEN 2
AIR COND
3
X BLEED
ENG 1 BLEED
APU BLEED
ENG 2 BLEED
SHUT
AUTO
OPEN
10
ANTI - ICE
PROBE / WINDOW HEAT
CABIN PRESS
CARGO SMOKE
VENTILATION
OXYGEN
8
9
2
13
START
WIPER
RAIN RPLNT

Picture 32 – Overhead VC view

1 Electrical area : you have the main battery switch and the 3 generators switches (engine left, APU, engine right).

2 APU ON/OFF switch

3 BLEED control panel, with engines left and right bleed switches, APU Bleed, X-Bleed selector(select the source of the pressurized air). **Please note that in the VC, the X-BLEED rotative selector must be set with the wheel mouse only**

4 Set of 3 Switches for the Fly By Wire main level computer

5 Set of 4 Switches for the Fly By Wire secondary level computer.

6 Engines fuel pumps switches, and « Crossfeed » switch, that permit to connect the left and the right fuel circuit

7 Engines hydraulic pumps switches, and electric backup pump switch.

8 Set of the navigation lighting switches.

9 Night panel and cockpit lighting switch

10 Set of De-ice switches, for engines, wings and pitot tubes.

11 Inertial navigation system.

12 Fire luminous warning and extinguishers switches for engines and APU.

13 « Fasten your seatbelt » and « No smoking » switches.

4.7 Fuel management

4.7.1 General case

The default FSX aircraft have a fuel tank management to reverse the reality, and that was the case of this Project Airbus. Indeed, in FSX, motors feed in first on the wing tanks and after, on the central tanks, whereas in reality, the opposite is true. I have decided to create a gauge for manage the fuel like the reality.

This version of the Airbus A320 has 6 tanks (A320 can get 5 to 7 seven tanks) :

- 2 central tanks (with reserve capacity)
- 2 tanks in each wing (1 main and 1 auxiliary).

« **CROSSFEED** »valve to connect left and right together
Here is normal situation :
- closed

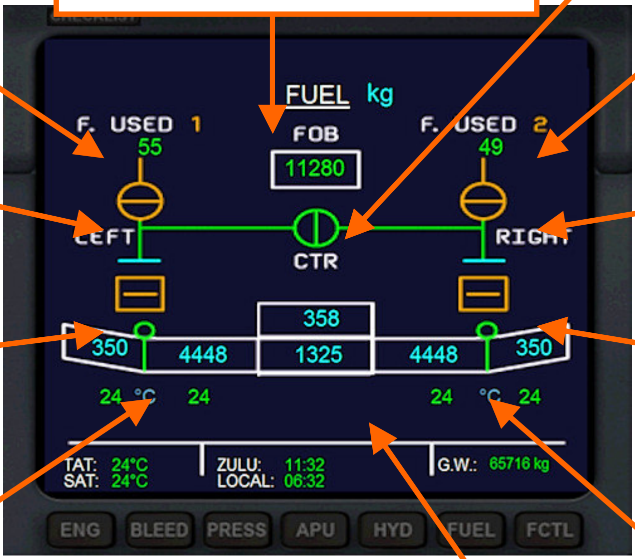
Total fuel remaining. This value can be displayed in kg or Lbs.(see picture 18, page 18).

Fuel quantity used by left engine since it has started.

Fuel quantity used by right engine since it has started.

Left engine fuel valve :
Orange = Closed
Green = open

Right engine fuel valve :
Orange = Closed
Green = open



Left fuel pump :
Orange = stopped
Green = run

Right fuel pump :
Orange = stopped
Green = run

Right wing tanks (right main and right auxiliary) :
Cyan = isolate
Green = in use

Right wing tanks (right main and right auxiliary) :
Cyan = isolate
Green = in use

Picture 33 – ECAM Fuel page

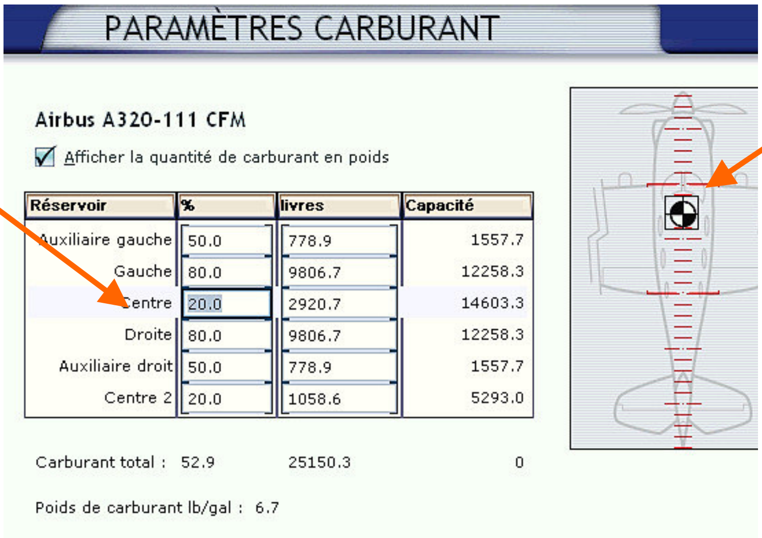
Center tanks (center 1 and center 2) :
Cyan = isolate
Green = in use

Cyan capacities numbers indicate that the tanks are isolates ; If a tank is in use, its capacity number is green ; Adjust your fuel capacity according your flight, because if you take too much fuel, you may exceed the maximum allowing landing weight (MLW) at destination. In first, reduce the amount of fuel of the center tank but try to keep 15-20% at least, because it will garantee a fuel reserve.

Center tank is isolate before there is empty. It keep 200 gallons. If at the end of yout flight, you need fuel, you can toggle to this reserve. (see following pages)

.

When you adjust your fuel capacity, **empty center tanks in first**, but keep, if it is possible 15-20% of capacity for these center tanks.
Center tanks have a reserve.
When you fly, engine feed toggle to wings tanks before the center tank is totally empty.
The total reserve of the 2 center tanks is 230 gallons.



PARAMÈTRES CARBURANT

Airbus A320-111 CFM

☑ Afficher la quantité de carburant en poids

Réservoir	%	livres	Capacité
Auxiliaire gauche	50.0	778.9	1557.7
Gauche	80.0	9806.7	12258.3
Centre	20.0	2920.7	14603.3
Droite	80.0	9806.7	12258.3
Auxiliaire droit	50.0	778.9	1557.7
Centre 2	20.0	1058.6	5293.0

Carburant total : 52.9 25150.3 0

Poids de carburant lb/gal : 6.7

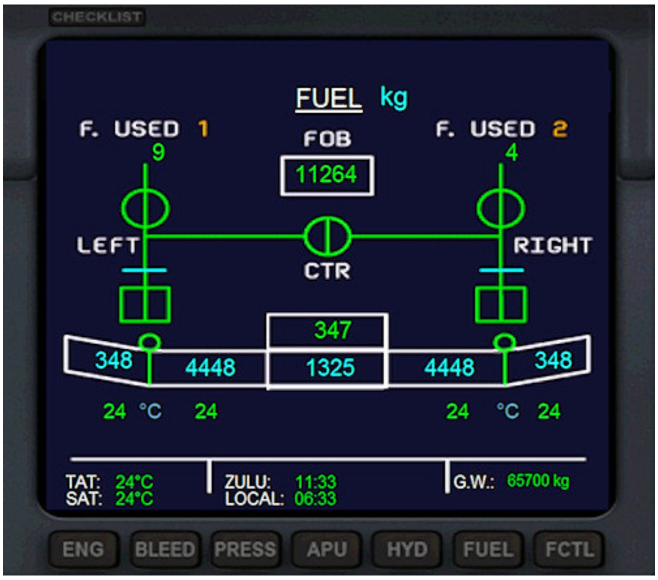
Be careful with the gravity center.try to keep it at the same place when you adjust fuel and load.

Picture 34 – FSX fuel selection menu

In first, fuel is pumped from center tanks in this sequence :

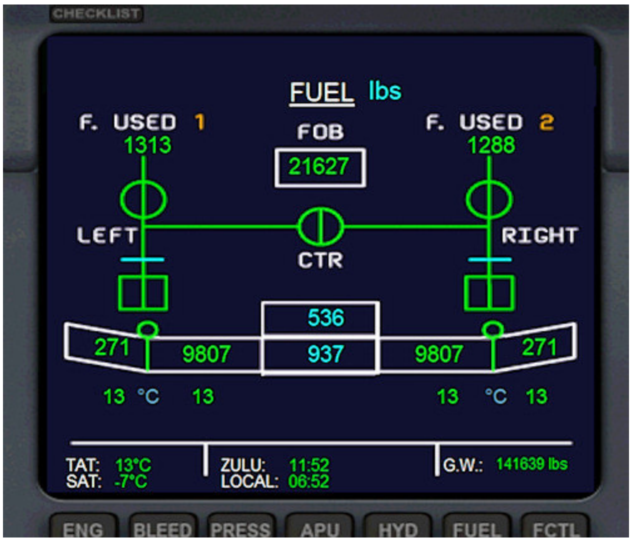
- Center tank 2 (until a reserve level of 80 gallons)
- Center tank 1 (until a reserve level of 150 gallons)
- At this moment, fuel selector toggle to wings tanks and each engine is feed by its wing
- Left wing tanks to left engine
- Right wing tanks to right engine.

The tank selection is automatically when the reserve level is reached.
On the picture below, aircraft has just takeoff and the Center tank 2 is in used in first until has been reach its reserve level and it will be isolated (cyan color) . engines feed on the center tanks until its reserve level will be reached.


CHECKLIST
FUEL kg
F. USED 1
9
FOB
11264
F. USED 2
4
LEFT
CTR
RIGHT
347
348
4448
1325
4448
348
24 °C 24
24 °C 24
TAT: 24°C
SAT: 24°C
ZULU: 11:33
LOCAL: 06:33
G.W.: 65700 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 35 – Center tank in use (capacities displayed in Kg)

When center tanks reach its reserve level, the tanks selectors toggle automatically to wings tanks

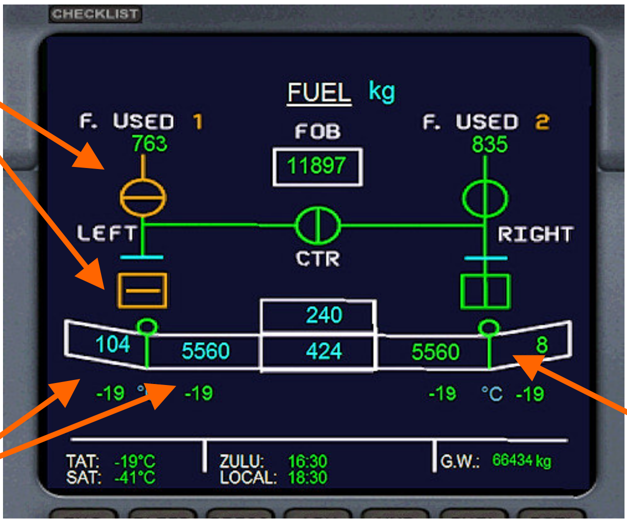

CHECKLIST
FUEL lbs
F. USED 1
1313
FOB
21627
F. USED 2
1288
LEFT
CTR
RIGHT
536
271
9807
937
9807
271
13 °C 13
13 °C 13
TAT: 13°C
SAT: -7°C
ZULU: 11:52
LOCAL: 06:52
G.W.: 141639 lbs
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

picture 36 – Engines fed by wings tanks now

From this moment, Each engine is fed by its wing. This configuration can lead some problems if you have a failure engine. We'll see next page, by simulating an engine fire, forcing us to stop this engine.

4.7.2 Engine failure and CROSSFEED use

If the aircraft is flying with wings tanks feed and an engine stop to run , an imbalance tanks will quickly appear and will increase.


CHECKLIST
FUEL kg
F. USED 1
763
FOB
11897
F. USED 2
835
LEFT
CTR
RIGHT
240
104
5560
424
5560
8
-19 °
-19
-19 °C -19
TAT: -19°C
SAT: -41°C
ZULU: 16:30
LOCAL: 18:30
G.W.: 66434 kg

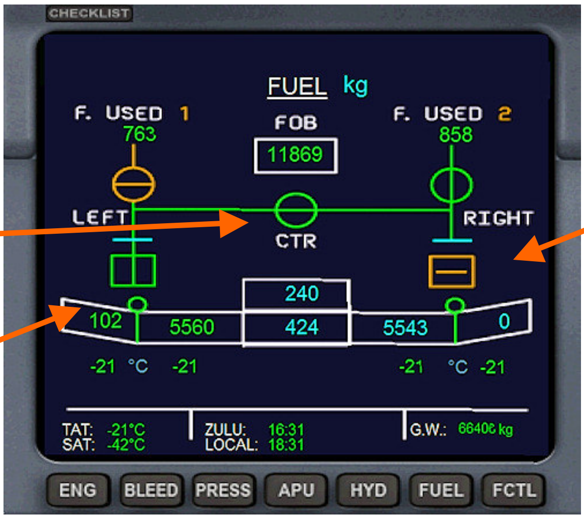
A The left engine just stopped due to damage. Its supply valve closes automatically and the left pump shutdown.

B – The left wing tank are isolated.

C – The right engine still run. Only the right wing is pumped. Imbalance appears and will increase

Picture 37 – wings tanks feed and engine damage

Fuel pumps switches and CROSSFEED switch (its name is X-FEED) are on the Overhead (area 6, picture 31 page 24, or picture 32 page 25).

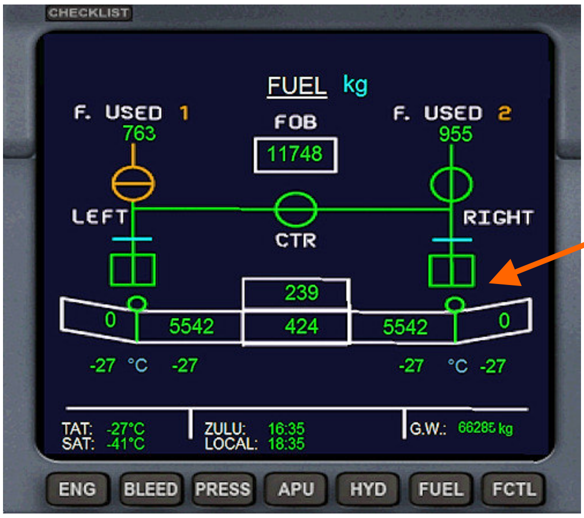

CHECKLIST
FUEL kg
F. USED 1
763
FOB
11869
F. USED 2
858
LEFT
CTR
RIGHT
240
102
5560
424
5543
0
-21 °C -21
-21 °C -21
TAT: -21°C
SAT: -42°C
ZULU: 16:31
LOCAL: 18:31
G.W.: 66406 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

1- You must open the CROSSFEED.. and re-activate the left fuel pump. If the 2 fuel pumps run, all the tanks will be open !

2 - You must run the left fuel pump, and open the Crossfeed ; All the tanks will be open.

3 - Stop the right fuel pump. This action isolate the right wing tanks and the center tank. With the CROSSFEED open, the right engine is fed by the left wing tanks.

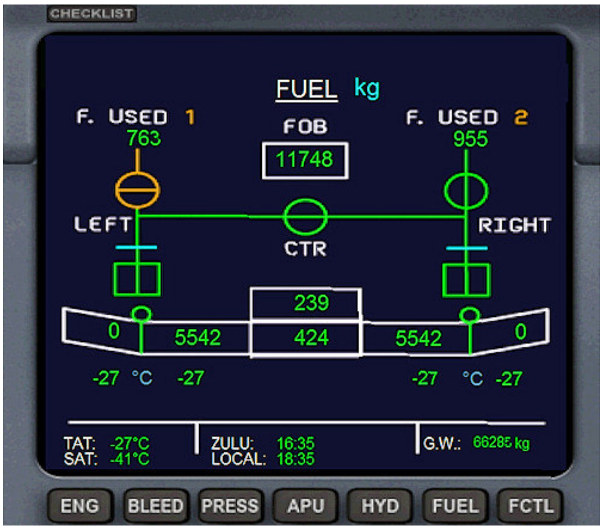
Picture 38 – Opening of the CROSSFEED and turn off the right fuel pump.


CHECKLIST
FUEL kg
F. USED 1
763
FOB
11748
F. USED 2
955
LEFT
CTR
RIGHT
239
0
5542
424
5542
0
-27 °C -27
-27 °C -27
TAT: -27°C
SAT: -41°C
ZULU: 16:35
LOCAL: 18:35
G.W.: 66285 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

When balance is recovery, you can turn on the right fuel pump. This action, in conjunction with the CROSSFEED open, opens all the fuel tanks.

Picture 39 – CROSSFEED opened, and all pumps run : all tanks are open

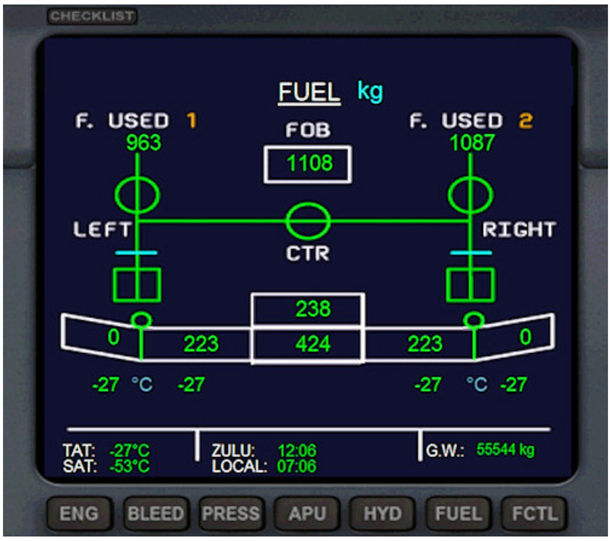
Think that when the crossfeed is open in conjunction with the 2 fuel pumps, all the tanks are opened.


CHECKLIST
FUEL kg
F. USED 1
763
FOB
11748
F. USED 2
955
LEFT
CTR
RIGHT
239
0
5542
424
5542
0
-27 °C -27
-27 °C -27
TAT: -27°C
SAT: -41°C
ZULU: 16:35
LOCAL: 18:35
G.W.: 66285 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 40 – CROSSFEED open with the 2 fuel pumps

4.7.3 CROSSFEED use in the case of low level fuel

In normal operation (without engine damage), if your level of fuel become too low, sound alarm is activated to inform you about the situation. This alarm run when the level of the wings tanks is under 50 gallons :


CHECKLIST
FUEL kg
F. USED 1
963
FOB
1108
F. USED 2
1087
LEFT
CTR
RIGHT
238
0
223
424
223
0
-27 °C -27
-27 °C -27
TAT: -27°C
SAT: -53°C
ZULU: 12:06
LOCAL: 07:06
G.W.: 55544 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 41 – opening of the CROSSFEED in case of low fuel levet

You must open the CROSSFEED (X-FEED) valve ; the sound alarm will be stopped, and this action will be open the center tanks with their fuel reserve. You must find an airport the nearest to land !

CROSSFEED valve can be opened while you start engines, if you go away with center tanks empty ; This will avoid to create a imbalance in the wings tanks at startup.

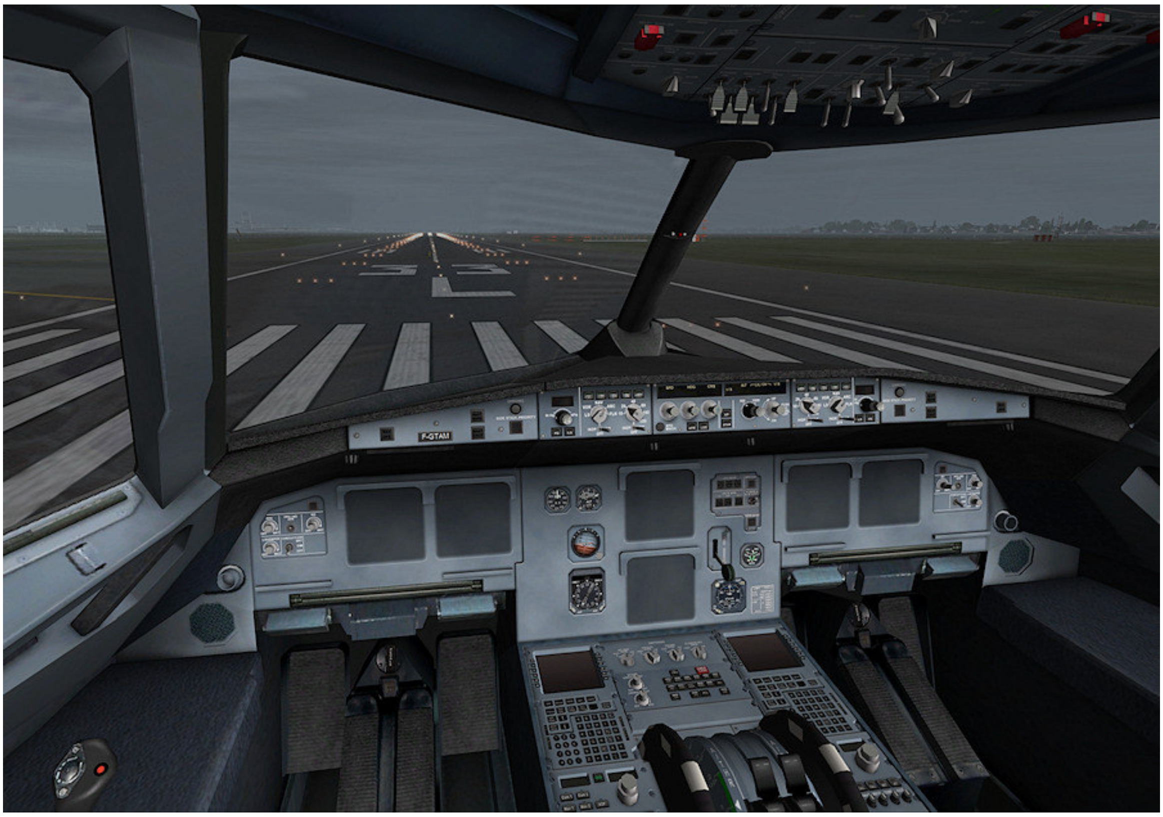
NOTA : in all cases, when you open the CROSSFEED valve, the Master Warning will appears. You will must clear this warnings by pressing the button.

The combination to open the CROSSFEED (X-FEED) and to activate the 2 fuel pumps open all the tanks

5 How to fly with this Airbus A320

I have programed on this aircraft 100% « Cold & Dark » situation. You must respect the engines startup procedure and the activation of all the aircraft systems. I thank **Jean-Louis Fonta** who has been my technical supervisor for the bleed procedure. For beginners, I kept the FSX automatic engine startup procedure by keys « CTRL + E », and I have added at this automatic procedure, the xml code to create the same animation on the screens and switches (especially on the « BLEED » page , to familiarize with the real procedure).

Here is the view of the cockpit when you load a flight :

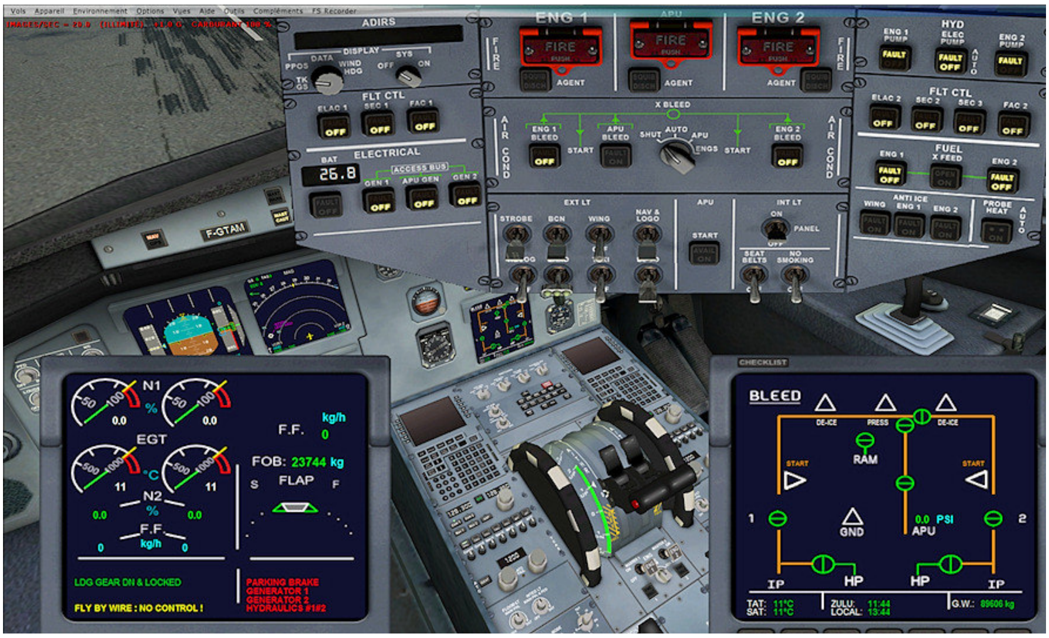


Picture 42 – Cold & Dark situation at downloaded flight

Jean-Pierre Varnier has wrote a complete checklist for the procedure ; You can display it with the FSX kneeboard (Many thanks, Jean-Pierre !). So, you will find this checlist at the end of this manual and a PDF printable version in the aircarft folder.

5.1 Engines startup procedure & Bleed circuit

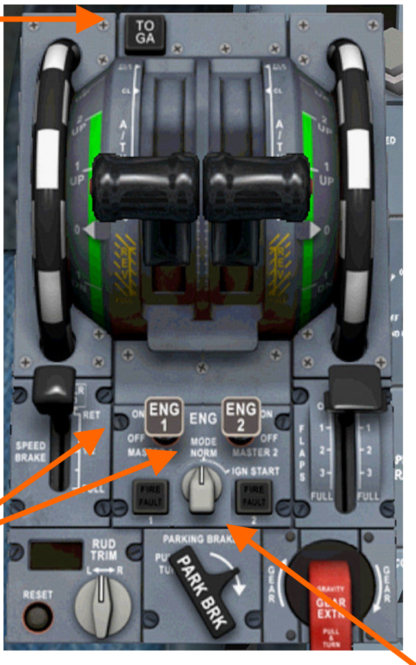
The first action that you must do is to switch the battery to powered the avionics. Here is the view of the cockpit when you have set the battery. By default the secondary lower ECAM will be on the bleed page, to help you for the engines start.



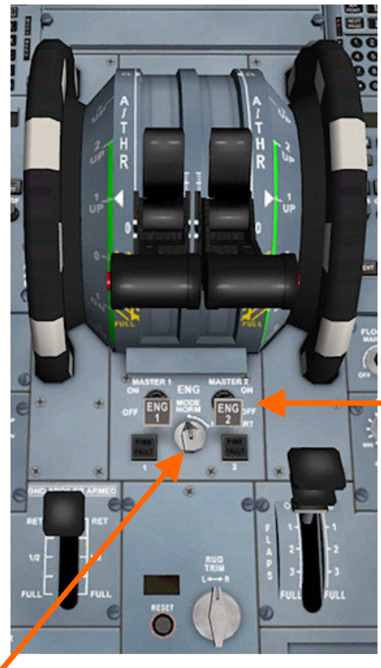
ENG 1
APU
ENG 2
FIRE
AGENT
ADIRS
FLT CTL
ELECTRICAL
26.8
X BLEED
ENG 1 BLEED
APU BLEED
ENG 2 BLEED
HYD
FUEL
ANTI ICE
EXT LT
APU
INT LT
F-GTAM
N1
EGT
N2
F.F.
FOB: 23744 kg
FLAP
LDG GEAR DN & LOCKED
FLY BY WIRE : NO CONTROL !
PARKING BRAKE
GENERATOR 1
GENERATOR 2
HYDRAULICS #1#2
BLEED
RAM
GND
APU
HP
IP
TAT: 11°C
SAT: 11°C
ZULU: 11:44
LOCAL: 13:44

Picture 43 – master power battery is under tension

You have already seen the overhead view (picture 31, page 24 or picture 32, page 25), here, you have the views of the throttle panel (2D and VC mode view).


TO GA
ENG 1
ENG 2
MODE NORM
IGN START
FIRE FAULT
SPEED BRAKE
RUD TRIM
RESET
PARKING BRAKE
PARK BRK
GEAR
FLAPS
FULL

Picture 44 – Throttle 2D panel


A THR
ENG
MASTER 1
MASTER 2
MODE NORM
FIRE FAULT
RUD TRIM
RESET
FLAPS
FULL

Picture 45 – Throttle panel in the VC

Switch for the TOGA mode, only present on the 2D panel; But, you can assign a key to activate this function.

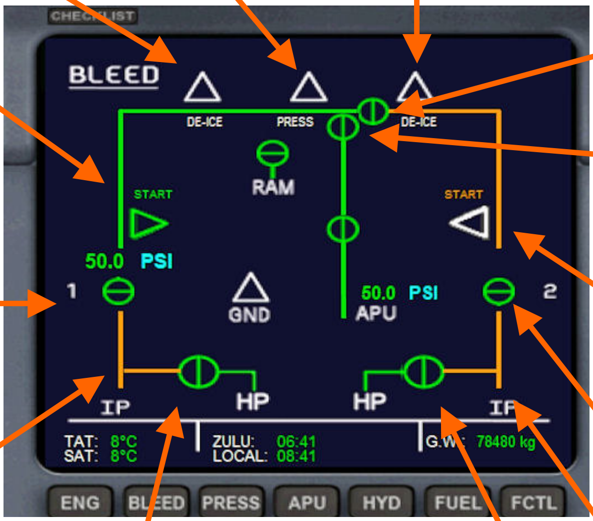
Master engine starters 1 et 2

Master engines starters 1 et 2

Master Ignition Switch.

Remainder of the meanings of the symbols BLEED's circuit

Note : Triangles are green when the appropriate system is activated.


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
50.0 PSI
1
GND
50.0 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:41
LOCAL: 08:41
G.W. 78480 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 46 – Secondary ECAM BLEED page

Triangle symbolizing wing and/or engine left deice.

Triangle symbolizing cabin pressurization .

Triangle symbolizing wing and/or engine right deice..

Triangle symbolizing the clearance state to start left engine:
-Green=Start is possible

X-Bleed ; this is the valve which permit to comunicate between left and right circuit.(here is closed)

APU-Bleed ; open it when this is APU which give air pressurized(here, is open).

Left engine Bleed valve.

Triangle symbolizing the clearance state to start right engine:
-White=Start is not possible

IP sheaths, from engine intermediate compressor stage.

Right engine bleed valve.

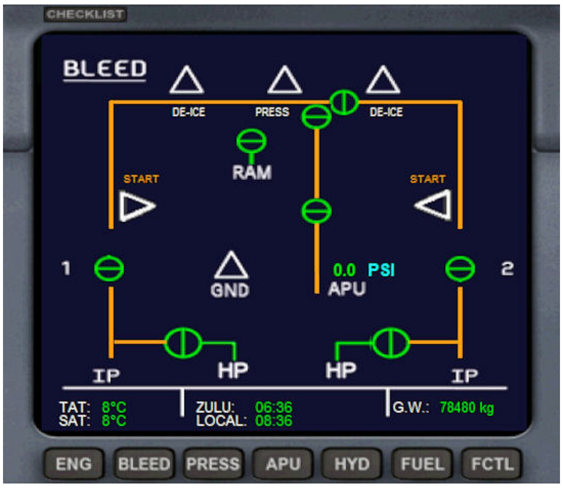
IP sheaths, from right engine intermediate compressor stage.

HP left and right Bleeds, opening circuits come from engines high pressure compressor stages.
these bleeds open automatically at 50% of N1 and close automatically at 54% of N1

Nota :
bleed RAM is not simulated with this aircraft.
GND triangle is the ground APU
And is not simulated.

5.1.1 Startup porcedure

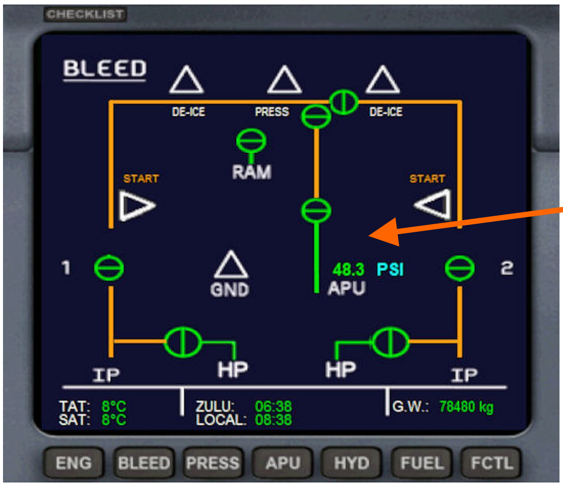
- Check the position to 0 of the throttle levers
- Check the parking brakes « ON »
- Turn on the battery switch


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
1
GND
0.0 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:36
LOCAL: 08:36
G.W.: 78480 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

When you turn on the battery switch, all the bleed sheaths are without pressure (orange color) and all the bleeds valves are closed.

Picture 47 – Secondary ECAM BLEED page

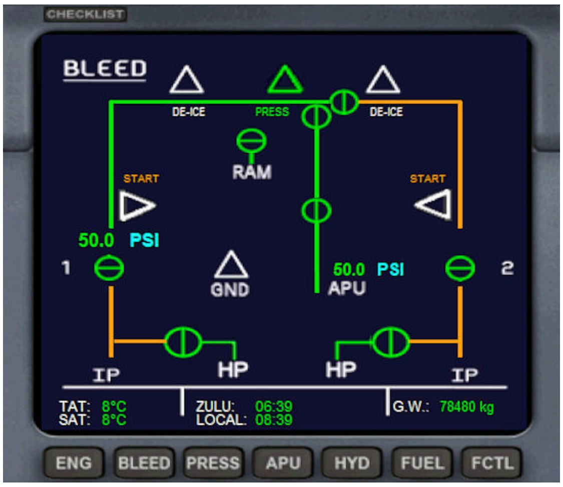
- Start the APU (label 2 on the Overhead picture)


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
1
GND
48.3 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:38
LOCAL: 08:38
G.W.: 78480 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

APU sheath turn green : it is under pressure(check PSI value).

Picture 48 – APU run

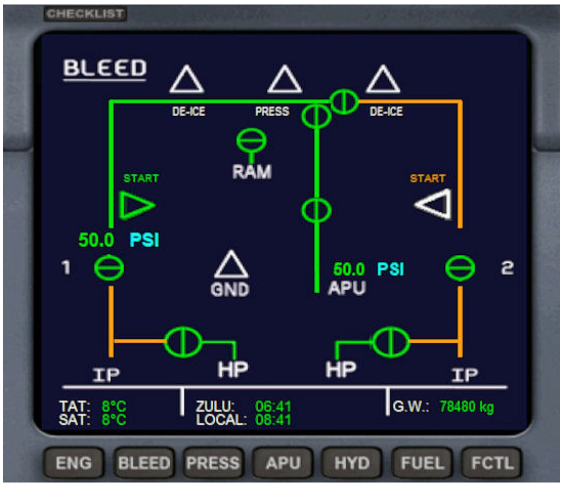
- Turn on APU's generator (label 1 on the Overhead picture)
- Turn the X-BLEED selector on APU position(label 3 on the Overhead picture), APU bleed will open


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
50.0 PSI
1
GND
50.0 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:39
LOCAL: 08:39
G.W.: 78480 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

APU's Bleed is now open, and the APU sheath is under pressure to the left engine.
Please, note that in he virtual cockpit overhead panel, the x-BLEED selector must be set with the wheel mouse only !

Picture 49 – APU Bleed open and pressurized

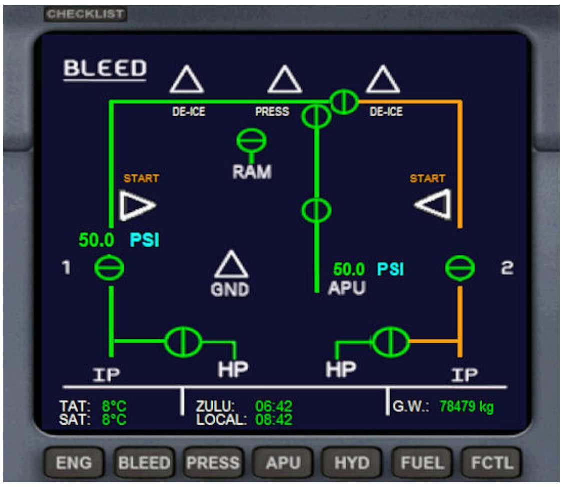
- Set the Master Ignition swith (between the master starters on IGN/START position (picture 44 or 45, page 31)
- Turn on the FUEL X-FEED switch (CROSSFEED) (area 6 of the Overhead)
- Turn on the left fuel pump (ENG1 , label 6 on the overhead)


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
50.0 PSI
1
GND
50.0 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:41
LOCAL: 08:41
G.W.: 78480 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

The triangle which symbolize the left engine starter turn on green. That’s indicate that you have the clearance to start the left engine.
Note that at this step, the triangle which symbolize cabin pressurization turn to white ; This function is temporarily disabled until the engine completed its startup..

Picture 50 – Clear to start right engine

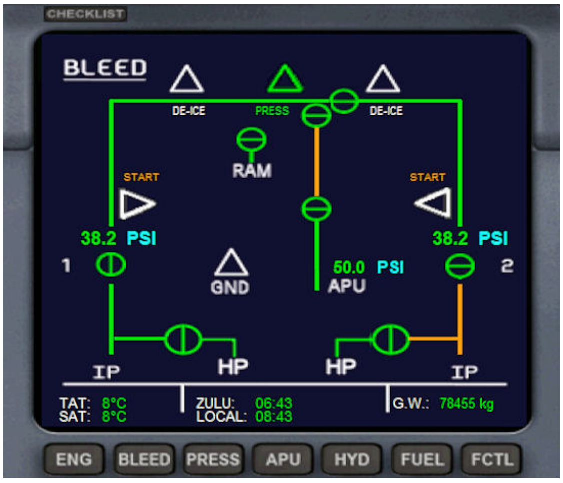
- Push the master starter 1 (picture 44/45, page 31)


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
50.0 PSI
1
GND
50.0 PSI
APU
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:42
LOCAL: 08:42
G.W.: 78479 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Left engine is started. HP valve is opened at 50% of N2 then is closed at 54% of N2.
« START » triangle is turned to white.
When N2 value is more than 20%, the hydraulic pump is automatically activated.
When the engine is started, its electric generator is automatically engaged.
It remains only to open the left engine Bleed and positioning the X-BLEED selector to "ENGS" position to send the air pressure from the left engine to the right engine.

Picture 51 – Left engine is started

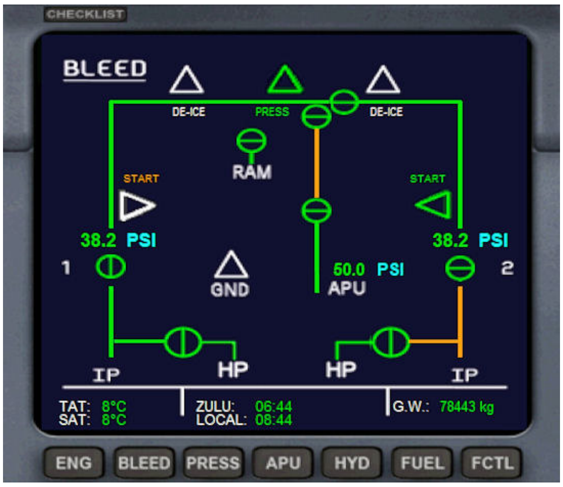
- Turn on the engine 1 bleed (area 3 of the overhead)
- Turn the X-BLEED selector on the « ENGS » position (It will close automaically the APU Bleed).


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
38.2 PSI
1
GND
50.0 PSI
APU
38.2 PSI
2
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:43
LOCAL: 08:43
G.W.: 78455 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

When the left engine bleed is open (ENG1), and the X-BLEED selector on the « ENGS » position, That will close automatically the APU bleed . Air pressure produce by the left engine is sent to the right engine. At this moment, you can shutdown the APU.

Picture 52 – X-BLEED open, air pressure go to right engine

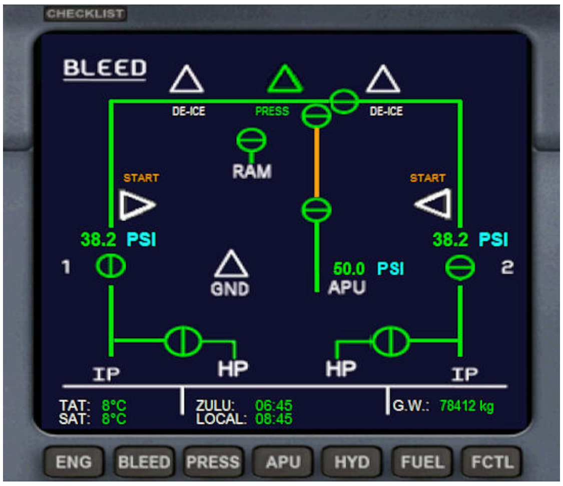
- Turn on the right engine fuel pump switch (ENG2 , area 6 of the overhead)


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
38.2 PSI
38.2 PSI
1
2
GND
50.0 PSI
APU
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:44
LOCAL: 08:44
G.W.: 78443 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 53 – You can toggle the master starter 2

The triangle which symbolize the right engine starter turn on green. That's indicate that you have the clearance to start the left engine.

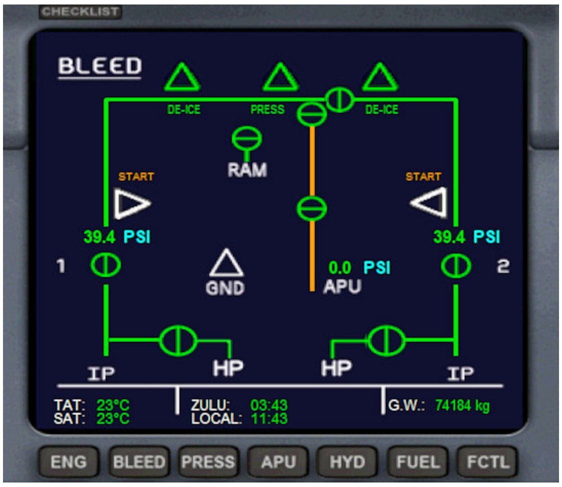
- Push the right master starter 2 (picture 44/45, page 31)


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
38.2 PSI
38.2 PSI
1
2
GND
50.0 PSI
APU
IP
HP
HP
IP
TAT: 8°C
SAT: 8°C
ZULU: 06:45
LOCAL: 08:45
G.W.: 78412 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

Picture 54 – Right engine is started

Right engine is started. HP valve is opened at 50% of N2 then is closed at 54% of N2. « START » triangle is turned to white.
When N2 value is more than 20%, the hydraulic pump is automatically activated.
When the engine is started, its electric generator is automatically engaged.
It remains only to open the right engine Bleed and positioning the X-BLEED selector to "AUTO" position.

- Open then engine 2 Bleed (area 3 of the overhead)
- Turn the X-BLEED selector on the « AUTO » .
- Check that the APU bleed is closed
- Close the X-FEED fuel valve (CROSSFEED , area 6 of the Overhead)
- Turn the Master Ignition swith on the « MODE NORM » position.


CHECKLIST
BLEED
DE-ICE
PRESS
DE-ICE
RAM
START
START
39.4 PSI
39.4 PSI
1
2
GND
0.0 PSI
APU
IP
HP
HP
IP
TAT: 23°C
SAT: 23°C
ZULU: 03:43
LOCAL: 11:43
G.W.: 74184 kg
ENG
BLEED
PRESS
APU
HYD
FUEL
FCTL

picture 55 – Right engine started, and APU shutdown.

The startup procedure is now completed. The green triangle vert « DE-ICE » show that wings or engines deice has been activated.
You can set the X-BLEED on « SHUT » or « AUTO » position.
If you select the « SHUT » position, in case of engine fire, you will must set yourself the engines bleed and the X-Bleed to maintain the air pressure inall the circuit.
If the X-Bleed selector is on « AUTO » position, the X-BLEED will open automatically to maintain air pressure in all circuit.

NOTE : like the X-FEED fuel valve (CROSSFEED) has been openned while the startup procedure, You must clear the master warning alarm by click on the button.

You can access with the FSX Kneeboard, to an ultra detailled checklist about engines startup procedure systems initialization. You will find also, in each aircraft folfer, file called « Printable A320 checklist.pdf » if you want to have it « in your hands »

5.1.2 Systems and avionics setup

At the beginning of a flight, the aircraft is in «Cold & Dark » situation . So, after engines startup You must activate all the necessary systems for your flight.

- In first, you must powered the Inertial navigation system (called ADIRS). See the area 11 of the picture 31 or 32 from the overhead, page 24 et 25.
  Toggle the « SYS » switch on « ON » position in 2D panel ovehead or « 1 » position in the overhead's VC.
  The inertial central run and display by default the heading and the speed of the aicraft (TAS).
  But, be careful, Data are not true until the aircraft moves ; By default, it display north heading (minus the local magnetic variation). The aircraft position will be updated when the aircraft will move
  With the left rotative selector, You can display geographic aircraft position and also, direction and speed of the wind.

- You must activate the flight controls of the Fly By Wire. Without this action, all flight controls will do not work. See the **chapter 5.6** to know the different modes of the FBW.

- Toggle the NAV1 & NAV2 switches (label 16 et 17 of the picture 0, page 9) ; They will display the radionav information on the lower left and right of the ND. If you toggle to the right, you will be in VOR mode, if you toggle to the left, you will be in ADF mode. Center is the default « OFF » position.

- Set the navigation lights

- According to the weather conditions,,set the de-ice controls (Pitot, wings , engines).

- You must clear the « MAST WARN » by press the button

- And if you have forgotten to adjust your fuel and pax capacity, you can do it by the FSX menu. Think that by default, the aircraft is at its maximum load capacity and in the most cases, you will must adjust load.
  If you adjust the fuel capacity, begin to empty the center tank while you keep 15-20% of its capacity at least to have a safety fuel reserve.(see **chapter 4.7** , page 26 about fuel management).
  If you have still too fuel, you can begin after to empty the wings tanks.
  It is very important to respect this order : first, empty center tanks and after, if necessary, empty wings tanks !

Your are ready now to begin your flight !

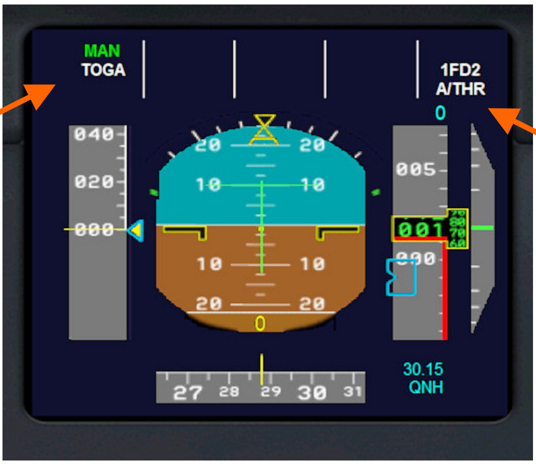
5.2 TOGA & AUTOBRAKE modes

5.2.1 TOGA Mode

TOGA mode (Take Off and Go Around) is a way that is works only **when the AutoThrottle is engaged**.
It helps to have 100% of engines power available, by a simple command on a button.
It is used for takeoff but also when landing, in final, if you are forced to cancel your intention to land at last moment, for any reasons.
To activate, you have either the FSX key command (CTRL+Shift+G), either the switch on the 2D throttle panel (picture 44 or picture 45, page 31).
When Toga is engaged, you have the word « Toga » displayed on the upper left of the PFD. Depending of the circumstances, the display may be different (while take off or landing or when VNAV is engaged) :

First case : manual Take off or Go around :

When a manual take off, the Toga text in green show that the mode is engaged .
To cancel TOGA, you must engage the autopilot in SPEED mode (SPD) or disengaged the Auto-Throttle.

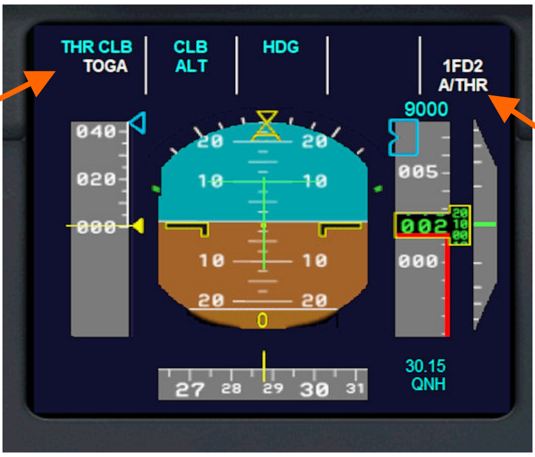


Auto-throttle must be engaged (A/THR switch) to allow TOGA function.

Picture 56 –TOGA when manual take Off.

Second Case : Take Off with VNAV armed (see next chapter, 5.3)

Take off with TOGA with VNAV armed. Cyan color for the text shows that VNAV is armed, but not yet active (see next **chapter 5.3**)

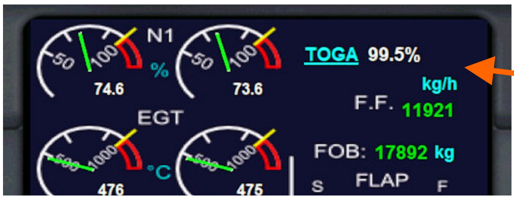


Auto-throttle must be activated (A/THR switch) to use TOGA mode

Picture 57 – TOGA at take off with VNAV Armed.

When you land, if you engage TOGA,your landing procedure (even if you are with the autopilot in ILS) will be cancelled, and aircraft will climb automatically with a 12° pitch, regardless the programmed vertical speed and altitude values of the autopilot until you cancel TOGA mode (by cancelling the auto-throttle.

Note : Do note cofuse the Toga indication of the upper left of the PFD, that is the real indication of the TOGA mode, with the indication that is on the upper right of the primary ECAM. The ECAM indication shows only the position of the throttle levers !!



This TOGA indication shows only the position of the throttle levers. It not means that TOGA mode is armed or engaged !

Picture 58 – information about postion of throttle levers

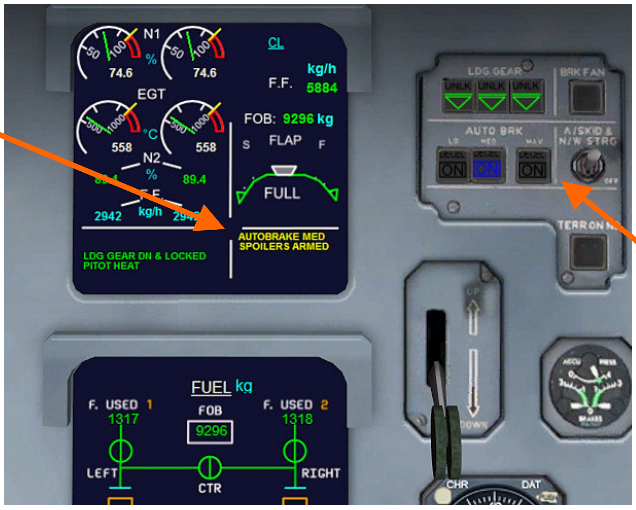
5.2.2 AUTOBRAKE

Stefan Liebe made functional in its Panel autobrake. It is controlled via switches located next to the landing gear lever. There are four positions :

- RTO (Reject Take OFF) is the higher position but only activable while takeoff.
- Low (Landing)
- Medium (landing)
- High (same high power brakes as RTO, but only for landing)

Nota : RTO and HIGH are activated by the same switch. This is the aircraft position which command function (RTO if aircraft is on ground, High if aircraft flys).
A yellow information message appears in the bottom right of primary ECAM to show the activated function (no message if autobrake is OFF) :
.

Autobrake Message information.



The 3 switches which command Autobrake on landing gear panel (VC or popup wndow).
RTO and high use the same switch.

Picture 59 – Autobrake controls

If you use FSUIPC, and you have a free axis on your joystick, You can set to this axis the autobrake function. In this case, Values to be programmed are the followings :

- Off = 1
- RTO = 0
- Low = 2
- Med = 3
- High = 4

5.2.3 RTO Function :

The Autobrake position RTO (Reject Take Off) aborts a take off being provided that the aircraft is not already reached V1 speed (Symbolized on the ASI / PFD by a small white one number).

To do this, when you are ready for takeoff, we must arm Autobrake on the panel, by engaging the right switch (MAX). The message autobrake RTO appears in yellow on the bottom right of the ECAM.
Then there are two cases to abort the takeoff procedure, depending on whether one takes off with the controls of engine power driven by the auto A / THR) or you manually actuates the throttle levers.

A) TakeOff in A/THR mode :

Once the autothrottle armed, you can takeoff on TOGA mode or with a speed set on the AP and IAS mode. From 60kts, the Spoilers will arm themselves (if you put at least 1+F flap setting), and from that moment, if you want to give up your intention to takeoff, you must disarm the autothrottle, and to operate the throttle levers to 0; this action automatically engage the brakes at maximum power and speed brakes will expand; Generally, it is the moment to engage the reverse thrust to stop as short as possible. The brakes remain engaged until the complete stop of the aircraft.

- **B) TakeOff with manual action on the throttle levers :**

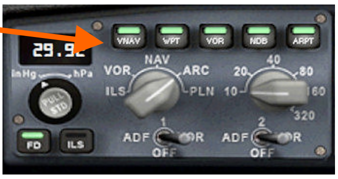
  You push your throttles with enough power to take off. Once the aircraft has exceeded 60kts, the spoilers will arm (if you put at least one notch of flaps), and from that moment, if you want to give up your intention to takeoff, just bring the throttle levers to 0; This action automatically engage the brakes at maximum power and speed brakes will expand;It is the moment to engage the reverse thrust to stop as short as possible. The brakes remain engaged until the complete stop of the aircraft.

5.3 Verticale navigation gauge (VNAV)

I have created for those who like me, do not use FMC, a vertical navigation gauge that manage the climb.
This gauge, allows the autopilot to manage the process of aircraft climb during each step of the climb, taking into account the weight of the aircraft.
The rate of climb (vertical speed - VS) are determined by four differents pre-programmed curves, and cut the rise in 11 steps.
This gauge works invisibly in the background. To use, you must complete a number of conditions, some of which are controlled by the gauge and the other not as uncontrollable (for the latter, it means that it is your responsibility to remember to required actions).
VNAV mode can be activated on the ground (before takeoff) or in the air (**if your are at least 2500 feet above the ground**), allowing in the latter case, turning it in succession, follow the different levels are given by FSX ATC or by an network ATC like VATSIM, Ivao ....

For VNAV works, you must create the following conditions :

VNAV switch to activate the function



Picture 60

5.3.1 Case #1 : Take Off (aircraft must be on the ground):

- The engines must be started (**checked condition**)
- Having armed the autothrottle (A / THR) (**checked condition**)
- It should have set the autopilot target altitude at least **3,000 feet** (**checked condition**)
- Having set the flaps at 1 + F position minimum (**checked condition**)
- Having set the barometer atmospheric pressure for the altimeter (condition not verified)
- You must set the heading of the runway in the HDG (condition not verified)
- From here you can harness the gauge by pressing the VNAV switch (see picture above)
- Please note, "THR CLB" then appear in cyan color on the PFD, indicating that the VNAV mode is armed and the display speed of the autopilot is set on 250 IAS by default.
- You can take off TOGA mode or manual throttle command. The VNAV will activated when the aircraft has left the ground and exceeded the speed of 175 knots.
- Please note, "THR CLB" now appears in green on the PFD, indicating that VNAV mode is activated, in HDG mode by default. You can switch to NAV mode (controlled by GPS or radio Nav1) whenever you want.

5.3.2 Case N°2 : In flight (aircraft must be 2500 ft above ground level):

- The autothrottle (A / THR) must be armed (**checked condition**)
- The autopilot must be hold on (ALT & SPD modes activated) (**checked condition**)
- The navigation mode (NAV GPS or radio NAV1) activated (condition not verified)
- It is necessary that the new altitude set on the AP is greater than the current altitude of the aircraft (yes!) and that **this elevation is at least greater than 2500 feet above ground level** (AGL) (**checked condition**).
- You can activate the gauge by pressing the VNAV button (see picture above)
- Please note, "THR CLB" now appear in green on the PFD, indicating that VNAV mode is enabled, the navigation mode in which you are at that point (either HDG or NAV mode (via the GPS or via radio Nav1).

Whether during takeoff or upon activation in flight, the VNAV will turn off by itself when the target altitude is reached, and the autopilot mode automatically toggle in SPEED, NAV(or HDG) and ALT mode.
You can disable at any moment VNAV by pressing the button "VNAV".

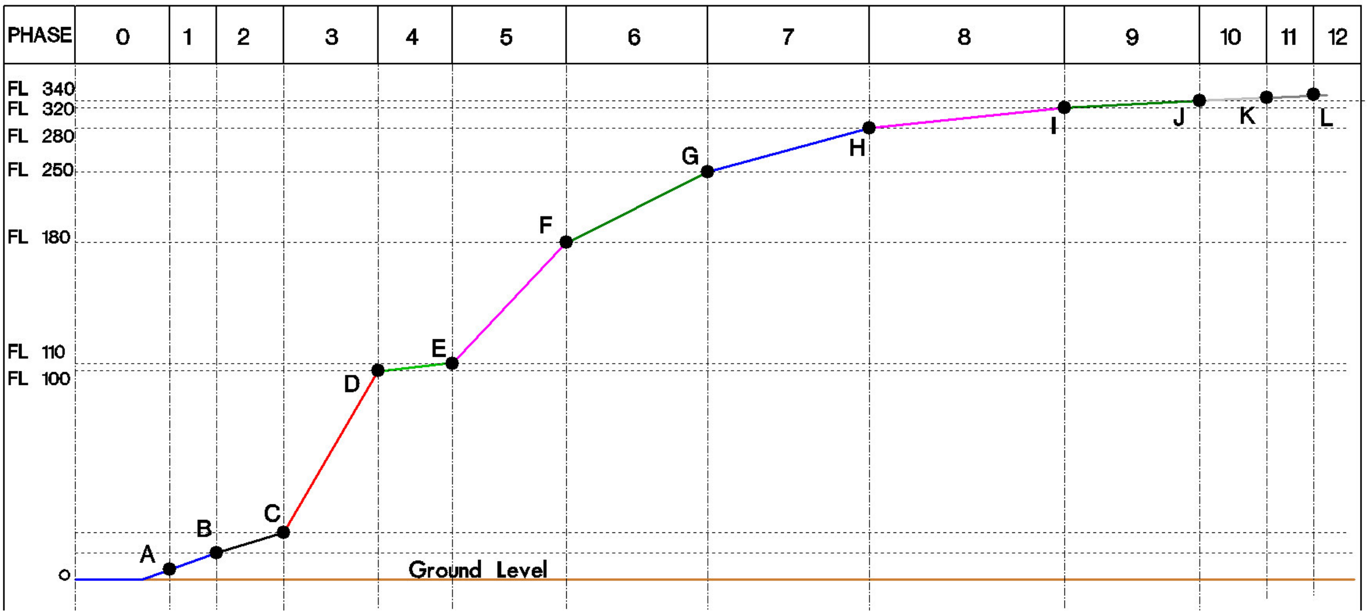
You can use as many times as you want the VNAV when your are in flight

When the climb of the aircraft is under control of the VNAV, you can change the settings of speed, climb rate (VS) and the also the target altitude, so making sure to remain in the aircraft flight domain.

If you change any of the parameters of flight, be aware that when the aircraft crosses one of the highlights of its climb curve, pre-programmed data of the gauge corresponding to this key points will be activated again.
Note : VNAV works only if the aircraft is on the ground, or if the aircarft is 2500 feet above ground (AGL)

Next page you will find a sketch of explanation of these key points and all climb step managed by the VNAV.

VNAV data - AIRBUS A319 v3 June 2012

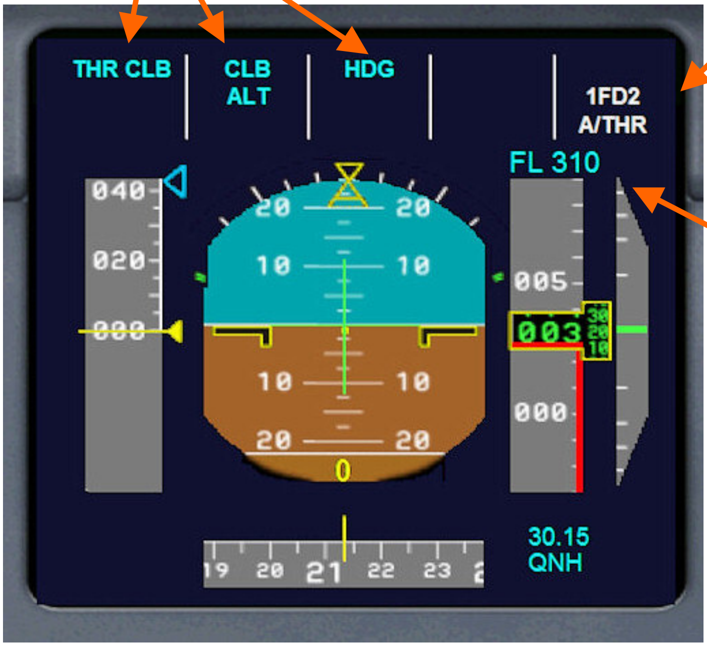


Picture 61 – VNAV gauge pre-programmed curves

- **Phase 0:** Take off. Point **A** is the time the plane reached 175 IAS, causing activtion the VNAV; At this point, the autopilot is on, HDG and ALT mode are activated
- **Phase 1**: From **A** point to **B** point, this is the initial acceleration during which the SFCC will automatically flaps up. **B** Point represents the moment when the aircraft reached 234 IAS; TOGA mode is deactivated (if it was) and autopilot engage SPEED mode (preset to 250 IAS). The vertical speed (VS) is set to 2000ft/mn
- **Phase 2:** The vertical speed is set to a value of 2400ft/mn. **C** Point represents the moment when the aircraft reaches 228 IAS
- · **Phase 3:.** The vertical speed is set to a value between 3500ft/mn to 3800ft/mn according weight of the aircraft. The **D** point is reached when the aircraft arrives at an altitude of 10000ft.
- **Phase 4:** Second phase of acceleration; The VS is set to 2400ft/mn and speed of the AP is set to 285 IAS. As the airplane exceed 270 IAS, the speed is again increased to 300 IAS. **E** Point is when the plane reached an altitude of 11000ft.
- **Phase 5:** VS is set to a value between 2500ft/mn to 3300ft/mn according weight of the aircraft. **F** point is the moment when the aircraft reaches FL 180.
- **Phase 6:** The speed of the aircraft is increased to 310 IAS. The VS is set to a value between 2200ft/mn to 2900ft/mn according the weight of the aircraft. The **G** point is the time the aircraft reached FL 250, transition altitude; A "ding" sound in the cockpit to warn of the change in speed mode. The display speed of the AP switches MACH exclusive. From this point, the speed of the aircraft will be constantly recalibrated from the altitude to get a true MACH speed if verticale speed is > 0.
- **Phase 7 :** The speed of the aircraft is scheduled to Mach 0.74, and VS is set to a value between 1700ft/mn 2300ft/mn according to aircraft weight. The **H** point is when the aircraft reaches FL 280.
- **Phase 8:** The speed of the aircraft is scheduled to Mach 0.77, and VS is set to a value between 1400ft/mn 1800ft/mn according to aircraft weight. The **I** point is when the aircraft reaches FL 320.
- **Phase 9 :** The aircraft speed is set at Mach 0.77, and VS is set to a fixed value of 1200ft/mn. **J** Point is when the aircraft reaches FL 340.
- **Phase 10:** The speed of the aircraft is scheduled to Mach 0.77, and VS is set to a fixed value of 1100ft/mn. From **K** point the maximum ceiling allowed for the aircraft is **FL390**.

So the complete curve of VNAV, when activated from the take off. But this happening if you turn in flight? It will simply adjust the parameters of the autopilot corresponding to the altitude where you activated the VNAV.
As a concrete example:
You fly to 14 000ft to 280 IAS **with autopilot**. Want to go up to your cruising altitude of 29 000ft using the VNAV. You just set the target alitutde of the AP to 29 000ft and press the VNAV button. The autopilot will then receive the settings for your alitude 14-000ft (so you are in Phase 5), so the speed will be tuned to 300 IAS and VS will be settled at a value between 2500ft/mn to 3300ft/mn according to the weight of your plane at this time. And the climb will continue by executing phases 5, 6, 7 and 8 and your plane will return to "normal" mode at 29 000ft at a speed of Mach 0.77.
You can enabled the VNAV as many times as you like. Simply ensure that when you engage it or you have a speed consistent with your altitude (if you fly too slowly, the VS of the VNAV may be too high and prevent your plane from accelerate, to see his speed drop. in this case, simply decrease the value of VS, the time the aircraft to accelerate.

If you have followed these instructions, the VNAV button should be on green and PFD must show the following informations :


THR CLB
CLB
ALT
HDG
1FD2
A/THR
FL 310
040
020
000
005
003
30
20
10
000
20
10
0
30.15
QNH
19
20
21
22
23

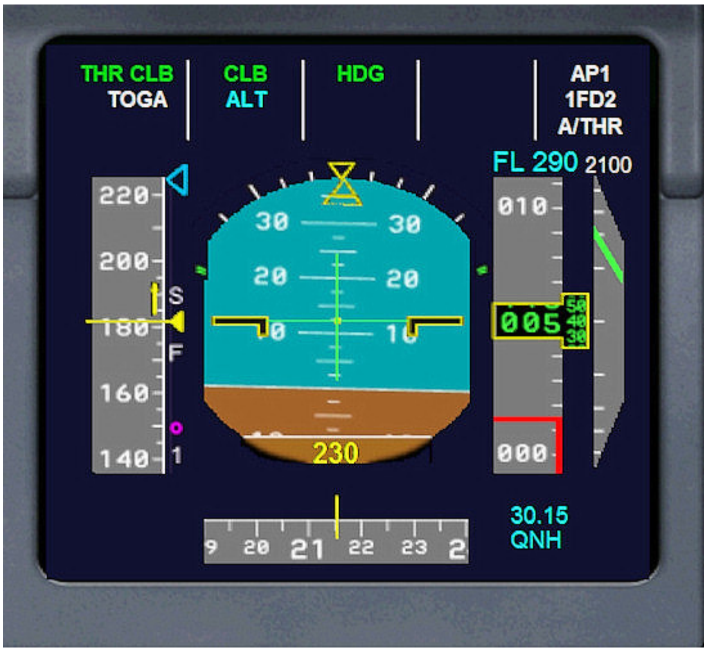
THR CLB I CLB I ALT I HDG indications
In Cyan color, show that the VNAV is armed but not yet active. Activation will be automatically after take offf, when the aircraft reaches a safety speed of 175 knots.

Auto-throttle and Flight Director armed

Target programmed altitude (It must be at least 3000ft). It can be modified after take off when the gauge will be activated and at any time.

Picture 62 – VNAV armed before take off

After takeoff, (generally in TOGA mode) When the aircraft reached 175 knots, the gauge automatically engages the autopilot and indications of the PFD turn green, indicating that the relevant functions are enabled. The climb begins in HDG mode (hence the usefulness of pre-set the HDG to the runway). From that moment, you can switch whenever you want NAV mode (LOC button on Airbus) for the aircraft starts to follow the route of your flight plan. Once the aircraft reaches the speed of 234 knots, TOGA mode will toggle to SPEED mode, and the aircraft started going to climb the curve calculated automatically by the gauge.


THR CLB
TOGA
CLB
ALT
HDG
AP1
1FD2
A/THR
FL 290
2100
220
200
180
160
140
S
F
1
30
20
10
230
010
005
50
40
30
000
30.15
QNH
9
20
21
22
23
2

Picture 63- VNAV has engaged the autopilot in HDG mode

At any time of the climb, you have the freedom to modify the values of vertical velocity, target altitude or aircraft speed , or even to a level (by setting the vertical speed to 0) if instructed by ATC for example.
But know that when the aircraft pass one of the 11 points of the climb curve, it will set the gauge programmed values of VS and speed at this point; But again, you can change these values

You can change their way up the value of the altitude of arrival, by increasing or reducing it. But if you set an altittude value lower than the actual altitude of the aircraft, it considers the gauge has reached the end of the climb and it will deactivate.

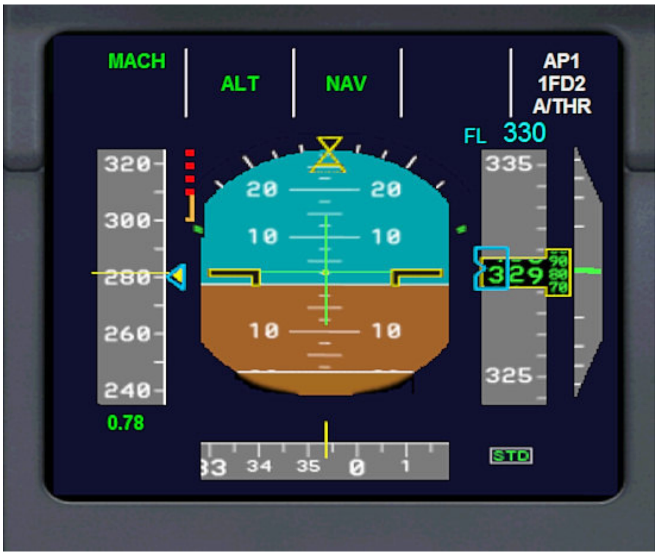
You can also disable at any time the gauge by pressing the VNAV button

You can use the VNAV under the ATC control, as climb per level, setting the altitude to the next level given by ATC and activating the VNAV for each of these levels. This method will guarantee an aircraft climb with optimal parameters.

Once at your cruising altitude, the gauge turns off by itself and the cruise continues under the control of the autopilot.

If you want activate VNAV in flight, the AP must be engaged before, in ALT,SPD mode and HDG or NAV mode

Automatic Vnav climb is completed ; Mach mode is engaged by the gauge



Picture 64 – MACH mode

Think to set baro altimeter to STD (29.92) when above 18 000ft .

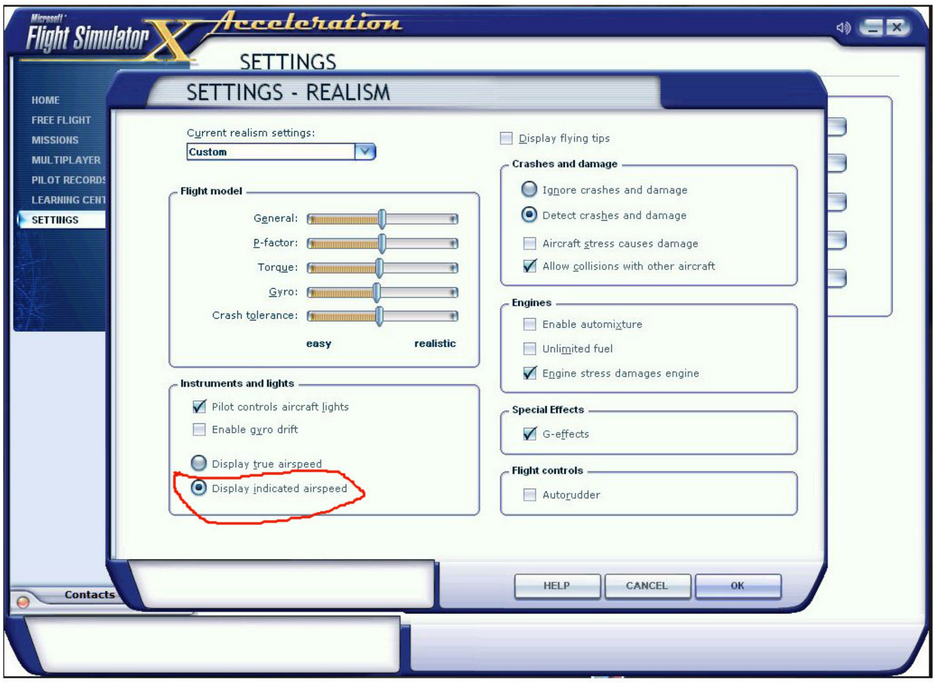
You can set PFD altitude information in feet or FL (if selected altitude is at least 5000ft) by mouse click on it

When the aircraft exceed FL 250, you will hear a « Ding » and the autopilot speed dial will show speed in MACH only.When the aircraft will be again below FL 250, it will show speed in IAS Knots.
Below FL 250, you can select IAS or Mach but when aircraft is **above FL 250, you will be only in Mach mode**.

Then it is time to address the chapter changes I made to the autopilot.

5.4 New Autopilot

Important ! : You must select in the FSX SETTINGS – REALISM : "Display indicated air speed"



Current realism settings: Custom

Flight model
General:
P-factor:
Torque:
Gyro:
Crash tolerance:
easy realistic

Instruments and lights
☑ Pilot controls aircraft lights
☐ Enable gyro drift
○ Display true airspeed
● Display indicated airspeed

☐ Display flying tips

Crashes and damage
○ Ignore crashes and damage
● Detect crashes and damage
☐ Aircraft stress causes damage
☑ Allow collisions with other aircraft

Engines
☐ Enable automixture
☐ Unlimited fuel
☑ Engine stress damages engine

Special Effects
☑ G-effects

Flight controls
☐ Autorudder

Picture 65 –realism settings in FSX menu

The stock FSX autopilot appears to me a huge failure. Indeed, even if it displays the Mach speed in AP, the AP takes as reference IAS speed at this setting; The consequence is that we are convinced that the airplane will not exceed the Mach which was display, whereas in reality, if the aircraft climbs, as it remembered the equivalence IAS when setting the Mach, and it uses this value as IAS speed reference, the plane will go faster than the indicated speed in mach and we go to a risk of overspeed arrived at high altitude.
This is explained (as we know) by the fact that with the rarefied air at high altitude, indicated airspeed IAS by pitot probes is distorted.

I'll take a concrete example:

- · At 20 000ft, a speed of 300 IAS is Mach 0.46 whereas 30 000ft, 300 IAS is Mach 0.77
- · Also at 20 000ft, Mach 0.77 is 365 IAS.

The consequence of this is that during the rise, if at 20 000ft, is set on the AP Mach 0.77, when the aircraft arrives at 30 000ft, You will be in overspeed (as it should reach 365 IAS.

To summarize, the default FSX AP does not recalibrate the speed with altitude during climb

To avoid this, I changed the gauge which manages the Autopilot of the plane, so that the speed continuously calibrates itself during the rise, from a determined altitude.I fixed arbitrarily (but not completely at random, don't worry) this altitude, I'll call in an abusive manner, **"Transition" altitude 25 000 ft.**

Concretely, here is the process during a manually climb or manage by VNAV:

As soon as the aircraft climbs beyond 25-000ft, the display speed of the AP automatically switches MACH;
As long as one is above 25 000ft, we can not display the IAS speed on the dial.
In order to have a warning at the crosswalks of this transition altitude, a signal will sound at 25 000ft for information.
From this point, the autopilot continuously monitors the actual speed of the aircraft in Mach (the one displayed under ASI of the PFD) not exceeding the speed MACH which was set to the AP dial. If ever this happens, the AP value internally recalibrates IAS versus altitude.

To summarize, from FL 250, climb is at constant MACH

So, no risk of overspeed, and the speed will be displayed on the AP will be the true aircraft's Mach speed.

By cons, during descent, as the operation is at the origin, the speed is not recalibrated, because otherwise there would be, there is a risk of overspeed.
During the descent, when the aircraft crosses the transition altitude of 25 000ft, the alarm will sound again, informing the user, and the AP dial will revert to IAS again.

This operating mode is active both during a climb managed manually using the AP, that when using VNAV mode.

These explanations may seem complex at first, but once you have tried the aircraft, you will quickly understand the operation and can not do without!

AP speed can be displayed in IAS or MACH under 25 000ft, But only on Mach Above 25 000ft.

5.4.1 Precautions when resuming a saved flight at high altitude (25000ft and above)

If you save a flight while the aircraft was at high altitude, FSX will record in its backup file the IAS of the aircraft at the time of backup.

But when reloading this flight, one of many bug of FSX will appear: in fact, end loading, the plane will have its AP value set to IAS, but there is an offset in calculating the altitude translation IAS / MACH, it's like during the first seconds of flight saved, the aircraft was at sea level, and secondly, engines start to slow down

To overcome this phenomenon, I had to introduce a delay in my gauge before it switches back to the IAS in MACH speed. So do not be surprised, it will take 5 to 10 seconds before the display of the autopilot shows the speed in MACH.
This is accentuated when using external weather software such as Active Sky or Rex (the time that the software re-injected into FSX weather data and barometric pressure).

On the other hand, walking off the engine slows down, it takes some time for their "stimulus".

All this to mean that the MACH speed at which the aircraft will be slightly delayed return of the MACH speed at which the aircraft was operating during the backup. The system minimizes the delay differential, but there may be a slight gap.

5.4.2 ..Precautions during the descent

Automatic recalibration of the MACH speed with altitude only works when climb or horizontal level flight.

When you begin your descent, the value displayed on the AP MACH is not going to recalibrate unless you change the setting (which is already the case in the stock FSX autopilot). So for downhill, your speed reference must be that given by the tape speed of the PFD.

Normally, this phenomenon has no effect, since falling for the same value IAS, your plane will actually slow down, so there is no risk, unless you have a descent rate too high.

See you at the end of the manual in terms of technical characteristics for the values to use during your descent.

5.5 Slats & Flaps Computer controler (SFCC)

Foreword :

This gauge, originally written by Stefan Liebe, sometimes showed incompatibility problems with some users. I rewrite the code from the xml gauge to correct these bugs and I added new code such as management of the 2nd and 3rd flaps position for takeoff.

The A320 shares with his little brothers of the same family (A318/A319/A321) the same wings.
Off, the A320 is middle weight , so you will use rarely the postion flaps position 3 because it has a low takeoff speed and no needs longer runways.

The SFCC is a partially automated management system components that are found on Airbus.

It provides the following functions :

- Flaps Automatic retractation after takeoff (with configuration 1+F , 2 or 3 for this A320)
- When aircraft is on the ground, first position (Slats only) is not enable, your will be in 1+F position directly when you press the first flaps control
- Position 1 (Slats only) is enable in flight only (begenning of the approach phase)
- The fact of flap ensures automatic arming of the spoilers
- During takeoff, If flaps are at least at the first position (position 1+F) spoilers will be armed automatically when the aircraft reach 60 knots (this function is in case of RTO)
- In flight, right out of the first notch of flap, the spoilers are armed automatically, in preparation for landing
- On landing, as soon as the wheels touch the runway, the spoilers are expanded, and as soon as the aircraft slows below 55 knots, and the spoilers are retracted automatically and disarmed.

Remember, the possible configurations of the slats & flaps on the A320 are as follows:

Maximum speed and slats & flaps positions

Position	Slats	Flaps	Max speed	Comment
1	18°	0°	230 kts	Approach(only selectable in flight)
1+F	18°	10°	215 kts	Take off / approach
2	22°	15°	200 kts	Short or middle heavy take off / approach
3	22°	20°	185 kts	Short or heavy take off / final
Full	27°	35 / 40° *	177 kts	Landing (gear must be extended, otherwise warning)

* 40° is only on for the IAE engines version.

Pins shutter speeds on the PFD strip speed appear white during takeoff, and yellow on landing.

5.6 Fly By Wire (FBW) and flight controls

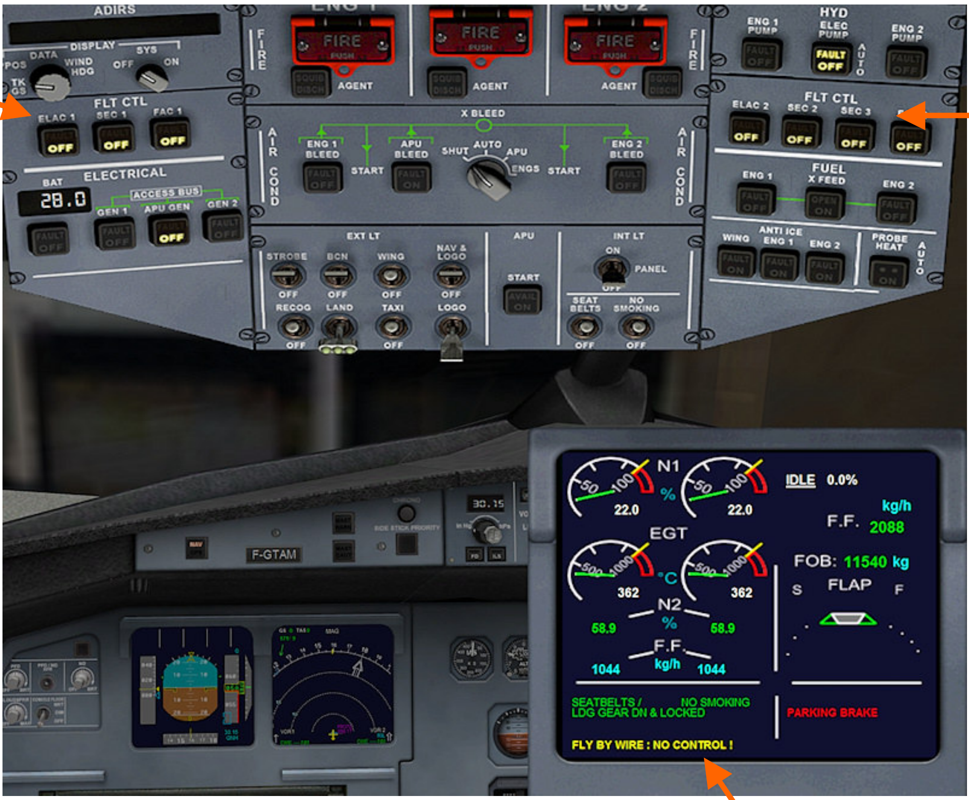
I activated in the aircraft.cfg file the "Fly By Wire" function on this aircraft, to be in the spirit of the real Airbus. While this feature is not very well simulated by FSX, I preferred to do so to leave everyone free to use or not (since you can enable or disable it from the overhead).

What is the Fly By Wire ?
The flight controls of modern aircraft are electrical and Airbus are now introduced a manual steering "guided" by on-board computers. That’s mean that there are computers between the flight controls (the famous Joystick) and the control surfaces (ailerons, elevons, rudder, trim). These computers are supposed to refine the manual control, preventing and prohibiting all maneuvers that could also make out the aircraft's flight envelope, thus endangering the (limiting angles of maneuver that could cause stress ....).

Summarizing coarsely (I hope the purists do not want me), the FBW has three operating modes:

IMPORTANT ! Loading a flight, all flight controls **are disabled** Fly By Wire; This means that all flight controls are ineffective and that the aircraft can not fly in this state !

You will necessarily choose a mode by pressing the corresponding buttons.



FLY BY WIRE : NO CONTROL !

First group of FBW controls

Second group of FBW controls

Picture 66 – FBW status when loading flight

ECAM message, informing you that flight controls are ineffective.

You must choose one of the FBW mode before to fly :

these 3 modes are the following :

- NORMAL LAW
- ALTERNATE LAW
- DIRECT LAW

We will not talk LAW ALTERNATE mode, because it is not simulated in Flight Simulator

Note : If automatic start with CTRL + E, DIRECT LAW mode is automatically activated so that the beginner is not disturbed..

5.6.1 Fly By Wire : « NORMAL LAW »

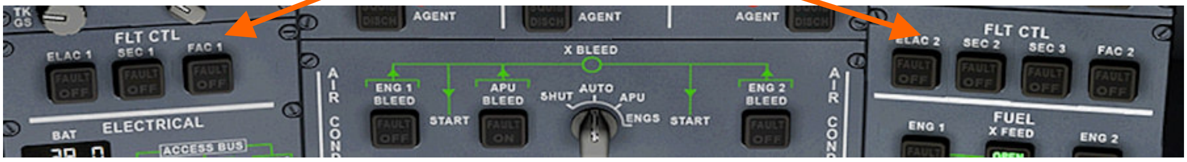
This is the standard mode of operation of the flight controls of an Airbus. In this mode, all of the orders given by the pilot are "filtered" by the FBW computers.
On the ground, all the control function as a conventional aircraft, but once in the air, only the "Joystick" is operating: in fact, the rudder (the order of the drift direction by the feet, and trim are inoperative and are fully managed by computers. If the pilot gives an order of mounted on the joystick, the aircraft will begin to change its angle of ascent up time that the pilot returns the joystick to 0 point and from this time, the aircraft will maintain its angle of ascent, with all circumstances.
The computers run the elevator to the order given by the pilot is maintained.
Another example, if horizontal flight, on a conventional aircraft, if you increase the engines thrust, the aircraft will begin to rise and you should compensate with trim to keep the horizontal flight; With FBW In NORMAL LAW, the computers will automatically manage the trim and to raise the aircraft attitude is maintained, despite the change in thrust.

In turn, no need to control the rudder, simply maneuver the joystick to the desired turn angle, the FBW does the rest, while maintaining the attitude of the aircraft.
In summary, this is an extreme simplification of flight control and only the pilot drive only with the joystick. On the other hand, if the pilot gives an order that could endanger the aircraft, because out of its flight envelop , order will not be executed.
To summarize, the NORMAL LAW mode can be related to a computer-assisted steering. This mode of operation may be surprising, as it introduces some inertia in the aircraft control (probably because that function is poorly simulated in FSX).

To activate this mode, Tou must activate all the 7 switches of the FLT CTL :

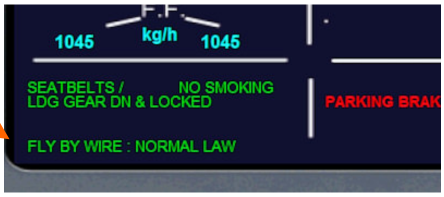
- ELAC1 : no luminous
- SEC1 : no luminous
- FAC1 : no luminous
- ELAC2 : no luminous
- SEC2 : no luminous
- SEC3 : no luminous
- FAC2 : no luminous

All the switches must be no luminous :
FBW is in NORMAL LAW mode



Picture 67 – FBW in NORMAL LAW mode - 2D panel view

This message appears
when you are in FBW
NORMAL LAW mode.



SEATBELTS / NO SMOKING
LDG GEAR DN & LOCKED
FLY BY WIRE : NORMAL LAW
PARKING BRAK

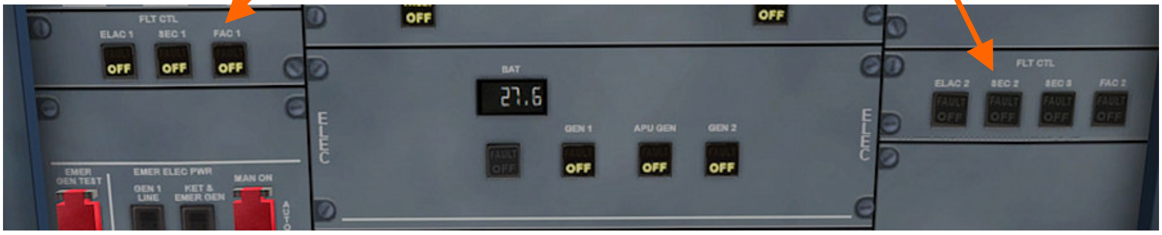
Picture 68 – NORMAL LAW information message on upper primary ECAM

5.6.2 Fly By Wire : « DIRECT LAW »

DIRECT LAW mode allows for flight control "classic", like any other airliner. The spreader regains its function to the rudder and the trim is functional whether at ground or in flight. In this mode, there is no difference with this Airbus and a Boeing.
This is my personal choice to fly.

ELAC1, SEC1 et FAC1 must be disabled (OFF)

ELAC2, SEC2, SEC3 et FAC2 must be enabled (no luminous)

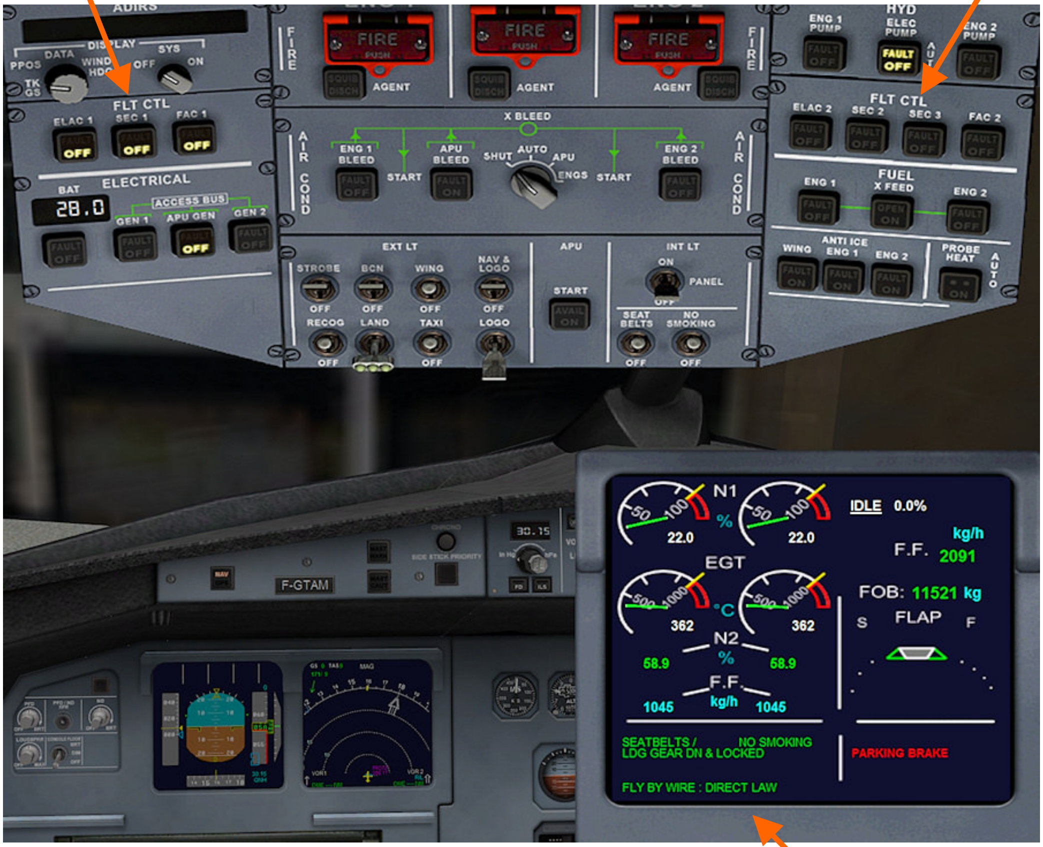

FLT CTL
ELAC 1
SEC 1
FAC 1
OFF
BAT
27.6
GEN 1
APU GEN
GEN 2
ELEC
ELAC 2
SEC 2
SEC 3
FAC 2
FAULT

Picture 69 – FBW in DIRECT LAW mode view from VC

ELAC1, SEC1 et FAC1 must be disabled (OFF)

Other view from 2D overhead panel

ELAC2, SEC2, SEC3 et FAC2 must be enabled (no luminous)


FLT CTL
ELAC 1
SEC 1
FAC 1
ELECTRICAL
BAT
28.0
FIRE
X BLEED
ELAC 2
SEC 2
SEC 3
FAC 2
FUEL
N1
EGT
N2
F.F.
IDLE 0.0%
FOB: 11521 kg
FLAP
SEATBELTS / LDG GEAR DN & LOCKED
NO SMOKING
PARKING BRAKE
FLY BY WIRE : DIRECT LAW

Picture 70 – FBW in DIRECT LAW mode – 2D overhead panel view with message on primary ECAM

This message appears when you are in FBW DIRECT LAW mode

5.7 Autoflare (Autolanding) and Callout system © Doug Dawson

Stefan Liebe has made a gauge for the Autoflare (ILS autoland) and is completed by the Doug Dawson's gauge of Callout, who gives voice announcement of altitude when descending on the glide / slope.
I had to make many changes to his gauge so it works perfectly with the Project Airbus and I managed to incorporate a touch of flare before the final hit, in order to have landing a little less brutal.
I will not here give all the explanations regarding landing ILS, please look at the many tutorials that are found easily on the net about it.
but just remember the great lines :

- You must set the radio frequency NAV1 to the ILS frequency of the runway you want to land. You will find the ILS runways frequencies and heading (course) of your destination airport on the "DESTINATION" page of the ND (see page 16 of this manual)
- Press the button "Call 1" of the radio NAV1
- Press the ILS button
- Set the ND selector in ILS mode
- Enter the "COURSE" value (heading of the runway) in the autopilot
- Toggle button GPS / NAV to NAV mode if it is not already
- Adjust your heading in HDG mode, or follow the ATC instructions to approach (FSX ATC or network ATC) or whether you must drive your aircraft at a distance of approximately 25-30Nm of the runway and at an altitude of 2700ft above the airport elevation (you also find this information on the "DESTINATION" page of the ND)
- The angle of the axis of the "ILS flag" should be about 30 ° or less (the ILS flag is a green cone that you appear on the screen of the ND in NAV mode or ARC mode).
- You must have set the autopilot in HDG mode and arming the NAV mode by pressing the "LOC" switch. The button "HDG" and "LOC" must be turned on and you must have the display of the terms "HDG" and "NAV" on the PFD screen.
- If you are fairly close to the airport, you must begin to hear the Morse code signal from the ILS radio beacon.
- · Your approach should be at moderate speed , less than 200 kts, with the flaps in position 2.
- · As soon as the aircraft will intercept the "GLIDE" signal (lateral guidance), the HDG light will turn off, and only the NAV indicator is always on (the green HDG indication on the PFD must disappear). This is a sign that the aircraft is now guided by side in the ILS beacon.
- Watch the little magenta "diamond" on the vertical scale on the right of the PFD; For now, it should be located at the top of the ladder. As soon as you see it begin to descend,decrease your speed to 180 kts, and set your flaps to the third position; You can down gear
- Press the "APPR" button before the magenta diamond crosses the center line of the scale. The indication "G/S" must appear on the PFD, indicating that you have captured the "SLOPE" (vertical guidance).
- Decrease your speed to 170 kts and Extend your flaps in Full postion
- Set the value Autobrake adequate according to the weight and the plane and the length of the runway.
- A small green circle appears to the right of the PFD vertical strip of speed and indicates the Vref (speed reference for landing)
- Adjust your speed on the green circle.
- When the magenta diamond passes the midline, the aircraft will begin its descent to the runway, automatically guided by the ILS.
- The Callout goes into action, with the voice annoucement of the altitude
- Arrive at 55 feet above the runway threshold, the gauge of autoflare, will modify the rate of descent to start rounding
- At 20 feet, the throttles are set to 0
- As soon as the wheels touched down, the spoilers will automatically deployed; the autobrake into action; You just have to engage the reverse thrust.
- At 60kts, cancel reverses
- A 55 kts, Spoilers retract automatically
- At 20kts the autopilot disconnects.
- You have arrived

NOTA : If there is a sudden change of level ground (mound, ditch building) before the runway threshold, the gauge of autoflare can be disturbed because it is based on the final altitude radar, which can cause erratic operation of the autoflare.

On the other hand, the proper functioning of this system has its limits:

- Above all, do not land in overload ! **(145 505 Lbs or 66 000kg max)**
- Respect the reference speed shown on the ASI (green dot)
- May the wind be stable (no burst or change of direction) and is **very close to the axis of the runway**

Overspeed, overload, crosswind will finish by a crash !

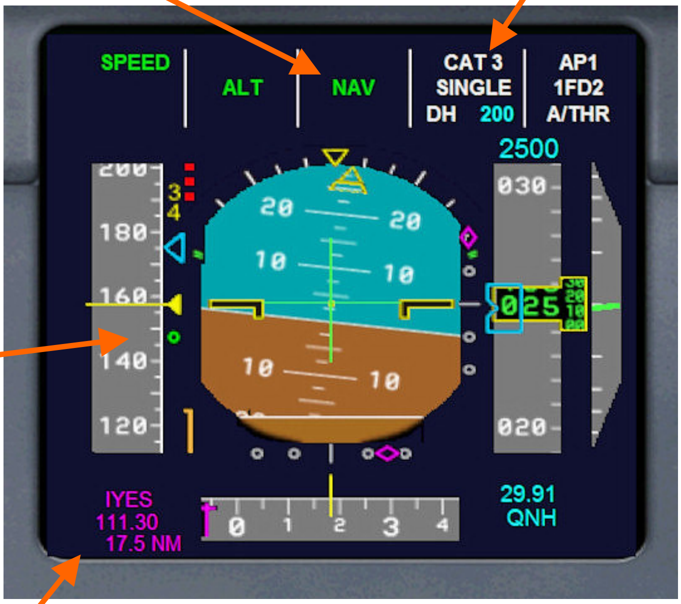
The Doug dawson Callout system gives the following annoucement :

- 2500
- 1000
- 500
- 200
- « minimum »
- 100
- 50
- 40
- 30
- 20
- 10

Now, almost until the last moment, you can change your mind, either by disengaging the autopilot, and by taking orders manually or by engaging the TOGA switch
The announcement "minimum" is the "Decision Height", an adjustable value (default to 200ft), which determines the ultimate point where you can change your mind, and start a Go-Around procedure. TOGA mode by switching the mode "GLIDE / SLOPE" is canceled, the incidence of the plane is set to 12 ° with the engines at full power.

ILS signal has been capted when HDG indication disappears et only NAV indication stays.

Show ILS Cat et type
DH = Decision height
DH is adjustable by click mouse on the area.

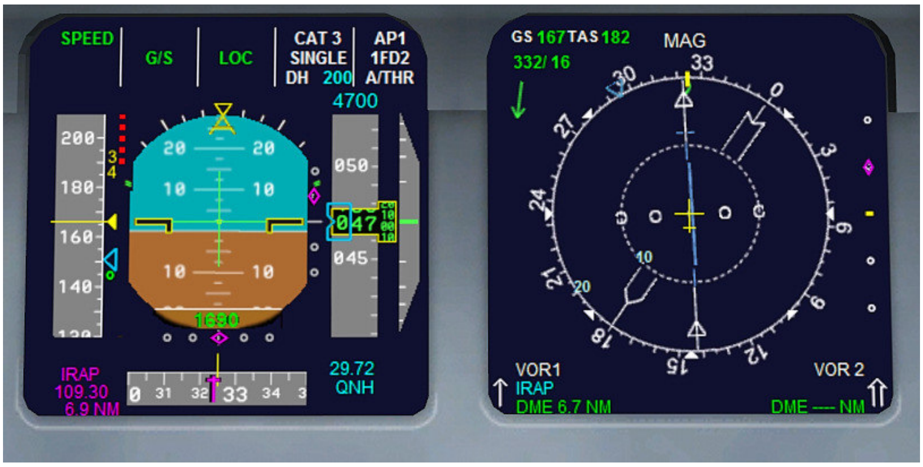


Green dot is the Vref, the safety landing speed. With autolanding, it is very important to not exceed this speed, see even a little below.

Picture 71 – PFD ILS mode

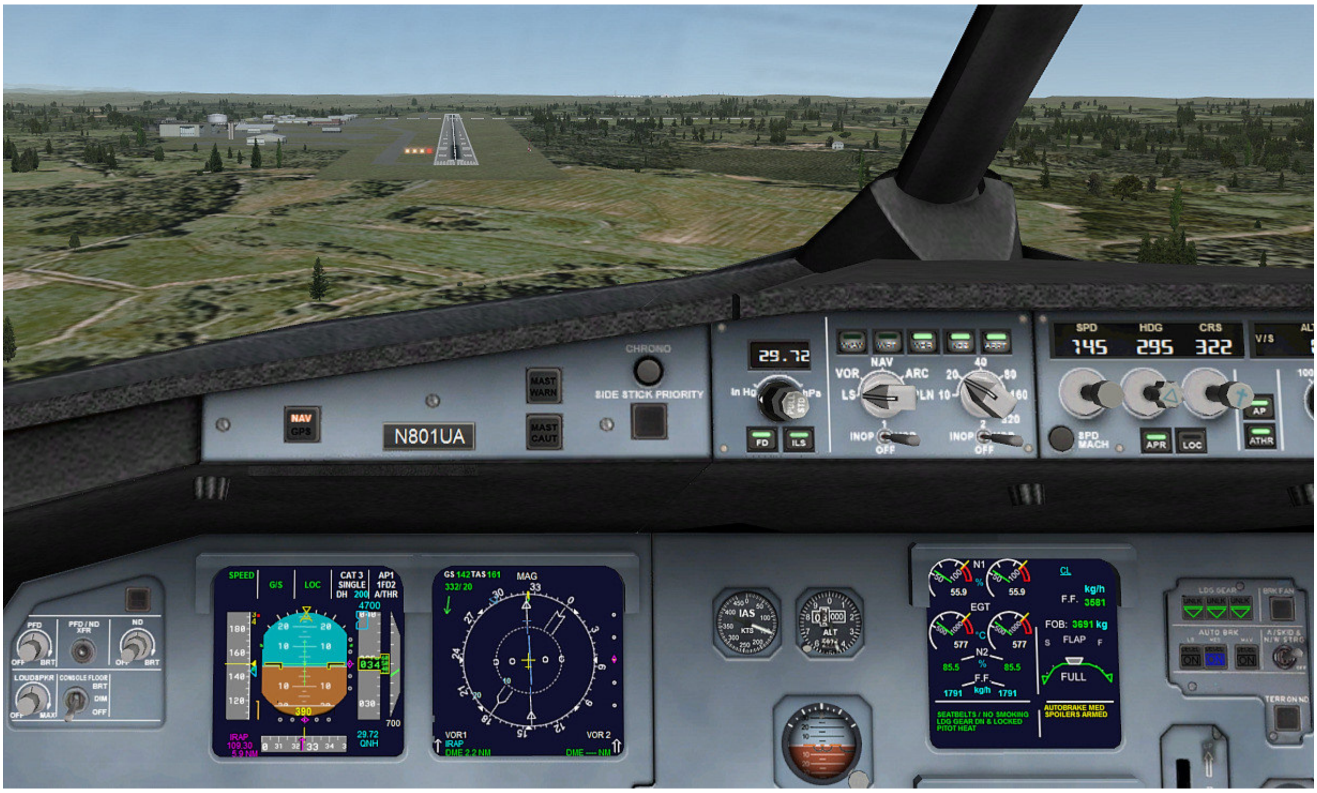
Display ILS ID, frequency and distance if it is a DME

Landing at Rapid City, LOC has intercepted the GLIDE SLOPE, the plane is about to embark on the glide slope, although it remains to match the pitch on the green mark to Vref. The conditions are excellent for a autolanding: The wind is in the line of the runway, and its strength, compensates for the fact that this airport is at high altitude (causing a real landing airspeed important, TAS).


SPEED
G/S
LOC
CAT 3
SINGLE
DH 200
AP1
1FD2
A/THR
4700
IRAP
109.30
6.9 NM
29.72
QNH
GS 167 TAS 182
332/ 16
MAG
VOR1
IRAP
DME 6.7 NM
VOR 2
DME ---- NM

Picture 72 – PFD & ND in ILS mode

Runway 32 Rapid City is seen, autobrake is set to medium (see next section), the full flaps (which cause the automatic arming of the spoilers) We are on the Glide slope;
We hear in the Cockpit voice announcement of the various steps of the descent.


N801UA
CHRONO
SIDE STICK PRIORITY
29.72
SPD
HDG
CRS
145
295
322
FD
ILS
APR
LOC
AP
ATHR
FULL
AUTOBRAKE MED
SPOILERS ARMED

Picture 73 –ILS landing - VC view

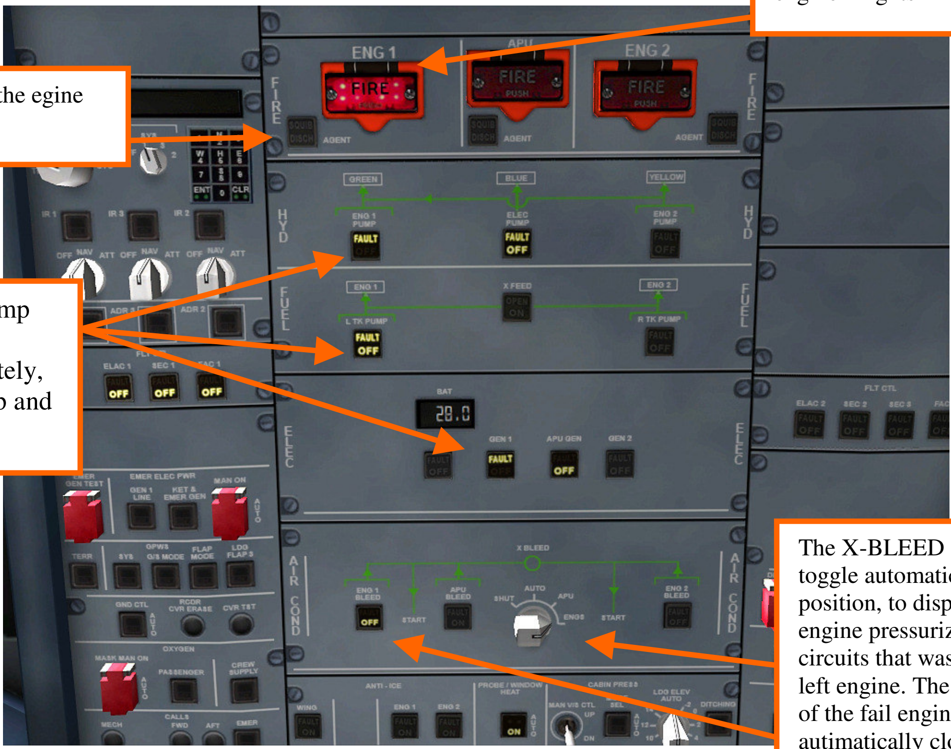
5.8 Engines failure management

I turned on the aircraft engine fault management and first and foremost, the possibility of a fire engine.
Imperative to minimize the engine failure, be sure to always set the X-BLEED on the "AUTO" position after starting the engines. (see area 3 of overhead picture, page 23 and 24).
Indeed, if your X-BLEED selector is set to AUTO, the bleeds will be ordered automatically in case of fire detection to keep the pressurization system operational.

5.8.1 Fire engine

Picture 74 – Fire on left engine…

In case of fire engine, an audible alarm sounded immediately and continuously. If the X-BLEED selector was on AUTO position, here is what happens:


ENG 1
APU
ENG 2
FIRE
FIRE
FIRE
AGENT
HYD
FUEL
ELEC
AIR COND
GREEN
BLUE
YELLOW
FAULT
OFF
X FEED
BAT
28.0
GEN 1
APU GEN
GEN 2
X BLEED
SHUT
AUTO
OPEN

The light « Fire engine » lights

Release button for the egine left extinguisher.

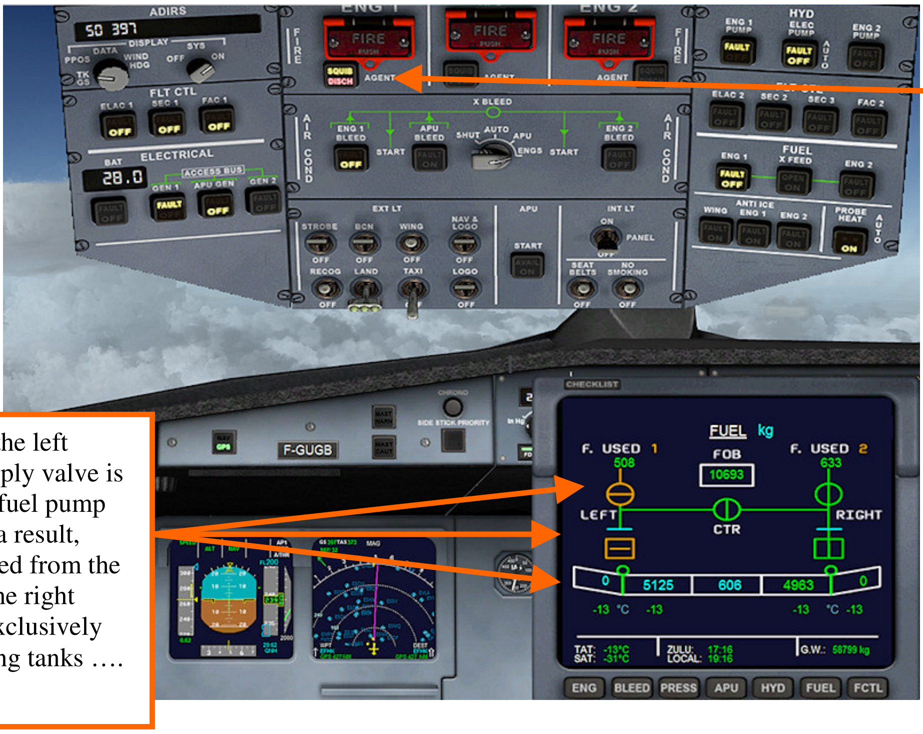
The hydraulic pump of the left engine stopped immediately, and the fuel pump and alternator.

The X-BLEED selector toggle automatically to ENGS position, to dispatch the right engine pressurized air to the circuits that was fed by the left engine. The engine bleed of the fail engine is autimatically closed.

Picture 74 – Fire detection and alarm with left engine on fire…

Right engine stop instantly !!.

It should operate the extinguisher at the earliest, to neutralize the fire. There is that once the fire is off the audible alarm stops



The fire extinguisher has been operated, the fire is out. The alarm is off.

As you noted, the left engine fuel supply valve is closed and the fuel pump is stopped: As a result, tanks are isolated from the left wing and the right engine is fed exclusively by the right wing tanks ….

Picture 76 – Fire is out. We'll have to manage the fuel system to prevent the plane imbalance ….
Please, note that this screenshots comes from the Airbus A319, which have jyst one center tank…

Because the left wing tanks are now isolated, the right engine pump its fuel only on the right wing, which will cause an imbalance of the aircraft. To remedy this, we will have to operate the fuel X-FEED valve (CROSSFEED), re-start the left fuel pump and turn off the right, to feed momentarily right engine with the left wing tanks, until return to equilibrium ;.

Once this equilibrium is reached, it will start again the left pump, without disconnecting the righ pump and leaving open the Crossfeed, so that the right engine feeds on all tanks.

When the Crossfeed is open and the 2 fuel pumps run, all tanks are in use.

All the fuel system management in case of engine failure is described at chapter 4.7.2, page 28 / 29.

5.8.2 Other engine failures

In the case of other engine failures (oil leak, lack of lubrication, etc ...), an alarm will sound, but an ad hoc basis, with the lighting of the master warning, before the engine fails permanently . For these failures, it will be yours to manage Bleeds before the engine failure (by opening the X-BLEED ENGS position and closing the engine bleed concerned, and manage the fuel system as described at **chapter 4.7.2, page 28 / 29.**

5.9 Tips for the best use of the A320 FD V3

- Select with care the amount of fuel needed for your flight. There is no point from overload, because you might be too heavy for landing at your destination. However, take a safety margin in case of contrary winds or diversion.
- Think that I have changed default FSX the fuel management, since it worked the opposite of reality .. On the A320 FD Special Version 3, the fuel is pumped first in the center tank, then in the wings; So before you start your flight when you choose the amount of fuel that you will prevail, empty primarily the center tanks (without going below the 15/20% threshold rate if you want to keep filling the reserve system security)
- If you change the payload (passengers or cargo) be sure to keep the center of gravity close to the original one.
- On takeoff, do not take too much slope, as the aircraft did note take a little speed; Do not exceed 2000 feet / min until the aircraft has not reached 220/230 kts.
- If the plane has an angle of climb too high from the takeoff, adjust quickly the trim (in DIRECT LAW mode only)
- At takeoff , select a flaps configuration adapted with the aircraft's weight, for reduce your takeoff speed or runway length required. Look at page 57, Vr speed data, or if you are already in the cockpit, you can access to the ref file via the kneeboard.
- When starting 100% manual, do not forget to switch on the flight controls of Fly By Wire in the configuration you want, otherwise the flight controls will not work !
- To restart an engine in the air, remember to reset the Master Ignition switch on IGN / START position and put on the X-BLEED ENGS if you reboot without APU.
- Use the interactive Checklist Stefan Lieb, it is very convenient
- Watch your landing weight (message "Check Weight" flashing red if exceeded).
- Be careful if you select the NORMAL LAW mode of Fly By Wire, your driving habits may be disturbed
- To open the aircraft's doors :

To open the aircraft's doors :	Main left door	= Shit + E
	Cargo doors (2)	= Shift + E & 2
	Rear left door	= Shift + E & 3
	The 2 Right doors	= Shift + E & 4

CLIMB : (So bot exceed 10° of pitch !)

Altitude	Verticale speed	Maximum speed
0 à 10.000 ft	2000 then 3000 to 3800 ft/mn	250 KIAS
10.000 to 18.000 ft	2200 to 3000 ft/mn	290 KIAS
18.000 to 25.000 ft	2000 to 2900 ft/mn	310 KIAS
25.000 to 28.000 ft	1700 to 2300 ft/mn	Mach 0.74
Above 28.000 ft	1100 to 1500 ft/mn	Mach 0.77

Recommended cruise speed = Mach 0.77 / Mach 0.80 - Maximum ceiling= 39.000 ft

Descent :

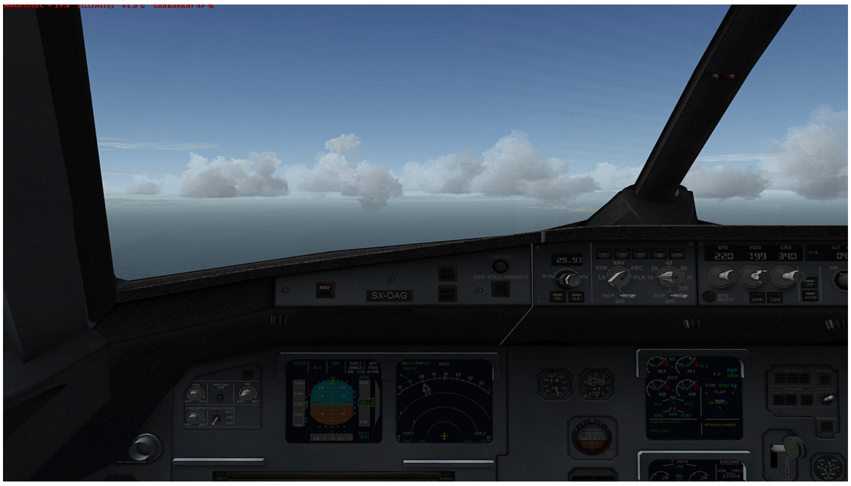
Altitude	Verticale speed	Maximum speed
39.000 to 25.000	2500 à 3000 ft/mn	Mach 0.72 max
25.000 to 18.000 ft	2500 à 2000 ft/mn	290 KIAS
18.000 to 10.000 ft	1800 ft/mn	280 KIAS
10.000 ft to approach	1500 ft/mn	250 KIAS
Approach to ILS signal	1200 ft/mn maxi	225 KIAS – Flaps 1 (S)

Landing

- Set ILS frequency NAV1
- Turn on landing lights
- Flaps 1+F 200 KIAS
- Flaps 2 190 KIAS
- At LOC interception → 180 KIAS Flaps 3
- At Slope interception → Gear down, flaps Full : Decrease your speed to Vref (green dot)
- Set Autobrake
- At touchdown, set engines reverses
- Turn off reverses under 60kts.

6 VC Day lighting

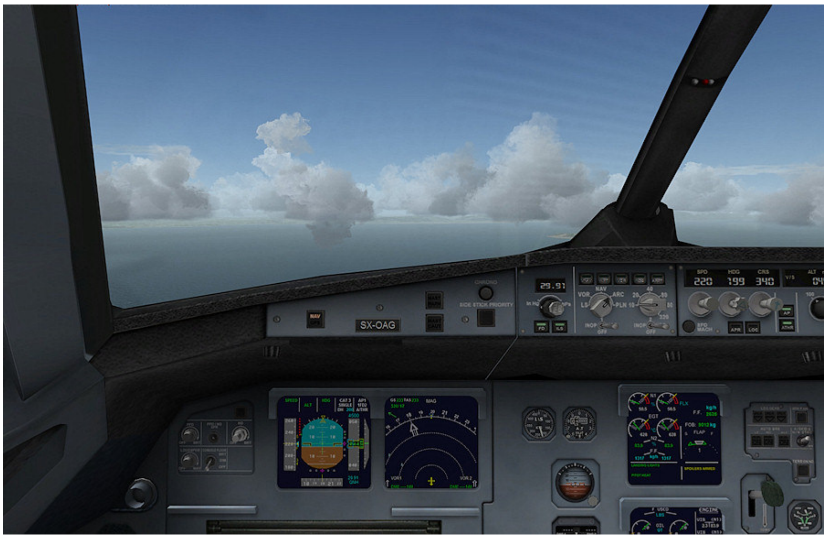
FSX has a big flaw with some aircraft in VC mode (Virtual Cockpit). At dawn or late afternoon when the light outside is low, but it is not yet night, the dashboard of the plane can be very dark (especially if you're flying against the light), that renders it unreadable and FSX only allows night mode switching panel ..... that when it gets dark. So during these phases of flight, it is extremely unpleasant to fly or must necessarily pass in 2D Cockpit.
This phenomenon also occurs in the daytime, when using software like "SHADE" which increases the contrast in FSX, and causing this situation even in daylight when flying in against the light.
To remedy this, I create a "day VC lighting." It can illuminate the dashboard under these conditions:
Picture example with software “Shade” against sunlight in days:



Picture 77 – default Virtual cockpit iew with « SHADE »

Like you see, it is very very darker !

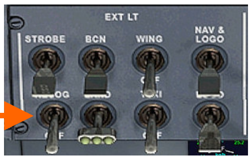
In the same condition, with my day VC lighting :



Picture 78 – My daylighting for the VC

It’s a better, isn’t it !
Initially, on the Project Airbus V2 versions I have already made, this cockpit day light was controlled by the general lighting switch panel; On the V3 version, I decided to completely separate the control of the day lighting of the general light switch of the cockpit.
For this, I "recovered" a light switch that was unused on this aircraft: The "RECOG" switch (see picture below), located on the overhead (only the 2D panel). So if you want to turn on the day lighting for the virtual cockpit, you simply activate the “RECOG” switch.

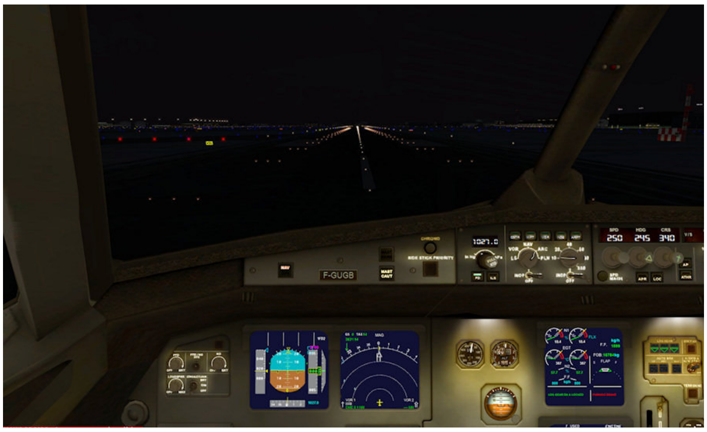
I use the « RECOG » light switch for turn on/off the cokpit day lighting.



NOTE: This switch is actuated in the 2D window of the overhead panel (Shift + 5 keys) It is inactive in the virtual cockpit.

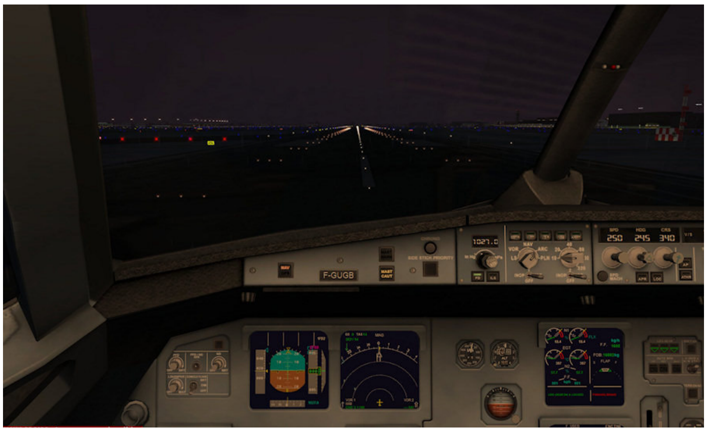
- If the day lighting is active, it may be that the light starts to flash in the VC when enabling all navigation lights with the landing lights and taxi lights simultaneously. To undo this mess, simply turn off taxi lights or landing lights.
- At night, if you enable the day lighting at the same time as the lighting standard of night VC, the two lights will superpimposed, making the dashboard too bright; So disable one of two lighting .

Default Night lighting VC. Label 9, picture 24 & 25, page 31 & 32).



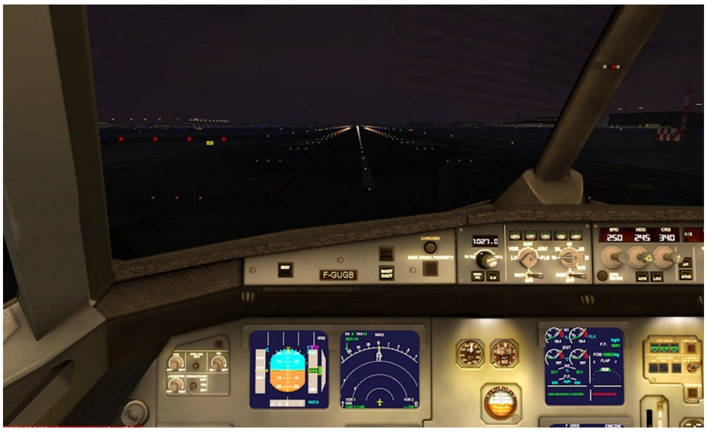
Picture 79 – Default night linghting VC of FSX

If you turn the daylighting's VC at night, the virtual cockpit will look like this. (Switch "RECOG" Zone 8, picture 24 and 25, page 31 and 32)



Picture 80 – My day lighting by night….

If you turn the night lighting and day lighting of VC, the two lights will be superimposed, making the dashboard too illuminous. The situation is not irreversible, simply cancel one of the two.



Picture 81 – If you set the day and night lighting at the same time, they will be surimposed VC

8 Airbus A320 features & data

Version of this package :

- **A320-100/200** Airbus Industrie code **WV0011**
- Two classes cabin – 12 + 138 seats
- **CFM** Version : 2 **CFM56-5B4** 27000 lbs (120.01 kN) thrust
- **IAE** Version : 2 **IAE v2527-A5** 26500 lbs (117.88 kN) thrust

Weights	Kilograms	Lbs
Empty weight (OEW) CFM engine	41 244	90 927
Empty weight (OEW) IAE engines	41 345	91 150
Maximum taxi weight (MRW)	75 900	167 331
Maximum Takeoff weight (MTOW)	75 500	166 449
Maximum Landing weight (MLW)	66 000	145 505

Dimensions	Meters	Feet
Lenght	37.57	123.26
Width	33.91	111.25

Capacités	Liters / Kg	US Gallons / Lbss
Maximum Fuel capacity	26 759 liters	7 069 Gallons
Maximum fuel Weight	21 005 kg	46 308 pounds
Pax Seats	150 to 180 (15 for this two classes version))	

Maximum operational speeds :

- Maximum tires landing speed : 195 kts
- Maximum operational speed (VMO) : 350 KIAS
- Maximum retractation landing gear (VLO) : 220 KIAS
- Maximum expand landing gear speed (VLE) : 250 KIAS
- Cruise speed (FL33) : Mach 0.77
- Maximum operational speed : Mach 0,825

Maximum turbulence penetration :

- bellow 20 000 feet : 270 KIAS
- above 20 000 pieds : 300 KIAS

Stall speed in charge :

- no flaps : 128 KIAS
- « Full Flaps » configuration : 100 KIAS

Maximum crosswind for takeoff and landing :

- For Takeoff and landing : 29 kts
- ILS CAT III Landing : 15 kts
- Maximum gust : 38 kts
- Maximum Tailwind takeoff : 15 kts
- Maximum tailwind landing : 10 kts

You can access to a Checklist and a reference file from the FSX kneeboard in the aircraft.

These 2 files have been released by **Jean-Pierre Varnier.** Many thanks to Jean-pierre

Take off Speeds Flaps : 1+F

Weight / Lbs	Weight / kg	V1	Vr	V2
165.500	75.500	138	156	159
156.500	71.000	132	150	153
147.500	67.000	127	144	147
139.000	63.000	122	139	142
130.000	59.000	117	135	138
123 500	56.000	116	133	136
119 000	54.000	116	131	134
114 600	52.000	116	126	131

Take off Speeds Flaps : 2

Weight / Lbs	Weight / kg	V1	Vr	V2
165.500	75.500	132	147	150
156.500	71.000	127	142	145
147.500	67.000	123	138	141
139.000	63.000	119	134	137
130.000	59.000	115	130	133
123 500	56.000	114	128	134
119 000	54.000	114	123	132

Take off Speeds Flaps : 3

Weight / Lbs	Weight / kg	V1	Vr	V2
165.500	75.500	130	144	147
156.500	71.000	125	139	142
147.500	67.000	121	135	138
139.000	63.000	118	132	135
130.000	59.000	113	130	133
123 500	56.000	113	128	133
119 000	54.000	113	126	131

Landing speeds flaps 4 (Full)

Weight / Lbs	Weight / kg	Vref / Kts
145.500	66.000	142
141 100	64.000	139
137.800	62.000	136
132 300	60.000	133
128.000	58.000	130
123 500	56.000	127
119 000	54.000	124

8 Troubleshootings

The speed goes crazy when climbing on autopilot
Either you forgot to activate the heaters pitot tubes (and they are frosted) or the parameters of realism of FSX are misconfigured: see chapter : 5.4, page 42

When I activate the landing lights, cockpit lighting flashes It may be that this bug is present on certain configuration when all the lights are turned on simultaneously; Unfortunately I have not yet found the solution to prevent it from happening, but it is easy to solve:
If the lighting of the dashboard will flash, then open the popup window of 2D Overhead (SHIFT + 5), and actuation of the switch "RECOG." The flashing is gone. (see chapter 6 page 54).

At night, the lighting of the dashboard of virtual cockpit is much too bright.
You have activated the day lignting with the night lighting. Turn off one of the 2 (the day lighting is operate by the « RECOG » switch of the Overhead.

VNAV mode will not be armed.
Forgot one step necessary for its implementation (adjustment of altitude or A/THR arm ...)
(cf chapitre 5.3, page 38).

After takeoff, the flaps do not want to retract all alone.
You have a rate of climb (vertical speed) inapropriate: It is either too low or it is too excessive.
The SFCC retract orders under conditions that the aircraft is between 200 and 2000ft feet above ground level (AGL), its speed at this time is at least 190kts and 210kts maximum, and that the rate of climb (VS) is at least 500ft/mn.

The speedometer of the PFD goes to 0 in flight.
The pitot tubes are frosted; You forgot to activate the heating of pitot tubes. The control is mounted on the overhead.
The speed is not recalibrated uphill beyond FL 250..

Mach speed is not recalibrated while climb above FL 250.
You fly too slowly; the autopilot controls the speed beyond that of 25 000ft above it is greater than M 0,65: Increase your speed.

The plane is landing next to the runway during a Autolanding (Autoflare).
There were probably too crosswind component. The autolanding can only work if the wind is very close to the axis of the runway (less than 15 ° deviation and less if wind is strong)

The aircraft crashed during a Autolanding (Autoflare).
Several possible reasons: either you pass the maximum allowed mass for landing (66 000kg / 145 505 lbs) or your landing speed was too high (you have not respected the Vref symbolize by the green circle on the tape speed of the PFD).

All the flight controls don't work !! !
You have forgotten to activate the Fly By Wire (or to choose the right mode)with the switches of the left and right FLT/CTL area of the de l'overhead.(See Chaper 5.6, page 44).

I have a fsx message which indicate that fuel level is low and that I must press CTRL+X
Don't care to this message. My aircraft use a specific fuel gauge, and it a sound alarm and ecam message will show you if your fuel level is too low; See chapter 4.7.

I cannot start engines or all displays are turn off.
If you have activated the battery switch, all avionics use power, so if you havn't start immediately APU or a Engine and don't set generator, voltage of the battery will be to low; Under 17 volts, System don't work; you must start APU and set APU generator to restore the battery. So, the manual engine startup is complex; see chapter 5.1, page 30)

My virtual cockpit is black (no texture) when I have installed a new Texture.
Missing file "Texture.cfg" in your new texture folder. This file points to the "Texture" folder which contain the VC's texture. You can copy the "texture.cfg" file that you will find in one of the texture.xxx come with my aircraft pack, and paste it in your new texture folder

NOTA : When you load a previously saved flight, some variables are reinitialized with defaults values, and I introduced a delay about ten seconds, so that the environment of FSX is stabilized and that I can restore the settings flight. In Mach mode (beyond 25 000 ft, it is possible that there is a slight difference in the speed of recovery of flight relative to the speed of the aircraft during the backup (this difference can be 2 or 3 tenth of mach). Check the different parameters that will not be found in the state where they were when the backup..

Aircraft 3D model cretors : Project Airbus Team
Base panel that has been used for this adaptation : Stefan Liebe
Data search, panel adaptation, xml coding and new xml gauges : François Doré
Kneeboard checklist and reference files : Jean-pierre Varnier
Technical supervision for the Bleed circuit and startup procedure : Jean-louis Fonta
Test and Debug : Members of http://www.pilote-virtuel.com/

If you have some problem or question, you can go to :
Support forum in french with dedicated thread : Support Airbus FD Special version in french
Support forum in english with dedicated thread : Support Airbus FD Special version in english

GOOD FLIGHT !!

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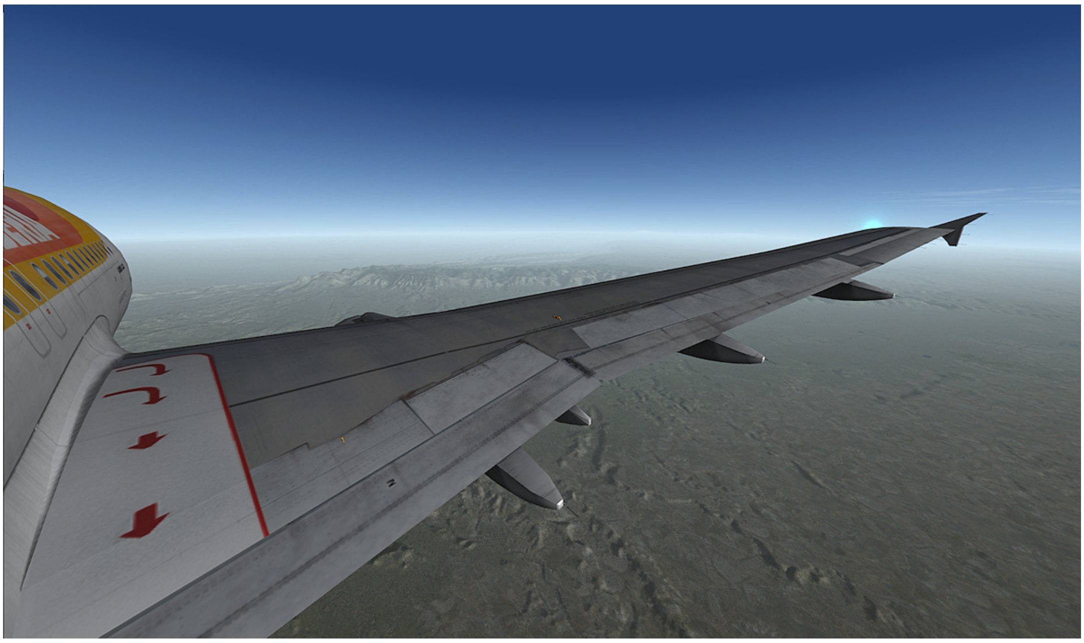
AIR INTER
A320



HAG
IBERIA
EC-HAG
AIRBUS A320
SEÑORIO DE BERTIZ