FLIGHT DECK SOFT

ADVANCED AVIONICS SUITE

JET45 V2

HANDBOOK AND USER GUIDE

VER. 02-APRIL-21

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INTRODUCTION

Welcome to the Flight Deck Soft **JET45** Advanced Avionics Suite. This software is intended for use with flight simulator software and provides the user with a comprehensive avionics solution for those building aircraft that use the style of avionics suite that is used in the Learjet 45. While the software does not claim to be a complete representation of the real-world counterpart of the avionics it is modeled after, it gives the user the ability to operate their simulation in a very realistic manner by way of an authentic appearance and a deep level of system modeling. Throughout the manual the user will find helpful information that goes beyond the use of **JET45** AAS but that also guides the user in the use of the software alongside the operation of the aircraft. However, it should also be noted that this package would make a great substitute avionics suite for other similarly-equipped aircraft as well.

While not a must, the user may find that having real-world handbooks and checklists of the aircraft used with this software a handy companion to guide the user through the proper operation techniques. Development of the **JET45** suite is on-going and the user should note that while there may be mention of certain components of the package mentioned here, that not all of the components have been development for release at this time nor is there any guarantee that the package will ever be 100% 'completed' compared to the real-world counterpart.

It is recommended that the user pay close attention to the guidelines and notes outlined in this User Guide in order to get the best performance out of the package.

*Items that are of utmost importance will be noted in **RED**.

*Items that are considered helpful the user will be noted in **GREEN**.

*Items that are considered for development but not yet available are in **PURPLE**.

INSTALLATION REQUIREMENTS AND SETUP

Jet45 AAS V2 is now a fully networked set of software that runs best on distributed PCs on your network. In order to maximize performance, especially when paired with our Arduino modules, the user should run Jet45 AAS on a non-flight FSX/P3D PC, or even up to 3 individual PCs depending on video output capabilities. For our development system, we have Je45 AAS spread across 3 relatively low spec PCs.

CAPT_PC: Runs DU1, DU2, CWP (via arduino interface), FGC, and all lower left MIP panels via arduino interfaces.

CENTER_PC: Runs RMU1/2, FMS1, and Standby Instruments, all center pedestal panels via arduino interfaces.

FO_PC: Runs DU3/4 and lower right MIP panels via arduino interfaces.

Additionally, a new software component is needed, Jet45 Server, which is responsible for passing all needed data between modules. This enabled the plug-and-play features of the new Arduino modules, and removes the need to use FSUIPC offsets to pass state data which we found to be impactful on FS performance and unreliable in some cases. The Jet45 Server can be run from any PC on your network and should be started and running before any Jet45 modules are started.

1) FSUIPC is required to be installed on the Server machine and **Wide Client** is to be installed and running on each Client machine that is to run any software component in this package. Without Wide Client installed and configured properly, this software will not work on a client.

2) The Microsoft **Redistributable** is required for this package to run. You can download and install this free package from Microsoft (search Microsoft redistributable on google). Install the x86 version if you are on a 32bit windows system, x64 if you are running a 64bit version of windows.

Visual Studio 2015, 2017 and 2019

Download the Microsoft Visual C++ Redistributable for Visual Studio 2015, 2017 and 2019. The following updates are the latest supported Visual C++ redistributable packages for Visual Studio 2015, 2017 and 2019. Included is a baseline version of the Universal C Runtime see MSDN for details.

- x86: vc_redist.x86.exe

- x64: vc_redist.x64.exe

4) Microsoft **Flight Simulator FSX (incl. steam) or P3D** is required for this package to run.

NOTE: you must have a paid and registered version of FSUIPC installed on the simulator PC and a registered copy of WIDEFS on any client PCs for Jet45 to function as a distributed networked system.

5) Once Jet45 is purchased through the Flight1 Software wrapper, the wrapper will then copy the zip file to a directory of your choosing. Once copied, the folder may be unzipped to a location of your choosing and the software will then be ready for use. If installing on multiple PCs, DO NOT copy the unzipped folders to other PCs as this can corrupt the licensing scheme and lead to undesirable results including prevention of the running of the software. It is strongly suggested that you use the original Flight1 Software wrapped version to install on multiple PCs, This preserves the licensing scheme and will result in a more robust installation. Please note that there is no limit on the number of times or PCs that the software can be installed.

6) To install the **JET45** Avionics Suite, simply unzip the zip file to the destination of your choice on your PC or Client PC. Depending on which component you are installing, make sure that you set the .INI files to the preferences that meet your requirements. Each component has different .INI files that may be required to be set differently depending on your application of the software so be sure to read the Component-Specific installation instructions that are included in the section belonging to that component (PFD, MFD, etc.). Once you have installed and configured your software and .INI file, the software can be run at any time but will not show any activity until FS is detected across the network.

NOTE: It's highly recommended that you start FSX/P3D before running any Jet45 components to ensure connectivity to the simulator.

INSTALLATION REQUIREMENTS AND SETUP cont.

Anatomy of configuration "ini" files

All Jet45 "modules" are configured through the use of text files which we call "ini files". These files can be opened in wordpad and directly edited. Each file has a header section that describes the options for each configuration parameter and should be self-explanatory. Once you have set the parameters and are happy with them, we suggest you save a copy of this file in case you need to recover your settings. You can simply do this by creating a copy and renaming it from .ini to .bak

Most of the issues reported with Jet45 are due to incorrect settings in the ini files. While there is no error checking when these files are read, they can be automatically regenerated by the software by simply deleting them and running the Jet45 program. They will be re-created on startup with default values.

NOTE: Window size settings are no longer stored in the .ini files, instead they are now logged into the windows registry. We did this so that other Jet45 components running on the same PC have "access" to the window locations of the other components. This is particularly important to enable the display reversion functions for DU1-DU4, as well as storage location for the paths to the FMS for updating the navigation database using the Navigraph database update tool. You may edit the windows registry if needed by navigating to: Computer\HKEY_CURRENT_USER\SOFTWARE\Jet45_AAS. Please note that editing registry values carries some risk of damage to normal windows operations, however none of the Jet45 registry values can cause problems if they are changed or deleted As with the ini files, you can delete the Jet45 registry values to have them regenerated on startup if needed.

SOFTWARE COMPONENT OVERVIEW

PRIMARY FLIGHT DISPLAYS (PFD)

The Flight Deck Soft **JET45** Advanced Avionics Suite provides a realistic representation of the Primary Flight Displays (PFD) found in the LJ40/45. The Primary Flight Displays typically are displayed on the outboard Display Units 1 and 4. See the Main Instrument Panel illustration in Appendix A.

PFD Main Features:

- Blanking when battery/bus power is off
- SYSTEM FAIL state when battery applied but no Avionics Master applied
- All primary flight data information (AS/ALT/HDG/PIT/ROLL, VS, etc.)
- Comprehensive EFIS integration with bearing source selectors as well as navigation source annunciation.
- Flight Guidance Modes currently selected (Autopilot Modes) NAV/FMS/APP/LOC
- Flight Director Status tied to FGC/EFIS
- Selectable Arc or Compass HSI Modes via EFIS Display Controller with FP Route mapping in Arc Mode.
- Low speed and Over-speed Awareness on Speed Tape
- V-speed markers on speed tape (settable from FMS or MFD vspd menu
- Flap Schedule Limits and low/high speed indications on Speed Tape
- Attractive Display Unit bezel artwork for users without dedicated hardware

Configuration of the PFD.INI file

To navigate to the PFD .INI simply use Windows Explorer to find the .INI file that is embedded in the Component folder and click on it to open in Note pad. Make sure that Word Wrap is ON in Note pad.

```
*****************************************************************************
* show_frame                    - display windows frame (yes,no)           *
* show_bezel                    - display graphical bezel  (yes,no)         *
* du_1_mode                     - Set to DU2 (MFD) or DU3 (EICAS) (yes,no)  *
* path_to_flight_plan           - windows path to FMS flight plan 'Routes' directory *
* path_to_du2                   - windows path to du2 for accfg.ini file    *
* path_to_du3                   - windows path to du3 for accfg.ini file    *
* Enable_arduino_reversion      - Enable arduino for reversion panels (yes, no) *
* PFD_Arduino_Port#             - Serial port for reversion Arduino (1-255) *
* Server_Name                   - Name of PC where Jet45_Server.exe is running *
*****************************************************************************
show_frame:yes
show_bezel:no
du_1_mode:yes
path_to_flight_plan:
path_to_du2:C:\Jet45-AAS\MFD
path_to_du3:|
Enable_Arduino:no
PFD_Arduino_Port#:5
Server_Name:demon
```

Most parameters are self-explanatory, however attention must be paid to the path values. The PFD need to know where to find the file "accfg.ini" file in the DU2/DU3 installation directories. In the example above, we only need to set the path for DU2 because this is the configuration file for PFD1. If this were the configuration file for PFD2 (DU4), we would need to set the path for the DU3 install location. This will be automated in a future release.

QUICK TIP: the accfg.ini file (in the MFD directory) is used to set parameters like flap speeds, Vmax, Vmin, and other general configuration parameters. If you are constantly seeing a red speed tape in normal flight speeds, chances are you have not set the path correctly and the PFD cannot "find" the accfg.ini file, or you have set the speed values incorrectly.

PFD DESCRIPTION

The PFD is used to provide Attitude, Altitude, Airspeed, Navigational, and other air data information as well such as Autopilot/FD Modes. The PFD is located on DU 1 and DU4.

Display Frame

The PFD display frame is adjustable by grabbing a corner with your mouse and moving to the desired size. After the software is closed and then restarted the software will remember the last location and size.
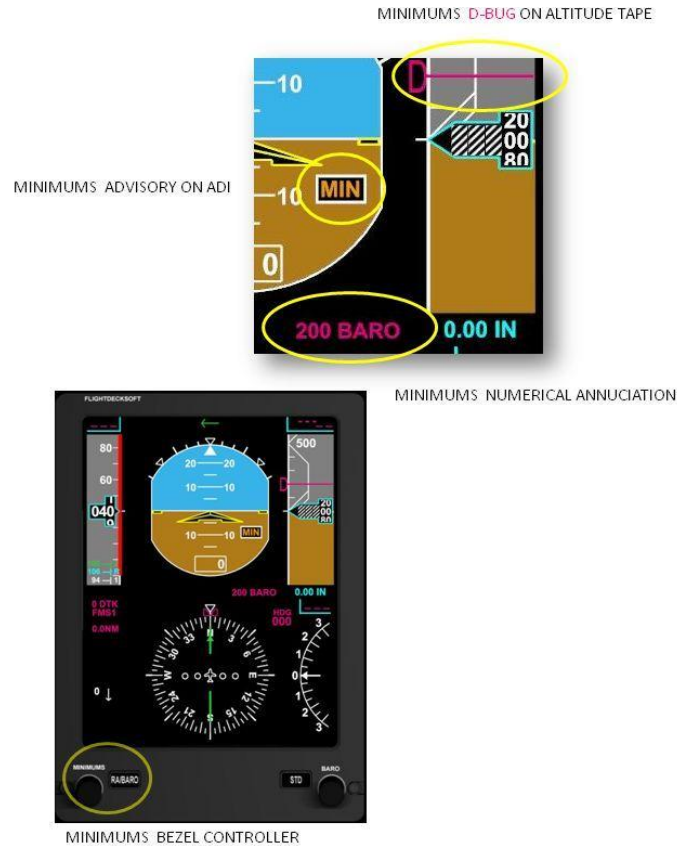
QUICK TIP: Once you have placed the PFD in the right position, you can press "F" on the keyboard to toggle the frame on and off, this is useful for fine tuning position of the display when using an instrument panel cover over the monitor displaying the software. This will also be remembered by the software so next time run, the frame will be on or off based on your last selection.

Bezel Controllers

MINIMUMS Rotary Encoder-

The MINIMUMS rotary encoder adjusts the altitude alert for minimum altitude decent notification. The value is displayed in the lower right corner of the ADI and is also marked on the Altitude tape as a **D**-shaped bug. When the aircraft has descended to or below the pre-selected minimums **MIN** is displayed on the ADI and an Aural Alert of "MINIMUMS" is played on the PC running the PFD software.

MINIMUMS D-BUG ON ALTITUDE TAPE

MINIMUMS ADVISORY ON ADI

MINIMUMS NUMERICAL ANNUCIATION

MINIMUMS BEZEL CONTROLLER

RA/BARO-

Switches between Radar Altimeter and Barometric Pressure

STD-

Sets the altimeter to standard pressure, 29.92" (In) or 1013 millibars (hPa) depending on the setting selected via the EFIS display controller. DU1 and DU4 can display the altimeter setting separately.

BARO Rotary Encoder-

Sets the altimeter to the required altimeter setting in inches (In) or millibars (hPa) depending on the setting selected via the EFIS display controller.

Display Area Data

ADI-

Attitude Direction Indicator. Provides the current attitude and Direction of the aircraft throughout the flight envelope.

HSI-

Horizontal Situation Indicator. Provides 360 degree compass mode or partial compass (Arc) mode. Arc mode also displays the flight plan route once loaded via the FP key on the MFD. Modes are selected via the EFIS display controller labeled HSI.

Bearing Pointers-

See section 9-1 *EFIS Display Controller* for detailed information on the Bearing Pointers displayed on the PFD.

ALTITUDE TAPE, WINDOW, and BUG-

Displays the altitude scale in 100 foot increments. The altitude window shows the current altitude based off of MSL (Mean Sea Level). The altitude tape will show the aircraft's current selected Minimum Altitude if selected via the Minimums rotary selector. The **magenta** altitude select bug is set via the ALT select rotary encoder on the FGC.

AIRSPEED TAPE, WINDOW, and BUG-

Displays the airspeed scale in 10 knot increments. The airspeed window shows the current airspeed as a digital readout as a rolling value with 1 knot increments. The minimum airspeed displayed is 40 KIAS (Knots Indicated Airspeed). At or below 40 KIAS the value will remain at 40. The airspeed will be displayed in KIAS until the aircraft reaches .41 mach at which point the window will display the airspeed as a mach value. When the airspeed window is replaced with mach the On-Ground speed zone below the airspeed tape automatically shows KIAS. The **magenta** airspeed select bug is set via the SPD rotary encoder on the FGC. See FGC for additional information regarding SPD Hold.

V Speeds

V Speeds can be manually calculated and entered via the **SPD** function key on the MFD and then transferred to be displayed on the speed tape on the PFD.
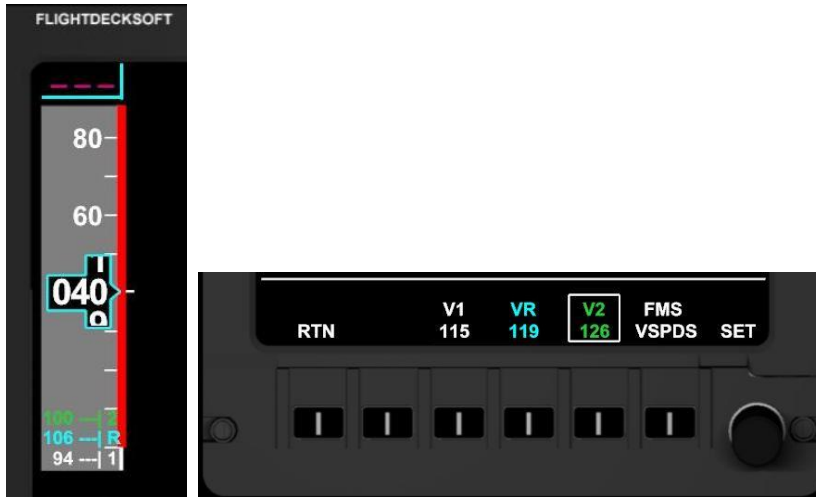
ON-Ground speed zone (User Optional via the .ini)**-**

Displays the current ground speed. Converts to mach values once in the air.

VERTICAL SPEED TAPE , WINDOW & BUG-

Analogue arch displays the vertical speed scale 500 foot increments for both positive and negative rates of climb. Digital scale within the arch displays at 100 foot increments. The magenta vertical speed select bug is set via the SPF select rotary encoder on the FGC. See FGC for additional information regarding VS.

FLIGHT DIRECTOR (FD)-

The FD provides flight guidance cues from the autopilot including pitch and roll. Pressing the FD button on the Flight Guidance Controller (FGC) will cause the FD to be annunciated in the form of an magenta inverted V on the ADI. **JET45 AAS** models FD priority and is symbolized by a green arrow located in the center of the FGC modes annunciation area above the ADI. By default the left (pilot) FD is the active or *Master* FD. FD priority can be determined by the direction of the arrow. The direction of the arrow indicates the Master side and the opposite side indicates the Copy side. Pressing the XFR button on the FGC swaps the side that is Master to the opposite side. Once transferred, the FD priority then uses the navigation sources from the EFIS controller on the side that it is pointing to while in NAV Hold mode.

FD/FGC MODE ANNUNCIATION-

ALT/VS, APP/LOC, FMS/NAV/HDG, YD is displayed above the ADI. These annunciations change according to the mode selected via the Flight Guidance Controller.

Currently selected Flight Guidance Controller modes are annunciated above the ADI as well as Flight Director side status. Modes include **AP, APP, ALT, HDG, LOC, NAV, VS, YD**. **GS** is annunciated upon capture of an ILS signal and is displayed above the vertical deviation scale.

FGC Mode example: Autopilot is ON and the aircraft is holding at an altitude of 19,000' with ALT hold engaged. FMS is the navigation source selected via the EFIS display controller with NAV1 bearing selector pointing to the CRG waypoint in the preloaded flight plan route. NAV2 is tuned to the CRG VOR. The left pointing green arrow indicates that the captain's Flight Director is the Master side. Yaw Damper is engaged.

FGC Mode example: Autopilot is ON and the aircraft is in a climbing right turn passing 33,680' for a target altitude of 41,000'; notice that ALT is replaced by VS which indicates that the autopilot is currently in vertical speed mode. Although the navigation source for NAV1 is the FMS, the aircraft is currently in HDG mode. NAV2 is tuned to the SSI VOR and ADF1 tuned to JUK NDB. The left pointing green arrow indicates that the captain's Flight Director is the Master side. Yaw Damper is engaged.

HSI MODES-

The PFD has two modes of display for the HSI; Compass and Arc.

See HSI Display Data for more information on these two modes.

HSI in ARC Mode   HSI in Compass Mode

Startup- Cold and Dark Avionics

Upon startup the PFD displays should be dark until Battery Master is applied. Once power is applied the display shows data areas and several **X**'s are shown to remind the crew that the avionics are in a failed state. Locations with **- - -** represent where the Air Data Computer (ADC) provides air data to the display once the Avionics Master switch is on. See Illustration 4-a for an example of the screen without Avionics Master applied.

Illustration 4-a

Excessive Pitch Attitude Advisory

The ADI contains **red** warning chevrons to bring attention to excessive pitch attitudes that guide the crew to lower the nose in an effort to avoid an aerodynamic stall situation.

Low Speed Awareness Line and Airspeed Box

The speed tape contains a **magenta** low speed awareness line to bring attention to slow airspeed conditions that alert the crew maintain proper speed in an effort to avoid an aerodynamic stall situation. The digital airspeed window turns **yellow** when the airspeed drops below 100 KIAS.

Currently the Low Speed Awareness Line does not adjust to altitude changes so be aware of performance parameters when operating at higher altitudes.

ENGINE INDICATING AND CREW ALERT SYSTEM (EICAS)

The Flight Deck Soft **JET45** Avionics Suite provides a realistic representation of the EICAS found in the LJ40/45. The EICAS is typically displayed on the Display Unit 2 However, the user may elect to swap it with the Multifunction Display and operate it on DU3. DU Reversion has been implemented to allow switching position with DU2.

EICAS Main Features:

All primary Engine, Hydraulic, Electrical and Environmental information

Control Surface Trim and Current positions (Ailerons, Elevators, Rudder, and Speed Brake/Spoiler)

Crew Alert System (CAS) Messages displayed per real-world LJ45 parameters.

Integrated Master Caution/Master Warning offset available for new CAS messages.
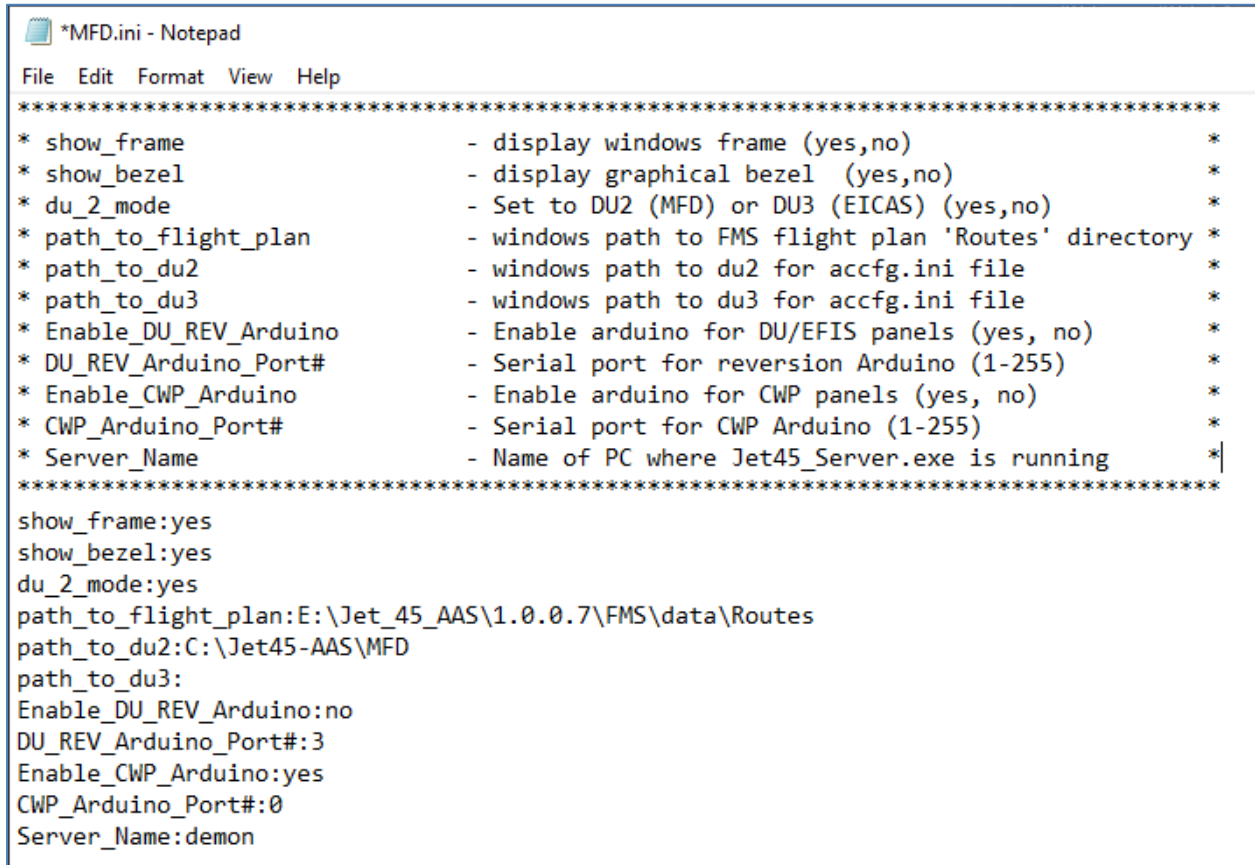
Engine Start/ Reverser Status

Basic **D**igital **E**lectronic **E**ngine **C**ontrol (DEEC) values for TO thrust setting based on real-world LJ45 performance data. MANUAL Mode option to remove DEEC values.

DU2 and DU3 Reversion (Display swapping)
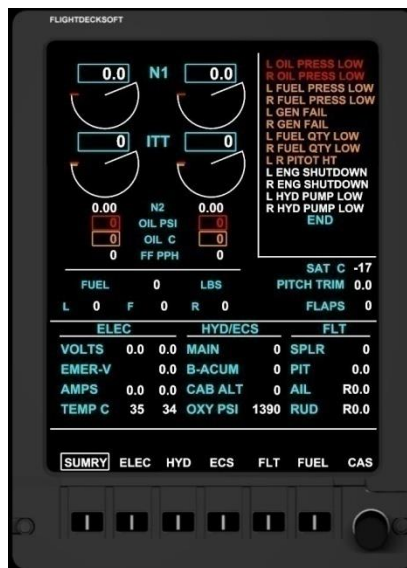
Configuration of the MFD.INI file

To navigate to the EICAS .INI simply use Windows Explorer to find the .INI file that is embedded in the Component folder and click on it to open in Note pad. Make sure that Word Wrap is ON in Note pad.

```
*MFD.ini - Notepad

File  Edit  Format  View  Help
**********************************************************************************
* show_frame                 - display windows frame (yes,no)                   *
* show_bezel                 - display graphical bezel  (yes,no)                *
* du_2_mode                  - Set to DU2 (MFD) or DU3 (EICAS) (yes,no)         *
* path_to_flight_plan        - windows path to FMS flight plan 'Routes' directory *
* path_to_du2                - windows path to du2 for accfg.ini file           *
* path_to_du3                - windows path to du3 for accfg.ini file           *
* Enable_DU_REV_Arduino      - Enable arduino for DU/EFIS panels (yes, no)      *
* DU_REV_Arduino_Port#       - Serial port for reversion Arduino (1-255)        *
* Enable_CWP_Arduino         - Enable arduino for CWP panels (yes, no)          *
* CWP_Arduino_Port#          - Serial port for CWP Arduino (1-255)              *
* Server_Name                - Name of PC where Jet45_Server.exe is running     *
**********************************************************************************
show_frame:yes
show_bezel:yes
du_2_mode:yes
path_to_flight_plan:E:\Jet_45_AAS\1.0.0.7\FMS\data\Routes
path_to_du2:C:\Jet45-AAS\MFD
path_to_du3:
Enable_DU_REV_Arduino:no
DU_REV_Arduino_Port#:3
Enable_CWP_Arduino:yes
CWP_Arduino_Port#:0
Server_Name:demon
```

MFD configuration is similar to the PFD. For flight plan displays, set your path to the flight plan folder of the FMS. In this case, the FMS is run on a different computer on the network than the MFD. Here, the PC running the FMS has been mapped as the "E" drive. Folder sharing must be setup correctly on all of your PCs for this to work. There are many good tutorials on how to setup file sharing and drive mapping on Google and YouTube.

Fundamental Engine Indications

N1-

Fan Speed shown as percentage from 0% up to 100.00%

ITT-

Internal Turbine Temperature shown in 1 degree increments from 0 to 1014 degrees.

N2-

Turbine Speed shown as percentage from 0% up to 115%.

OIL PSI-

Oil Pressure shown as degrees Celsius up to 150.

OIL C-

Oil Temperature shown as degrees Celsius up to 175.

FUEL FLOW PPH-

Fuel Flow in Pounds Per-Hour

FUEL QUANTITY-

Fuel Quantity on board in pounds. If the fuel quantity level is at or lower than 330 pounds in the Left or Right wing tanks, amber boxes will surround the **amber** digital value of fuel remaining as a advisory to the crew.

Control Surface Trim Values and Positions

Contained within the FLT page is the current Pitch, Ailerons, Spoilers and Flaps positions.

Pitch-

Shows the current position of the pitch trim both graphically and digitally.

Ailerons-

Shows the current position of the aileron trim both graphically and digitally.

Spoilers-

Shows the current position of the spoiler both graphically and digitally. Maximum spoiler value is 60 and due to the spoilers being used as spoilerons it is common to see a spoiler value depicted when turning the yoke to the left or right.

Per real world LJ45 publications, SPOILER AND FLAPS SHOULD NOT BE EXTENDED AT THE SAME TIME.

Flaps-   Shows the current position of the flaps graphically.
                                    Flap positions are 0 (UP), 8, 20, and 40 (DOWN).

Flaps Limit Schedule-

8 DEGREES:	250 KIAS
20 DEGREES:	200 KIAS
40 DEGREES:	150 KIAS

Crew Alert System (CAS)

Located in the right-hand side of the EICAS screen is the CAS section that provides the crew various messages that are generated under certain conditions.
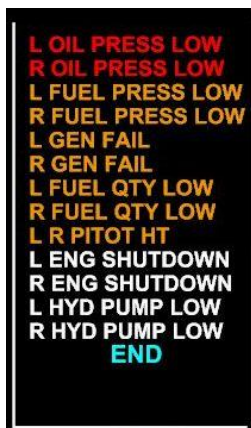
CAS Messaging is in 3 colors:

Advisory messages advise the crew of notable events on board the aircraft.

Caution messages advise the crew of items that need attention in a timely manner.

Warning messages advise the crew of items that need attention immediately.

END is displayed at the bottom of the CAS section to signify no other messages.

NOTE: Both Caution and Warning messages are integrated with the Master Caution/Master Warning system via a dedicated offset. Each time a Caution or Warning message is generated the DU/REV Arduino module will set an output to a pin which should be wired to the WARN/CAUT indicators on the Reversion Panel. It is advisable to use self-flashing LEDs in the Reversion panel to replicate the actual behaviors above.

Engine Status

Engine performance monitoring is made simple by observing the N1, ITT, N2, Oil PSI and Oil temperature values presented on the EICAS screen. Any time a parameter's caution or warning value is exceeded; the value becomes boxed and turns **amber** (CAUTION) or **red** (WARNING). Please see the *Known Issues* section for more information regarding Engine Status values.

Thrust Reverse

Above the N1 display on each engine is a thrust reverse status annunciation. When reverse thrust is initially applied `REV` is displayed as the reversers transition from locked to unlocked into idle reverse thrust.

DEP is displayed when the reverse levers are moved to apply any reverse thrust aside from Idle reverse thrust.

DEEC Implementation

Digital **E**lectronic **E**ngine **C**ontrol has been modeled for Takeoff Thrust (TO) in this package. The TO Mode provides a N1 limit value in **magenta** that is located just under the current N1 value as well as a **magenta delta-shaped pointer** that shows the position of where the N1 setting should remain according to the DEEC calculation. DEEC TO Mode data will be displayed anytime the aircraft is on the ground or has flaps set at 8 or greater while in the air. The crew should set takeoff thrust no higher than the value presented in order to gain the best engine performance without exceeding the published engine parameters. The DEEC TO Mode display can be removed by pressing the Manual Fuel Mode button (MAN) on the Engine Start panel if the user has implemented the included MAN Mode offset.
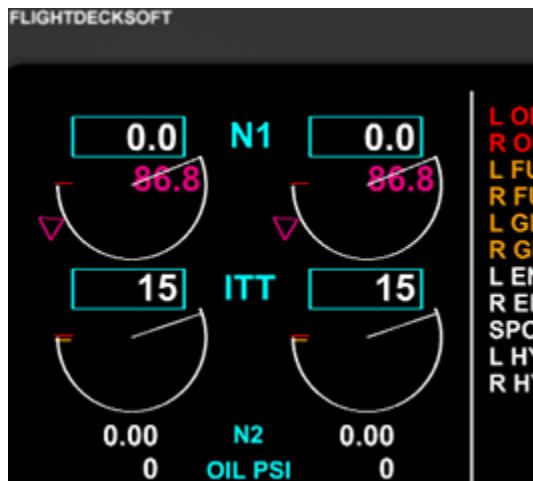
DU Reversion

For convenience the crew can employ Display Unit Reversion between the ND/Map display and the EICAS displays (example DU2 to DU3). This is helpful for those who may allow prefer the MFD/NAV Display to be placed on DU2 rather than DU3. DU Reversion is handled by pressing the momentary EICAS REVERSION selector which is located on both ends of the glare shield where the Master Caution/Master Warning panels are located. Once activated, the DU/REV Arduino modules will signal the EICAS display to change to the ND/MAP display that is typically found on DU3. Pressing the reversion button again will return it to the EICAS mode.
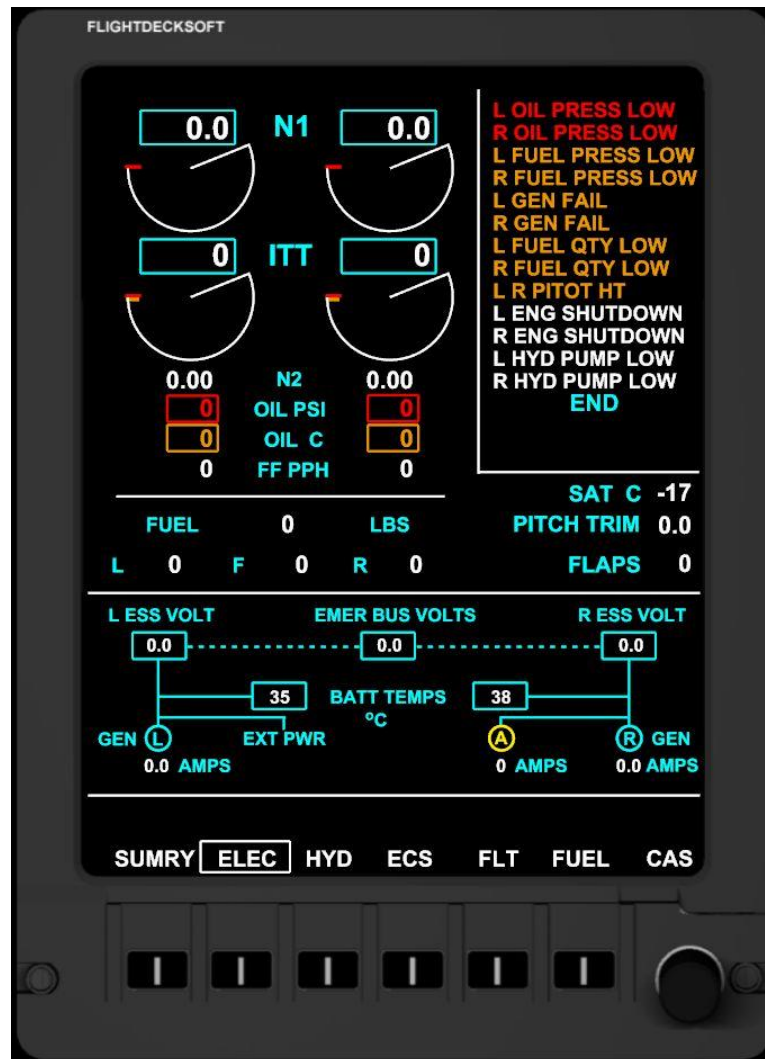
EICAS PAGES

SUMRY

Summary Page. Shows an overview of the Electrical, Hydraulic/ECS, and Flight data in addition to the current engine status display.
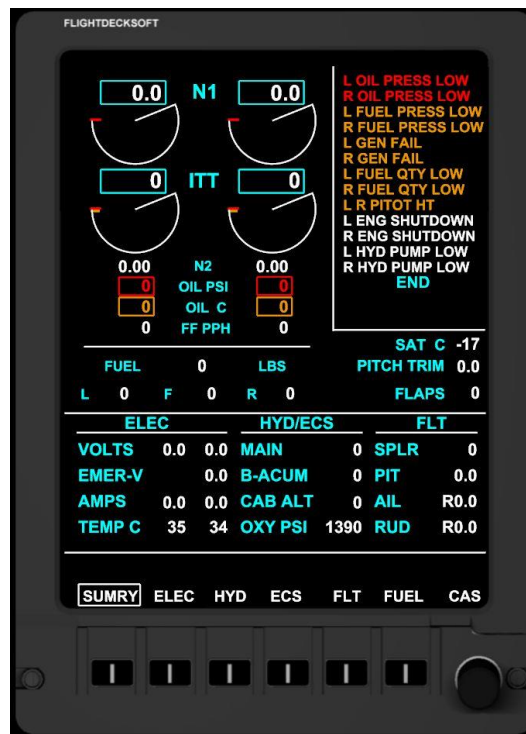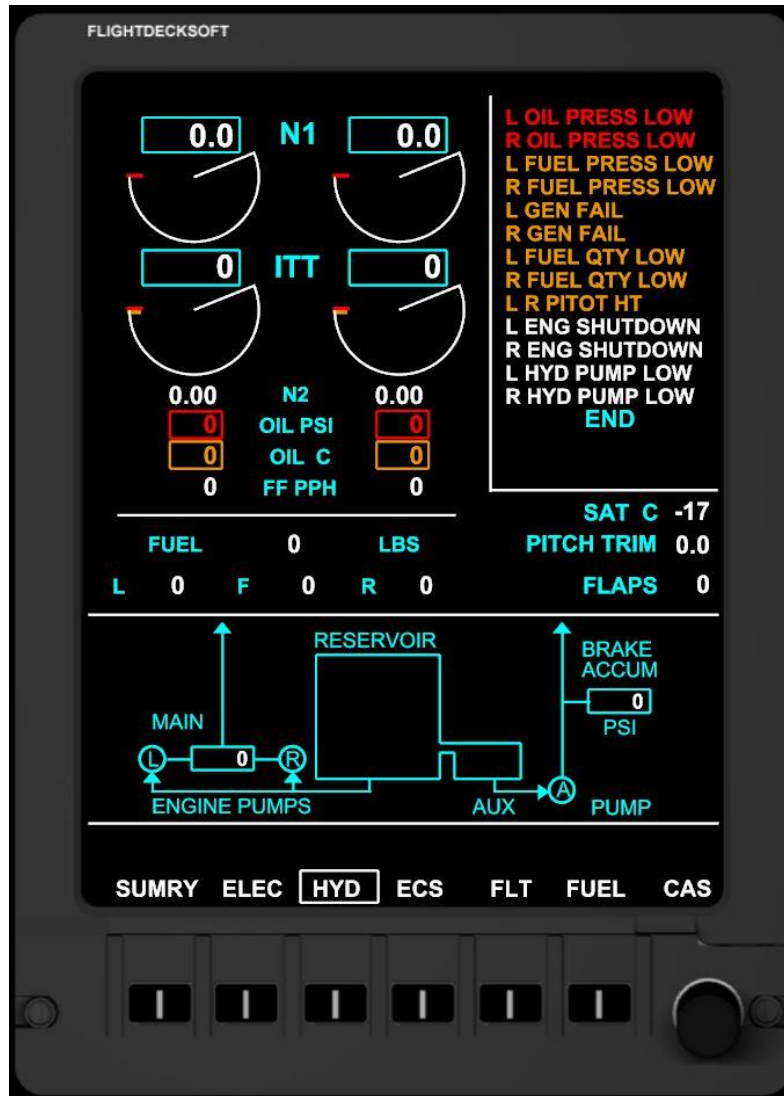
ELEC

Electrical Page. Shows detailed electrical system information in addition to the current engine status display.

Electrical loading activity can be observed while adjusting flaps and other activities.
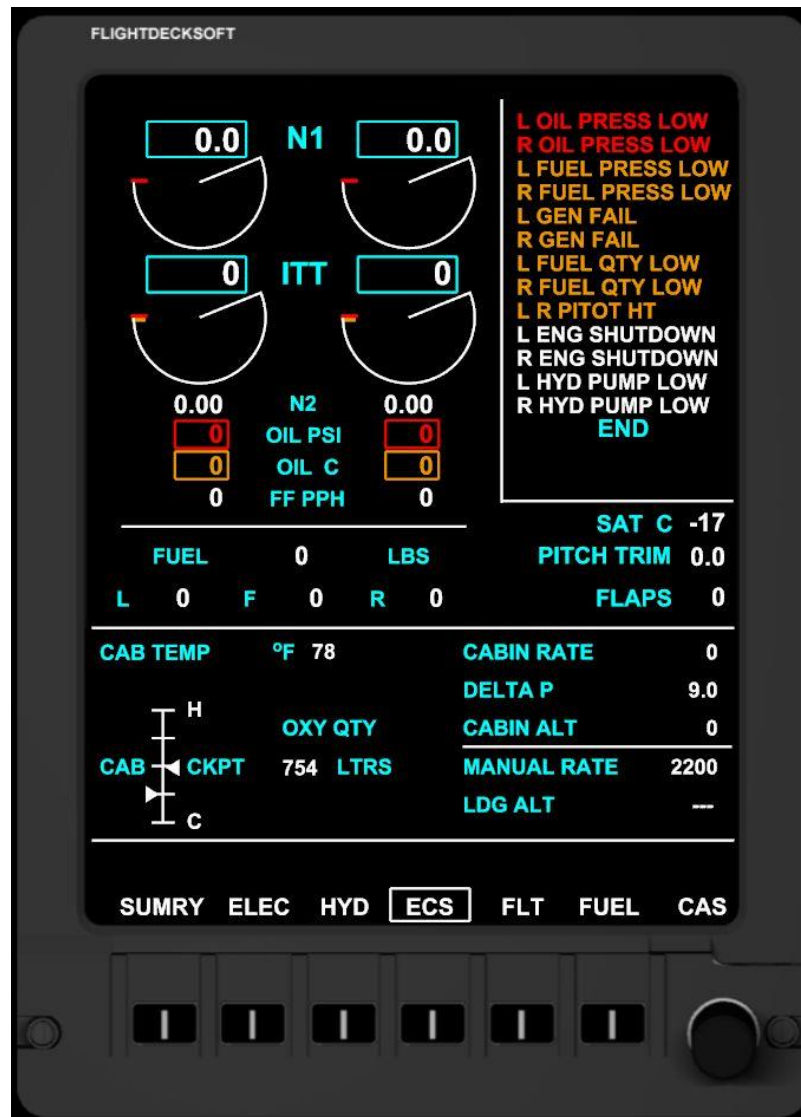
HYD

Hydraulic System Page. Shows detailed electrical system information in addition to the current engine status display.

ECS

Environmental Control System Page. Shows detailed ECS information in addition to the current engine status display.

CABIN ALT is dynamic and based on pressure modeling. All other values are typically static within this package.

FLT

Flight Controls page. Shows detailed Aileron/Elevator/Rudder trim values. Shows Flaps, and Spoiler control surface information in addition to the current engine status display.
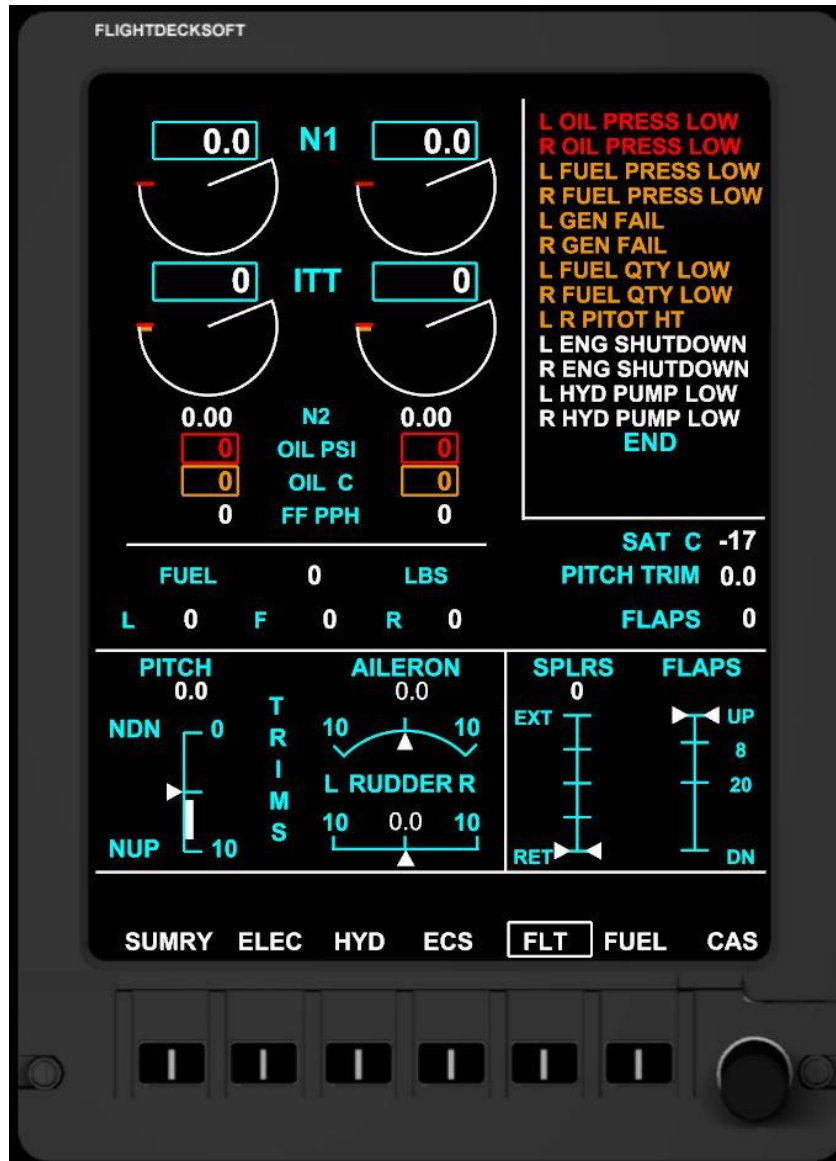
Notice the **white** band on the PITCH trim scale. Pitch trim is typically set within the band for takeoff within FS. Per the LJ45 handbook, it must be set in the band.

FUEL

Fuel Status Page. Shows detailed Fuel Status information in addition to the current engine status display.
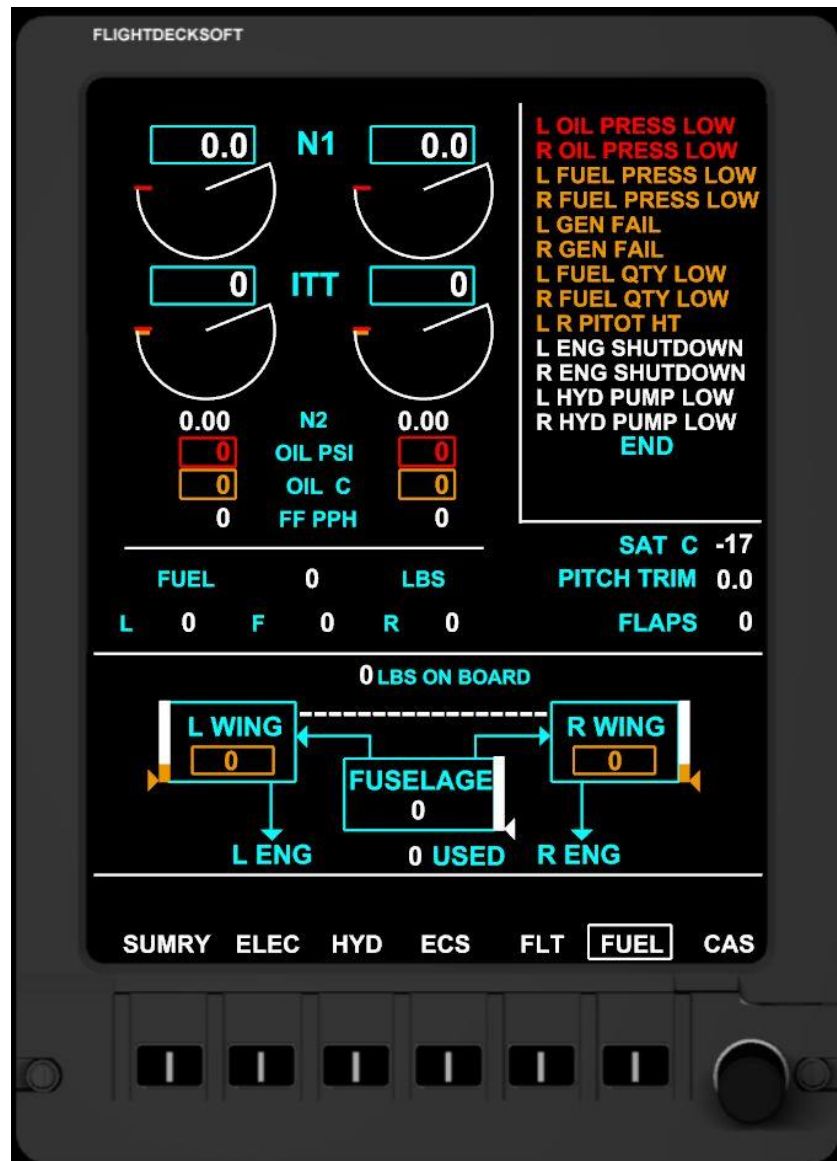
Notice the **amber** boxes shown for the L & R wing tank fuel level. This occurs at 330 lbs and less.

MULTI FUNCTION DISPLAYS (MFD)

The Flight Deck Soft **JET45** Advanced Avionics Suite provides a realistic representation of the Multi-Function Displays (MFD) found in the LJ40/45. The MFDs typically are displayed on DU 3, but the user may elect to display it on DU2 using DU Reversion.

MFD Main Features:

- Flight Plan Route depiction with waypoints and navaids in MAP Mode.
- Route depiction with de-clutter coding to allow easy viewing of navaids depending on Range Scale
- 6 Select Keys to access several pages of information regarding Flight Plans, navaid depiction, system summary, etc.
- Support for Rotary Encoder to adjust Map Range and to select Flight Plans.
- Flight Plan selection (up to 9 in the list available at any one time).
- Flight Plans can be switched and depicted on the fly
- TCAS detection and display with adjustable display range of 6NM+
- Attractive Display Unit bezel artwork for users without dedicated hardware

Configuration of the MFD.INI file

To navigate to the MFD .INI simply use Windows Explorer to find the .INI file that is embedded in the Component folder and click on it to open in Note pad. Make sure that Word Wrap is ON in Note pad.

The configuration of the MFD, versus EICAS mode is accomplished by setting the parameter "du_2_mode" to "no". All other parameters are set as above.

MFD DESCRIPTION

The MFD is typically used to display the Flight Plan (FP) Route, TAS, SAT, GS, TCAS, and various critical aircraft system data. The MFD is mainly comprised of a large compass arc that shows a degree indicator line every 5 degrees and a **magenta** heading bug with bug direction arrow pointing to the closest side the bug is located when the bug is off scale. The compass arc is capable of displaying different ranges to increase or decrease the amount of FP Route displayed in **2.5, 5, 12.5, 25, 50, 100, 150, 250**, and **500** nm ranges. The compass line represents **2x** the distance indicated by the range ring value. The simulator's Air Data Computer (ADC) calculates the current wind speed and direction and then displays it on the center left side of the compass arc.

OPERATION OF THE MFD

Flight Plan Selection and Loading

The MFD can display up to 9 different flight plans that are pulled from the MSFS flight plan location on your FS Server. To load a Flight Plan click on the **MFD** button and then the **LOAD FPLN** button on the MFD DU Bezel.

IMPORTANT NOTE: The MFD can read standard MSFS .pln Flight Plan text files that are generated via the default MSFS flight planner, FS Build, Simroutes.com, and any other flight planner that uses the .pln format. –HOWEVER- Be sure to only allow your Flight Plan folder on the server to hold no more than 50 Flight Plans at any one time to prevent the MFD from crashing. The capacity may be increased in future releases.

Once you are given a choice of Flight Plans to load, scroll through the list by clicking on the Rotary Selector labeled **M/P RNG** on the right of the DU Bezel. A selection box will appear over the plan that will be loaded upon pressing the **LOAD FPLN** button once again. The chosen FP should appear now with the aircraft symbol at the starting point of the FP. Press **RTN** to Return to the main menu.

MULTI FUNCTION DISPLAYS (MFD) contd.

Displaying Navaids, Waypoints, and Route Information

VORs and Airports may be viewed on the MFD by pressing **MFD** and then **NAV/APT** button on the DU Bezel. Only the closest navaids and airports will be displayed on the MFD to prevent clutter.
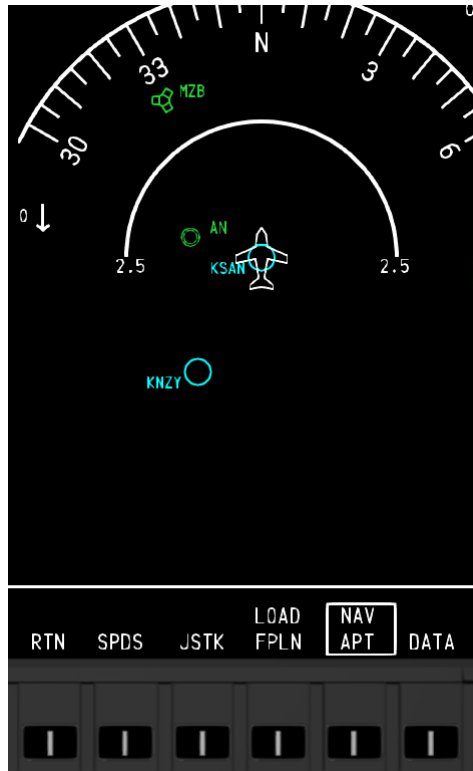
Aircraft Systems

Aircraft Systems may be reviewed by pressing the **SYS** option on the DU Bezel. From there various choices can be selected and information reviewed. **SUMRY** shows a snapshot of three critical Aircraft Systems- *Electrical, Hydraulic and Flight Surface Trim indications*. Pressing **ELEC, HYD, ECS, FLT, and FUEL** displays a more in-depth depiction of the system of that page. Pressing **RTN** will return to the main MFD screen menu. Pressing **SUMRY** returns the Summary Page and pressing **RTN** returns to the main MFD page.

MULTI FUNCTION DISPLAYS (MFD) contd.

ELEC (Electrical Page)

The Electrical Page contains electrical system information and a basic schematic of the system.

Illustration 6-A

MULTI FUNCTION DISPLAYS (MFD) contd.

HYD (Hydraulic Page)

The Hydraulic Page contains information on hydraulic quantities and schematics.

Illustration 6-B

MULTI FUNCTION DISPLAYS (MFD) contd.

ECS (Environmental Control System Page)

The ECS Page displays cabin/cockpit temperatures as well as oxygen quantity.

Illustration 6-C

CABIN ALT is dynamic and based on pressure modeling. All other values are typically static within this package.

MULTI FUNCTION DISPLAYS (MFD) contd.

FLT (Flight Page)

The FLT Page displays the elevator, aileron, and rudder trim positions as well as the positions of both the flaps and speed brake/spoiler.

Illustration 6-D

MULTI FUNCTION DISPLAYS (MFD) contd.

FUEL (Fuel Page)

The Fuel Page contains the amount of fuel in the Left, Center, and Right fuel tanks. When the fuel level in the Left or Right wing tank reaches 350 lbs or less, a yellow box encompasses the fuel remaining as a caution of the low fuel levels.

Illustration 6-E

Notice the **amber** boxes shown for the L & R wing tank fuel level. This occurs at 330 lbs and less.

MULTI FUNCTION DISPLAYS (MFD) contd.

Traffic Collision & Avoidance System (TCAS)

The **JET45** AAS features TCAS that detects AI aircraft and displays their position relative to the aircraft. At this time live traffic from online sessions is not displayed on the TCAS screen.

Illustration 6-F

TCAS screen with no aircraft in the vicinity   TCAS screen with 3 aircraft in the vicinity

TCAS targets are shown as a colored diamond with a numerical value as well as a (+) or (-) sign next to them. The numerical value indicates the altitude difference between the aircraft and the target and the sign indicates whether the target is above or below the aircraft.

Proximity targets are **Cyan**

Caution/Traffic advisory targets are in **Amber**

Warning/Resolution advisory targets are **Red**.

TCAS Range is displayed as an adjustable nm value at the 3 o'clock position on the range line with a fixed range of 2 nm symbolized by the near-field 360 degree range ring. The range can be adjusted from the TCAS RANGE parameter on the RMUs.

RADIO MANAGEMENT UNITS (RMUs)

The Flight Deck Soft **JET45** Advanced Avionics Suite provides a realistic representation of the Radio Management Units found in the LJ40/45. The RMUs typically are displayed

41

with NAV1/NAV2, COM1/COM2, ADF, AND XPONDER Information, but the user may elect to display the Backup Engine or Navigation functions on these units just like the real-world counterpart does in the event of DU Failure.

Main Features:

- NAV1/COM1 on RMU1 and NAV2/COM2 on RMU2 as well as ADF and ATC.
- Functional Line Select Keys for Transfer and Function Input
- Storage of NAV/COM frequencies for call up by the user via the Line Select Keys.
- Backup Navigation (ILS) Page
- Multiple Backup Engine Pages
- TCAS altitude band and range setting (tied to TCAS display on MFD)
- Transponder STBY/IDENT support for online ATC applications
- Attractive RMU Bezel artwork for users without dedicated hardware

Configuration of the .INI file

To navigate to the RMU .INI simply use Windows Explorer to find the .INI file that is embedded in the Component folder and click on it to open in Note pad. Make sure that Word Wrap is ON in Note pad.

RADIO MANAGEMENT UNITS (RMUs) contd.
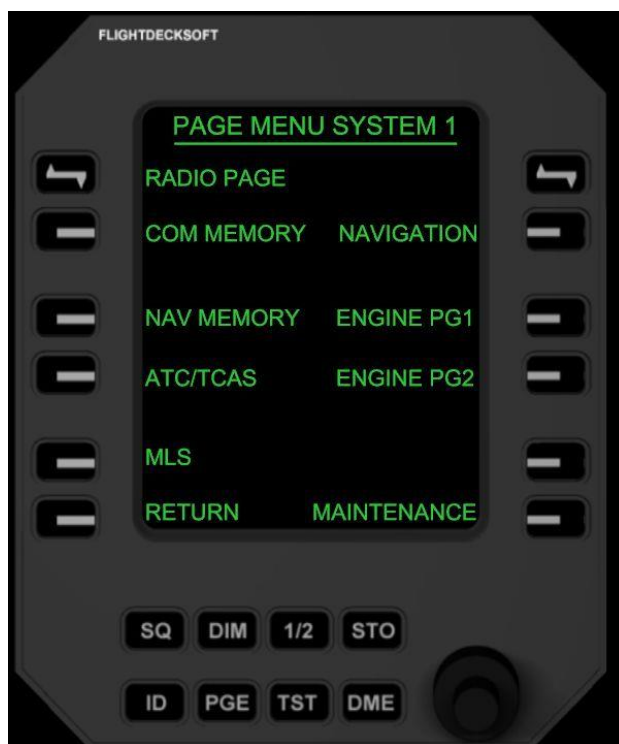
RMU Line Select Key (LSK) Guide

Illustration 7-a

RADIO MANAGEMENT UNITS (RMUs) contd.

Page Menu

The Page Menu is accessed via the PGE selection key located on the lower RMU bezel.

Radio Page-

Main RMU page to access NAV/COM/ADF/ATC

COM Memory-

COM frequency storage

NAV Memory-

Navigation frequency storage. Up to 10 frequencies may be stored by the user.

ATC/TCAS-

Aircraft identification and TCAS information. Partially Functional

RADIO MANAGEMENT UNITS (RMUs) contd.

Return-

Returns to the Radio Page screen

Navigation-

Provides backup Navigation/ILS display information. CRS is adjustable via the rotary encoder after selecting LSK 6.

Engine Pg 1-

Analog L/R Engine scale. N1, ITT, Fuel

Engine Pg 2-

Digital L/R Engine scale. N1, ITT, Fuel

Maintenance-

NON FUNCTIONAL

FLIGHT GUIDANCE CONTROLLER (FGC)

Jet45 AAS V2 includes a highly functional Flight Guidance Controller. It uses some standard FSX/P3D autopilot features like Altitude hold, Heading Hold, VOR navigation, Vertical Speed Hold (For FMS VNAV), and Yaw Damper. There are also several custom

modes that only Jet45 AAS offers, such as Speed Hold using pitch, Bank Hold, Altitude Select Mode (ASEL), and FMS lateral and vertical navigation. It's fully integrated to operate seamlessly with the FMS and the PFD HSI indications.

Upon pressing the AP Master to the ON/Engaged status, the following items should also be **activated**-

YAW DAMPER (YD)

FLIGHT DIRECTOR (FD)

ATTITUDE HOLD (A FUNCTION OF VERTICAL SPEED HOLD)

Upon pressing the YD Button to **OFF**, the AP Master should disconnect as well as any other FGC (Autopilot) modes.

However, pressing the AP Master to OFF should **NOT** disconnect the YD. The YD should only be disconnected by actually pressing the YD button on the FGC.

Upon pressing the AP Master to the OFF/Disconnected status, the following items should also be **de-activated**-

ALL FGC modes except YAW DAMPER (YD)

FLIGHT GUIDANCE CONTROLLER (FGC) (contd.)

Using NAV hold to fly a preloaded flight plan

Anytime NAV hold on the Flight Guidance Controller is pressed and the autopilot is engaged the aircraft will fly to the source selected via the EFIS Display Controller. If a

flight plan is loaded and **FMS** is selected, the aircraft should follow the loaded flight plan. If **NAV** is selected as the navigation source then the aircraft should turn and intercept the radial course bearing of the VOR that is tuned to NAV1.

NOTE: Currently the last pressed FMS/NAV source on the Pilot or Copilot EFIS panel will determine which side is the Master Side. The XFR switch is what actually determines the Master Side and is depicted by the direction the green arrow is pointing to on the top of the PFD. The XFR function is under development.

See additional notes on NAV usage in the **CDU/FLIGHT MANAGEMENT SYSTEM** Section 10.

SPD Hold & VS (Vertical Speed Mode)

The LJ45 uses a single rotary encoder to control both the Vertical Speed (**VS**) and forward speed (**SPD**) while in a climb or decent. It should be noted that **SPD** mode **DOES NOT** control the throttle nor forward speed while straight and level as the LJ45 has no auto throttle system.

Using the default LJ45 the crew has control over their VS via the vertical speed rotary encoder. Forward speed is normally maintained by throttle position. When the SPD hold function is enabled, the FGC will command a pitch attitude required to hold airspeed. NOTE: While SPD is enabled, you may not be able to maintain constant altitude and will not have direct pitch control of the aircraft.

EFIS DISPLAY CONTROLLER (EFIS)

NOTE: As of the V2 release of Jet45 AAS, the EFIS function has been integrated into the PFD software to be used with the PFD/EFIS Arduino modules. There is no longer an EFIS software component or offsets needed. This section is intended to detail the

function of the EFIS controller found in the Learjet 40/45 and its effects on Jet45 software displays.

Illustration 9-a

EFIS Functions

The seven momentary pushbuttons across the top of the EFIS panel are described below.

In/hPa- Switches between Inches of Pressure and hectoPascals (millibars)

CUE- Switches the Flight Director style from Inverted V to Cross Hair. Inverted V is the default and only mode available currently.

FPA- Flight Path Angle. Currently Unavailable.

WX- Weather Radar Display. Currently Unavailable.

HSI- Toggles between Map and Arc modes on the HSI compass. Map is the default setting.

FMS- Displays GPS/FMS information on the HSI. NAV source is from the GPS/FMS.

NAV- Displays VOR & Localizer information on the HSI. NAV source is from the currently tuned VOR/NDB.

The two rotary selector switches across the bottom of the EFIS panel are described below.

BRG ◯

FMS- The bearing points to the GPS/FMS waypoint loaded via the Flight Planner

ADF- The bearing points to the NDB waypoint tuned via ADF1

NAV-   The bearing points to the VOR waypoint tuned via NAV1

OFF-   Turns off the bearing pointer

BRG <>

FMS-   The bearing points to the GPS/FMS waypoint loaded via the Flight Planner

ADF-   The bearing points to the NDB waypoint tuned via ADF2

NAV-   The bearing points to the VOR waypoint tuned via NAV2

OFF-   Turns off the bearing pointer

OUTBD DU/INBD DU DIM-   Provides Display Unit Dimming. Currently Unavailable.

PUSH TO TEST-   Currently Unavailable.

Using the EFIS Display Controller in conjunction with the FGC

Anytime NAV hold on the Flight Guidance Controller is pressed and the autopilot is engaged the aircraft will fly to the source selected via the EFIS Display Controller. If a flight plan is loaded and **FMS** is selected, the aircraft should follow the loaded flight plan. If **NAV** is selected as the navigation source then the aircraft should turn and intercept the radial course bearing of the VOR that is tuned to NAV1.

NOTE: While a transfer function of the FD/navigation source has been made available, some users may experience the left (Master side by default) FD has priority even if pointing right until they re-engage the desired navigation source on the left EFIS.

CDU/FLIGHT MANAGEMENT SYSTEM (CDU/FMS)

RESERVED