DASSAULT FALCON 900EX EASY

SYSTEMS SUMMARY

Airplane Diagnostic & Maintenance

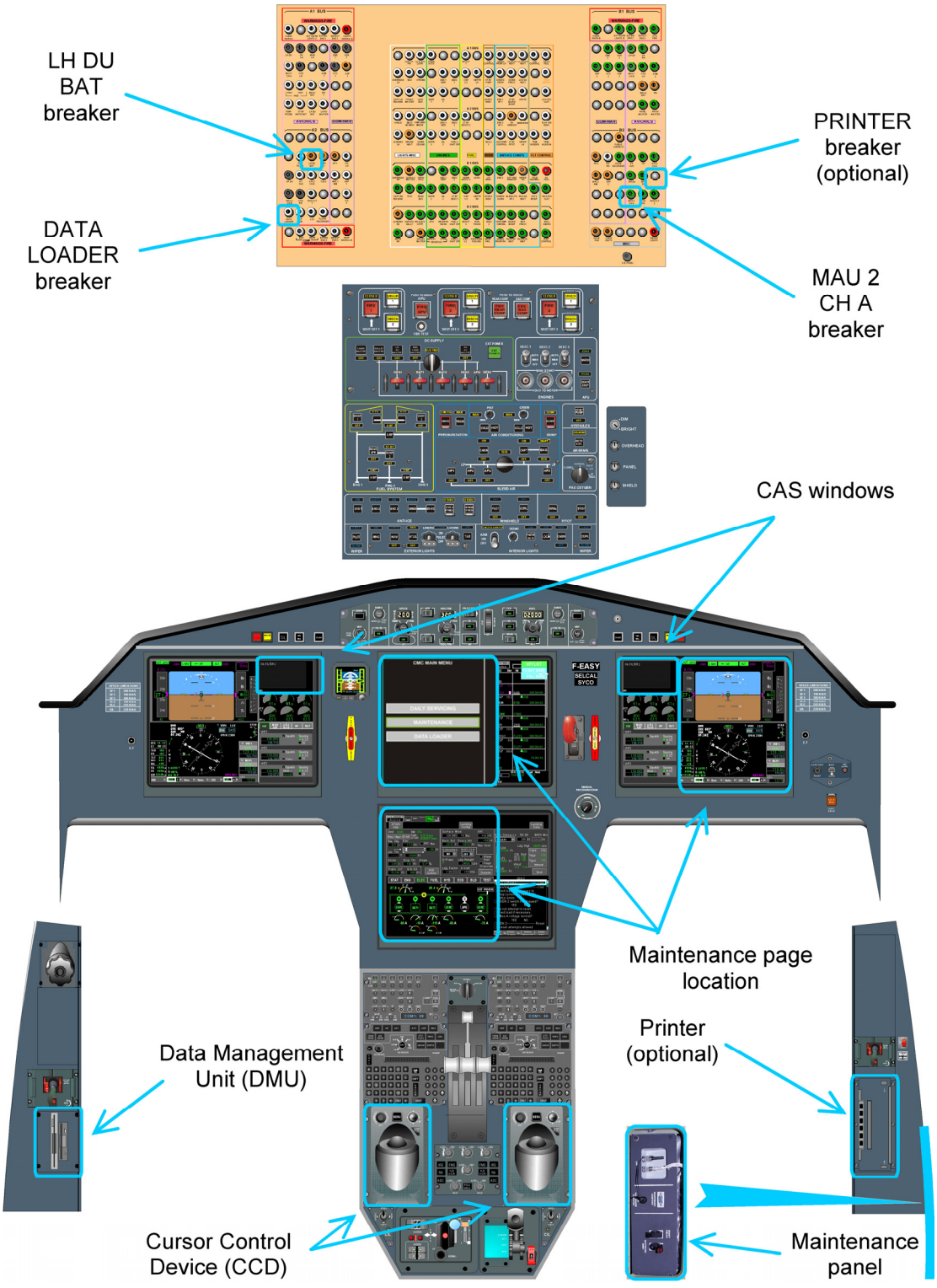
INTRODUCTION

The F900EX EASy system enables the flight or maintenance crew to:

- obtain airplane systems failure information requested for an optimized and safe dispatch decision,
- print or download maintenance reports,
- upload navigation files and data bases,
- obtain airplane failure and status information, perform complementary ground tests, and perform data recording on selected events, as requested for servicing, maintenance and troubleshooting operations.

The above listed capabilities rest on the F900EX EASy Airplane Diagnostic and Maintenance System (ADMS) which includes first:

- the EASy functions in charge of elaboration and display of failure information for dispatch decision,
- the EASy Central Maintenance Computer Function (CMCF):
  - detect failures and to report them to the EASy system in real time, in flight or on ground,
  - perform initiated complementary tests, on ground.



FLIGHT DECK OVERVIEW

ELABORATION AND DISPLAY OF FAILURE INFORMATION FOR DISPATCH DECISION

The EASy avionics system processes the EASy input data, and, when a failure is detected, generates the proper cockpit indication for dispatch decision. This indication can be one or several CAS messages, as well as abnormal status indication presented in PDU (gears, slats / flaps, airbrakes, …).

When recommended by the Master Minimum Equipment List (MMEL), and in order to limit as much as possible dispatch restriction, detailed failure information can be obtained in the Status Synoptics.

CENTRAL MAINTENANCE COMPUTER FUNCTION

The EASy Central Maintenance Computer Function (CMCF) provides:

- a single access to avionics, HGS, engines and A/C systems maintenance messages, status information and initiated ground tests, requested for servicing, maintenance and troubleshooting purposes,
- a mean of loading navigation files and data bases, and system software from the on-board Data Management Unit (DMU) located in the cockpit (LH console), or from a laptop acting as a Centralized Maintenance Computer (CMC) remote terminal,
- a mean of downloading maintenance data to the on-board Data Management Unit (DMU), or to a laptop acting as a CMC remote terminal,
- a mean of printing data on the on-board printer located in the cockpit (RH console),
- a mean of configuring the Maintenance Computer RS-232 port located in the cockpit maintenance panel, in order to connect it to one of the following A/C system computers:
  - Fuel Quantity Management Computer (FQMC) Channels 1 and 2, Braking System Computer Unit (BSCU) 1 and 2, Cabin Pressurization Computer (CPC), Bleed Air Supply Computer (BASC), Control and Monitoring, Engine Vibration Monitoring Computer (EVMC) 1, 2 and 3, and Digital Electronic Engine Computers (DEEC) 1, 2 and 3.

The Centralized Maintenance Computer (CMC) module hosts the Central Maintenance Computer Function. It can be controlled:

- from the cockpit, on ground, with the CCD and the CMC maintenance page displayed in one MDU,
- from a standard laptop connected to the EASy Local Area Network (LAN) BNC connector located in the maintenance panel, and configured as a CMC Remote Terminal by executing the dedicated Honeywell CMC-RT software. The CMC Remote Terminal can be used with the A/C being either in ground or flight configuration.

In this document, the CMC cockpit control mode is the only mode described. For more information related to the laptop use as a CMC remote terminal, refer to the Airplane Maintenance Manual / ATA 45.

NOTE

The Central Maintenance Function software does not comply with certification requirements applicable to functions generating and displaying information related to the safety of flights. Consequently, failure and status information displayed on the CMC Maintenance Page cannot be considered as the only information used for dispatch decision: They are dedicated to servicing, maintenance and troubleshooting purposes.

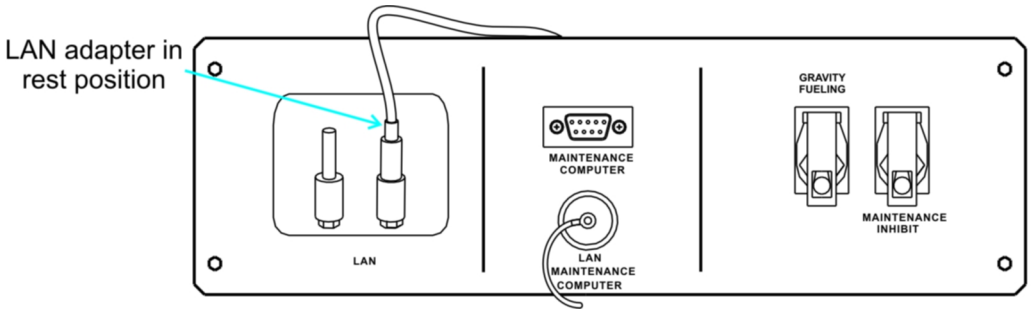
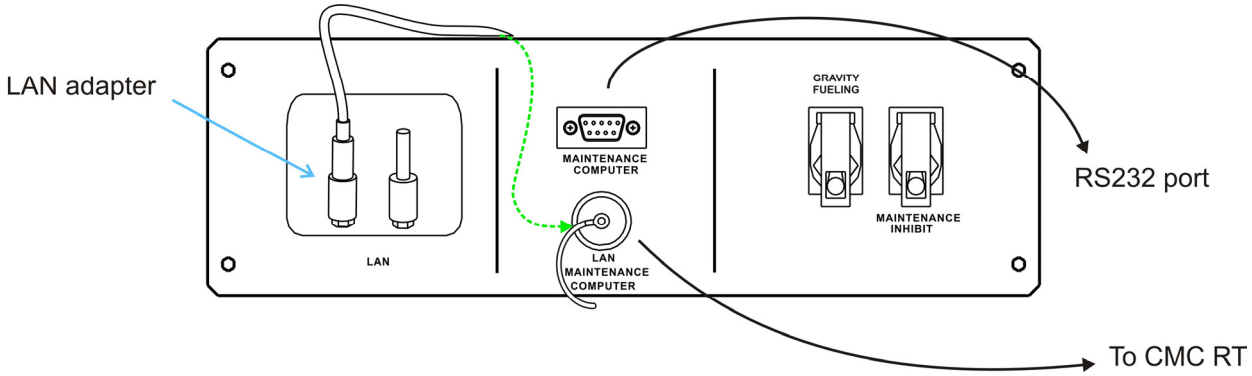
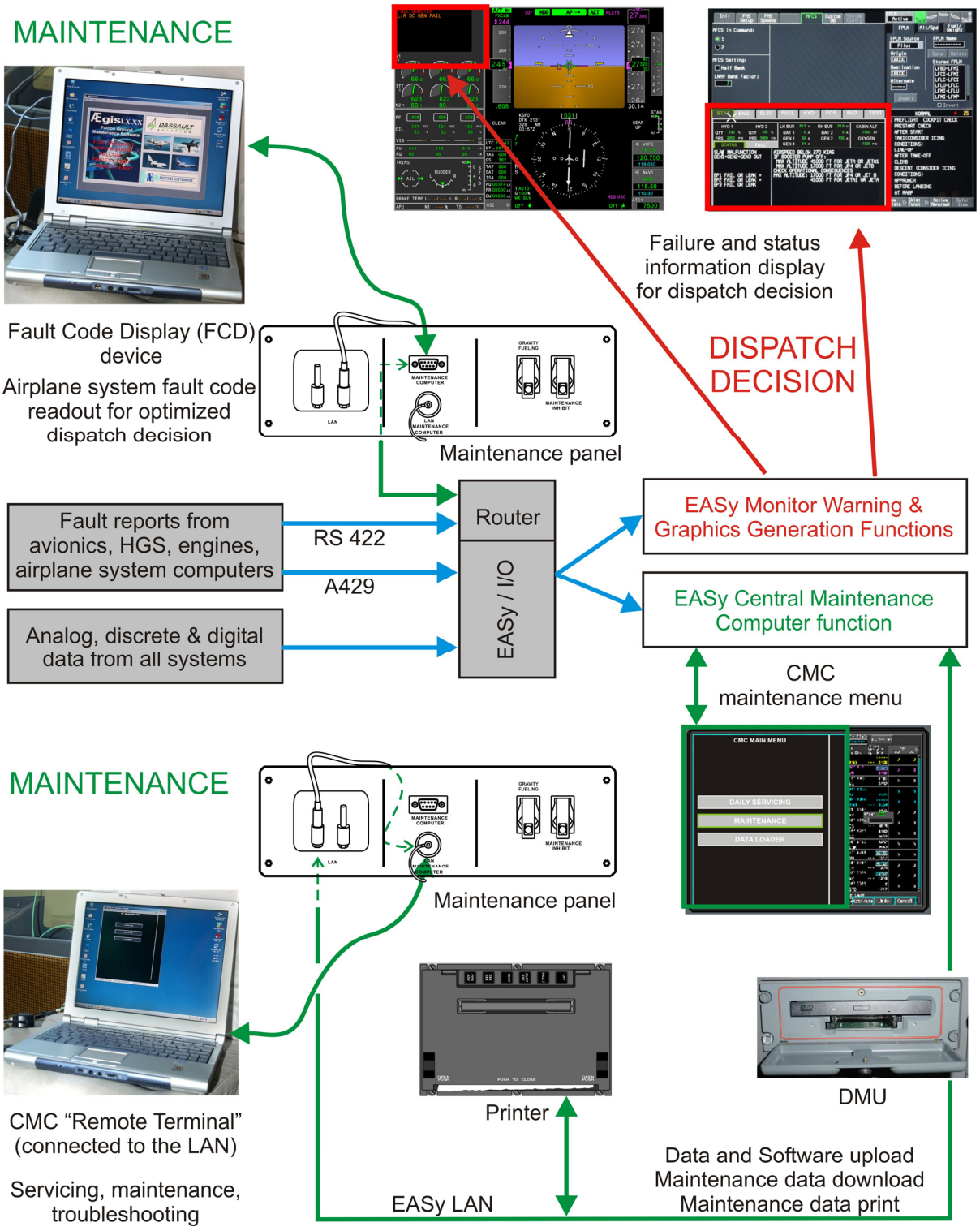


FIGURE 02-45-05-01 MAINTENANCE PANEL - NORMAL FLIGHT



MAINTENANCE PANEL - MAINTENANCE OPERATION



CENTRAL MAINTENANCE SYSTEM FUNCTIONAL ARCHITECTURE

SOURCES

ELECTRICAL

The Centralized Maintenance Computer (CMC) is a Modular Avionics Unit (MAU) module installed in MAU 2 Channel A – slot 2 (MAU 2 is installed in the airplane nose cone). It is powered through bus B2 when the RH AV MASTER switch is depressed, and is protected by the MAU 2 CH A circuit breaker. The CMC is consequently not powered in MINI LOAD mode. The CMC is also powered by the DU 1 stand-by battery in order to ensure a proper CMC shut-down at avionics or airplane power off.

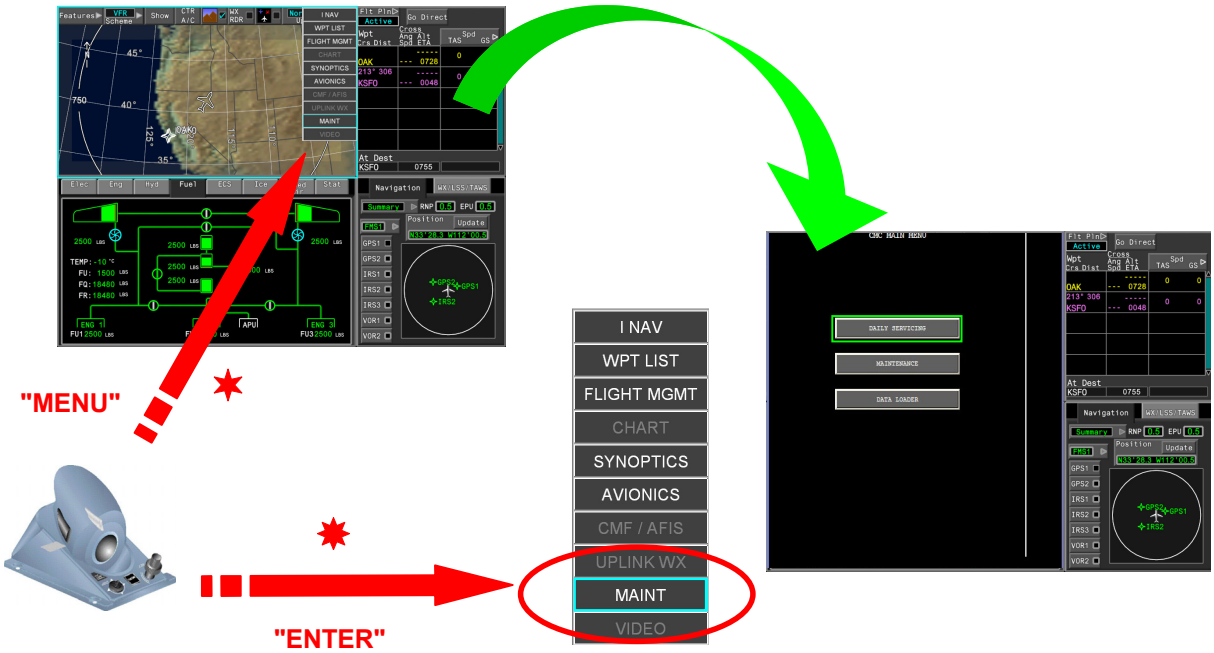
DATA

All information received by the MAU(s) for flight management is available for the CMF for processing and display of failure information.

ACCESS TO THE MAINTENANCE PAGE ON MDU

The CMC Maintenance page can be displayed on the upper or lower MDU, or on the right PDU if configured as an MDU. Its display is commanded as follows:

- put the CCD cursor in any 1/3 or 2/3 window of the selected MDU,
- call the menu by depressing the CCD MENU button,
- select the MAINT item of the menu. The CMC maintenance page will appear on the MDU as a 2/3 window.



ACCESS TO THE MAINTENANCE PAGE ON MDU

INTRODUCTION

The elaboration and display of failure information requested for an optimized and safe dispatch decision is based on the following principles (See figure 02-45-10-01):

- a CAS message is displayed in case of any system failure identified by the EASy system, and which impacts the airplane dispatch capability,
- in order to limit the number of CAS messages, failures reported as fault codes by braking, fuel and bleed air and anti-ice systems computers are signalized by a generic CAS message **FAULT CODE** indicates to the crew that at least one fault code that may affect dispatch is displayed in Status synoptics.
- a table of CAS messages along with their references to enter in the MMEL item list is included in the MMEL preambule,

NOTE

Any CAS messages not listed in that MMEL reference table is to be considered as a NO GO.

- a MMEL item list reference is associated to any CAS message which can be displayed on ground,
- the MMEL recommands getting additional information on the STAT synoptic for an optimized dispatch decision.

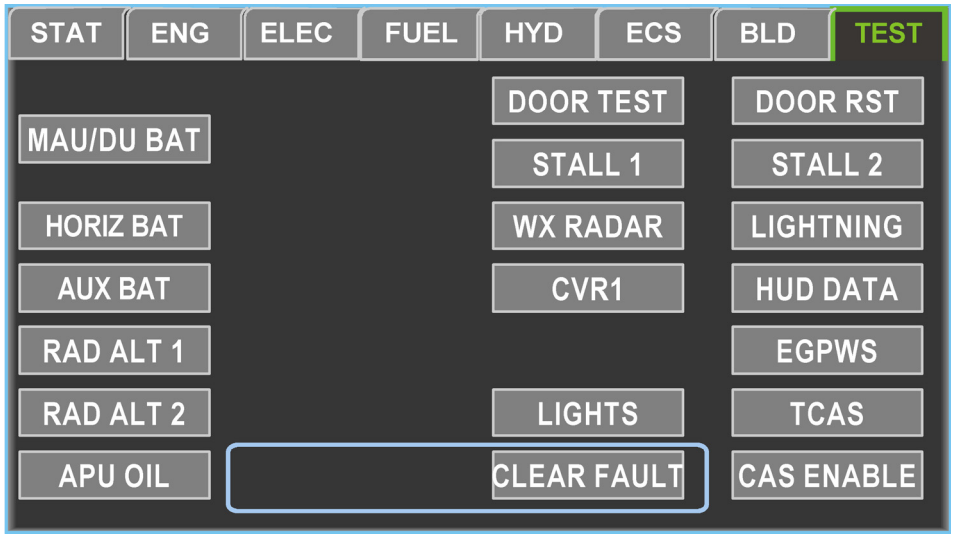
Some failures impacting the airplane dispatch can only be detected when the airplane is in a specific operational configuration (e.g.: engine running, anti-ice operating, braking with anti-skid operating, …).

To keep the failure information displayed when the airplane is no longer in this operational configuration, the corresponding CAS message is latched until a CLEAR FAULT soft key activation in the Test Synoptics (See figure 02-45-10-00).

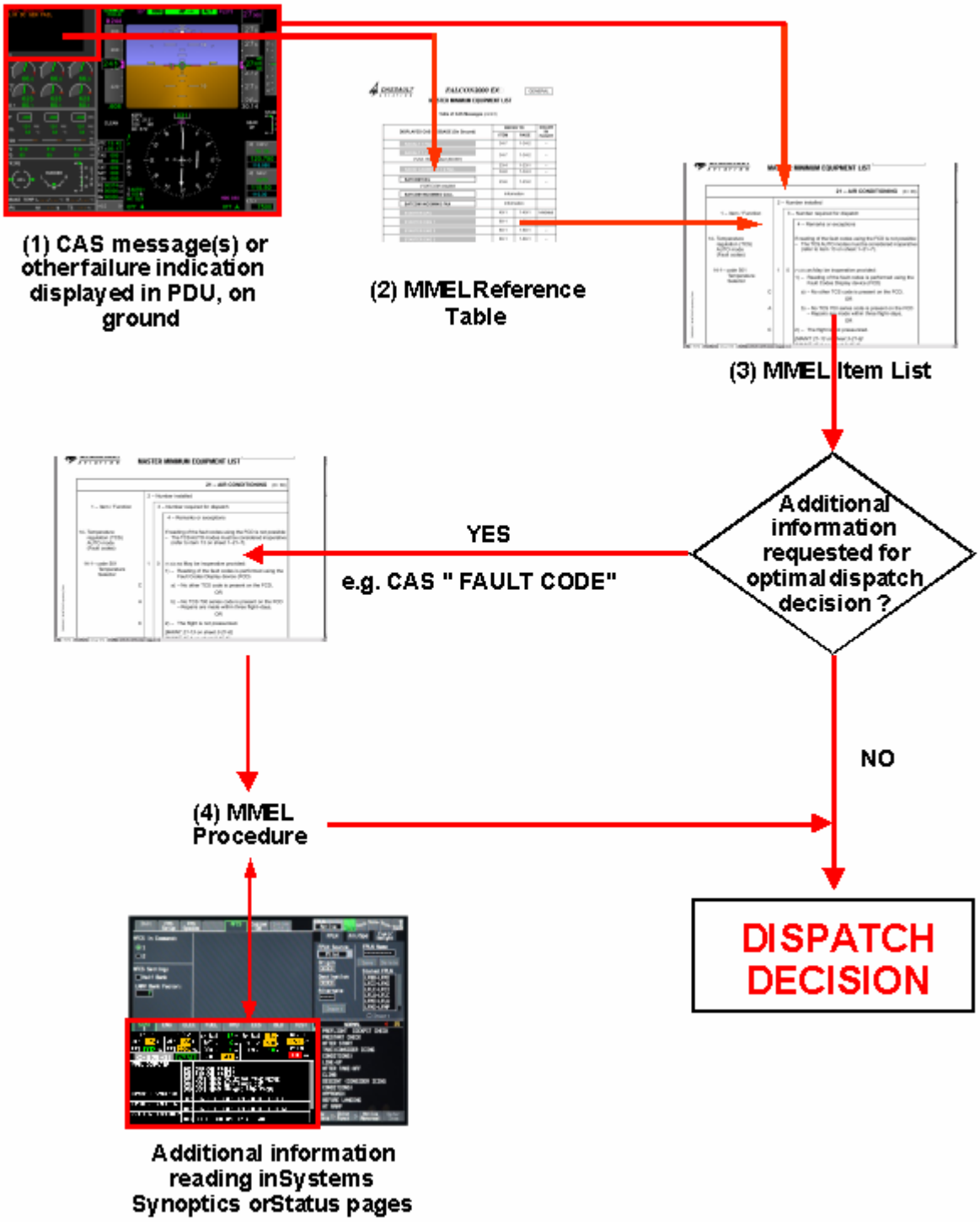
This allows the system to:

- Make sure that the dispatch decision is taken with all CAS messages related to known A/C failures being displayed to the crew,
- inform the crew performing the DAILY SERVICING operation, enabling him to cure with anticipation any failure that was detected during the previous flights, and that could impact the next mission,

The CLEAR FAULT soft key shall consequently not be activated to confirm the failure, unless otherwise specified in the MMEL.



CLEAR FAULT SOFT KEY



DISPATCH DECISION - PRINCIPLE

CAS MESSAGES

CAS MESSAGE	DEFINITION
FAULT CODE	On ground, message indicating that an aircraft system computer has recorded a failure that may affect dispatch and the detail failure (computer and fault code) is displayed in Status page.
FAULT CODE	In flight, message indicating that an aircraft system computer has recorded a failure that may affect dispatch and the detail failure (computer and fault code) is displayed in Status page.

INTRODUCTION

A print or download of maintenance reports can be performed to provide the maintenance crew with detailed information in case of a problem encountered during the flight.

The maintenance report can be:

- printed on the cockpit printer,
- downloaded on a PCMCIA memory PC-CARD inserted the PCMCIA slot 2 of the on-board Data Management Unit (DMU),
- downloaded on the hard drive of a laptop connected to the LAN as a CMC remote terminal.

The CMC reports could be:

- CURRENT LEG FDE / MAINT MSG, which contains all the maintenance messages logged during the current flight leg.

NOTE

A new flight leg is initiated at the first engine start following a complete stop of all engines.

- ACTIVE FDE / MAINT MSG, which contains the maintenance messages and CAS messages still active at the time of the download or print operation. It must be noted that some failures that occurred during the leg that must to be fixed by the maintenance technicians might not appear in this report (intermittent failures, failures only detected in specific operating conditions such as engines running, …),
- Other available CMC reports are detailed in the Airplane Maintenance Manual / ATA 45.

PROCEDURE

The printing or downloading of a maintenance report is controlled as follows:

- display the CMC Maintenance Page in a MDU,
- display the REPORTS CMC page by selecting MAINTENANCE in the CMC main menu, then EXTENDED MAINTENANCE, then REPORTS,
- move the cursor in the list of available reports with the CCD knob, to select the report to be printed or downloaded,
- click on the selected report name through the CCD. This opens the list of available devices for printing or downloading:
  - COCKPIT PRINTER,
  - LOCAL STORAGE: To be selected to download the file on a laptop hard drive. This is only possible when the operation is performed with a laptop connected to the LAN as a CMC remote terminal,
  - DMU PCMCIA: To be selected to download the file on a PCMCIA PC-CARD inserted in the DMU slot,
- select one of the above listed devices with the CCD knob,
- launch the print or download operation by clicking on the CCD Enter key. When the operation is complete, a completion status will appear at the bottom of the screen.

PRINT OR DOWNLOAD OF MAINTENANCE REPORT

INTRODUCTION TO UPLOAD OF NAVIGATION DATA BASES

Upload of files and data bases are requested to:

- periodically update navigation and terrain data bases requested for the INAV and FMS EASy functions, and Jeppesen electronic charts (if the option was selected by the operator),
- load a flight plan prepared on an external computer and stored on a CD-ROM or on a PCMCIA memory PC-CARD.

The navigation and terrain data bases and the Jeppesen electronic charts are distributed to the operator by the Integrated Navigation Data Service (INDS) which was developed through an alliance of Honeywell and Jeppesen, to provide state-of-the-art data service for the new EASy cockpit.

These data are provided under the format of CD-ROM:

- INDS CD-ROM #1 (Blue), updated every 14 days, containing Jeppesen e-Charts (if the option was selected by the operator), Obstacles, Geopolitical Information, Airport Information,
- INDS CD-ROM #2 (Red), updated every 28 days, containing Navigation Data and Airspace and Communications Data,
- INDS CD-ROM #3 (Green), updated every 6 to 12 months, containing terrain Data.

The upload of navigation files and data bases can be performed:

- either from the cockpit by inserting the INDS CD-ROM or the PCMCIA memory PC-CARD containing the flight plan to be uploaded in the DMU drive, and controlling the loading process with the CMC,
- or from a laptop connected to the LAN as a CMC Remote Terminal, by inserting the INDS CD-ROM or the PCMCIA memory PC-CARD containing the flight plan to be uploaded in the corresponding laptop drive.

PROCEDURE

The upload of data bases from the cockpit is controlled from the CMC as follows:

- power on the avionics system by depressing Mini Load, LH AV MASTER and RH AV MASTER switches, in order to make sure that MAU modules to be loaded are powered,
- insert the appropriate INDS CD-ROM in the corresponding DMU drive,
- display the CMC Maintenance Page in a MDU,
- activate the Data Loading System (DLS) function by selecting DATA LOADER in the CMC main menu,
- click on the FULL LOAD button located on the RH button bar for an automatic loading of the appropriate MAU modules with the files located on the CD-ROM. The list of drives available for the upload operation appear,
- move the cursor in the list using the CCD knob, and select the appropriate DMU drive (CD-ROM or PCMCIA Slot 2) by clicking on the CCD Enter key. This expands the list of files '_DR' available for upload,
- move the cursor in the list of '_DR' files using the CCD knob, and select the file to be uploaded by clicking on the CCD Enter key (Refer to the INDS CD-ROM installation letter as needed for identification of the '_DR' file to be selected). A text description of the content of the selected '_DR' file appears at the bottom of the screen,
- click on the SELECT FILE button located on the RH button bar, to initiate the configuration check of the modules to be loaded. During the configuration check, the % complete and a list of errors displayed as needed to reflect status of modules checked in the system. On completion of the configuration check, the estimated load time is displayed, and the START LOAD button appears on the RH button bar,
- click on the START LOAD button to launch the selected file loading. On Load completion, error codes, if any will be displayed, along with the indication that the load is 100% complete.

NOTE

Refer to the Airplane Maintenance Manual – ATA 45 for additional information related to error codes which might be displayed during the configuration check (8) and loading (9) phases.

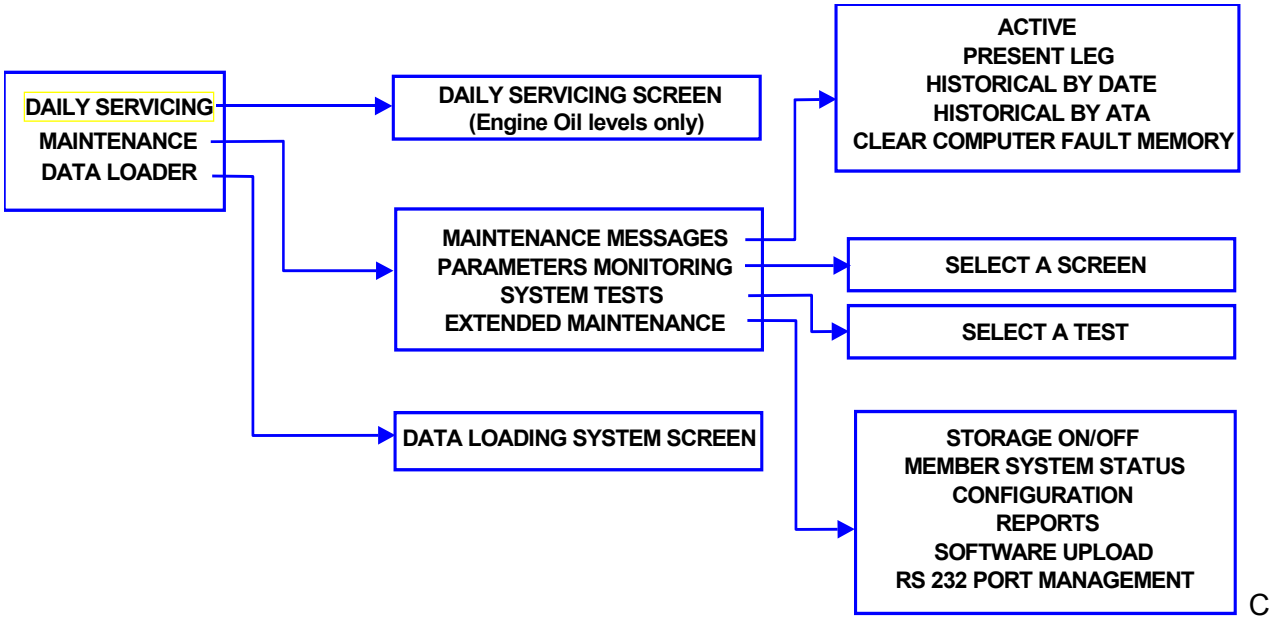
INTRODUCTION TO MAINTENANCE

The Central Maintenance Computer Function is offering to the maintenance crew a set of sub functions in order to facilitate the whole A/C troubleshooting and maintenance.

This set of sub-functions is made available to him through the various CMC menus, organization of which is described in the figure below.

The main sub-functions are:

- maintenance messages processing and display,
- parameters monitoring,
- system tests (initiated ground tests).



C

CMC MENUS ORGANIZATION

MAINTENANCE MESSAGES PROCESSING AND DISPLAY

Maintenance messages are elaborated by the Central Maintenance Computer Function based on any failure information or flight data made available to EASy.

Fault processing equations are defined with the objective of providing the mechanics with only the maintenance message identifying the root cause. These fault processing equations associate the various available information to isolate the failure and to eliminate as much as possible the cascade effects.

They result in maintenance messages which mainly contain the following information:

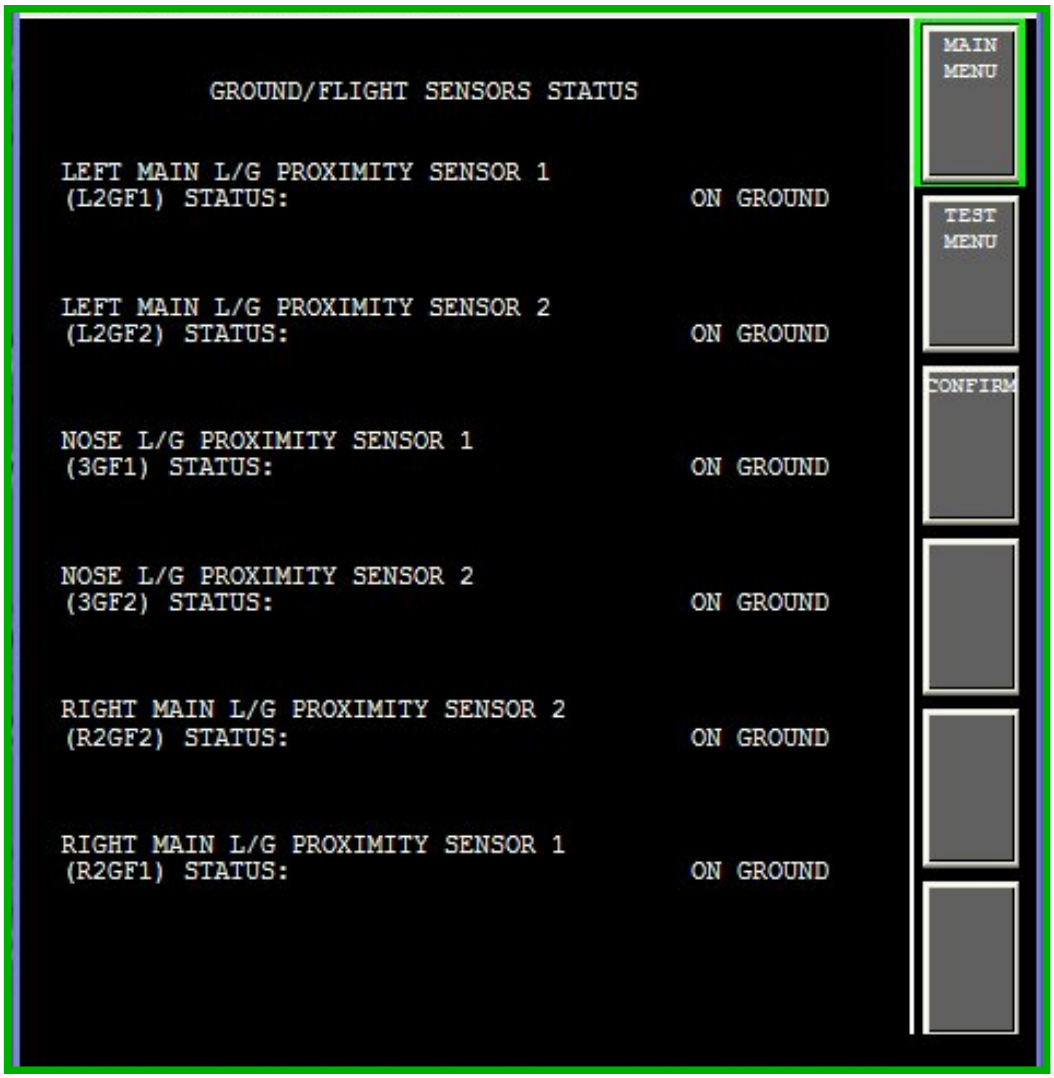
- maintenance message name,
- list of possible Line replaceable units at fault, ordered from the most to the less probable,
- symptoms, as visible by the flight or maintenance crew,
- flight phase and time stamp of all identified transition of the message from the Inactive to Active or Active to Inactive status,
- reference of the Fault Isolation Procedure of the Airplane Maintenance Manual detailing the maintenance actions to be performed if the message occurs.

The maintenance messages are stored in the Fault History Database. The CMC Maintenance Messages menu allows the operator to display messages being in the Active status at the time of the display, or messages which were stored in the Fault History Database during the present or previous legs.

PARAMETERS MONITORING

The Central Maintenance Computer Function is capable of displaying and refreshing in real time screens of parameters (e.g. screen containing landing gear proximity sensors status presented in figure).

These parameters monitoring screens are defined to ease the troubleshooting and maintenance operations by reducing the external test equipment requirements.



EXAMPLE OF PARAMETERS MONITORING SCREEN

SYSTEM TESTS

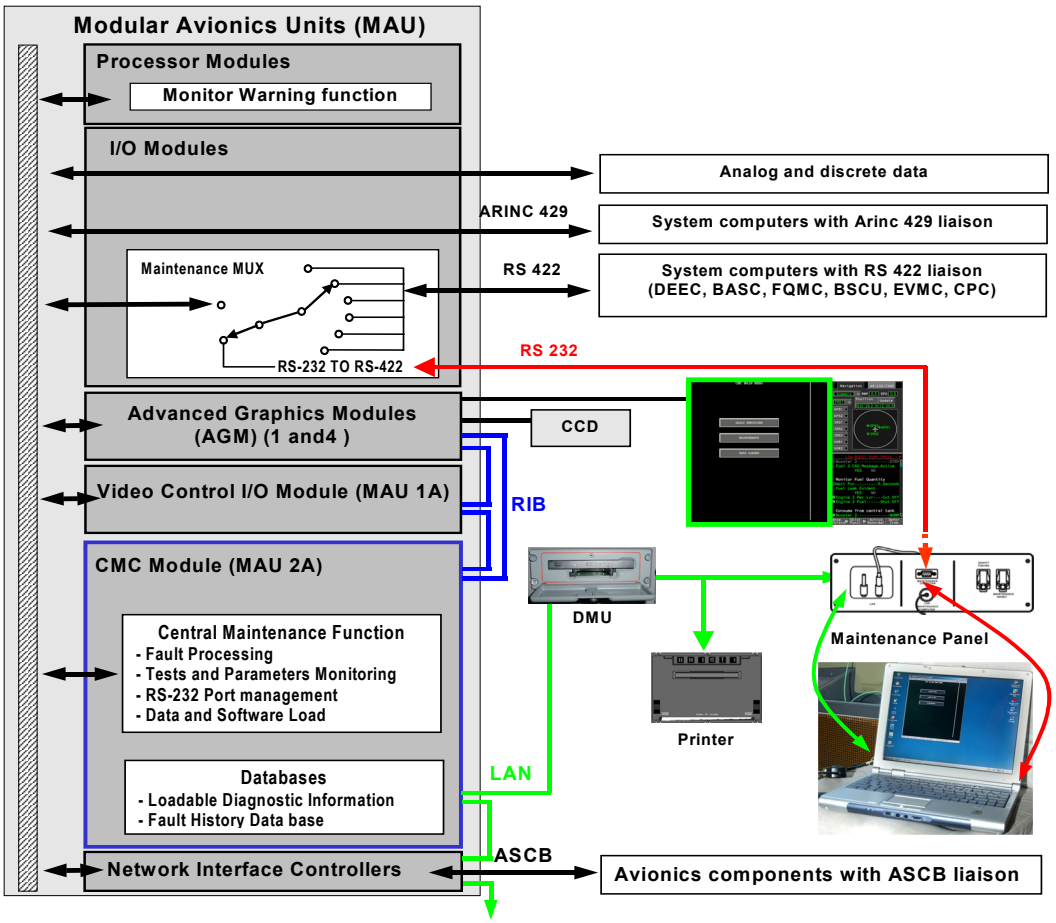
The Central Maintenance Computer Function is capable of initiating ground tests of capable systems.

These initiated ground tests are mainly defined to simplify the return-to-service operational tests to be performed after a system component replacement.

HARDWARE ARCHITECTURE AND COMPONENTS

The following schematics present the hardware components and liaisons involved in the Airplane Diagnostic and Maintenance System (ASMS).

MAINTENANCE INHIBIT is a guarded switch which allows ground maintenance operation with inhibition of overhead panel automatic sequences.



CENTRAL MAINTENANCE SYSTEM HARDWARE ARCHITECTURE

CAS MESSAGES

CAS MESSAGE	DEFINITION
CMC CMPTR MEM FAIL	Maintenance computer memory is full.
CMC CMPTR FAIL	Maintenance computer failed