

2.32. FLIGHT MANAGEMENT SYSTEM

The FMS-3000 Flight Management System (FMS) consists of:

- one CDU-3000 Control Display Unit (on the central control pedestal),
- one FMC-3000 Flight Management Computer (inside the IAPS)
- one DBU-4100 Data Base Unit (behind the pilot's seat).

The FMS-3000 provides capability of en route, terminal and non-precision approach navigation, based on information coming from the aircraft's available sensors, computed by the FMS to fly from way-point to way-point along a flight plan route.

The FMS receives information from GPS receiver, VOR1 and VOR2 navigation systems, three channels DME transceiver, AHS and ADC sensors.

All the available data concur to calculate and maintain the Best Computed Position.

GPS and navigation systems information are continuously monitored by the FMC for availability and reliability: data found to be out of the admitted precision accuracy are automatically excluded from aircraft position computation and navigation functions.

The FMS interfaces with the aircraft electronic flight displays to provide navigation information on both left and right PFDs and MFD.

The FMS also computes steering commands that are used by the flight control system to automatically fly the aircraft along the route.

Due to design characteristics, the system is capable to manage navigation on Horizontal and Vertical flight plane, allowing B-RNAV and P-RNAV operations as per European airspace requirement as well as VNAV and RNAV En Route and Terminal operation as per U.S. airspace requirements.

The Control Display Unit is the pilot's interface with the various functions of the FMS-3000 system.

The DBU is a data loader for the FMS-3000 system.

Furthermore, a connector on the right side of the control pedestal, allows the FMS to be connected with a remote PC or laptop computer running the PCD-3000 Data Loader program for faster database updating with respect to the DBU.

On ground database updating and flight planning are possible with the minimum of avionics equipment powered.

DESCRIPTION AND OPERATION
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The Flight Management Computer is powered by the Left Avionics Supplementary Bus through the L IAPS 7.5-ampere circuit breaker on the pilot's C/B panel.

The Data Base Unit is powered by the Right Single Feed Bus through the DBU 3-ampere circuit breaker on the copilot's C/B panel.

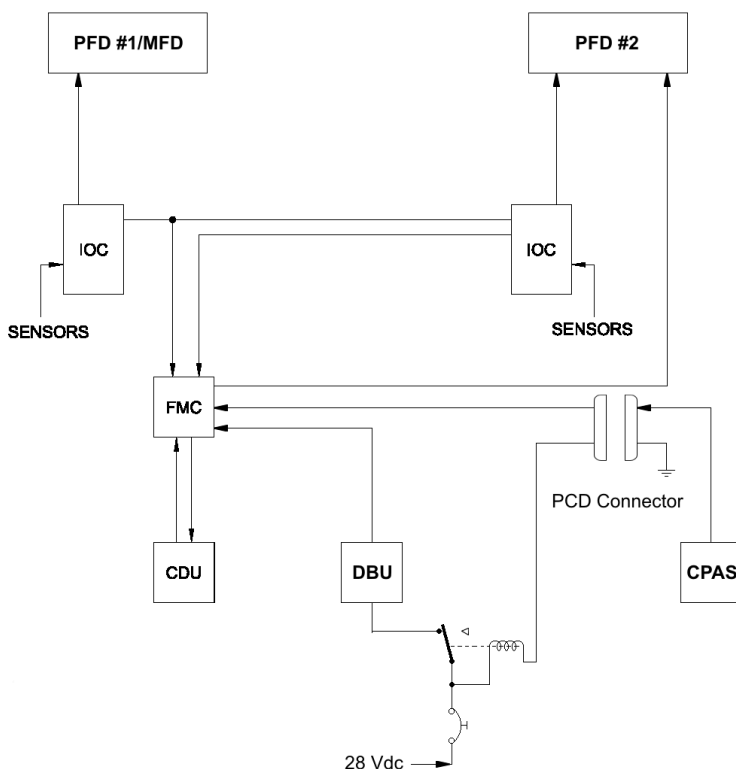


Figure 2.32-1. Flight Management System block diagram

OPERATIONS

To accurately determine the aircraft present position, after power is applied to the FMS, a position initialization process is required. The position initialization process is done with the CDU on the POS INIT pages.

The pilot selects or enters into the FMS the best known value for the current position of the aircraft, such as the position of the airport, gate, runway threshold or navaid.

To determine the aircraft present position, the FMS uses all the installed and enabled navigation sensors available (GPS and VOR/DME systems). Each sensor data is part of the position determination as long as the sensor data is valid or it has not been specifically disabled. At startup, all navigation sensors are enabled to be used by the FMS. Disable the navigation sensors may degrade the accuracy of the position determination.

VOR / DME sensors auto-tuning mode can be operated when FMS is selected as active navigation source. Pilot's manual change of VOR / DME frequencies will disable auto-tuning functionality, that can be selected again each time during flight.

NOTE

Enabling auto-tuning operations during FMS navigation is important in order to automatically select the best VOR / DME ground station useful for aircraft position computation.

FMS navigation is based on the use of all the aircraft available navigation sensors to fly from way-point to way-point along a flight plan route.

A way-point is any fixed geographical point that is used as a reference for a navigation fix. Way-points may be either predefined or pilot defined. Predefined way-points are stored in the FMS navigation data base with the identifier that is shown on aeronautical charts. These way-points may be airports, navaids or intersections. Pilot defined way-points are stored within the FMS but not in the FMS navigation data base.

The FMS determines the present position relative to the flight plan route and computes steering commands for use by the flight control system to fly the aircraft along the route.

The flight plan route is created by selecting way-points or airways from the data base. FMS holds two flight plans. One is the active flight plan and the other one is the secondary flight plan. The active flight plan and secondary flight plan are completely independent. Only the active flight plan is used for navigation when FMS has been selected as active NAV source.

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The FMS provides navigation in en route, terminal and approach phases of flight.

Terminal phase of flight is determined when an origin or arrival airport has been entered in the flight plan and the location of the aircraft is within 30 NM of the origin or arrival airport.

Approach phase of flight is determined upon passage of 2 NM inbound to FAF (Final Approach Fix) and fly a non-precision approach when the approach has been activated.

Two minutes prior to reaching the last way-point of a flight plan, the CDU message line and page show the message "LAST WAY-POINT" and the way-point alert flashes the way-point for five seconds. When the aircraft is within five seconds of passing abeam the last way-point, the way-point alert again flashes the way-point. As the aircraft passes abeam the last way-point, the FMS stops steering to follow a course and rolls the aircraft to wings level to maintain the aircraft's current heading. The FMS will continue to steer the current heading until it is deselected as the navigation source or until a new way-point is entered into the flight plan and the legs page will show the last way-point until a new one is entered.

The PFD shows the information related to FMS operations, including NAV source annunciation, course/deviation bar, a navigation data readout, Vertical Navigation (VNAV) information and FMS messages.

The MFD shows both FMS Map and Text displays. In the Map display modes, symbols are used to identify and show the various navigation facilities in relation to the current position of the aircraft or a selected way-point along the flight plan. The MFD also has a five-line text window that can be enabled to show selected navigation and VNAV information above the MFD map display. Text displays show information related to the flight plan progress, current position of the aircraft, status of navigation sensors (VOR/DME and GPS), fuel management and other functions. FMS Text pages cannot be displayed on the MFD while the MFD is in MAP mode.

The FMS shows various messages and annunciations on the CDU, PFD and MFD displays.

There are two display lines on the CDU that show messages. One is the bottom display line, called the message line; the other is the scratchpad line.

Messages that are displayed on the CDU scratchpad line are generally related to database and maintenance operations. These messages show in white for approximately one second, then the previous scratchpad entry returns for correction or deletion. The PFD and MFD do not display annunciations for

scratchpad messages. Furthermore, scratchpad messages do not show on the MESSAGES page.

Messages that are displayed on the message line are generally related to the system operation. Most of these messages also show on the CDU MESSAGES page. For many of these messages, the FMS generates an annunciation on the PFD and/or MFD at the same time. Some conditions may cause two annunciations to show on the PFD.

On the message line, a new message overwrites any existing message except for the execute message. When multiple messages occur, they are prioritized and the most important or most recent message is the one that shows. The MESSAGES page stores all the current active messages that were generated for the message line.

FMS annunciations on the PFD and MFD alert the pilot regarding specific operating conditions. These messages stay on as far as the alert condition persists, or for a minimum of five seconds.

The PFD annunciation line are below the NAV sensor annunciations; the PFD message line is in the middle of the HSI display.

The MFD message line is at the bottom of the MFD display.

Refer to the Collins "FMS-3000 Flight Management System Operator's Guide for the Piaggio P.180 Avanti", doc. n. 523-0806485, for details about FMS operations.

The selection of the FMS on ground capability through the "FMS ON GND" switch, on the MISCELLANEOUS/REVERSIONARY panel, allows to power the minimum required avionics equipment to perform FMS ground operations.