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PREAMBLE

The Auto Flight System is described in the volume 1 and 4 :

- the volume 1 chapter 22 gives a general description of the system and the different functions (architecture, modes, FMA, functions...).
- the volume 4 “FMGS PILOT'S GUIDE” is devoted to the FMGS System operation (MCDU pages, MCDU message, Procedures).

DESCRIPTION

The Flight Management Guidance and envelope System (FMGS) contains the following units :

- Two Flight Management Guidance and envelope Computers (FMGC).
- Three Multipurpose Control and Display Units (MCDU)
- One Flight Control Unit (FCU)
- One Flight Management source selection device.

GENERAL PHILOSOPHY

The Flight Management and Guidance System (FMGS) provides predictions of flight time, mileage, speed, economy profiles and altitude. It reduces cockpit workload, improves efficiency and eliminates many routine operations normally performed by the pilots.

During cockpit preparation the pilot inserts a preplanned route from origin to destination via the Multifunction Control and Display Units (MCDUs). This route includes the departure, enroute waypoints, arrival, approach, missed approach and alternate route as selected from the navigation database. The system generates optimum vertical and lateral flight profiles and predicted progress along the entire flight path. Either FMGC performs all operations if one FMGC fails.

The pilot may modify any flight parameter on a short term basis (SPD, V/S, HDG...) and the FMGS will guide the aircraft to the manually selected target. This pilot controlled guidance is called “selected”.

There are two types of GUIDANCE :

- Managed guidance : The aircraft is guided along the preplanned route, vertical, lateral, and speed/Mach profile. This type of preplanned guidance is called “Managed”.

Predicted targets are computed by the FMGS.

- Selected guidance : The aircraft is guided to the selected target modified by the pilot.

Targets are selected on the flight control unit located on the pilots glareshield. The decision to engage a “selected” or a “managed” guidance is always under the control of the pilot.

Selected guidance has priority over managed guidance.

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FLIGHT MANAGEMENT GUIDANCE COMPUTER (FMGC)

Each FMGC is divided into four main parts :

- The Flight Management (FM) part controls the following functions :
 - Navigation and management of navigation radios.
 - Management flight planning.
 - Prediction and optimization of performance.
 - Management of displays.
- The Flight Guidance (FG) part performs the following functions :
 - Autopilot (AP) command
 - Flight Director (FD) command
 - Autothrust (A/THR) command
- The Flight Envelope (FE) part controls the following functions :
 - Computation of data for the flight envelope and speed functions
 - Monitoring of parameters used by FG and FE parts
 - Windshear and aft Center of Gravity (CG) detection
 - Computation of GW and CG information
- The Fault Isolation and Detection System (FIDS) part providing :
 - Acquisition and concentration of maintenance data
 - Interface with the Central Maintenance Computer (CMC)

Each FMGC has its own set of databases. The individual databases can be independently loaded into their respective FMGC, or independently copied from one FMGC to the other. It takes 20 minutes to load all the databases into both FMGCs.

Each FMGC contains these main databases :

1. The Navigation database (2.8 Mbytes) contains standard navigation data : Nav aids, waypoints, airways, enroute information, holding patterns, airports, runways, procedures (SIDs, STARs, etc.), company routes, alternates.

The airline updates this part every 28 days, and is responsible for defining, acquiring, updating, loading, and using this data.

2. The Airline Modifiable Information (AMI, also referred to as the FM Airline Configuration file), contains :
 - Airline policy values : THR RED altitude, ACC altitude, EO ACC altitude, PERF factor, IDLE factor.
 - Fuel policy values : Fuel for taxi, % of route reserve, maximum and minimum values of route reserve, etc.
 - ACARS interface customization.
 - The Aircraft Performance database, is a set of Engine model, Aerodynamical model, and Performance model. The airline cannot modify this database.
 - The Magnetic Variation database :

In addition, each FMGC contains pilot-stored elements that enable the pilot to create 20 waypoints, 10 runways, 20 nav aids, and 5 routes.

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MULTIPURPOSE CONTROL AND DISPLAY UNIT (MCDU)

Three MCDUs are installed on the pedestal for flight crew loading and display of data. The use of MCDU allows the flight crew to interface with the FMGC by selection of a flight plan for lateral and vertical trajectories and speed profiles. The crew may also modify selected navigation or performance data and specific functions of Flight Management (revised flight plan, engine-out, secondary flight plan, etc.). Additional data from peripherals (Centralized Maintenance System (CMS), ARINC Communications, Reporting System (ACARS) can also be displayed. Data that are entered into the MCDU that are illogical or beyond the aircraft capabilities will either be disregarded or will generate an advisory message. The MCDUs allow back up navigation in case of dual FM failure.

FLIGHT CONTROL UNIT (FCU)

The FCU located on the glareshield, is the short-term interface between the crew and the FMGC. It is used to select any flight parameters or modify those selected in the MCDU. The autopilots and autothrust functions may be engaged or disengaged. Different guidance modes can be selected to change various targets (speed, heading, track, altitude, flight path angle, vertical speed).

FM SOURCE SELECTOR

This selector allow to switch the FMGC data to the offside MCDU and EFIS display in case of one FM failure.

OTHER CREW INTERFACES

THRUST LEVERS

The thrust levers are the main interface between the Flight Management Guidance Computer, the Full Authority Digital Engine Control System (FADEC), and the flight crew.

They :

- arm the autothrust at takeoff, when “FLX “ or “TOGA” is selected,
- limit the maximum thrust by their position when autothrust is active,
- disconnect the autothrust system when the flight crew sets them to “IDLE”,
- command the thrust manually when autothrust is not active,
- engage the common modes (takeoff or goaround) when TOGA (or “FLX” for takeoff) is set,
- when positionned between IDLE and CL detent (MCT in engine out), set the autothrust to the active mode.

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ELECTRONIC FLIGHT INSTRUMENTS (EFIS)

Two primary flight displays (PFD) and navigation displays (ND) provide the pilot with full time flight guidance, navigation and system advisory information for all phases of flight. An EFIS control panel is located at each end of the glareshield and is used to control both primary and navigation data displays. The panel includes controls to select various modes within the PFD. A selector allows the barometric altimeter setting to be displayed on the PFD. Various distant ranges can be selected on the ND with two toggle switches that allow display of either the left or right VOR/ADF bearing pointers on the ND.

PRIMARY FLIGHT DISPLAYS

The PFDs combine several conventional flight instrument indications onto one color display panel for pilot centralized reference of flight data.

This centralized color display includes :

- Flight Director attitude guidance targets
- armed and engaged modes
- navigation and instrument approach information
- altimeter setting
- barometric altitude
- system messages.

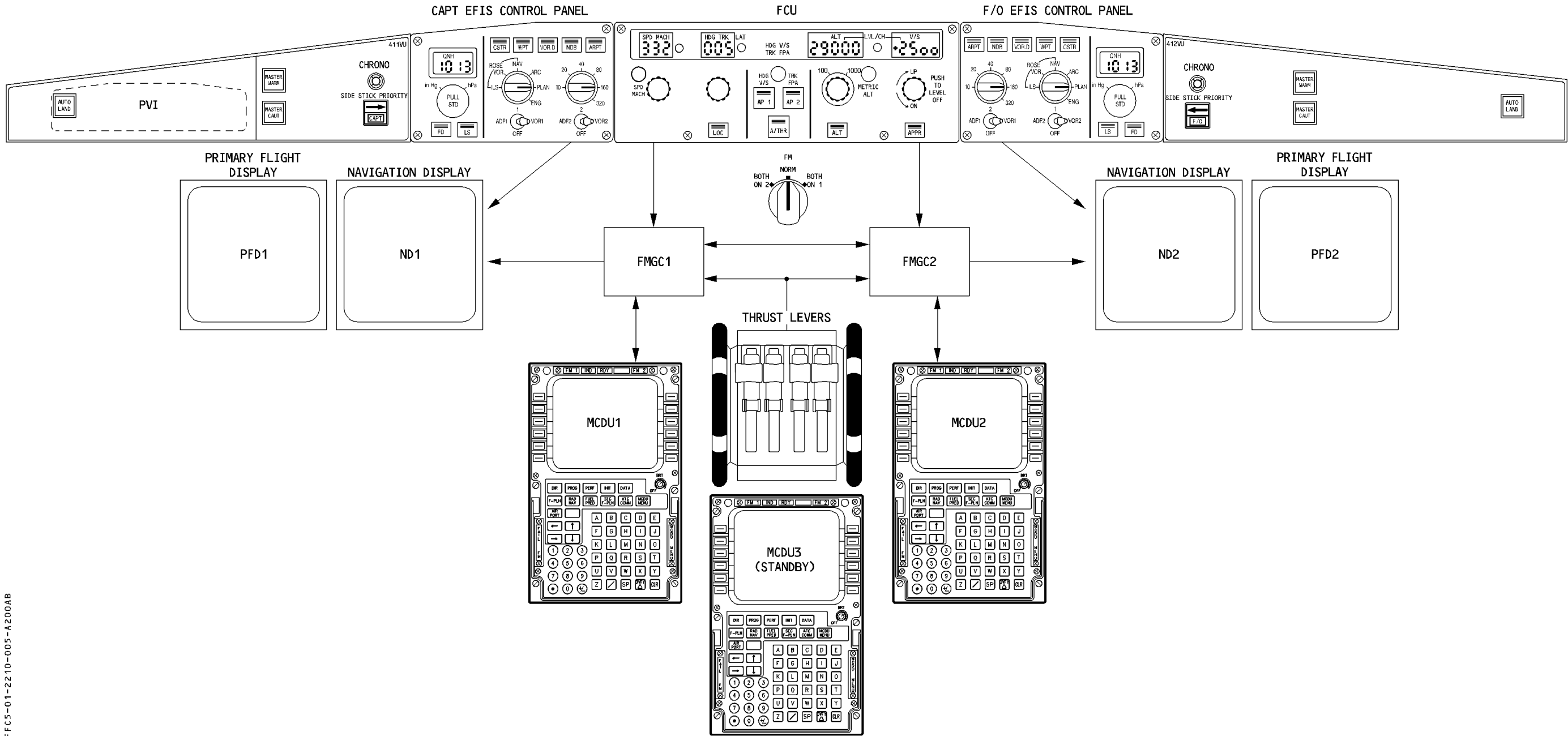
NAVIGATION DISPLAYS

Five different color navigation compass displays can be selected.

- arc (map mode)
- compass rose NAV (map mode)
- compass rose VOR
- compass rose ILS
- plan

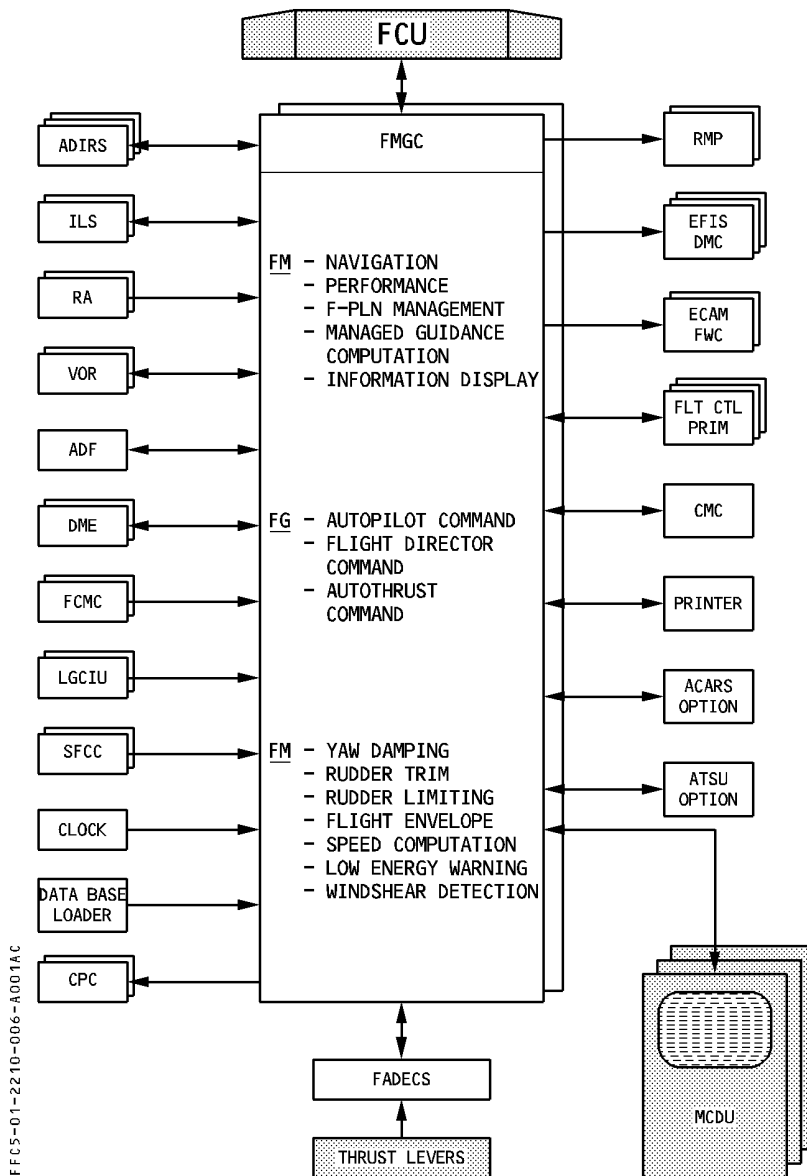
Information displayed onto these modes uses aircraft position as a reference point to the flight plan navigation data (lateral and vertical information).

CREW INTERFACE WITH FMGC



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SYSTEM INTERFACE DIAGRAM



FMGS MODES OF OPERATION

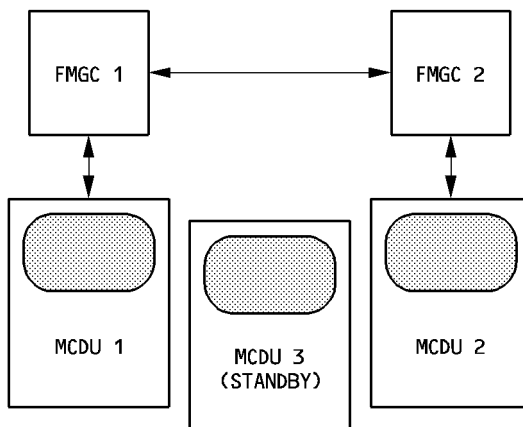
The FMGS has four modes of operation :

- dual mode (the normal mode)
- independent mode. Each FMGC being controlled by its associated MCDU.
- single mode (using one FMGC only)
- back up navigation mode

DUAL MODE

This is the normal mode. The two FMGCs are synchronized : each performs its own computations and exchanges data with the other through a crosstalk bus.

One FMGC is the master, the other the slave, so that some data in the slave FMGC comes from the master. All data inserted into any MCDU is transferred to both FMGCs and to all peripherals.



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MASTER FMGC LOGIC :

- If one autopilot (AP) is engaged, the related FMGC is master :
 - it uses the onside FD for guidance
 - it controls the A/THR
 - it controls the FMA 1 and 2
- If two APs are engaged, FMGC1 is master.
- If no AP is engaged and
 - the FD1 pushbutton is on, then FMGC1 is master.
 - the FD1 pushbutton is off, and FD2 pushbutton on then FMGC2 is master.
- if no AP/FD is engaged, A/THR is controlled by FMGC1.

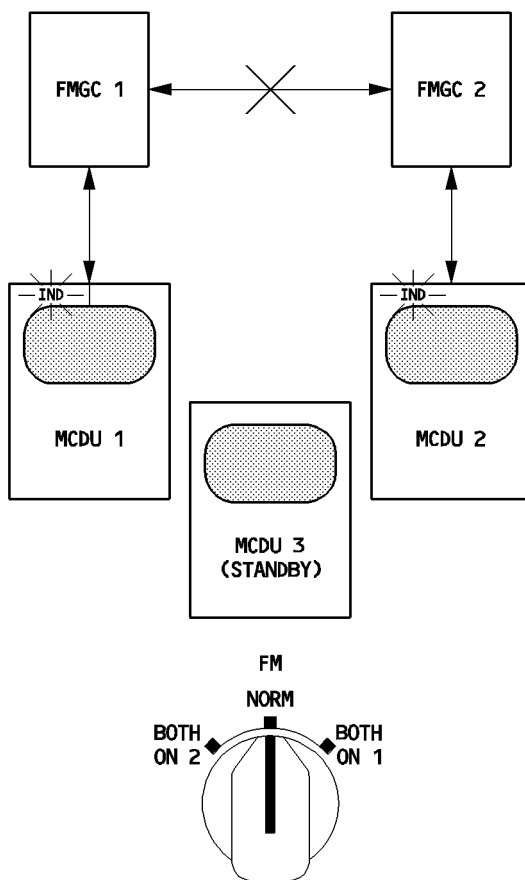
INDEPENDENT MODE

The system selects this degraded mode automatically if it has a major mismatch (database incompatibility, operations program incompatibility . . .). Both FMGCs work independently and are linked only to peripherals on their own sides of the flight deck (“onside” peripherals).

When this occurs, “INDEPENDENT OPERATION” appears on the MCDU scratchpad.

The “IND” annunciator light illuminates amber on the top of the MCDU when the onside FMGC detects an independent operation.

Each MCDU transmits data it receives only to its onside FMGC, and it affects only the onside EFIS (Electronic Flight Instrument System) and RMP (Radio Management Panel).

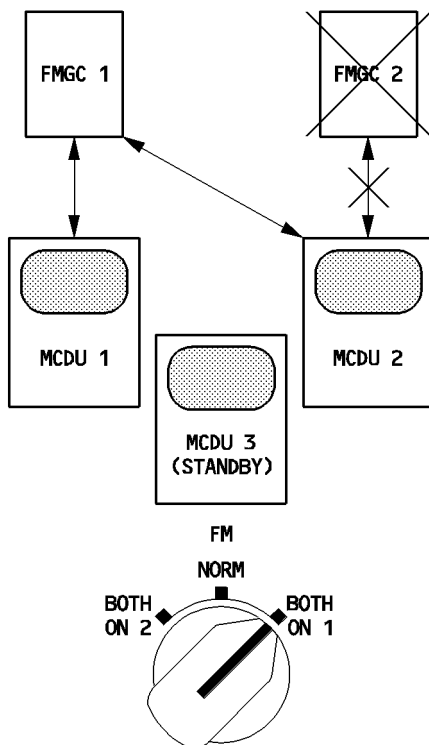


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For independent mode procedure refer to 4.06.10.

SINGLE MODE

The system selects this degraded mode automatically if one FMGC fails. The pilot selects the FM source selector to transfer the remaining FMGC data to the offside MCDU and EFIS display. The remaining FMGC drives all the peripherals, so, for example, any entry on one MCDU goes to both MCDUs. The ND on the side with the failed FMGC displays "OFF SIDE FM CONTROL" in amber.



For single mode procedure refer to 4.06.10.

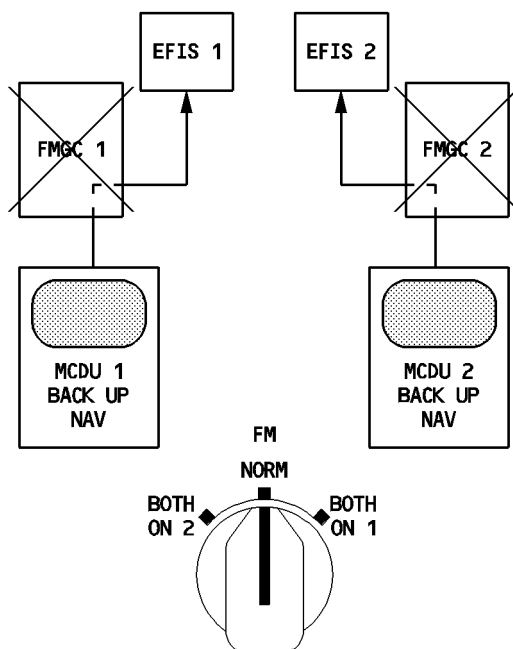
BACK UP NAVIGATION MODE

The pilot selects on the MCDU menu page this degraded mode when both FMGC fuel. He recovers the navigation function through the MCDU and IRS.

The MCDU memorizes the flight plan which has been continuously down loaded in its memory by the FMGC until it failed.

The following features are provided:

- Flight Planning
- Aircraft position using outside IRS or IRS 3
- F-PLN display on ND
- No AP/FD NAV mode
- Limited lateral revision
- F-PLN automatic sequencing

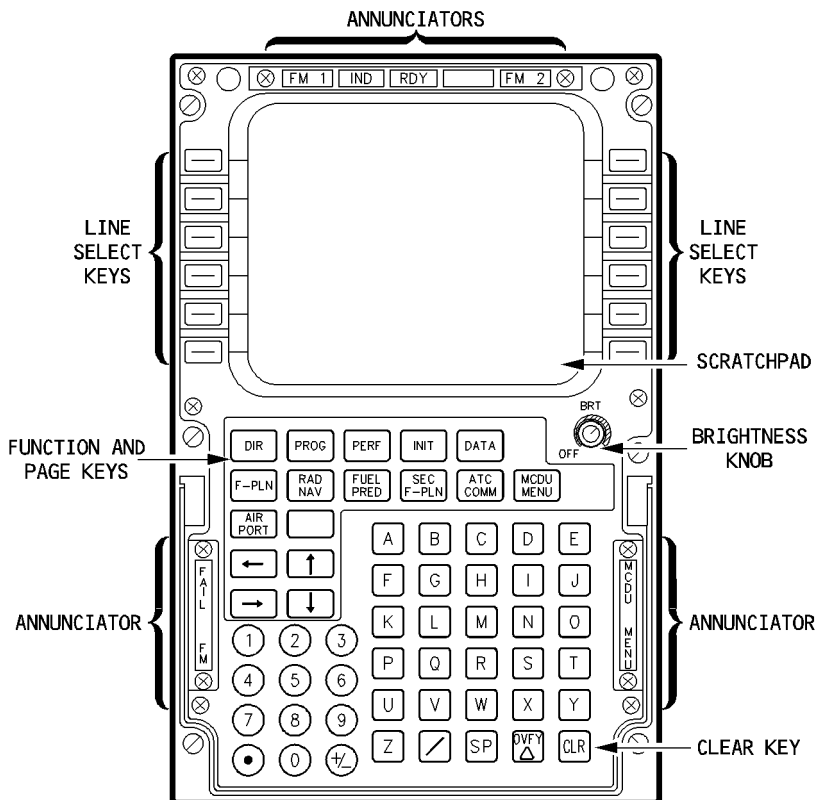


Note : MCDU 3 is not able to operate as back up navigation even when it replaces MCDU 1 or 2.

The back up navigation mode is only accessible on the MCDU MENU page if the FM source selector is set to NORM position.

PILOT INTERFACE

MULTI PURPOSE CONTROL DISPLAY UNIT (MCDU)



GENERAL

The MCDU is a cathode ray tube that generates 14 lines of 24 characters each :

- a title line that gives the name of the current page in large letters,
- six label lines, each of which names the data displayed just below it (on the data field line),
- six data field lines that display computed data or data inserted by the pilot
- The scratchpad line which displays :
 - specific messages
 - information the pilot has entered by means of the number and letter keys and which he can then move to one of the data fields.

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LINE SELECT KEYS

There is a column of keys on each side of the screen. The pilot uses these to:

- Move a parameter he has entered in the scratchpad to the appropriate line on the main screen.
- Call up a specific function page indicated by a prompt displayed on the adjacent line.
- Call up lateral or vertical revision pages from the flight plan page.

KEYBOARD

The keyboard includes :

- Function and
Page keys

Call up functions and pages the pilot uses for flight management functions and computations.

↑ ↓ (or SLEW) keys

Move a page up or down to display portions that are off the screen.

← → key

Moves to the next page of a multi-page element. An arrow in the top right corner indicates that another page is available.

AIRPORT key

Calls up the flight plan page that contains the next airport along the current flight plan. Successive pushes on the key show the alternate airport, the origin airport (before takeoff), and the next airport again.

- Number and letter keys allow the pilot to insert data in the scratchpad so that he can use a key to enter it in the main display.
- Three keys have special functions :
CLR (clear) key

Erases material (messages or inserted data) from the scratchpad or from certain areas of displayed pages.

OVFY (overfly) key

Allows the aircraft to overfly a selected waypoint.

SP (space) key

Allows to insert a space in specific messages.

ANNUNCIATORS (on the side of the keyboard)

FAIL (amber)

Indicates that the Multipurpose Control and Display Unit (MCDU) has failed.

MCDU MENU (white)

Indicates that the pilot should call up a peripheral linked to the MCDU (such as ACARS or CMS).

FM (white)

Comes on while the crew is using the MCDU to display peripherals.

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ANNUNCIATORS (on the top of the keyboard)

FM 1 and FM 2 (amber) : the onside FM is failed

Note : – The FM failure annunciator on MCDU 3 comes on only if MCDU 3 operates as a back up of MCDU 1 or 2
– A MCDU has never both FM failure annunciators ON.

IND (amber) : The onside FM detects an independent mode of operation while both FM are healthy.

RDY (green) : MCDU has passed its power up test after its BRT knob was turned to ON.

BRT KNOB

Controls the light intensity of the entire MCDU.

Note : In case of MCDU 1 or 2 failure, its brightness knob has to be switched off to allow the MCDU3 connection to the corresponding FMGC.

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DATA ENTRY

The pilot enters data by typing it into the scratchpad on the MCDU. Next, pressing the line select key will load the data from the scratchpad into the desired field. An error message displays if the data are out of range or not formatted correctly. To correct data, the pilot may clear the message with the clear (CLR) key and then retype the message into the scratchpad. Pressing the CLR key when the scratchpad is empty displays “CLR”. To clear data from a field, line select CLR from the scratchpad to the data field to be cleared.

MCDU ENTRY FORMAT

The pilot enters information into the MCDU at the bottom line of the scratchpad. When data has lead zeros, they may be omitted if desired. For example a three-digit wind direction of 060 may be typed as 60. The display will still show 060. To enter an altitude below 1000 feet, the lead zero must be added as 0400 for 400 feet. This differentiates the altitude from a flight level.

To enter a double data entry such a speed/altitude, the separating slash must be used. If entering only the first part of a double entry, omit the slash. To enter only the second part of a double entry, a leading slash must be used i.e./0400 feet.

MESSAGES

The scratchpad displays various messages for pilot information. These messages are prioritized by importance to the pilot as either amber or white.

Amber messages are :

- Navigation messages
- Data entry message
- EFIS repeat messages

Amber messages are categorized into two types :

- Type 1 message that is a direct result of a pilot action. Type 1 messages are displayed immediately in the scratchpad ahead of other messages.
- Type 2 messages inform the pilot of a given situation or request a specific action. Stored in “last in”, “first out” message queue that holds maximum of 5 messages.

Type 2 messages are displayed in the scratchpad only if there are no Type 1 messages or other data and will remain until all the messages have been viewed and cleared with the CLR key.

White messages are advisory only.

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CHARACTERS

Small and large fonts are displayed according to the following rules :

- The title line and the scratchpad are displayed in large font.
- Datafields are usually displayed in large font.
- Label lines are displayed in small font.
- Pilot entries and modifiable data are displayed in large font.
- Defaulted/computed and non modifiable data are displayed in small font.

COLORS

DATA	MCDU COLOR
TITLES, COMMENTS <, >, ↑ ↓ ← → DASHES, MINOR MESSAGES	WHITE
MODIFIABLE DATA SELECTABLE DATA BRACKETS	BLUE
NON MODIFIABLE DATA ACTIVE DATA	GREEN
– MANDATORY DATA (BOXES) – PILOT ACTION REQUIRED – IMPORTANT MESSAGES – MISSED CONSTRAINT	AMBER
CONSTRAINTS MAX ALTITUDE	MAGENTA
PRIMARY F-PLN	GREEN WAYPOINTS, WHITE LEGS
TEMPORARY F-PLN	YELLOW WAYPOINTS, WHITE LEGS
SECONDARY F-PLN	WHITE WAYPOINTS AND LEGS
MISSED APPROACH (not active)	BLUE WAYPOINTS, WHITE LEGS
ALTERNATE F-PLN (not active)	BLUE WAYPOINTS, WHITE LEGS
OFFSET	GREEN WAYPOINTS, WHITE LEGS OFST IN THE TITLE OF F-PLN PAGE
TUNED NAVAID	BLUE
TO WAYPOINT AND DESTINATION	WHITE

SCREEN PROMPTS

→ UPPER RIGHT CORNER OF THE SCREEN
INDICATES THAT NEXT PAGE IS AVAILABLE
BY DEPRESSING THE → KEY.

□ □ □ : DATA ENTRY IS MANDATORY TO
ALLOW THE FMGC TO PERFORM ALL
ITS FUNCTIONS.

↑ ↓ : WHEN THESE ARROWS ARE BESIDE
A LABEL LINE, IT IS POSSIBLE
TO INCREASE OR DECREASE
THE VALUE DISPLAYED BELOW
BY PRESSING ↑ OR ↓ KEYS
ON THE KEYBOARD.

LABEL LINE

DATALINE OR DATA FIELD

--- : THIS DATA WILL BE COMPUTED BY THE
FMGC IF IT HAS ENOUGH INFORMATION,
PROVIDED OUT OF THE DATA BASE,
OR INSERTED BY THE CREW.

← → A TURN (LEFT←OR REGHT→)
IS SPECIFIED ON THE LEG WHICH
STARTS AT THE WAYPOINT
ADJACENT TO THE ARROW.

★ : INDICATES THAT A CONSTRAINT
HAS BEEN INSERTED. DISPLAYED
ONLY IF PREDICTIONS AVAILABLE.

D : DISPLAYED BESIDE A FIXED
WAYPOINT ON THE F-PLN PAGE
TO INDICATE THAT THE A/C
MUST OVERFLY THE FIXED WAYPOINT

★ : INDICATES THAT PRESSING THE
ADJACENT LS KEY WILL CHANGE
PARAMETERS AFFECTING THE
ACTIVE SITUATION

← → : INDICATES THAT PRESSING
THE ADJACENT LS KEY WILL
ACTIVATE THE PROMPT OR
SELECT SOME DATA

↑ ↓ : SCROLLING IS AVAILABLE BY PRESSING
↑ OR ↓ KEY ON THE KEYBOARD.
THE PAGE IS NOT LARGE ENOUGH TO
DISPLAY THE WHOLE INFORMATION.

[] : A DATA INSERTION IS POSSIBLE.

<OR> : MEANS THAT ANOTHER PAGE MAY BE
ACCESSED BY PRESSING THE ADJACENT LS
KEY.

+,-:WHEN AN ALTITUDE CONSTRAINT HAS
BEEN ENTERED AT A WAYPOINT, THE
CONSTRAINT VALUE IS DISPLAYED ON THE
VERT REV PAGE.
A PLUS (+) IS DISPLAYED FOR AN OR ABOVE
ALTITUDE CONSTRAINT AND A MINUS (-) FOR
AN AT OR BELOW ALTITUDE CONSTRAINT.

INIT		FROM/TO →	
1L	CO RTE	1R	
2L	ALTN RTE	2R	ALTN
3L	FLT NBR	3R	
4L	LAT ↑ ↓	4R	LONG
5L	COST INDEX	5R	WIND>
6L	CRZ FL/TEMP	6R	TROPO
			36090

FROM TMPY		UT 1234 →
1L	BET ←	1R
2L	A220	2R
3L	NABIE	3R
4L	W175	4R
5L	W176D	5R
6L	W177	6R
←ERASE		INSERT★

LAT REV FROM BET	
59°45.8N/168°51.2W	
1L	1R
2L	2R
3L	3R
4L	4R
5L	5R
6L	6R

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MCDU FUNCTION KEYS

The function keys on the Multipurpose Control and Display Units allow the pilot to call up MCDU pages quickly.

The following is a summary of the purpose of each key. (Volume 4, FMGS Pilot's Guide provides a full description of the pages).

DIR	Calls up the DIR TO page, and allows the pilot to proceed directly from present position to any waypoint entered manually or selected in the active flight plan.
PROG	Calls up the progress page corresponding to the phase of the active flight plan that is in progress. This page displays navigation information and active data such as the optimum and maximum recommended cruise flight levels. It allows the pilot to update the FMGS position and to get a bearing and distance to any location.
PERF	Calls up the performance pages, which display the optimum speed or Mach number for each phase. The pilot can amend these pages. The first page to be displayed is the one corresponding to the current flight phase (except for preflight and done phases). The pilot can then use the appropriate 6L or 6R key to call up pages corresponding to future flight phases.
INIT	Calls up the flight plan initialization A page, which also gives the pilot access to the B page. The pilot uses the INIT pages to initialize Flight Management for the flight. The pilot uses the INIT A page primarily to insert his flight plan and to align the inertial reference system. The pilot uses the INIT B page to insert aircraft weight, fuel on board, CG and various fuel requirements. The FMGS uses this data to compute predictions and fuel planning parameters. The pilot has access to the INIT A page only in the preflight phase. INIT B page (not accessible after engine start) is called up by pressing the "NEXT PAGE" key.

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DATA	Calls up the data index page. This gives the pilot access to various reference pages that show aircraft position, aircraft status, runways, waypoints, nav aids, routes and data stored by the pilot.
F-PLN	Calls up the flight plan A and B pages, which contain a leg-by-leg description of the active primary flight plan. The pilot can use the slewing keys to review the entire active flight plan. He can make all lateral and vertical revisions to the flight plan through these pages, using the left keys for lateral revision and the right keys for vertical revision.
RAD NAV	Calls up the RADIO NAV page. This page displays the radio nav aids tuned automatically or manually through the FMGC.
FUEL PRED	Calls up the fuel prediction page. Once the engines are started, this page displays the fuel predicted to be remaining at the destination and the alternate, as well as fuel management data.
SEC F-PLN	Calls up the index page for the secondary flight plan. The pilot can use this page to call up the secondary flight plan and all the functions related to it (copying, deleting, reviewing, activating, and the INIT and PERF pages).
ATC COMM	Calls up the ATC applications (not activated).
MCDU MENU	Calls up the MCDU MENU page, which displays the subsystems currently addressed via the MCDU. The key next to the name of a subsystem enables the crew to select that subsystem. When the MCDU MENU annunciator lights up, the pilot should press the MCDU MENU key. The menu will have [REQ] displayed next to the name of the subsystem that requires attention.
AIRPORT	Calls up the flight plan page which includes the next airport along the current flight plan. The first push on AIRPORT key displays the destination. Successive pushes show the alternate, the origine, and the destination again.

MCDU PAGES

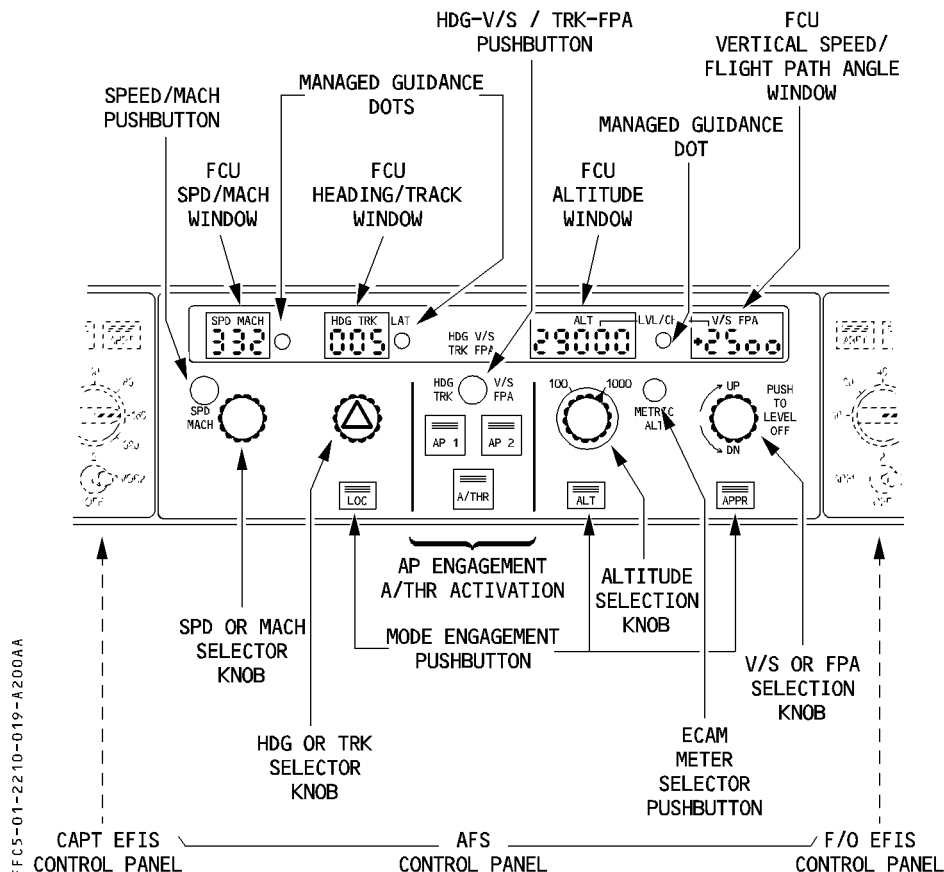
(Refer to FCOM 4.30.20).

FLIGHT CONTROL UNIT (FCU)

The FCU, which is on the glareshield, actually consists of three control panels, one for the automatic flight controls and two for the Electronic Flight Instrument System (EFIS).

For a description of the EFIS control panel, see Chapter 1.31.

The FCU has two channels, each of which can independently command the central panel. If one channel fails, the other channel can control all the functions.



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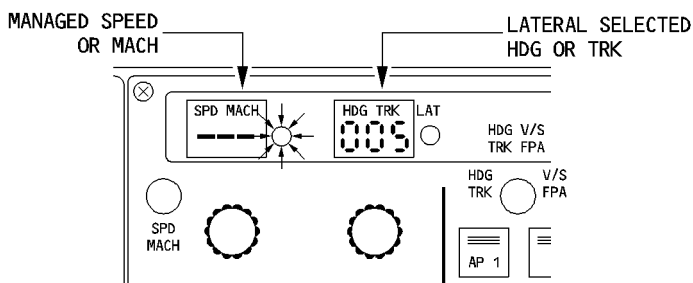
FCU PHILOSOPHY

The pilot can use two types of guidance to control the aircraft in auto flight. One type is managed by the Flight Management Guidance System (FMGS). The other uses target quantities which are manually entered by the pilot.

When the aircraft uses target quantities from the FMGS (managed guidance), the FCU windows display dashes and the white dots next to those windows light up.

When the aircraft uses target quantities, entered by the pilot (selected guidance), the windows display the selected numbers and the white dots do not light up.

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Note : The altitude window always displays an altitude selected by the pilot (never dashes).

The FCU has four selector knobs :

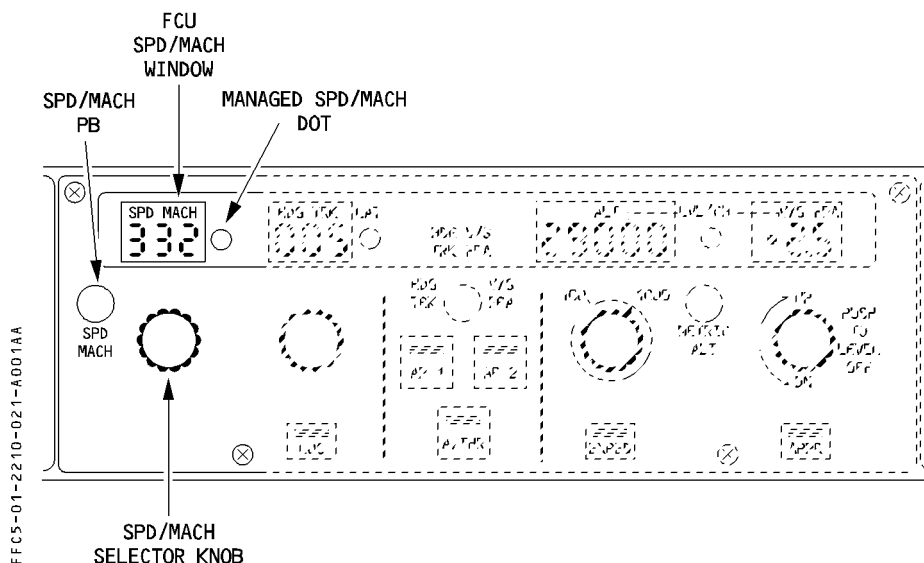
- SPD-MACH
- HDG-TRK
- ALT
- V/S-FPA

The selector knobs can be rotated, pushed in, and pulled out.

- In order to arm or engage managed guidance for a given mode, the pilot presses the associated selector knob. If, for example, he presses the HDG selector knob, he engages or arms the NAV mode.
- In order to engage a selected guidance mode, the pilot turns the selector knob to set the desired value, then pulls the knob out to engage the mode with a target value equal to the selected value.

Note : In managed guidance (lateral, vertical guidance or managed speed), the corresponding window is dashed. Turning a selector knob without pulling it displays a value that is the sum of the current target and the turn action value. The display remains 45 seconds before dashes reappear. This rule does not apply to the ALT selector knob/window.

SPEED/MACH CONTROL AREA



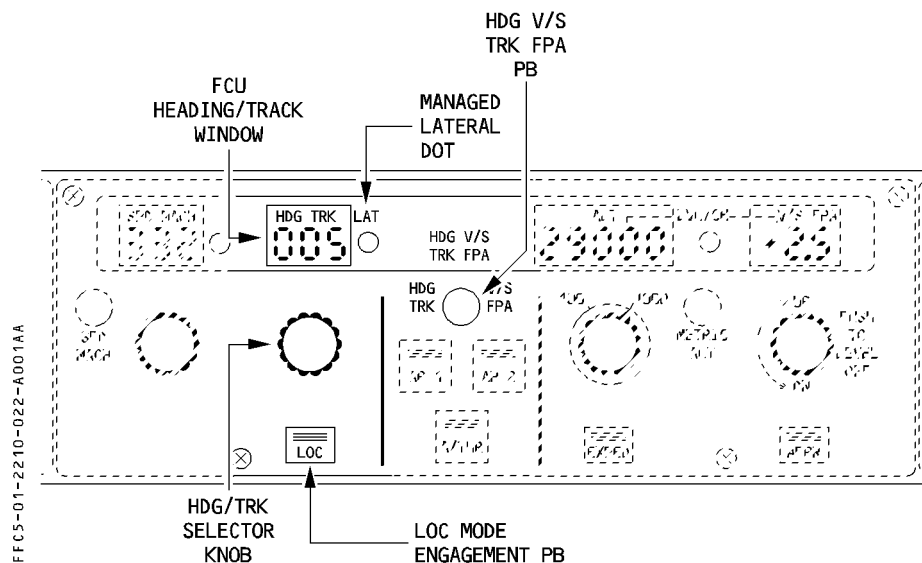
- **SPD/MACH selector knob**

Display range : between 100 and 399 knots for speed, between 0.10 and 0.99 for Mach number.
One rotation of the knob corresponds to approximately 30 knots or 0.3 Mach.

- **SPD/MACH pushbutton**

Pushing this pushbutton changes the SPD target to the corresponding MACH target and vice versa.

LATERAL CONTROL AREA



- **HDG/TRK selector knob**

Display range : between 0° and 359°.

One rotation of the knob corresponds to 30° (1° per click).

- **LOC pushbutton**

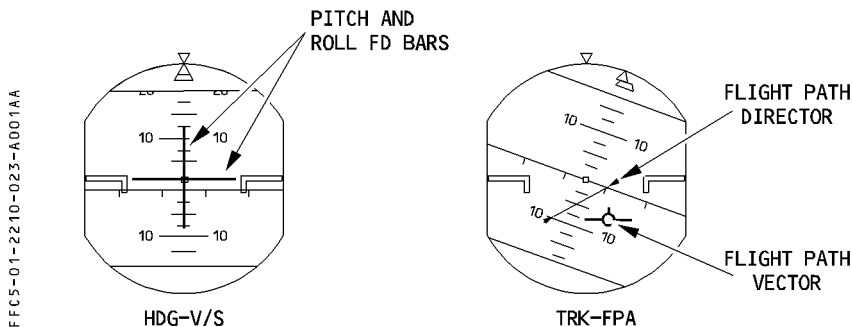
Pushing this pushbutton arms, engages, or disengages the LOC mode.

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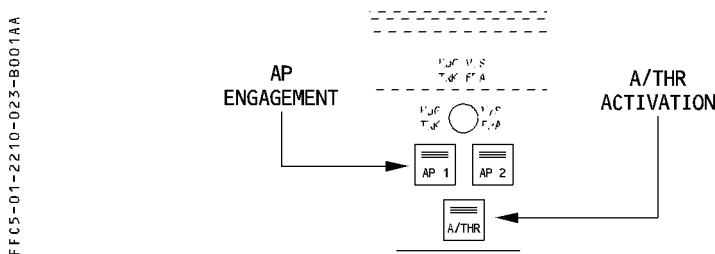
• HDG V / S - TRK FPA pushbutton

The pilot uses this pushbutton to select HDG (associated with V/S) or TRK (associated with FPA). Pushing it :

- Displays the Flight Path Vector (FPV) on the Primary Flight Display (PFD) or deletes it.
- On the PFD, changes the FD crossbar display (with the aircraft attitude as its reference) to the aircraft Flight Path Director (with the flight path vector as its reference) and vice versa.
- Changes heading reference into track reference in the HDG/TRK window and vice versa.
- Changes vertical speed reference target into flight path angle reference target in the V/S-FPA window and vice versa.



AP-A/THR CONTROL AREA



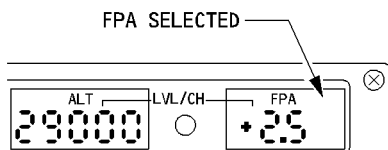
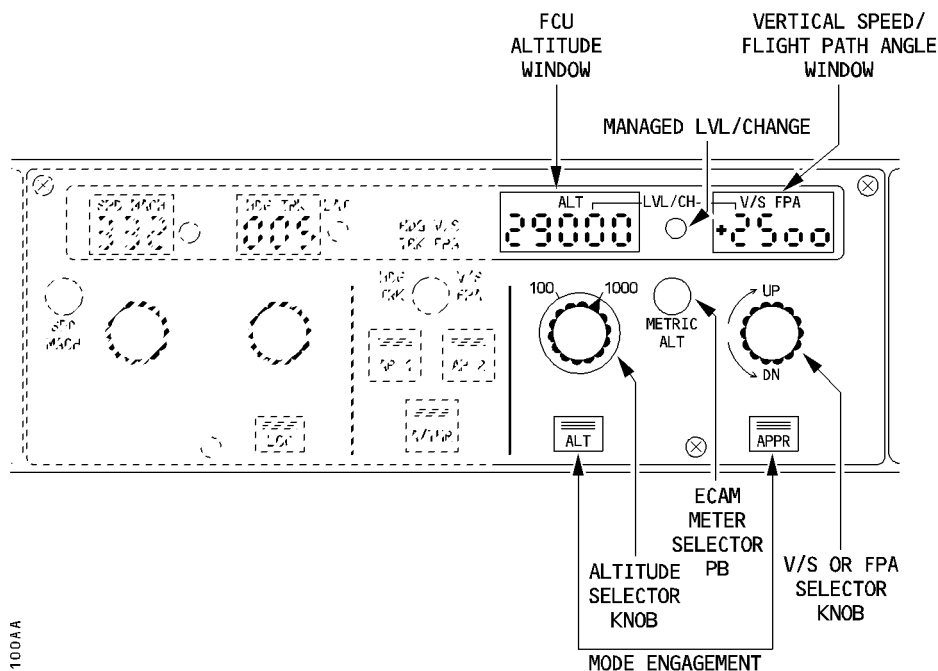
• AP1 AP2 pushbuttons

The pilot uses these pushbuttons to engage or disengage the autopilots. The buttons illuminate green when the autopilot is engaged.

• A/THR pushbutton

The pilot uses this pushbutton to arm, activate, or disconnect the autothrust (A/THR). This button illuminates green if the A/THR is armed or active.

VERTICAL CONTROL AREA



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VERTICAL CONTROL AREA (CONT'D)

The FCU altitude window always displays a target value selected by the pilot. It never displays dashes.

- **Altitude selector knob (inner and outer)**

Display range : 100 to 49000 feet

- The outer knob has two positions, 100 and 1000.
- The inner knob sets the altitude in the FCU windows in increments of 100 or 1000 feet, depending upon the position of the outer knob.

- **ALT pushbutton**

The pilot uses this pushbutton to command an immediate level-off.

- **METRIC ALT pushbutton**

The pilot uses this pushbutton to display the FCU altitude target on the ECAM in meters.

- **V/S or FPA selector knob**

Range (V/S) : – 6000 to + 6000 ft/min
2 clicks = 100 ft/min
If the pilot turns the knob slowly, each click equals 100 ft/min.

Range (FPA) : – 9.9° to + 9.9°
1 click = 0.1°

The pilot turns this knob to set the value of vertical speed (V/S) or flight path angle (FPA) to be displayed in the V/S or FPA window. (He chooses which, V/S or FPA, is to be displayed by pushing the HDG V/S or TRK FPA pushbutton.

One rotation of the knob corresponds to 32 clicks. One complete rotation sets :

FPA = 3.2°

V/S = 1600 ft/min

When the pilot pushes in the V/S or FPA knob the system commands an immediate level-off by engaging the V/S or FPA mode with a target of zero. The flight mode annunciator (FMA) then displays "V/S = 0" in green when V/S or FPA is nulled. If the pilot now turns the knob to put in a new setting for V/S or FPA, the aircraft changes flight path accordingly.

- **APPR pushbutton**

This pushbutton arms, disarms, engages, or disengages the approach modes :
LOC and G/S modes if an ILS approach is selected in the active F-PLN.

APP NAV-FINAL modes if a non precision approach is selected in the active F-PLN.



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