

Mead

GOVERNMENT
EXHIBIT

kc
MN00670

01-455-A (ID)

K3368

020510005

HC



120 SHEETS
WIDE RULED
10½x 8in / 26.6 x 20.3cm
3 SUBJECT NOTEBOOK



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787-900.

Autopilot → autopilot flight director system
(AFDS)
→ Autothrottle system (A/T)

AFDS → Mode Control Panel (MCP)
→ 3 Flight Control Computers (FCC)
→ aileron, elevator, rudder, autopilot
and some actuators

The autopilot system operates as an integral part of 787-900 flight management system (FMS)

The FMS (Left/Right FMCs and 3 CDU) contain the navigation & performance databases which compute LNAV, VNAV and performance speed control functions to the autopilot system.

Normally the AFDS and A/T are controlled automatically by the FMS to perform lateral and vertical flight path guidance during climb, cruise and descent (LNAV, VNAV and A/T engaged)

Control of the AFDS is by MCP.

Autotrottle is by MCP & FMS (CMDs)

Autopilot Flight Director System (AFDS)

AFDS is a triple system \rightarrow 3 flight control computers (FCC) and the single mode panel (MCP)

The MCP control \rightarrow autopilot

\rightarrow flight director

\rightarrow altitude select

\rightarrow autotrottle function

The 3 FCC \rightarrow Left Center Right, \rightarrow command three respective hydraulically powered auto pilot servos which operate the flight control through 3 separate hydraulic systems

MCP switches are pushed to select an autopilot / flight director and for autotrottle mode.

A light bar in the lower half of the switch illuminates & indicates the mode has been selected.

Made engagement is received by flight mode
annunciation displayed on the primary
flight display (PFD)

All modes can be disengaged by selecting
another mode or by disconnecting the
A/P and coming off both flight directors
(FDs).

The Exception is seeing an approach after
LOC and G/S have captured. In this
situation LOC and G/S mode can be
disengaged by disconnecting the A/P and
turning both FDs off or by pulling or
throwing gear around (TO/GA) switch and
engaging the TO/GA mode.

Only VNAV, LNAV, LOC and A/P after
they have been selected to the armed status
can be disengaged by pushing the mode
switch a second time.

Autopilot disconnect (manually)

* Push the autopilot disengage switch on either
of the control wheels

• Push the autopilot disengage brace down on the mode control panel (MCP)

Flight Director: command bars are displayed on the PFD if FD is on

Also display of FD off when TO/GA ^{mode} with $> 80k$ and flap out of up

Autoland Status - it informs the crew of the status of the autopilot system per TCS approach, with autoland conduct & roll-out

Land 3 (green)

Land 2 (green)

No autoland amber

No LAND 3 is displayed but LAND 2 is available
No AUTO LAND is displayed if you can use autoland

Autobrake Sys (AIB)

^{7/11/11} caused of Threat Management of the FFC specific control & indicator on the MCP
autobrake sever

The Thrust Levers may be manually positioned, but the flight crew will need to disengage the A/T. A/T will reposition it according to requirements.

Except when A/T is engaged in the HOLD position.

A/T can be disconnected manually by pushing out the call disconnect switch, position the A/T ARM switch to off.

Automatic disconnect

- fault

- switch master FMC between FMCs

- not to select master FMC

- FMC fails

- Reverse Thrust Lever is moved to reverse

- 2 Engine shut

- EEC switches to all modes

Autothrottle Mode Engaged (green)

THR REF → engaged

THR → engaged

SPN → engaged

IDLE → "

HOLD → engaged.

73-25

Autopilot Operations

Takeoff Operations Briefing

The TO/GA Takeoff mode is armed then the speed flight director secures a place on with the aircraft on the ground

PFD displays FD as the AFD's engaged status and TO/GA as the roll & pitch mode

FD command bar display at 8° nose up, wing level,

All autopilot mode disengage & Takeoff is flight director only function

The autothrottle (A/T) is armed during preflight

Autocrew

The autopilot (AP) and the Flight Director (FD) can be used to fly lateral & vertical tracks (CNAV & VNAV).

Autothrottle system (AT) can be operated independently of the autopilot or flight director. Thus \rightarrow arm the autothrottle \rightarrow select speed or thrust schedule located on MCP.

Speed Protection

With the autothrottle engaged speed protection is available for all pitch modes except the vertical speed (V/S) mode.

Speed protection prevents exceeding maximum operating, gear extend or flap.

FMC uses 5 knot margin

If an engine fails at cruise altitude, the FD will try to maintain cruise altitude.

Approach:

AEDS provide guidance for multiple A/P precision approach (LAND 3 or LAND 2) or single A/P non precision approach (CALS)

Multiple Autopilot Approaches

Review the approach sheets versus the AEDS for glide slope & localizer capture and tracking.

If one autopilot is engaged the other autopilot will be disengaged when the approach sheet is published.

Descent on the localizer, prior to the final approach fix, may be accomplished using VNAV, US or FCFS mode.

VNAV will terminate at glide slope interception and glide slope (GS) will be engaged pitch mode for final approach until FLARE mode engages at 50ft AGL.

Autopilot is accomplished by the ACP system only during a multiple ACP approach.

With LAND 3 and LAND 2 announced on the PFDs. A/P control of the sidestick is active

It provides automatic sidestick compensation for an asymmetric thrust condition \rightarrow engine failure during precision approach and free runway alignment

If A/Ps are disengaged manually or automatically during asymmetric thrust condition with sidestick control active, the sidestick will return to the trimmed position.

Happen in TOGO

Flare - pitch mode only operates during a multiple autopilot approach not during single A/P or FD only approach.

FLARE is armed when LAND 3 or 2 engages air via both PFD

- at soft RA

it replaces C/S pitch and annunciations on both PFD

17/11

Roll over roll over only operate during
multi autopilot approach. It provides
summary controller roll over guidance

Roll over command when Cat 3 and 2 engaged
and is announced on both PFD

- 5 ft RA

- Replace the COC on both PFD

Localizer centerline is maintained by A/P
control of runway nose wheel steering

until A/P nose disengages

Single Autopilot Approach

During the localizer switch occurs the A/P DS
for localizer capture and tracking.

Nose wheel steering is maintained by the manual
steering by VNAV, VLS and FCH
pitch control.

VNAV not recommended during roll over

Go Around

Manual missed approach (TO/GA not pressed, no H/P out D in A/T)

Flight deck determined missed approach using
FLCA - (TO/GA ^{switch} pressed, H/P, & T operate)

Autopilot missed approach using
FLCA (TO/GA switch pressed, A/P, H/P
A/T operate)

TO/GA stay even if ~~landed~~

Termination of TO/GA events

Below 400 ft RA \rightarrow disengage H/P auto
turn off. both flight deck

Above 400 ft RA \rightarrow select a different call &
pitch mode

27/11

Altitude Alert System is referenced to
the altitude selected in the ALT window
on the MCP.

Alerting when approaching and/or penetration
from the selected altitude.

At 900ft below the altitude selected in ALT window
on the MCP, a white height bar is displayed
around the ~~current~~ selected alt on the
altitude display on the PFD and a ~~visual~~
tone sound (1s). The white bar is around
the current alt display when below.

At 300ft below, the white height bar
around the selected alt disappears and the
bracketed white bar around the current alt
retains its bars held while below.

Penetration

300ft penetration alarm or bracket

⇒ Master caution light illuminated

“ “ “ tone sound

17012
EICAS caution message ⇒ ALTITUDE HI PRT. 0.0 ft

Current altitude has turned amber

At 900ft deviation from the selected alti
accuracy returning to within 300ft

- Master cabin crew briefing
EICAS caution no longer displayed
Current altitude was changed to white

Altitude deviations can be reset by changing
selected altitude on the MCP to an altitude
at least 900ft different than the MCP selected
altitude.

~~No~~ - when gliderlap captures are gear down and
counseling plays selected,

Critical Indicators:

→ Speed Scales - Operative only in flight and above 800ft after takeoff.

Not operative when VNAV XX or FCAPS or TOGA

Thrust Scales - only above 800ft after takeoff

The THR light bar is illuminated only when an AT Thrust mode is engaged by pushing the THR scales.

IAS/MACH

Activate → Select the command speed display in the window and in the PFD.

Not operative when IAS/MACH window is blank (VNAV engaged)

Reset → with VNAV engaged. IAS/MACH windows are blank, pushing selector opens the window displaying the current & MC target IAS/MACH. To get IAS/MACH can be increased/decreased (speed increments) by rotating the selector.

IAS / MACH select switch

Push alternates IAS / MACH window display between current IAS and current MACH, if within indicated range

IAS / MACH window

Open

With SPD, FLC ~~CH~~, V/S or TO/GA mode engaged the window is open.

Closed. VNAV engaged FMC, determined speed

Lateral Navigation Switch

Base illuminated when selected

LNAV armed (white small font) or engaged (green large font) on PFD.

Vertical Navigation Switch

Push base illuminates when selected.

Flight Level Change Switch

Push: Base illuminates when selected

FLCH SPD pusher made will engage in the air and set an altitude above 800 ft

17/11/15

FD - Heading Warden

Display the selected heading
(also display on both PFD - ND)

Heading Selector - Pilot → set the selected
heading in warden and also on PFD's &
ND's.

Heading Select switch

Push - Select engages HDG ~~SEL~~ SEL as well
mode.

Bank Limit Selector

Allow selection of five preset bank angle limits
on an automatic mode.

Heading Hold switch

Push - Select engages HDG Hold as well mode.

Automatic engagement: HDG Hold mode
called engages as well mode when → FD
engaged while no A/P is engaged in CRM
etc.

Vertical Speed Sweets

Push - Bar illuminates when selected

Automatic engagement V/S automatically engage as pitch mode when
AP is engage
etc

Vertical Speed Select

UP/DN, which become active only after
V/S is engaged/pitch mode

Vertical Speed Window

Blank when V/S is not engaged

Altitude Hold sweets

Push - Bar illuminates when selected / engaged

Altitude selector

Rotate - Change the displayed altitude in
the altitude window on the PFDs

Push - when VNAV engaged etc etc

2/20/17

Altitude Window display selected altitude

Localizer - Push Barometer when selected/engaged

Approach Switch

Push with localizer and glide slope captured and radio altitude passing below 1500 ft automatic engagement of the autoland system occurs

Autobrake disconnect switch

TO/GA switch

Airbrake Disengage Switch

EICAS Alert Message

automatically appear in primary EICAS
(appear next corner)

Autopilot system alert message \Rightarrow Warning
caution
Advisory

Communications

- 4 audio panel and 3 radio tuning panel

3 audio panel are on the center stand. The fourth is on the left seat rail near the 2nd drawer seat.

3 radio tuning are on the center stand.

3 VHF - 2 HF radio

3 intercept system

ACAS system allows both manual and automatic communication.

Provision for SAT COM communication.

Navigation and control identified & recorded on the ~~radio~~ audio panel

Audio Panel

Transmit & receive

Radio Tuning Panel

13021
Controls the frequency transfer switch transfer frequency into the active frequency

The left Radio Terminal is associated with UHF C and HF C. The

The right RTP is a UHF R and HF R.

Center RTP \rightarrow UHF C.

If a RTP fails \rightarrow disconnect by pulling OFF.

UHF ~~HF~~ Radios

\rightarrow UHF radios - Left (L) Right (R) Center (C),
control frequency and RTP.

UHF C is used to receive ACARS data.

When ACARS is displayed in the center RTP
active freq indicator, ACARS is tuned & search
for ACARS data by automatically changing frequencies
automatic communication. However UHF C

Manually selecting a frequency into the active
frequency indicator of the UHF C radio allows
ACARS and allows normal communication.

12-22

HF Radio

2 HF modes L & R
~~select~~

Operate by way of 3 R+P

AM - amplitude modulation

Receptli

M 023