

GENERAL

The guidance function is achieved by the Flight Guidance (FG) part of the FMGS which controls :

- the Flight Director (FD)
- the Auto Pilot (AP)
- the Auto Thrust (A/THR).

GUIDANCE MODES

Two types of autopilot and flight director modes are available to guide the aircraft :

- Managed modes, which steer the aircraft along the lateral, vertical, and speed profiles according to the data the pilot inserts into the MCDU. Flight Management (in the Flight Management and Guidance Computer) computes the corresponding guidance targets.
- Selected modes, which steer the aircraft according to target values that the pilot selects and the FCU windows display.

GUIDANCE	MANAGED modes	SELECTED modes
LATERAL	NAV, APP NAV B/C*, B/C, LOC*, LOC RWY RWY TRK GA TRK ROLL OUT	HDG – TRK
VERTICAL	SRS (T.O and G.A) CLB, DES ALT*, ALT ALT CSTR*, ALT CSTR G/S*, G/S FINAL, FLARE	OP CLB, OP DES V/S, FPA ALT*, ALT
SPEED	FMGC REFERENCE (ECON, Auto SPD, SPD LIM)	FCU REFERENCE

MODE SELECTION

MANAGED MODES

- At takeoff, the managed modes engage automatically when the pilot sets the thrust levers at the TO or FLX detent.
- During flight, the pilot can arm or engage the managed modes (if the aircraft meets engagement conditions) by pushing in the appropriate knobs on the Flight Control Unit (FCU).
- The pilot pushes the “DIR TO” key on the MCDU to insert a DIR TO leg. It engages or maintains the NAV mode.
- The pilot pushes the “APPR” pushbutton on the FCU to arm or engage the localizer and glide slope or “APP NAV-FINAL”, depending upon the approach type he had inserted in the flight plan.
- The “LOC” pushbutton arms or engages only the localizer mode.

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SELECTED MODES

The pilot can engage the selected modes by pulling out the appropriate FCU selection knobs.

INTERACTION BETWEEN AP/FD AND A/THR MODES

The AP/FD pitch modes can control a target SPD/MACH or a vertical trajectory ; the A/THR modes can control a fixed thrust or a target SPD/MACH. AP/FD and A/THR cannot simultaneously control a target SPD/MACH. Consequently the AP/FD pitch modes and A/THR modes are integrated as follows :

- If an AP/FD pitch mode controls a vertical trajectory, the A/THR mode controls the target SPD/MACH.
- If an AP/FD pitch mode controls a target speed or Mach, the A/THR mode controls the thrust.
- If no AP/FD pitch mode is engaged, the A/THR mode reverts to SPD/MACH mode.

In other words, the selection of a pitch mode determines the associated A/THR mode.

AP/FD pitch modes	A/THR modes
V/S – FPA DES (geometric path) ALT*, ALT G/S*, G/S FINAL AP/FD OFF	SPD/MACH MODE
OPEN CLB/OPEN DES CLB/DES (idle path) SRS	
FLARE	RETARD (IDLE)

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FLIGHT DIRECTOR

GENERAL

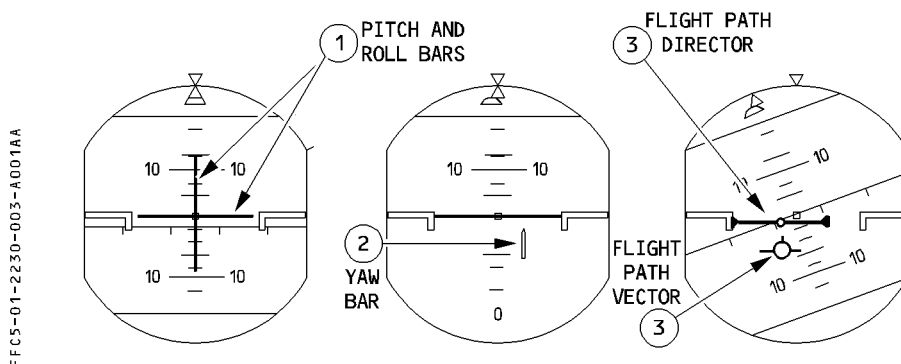
The Flight Director (FD) displays guidance commands from the Flight Management and Guidance Computer (FMGC) on the Primary Flight Display (PFD).

The pilot may fly the aircraft manually, following FMGC guidance commands, or crosscheck the FMGC orders when the autopilot is engaged.

In normal operations, FD1 displays FMGC1 orders on PFD1 and FD2 displays FMGC2 orders on PFD2. The FDs use their respective outside FMGCs.

On the PFD :

1. The FD pitch and roll crossbars show pitch and roll demands.
2. Below 30 feet during landing and takeoff, when a localizer is available, the vertical bar is replaced by a yaw bar that gives lateral orders.
3. The Flight Path Director (FPD) symbol relates to the Flight Path Vector (FPV).



The HDG V/S – TRK FPA pushbutton on the FCU permits the pilot to select either type of reference and display.

The FD pushbutton on the Electronic Flight Instrument System (EFIS) control panel allows the FD bars to be displayed or removed.

FD bars (HDG V/S selected on the FCU)

- The pitch bar is displayed if a vertical mode is engaged. It gives pitch orders for the vertical guidance.
- The roll bar is displayed if a lateral mode is engaged. It gives roll orders for lateral guidance.

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Flight Path Director (TRK FPA selected on the FCU)

The display is an alternate way of transmitting flight director commands.

- The Flight Path Vector (FPV) symbol illustrates the actual track and flight path angle being flown.
- The Flight Path Director (FPD) symbol shows the pilot how to intercept and fly the vertical and lateral flight trajectory.

When the pilot superimposes the FPV and the FPD symbols, the aircraft flies the commanded trajectory.

FLIGHT DIRECTOR (FD) ENGAGEMENT

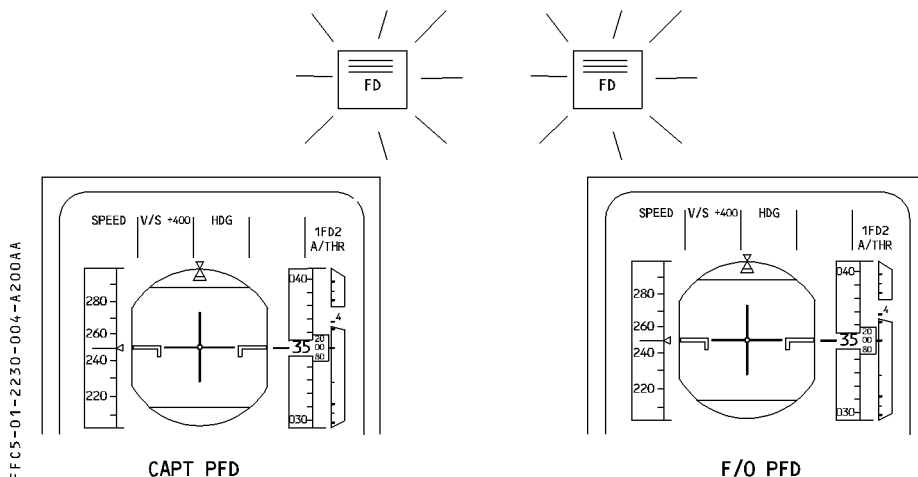
The FDs are automatically engaged whenever the FMGC powers up.

GROUND ENGAGEMENT

- The “1 FD2” symbol appears on both PFDs.
- No FD bars appear on the PFDs. The PFD displays FD orders when a mode is active on the corresponding axis.
- The FCU windows display dashes.

MANUAL FLIGHT ENGAGEMENT

Provided AP/FD is off (no lateral or vertical mode displayed on FMA), the two FDs engage in the HDG V/S or TRK FPA modes (basic modes) when FD pushbuttons are pressed.



AUTOMATIC FLIGHT ENGAGEMENT

FD bars are automatically restored in SRS/GA TRK modes at go-around engagement. If FPV/FPD was previously selected, it reverts to FD bars.

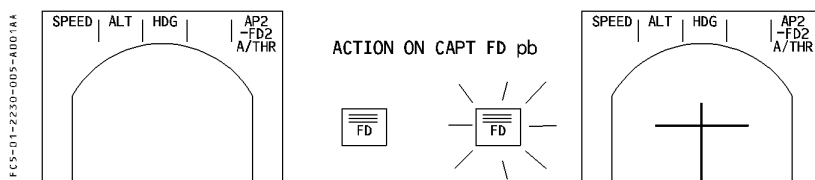
FLIGHT DIRECTOR (FD) DISENGAGEMENT

The flight crew may disengage one or two FDs manually, or FDs may disengage automatically if there is a failure.

MANUAL FLIGHT DIRECTOR DISENGAGEMENT

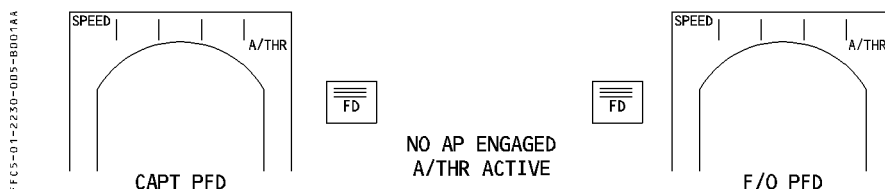
One FD off :

- The FD bars no longer appear on the associated PFD.
- The corresponding FD is disengaged.



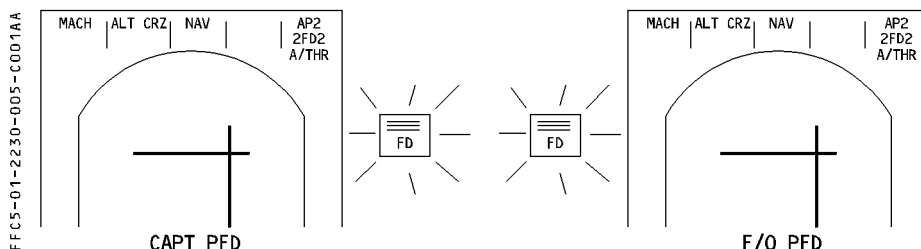
Both FDs off:

- The FD bars disappear from both PFDs.
- If no AP was engaged, lateral and vertical modes disengage. The A/THR, if active, automatically reverts to (or remains in) SPEED/MACH mode.
- If one AP was engaged when FDs are switched OFF, this AP remains engaged in the active modes but the FDs are no longer displayed.



AUTOMATIC FLIGHT DIRECTOR DISENGAGEMENT

If one FD fails or one FMGC is not valid, both PFDs display the remaining FD.



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AUTOMATIC DISENGAGEMENT DUE TO SPEED PROTECTION

When APs are not engaged and if you do not fly the FD bars, an automatic disengagement of FDs and corresponding FMA modes will occur if the aircraft speed reaches VMAX in climb with CLB or OP CLB mode engaged or if the aircraft speed decreases to VLS in descent with DES, OP DES mode engaged. Refer to Automatic speed protection in this chapter.

AUTOMATIC FD REMOVAL

- The FD pitch bar is removed when no vertical mode is engaged or when ROLL OUT is engaged.
- The roll FD bar is removed when no lateral mode is engaged or when the RWY or ROLL OUT mode is engaged.
- Both FDs are removed when the aircraft pitch exceeds 25° up or 13° down, or bank angle exceeds 45°.

Note : If from AP/FDs off, FD2 then FD1, are engaged within 150 milliseconds (one computation cycle), a flip flop of master FMGC may occur.

As a result, no vertical mode engages and dashes are displayed on FMA 1st column, 1st line (A/THR mode).

Engaging V/S mode manually reselects the correct FMGC and restores the display.

FD WARNINGS

FD WARNINGS	CONDITIONS
Pitch FD bar (or FPV) flashes 10 seconds	– if the ALT* mode is lost further to FCU altitude reference change of more than 250 ft. – when in APPR mode (G/S*, G/S, LAND, FINAL) FD reverts to V/S mode (pilot action or loss of vertical approach mode) – one AP or one FD is engaged while both AP/FD were previously off.
Pitch FD bar (or FPV) flashes permanently	Transmission of the GLIDE data is interrupted when in G/S, G/S* or LAND modes above 100 ft RA.
Roll FD bar (or FPV) flashes 10 seconds	– When in APPR mode (LOC*, LOC, LAND, APP NAV) FD reverts to HDG mode (Pilot action or loss of lateral approach mode). – One AP or one FD is engaged while both AP/FD were previously off.
Roll FD bar (or FPV) flashes permanently	Transmission of the LOC data is interrupted when in LOC, LOC* or LAND modes above 15 ft RA.

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AUTOPILOT

GENERAL

The AP :

- Stabilizes the aircraft around its center of gravity.
- Acquires and tracks a flight path.
- Flies the aircraft to an automatic landing or go around.

The AP commands the :

- Position of the flight control surfaces for pitch, roll, and yaw
- Nose wheel position.

AP ENGAGEMENT

The flight crew can engage AP1 or AP2 by pressing the corresponding pushbutton on the FCU if the aircraft has been airborne for at least five seconds.

When one AP is engaged, the corresponding FCU pushbutton comes on and AP1 (or 2) is displayed on the FMAs.

AP can be engaged when :

- * Aircraft speed is within VLS and VMAX.
- * Aircraft pitch angle does not exceed 10° nose down or 22° nose up.
- * Bank angle is less than 40°
- * On ground, if the engines are not running. It disengages when one engine is started.
- * Two APs may be engaged at a time (AP1 active, AP2 in standby), when the localizer/glide-slope or roll out or go around mode is armed or engaged. Only one AP can be engaged at a time in all other cases.
- * If one AP pushbutton is set to on with both FDs off, the AP engages in HDG V/S or TRK-FPA mode, depending upon which the pilot has selected on the FCU.
- * If one AP pushbutton is set to on with at least one FD already on, the AP engages in the current active FD modes.
- * AP engagement increases the break out force on the sidestick controllers and on the rudder pedals.
- * In flight, with the rudder pedals already deflected, by pressing the AP pushbutton.

In dual BACK UP NAV, AP can be engaged in selected modes if the FG part is available.

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AP engagement is indicated by the lighting of the corresponding FCU pushbutton and by the appearance of “AP1” (or 2) on the Flight Mode Annunciator on the PFD.

AP DISENGAGEMENT

AP1 or 2 disengages when :

- The pilot presses the take-over pushbutton on the sidestick.
- The pilot presses the corresponding AP pushbutton on the FCU.
- The pilot pushes on the sidestick harder than a certain threshold.
- The other AP is engaged, except when localizer/glide slope modes are armed or engaged, or roll out or go around mode is engaged.
- The thrust levers are set above the MCT detent and the aircraft is on the ground.
- The aircraft reaches the MDA/MDH – 50 feet (MDH – 50 feet) or 400 feet AGL if no MDA/MDH with APPR mode engaged and a non-ILS approach selected.
- One of the engagement conditions is lost.
- Furthermore, in normal law with all protections available the AP will disconnect if :
 - The high-speed protection is active.
 - Angle-of-attack protection is active ($\alpha_{prot} + 1$ is reached).
 - The pitch attitude exceeds 25° up or 13° down or bank angle exceeds 45°.
- During flight, the rudder pedals are pressed beyond a certain threshold.

The standard way for the flight crew to disengage the AP is to press the takeover pushbutton on the sidestick.

When AP is OFF, the associated FCU pushbutton extinguishes and the “AP1” (or AP2) is removed from the FMA on the PFD.

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AP WARNINGS

When the AP is disengaged, the system warns the pilot :

- If the pilot disengages it with the takeover pushbutton on the sidestick, the warnings are temporary.
- If the disengagement results either from a failure, from the pilot pushing the pushbutton on the FCU, or from a force on the sidestick, the visual and audio warnings are continual.

		AP DISENGAGEMENT	
		TAKE OVER PB on SIDE STICK	BY OTHER MEANS
CONSEQUENCE	MASTER WARNING	flashing red during 3 sec max	flashing red
	ECAM	red AP OFF message 9 sec maximum	red warning AUTO FLT AP OFF
	AUDIO	cavalry charge 0.5 sec min 1.5 sec maximum	continuous cavalry charge 1.5 sec minimum
	CLR PB on ECAM CONTROL PANEL	extinguished	illuminated
ACTION	MASTER WARNING	extinguishes M.W. erases ECAM warning stops audio if pressed within 1.5 sec	extinguishes M.W. stops audio after 1.5 sec
	CLR PB on ECAM CONTROL PANEL	No effect	extinguishes CLR pb erases ECAM message calls status
	TAKE OVER PB	extinguishes M.W. erases ECAM warning stops audio if pressed within 1.5 sec.	extinguishes M.W. stops audio after 1.5 sec
ECAM STATUS MESSAGE		NO	YES

AUTOLAND WARNING

The autoland red warning flashes in LAND mode when :

- The radio altitude goes below 200 feet and :
 - * The aircraft gets too far off the beam (LOC or GLIDE).
 - * Or both glide slope transmitters or receivers fail.
 - * Or both localizer transmitters or receivers fail.
 - * Or both radio altimeters differ from more than 15 feet.
 - * Or both autopilots fail.

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SPEED/MACH CONTROL

In flight either the AP/FD pitch control or the autothrust may acquire and hold a target speed or Mach number, according to the engaged modes.

The speed control is :

- managed when the target comes from the FMGS
- selected when the target comes from the SPD/MACH FCU window.

MANAGED SPEED/MACH TARGET

When the speed target is managed, the SPD/MACH window of the FCU shows dashes, and the corresponding dot is lighted. The PFD speed scale shows the speed target in magenta.

ENGAGEMENT CONDITIONS

The SPD target is managed whenever AP or FD is engaged and one of the following occurs:

- The pilot pushes in the SPD/MACH selector knob.
- V2 is inserted in the MCDU.
- The speed reference system (SRS) is engaged (takeoff or go around mode).

Note : *At takeoff, SRS will not engage if V2 is not available.*

DISENGAGEMENT CONDITIONS

Managed speed disengages any time the pilot selects a speed target on the FCU, or if the speed was preselected.

SPEED PROFILE

The form of the managed SPD profile depends on the lateral NAV mode.

- If NAV mode is engaged, the SPD profile takes into account all the constraints linked to the flight plan.

The SPD profile is :

V2 - SPD LIM - SPD CSTR (if applicable) - ECON CLB SPD/MACH - ECON CRZ MACH - ECON or selected DES MACH/SPD - SPD LIM - SPD CSTR (if applicable) - HOLD SPD (if applicable) - VAPP

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- If NAV mode is not engaged, the SPD/MACH constraints are not considered.

The SPD profile is :

V2 - SPD LIM - ECON CLB SPD/MACH - ECON CRZ MACH - ECON or selected DES MACH/SPD - SPD LIM - VAPP.

Note : – When both AP/FDs are OFF, A/THR reverts to selected SPEED mode except, when the approach phase is activated on MCDU where both managed and selected SPD are available.

- The managed speed/Mach target may be set below maneuvering speed but as long as the speed target is managed, the FMGS limits the aircraft to the maneuvering speed of the current slats/flaps configuration (VAPP, F, S, Green Dot).
- If the managed speed/Mach target is set above VMAX (VFE, VMO, MMO) the FMGS automatically limits the speed to VMAX.

MINI GROUND SPEED

In approach phase the managed speed target is the Mini Ground Speed target computed by the Flight Guidance (FG) part of the FMGS. Refer to 1.22.30 Autothrust for details.

SELECTED SPEED/MACH TARGET

To use a selected speed/Mach target, the pilot uses the knob on the FCU to set the target speed, which is then displayed in the FCU window. It is also displayed in blue on the PFD speed scale.

Note : The selected speed/Mach target may be set beyond VLS or VMAX, but when autothrust is active, the guidance limits the speed to VLS or VMAX.

Selected speed has priority over managed speed. The only automatic change-over from selected to managed speed target may occur at go around mode engagement.

In flight, if the situation calls for managed speed, both the PFD and the MCDU display a message proposing a manual change to managed speed (for example, SET MANAGED SPEED, SET HOLD SPEED).

ENGAGEMENT CONDITIONS

The aircraft has a selected speed target under any one of the following conditions :

- The pilot pulls out the SPD/MACH selector knob (5 seconds after lift-off)
- Both AP/FDs are OFF (except in APPR phase)
- The FM speed target is lost except below 700 feet RA in takeoff, LAND or go around mode.
- The MCDU has a preselected speed for the next phase, and the aircraft transitions into that phase.
- The FMGC is powered up in flight.
- 5 seconds after lift off when a takeoff is initiated without managed or selected speed.

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DISENGAGEMENT CONDITIONS

The selected speed target disengages when :

- the managed speed target engages
- on ground at AP or FD engagement
- on ground at engine start

Note : *It is not possible to activate selected speed mode on the ground with engines running and FD on until after takeoff.*

SELECTED DESCENT SPEED

A manual speed or Mach may be inserted by the crew on the PERF DES page to replace the ECON DES SPD.

In this case, although the value is selected by the crew, this speed or Mach is taken into account to compute the top of descent and the descent profile.

SPEED/MACH SWITCHING

- At the crossover altitude, the FMGC automatically changes the selected speed target to the corresponding Mach target.

The FCU displays the Mach number corresponding to the speed at the switching altitude.

Note : *when the speed is selected, the pilot can do the switching manually by pressing the SPEED/MACH pushbutton on the FCU. The FCU then displays the aircraft Mach number.*

- When the target speed is managed, the FMGC commands the switchover automatically as a function of the ECON MACH value.

MANAGED SPEED TARGET MEMORIZATION

A dual FM failure has different consequences when it occurs in different phases of the flight. The system handles target speed and SPD mode as follows :

- During approach with LOC and G/S engaged and radio altitude < 700 feet, the target speed is set to VAPP as previously memorized, and managed SPD target is maintained.
- At go around, the target speed becomes the memorized go around speed, which is the higher of VAPP or the speed when go around was initiated. Managed SPD target is maintained.
- In all other cases managed target speed reverts to selected, the value being the speed at the moment of the failure.

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SPEED/MACH FCU WINDOW SYNCHRONIZATION

When the target SPD is managed, the SPD/MACH display of the FCU shows dashes. However, the window displays the target SPD or MACH in the following situations.

- The pilot turns the SPD/MACH selector knob.
If the pilot does not pull the knob within 45 seconds after turning it, the selection reverts to dashes.
- The pilot manually engages a selected SPD target.
- If the flight crew has manually preselected a speed or Mach number for the next phase on the MCDU PERF page, that preselected SPD/MACH engages when the aircraft enters that phase and the FCU window then displays as the target the preselected speed or Mach.
- If the FMGS is powered up in flight, the synchronized speed/Mach value is the current aircraft speed or Mach number.
- If no V2 is entered at takeoff, the V/S mode engages 5 seconds after lift-off (no speed reference system). The FCU speed target is the speed at V/S mode engagement. (A/THR becomes active when the thrust levers are set in the active range).
- If both FMGCs fail, the speed displayed is the last aircraft speed acquired before the failure.

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AP/FD MODES GENERAL

The FMGS has guidance parameters for both AP/FD lateral and vertical modes.

The AP/FD lateral modes are :

RWY, RWY TRK	Runway, Runway track mode
NAV	Nav mode
HDG, TRK	Heading, track mode. Also called basic modes.
APP NAV	Approach Nav mode
LOC*, LOC	Loc capture, Loc track mode
LOC B/C	Loc back course
• LAND	Land mode. Managed submode that includes LOC and G/S modes below 400 feet RA.
• FINAL APP	Final approach mode. Managed submode that includes APP NAV and FINAL modes during non precision approach.
ROLL OUT	Roll out mode. (Autoland)
GA TRK	Go around track mode

The AP/FD vertical modes are :

SRS	SRS mode used for takeoff and go around
CLB	Climb mode
DES	Descent mode
OP CLB	Open Climb mode
OP DES	Open Descent mode
V/S or FPA	Vertical speed mode or Flight Path Angle mode. Also called basic modes.
ALT*	Altitude capture,
ALT	Altitude Hold mode
ALT CST*	Altitude constraint capture,
ALT CST	Altitude constraint hold mode
ALT CRZ*	Altitude capture of the cruise flight level
ALT CRZ	Altitude hold of the cruise flight level
G/S*	Glide slope capture,
G/S	Glide slope mode.
FINAL	Final mode (non precision approach)
FLARE	Flare mode (Autoland)

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AP/FD LATERAL MODES

HEADING OR TRACK : HDG - TRK

These modes guide the aircraft laterally along a heading or track selected by the flight crew.
The HDG/TRK window of the FCU displays the target heading or track.
The pilot uses the HDG V/S -TRK FPA pushbutton to select heading or track.

ENGAGEMENT CONDITIONS

- HDG or TRK is engaged when one of the following conditions is met :
- The pilot pulls out the HDG-TRK selector knob (not sooner than five seconds after lift-off).
 - NAV is disengaged, either by the loss of the lateral flight plan or by the pilot entering a flight plan discontinuity.
 - FINAL mode (armed or engaged) is lost when the aircraft is in APP NAV mode.
 - LOC or LOC* mode is lost.
 - The pilot engages the AP/FD with no other mode already engaged (basic mode of AP/FD engagement).
 - LOC mode is armed when FINAL APP were previously engaged.
 - LOC or LOC* being armed or engaged, the APPR pushbutton is deactivated (above 400 feet).

DISENGAGEMENT CONDITIONS

The engagement of any other lateral mode disengages HDG or TRK.

SYNCHRONIZING THE HDG/TRK WINDOW OF THE FCU

- The lateral window of the FCU displays a heading or a track value when :
- The HDG/TRK mode is engaged. The displayed value is the current HDG/TRK or the manually selected value of the target.
 - The pilot turns the HDG/TRK selection knob. The value in the window first synchronizes with the current HDG/TRK, then displays the manual selection. It remains displayed for 45 seconds depending upon FCU standard, then vanishes if the pilot does not pull the knob (except in HDG preset).
 - A HDG/TRK is preset (see below).
 - AP/FD is lost. The value becomes that of the aircraft current heading or track.

Note : If HDG is switched to TRK (or vice versa), the value displayed in the window switches from heading to track (or vice versa).

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HDG/TRK PRESET

The system has a HDG/TRK preset function for takeoff and go around.

If the pilot chooses not to fly the flight plan after takeoff or go around, he may preset a HDG or a TRK on the FCU by turning the HDG/TRK selector knob. The value he sets remains displayed in the FCU HDG/TRK window until the knob is pulled.

Operation at takeoff

HDG/TRK preset is available before takeoff and up to 30 feet RA. Turning the HDG/TRK selector knob before 30 feet sets the desired HDG/TRK. As a consequence:

- NAV is disarmed
- At 30 feet, RWY TRK is annunciated until the HDG/TRK knob is pulled.

Operation at go around

Whenever the LOC*, LOC, LAND, FINAL, or GA modes are engaged, the HDG preset is available. If the pilot rotates the HDG/TRK knob to set the value, it will remain displayed in the window. Pull out the HDG/TRK knob to activate the mode and turn the aircraft on to the preset value.

Cancellation

The pilot can cancel a preset HDG/TRK by :

- engaging the NAV mode (DIR TO)
- pushing in the HDG/TRK knob (arming NAV mode)
- disengaging AP/FD

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NAVIGATION (NAV)

NAV mode is a managed mode that steers the aircraft laterally along the flight plan defined in the FMGS. It is designed to have a zero cross-track error. The pilot can arm or engage the NAV mode if the MCDU contains a lateral flight plan.

ARMING CONDITIONS

Satisfying one of the following conditions arms NAV :

- The aircraft is on the ground with no HDG/TRK preset and no other lateral mode except runway mode
- The pilot pushes in the HDG/TRK selector knob, unless the LOC mode is engaged.
- The pilot presses the APPR pushbutton, if a non-ILS approach is selected.
- The pilot selects a DIR TO/INTERCEPT when in HDG or TRK mode.

DISARMING CONDITIONS

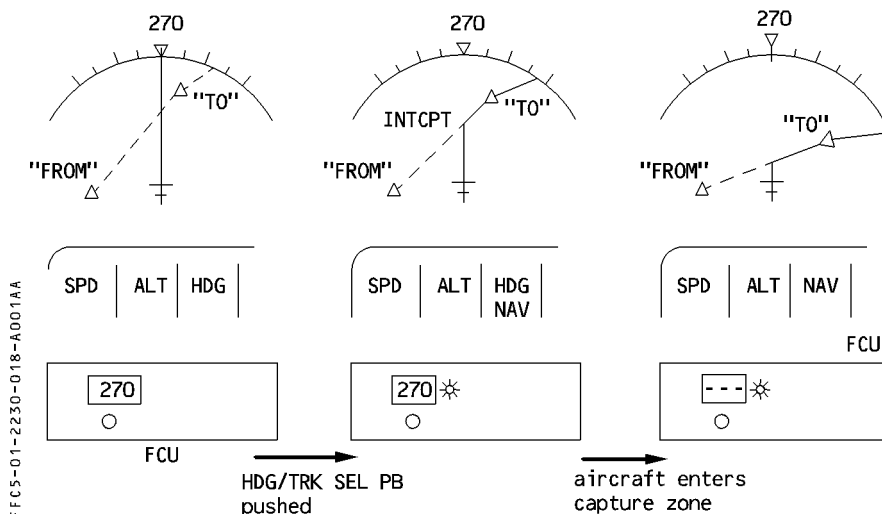
NAV mode disarms if one of the following occurs :

- The pilot pulls out the HDG/TRK selector knob.
- The pilot selects a preset HDG/TRK (TO or GA)
- The pilot arms the LOC mode by pressing the LOC pushbutton.
- The pilot selects GA mode.
- LAND mode has engaged.
- The pilot presses the APPR pushbutton to deselect the non-ILS approach.
- The pilot deselects both AP/FDs.

ENGAGEMENT CONDITIONS

NAV mode engages :

- Automatically at 30 feet RA after takeoff (if armed on the ground).
- When the pilot orders "DIR TO" (except below 700 feet RA in LOC mode).
- When the pilot pushes in the HDG/TRK select knob when the aircraft is close to (within ~ 1 NM of) the active flight plan leg.
- Automatically in flight when NAV is armed and the aircraft reaches the capture zone for the active flight plan leg.



CAUTION

When NAV is armed, it will automatically engage if :

- * the aircraft track line intercepts the flight plan before the TO waypoint and
- * the intercept waypoint (INTCPT) is displayed on the ND and
- * the aircraft reaches the active flight plan leg.

Note : The TO waypoint is displayed in white on NDs and MCDUs.

DISENGAGEMENT CONDITIONS

The NAV mode disengages when :

- Any other lateral mode is engaged.
- The flight plan is lost or the aircraft enters a flight plan discontinuity.
- At MDA-50 feet when APP NAV is engaged.

INTERACTIONS WITH VERTICAL MODES

When NAV mode is engaged, the vertical managed modes CLB or DES or FINAL take into account altitude and speed constraints linked to waypoints on the lateral flight plan. If NAV mode is disengaged the vertical managed modes are not available and all downpath altitude and speed constraints are ignored.

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LOCALIZER MODE THROUGH THE LOC PUSHBUTTON

This mode captures and tracks a localizer beam independently of the glide path beam. Pilots use it to fly localizer-only approaches or to initiate an ILS approach when intercepting the glide slope from above.

ARMING CONDITIONS

The pilot arms the LOC mode by pressing the LOC pushbutton, provided that :

- An ILS is tuned (frequency and runway course).
- The aircraft is above 400 feet RA.
- TO or GA mode is not engaged.

DISARMING CONDITIONS

LOC mode is disarmed by :

- Pressing the LOC pushbutton when LOC is armed.
- Arming the NAV mode.
- Engaging the GA mode.

Note : Engaging NAV mode by selecting DIR TO does not disarm the LOC mode.

ENGAGEMENT CONDITIONS

The LOC mode engages automatically when capture conditions are met.

DISENGAGEMENT CONDITIONS

The LOC mode disengages :

- When another lateral mode is engaged.
- When the pilot presses the LOC pushbutton again (engaging the HDG/TRK mode on the current HDG/TRK).

LOC BACK COURSE MODE (LOC B/C)

This mode captures and tracks the back beam of a LOC. This approach is considered as a non precision approach, and must be flown with AP/FD in TRK/FPA modes, A/THR being active.

See FMGS Pilot's Guide 4.05.70 for details. (FCOM Vol 4).

AP/FD VERTICAL MODES

Vertical modes guide the aircraft in the vertical plan.

PRINCIPLES

To leave an FCU selected altitude for another target altitude, two things must happen :
the pilot must turn the altitude (ALT) selector knob in order to display the new target altitude and either :

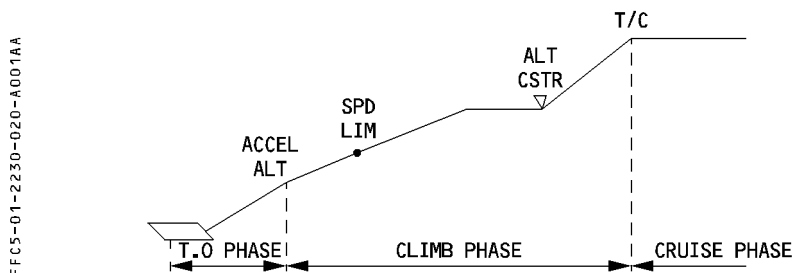
- pull out the ALT selector knob to engage the OPEN CLB/DES mode, or
- push in the ALT selector knob to engage the CLB/DES mode, or
- select a target vertical speed (V/S) and pull out the V/S FPA selector knob to engage V/S mode.

This arms ALT mode.

CLIMB MODE (CLB)

CLB mode guides the aircraft in a managed climb, at either a managed or a selected target speed, to an FCU selected altitude, taking into account altitude constraints at waypoints. The system also considers speed constraints if the target speed is managed.

The vertical flight path may include several segments :



The pilot can arm the CLB mode during the takeoff, go around, climb, and cruise phases and engage it during the climb and cruise phases.

ARMING CONDITIONS

The CLB mode is armed :

- on the ground or when SRS mode is engaged (TO or GA) if the following conditions are met :
 - No other vertical mode is engaged.
 - The ACCEL ALT (defined on the MCDU PERF TO or GA pages) is below the FCU selected altitude and the lowest altitude constraint.

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- In flight, when the climb or go-around phase is active, and the following conditions are met:
 - The lateral NAV mode is engaged, and
 - The FCU-selected altitude is above the aircraft's present altitude and the aircraft captures or flies an altitude constraint.

DISARMING CONDITIONS

The CLB mode is disarmed, if one of the following conditions is met :

- Another vertical mode is engaged.
- The FCU-selected altitude is lower than the aircraft present level.
- The FCU-selected altitude is set at an altitude constraint, while ALT CSTR* or ALT CSTR mode is engaged.
- The aircraft transitions to DES or APPR phase.
- Arming requirements are no longer met.
- Vertical flight path validity is lost, or NAV mode is lost with ALT CSTR* or ALT CSTR or ALT or ALT* mode engaged.

ENGAGEMENT CONDITIONS

The CLB mode can be engaged if all of the following conditions are met :

- The aircraft has been in flight for more than 5 seconds.
- The selected FCU level is above the present aircraft level.
- The descent, approach, or go-around phase is not active.
- NAV mode is engaged.
- Glideslope (G/S) mode is not engaged.

CLB mode automatically engages, when the aircraft reaches ACC ALT, or sequences a waypoint with an altitude constraint while CLB mode is armed.

CLB mode manually engages, when the pilot pushes in the ALT select knob, with the CLB mode not armed and an altitude constraint not effective.

Note : When CLB mode is engaged :

- The V/S (FPA) window of the FCU shows dashes.
- The managed LVL/CH dot on the FCU lights up.
- The Flight Mode Annunciator displays “CLB” in Column 2.

DISENGAGEMENT CONDITIONS

The CLB mode disengages, if one of the following conditions is met :

- NAV mode is lost or disengaged (OP CLB engages). In this case, the reversion to OP CLB is accompanied by a triple click aural warning.
- Another vertical mode engages.
- The pilot selects an altitude on the FCU that is lower than the present aircraft altitude. V/S (FPA) engages on current V/S (FPA).

GUIDANCE

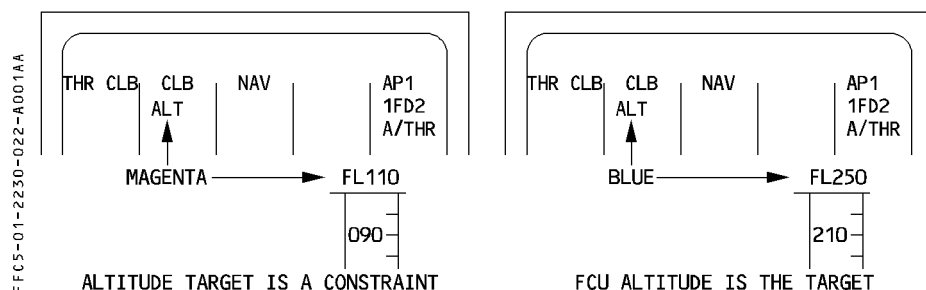
Climb mode guides the aircraft up to the FCU selected altitude. It tries to respect speed and altitude constraints.

The AP/FD pitch controls the speed or Mach number target while the A/THR controls the thrust set at maximum climb thrust.

When climb mode is engaged :

The system arms ALT mode and displays the next applicable altitude target on the PFD altitude scale.

- ALT is magenta on the FMA second line and the altitude value is displayed in magenta on the PFD altitude scale if the next altitude target is a constraint.



- ALT is blue on the FMA second line and the altitude value is displayed in blue on the PFD altitude scale if the next altitude target is the FCU selected altitude.

In climb mode, the system does not modify the target speed to match the altitude constraints. The pilot has to select it manually using the information displayed on the PROG page.

When the aircraft levels off at an altitude constraint, CLB mode arms. It will engage automatically when the waypoint is sequenced. (If the FCU selected altitude is above the constraint).

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		SEQ 300	REV 16

OPEN CLIMB

The OPEN CLB mode is a selected mode. It uses the AP/FD pitch mode to maintain a speed or a Mach (selected or managed) while the A/THR, if active, maintains maximum climb thrust.

ENGAGEMENT CONDITIONS

The OPEN CLB mode can only be engaged, if all of the following conditions are met :

- The aircraft is in flight for more than 5 seconds.
- The LAND mode is not engaged.
- The FCU-selected altitude is higher than the aircraft's present altitude.

The OPEN CLB mode is engaged, if one of the following conditions occurs :

- The pilot pulls out the ALT selector knob.
- The pilot pulls out the SPD/MACH selector knob, when TO or GA mode is engaged.
- Acceleration altitude is reached with CLB armed, and NAV mode not engaged ;
- Loss of NAV mode or vertical F-PLN when CLB mode is engaged. The reversion to OPEN CLB is accompanied by a triple click aural warning (see mode reversions).

ALT mode is systematically armed.

DISENGAGEMENT CONDITIONS

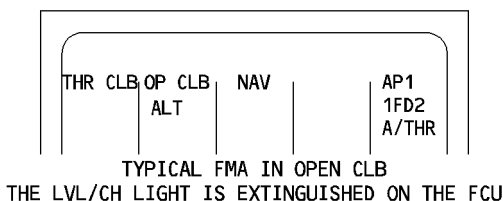
The OPEN CLB mode is disengaged by one of the following conditions :

- Engagement of any other vertical mode.
- Selection of a lower altitude (on FCU) than the current aircraft altitude. V/S (FPA) engages on the current V/S (FPA) (see mode reversions).

GUIDANCE

When OPEN CLB is engaged, the target Speed/Mach is maintained by adjusting the pitch with the elevator whereas thrust is maintained either by the A/THR or manually by the pilot. Speed may either be selected or managed.

The OPEN CLB mode disregards all altitude constraints up to the FCU-selected altitude.



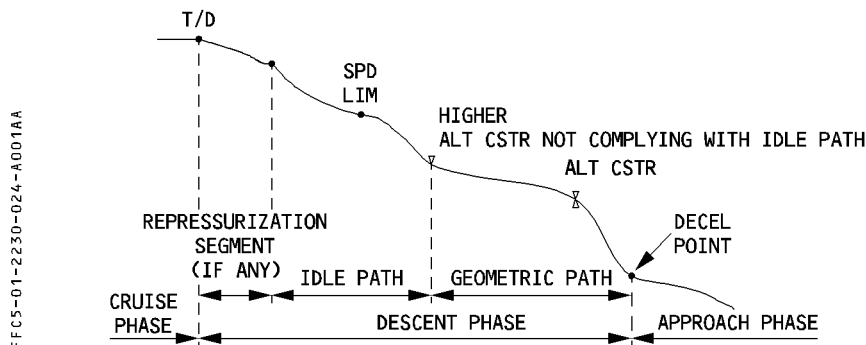
Note : A level change of less than 1200 feet in OPEN CLB mode with A/THR active produces a 1000 ft/min climb.

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			SEQ 001	REV 14

DESCENT MODE (DES)

DES mode provides managed vertical guidance along a computed descent profile. The profile is computed from “Top of Descent” at the cruise flight level down to the “Decel” point, where guidance begins the deceleration to VAPP, to be reached at 1000 feet above touch down on the final descent path. The descent profile takes into account wind data and data from the lateral and vertical flight plans and it is based upon the managed descent speed profile. It does not take holding patterns into consideration. The descent profile has several segments :

- A repressurization segment. When necessary, this produces a repressurization rate for the cabin during descent. It is a function of the destination airport altitude and the selected cabin rate (defaulted to – 350 feet/min but this can be modified).
- Idle path segment. The AP/FD controls the speed and autothrust stays at idle thrust. Guidance computes this profile from top of descent or the end of the repressurization segment to the first vertical constraint that cannot be flown at idle thrust.
- Geometric path segments. The AP/FD controls the vertical path, and autothrust controls the speed. These segments take the aircraft from the first constraint to the deceleration point.



The descent mode is a managed mode that may be engaged during cruise. It can be armed or engaged in descent and approach phases (unless the FCU selected altitude is higher than the present aircraft altitude).

ARMING CONDITIONS

The DES mode is armed when an ALT CSTR is captured and all the following conditions are met :

- FCU selected altitude is lower than present altitude
- NAV, LOC* or LOC is engaged.
- Take off or go-around phase is not active.
- Flight profile is available.

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			SEQ 100	REV 16

DISARMING CONDITIONS

The DES mode is disarmed, if one of the following conditions is met :

- Engagement of another vertical mode.
- FCU-selected altitude is set above the aircrafts' current altitude.
- Loss of NAV, LOC*, or LOC mode.
- Switching to the takeoff, climb, or go-around phase
- Loss of vertical flight path validity.

ENGAGEMENT CONDITIONS

The DES mode can be engaged, when the following conditions are met :

- The FCU-selected altitude is lower than the present altitude.
- NAV, LOC*, or LOC is engaged.
- Takeoff, climb, or go-around phase is not active.
- Vertical flight path is valid.
- TO, CLB, G/S, LAND, FINAL or GA mode is not engaged, and :
 - The aircraft sequences a waypoint, with an ALT CSTR, and DES mode is armed. The DES mode engages automatically, or
 - The pilot presses the ALT selector knob when ALT CSTR* or ALT CSTR mode is not engaged, or
 - The pilot presses the ALT selector knob, ALT* or ALT is engaged and the current aircraft altitude is not an effective altitude constraint of the F-PLN.

Note : *When DES mode is engaged :*

- *The V/S (FPA) window of FCU shows dashes.*
- *The managed LVL/CH dot on the FCU lights up.*

DISENGAGEMENT CONDITIONS

The DES mode is disengaged, if one of the following conditions is met :

- NAV mode is disengaged, and V/S (FPA) engages. (See reversions). A triple click aural warning will sound (Refer to 1.22.30 mode reversion).
- Another vertical mode engages.
- The pilot selects an altitude on the FCU that is higher than the aircrafts' present altitude, and the V/S (FPA) engages on the current V/S (FPA). A triple click aural warning will sound. (Refer to 1.22.30 mode reversion).
- NAV mode is lost due to a discontinuity in the descent profile. AP/FD reverts to basic mode, and a triple click aural warning sounds.

	AUTO FLIGHT FLIGHT GUIDANCE	1.22.30	P 26
		SEQ 001	REV 10

GUIDANCE

Descent initiation

In order to initiate the descent, the pilot :

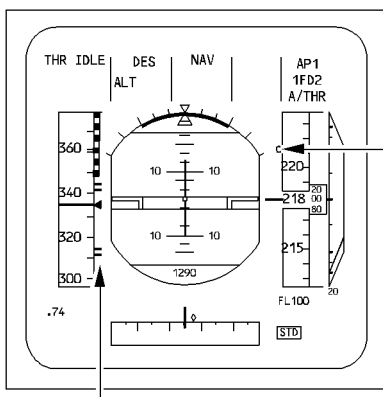
- Turns the ALT selector knob to set the cleared altitude.
- Pushes in the ALT selector knob.
 - If the aircraft has not reached top of descent (T/D), it will descend immediately at a constant V/S, converging on the descent profile.
 - If the aircraft is at or beyond T/D, it descends immediately at idle thrust.

During the descent :

The pilot sees a vertical deviation symbol (VDEV) along the ALT scale on the PFD and on the PROG page, so as to monitor the aircraft vertical position on the calculated descent profile.

The aircraft may deviate from the DES path while DES mode is engaged if :

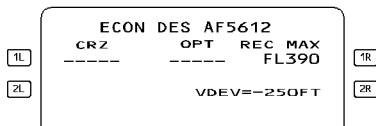
- unexpected wind conditions is encountered or,
- anti-icing is turned on or,
- lateral flight plan is modified.



VDEV
SYMBOL

PFD display in
managed DES mode.

MANAGED SPD RANGE

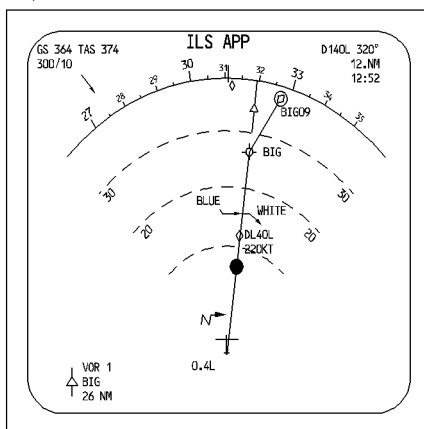
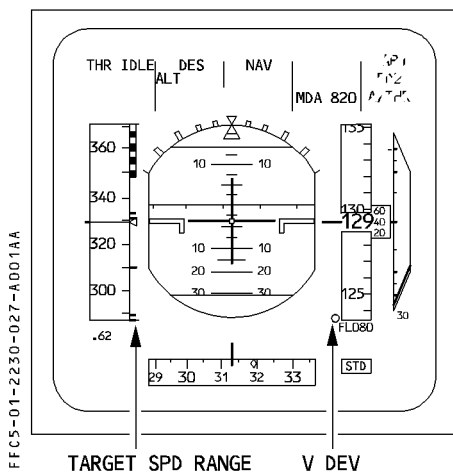
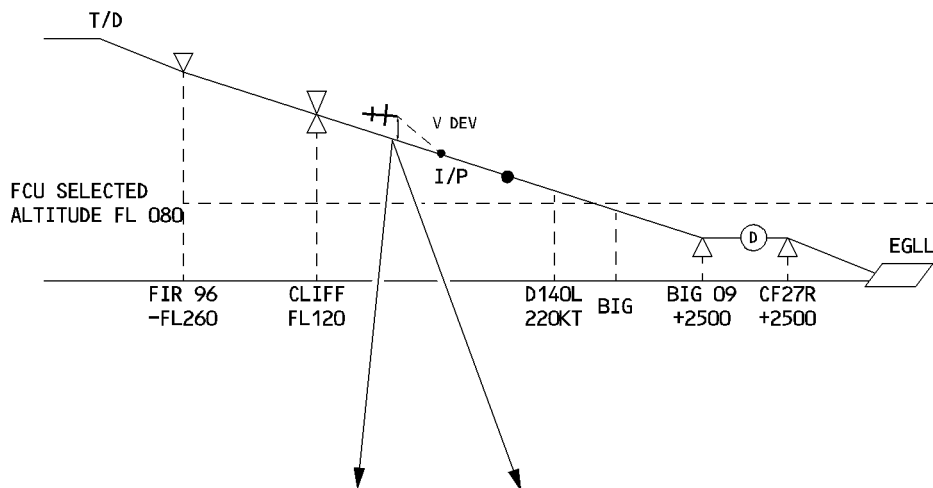


VDEV value on the
PROG page

FFCS-01-2230-026-A001AA

When the speed is managed, a managed SPD range shows, on the PFD, acceptable speed variations around the nominal descent speed target (limited to ± 20 knots).

Associated with the V DEV displayed on PFD, the ND shows an intercept point  on the flight plan. It indicates the position where the system predicts that the aircraft will intercept the descent profile.



FFCS-01-2230-027-A001AA

– Aircraft above the descent profile :

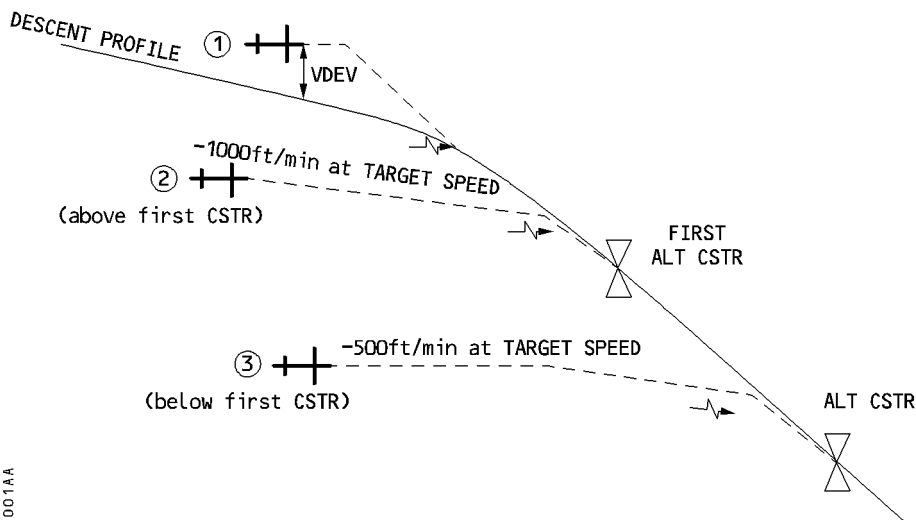
If the aircraft is above the descent profile, the speed will increase toward the upper limit of the managed speed range. If the speed reaches the upper limit, the aircraft will maintain the speed but will deviate from the profile (autothrust at idle).

The navigation display presents a pseudo waypoint $\curvearrowright$ (intercept point) along the flight plan, that assumes the aircraft will return to the profile using :

- idle thrust
- 1/2 speedbrake extension
- ECON speed plus a margin (until intercepting the profile).

Whenever the intercept point is predicted to be close to a constrained waypoint, the PFD and MCDU display an “EXTEND SPD BRK” message.

Note : With DES mode engaged, the speedbrakes extension will not necessarily increase the descent rate. It increases only if the aircraft is above path.



- ① A/C ABOVE THE PROFILE
- IDLE THRUST
 - TARGET SPD + MARGIN
 - 1/2 SPEEDBRAKES IF REQUESTED

- ② and ③ A/C BELOW THE PROFILE
- SPEED MODE
 - TARGET SPEED

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			SEQ 001	REV 10

– Aircraft below the profile

If the aircraft is below the descent profile, its speed will be maintained at target speed until it reaches the descent profile.

The intercept point on the navigation display is based on the following assumptions :

- if the aircraft is flying an idle segment :
The FMGS maintains $V/S = -1000$ ft/min and target speed, until it reaches the constraint altitude or intercepts the profile.
- if the aircraft is flying a geometric segment :
The FMGS maintains a constant -500 ft/min until it intercepts either the altitude constraint or the profile.

– Leveling off at a constraint

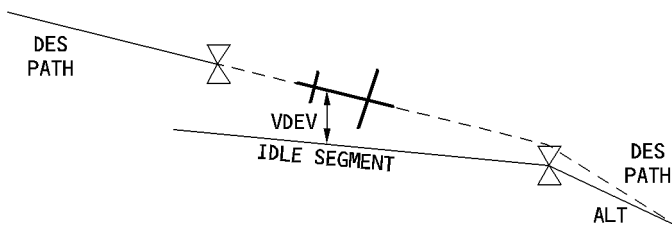
- If the aircraft levels off at an ALT CSTR, the DES mode arms and remains armed until the aircraft passes the constraint, then reengages (if the FCU altitude is set below the altitude of the constraint).
- if the FCU selected altitude is that of a constraint, the pilot may continue the descent below that altitude by turning the ALT SEL knob and pushing it in. This arms the DES mode, which reengages when the aircraft passes the constraint waypoint.

• Guidance in a hold :

Just before the aircraft enters a holding pattern, the speed target becomes the holding speed. In the holding pattern, the DES mode commands $V/S = -1000$ ft/min while autothrust maintains the holding speed. The aircraft will level off at the next altitude constraint if it is reached during the hold. The vertical deviation (VDEV) is based on the altitude at which the aircraft is supposed to cross the exit fix in order to be properly positioned on the descent profile.

• Too steep path :

A segment between two constraints is called “too steep path” when Flight Management predicts that it is impossible to fly it at the preplanned speed with 1/2 speedbrakes extended. The MCDU displays TOO STEEP PATH and FM does not furnish predictions for the waypoints included in the TOO STEEP PATH segment. When the aircraft reaches the beginning of the too steep path segment, the FM recomputes the VDEV using an idle segment from the end of the too steep path segment.

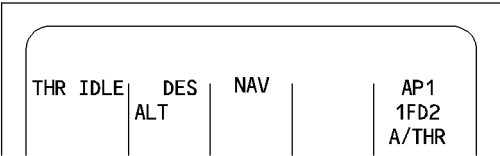


FFCS-01-2230-029-A001AA

– FMA display

When DES mode is engaged, the system arms ALT and displays the applicable target altitude on the PFD altitude scale.

- If the next predicted level-off is an altitude constraint, ALT is magenta on the FMA second line and the PFD displays the altitude constraint magenta below the altitude scale.
When ALT CSTR (green) is engaged (aircraft flying at ALT CSTR), the system arms DES blue. When the aircraft meets the constraint, DES again engages automatically.
- If the next predicted level-off is the FCU altitude, ALT is blue on the FMA and the PFD displays the FCU-selected altitude in blue.



Typical FMA in DES

FFCS-01-2230-030-A001AA

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		SEQ 100	REV 16

OPEN DESCENT MODE (OP DES)

The OPEN DESCENT mode is a selected mode. It maintains a SPD/MACH (selected or managed) with the AP/FD pitch mode, while autothrust (if active) maintains IDLE thrust.

It is not to be used for final approach.

ENGAGEMENT CONDITIONS

The OPEN DES mode can only be engaged, if the following conditions are met :

- The aircraft has been in flight for more than five seconds,
- LAND mode is not engaged.
- The FCU-selected altitude is lower than the present altitude.

The OPEN DES mode is engaged by :

- Pulling out the ALT selection knob.

Note : When OP DES is engaged :

- The FMA displays “OP DES”.
- The managed LVL/CH dot on the FCU goes out.
- The system arms the ALT mode.

DISENGAGEMENT CONDITIONS

The OPEN DES mode is disengaged by one of the following :

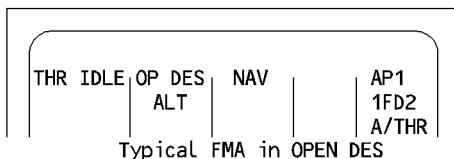
- Manual engagement of another vertical mode.
- Selection of an altitude higher than the present altitude. V/S (FPA) engages on the current V/S (FPA). If within 5 seconds after the reversion to V/S the pilot does not confirm the altitude target change by another expected action, a triple click sounds, and the V/S (FPA) is boxed white and flashes for 10 seconds.

GUIDANCE

When OPEN DES is engaged, pitch control maintains the target speed/ Mach number, and autothrust maintains idle thrust (or the pilot maintains it manually).

The speed target may either be selected or managed.

The OPEN DES disregards all altitude constraints.



ALTITUDE ACQUIRE MODE (ALT*, ALT CSTR*, ALT CRZ*)

ALT* mode guides the aircraft to acquire the FCU-selected altitude.

ALT CSTR* guides the aircraft to acquire an altitude constraint provided by Flight Management.

ALT CRZ* guides the aircraft to acquire the cruise altitude, as selected on the FCU and the MCDU PROG page.

Once the aircraft has reached the altitude, the altitude mode ALT or ALT CSTR or ALT CRZ engages.

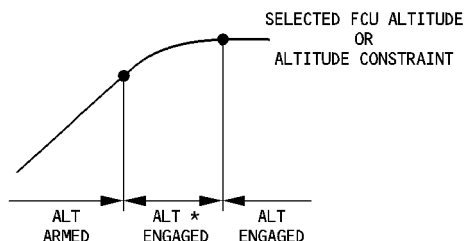
ARMING CONDITIONS

ALT*, or ALT CSTR*, or ALT CRZ* can be internally armed, but it is not displayed for the pilot.

ENGAGEMENT CONDITIONS

The mode engages when the aircraft reaches the altitude capture zone, defined by the aircraft vertical speed (among other parameters).

FFCS-01-2230-032-A 300AA



Note : ALT* and ALT CSTR* cannot be engaged below 400 feet, if either the takeoff, or the go-around mode is engaged.

DISENGAGEMENT CONDITIONS

- Engagement of V/S mode on the current vertical speed, by changing the FCU altitude selector knob by more than 250 feet.

If within 5 seconds after reversion to V/S (FPA) the pilot does not confirm the altitude target change by :

- Pulling the ALT knob, or
- Setting a new V/S (FPA) target, or
- Pushing the ALT pushbutton on the FCU,

A triple click aural warning sounds, and the V/S (FPA) is boxed white for 10 additional seconds.

- Engagement of another vertical mode, provided the FCU altitude has been changed by more than 250 feet.

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			SEQ 100	REV 11

GUIDANCE

ALT* mode has an internal V/S guidance that is a direct function of the difference between present altitude and the altitude target.

The system switches automatically to ALT (altitude hold) when the altitude deviation becomes less than 40 feet.

Note : – *If the baro setting is changed during ALT*, this may lead to an FCU target overshoot due to the change of the current value of the altitude. However ALT* mode will allow the FCU altitude to be regained.*

- *For aircraft equipped with QFE option, a switching from STD to QFE (or vice versa) in ALT CSTR*, will change the target value and a reversion to V/S may occur if the target value is modified of 250 feet or more.*

	AUTO FLIGHT FLIGHT GUIDANCE		1.22.30	P 34
			SEQ 100	REV 10

ALTITUDE HOLD MODE (ALT/ALT CST/ALT CRZ)

The ALT mode maintains a target altitude. This target altitude is either the FCU selected altitude (ALT, ALT CRZ) or an altitude constraint delivered by the Flight Management (ALT CSTR).

ARMING CONDITIONS

The ALT mode arms automatically whenever the aircraft climbs or descends toward the target altitude. When ALT is armed, the FMA displays the ALT message on its second line :

- blue when the target altitude is the FCU selected altitude
- magenta if the target altitude is an altitude constraint.

ENGAGEMENT CONDITIONS

ALT mode engages when :

- the difference between present altitude and target altitude becomes less than 40 feet with ALT* engaged.
- or when the ALT pushbutton of the FCU is pressed.

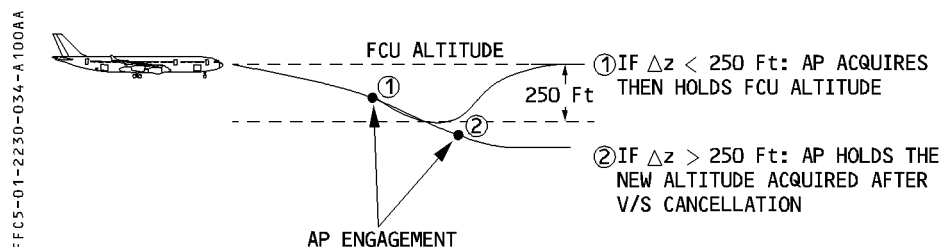
DISENGAGEMENT CONDITIONS

The ALT mode disengages when any other vertical mode engages.

The ALT pushbutton cannot be used to disengage ALT mode.

GUIDANCE

- The altitude that ALT mode holds is the altitude it memorized when engaged. It is not affected by a change of barometric reference or by a change in the barometric correction.
- When ALT is engaged, the FMA displays “ALT” in green if it is the FCU altitude or ALT CSTR in green if it is an altitude constraint.
- If the AP is engaged while FD is already engaged in ALT mode at the FCU-selected altitude, the autopilot :
 - acquires and holds the FCU altitude if present altitude is within 250 feet of it, or
 - commands a level-off if present altitude is more than 250 feet from the FCU altitude.

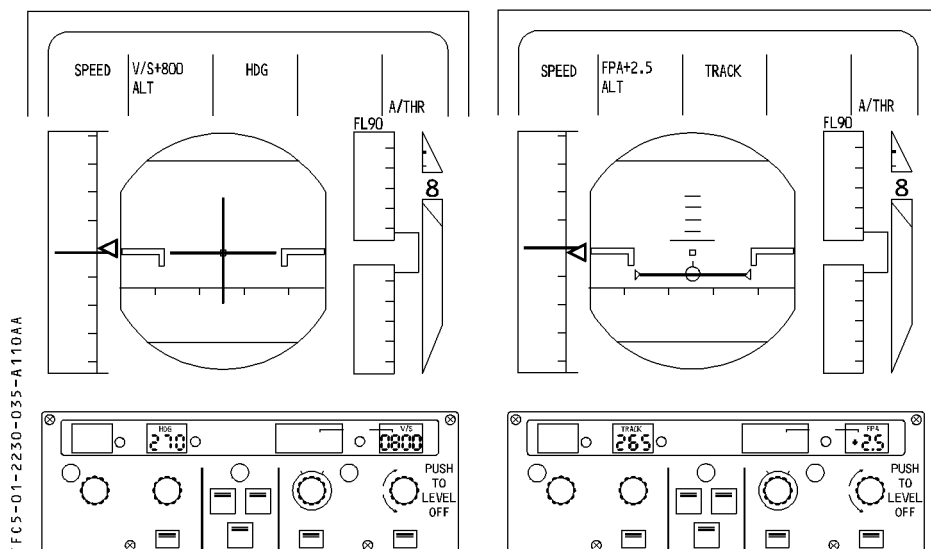


	AUTO FLIGHT FLIGHT GUIDANCE	1.22.30	P 35
		SEQ 110	REV 10

VERTICAL SPEED MODE — FLIGHT PATH ANGLE MODE (V/S - FPA)

The V/S - FPA is a selected mode. It acquires and holds the vertical speed or the flight path angle displayed in the V/S - FPA window of the FCU.

The HDG V/S TRK FPA pushbutton on the FCU allows the pilot to select either type of reference to be used for guidance and for display on the PFD.



ENGAGEMENT CONDITIONS

The pilot can engage the mode manually as follows :

- Pull out the V/S FPA selection knob (at least five seconds after lift-off) or push it in for an immediate level-off (V/S = 0).
- Engage the AP and/or FD if AP and FD were not engaged (basic mode of AP/FD engagement).
- Select a different altitude (more than 250 feet from present altitude) when in ALT*.
- Select a higher altitude than present altitude when in DES, OP DES mode.
- Select a lower altitude than present altitude when in CLB, OP CLB mode.

The mode engages automatically :

- five seconds after lift-off, if no other vertical mode is engaged
- upon loss of G/S* or G/S mode
- upon loss of FINAL mode
- upon loss of LOC* or LOC mode
- upon loss of NAV mode when DES mode is engaged
- upon loss of vertical flight path in DES mode

	AUTO FLIGHT FLIGHT GUIDANCE		1.22.30	P 36
			SEQ 001	REV 10

When V/S - FPA mode is engaged, V/S or FPA is displayed in green on the FMA with the current target.

DISENGAGEMENT CONDITIONS

The pilot can disengage the V/S mode manually by :

- pulling or pushing the altitude selector knob
- initiating a go around.

It disengages automatically :

- when the aircraft reaches the FCU altitude or
- upon G/S* engagement.

GUIDANCE

The FMGC pitch mode guides the aircraft to the target V/S or FPA. The corresponding A/THR mode is SPEED or MACH. The FMA displays “V/S (FPA)”.

The V/S (FPA) guidance has priority over the speed guidance. If the selected target V/S or FPA is too high (relative to the current thrust condition and speed), the FMGC will steer the aircraft to the target V/S or FPA, but the aircraft will also accelerate or decelerate. When the speed reaches the authorized limit, the V/S or FPA decreases automatically to maintain the minimum (or maximum) speed limit. (Also refer to reversion modes).

	AUTO FLIGHT FLIGHT GUIDANCE		1.22.30	P 37
			SEQ 100	REV 16

MODE REVERSIONS AND AUTOMATIC SPEED MODE PROTECTION

There are several types of mode reversions. Each one observes a specific logic that can be described as follows :

INTERACTION BETWEEN LATERAL MODES, VERTICAL MODES, AND MANAGED SPEED PROFILE

- **When NAV mode is engaged :**

The FMGS guides the aircraft along the flight plan and considers the constraints attached to the F-PLN waypoints. As a result, managed CLB and DES modes are available.

- **When NAV mode is not engaged :**

The FMGS considers that the flight plan is not followed and ignores all speed and altitude constraints linked to the flight plan waypoints. As a result, the managed vertical CLB and DES modes are not available. The managed SPD profile disregards the speed constraints.

As a consequence : When NAV mode disengages (manual or automatic)

- CLB mode, when engaged, reverts to OPEN CLB.
- DES mode, when engaged, reverts to V/S mode on current value.
- Speed and altitude constraints are disregarded (but speed limit is retained).
- When OPEN CLB or V/S engages following the NAV mode disengagement, the lateral mode is boxed white for 10 seconds. The vertical mode is boxed white.

If disengagement of the NAV mode is not confirmed by one of the following actions within 5 seconds :

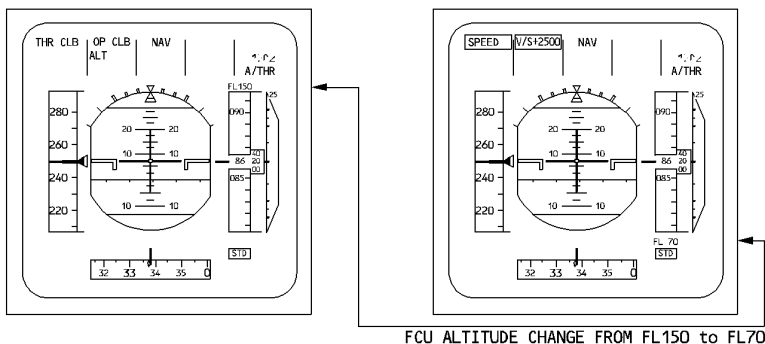
- New FCU altitude target
- Level-off
- V/S selection

Then the triple click aural warning sounds.

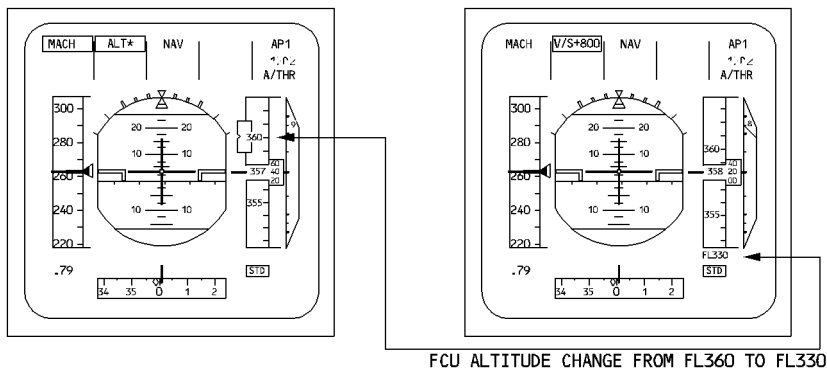
MODE REVERSION DUE TO FCU ALTITUDE CHANGE

- When an OPEN mode is engaged, the aircraft climbs or descends towards the altitude set on the FCU. If the pilot sets the FCU altitude to a target incompatible with the active open mode, a mode reversion occurs and V/S (FPA) engages on the current V/S (FPA). This reversion applies to CLB, OP CLB, DES, OP DES.

e.g. : Reversion from OP CLB to V/S.



- With ALT* engaged, if the target altitude is changed by any value greater than 250 feet, V/S (FPA) engages on the current V/S (or FPA) . (Also Refer to the mode reversion table.)



If within 5 seconds after reversion to V/S (FPA) the pilot does not confirm the altitude target change by :

- Pulling the ALT knob, or
- Setting a new V/S (FPA) target, or
- Pushing the ALT pushbutton on the FCU,

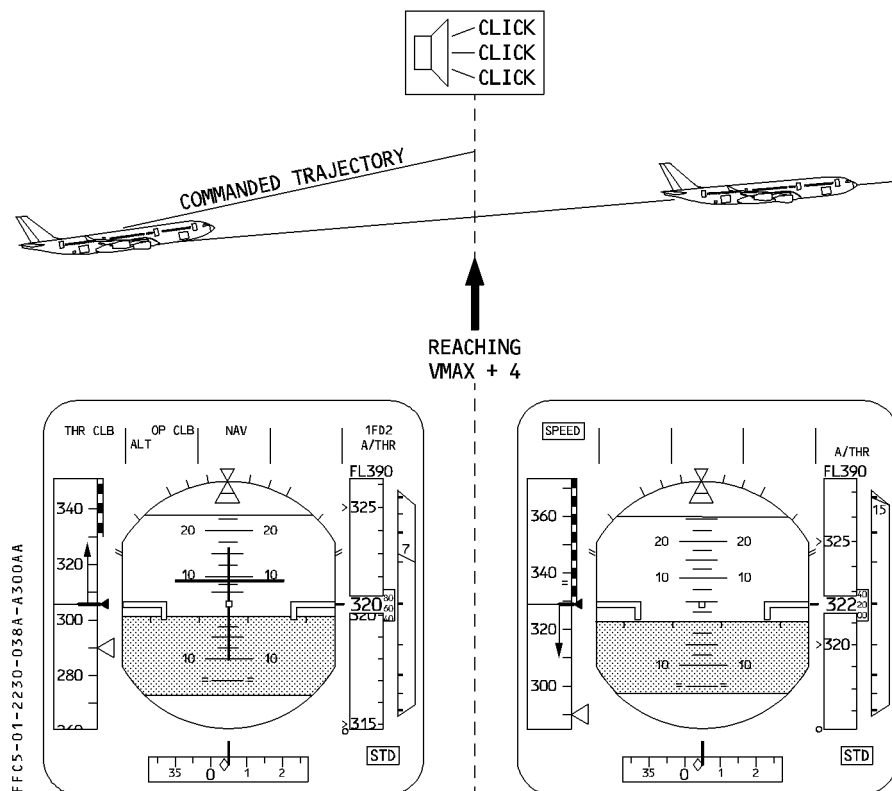
A triple click aural warning sounds, and the V/S (FPA) is boxed white for 10 additional seconds.

AUTOMATIC SPEED MODE PROTECTION

FD bars are engaged in an OPEN mode in climb with AP not engaged

If FD bars are engaged in CLIMB, or OPEN CLIMB mode and the pilot does not follow the FD bars to maintain the commanded climb (pitch too low and autothrust in maximum climb thrust), the aircraft accelerates.

Both FD bars disengage when $V_{MAX}+4$ is reached (V_{MAX} being V_{MO} , V_{LE} or V_{FE}). If the A/THR is active, it reverts to SPEED mode and reduces the thrust to recover the speed target. A triple click aural warning sounds.



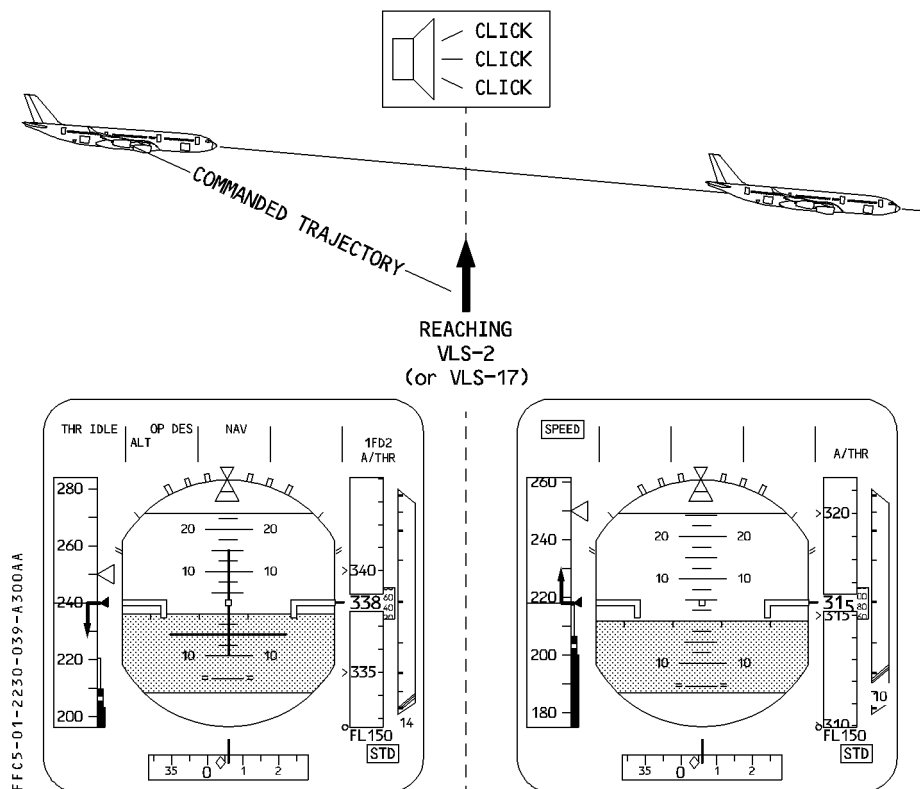
FFC5-01-2230-038A-A300AA

AUTOMATIC SPEED MODE PROTECTION

FDs are engaged in an OPEN mode in descent with AP not engaged

If FDs are engaged in DESCENT, or OPEN DESCENT mode and if the pilot does not follow the FD bars to maintain the commanded descent, the aircraft decelerates (pitch too high and autothrust in IDLE).

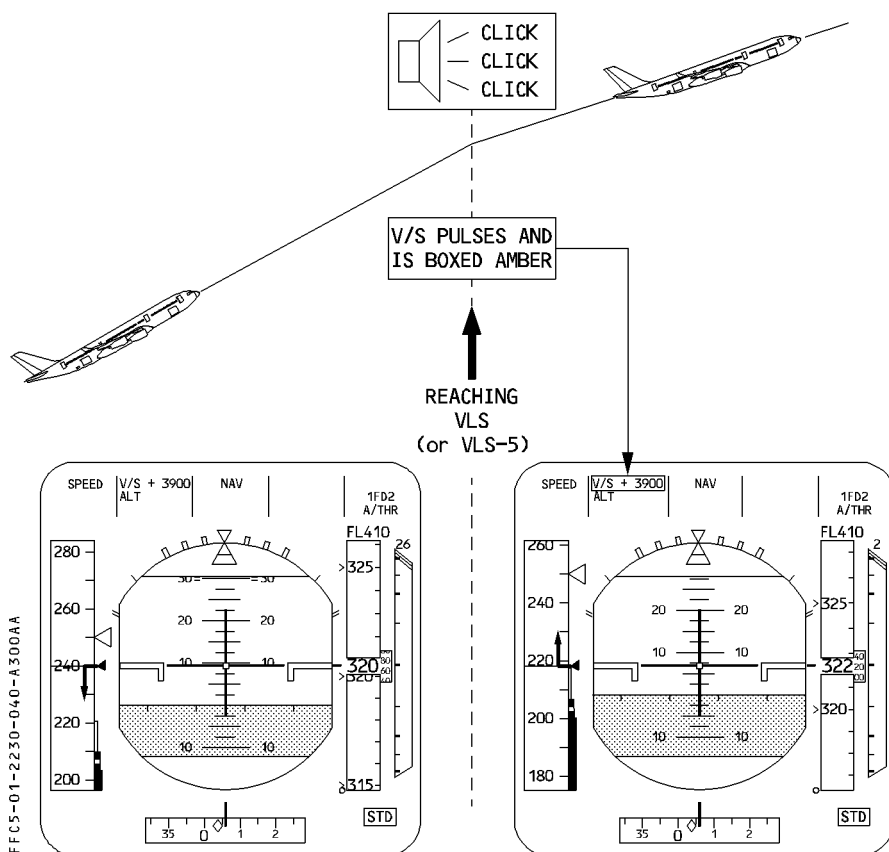
Both FDs disengage when VLS-2 (or VLS-17 if speedbrakes extended) is reached. If the A/THR is active, it reverts to SPEED mode, and increases the thrust to recover the speed target. A triple click aural warning sounds.



AUTOMATIC SPEED PROTECTION IN VERTICAL SPEED MODE

During climb

If the selected target V/S (FPA) is too high (relative to the thrust condition and speed), the FMGS maintains the target V/S (FPA), but the aircraft decelerates and the indicated airspeed decreases. When reaching VLS (or VLS-5, if the speed target is VLS), the selected V/S (FPA) target is temporarily abandoned to maintain VLS, but the V/S mode remains engaged.

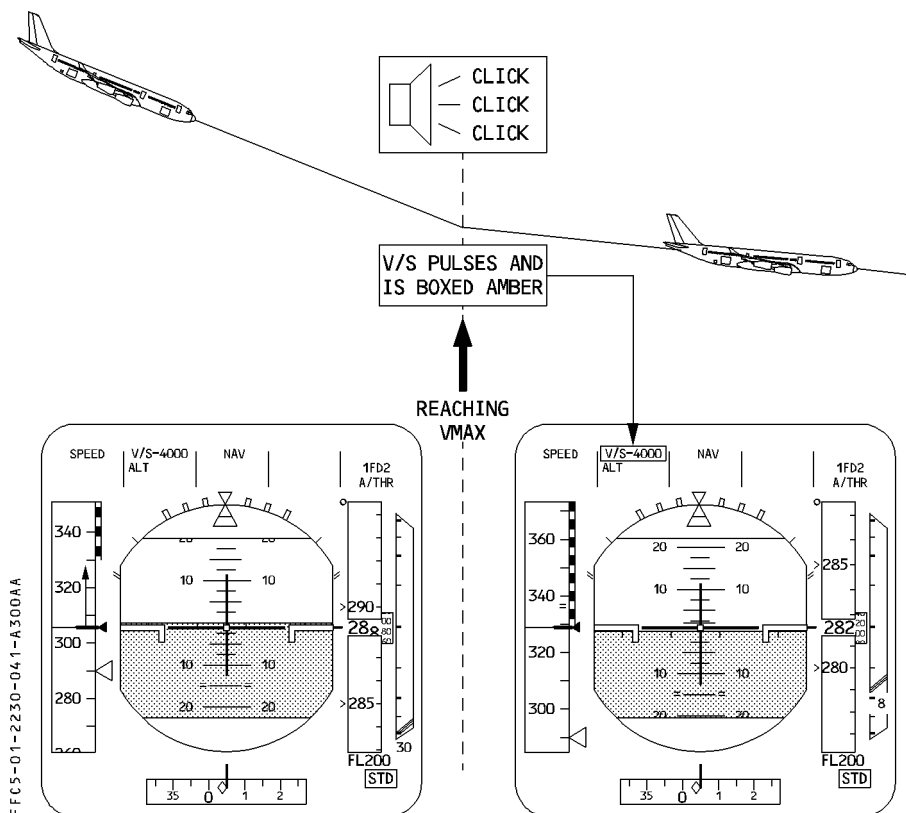


The FMGS automatically decreases the vertical speed to maintain VLS. The V/S displayed on the FMA is boxed in amber. The amber box flashes, and the selected target is not modified and pulses.

AUTOMATIC SPEED PROTECTION IN VERTICAL SPEED MODE

During descent

If the selected target V/S (FPA) is too high (relative to the thrust condition and speed), the FMGS maintains the target V/S (FPA) but the aircraft accelerates towards VMAX (VMO or VLE in clean, or VFE + 4 knots). When reaching VMAX, the selected V/S (FPA) target is temporarily abandoned to maintain VMAX, but the V/S mode remains engaged. A triple click aural warning sounds.



The FMGS automatically decreases the vertical speed to maintain VMAX. The V/S displayed on the FMA is boxed in amber. The amber box flashes, and the selected target is not modified and pulses.

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MODE REVERSIONS

Reversion due to FCU ALTITUDE changes

CONDITIONS	ACTION	CONSEQUENCE
OP CLB engaged CLB engaged	FCU selected ALT set below a/c altitude	V/S-FPA engages on current V/S-FPA
OPDES engaged DES engaged	FCU selected ALT set above a/c altitude	
ALT* active	FCU selected ALT modification (greater than 250 ft)	

Reversion due to loss of NAV mode

CONDITIONS	EVENT	CONSEQUENCE
CLB engaged	Loss of lateral managed mode : NAV	OP CLB engages
DES engaged		V/S engages

SPEED PROTECTION when FD orders are not followed

These reversions occur when the aircraft is in manual flight and the pilot fails to follow the FD bars.

CONDITIONS	EVENT	CONSEQUENCE
- FD engaged - AP OFF - A/THR active (IDLE) - DES or OP DES engaged	When A/C speed = Vmin	Automatic engagement of SPD mode on A/THR. FD bars are removed. Thrust is increased, speed target is regained
- FD engaged - APOFF - A/THR active (climb thrust) - CLB or OP CLB engaged	When A/C speed = Vmax	Automatic engagement of SPD mode on A/THR FD bars are removed. Thrust is decreased, speed target is regained

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Enhanced mode reversion alertness

The following sequences, or mode reversions, are highlighted by a triple click :

- V/S selection in ALT*
- SPD selection in SRS
- CLB to OP CLB, upon lateral crew action while climbing toward a constraint
- ALT* to V/S, upon ALT target change
- FD disengagement in OPEN modes
- Alerting FMA display when V/S-FPA target is not held
- CLB to OP CLB reversion, upon profile loss
- Automatic FD re-engagement in basic mode
- DES to V/S upon flight plan loss, or upon no lateral crew action
- FINAL DES to V/S, upon NAV loss
- Reversion to V/S when selected ALT crosses the current altitude
- Automatic FD re-engagement in basic lateral mode
- NAV to HDG, upon NAV loss

AP/FD COMMON MODES

GENERAL

These modes are called “common” because they are related to both the lateral and the vertical axes.

The AP/FD common modes are :

- On takeoff : Runway/Runway track associated to SRS vertical modes.
- In approach : ILS approach (LAND) or non-ILS approach (FINAL APP).
- In go-around : Go-around track associated to SRS vertical modes.

These modes are simultaneously engaged on both axes.

COMMON MODES		VERTICAL	LATERAL
TAKEOFF		SRS	RWY RWY TRK
APPROACH MODES	ILS APPROACH	G/S* G/S	LOC* LOC
		LAND, FLARE, ROLLOUT	
	NON ILS APPROACH	FINAL	APP NAV
GO AROUND (GA)		SRS	GA TRK

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TAKEOFF

Takeoff mode combines the vertical mode of the Speed Reference System (SRS) with the RWY lateral mode. Both are simultaneously engaged, but may be disengaged separately. Takeoff mode is available :

- During the takeoff run and initial climb on the FD.
- Five seconds after lift-off on the AP.

SRS (SPEED REFERENCE SYSTEM)

SRS mode controls pitch to steer the aircraft along a path in the vertical plane at a speed defined by the SRS guidance law.

– Engagement conditions

The SRS mode automatically engages when the thrust levers are set to the TOGA detent, or the MCT/FLX detent, or a derated level (◀if) :

- V2 is inserted in the MCDU PERF TO page. If V2 is not inserted, V/S engages 5 seconds after lift-off on current value.
- Slats are extended.
- The aircraft has been on the ground for at least 30 seconds.

– Disengagement conditions

The mode disengages :

- Manually when another vertical mode engages. If the pilot selects a speed while in SRS mode, SRS reverts to OP CLB, and a triple click aural warning sounds.
- Automatically, when the aircraft reaches acceleration altitude or an FCU-selected altitude (if it is lower than the ACCEL ALT but above 400 feet RA).

– Guidance

In SRS mode, the aircraft maintains a speed target equal to $V2 + 10$ knots in normal engine configuration. When the FMGS detects an engine failure, the speed target becomes the highest of V2 or current speed, limited by $V2 + 15$ knots.

The guidance law also includes :

- Attitude protection to reduce aircraft nose-up during takeoff (15° or 22.5° maximum in case of windshear)
- A flight path angle protection that ensures a minimum climb slope of 0.5° .

Note : *If during takeoff the pilot inadvertently sets an altitude below the present altitude, on the FCU, the aircraft will remain in SRS mode until the pilot takes some other action.*

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RUNWAY (RWY)

The RUNWAY mode has two submodes :

- RWY mode, which gives lateral guidance orders during takeoff roll and initial climb out (up to 30 feet RA) if a LOC signal is available.
- RWY TRK mode, which gives lateral guidance on the track the aircraft was flying at mode engagement (at 30 feet RA).

– Engagement conditions

The RWY engagement conditions are :

- The conditions required for SRS mode engagement :
 - V2 is inserted in the MCDU PERF TO page
 - slats are extended.
 - the aircraft has been on ground for at least 30 seconds.
- The aircraft is receiving a LOC signal and LOC deviation is less than 1/2 dot.
- The aircraft heading is within 20° of the ILS related course.
- The ILS course is identical to the runway heading of the origin airport as selected for the active flight plan, if any.

The RWY TRK mode engages automatically at 30 feet (RA) if NAV mode does not engage (NAV not armed prior to takeoff).

– Disengagement conditions

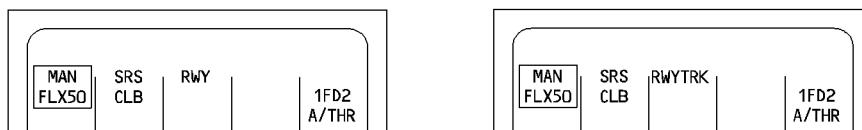
RWY mode disengages if :

- The LOC signal is lost below 30 feet RA or the aircraft heading and the runway heading differ by more than 20°.
- Another lateral mode is engaged.

Note : *If the takeoff runway has no ILS or if an ILS back course has been selected RWY mode is not available and the PFD does not display the yaw bar nor RWY on FMA.*

– Guidance

- The RWY mode uses the LOC signal to guide the aircraft on the runway centerline while the aircraft is on the ground.
The PFD displays the FD yaw bar.
The FMA displays RWY.
- The RWY TRK mode guides the aircraft on the track the aircraft was flying at mode engagement.
The FD displays the conventional guidance bar. The FMA displays “RWY TRK”.



Typical FMA with RWY mode engaged.

APPROACH

The aircraft can fly two different types of approaches :

- ILS (or LOC) approaches
- Non-ILS approaches (VOR/DME, VOR, NDB, RNAV)

The pilot uses an ARRIVAL lateral revision to insert these approaches into the flight plan.

The APPR pushbutton on the FCU is used to arm engage the guidance modes related to the approach inserted into the flight plan.

- For an ILS approach, the guidance modes are LOC and G/S.
- For a non-ILS approach, the guidance modes are APP NAV and FINAL (FINAL APP).

ILS APPROACH

The ILS approach mode includes the following modes :

VERTICAL MODE	LATERAL MODE
G/S* (capture)	LOC* (capture)
G/S (track)	LOC (track)
COMMONMODES LAND - FLARE - ROLL OUT	

The sequencing of these modes is automatic once the pilot has pushed the APPR pushbutton and the conditions for engagement are met.

Selection

The ILS approach is selected when the approach pushbutton of the FCU is pressed and

- an ILS approach or a runway only or no approach is inserted in the Flight Management flight plan (arrival page), and an ILS frequency is set in on the MCDU, or
- both radio management panels are set to NAV and each has the ILS frequency and course set in.

Note : *The ILS frequency will be automatically tuned when the direct distance to destination is below 300 NM.*

Check approach guidance message

If the pilot inserts a non-ILS approach into the flight plan and then uses the RAD NAV page to manually tune in an ILS. The MCDU displays “CHECK APPR GUIDANCE”. This message is a reminder that the available APPR guidance modes are APP NAV and FINAL.

RADIO NAV

VOR 1/FREQ FREQ/VOR2

OL/111.20 111.20/OL

CRS CRS

259 259

ILS /FREQ

OLW/109.5

CRS

259

ADF 1/FREQ FREQ/ADF2

C C/C C C C/C C

1L

2L

3L

4L

5L

6L

CHECK APPR GUIDANCE

1R

2R

3R

4R

5R

6R

Example : OLW was manually entered on the RAD NAV page, although a VOR approach is selected in the flight plan.

Arming conditions of LOC and G/S modes

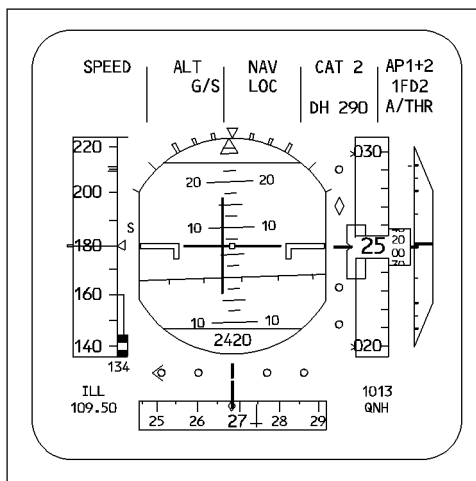
The pilot arms the (ILS) APPR mode (LOC and G/S in blue on the FMA) by pushing the APPR pushbutton on the FCU, provided that :

- An ILS approach is selected,
- The aircraft is above 400 feet RA,
- The ILS is available,
- Go-around or takeoff or final mode is not engaged,
- ILS frequency and course are identically set on both receivers.
- LOC and G/S blue are displayed on the FMA. Both modes will automatically engage when conditions are met.
- Second autopilot may be engaged.
- Current landing capability is displayed on the FMAs.

Disarming conditions of LOC and G/S modes

ILS APPR mode is disarmed if the aircraft is above 400 feet and one of the following conditions is met :

- When the pilot presses the APPR pushbutton, both the LOC and the G/S modes disarm.
 - The HDG/TRK mode engages, if the LOC mode was engaged, and the V/S or FPA mode engages if the G/S mode was engaged.
- When the pilot presses the LOC pushbutton, only the G/S mode disarms and :
 - The V/S or FPA mode engages, if the G/S mode was engaged.
- The pilot pulls the HDG/TRK selector knob.
- The pilot engages go-around mode.



LOC AND G/S ARMED

Engagement conditions of LOC and G/S modes

When ILS capture conditions are fulfilled :

- LOC* mode engages, and
- G/S* mode engages (No radio altimeter validity is required with this standard for G/S engagement).

The FMA displays “LOC*” or “G/S*” or both in green.

Nevertheless, G/S* mode cannot engage if :

- LOC* mode is not engaged, or
- the aircraft is above the glide path and its trajectory does not cross the ILS G/S beam.

The FMA displays “LOC” and “G/S” in green.

Once the aircraft is established on LOC axis :

- LOC mode engages,
- G/S mode engages when the aircraft is established on G/S axis.

The FMA displays “LOC” and “G/S” in green.

The AP/FD guides the aircraft along the G/S down to 30 feet and along the LOC during the flare and the roll out.

Note : G/S* or G/S may engage at altitudes that are above the radio altimeter validity (8000 feet for TRT, 5000 feet for Collins radio altimeter) but the landing capability displayed on the FMA will reflect the lack of radio altimeter validity (CAT1 only) until the RAs become active.

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Disengagement conditions of LOC and G/S modes

If the aircraft is above 400 feet the (ILS) APPR mode disengages :

- When the pilot pushes in the APPR pushbutton : the system reverts to basic modes (HDG V/S, TRK FPA).
- When the pilot pushes in the LOC pushbutton : LOC mode remains engaged. The system reverts to V/S FPA, if G/S was engaged.
- When the pilot pulls out the HDG/TRK selector knob : the system reverts to basic modes HDG V/S or TRK FPA.
- When the pilot pulls out the V/S FPA selector knob while G/S engaged. The system reverts to basic modes HDG V/S or TRK FPA.
- When the pilot engages go-around mode.

LOC capture assistance function

In NAV mode, and when within 20 NM of the destination runway, the aircraft is guided with a track angle of 20° from the LOC axis. This helps the aircraft to intercept and capture the LOC beam. When the ILS frequency, or the ILS ident entered on the RAD NAV page differs from the ILS of destination runway entered in the Flight Plan :

- The aircraft loses the LOC capture assistance function.
- The message “RWY/ILS MISMATCH” is displayed in the scratchpad.
- The pilot should select the HDG mode to perform the LOC capture.

Note : *There is no G/S capture assistance. The pilot shall ensure that the aircraft flight path intercepts the glideslope beam.*

LAND MODE

Engagement conditions

LAND mode automatically engages when the LOC and G/S modes are engaged and the aircraft is below 400 feet RA. The FMA displays “LAND”, indicating that LOC and G/S are locked, no action on the FCU will disengage LAND mode, FLARE and ROLL OUT modes will successively engage.

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Disengagement conditions

LAND mode disengages :

- Upon engagement of the go-around mode ;
- If the pilot presses the APPR pushbutton, when the aircraft has been on the ground for at least 10 seconds with the autopilot disconnected.

Note : *When LAND is not displayed on the FMA at/or slightly below 400 feet, the landing capability degrades to CAT1 and the triple click is generated. No autoland is authorized with CAT1 displayed on the FMA.*

FLARE MODE

Once the aircraft reaches approximately 40 feet RA (the precise value is a function of V/S),

- The FLARE mode engages.
- The FMA displays “FLARE” in green.

At 30 feet RA, the aircraft flares on the pitch axis. If autothrust is active, thrust is automatically set to IDLE (Refer to A/THR RETARD mode).

Align sub-mode

Align is a sub-mode of LAND that lines up the aircraft's axis with the ILS course at approximately 30 feet. Align sub-mode is not displayed to the crew.

Note : *Align sub-mode is often known as “decrab” function.*

ROLL OUT MODE

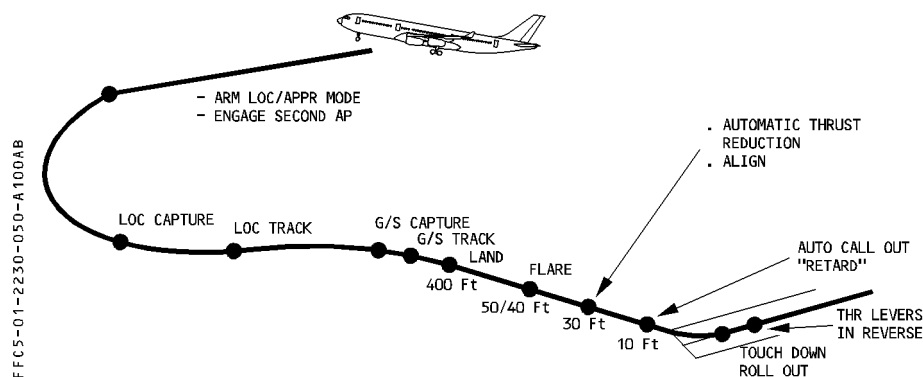
At touchdown, the ROLL OUT mode engages and guides the aircraft along the runway centerline. The FMA displays “ROLL OUT” in green, and the PFD displays the yaw bar and no FD bars.

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SPEED CONTROL

During an ILS approach, autothrust controls the speed, and the speed target may be selected or managed. Autothrust memorizes the approach speed at 700 feet RA so that it can continue to fly a stable approach, even if the FM part of the FMGS fails.

TYPICAL ILS APPROACH



AUTOLAND WARNING LIGHT

The following situations, when occurring below 200 feet RA with the aircraft in LAND mode, trigger the flashing AUTOLAND red warning and a triple click aural warning :

- Both APs OFF below 200 feet RA
- Excessive deviation in LOC (1/4 dot above 15 feet RA) or GLIDE (1 dot above 100 feet RA). In addition, LOC and GLIDE scales flash on the PFD.
- Loss of LOC signal above 15 feet or loss of GLIDE signal above 100 feet. The FD bars flash on the PFD. The LAND mode remains engaged.
- The difference between both radio altimeter indications is greater than 15 feet.

LANDING CAPABILITIES

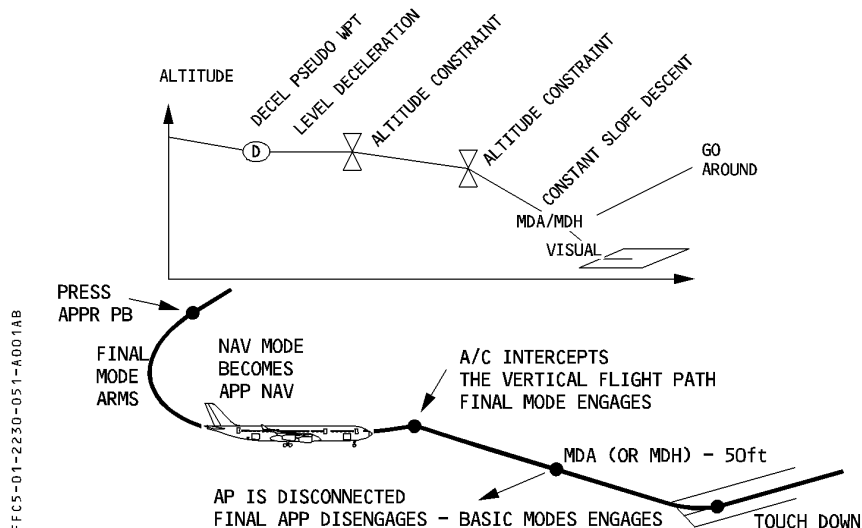
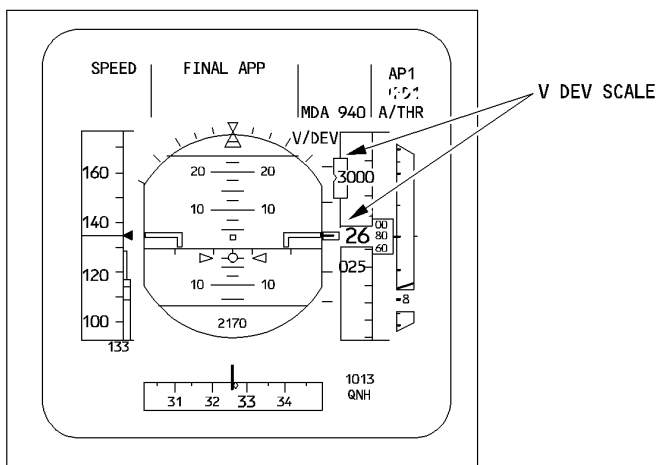
Each FMGC computes its own automatic landing capability according to the availability of computers or sensors or functions (Refer to 4.05.70)

The FMA displays "CAT1", "CAT 2", "CAT 3 SINGLE" or "CAT 3 DUAL" messages as soon as the APPR pushbutton is pushed in to arm ILS approach modes.

NON PRECISION APPROACH MODE

This mode guides the aircraft laterally and vertically down to the Minimum Descent Altitude (MDA) or Minimum Descent Height (MDH) along the final descent profile computed by the FMGS.

This mode is used to fly a NON ILS approach (VOR, VOR/DME, NDB, RNAV...) as inserted into the flight plan.



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The non precision approach includes the following managed modes :

APP NAV mode for lateral guidance

FINAL mode for vertical guidance

SELECTION

A non precision approach (VOR, VOR/DME, NDB, RNAV) is selected if the active flight plan calls for it (and it has been inserted in that flight plan).

ARMING CONDITIONS

The pilot arms the APP NAV and FINAL modes by pushing the APPR pushbutton on the FCU if all the following conditions are met :

- The aircraft is above 400 feet AGL.
- The flight plan is valid (lateral and vertical profile).
- The active flight plan has selected a non precision approach.
- GA mode is not engaged.

The FMA displays “FINAL” and “APP NAV” in blue.

If NAV mode was already engaged, APP NAV engages immediately.

DISARMING CONDITIONS

FINAL and NAV modes are disarmed :

- if the pilot pushes the APPR pushbutton or
- if the pilot pushes the LOC pushbutton, arming the LOC mode or
- if the pilot engages the GO AROUND mode.

ENGAGEMENT CONDITIONS

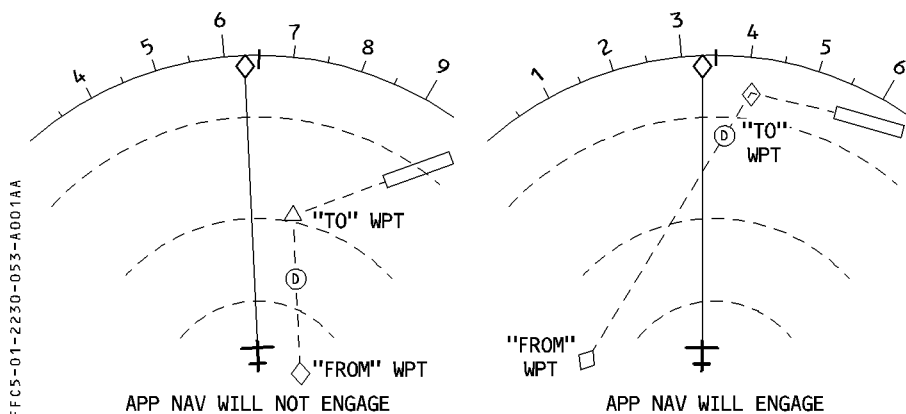
APP NAV and NAV modes engage under the same conditions :

If NAV mode was engaged, APP NAV engages immediately. If HDG/TRK is engaged, APP NAV engages when the intercept conditions are met (aircraft track line must intercept the flight plan active leg).

FINAL mode engages if :

- APPR phase is active and the deceleration point has sequenced and
- APP NAV is engaged and
- Cross track error is less than 1.5 NM and
- FINAL is armed, and
 - the aircraft intercepts a descending leg of the vertical flight path or
 - in V/S (FPA) or OPEN DES, the aircraft intercepts a level-off segment of the vertical flight profile, with a selected altitude different from this level-off segment.

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DISENGAGEMENT CONDITIONS

The FINAL and APP NAV modes disengage :

- If the pilot pushes the APPR pushbutton (HDG V/S or TRK FPA mode engages)
- If the pilot pushes the LOC pushbutton (LOC mode arms if an ILS is selected otherwise HDG V/S or TRK FPA mode engages)
- If the pilot pulls out the HDG TRK selector knob, the FMGS reverts to basic modes HDG V/S or TRK FPA
- If the pilot engages V/S or FPA mode, FINAL APP NAV disengages and basic modes HDG V/S or TRK FPA engage.
- Automatically at MDA (or MDH) – 50 feet or 400 feet AGL if no MDA/MDH entered.
- When the GO AROUND mode engages.

GUIDANCE

The FINAL mode guides the aircraft on the vertical profile down to the Minimum Descent Altitude (or the Minimum Descent Height, if the aircraft has the QFE pin program installed)

The FINAL mode does the following :

- Displays a vertical deviation scale (± 200 feet) on the Primary Flight Display and a VDEV symbol showing deviation from descent path.
- Anticipates leaving the altitude selected by the Flight Control Unit, when the aircraft reaches the Continue Descent symbol (arrow blue on the navigation display).
- Gives precise vertical guidance on the descent and final path with an internal vertical speed limitation to avoid excessive V/S.

If the autopilot is engaged while you are using the APP NAV/FINAL modes, it automatically disengages at MDA (or MDH) – 50 feet.

FD modes revert to basic HDG-V/S or TRK-FPA.

WARNING

If GPS PRIMARY is lost during a non ILS approach, a triple click aural warning sounds.

GO AROUND (GA)

Go-around mode combines the speed reference system's (SRS) vertical mode with the GA TRK lateral mode.

ENGAGEMENT CONDITIONS

Setting at least one thrust lever to the TOGA detent engages both SRS/GA TRK modes, if:

- The flaps lever is at least in position 1, and
- The aircraft is in flight, or
- The aircraft has been on ground for less than 30 seconds (AP disengages and can be re-engaged five seconds after lift-off).

The FMA displays “SRS” and “GA TRK” in green.

Vbars are automatically restored at go-around engagement.

DISENGAGEMENT CONDITIONS

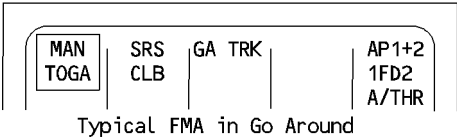
- SRS mode disengages :
 - When the pilot engages another vertical mode.
 When the pilot selects a speed while in SRS mode, SRS reverts to OP CLB and a triple click aural warning sounds.
 - Automatically, at go-around acceleration altitude (GA ACC ALT) or when ALT* engages, whichever occurs first (above 400 feet).
- GA TRK disengages when the pilot engages another lateral mode above 100 feet RA.

Note : *In dual AP configuration, disengagement of the GO AROUND mode, on either axis, causes AP2 to disconnect.*

GUIDANCE

- The SRS guidance law maintains the speed the aircraft had at GA engagement or VAPP, whichever is higher. At ACC ALT, the target speed becomes Green Dot Speed.
- GA TRK mode guides the aircraft along the track the aircraft was following at mode engagement.

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AUTOTHRUST

GENERAL

The autothrust (A/THR) is a function of the FMGS, it includes 2 independent A/THR commands, one per FMGC. Each one is able to control the thrust of the 4 engines simultaneously through 4 engine interface units and 4 engine control units. Only one FMGC controls the active A/THR, it is called the master FMGC.

Thrust is controlled :

- automatically when the A/THR is active
- manually by the pilot.

The autothrust is active when the A/THR pushbutton of the FCU is lighted green and A/THR is displayed white in the FMA 5th column.

The position of the thrust levers determines whether A/THR is armed, active, or disconnected.

The autothrust system, when active :

- maintains a specific thrust in THRUST mode
- controls the aircraft speed or MACH in SPEED/MACH mode
- uses ALPHA FLOOR mode to set maximum thrust when the aircraft angle of attack exceeds a specific threshold.

The autothrust system can operate independently or with the AP/FD.

- When performing alone, A/THR always controls the speed.
- If the autothrust system is working with the AP/FD, the A/THR mode and AP/FD pitch modes are linked together. (Refer to 1.22.30 Interaction between AP/FD and A/THR modes).

When autothrust is active, the FMGS commands the thrust according to the vertical mode logic, but uses a thrust not greater than the thrust commanded by the position of the thrust lever. For example, when the thrust levers are set at the CL (climb) detent, A/THR can command thrust between idle and max climb.

The autothrust system, when armed, automatically activates if the thrust levers are moved into the active range sector. Outside of this range, thrust levers control thrust directly.

Master A/THR

The thrust being controlled being one A/THR only, when one AP is engaged, priority is given to the associated autothrust.

When both APs are engaged or no AP/FD engaged, A/THR 1 has the priority.

THRUST LEVERS

The pilot uses the thrust levers to do the following :

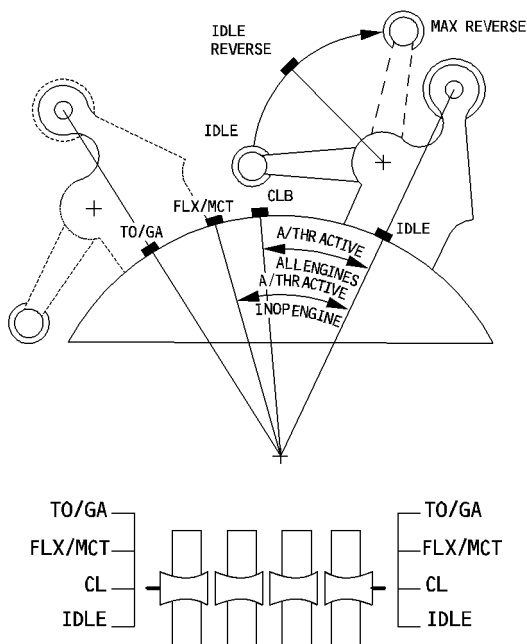
- Manually select engine thrust.
- Arm and activate autothrust (A/THR).
- Engage reverse thrust.
- Engage the takeoff and go around modes.

When autothrust is disconnected, the thrust levers control thrust directly : each lever position corresponds to a given thrust.

4 detents divide each of the thrust lever sectors into three segments. The detents are :

- TO GA : Maximum takeoff thrust
FLX MCT : Maximum continuous thrust (or FLX at takeoff)
CL : Maximum climb thrust
IDLE : Idle thrust.

When the thrust levers are at the IDLE position, the pilot can pull the reverse levers.



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A/THR ARMING

Arming conditions of the A/THR are numerous, let's quote the most important :

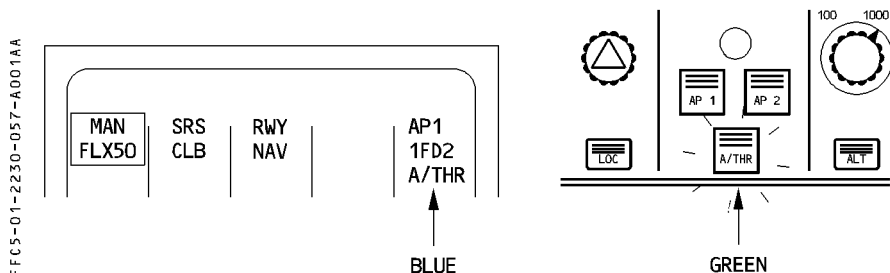
- one FMGC operative
- 2 ADIRS operative
- 3 FADECs operative and A/THR function is available on each engine
- one channel of the FCU operative
- A/THR is not manually disabled (instinctive disconnect pushbutton has not been pressed for more than 15 seconds).

The pilot arms A/THR :

- on the ground
 - by pushing the A/THR pushbutton on the FCU when the engines are not running or
 - by setting the thrust levers at the FLX or TOGA detent when the engines are running.
- in flight
 - by pushing the A/THR pushbutton on the FCU while the thrust levers are out of the active range or
 - by setting thrust levers beyond the CLB detent, or at least one lever beyond the MCT detent or
 - by engaging the go around mode.

A/THR armed is indicated by :

- illumination of A/THR pushbutton on FCU
- A/THR displayed in blue on the FMA



Note : At takeoff if thrust levers are set back to idle, A/THR disengages and cannot be rearmed until airborne.

A/THR ACTIVATION

The A/THR is active when it controls thrust or speed. The position of the thrust lever determines the maximum thrust that the A/THR system can command (except in α -floor condition).

The A/THR being armed, is activated :

- when the pilot sets the thrust levers between the CL and IDLE detents (all engines operative)
- when the pilot sets the thrust levers between the MCT and IDLE detents (one engine inoperative).

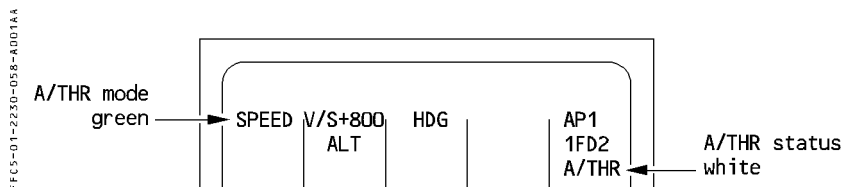
The A/THR being disconnected, is activated when the pilot pushes the FCU pushbutton while the thrust levers are within the active range, including IDLE position.

Note : When the pilot sets both thrust levers to IDLE position, the A/THR disconnects but, if the pilot pushes the A/THR pushbutton of the FCU, he will simultaneously arm and activate the autothrust. Due to the thrust levers position, IDLE thrust will be maintained.

- when ALPHA FLOOR is activated, regardless of the initial status of A/THR and the position of the thrust levers.

When A/THR is active :

- the A/THR pushbutton on the FCU lights up.
- the FMA displays A/THR mode in green in the first column and A/THR in white in the fifth column.



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EFFECTS OF THRUST LEVER MOVEMENT WHILE A/THR IS ACTIVE

- When all thrust levers are set above the CL detent or at least one above the MCT detent, the A/THR reverts from active to armed. “A/THR” turns to blue on the FMA and the thrust levers control the thrust directly. The FMA displays “MAN THR” white in its first column.
The thrust levers provide the crew with an immediate increase of thrust when thrust levers are pushed above the CL detent (4 engines) or the active thrust levers above the MCT detent (one engine inoperative).
- When all thrust levers are set below the CL (4 engines) or 3 thrust levers are set below the MCT (1 engine inoperative), “ATHR LIMITED” ECAM message is activated (with single chime and amber caution) every 5 seconds until the pilot moves the levers into the detent, “THR LVR” green is displayed on the FMA.
“LVR CLB” (all engines operative) or “LVR MCT” (one engine inoperative) flashes white in the first column of the FMA.
This device reminds the crew that the normal operating position of the thrust levers, when A/THR is active, is the CL detent (all engines) or the MCT detent (one engine inoperative).
- When at least one thrust lever is set out of the CL (or MCT) detent, with autothrust active, the “LVR ASYM” amber message comes up until all levers are set in the CL detent.

A/THR DISCONNECT

When the A/THR is disconnected, it is neither armed nor active.

The A/THR can be disconnected in two ways :

- * Standard disconnection
 - The pilot pushes the instinctive disconnect pushbutton on the thrust levers (which immediately sets the thrust corresponding to the lever positions) or
 - The pilot sets all thrust levers to IDLE detent.
- * Non-standard disconnection
 - The pilot pushes the A/THR pushbutton on the FCU while A/THR is armed/active, or
 - The system loses one of the arming conditions.
- * **Below 100 feet radio altitude**

When the radio altitude is below 100 feet and the pilot sets all thrust levers above the CL detent or one above the MCT detent, the autothrust will disconnect. It will rearm automatically when at least one of the thrust levers is set to TOGA.

If the PF set the thrust levers above CL detent but below TOGA and come back to CL detent, the A/THR will disconnect and remain disconnected. As a result, the thrust will increase up to CLIMB thrust. The crew has to manually set the appropriate thrust for landing (or go around).

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CAUTION

If the pilot pushes and holds one instinctive disconnect pushbutton for more than 15 seconds, the A/THR system is disconnected for the remainder of the flight. All A/THR functions including ALPHA FLOOR are lost, and they can be recovered only at the next FMGC power-up (on ground).

THRUST LOCK FUNCTION

The THRUST LOCK function is activated when the thrust levers are in the CL detent (or the MCT detent with one engine out) and the pilot pushes the FCU A/THR pushbutton or the A/THR disconnects due to a failure.

The thrust is locked or frozen at its level prior to disconnection. Moving the thrust levers out of the CL or MCT detent suppresses the thrust lock, and reverts to manual control.

When the thrust lock function is active :

- “THR LK” flashes amber on the FMA.
- ECAM “ENG THRUST LOCKED” flashes every five seconds.
- ECAM displays “THR LEVERS..... MOVE”
- A single chime sounds and the Master Caution Light flashes every five seconds.

All warnings cease when the pilot moves the thrust levers out of the detent.

A/THR DISCONNECT CAUTION

The standard disconnection triggers a temporary ECAM message and a single chime.

The non standard disconnection (A/THR pb pressed on the FCU or A/THR failure) triggers continuous visual cautions until the pilot reacts. The single chime sounds.

		A/THR DISCONNECTION	
		BY INSTINCTIVE DISCONNECT OR SETTING TWO LEVERS TO IDLE (if above 50 feet RA)	BY OTHER MEANS
CONSEQUENCE	MASTER CAUTION	illuminated-3 sec max	illuminated
	ECAM MESSAGE	amber A/THR OFF message 9 sec maximum	caution
	AUDIO	single chime	single chime
	CLR pushbutton on ECAM CONTROL PANEL	extinguished	illuminated
ACTION	MASTER CAUTION pushbutton	extinguishes MASTER CAUTION light, erases ECAM message.	extinguishes MASTER CAUTION light
	CLR pushbutton on ECAM CONTROL PANEL	No effect	extinguishes MC light and CLR pushbutton, erases ECAM message calls status
	INSTINCTIVE DISCONNECT pushbutton	extinguishes MASTER CAUTION light, erases ECAM message.	extinguishes MASTER CAUTION light
ECAM STATUS MESSAGE		NO	YES

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A/THR MODES

Except in takeoff and go-around situations, normal operation of the A/THR system requires the thrust levers to be :

- In the CL detent for the 4 engine configuration. If they are not set in the CL detent, “LVR CLB” flashes white on the FMA.
- In MCT detent, when in one-engine-out configuration. If the other levers are not set in the MCT detent, “LVR MCT” flashes white on the FMA.

The A/THR modes are automatically selected in conjunction with the AP/FD modes (except for ALPHA FLOOR).

A/THR in THRUST mode	AP/FD pitch mode maintains the speed : OP CLB - OP DES - CLB - SRS - FLARE and DES (IDLE path)
A/THR in SPEED/MACH mode	If neither AP nor FD is engaged. If AP/FD controls a vertical path V/S-FPA-ALT*- ALT CST*-ALT-ALT CRZ-G/S* -G/S-FINAL and DES (geometric path)
A/THR in RETARD mode	Automatic landing (AP engaged in LAND mode).

THRUST mode

- In THRUST mode, autothrust commands a specific thrust level in conjunction with the AP/FD pitch mode. This thrust level is limited by the thrust lever position.

FMA display	Meaning
THRMCT	The most advanced thrust lever is in the MCT detent (engine-out)
THR CLB	The most advanced lever is in the CL detent.
THR LVR	Thrust levers are either below CL or MCT detent, or at least one thrust lever is in CL detent and the others above CL detent.
THRIDLE	A/THR commands IDLE thrust.
THR DES	A/THR commands a reduced thrust while DES mode is engaged.

Note : When the A/THR is armed for takeoff, or go-around, the FMA displays “MAN TOGA” (or “MAN FLX” or MAN DTO ) in white to remind the crew that the thrust levers have been positioned properly.

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RETARD mode

The RETARD mode is available only during automatic landing (AP engaged in LAND mode). RETARD mode engages at approximately 40 feet RA and remains engaged after touchdown.

The A/THR commands IDLE thrust during the flare and the FMA and engine warning display show "IDLE".

If the autopilot is disengaged during the flare before touchdown, the SPEED mode replaces RETARD mode, and the pilot has to reduce thrust manually.

Note : *In automatic landing, the system generates a "RETARD" callout at 10 feet RA, which prompts the pilot to move the thrust levers to IDLE in order to confirm thrust reduction. In manual landing conditions, the system generates this callout as a reminder at 20 feet RA.*

SPEED/MACH mode

In SPEED/MACH mode, the A/THR adjusts the thrust in order to acquire and hold a speed or Mach target.

The speed or Mach target may be :

- selected on the FCU by the pilot
- managed by the FMGC.

When in SPEED or MACH mode, the A/THR does not allow speed excursions beyond the following limits regardless of the target speed or Mach number :

- For a selected speed target, the limits are VLS and VMAX (VMO-MMO, VFE-VLE, whichever applies).
- For a managed speed target, the limits are maneuvering speed (Green Dot, S, F, whichever applies) and maximum speed (320/.84-VFE-VLE whichever applies).

The changeover from SPEED to MACH mode is either automatically performed by the FMGC or manually by the pilots (in selected speed target only) by pushing the SPD/MACH change-over pushbutton.

The FMA displays "SPEED" or "MACH".

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MACH MODE IN CRUISE PHASE (A/THR SOFT MODE)

When the aircraft is in ALT CRZ mode with the autopilot engaged, autothrust engaged in MACH mode, and is within a + -3 kt range of the target speed, the auto thrust soft mode engages. This mode reduces the thrust variation in cruise, specifically in light turbulence. The auto thrust soft mode disengages when the speed deviation from the target becomes too large or the target is modified ; autothrust transition from soft to basic mode may lead to transient thrust variation. This mode is inhibited with speedbrakes extended, or with engine out or when Mach target is below 0.65.

SPEED MODE IN APPROACH PHASE

When the aircraft flies an approach in managed speed, the speed target displayed on the PFD in magenta, is variable during the approach.

This managed speed target, is computed in the FMGS using the “ground speed mini function”.

GROUND SPEED MINI FUNCTION PRINCIPLE

The purpose of the ground speed mini function is to take advantage of the aircraft inertia, when the wind conditions vary during the approach. It does so by providing the crew with an adequate indicated speed target. When the aircraft flies this indicated speed target, the energy of the aircraft is maintained above a minimum level ensuring standard aerodynamic margins versus stall.

If the A/THR is active in SPEED mode, it will automatically follow the speed target, ensuring an efficient thrust management during the approach.

The minimum energy level is the energy level the aircraft will have at touch down if it lands at VAPP speed with the tower reported wind as inserted in the PERF APPR page.

The minimum energy level is represented by the Ground Speed the aircraft will have at touchdown. This Ground Speed is called “GROUND SPD MINI”.

During the approach, the FMGS continuously computes the speed target using the wind experienced by the aircraft in order to keep the ground speed at or above the “Ground Speed Mini”.

The lowest speed target is limited to VAPP.

The speed target is displayed on the PFD speed scale in magenta, when approach phase and managed speed are active. It is independent of the AP/FD and/or ATHR engagements.

Wind is a key factor in the ground speed mini function.

TWR WIND

It is the MAG WIND entered in the PERF approach page. It is the average wind as provided by the ATIS or the tower. Gusts must not be inserted, they are included in the ground speed mini computation.

Example

FFCS-01-2230-065-A001AA

DEST
GNH
1015
TEMP
[]°
MAG WIND
090/30
TRANS ALT
4000
VAPP
140

APPR
FLP RETR
F=141
SLT RETR
S=176
CLEAN
0=188
VLS
130

FINAL
ILS09R
MDA
[]
DH
367
LDG CONF
CONF3 ✱
FULL
NEXT
PHASE >

1L
2L
3L
4L
5L
6L

1R
2R
3R
4R
5R
6R

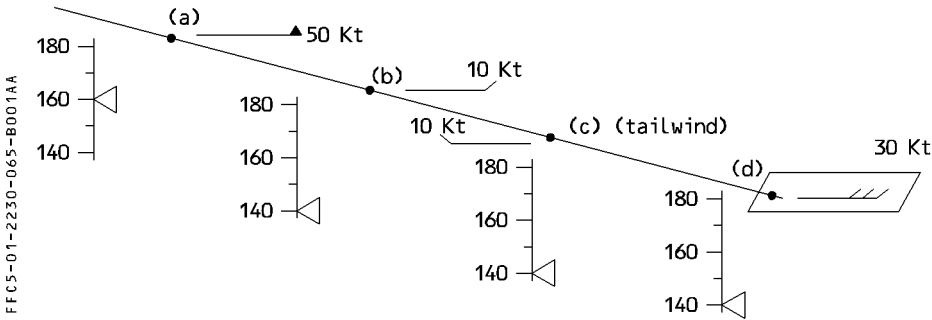
PERF APPR PAGE
ILS APPROACH

- Approach on runway 09
- TWR wind in PERF APPR page : 090/30
- VLS = 130 kt

The three formulae give the following values :

1. $VAPP = 130 + \text{MAX}(5, 1/3 \text{ of } 30) = 140 \text{ kt}$
2. $GS \text{ Mini} = 140 - 30 = 110 \text{ kt}$
3. $IAS \text{ target} = \text{MAX}(140, 110 + \text{current headwind component})$

Current wind in Approach	IAS target
(a) 090/50	$\text{MAX}(VAPP, 110 + 50) = 160\text{kt}$
(b) 090/10	$\text{MAX}(VAPP, 110 + 10) = 140 \text{ kt}$
(c) 270/10	$\text{MAX}(VAPP, 110 - 10) = 140\text{kt}$
(d) 090/30	$\text{MAX}(VAPP, 110 + 30) = 140 \text{ kt}$



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A/THR MODE REVERSION

CONDITIONS	EVENT	CONSEQUENCES
• A/THR active in THR mode • AP OFF • FD engaged • DES or "OP" DES engaged (CLB or OP CLB)	aircraft speed = VLS (Vmax)	• A/THR reverts to SPD mode • FD bars are removed

For detail refer to "Speed mode protection".

Alpha floor

The ALPHA FLOOR protection is triggered when the FMGCs receive a signal elaborated by the PRIMs. This signal is sent when the aircraft angle of attack is above a predetermined threshold function of the aircraft configuration. The A/THR is automatically activated and commands TOGA thrust regardless of thrust lever positions. This protection is available from lift off to 100 feet RA in approach.

Following indications are then provided :

- A-FLOOR on the FMA and on the EWD as long as α floor conditions are met
- TOGA LK on the FMA when the aircraft leaves the α floor conditions.

TOGA thrust is then frozen

A FLOOR and TOGA LK are displayed in green and surrounded by an amber flashing box.

In order to cancel the ALPHA FLOOR or TOGA LK thrust, disconnect the A/THR.

Note : Alpha Floor is inhibited :

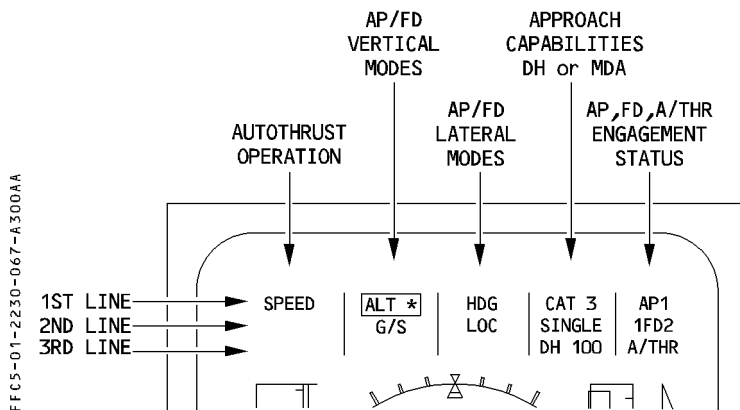
- in case of outer engine failure if flaps out or derated takeoff is selected
- in case of dual engine failure on the same wing
- below 100 feet at landing
- above M.53

Alpha Floor protection is lost in case of A/THR failure.

FLIGHT MODE ANNUNCIATOR (FMA)

The Flight Mode Annunciator (FMA), located on the top of the PFDs, reflects the status of the A/THR, the AP/FD vertical and lateral modes, the approach capabilities, and the AP/FD-A/THR engagement status.

A white box is displayed for 10 seconds around each new annunciation. The white box display time may be increased to 15 seconds in some mode reversion cases associated with a triple click aural warning.



In the three left columns :

The engaged modes are displayed in green on the first line.

The armed modes are displayed in blue, or in magenta, on the second line.

Modes, armed due to a constraint, are displayed in magenta.

Special messages, are displayed on the third line :

- First priority is given to messages related to flight controls :
 - MAN PITCH TRIM ONLY flashes red for 9 seconds, then remains steady.
 - USE MAN PITCH TRIM pulses amber for 9 seconds, then remains steady.
- Lower priority messages related to FMGS.

In the fourth column, approach capabilities are displayed in white.

DH or MDA/MDH is displayed in blue.

In the right column, AP, FD, A/THR engagement status are displayed in white.

FD is boxed for 10 seconds, in case of automatic FMGC switching.

When armed, A/THR is displayed blue.

Note : The FMGS synchronizes A/THR mode, AP/FD modes, and landing capability to provide identical information on both PFDs.

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AUTO THRUST ANNUNCIATIONS (FMA COLUMN 1)

First line

DISPLAY	COLOR	MEANING
MAN TOGA	White White box	A/THR is armed, at least one thrust lever is in TOGA detent.
MAN FLX 50	White White box	A/THR is armed, at least one thrust lever is in MCT/FLX detent, with FLX TO temp set at, 50°. Other thrust levers are at, or below, the MCT/FLX detent. 50 is displayed in blue.
MAN MCT	White White box	A/THR is armed, at least one thrust lever is in MCT detent ; the others are at, or below, this detent and no FLX or DTO is entered.
MAN DTO 	White White box	A/THR is armed, at least one thrust lever is in MCT/FLX detent, with an entered derated level. Other thrust levers are at, or below, the MCT/FLX/DTO detent.
MAN THR	White Amber box	A/THR is armed. This indication is not displayed during T.O or GA phases. The most advanced thrust lever is above the MCT detent ; or, all thrust levers are above CLdetent.
THR MCT	Green	A/THR is active in thrust mode and the most advanced thrust lever is in the MCT detent (engine-out).
THR CLB	Green	A/THR is active in thrust mode, and the most advanced thrust lever is in the CL detent.
THR DCLB 1 (2) 	Green	A/THR is active in thrust mode. The most advanced thrust lever is in the CL detent, and the crew has selected a derated climb.
THR IDLE	Green	A/THR is active in thrust mode, and commands idle thrust.
THR LVR	Green	A/THR is active in thrust mode, all thrust levers are below CL detent, or the most advanced thrust lever(s) is between CL and MCT detent with at least one lever in CL detent.
THR DES	Green	A/THR is active in thrust mode and commands a reduced thrust, while DES mode is engaged.
SPEED or MACH	Green	A/THR is active in SPEED or MACH mode.
A. FLOOR	Green Amber box	A/THR is active and commands a reduced TOGA thrust, while α FLOOR conditions are met.
TOGA LK	Green Amber box	A/THR is active and TOGA thrust is frozen (α FLOOR conditions are no longer met).

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Second/third lines

The second and third lines display various caution messages.

Second line

DISPLAY	COLOR	MEANING
LVR CLB (flashing)	White	Request to set the thrust levers in CL detent
LVR MCT (flashing)	White	Request to set the thrust levers in MCT detent.

Third line

DISPLAY	COLOR	MEANING
LVR ASYM	Amber	One thrust lever is in a detent (CLB or MCT) while all others are not in this detent. (4 engines only).
THR LK (flashing)	Amber	The thrust is frozen due to non-standard A/THR disconnection (FCU disconnection or failure).

Note : *The amber caution flashes and a single chime sounds every 5 seconds, as long as the pilot does not take action in the following cases :*

- THR LK
- THR CLB (if the thrust levers are below the CLB detent)
- LVR MCT (if the thrust levers are below the FLX/MCT detent).

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API/FD VERTICAL MODES (FMA COLUMN 2)

First line

DISPLAY	COLOR	MEANING
SRS	Green	Takeoff or go-around mode is engaged.
CLB	Green	Climb mode is engaged. The FMGS target altitude is higher than the actual altitude. ALT CSTR are taken into account.
OP CLB	Green	Open Climb mode is engaged. The FCU-selected altitude is higher than the actual altitude.
ALT*	Green	ALT CAPTURE at the FCU-selected altitude is engaged.
ALT CST*	Green	ALT CAPTURE at the ALT CSTR altitude (vertical profile) is engaged.
ALT CRZ*	Green	ALTCAPTURE at the CRZ FL is engaged.
ALT	Green	ALT mode is engaged. The FCU selected altitude is held.
ALT CST	Green	An ALT CSTR is held (vertical profile).
ALT CRZ	Green	SOFT ALT mode and NAV mode are engaged.
DES	Green	Descent mode is engaged. The FMGS target altitude is lower than the actual altitude. ALT CSTR are taken into account.
OP DES	Green	Open Descent mode is engaged. The FCU-selected altitude is lower than the actual altitude.
G/S*	Green	Glide Slope capture mode is engaged.
G/S	Green	Glide Slope mode is engaged.
V/S ± XXXX	Green	Vertical speed mode is engaged to acquire and hold the V/S selected on the FCU. Target is displayed in blue. If the aircraft reaches VLS or Vmax and cannot maintain the target, the indication is boxed amber and flashes, and the target pulses.
FPA ± X.X°	Green	Flight Path Angle mode is engaged to acquire and hold the FPA selected on the FCU. Target is displayed in blue. If the aircraft reaches VLS or Vmax and cannot maintain the target, the indication is boxed amber and flashes, and the target pulses.

Second line

DISPLAY	COLOR	MEANING
ALT	Blue or Magenta	Altitude mode is armed : – Blue, when the target altitude is the FCU-selected altitude. – Magenta, when the target altitude is an ALT CSTR.
ALT CRZ	Blue	Altitude mode is armed. Target altitude is the CRZ FL.
CLB	Blue	Climb mode is armed before the climb phase.
DES	Blue	Descent mode is armed before the descent phase.
FINAL	Blue	Final descent mode is armed.
G/S	Blue	Glide Slope mode is armed.
OP CLB	Blue	Open Climb mode is armed.

Note : Two modes may be armed at the same time : ALT G/S, ALT FINAL, DES G/S, DES FINAL.

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Third line

DISPLAY	COLOR	MEANING
SPEED SEL XXX	Blue	Indicates a preset speed associated with the cruise, climb or descent phase.
MACH SEL. XX	Blue	Indicates a preset Mach associated with the cruise, climb or descent phase.

Note : These two messages are displayed in the first and second columns (third line).

API/FD LATERAL MODES (FMA COLUMN 3)

First line

DISPLAY	COLOR	MEANING
RWY	Green	RWY mode is engaged.
RWY TRK	Green	RWY mode is engaged once airborne at, or above, 30 feet.
TRACK	Green	TRACK mode is engaged.
HDG	Green	HEADING mode is engaged.
NAV	Green	NAV mode is engaged to guide the aircraft along the FM lateral F-PLN.
LOC*	Green	LOC capture mode is engaged.
LOC	Green	LOC track mode is engaged.
LOC B/C*	Green	Back beam capture mode is engaged.
LOC B/C	Green	Back beam mode is engaged.
APP NAV	Green	NAV mode is engaged during a NON ILS approach.
GA TRK	Green	GO AROUND track mode is engaged.

Second line

DISPLAY	COLOR	MEANING
LOCB/C	Blue	Back beam mode is armed.
LOC	Blue	LOC mode is armed.
APP NAV	Blue	NAV mode is armed for a NON ILS approach.
NAV	Blue	NAV mode is armed.

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API/FD COMMON MODES (FMA COLUMN 2 AND 3)

DISPLAY	COLOR	MEANING
ROLL OUT	Green	Roll out mode is engaged.
FLARE	Green	Flare mode is engaged.
LAND	Green	Land mode is engaged below 400 feet RA.
FINAL APP	Green	APP NAV and FINAL modes are engaged during a NONILS approach

APPROACH CAPABILITIES (FMA COLUMN 4)

First line

DISPLAY	COLOR	MEANING
CAT 1	White	CAT 1 capability available
CAT 2	White	CAT 2 capability available
CAT 3	White	CAT 3 capability available

Second line

DISPLAY	COLOR	MEANING
SINGLE	White	CAT 3 capability available, with FAIL PASSIVE condition.
DUAL	White	CAT 3 capability available, with FAIL OPERATIONAL condition.

Third line

DISPLAY	COLOR	MEANING
MDA/MDH XXX	White Blue	Minimum descent altitude or minimum descent height as inserted by the pilot on PERF APPR page.
DH XXX/NODH	White Blue	Decision height as inserted by the pilot on PERF APPR page. NO DH: when NO inserted on PERF APPR page.

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AP/FD – A/THR ENGAGEMENT STATUS (FMA COLUMN 5)

First line

DISPLAY	COLOR	MEANING
AP 1 + 2	White	Autopilot 1 and 2 are engaged.
AP 1	White	Autopilot 1 is engaged.
AP 2	White	Autopilot 2 is engaged.

Second line

DISPLAY	COLOR	MEANING
X FD Y	White	X and Y give the FD engagement status on PFD 1 and PFD 2. X and Y can be 1, 2, –. – : no FD is engaged on the corresponding PFD 1 : FD 1 is engaged. 2 : FD 2 is engaged. e.g. : the normal status (FD 1 and 2 are engaged) is 1FD2.

Third line

DISPLAY	COLOR	MEANING
A/THR	White	A/THR is active.
A/THR	Blue	A/THR is armed and not active.

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SPECIAL MESSAGES (FMA COLUMNS 2 AND 3)

Three types of messages are displayed on the third line :

- first priority is given to F/CTL messages
- then vertical FM messages
- then EFIS reconfiguration messages

DISPLAY	COLOR	CONDITIONS
MAN PITCH TRIM ONLY	Red	Displayed in case of loss of L + R elevators.
USE MAN PITCH TRIM	Amber	F/CTL are in direct law or in flare law with dual RA failure.
CHECK APP SELECTION	White	The aircraft is in cruise at less than 100 NM from the top of descent or in descent or in approach and: – a non ILS approach has been selected. – an ILS frequency is tuned on the RAD NAV page
SET MANAGED SPEED	White	The SPEED target is selected and a preselected SPEED does not exist for the next flight phase
SET GREEN DOT SPEED	White	The aircraft is in Engine Out mode and the SPEED target is selected. This message is displayed if: the FCU selected speed is : ≤ Green Dot – 10 kt or ≥ Green Dot + 10 kt except in ALT* and ALT mode
SET HOLD SPEED	White	The aircraft is in selected SPEED control, an HM leg is inserted in the F-PLN and the aircraft is 30 seconds before the deceleration zone to the precomputed HOLD SPEED.
DECELERATE	White	This message is displayed if the thrust is not reduced when passing the top of descent, and the aircraft is above the flight profile.
EXTEND SPD BRK	White	DES mode is engaged, idle is selected, and: – either the aircraft is above the vertical profile and the predicted intercept point of the theoretical profile is at less than 2 NM from the next ALT CSTR and the predicted aircraft altitude at next ALT CSTR is greater than ALT CSTR – 500 feet. – or in auto speed control if the aircraft enters in a speedbrake decelerating segment (next speed limit or speed constraint)
RETRACT SPD BRK	White	Speedbrakes are extended, DES mode is engaged and : – ALT* or ALT mode engages or – aircraft is below the path. – CONF 3 or FULL is reached.
EFIS SINGLE SOURCE 1 or EFIS SINGLE SOURCE2	White	CAPT and F/O Display Units are fed by the same source : either captain side source (1) or first officer side source (2). Range and mode selections can be done only by the appropriate side.
EFIS SWTG NOT ALLOWED	Amber	EFIS configuration selected by the pilot is not allowed: DMC 1 for F/O Display Units or DMC2 for CAPT Display Units, and conditions for "EFIS SINGLE SOURCE" not fulfilled.