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GENERAL

The airplane is equipped with an Automatic Flight Control System (AFCS) which can operate throughout the entire flight envelope. Two digital flight guidance computers (DFGS 1 and 2) and a Flight Management System (FMS) provide data input for AFCS functions. DFGC 1 and 2 receive data from the digital central air data computers (CADC 1 and 2), VHF navigation systems (VOR/LOC/GS 1 and 2), Attitude Heading Reference Systems (AHRS 1, 2, 3), radio altimeters 1 and 2, dual three axis accelerometers, dual lateral accelerometers, flight management computer and sensors of other airplane systems and functions.

A Flight Guidance Control Panel (FGCP) is provided for selection of desired FGS modes of operation.

DFGC provides data inputs for the following integrated AFGC functions; autopilot (AP), stability augmentation (yaw damper, mach trim compensator), flight director (FD), speed control (SC), autothrottle system (ATS), thrust rating (EPR) and synchronization, automatic reserve thrust (ART), and altitude alert.

Autoland capability is also provided (including flare-touchdown and rollout).

Flight Mode Annunciator (FMA) is provided on the instrument panel. The FMA displays the following: annunciations for selected FGS mode of operation; legend annunciations to indicate that the navigation to indicate system failure; AP and THROTTLE warning lights; and FD and AP selection.



AUTOPILOT (AP)

The AP function, operating in conjunction with the yaw damper function, automatically controls the airplane pitch, roll and yaw maneuvering axes. Appropriate control surfaces are actuated by the AP control to control the airplane for the selected AP mode of operation.

The AP will automatically control airplane for the following maneuvers: maintain an existing altitude; capturing a preselected altitude; maintain a preselected vertical speed, indicated speed or Mach number; fly an FMS horizontal and vertical profile; fly a PMS vertical profile; maintain an existing heading; fly to, capture and track a selected VOR or localizer course; capture and track a glideslope; runway alignment and flare, and rollout for automatic landing. Appropriate annunciations will appear on FMA to indicate existing AP operating mode.

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STABILITY AUGMENTATION

- Mach Trim Compensator

DFGS provide computations for the Mach trim compensator function. The MCT compensates for nosedown pitching moments that are generated during operation at high mach numbers.

- Yaw Damper

The yaw damper function (including automatic turn coordination) is activated anytime the AP is engaged provided YAW DAMP switch is not in OVRD. With AP disengaged, the yaw damper function can be activated by moving the YAW DAMP switch to ON.

Yaw damper series actuator can be inhibited by moving YAW DAMP switch to OVRD.

FLIGHT DIRECTOR (FD)

The FD function provides visual guidance commands to fly the airplane manually or to visually monitor AP response to guidance commands. The FGS operating modes can be selected for FD with AP disengaged.

In MaddogX it is possible to choose between SINGLE CUE or CROSS BAR representation of FD commands on PFD.

ALTITUDE ALERT

The altitude alert function automatically alerts the pilots that the airplane is approaching the preselected altitude or that the airplane is deviating from a previously selected and acquired altitude. An advisory light on the altimeter provide the alert for either of the above situations.

The advisory light will come on and a one second aural/annunciation will sound when the airplane is approximately 750 feet from the selected altitude. When within 250 from the selected altitude the advisory light will go off.

If the airplane subsequently deviates more than 250 feet from selected altitude, the advisory light will come on and a continuing series of an aural tone alternating with the spoken word "altitude" will be heard.

The altitude alert deviation function is inhibited if flaps are extended more than 26° and/or if the glideslope is captured.

THRUST RATING COMPUTER (TRC)

The thrust rating computation is provided by the DFGS which receive inputs from a ram air temperature. The DFGS supply data to the indicator for automatic display of EPR LIM for mode selected. For a more detailed description of TRC, refer to chap. 17 Powerplant.

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AUTOTHROTTLE/SPEED CONTROL (ATS/SC)

The autothrottle speed control functions are available for operation from takeoff to landing. The DFGS provide thrust lever commands and speed control pitch commands for flight director, autopilot and fast/slow pointer display.

The speed control provides two automatically coupled speed control modes (takeoff and go-around).

Therefore, takeoff and go around modes are available only when the flight director and/or autopilot are engaged.

Selectable ATS modes are: indicated airspeed select (SPD SEL), mach select (MACH SEL), FMS EPR, FMS OVRD and EPR limit.

The thrust rating indicator is used to select the thrust EPR for EPR limit mode.

Modes that occur automatically are: SPD ATL/MACH ATL, LOW LIM, FLAP LIM, SLAT LIM, VMO LIM, MMO LIM, ALFA SPD, RETD, and CLMP. Speed error signal are displayed by the fast/slow pointer on the PFD.

Speed control inputs for attitude control are displayed by the pitch command bar and fast/slow pointer in the PFD during takeoff and go-around modes.

During takeoff mode of operation, the pith command bar will command a pitch attitude to maintain V_2+10 KIAS.

During go-around mode, the pitch command bar will command a pitch attitude to maintain go-around speed.

AUTOTHROTTLE

The autothrottle functions automatically positions the thrust levers to maintain airspeed or engine thrust as required for the operational mode selected.

The autothrottle is engaged by a solenoid held switch. The switch will not remain engaged unless all interlocks and engage requirements are satisfied.

Autothrottle takeoff mode is initiated by selecting TO or TO FLX on the thrust rating indicator, pushing the TO/GA button.

Go-around mode is initiated by pushing the TO/GA button with the airplane airborne or on the ground for less than 20 seconds.

FLIGHT MANAGEMENT SYSTEM

The Flight Management System (FMS) consists of two Advanced Flight Management Computers (AFMC), two Multipurpose Control Display Units (MCDU), and an FMS source selector.

Lateral guidance function is engaged by pushing the NAV button on the flight guidance control panel (FGCP) after performance data and an active route has been entered and executed through the MCDU. Vertical guidance function is engaged by pushing the VNAV button on the FGCP after the autothrottle was engaged.

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WINDSHEAR ALERTING AND GUIDANCE SYSTEM

The aircraft Windshear Alerting and Guidance System (WAGS) is designed to provide detection, alerting, and guidance through hazardous windshear condition. The system consists of a Windshear Computer (WSC) and associated interfacing systems.

INDICATIONS

When the WSC detects a windshear condition, it provides both aural and visual cockpit annunciations. A red windshear warning (decreasing performance windshear) or an amber windshear warning (increasing performance windshear) will be displayed on the glare shield when the WSC detects the appropriate windshear condition and a windshear vocal message "HEADWIND SHEAR" or "TAILWIND SHEAR" will be generated depending on the type of windshear.

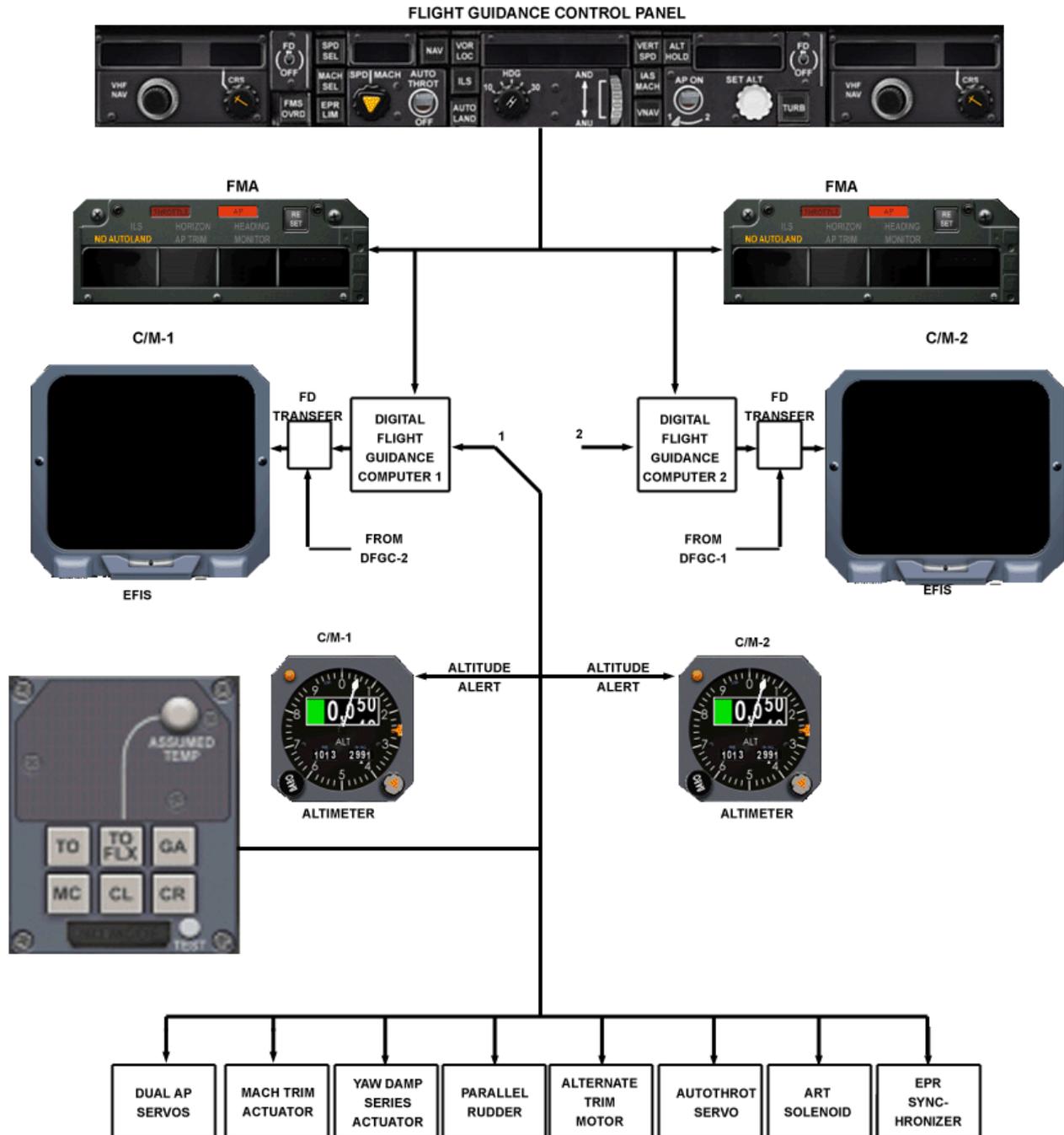
The WSC provides pitch guidance commands for all windshear encounters during all takeoff and go-around operations.

The WSC provides guidance to achieve an energy conserving flight path which enhances the aerodynamic efficiency of the airplane in a windshear encounter.

WINDSHEAR TEST

When the airplane is on the ground and airspeed is less than 30 KIAS, the windshear system may be checked for proper response. The windshear eight second test is initiated by moving the switch to the momentary TEST position.

AUTOMATIC FLIGHT CONTROL SYSTEM



Mode Buttons

ALT HOLD: Select existing altitude for the FGS altitude hold mode. FMA annunciates ALT HLD.

VERT SPD: Selects exiting vertical speed for the FGS vertical speed mode. FMA annunciates VERT SPD. Selection of desired value is made by the pitch control wheel.

IAS MACH:

Above 27000' and 0.5 Mach: Selects FGS Mach control mode. If desired, FGS IAS control mode may be selected by pressing the button a second time.

Below 27000': Selects FGS indicated airspeed control mode. If desired, FGS MACH control mode may be selected by pressing the button a second time.

PFD displays commands and AP adjust pitch attitude to maintain selected existing MACH or IAS. FMA annunciates MACH or IAS, as appropriate. Selection of desired value is made by the pitch control wheel.

VNAV: Selects FMS data for pitch and thrust command. FMS annunciates VNAV CLB, VNAV LVL or VNAV DES.

ALT Preselect Readout: Digital readout of altitude selected with ALT set knob.

GLARESHIELD



AP Switch: (Solenoid held in position). Permits engagement and disengagement of AP. Switch will automatically disengage when a loss of power or malfunction occurs.

DFGC 1-2 Selector: Permits selection of DFGC 1 or 2 for all FGS functions. If AP and/or ATS are engaged, switching DFGC will cause AP and ATS to disengage.

ALT Set Knob:

Knob has three positions, spring loaded to center position.

ROTATED: Click to increment/decrement altitude by 1000 feet, or use the mouse wheel.

PULLED: (left click when the mouse cursor is a hand without + or - sign) Arm FGS for preselected altitude capture.

FD Switch:

FD: Permits commands from DFGS to be displayed in the PFD display.

OFF: Turns off DFGS pitch and roll commands.

TURB Mode Button:

Dampened FGS pitch and roll attitude control provided. Autothrottle will automatically disengage. FMA annunciates WNG LVL and TURB and THROTTLE light will come on flashing. Pitch profile readout will display airplane pitch attitude existing at time of mode engagement.

NAV: Arm FGS to capture and track selected FMS route. FMA will annunciate NAV (amber) when armed, NAV CAP at capture and NAV TRK when tracking the desired FMS route.

HDG Readout:

Digital readout of heading selected with HDG select knob.

Pitch Profile Readout:

First windows display operating mode. V (vertical speed), M (Mach), S (indicated airspeed) or P (pitch attitude). Second window displays pitch reference, + (climb) or - (descent). Remaining window display appropriate numerical value.

Mode Buttons

VOR LOC: Arms DFGS to capture and track a selected VOR or LOC course. PFD displays roll commands and AP will fly airplane to capture and track course.

FMA will annunciate VOR or LOC when armed, VOR or LOC CAP at course capture, VOR CRS during station passage and VOR or LOC TRK when tracking course.

ILS: Arms FGS to capture and track a selected localizer course and glideslope. PFD displays roll and pitch commands and AP will fly airplane to capture and track localizer and glideslope. FMA will annunciate ILS when armed, LOC CAP at localizer capture, LOC TRK when tracking localizer, GS CAP at glideslope capture and GS TRK when tracking glideslope.

AUTO LAND: Arms FGS to establish AUTO LAND mode when both localizer and glideslope are being tracked. FMA annunciate AUT LND.



GLARESHIELD

HDG Select Knob: Can be rotated, pushed (right click) or pulled (left click).

ROTATED: Provide fine heading select.

PUSHED: HDG HLD mode engaged.

PULLED: HDG SEL mode engaged.

OUTER KNOB: Selects bank limit for operation in HDG SEL, VOR CAP and VOR CRS mode only. (click on the left or right of the knob to change the bank limit value).

Pitch Control Wheel:

Depending upon pitch mode selected, operation of pitch control wheel toward AND (airplane nose down) or ANU (airplane nose up) will command acquiring and/or maintaining desired vertical speed, airspeed, Mach, and pitch angle. Pitch control wheel function is inhibited after glideslope capture.



Heading Bug:

Indicates heading selected by HDG knob on flight guidance control panel. Refer also to chap. 07 Flight Instruments and chap. 15 Navigation systems.

Fast/Slow pointer:

Indicates difference between actual airplane speed and ATS selected speed (on SPD/MACH readout) or computed safe stall margin speed (ALPHA SPD) or FMS computed speed.

NOTE: When operating in turbulent air conditions, an automatic increase in alpha speed is added to compensate for wind gusts. The increase threshold is 2 knots and will increase up to five knots.

Pointer will be removed from view when thrust levers retard during flare.

FD Command Bar:

Provide lateral and pitch guidance commands from the DFGS. Command bar will be removed from view if lateral/pitch guidance are invalid.



PFD: For more information on Primary Flight Display, refer to chapter 15 Navigation System.



OVERHEAD PANEL

FD CMD Transfer Selector:

BOTH ON 2: DFGC 2 provides command inputs to command bars and fast/slow pointer on C/M-1's and C/M-2's PFD.

NORM: DFGC 1 provides command inputs to command bars and fast/slow pointer on C/M-1's PFD. DFGC 2 provides command inputs to command bars and fast/slow pointer on C/M-2's PFD.

BOTH ON 1: DFGC 1 provides command inputs to command bars and fast/slow pointer on C/M-1's and C/M-2's PFD.

ALTITUDE ALERT SYSTEM

ALT Set Knob and Preselect Readout:

Values selected by knob and shown on readout establishes threshold for altitude alert advisories.



Altitude Alert Light:

ON: (steady and one second aural tone). When airplane is at the altitude advisory threshold (minimum of 750 feet from selected altitude).

FLASHING: (One second aural/vocal warning). When airplane deviates than 250 feet or more from previously selected and acquired altitude. The warning can be reset by selecting a new altitude with the ALT set knob.

OFF: When within 250 feet of selected altitude.



AUTOTHROTTLE

Autothrottle Mode Buttons:

SPD SEL: Selects SPD SEL mode. ATS will maintain speed indicated in the SPD/MACH readout. FMA will display SPD and selected numerical value.

MACH SEL: Selects MACH SEL mode. ATS will maintain mach indicated in the SPD/MACH readout. FMA will display MACH and selected numerical value.

EPR LIMIT: Selects EPR Lim mode. FMA will display EPR plus mode selected on thrust rating indicator except when TO FLX. When TO FLX mode is selected, EPR plus ASSUMED TEMP readout is displayed on FMA.

FMS OVRD: When pushed permits to use the SPD/MACH selector knob to select the speed to maintain when the VNAV FMS mode is engaged. Press again the button to return to normal FMS operation.

NOTE: EPR LIM mode is automatically selected when either TO/GA button is pushed.

Autothrottle SPD / MACH

Readout: Digital readout of indicated airspeed or Mach selected with SPD/MACH select knob.



SPD / MACH Selector Knob:

Knob has three positions, springloaded to normal.

ROTATED: Selects SPD/MACH settings.

PUSHED: Alternately switches SPD and MACH readout.

AUTO THROT

Switch:

(Solenoid held in position)
Permits engagement and disengagement of

ATS. Switch will automatically go to OFF when a loss of power or malfunction occurs, or when reverse thrust is actuated. If FMA THROTTLE light is on, placing switch to AUTO THROT reset light.

Airspeed Command Bug:

Set with SPD/MACH select knob or when FMS VNAV is selected, the bug is automatically to the speed as computed by the FMS.



AUTOTHROTTLE

THROTTLE Warning Light:

ON: (flashing) whenever autothrottle disengages.



TO/GA (Takeoff and Go Around) Button:

PUSHED: Selects takeoff or go-around mode as applicable. FMA will display TAK OFF or GO RND, as applicable, on pitch and roll annunciators. EPR T/O, EPR – or EPR G/A, as selected on the thrust rating indicator, will be display in the ATS annunciators if ATS is engaged.



FLIGHT MODE ANNUNCIATOR - FMA

The FMA display is divided into four parts, associated to specific annunciations for the different FGS modes. The function of the different windows can be remembered through the word TARP, which is composed with the words Throttle, Arm, Roll, and Pitch.

In the Throttle window all messages from ATS are annunciated; In the ARM window all the armed modes are annunciated (with amber color); In the roll window all the roll modes are annunciated and in the pitch window all the annunciation associated with the pitch modes are displayed.



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AUTOTHROTTLE MODE ANNUNCIATIONS

ALFA SPD	ATS in ALFA SPD mode. Thrust levers controlled to maintain a safe margin above stall speed.
ATS OFF	VNAV mode selected, autothrottle OFF. Light flashes as reminder to engage autothrottles.
AUTO LND	Autoland preflight ground test is in progress. Appears for approximately 50 seconds.
CLMP	ATS in CLAMP MODE. Power is removed from ATS servo (thrust levers remains stationary).
CLMP FMS	VNAV selected. Power is removed from ATS servo (thrust levers remains stationary).
EPR CL	ATS in EPR LIM mode with CL thrust selected. Thrust levers controlled to maintain climb thrust limit.
EPR CR	ATS in EPR LIM mode with CR thrust selected. Thrust levers controlled to maintain cruise thrust limit.
EPR GA	ATS in go around mode with G/A thrust selected. Thrust levers controlled to maintain EPR G/A thrust limit.
EPR MCT	ATS in EPR LIM mode with MCT thrust selected. Thrust levers controlled to maintain maximum continuous thrust.
EPR T/O	ATS in EPR LIM mode with T/O thrust selected. Thrust levers controlled to maintain EPR limit takeoff thrust.
EPR 49	ATS in EPR LIM mode with 49° Celsius selected on ASSUMED TEMP readout (assumed temperature will be display) and T/O FLX thrust selected.
FLAP LIM	ATS controlling thrust levers to prevent exceeding flap limit airspeed.
FMS EPR	VNAV selected. ATS controlling thrust levers to maintain FMS calculated EPR.
FMS IDL	VNAV selected. ATS controlling thrust levers to maintain FMS calculated idle.
FMS SPD	VNAV selected. ATS controlling thrust levers to maintain FMS calculated speed.
PERF CLB	PERF mode engaged. ATS controlling thrust levers to maintain PMS calculated EPR. (PMS equipped aircraft only)
PERF CRZ	PERF mode engaged. ATS controlling thrust levers to maintain PMS calculated speed. (PMS equipped aircraft only)
PERF DES	PERF mode engaged. ATS controlling thrust levers to maintain PMS calculated EPR and speed. (PMS equipped aircraft only)
LOW LIM	Occurs automatically when ATS command would require a thrust lever setting lower than the minimum authority limit.
MACH 760	ATS in MACH SEL mode. Thrust levers controlled to maintain .760 mach as selected in the SPD/MACH readout.
MMO LIM	Indicates that ATS is automatically limited to not exceed maximum operating mach number. (MMO)
OVRD XXX	(VNAV mode engaged). When FMS OVRD selected, throttles controlled to maintain speed FGCP SPD/MACH readout.
OVRD LIM	(VNAV mode) When FMS OVRD selected and speed above VMax or below VMin, throttles controlled to maintain limit speed indicated by speed bug.
DFGC PWR	Automatic Power Up Test in progress. Occurs approximately 2 minutes after landing.
SLAT LIM	ATS controlling throttles to prevent slat limit airspeed.
SPD/MACH ATL	ATS limit when operating in SPD SEL or MACH SEL mode, as applicable. Automatically occurs when ATS throttles command would exceed EPR limit.
SPD 310	ATS in SPD SEL mode. Throttle controlled to maintain 310 KIAS as selected in the SPD/MACH readout.
VMO LIM	Indicates that ATS is automatically limited to not exceed maximum operating airspeed (VMO).
WIND SHR	The WAGS has detected a tail wind or head wind shear condition.

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ARM MODE ANNUNCIATIONS

ALT	Altitude preselect armed for automatic capture of selected altitude.
AUT G/A	FGS armed for fully automatic go-around capability.
ILS	ILS mode armed for automatic capture of localizer and glideslope of selected ILS.
ILS ALT	ILS mode armed for automatic capture of localizer and glideslope of selected ILS and altitude preselect armed for automatic capture of selected altitude.
LND	Land mode armed for automatic capture of selected ILS for automatic landing.
LND ALT	Land mode armed for automatic capture of selected ILS for automatic landing and altitude preselect armed for automatic capture of selected altitude.
LOC	LOC mode armed for automatic capture of selected localizer course.
LOC ALT	LOC mode armed for automatic capture of selected localizer course and altitude preselect armed for automatic capture of selected altitude.
MAN G/A	FGS armed for manual go-around capability.
NAV	FMS NAV mode is armed.
PRE	Auto Land pre-flight test in progress. Appears approximately 50 seconds.
973 UP	Automatic Power Up Test in progress. Occurs approximately 2 minutes after landing.
VOR	VOR mode armed for automatic capture of selected VOR course.
VOR ALT	VOR mode armed for automatic capture of selected VOR course and altitude preselect armed for automatic capture of selected altitude.
FD G/A	FGS armed for flight director go-around capability.
20 G/A	FGS armed for 20-foot automatic go around capability.
AUT W/S	FSG armed for fully automatic wind shear guidance.
FD W/S	FSG armed for flight director wind shear guidance.

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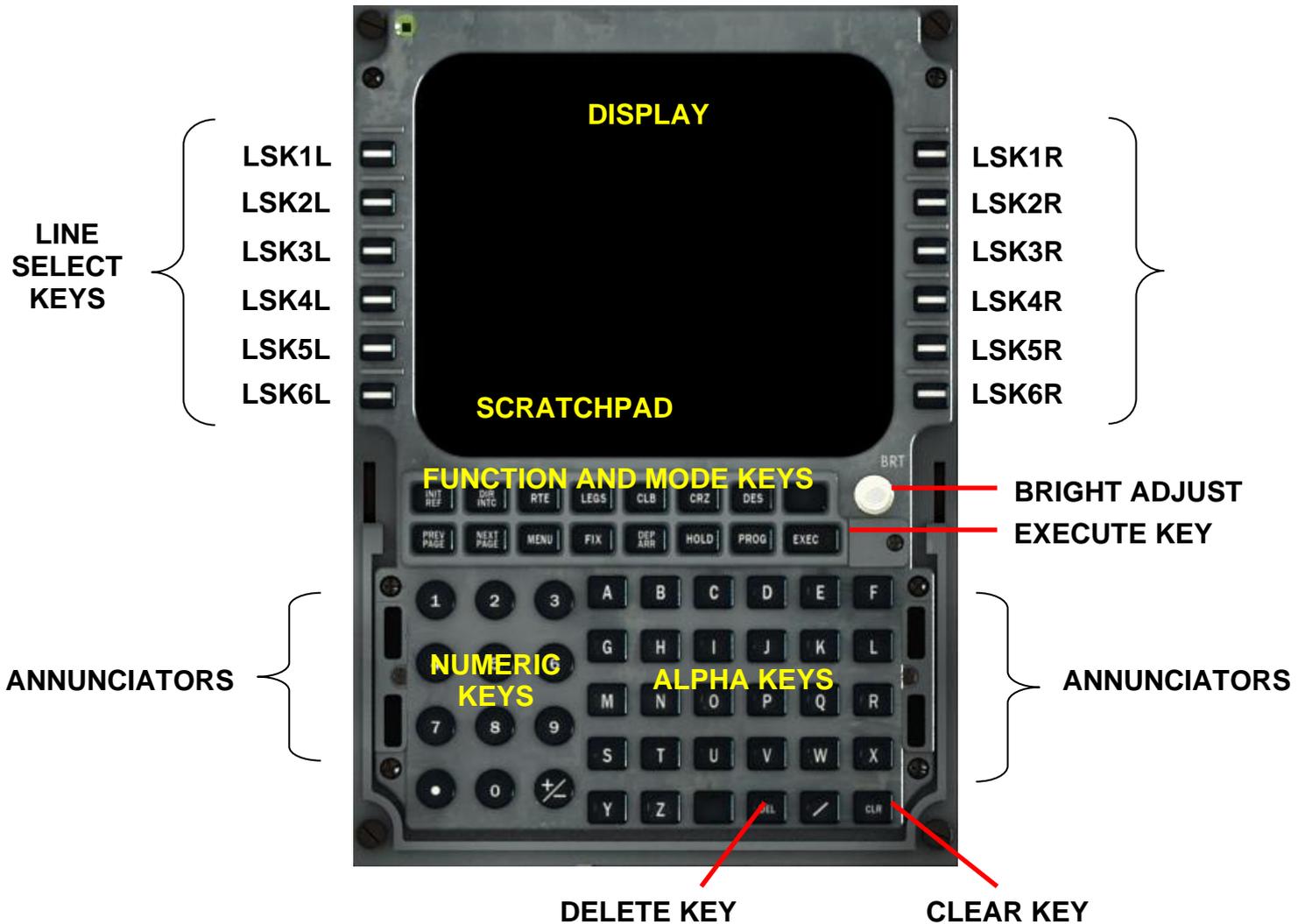
ROLL MODE ANNUNCIATIONS

ALN	Align mode engaged. Airplane maneuvered to maintain runway alignment.
AUT LND	LAND mode engaged. Logic for mode is satisfied to perform automatic landing.
FLT	Auto Land pre-flight test in progress. Appears approximately 50 seconds.
GO RND	Go-around mode engaged. Existing magnetic heading maintained and roll command bar on PFD commands wings level.
HDG HLD	Heading hold (roll basic mode) engaged and existing magnetic heading maintained.
HDG SEL	Heading select mode engaged and heading select in HDG readout maintained.
LOC CAP	LOC, ILS or LAND mode engaged and capture of localizer course has occurred.
LOC TRK	LOC, ILS or LAND mode engaged, and airplane is tracking localizer course.
NAV CAP	NAV mode engaged and FMS is capturing the active lateral path.
NAV TRK	NAV mode engaged and FMS is tracking NAV the active lateral path.
NAV HLD	NAV mode engaged and FMS is in an internal heading hold until the present track intercept the lateral path.
ROL OUT	Main gear wheel spin-up has occurred. AP maintains runway localizer alignment with nosewheel steering.
TAK OFF	Takeoff mode engaged. After liftoff roll command bar in PFD will commands wing level to maintain heading.
TST	Automatic Power Up Test in progress. Occurs approximately 2 minutes after landing.
VOR CAP	Capture of selected VOR course has occurred.
VOR CRS	Station passage is occurring.
VOR TRK	Airplane is tracking selected VOR course.
WING LVL	Turbulence mode engaged. Roll command bar in PFD will commands wing level to maintain heading.

PITCH MODE ANNUNCIATIONS

ALT CAP	Altitude preselect mode engaged and altitude capture has occurred.
ALT HLD	DFGS is providing flight director/autopilot commands to maintain barometric altitude at which altitude hold mode was engaged.
AUL LND	LAND mode engaged. Logic for mode is satisfied to perform automatic landing
BOX 1/BOX 2	Automatic Power Up Test in progress. Occurs approximately 2 minutes after landing.
FLAR	LAND mode engaged and flare mode initiated.
GO RND	Go-around mode engaged. Airplane controlled to maintain a safe margin above stall airspeed while establishing a climb attitude.
G/S CAP	ILS or LAND mode engaged, and glideslope capture has occurred.
G/S TRK	ILS or LAND mode engaged, and airplane is tracking glideslope.
IAS	IAS hold mode engaged and indicated airspeed maintained by pitch attitude.
MACH	MACH hold mode engaged and mach number maintained by pitch attitude.
NO FLR	ILS mode engaged and autopilot remains engaged at radio altitude of 100 feet. Flashing annunciation.
ROL OUT	Main gear wheel spin-up has occurred. Annunciations remain until autopilot is disengaged.
TAK OFF	Takeoff mode engaged. After liftoff, pitch command bar on PFD will display pitch commands to maintain V_2+10 KIAS.
TEST	Auto Land pre-flight test in progress. Appears approximately 50 seconds.
VNAV CAP	FMS is coupled with DFGS and is in the VNAV capture mode.
VNAV CLB	(VNAV mode engaged) Climb pitch attitude as determined by FMS.
VNAV DES	(VNAV mode engaged) Descent pitch attitude as determined by FMS.
VNAV LVL	(VNAV mode engaged) Altitude maintained by pitch attitude has determined by FMS.
PERF CLB	PERF mode engaged. Climb pitch attitude as determined by PMS. (PMS equipped aircraft only)
PERF CRZ	PERF mode engaged. Altitude maintained by pitch attitude as determined by PMS. (PMS equipped aircraft only)
PERF DES	PERF mode engaged. Descent pitch attitude as determined by PMS. (PMS equipped aircraft only)
SPD LOW	The engaged pitch mode is commanding a pitch attitude that results in an airspeed below the ALFA reference speed. SPD LOW annunciation will flash alternatively with the engaged pitch mode annunciation when airspeed decrease to 10 percent below the reference ALFA speed.
WIND SHR	Wind shear pitch guidance.

FLIGHT MANAGEMENT SYSTEM



DISPLAY: The DISPLAY is divided into four areas. The first line is the title of the displayed page. The left/right fields display data of selected page. The last line (SCRATCHPAD) shows typed alphanumeric data and system generated messages.

LINE SELECT KEYS: the LSK are 12 keys that permit entry of data from the scratchpad to the desired line or, if the key is pressed with the scratchpad empty, it will enter the content of that line into the scratchpad, if applicable.

EXECUTE KEY: Before any modification can be effective, it must be executed through the EXEC key, that will be illuminated until pressed.

DELETE KEY: Pressing this key inserts the word DELETE into the scratchpad. Then pressing a line select key deletes data in the corresponding field, where permitted

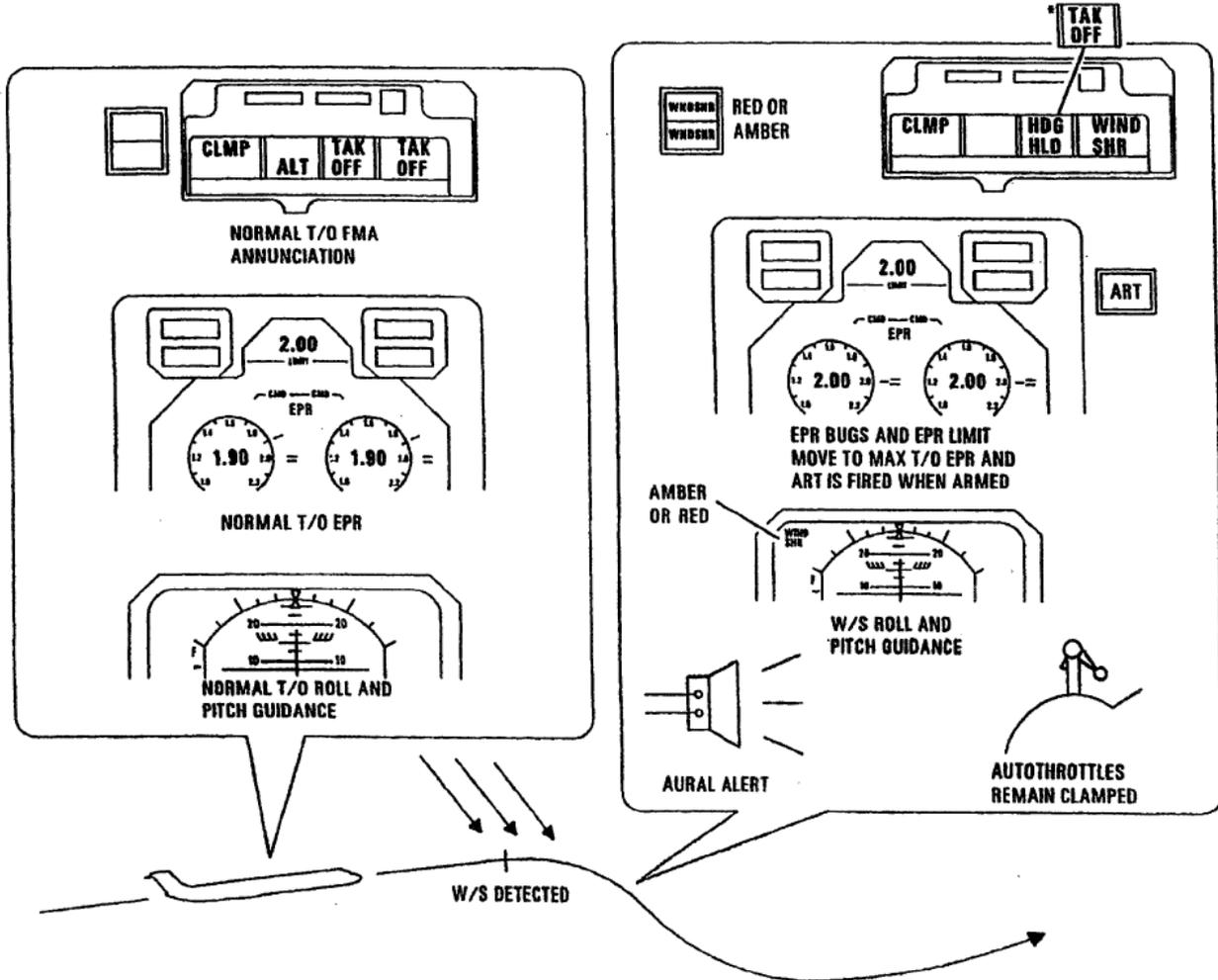
CLEAR KEY: The CLR key it is used to delete, character by character, the data in the SCRATCHPAD.

BRIGHT ADJUST: To regulate brightness of DISPLAY.

WINDSHEAR ALERTING AND GUIDANCE SYSTEM

WINDSHEAR ENCOUNTER AFTER LIFTOFF

*FOR INCREASING SHEAR



WINDSHEAR ALERTING AND GUIDANCE SYSTEM

