SECTION V
FLIGHT SYSTEMS

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont)

TABLE OF CONTENTS (Cont)

TABLE OF CONTENTS (Cont)

SECTION V
FLIGHT SYSTEMS

FLIGHT CONTROLS

The primary flight controls (ailerons, elevator, and rudder) are mechanically operated through the control columns, control wheels, and rudder pedals. The flaps and spoilers are hydraulically operated and electrically controlled. Aircraft trim systems (pitch, roll, and yaw) are electrically operated and controlled.

AILERON AND ELEVATOR

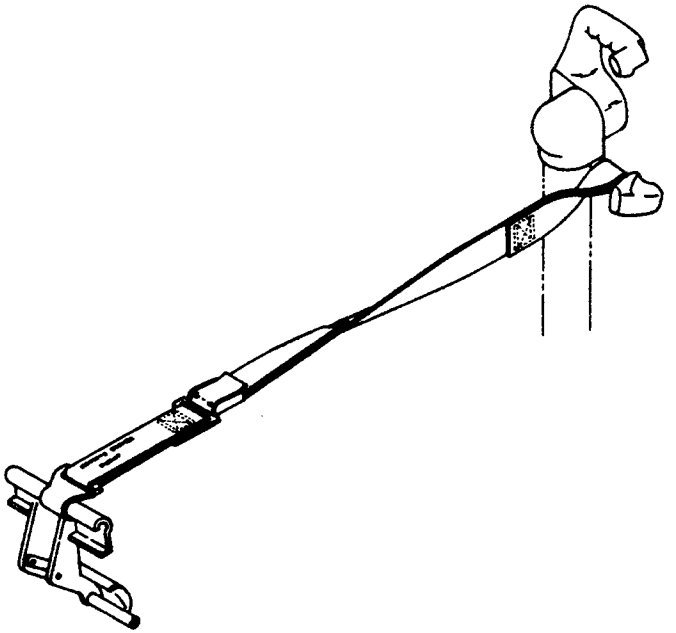
Movement of the control columns and control wheels is mechanically translated into elevator and aileron control surface movement through systems of cables, pulleys, and push-pull rods. In addition to aileron control, the control wheels incorporate switches that control normal trim, pitch-axis interrupt, rudder boost interrupt, autopilot and yaw damper disconnect, autopilot control wheel steering (CWS) function, flight director clear, microphone keying, transponder ident function, and nose-wheel steering engage and disengage circuits. Control wheel switch functions are discussed under the applicable system.

RUDDER

Rudder pedal movement is mechanically translated into rudder control surface movement through a system of cables, pulleys, and bellcranks. Nose-wheel steering, when engaged, is electronically controlled by the pedals and braking may be accomplished by depressing the upper portion of the pedals.

CONTROLS GUST LOCK

A controls gust lock is provided to help prevent wind gust damage to the movable control surfaces. When installed, the lock provides security by holding full rudder, full aileron, and full down elevator.



14-145A

CONTROLS GUST LOCK
Figure 5-1

FLAPS

The hydraulically-actuated, electrically-controlled flap system provides flap settings of UP (0°), 8°, 20°, and DN (40°). The single-slotted flaps are attached to the rear wing spar with tracks, rollers, and hinges. The flap selector switch controls a solenoid-operated hydraulic control valve that meters hydraulic pressure to the flap actuators. The actuators mechanically rotate sectors attached to the flaps through adjustable push-pull tubes. Interconnecting cables and pulleys synchronize flap movement throughout the range of travel. A flap position switch is mechanically connected to each flap sector. These switches provide flap position information to the landing gear warning, stall warning, spoiler warning, trim-in-motion warning, takeoff configuration monitor system, and rudder boost systems. A flap limit switch is mechanically connected to each sector to automatically maintain flap position at the selected setting. The flap control system operates on 28 VDC supplied through the 3-amp FLAPS circuit breaker on the copilot's circuit breaker panel. The flap control system is operative during EMER BUS mode.

FLAP SELECTOR SWITCH

The flap selector switch is located on the right side of the pedestal near the thrust levers. The switch has four positions: UP, 8, 20, and DN. When 8° or 20° flaps are selected, 28 VDC is directed to the applicable (up or down) solenoid of the flap control valve. The flap control valve will meter hydraulic pressure to the flap actuators and move the flaps in the desired direction. As the flaps approach within 1° of the selected setting, the applicable flap limit switch will remove power from the flap control valve solenoid and flap travel will stop. When UP is selected, 28 VDC is directed to the up solenoid of the flap control valve and the flaps will move in the up direction. When DN is selected, 28 VDC is directed to the down solenoid of the flap control valve and the flaps will move in the down direction. When the flaps reach full extension, the "down" pressure will remain to maintain the flaps full down.

FLAP POSITION INDICATOR

The vertical-scale FLAP position indicator, mounted in the center switch panel, provides the crew with visual indication of flap position. The indicator face consists of a scale, which has markings for UP (0°), 8°, 20°, and DN (40°), and a pointer on the right margin of the scale. A potentiometer connected to the left flap sector transmits the flap position signal to the indicator. The indicator operates on 28 VDC supplied through the 2-amp TRIM-FLAP IND circuit breaker on the copilot's circuit breaker panel.

SPOILERS

The spoilers are located on the upper surface of the wings forward of the flaps. The spoilers are electrically controlled and hydraulically actuated. The SPOILER switch on the forward pedestal is used to symmetrically extend and retract the spoilers. As the switch is moved to the EXT position, the solenoid valve directs hydraulic pressure to the extend port of the spoiler actuators which causes the spoilers to extend. As the spoilers unseat and extend through 1°, the amber SPOILER light will illuminate signifying the spoilers are not retracted and locked. The spoilers will fully extend in 5 to 7 seconds. Full extension is approximately 47°. However, during flight, a pressure relief allows the spoilers to "blow down" to a lesser extension angle. When RET is selected, the solenoid valve will direct hydraulic pressure to the retract port of the spoiler actuators which causes the spoilers to retract. When retracted, the spoilers are secured by an internal locking mechanism in the actuators. During normal operation, the spoilers will fully extend or retract in approximately 5 to 7 seconds. Spoiler control circuits operate on 28 VDC supplied through the 3-amp SPOILER circuit breaker on the copilot's circuit breaker panel. The spoiler control system is operative during EMER BUS mode.

SPOILER SWITCH

Symmetric extension and retraction of the spoilers is controlled through the SPOILER switch located on the right side of the pedestal adjacent to the thrust levers. The switch is guarded to prevent inadvertent spoiler actuation. The switch has two positions: EXT and RET. When the switch is set to EXT, both spoilers will extend and the SPOILER light will illuminate. When the switch is set to RET, both spoilers will retract.

SPOILER LIGHT

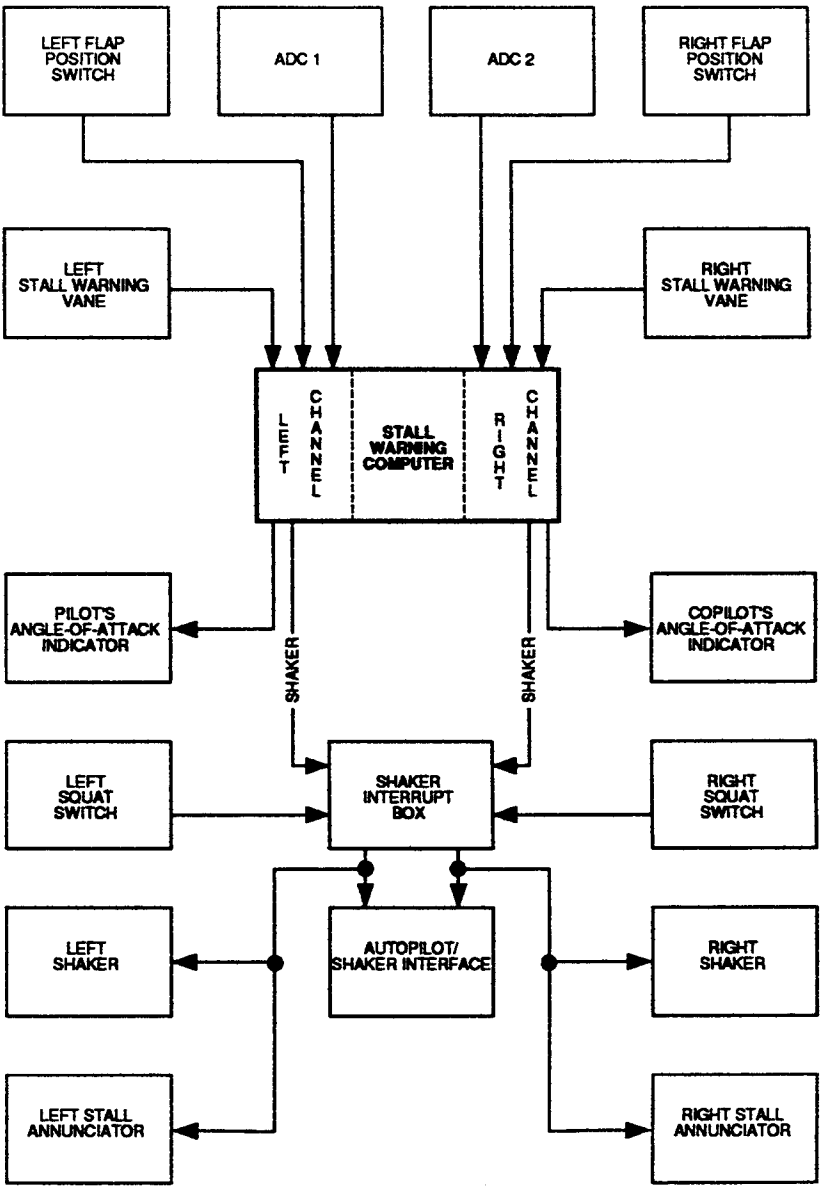
The amber SPOILER light, located on the glareshield annunciator panel, will illuminate steady whenever the flaps are UP and the spoilers are extended. The light will flash if the spoilers are extended and the flaps are beyond 3°. The light is operated by a 1°-up position switch for each spoiler. The light will illuminate if either 1°-up switch is actuated.

WARNING SYSTEMS

STALL WARNING SYSTEM

A stall warning system is installed to provide the crew with visual and tactile warning of an impending stall. The major components of the stall warning system consist of the following: left and right stall vanes on the forward fuselage, a two-channel computer-amplifier, shaker interrupt box, flap position switches for each flap, a stick shaker for each crew position, an angle-of-attack indicator for each crew position, L and R STALL warning lights, and associated aircraft wiring. The flap position switches provide bias information to the computer-amplifier which will decrease stall indication speeds as the flaps go from 0° to 40°. Above approximately 22,500 feet pressure altitude, a signal from the air data computers will bias the system to increase stall indication speeds approximately 15 knots. The stick shakers are eccentric weights driven by an electric motor and actuation is evidenced by a high-frequency vibration of the control columns. The left and right systems are completely independent and utilize separate electronics, stall vanes, altitude bias signals, shaker motors, and flap switches. The stall warning system operates on 28 VDC supplied through the 5-amp L and R STALL WARN circuit breakers on the pilot's and copilot's circuit breaker panels respectively. The stall warning system is operative during EMER BUS mode. The stick shaker and STALL warning light circuits are wired through the shaker interrupt box and squat switches; therefore, the stick shaker and STALL warning lights are deactivated when the squat switches are in the ground mode. The stick shaker and STALL warning lights will be deactivated for 3 to 5 seconds after lift-off. The angle-of-attack indicators remain active both on the ground and inflight. The stall warning systems may be tested on the ground using the rotary-type systems test switch, located on the pilot's instrument panel. The stall vanes are heated to provide anti-ice protection during flight (Refer to PITOT-STATIC AND STALL WARNING ANTI-ICE, Section VI).

During flight, the stall warning vanes align with the local airstream and transducers produce a voltage proportional to airplane angle of attack. The transducer signals are transmitted to the appropriate computer-amplifier channel along with flap position information from the flap position switches and altitude information from the air data computers. The angle-of-attack indicator pointers will enter the yellow segment, the L and R STALL lights will illuminate and flash, and the stick shakers will actuate when the angle of attack increases to an angle corresponding to an airspeed at least 7% above the stall speed published in the Airplane Flight Manual.



STALL WARNING SYSTEM BLOCK DIAGRAM
Figure 5-2

ANGLE-OF-ATTACK INDICATORS

The angle-of-attack indicators, located on the pilot's and copilot's instrument panels, translate signals from the stall warning computer-amplifier into visual indication of stall margin. The left stall warning system utilizes the pilot's angle-of-attack indicator and the right stall warning system utilizes the copilot's angle-of-attack indicator. Each indicator face is divided into three segments as follows: green - safe, yellow - caution/shaker, and red - danger.

STALL WARNING LIGHTS

The red L and R STALL warning lights, located in the glareshield annunciator panel, are installed to indicate impending stall or a system malfunction. During flight operations, the lights will illuminate and flash when the shaker is actuated. The lights are pulsed at the same frequency and duration as the shakers; therefore, the flash duration will increase as the angle-of-attack increases from initial shaker actuation. At or just prior to the angle-of-attack pointer entering the red segment, the flash duration is sufficient to cause the lights to appear steady.

SYSTEM TEST SWITCH — STALL WARNING FUNCTION

The rotary-type system test switch, located on the pilot's instrument panel, is used to test the left and right stall warning systems. Each system is individually tested through the L STALL and R STALL positions of the system test switch. The test is initiated by rotating the system test switch to L or R STALL (as applicable) and then depressing the switch PRESS TEST button. When the test sequence is initiated, the corresponding angle-of-attack indicator pointer will begin to sweep from the green segment toward the red segment. As the pointer passes the green-yellow margin, the stick-shaker will actuate, the MSTR WARN lights will illuminate, and the applicable STALL light will begin to flash. Shaker actuation is made evident by high frequency vibration of the control column.

OVERSPEED WARNING SYSTEM

The overspeed warning system provides an audible overspeed warning in the event aircraft speed exceeds a Mach or airspeed limit. The overspeed warning horn is activated by the air data computers when the position of the airspeed pointer and the maximum allowable pointer (barber pole) coincide. 28 VDC for system circuits is supplied through the 5-amp WARN HORNS circuit breaker on the copilot's circuit breaker panel. The overspeed warning horn is operative during EMER BUS mode. The overspeed warning horn will sound under any of the following conditions:

1. Airspeed exceeds V_{MO}.
2. Mach exceeds M_{MO}.

NOTE: When Mach trim is inoperative and autopilots are disengaged, the maximum allowable pointers will reposition to reflect the reduced M_{MO} for this condition.

SYSTEM TEST SWITCH — OVERSPEED WARNING FUNCTION

The rotary-type system test switch, located on the pilot's instrument panel, is used to test the overspeed warning system. The test sequence is initiated by rotating the system test switch to ADC and then depressing the switch PRESS TEST button. When the test sequence is initiated, the pilot's air data system will test and the overspeed warning horn will sound, then the copilot's air data system will test and the overspeed warning horn will sound. Refer the Bendix/King KFC 3100 Flight Control System Pilot's Guide for a detailed explanation of the air data system self-test.

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS-I) (OPTIONAL)

The TCAS-I system provides the crew with aural and visual indications of potentially dangerous flight paths relative to other aircraft in the vicinity. The system interrogates other transponder-equipped aircraft and determines their bearing, range, and relative altitude if the intruder has altitude encoding transponder in operation. With this information the TCAS processor can generate aural and visual advisories to the crew.

The TCAS-I system consists of a processor, TPR/TCAS control unit, two bearing antennas, a TCAS ONLY display on the MFD (selectable by the MFD control panel), remote TCAS status annunciator and associated aircraft wiring. System control is through the TPR/TCAS control unit. Power for the system operation is 28 VDC supplied through the 5-amp TCAS circuit breaker on the copilot's circuit breaker panel.

Advisories are issued to the crew via the aircraft audio system, the MFD, and a remote annunciator located above the MFD. Aural advisories generated by the ground proximity/windshear warning system (if installed) will have priority over aural advisories generated by the TCAS-I.

Refer to the applicable AFM supplement and Bendix/King Pilot's Guides for further details and operating instructions.

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS-II) (OPTIONAL)

The TCAS-II system provides the crew with aural and visual indications of potentially dangerous flight paths relative to other aircraft in the vicinity. The system interrogates other transponder-equipped aircraft and determines their bearing, range, and altitude. With this information the TCAS processor can generate Traffic Advisories (TA) and Resolution Advisories (RA) to prevent or correct traffic conflicts.

The TCAS-II system consists of a processor, TPR/TCAS control unit, two bearing antennas, remote TCAS status annunciator and associated aircraft wiring. System control is through the TPR/TCAS control unit. Power for the system operation is 28 VDC supplied through the 5-amp TCAS circuit breaker on the copilot's circuit breaker panel.

Advisories are issued to the crew via the aircraft audio system, the MFD, the pilot and copilot altitude/vertical speed indicators, and a remote annunciator located above the MFD. Aural advisories generated by the ground proximity/windshear warning system (if installed) will have priority over aural advisories generated by the TCAS-II.

Refer to the applicable AFM supplement and Bendix/King Pilot's Guides for further details and operating instructions.

GROUND PROXIMITY WARNING SYSTEM WITH WINDSHEAR WARNING (GPWS) (OPTIONAL)

The MK-VII Warning System (GPWS/WS) provides the pilot with aural and visual warning of potentially dangerous flight paths relative to ground and windshear conditions.

The system automatically and continuously monitors the airplane's flight path with respect to terrain when the aircraft is below 2450 feet radio altitude (altitude AGL). If the airplane's projected flight path would imminently result in terrain impact, the system issues appropriate visual and voice warnings. Warnings are issued for excessive sink rate, excessive terrain closure rate, descent after takeoff or missed approach, proximity to terrain with flaps and/or gear up, descent below glideslope, and descent below decision height (DH).

The system computes windshear and alerts the crew of windshear of sufficient magnitude to be hazardous to the aircraft. Windshear alerts are given for increasing headwind/decreasing tailwind and/or updraft. Windshear warnings are given for decreasing headwind/increasing tailwind and/or down-draft.

The system consists of the GPWS computer, a biaxial accelerometer, a set of annunciator light/switches on the instrument panel at each crew position, "FAIL" annunciators on the center instrument panel, a flap position override switch, and associated aircraft wiring. Voice warnings are made through the cockpit speakers and the headphones. The system receives inputs from the #1 air data computer, #1 AHRS, L stall warning vane, radio altimeter, #1 nav receiver (G/S), nose gear down and locked switch, and the left flap 13° and 25° switch. The system operates on 115 VAC supplied through the 1-amp GPWS/WNDSHR circuit breaker on the pilot's circuit breaker panel.

Refer to the applicable AFM supplement for further details and operating instructions.

ENHANCED GROUND PROXIMITY WARNING SYSTEM WITH WINDSHEAR WARNING (EGPWS) (OPTIONAL)

The AlliedSignal Enhanced Ground Proximity Warning System (EGPWS) provides the pilot with aural and visual warnings of possible terrain (or obstacle) proximity, excessive deviation below ILS glideslope, and for detection of severe windshear conditions. The EGPWS also provides aural alerts for descent below pre-defined altitudes during final approach, including a minimum descent altitude awareness callout and excessive bank angle alerting.

The EGPWS extends the Ground Proximity Warning (including Altitude Awareness Callouts and Bank Angle Alerting) and Windshear Detection functionality of previous GPWS systems by adding Terrain (or Obstacle) Awareness Alerting and Display (TAAD) (including "Peaks Mode") and Terrain Clearance Floor (TCF) functions.

The system consists of: the EGPWS computer; a set of annunciator light/switches located on the instrument panel at each crew position; a flap override switch, an inhibit terrain switch, an inhibit glideslope switch and a test switch (all located in the pedestal); terrain not available, TCAS fail, TCAS standby annunciators and terrain display on switch (all located on the center instrument panel); and the associated aircraft wiring. Voice warnings are made through the cockpit speakers and the headphones. Voice warnings generated by the EGPWS will have priority over voice warnings generated by the TCAS (if installed). Terrain data may be displayed on the MFD. The system receives inputs from ADC, AHRS, stall warning vane, NAV receiver, the FMS, the radio altimeter, the nose gear down and locked switch, and the left flap 13° and 25° switches. The system operates on 28 VDC supplied through the 5-amp GPWS/WNDSHR circuit breaker on the pilot's circuit breaker panel.

Refer to the applicable AFM supplement for further details and operating instructions.

MACH TRIM SYSTEM

The Mach trim system provides automatic pitch trim in response to Mach changes to increase longitudinal stability and counteract the center-of-lift movement at speeds above approximately 0.70 M_I if the autopilot is disengaged or inoperative. The system consists of a computer, a trim followup, MACH TRIM annunciator and associated aircraft wiring. The Mach trim system utilizes the primary motor of the horizontal stabilizer pitch trim actuator to effect trim changes. The Mach trim computer operates on 115 VAC supplied through the 1-amp MACH TRIM circuit breaker on the pilot's circuit breaker panel and 28 VDC supplied through the 20-amp primary pitch trim current limiter.

During flight, with neither autopilot engaged, the Mach trim system will automatically engage at approximately 0.70 M_I. As the aircraft Mach number changes, the change is sensed by the air data computers and transmitted to the Mach trim computer. If the aircraft is not retrimmed to compensate for the Mach change, the Mach trim computer will command the appropriate pitch trim change (nose up for increased Mach and nose down for decreased Mach) through the horizontal stabilizer pitch trim actuator. A followup on the horizontal stabilizer will transmit a horizontal stabilizer position signal to the Mach trim computer. Stabilizer trim motion will cease as the followup stabilizer position signal cancels the pitch trim signal from the Mach trim computer. A monitor is installed to disengage Mach trim in the event of a malfunction. If the monitor disengages Mach trim and Mach is above 0.78 M_I, the overspeed warning horn will sound. The Mach trim system is resynchronized whenever either pilot manually trims the aircraft and a synchronous standby mode is maintained if the autopilot is engage. In flight, synchronization may also be accomplished through the system test switch on the pilot's instrument panel.

PITCH TRIM SELECTOR SWITCH — MACH TRIM FUNCTION

The Mach trim system utilizes the primary motor of the horizontal stabilizer pitch trim actuator to increase longitudinal stability. If the PITCH TRIM selector switch on the pedestal is in the PRI position, Mach trim will automatically engage at approximately 0.70 M_I if neither autopilot is engaged. Mach trim will not engage or will disengage when the PITCH TRIM selector switch is moved to the OFF or

SEC position. If the PITCH TRIM selector switch is in OFF or SEC, the Mach trim monitor will remain active and will illuminate the MACH TRIM light and cause the overspeed warning horn to sound above 0.78 M_I.

MACH TRIM LIGHT

The amber MACH TRIM annunciator light, located on the glareshield annunciator panel, will illuminate whenever the Mach trim monitor has disengaged the Mach trim system. Whenever the Mach trim system is disengaged and Mach is above 0.78 M_I, the overspeed warning horn will sound if neither autopilot is engaged. The Mach trim monitor continuously monitors input signals and power to the Mach trim computer. In the event of loss of power to the Mach trim computer or primary pitch trim system, loss of input signals to the Mach trim computer, or a Mach/horizontal stabilizer position error, the Mach trim monitor will disengage Mach trim and illuminate the MACH TRIM light.

SYSTEM TEST SWITCH — MACH TRIM FUNCTION

The rotary-type system test switch, located on the pilot's instrument panel, is used to test the Mach trim system and the Mach trim monitor while the aircraft is on the ground. In flight, the switch may be used to resynchronize the system if the Mach trim monitor has disengaged the system. The test function is initiated by rotating the switch to MACH TRIM and then depressing the switch PRESS TEST button. When the aircraft is on the ground and the test sequence is initiated, the test switch inserts a signal that causes the horizontal stabilizer to trim in the nose-up direction. Since there is no corresponding airspeed change, the Mach trim monitor senses a Mach/horizontal stabilizer position error, disengages Mach trim, and illuminates the MACH TRIM light. In flight, depressing the PRESS TEST button will resynchronize the Mach trim system to the horizontal stabilizer position and Mach existing when the PRESS TEST button was depressed.

PITCH TRIM SYSTEM

Pitch trim is accomplished by repositioning the horizontal stabilizer to the desired trim setting through actuation of the horizontal stabilizer pitch trim actuator. The actuator is a dual-motor, screwjack-type actuator. The primary motor is operated by the aircraft primary pitch trim system. The secondary motor is operated by the aircraft secondary pitch trim system and the autopilot. A speed controller in the primary pitch trim system changes primary pitch trim rate as a function of flap position. The speed controller allows high trim rates when the flaps are beyond 3° down and low trim rates when the flaps are up. A trim speed monitor is incorporated into the speed controller to alert the crew of a trim speed error. The primary and secondary pitch trim systems are electrically independent and mode selection is made through a selector switch. Primary pitch trim is pilot controlled through trim switches on each control wheel. Secondary pitch trim is pilot controlled through a switch on the pedestal. Emergency interrupt is provided for both systems through the Control Wheel Master switches (MSW). Horizontal stabilizer trim position is displayed on a pedestal mounted indicator. Primary pitch trim control circuits operate on 28 VDC supplied through the 3-amp PRI PITCH TRIM circuit breaker on the pilot's circuit breaker panel. The primary motor operates on 28 VDC supplied through a 20-amp current limiter. Secondary pitch trim control circuits and actuator motor operate on 28 VDC supplied through the 7.5-amp SEC PITCH TRIM circuit breaker on the copilot's circuit breaker panel. Primary and secondary pitch trim are operative during EMER BUS mode.

PITCH TRIM SELECTOR SWITCH

The PITCH TRIM selector switch, located on the pedestal trim control panel, provides primary and secondary mode selection for the pitch trim systems. The switch has three positions: PRI, OFF, and SEC. When the switch is set to PRI, a ground path is provided for the primary pitch trim system control circuits and trim changes are accomplished through the control wheel trim switches. When the switch is set to SEC, a ground path is provided for the secondary pitch trim system control circuits and trim changes are accomplished through the pedestal NOSE DN-OFF-NOSE UP switch. When the switch is set to the OFF position, both pitch trim electrical control circuits are isolated from the aircraft electrical system. The autopilot is inoperative with the PITCH TRIM selector switch in the OFF position.

CONTROL WHEEL TRIM SWITCHES — PITCH FUNCTION

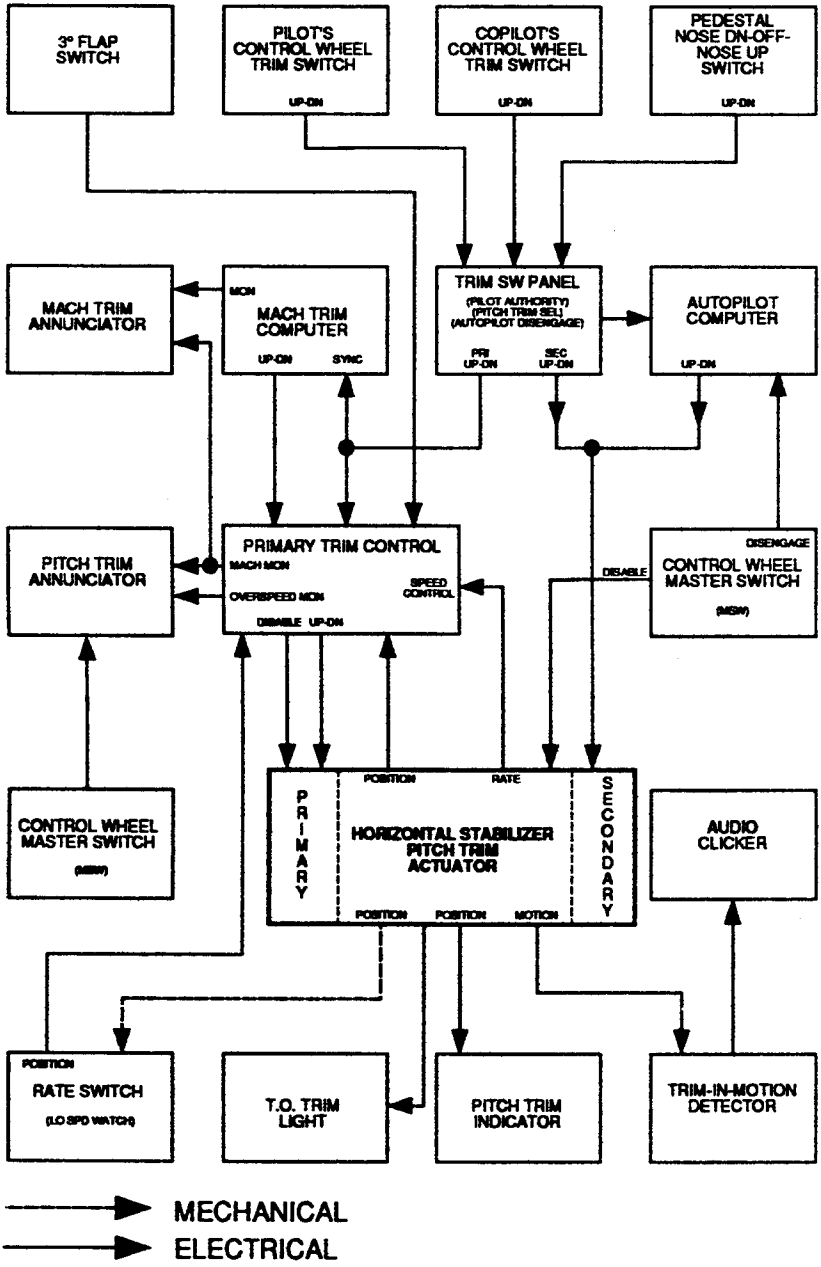
Each control wheel trim switch is a dual-function (trim and trim arming) switch which controls primary pitch trim and roll trim. One switch is located on the outboard horn of each control wheel. Each switch has four positions: LWD, RWD, NOSE UP, and NOSE DOWN. The trim arming button on top of the switch must be depressed for trim motion to occur. With the PITCH TRIM selector switch in the PRI position, actuation of either switch to NOSE UP or NOSE DOWN will signal the primary motor in the horizontal stabilizer pitch trim actuator to move the stabilizer in the appropriate direction. Actuation of the pilot's switch will override actuation of the copilot's switch. Actuation of either switch to any of the four positions (LWD, RWD, NOSE UP, or NOSE DOWN) with the trim arming button depressed will disengage the autopilot if an autopilot CWS switch is not depressed.

PEDESTAL NOSE DN-OFF-NOSE UP SWITCH

The NOSE DN-OFF-NOSE UP switch, located on the pedestal trim control panel, controls secondary pitch trim. The switch is spring loaded to the center (OFF) position. With the PITCH TRIM selector switch in the SEC position, actuation of the NOSE DN-OFF-NOSE UP switch to NOSE DN or NOSE UP will signal the secondary motor of the horizontal stabilizer pitch trim actuator to move the stabilizer in the appropriate direction. Actuation of the secondary pitch trim switch will disengage the autopilot. With the PITCH TRIM Selector Switch in the PRI or OFF position, this switch has no trimming effect.

CONTROL WHEEL MASTER SWITCHES — PITCH TRIM FUNCTION

A Control Wheel Master Switch (MSW) is located beneath the control wheel trim switch on the outboard horn of each control wheel. In addition to the switch's other functions, either Control Wheel Master Switch (MSW), when depressed, will inhibit primary or secondary pitch trim. If the Control Wheel Master Switch (MSW) is used to inhibit primary pitch trim, primary pitch trim will not resume until the Control Wheel Master Switch (MSW) is released and the trim input is removed. Therefore, during the preflight check of the primary pitch trim system, it is necessary to release the control wheel trim switch as well as the Control Wheel Master Switch (MSW) to reset the system. Secondary pitch trim, however, will be inhibited only as long as the Control Wheel Master Switch (MSW) is held.



PITCH TRIM SYSTEM BLOCK DIAGRAM
Figure 5-3

PITCH TRIM LIGHT

An amber PITCH TRIM annunciator light, located on the glareshield annunciator panel, is installed to alert the crew of primary pitch trim system malfunctions during flight. Additionally, the PITCH TRIM light will illuminate whenever either Control Wheel Master Switch (MSW) is depressed.

T.O. TRIM LIGHT

An amber T.O. TRIM annunciator light, located on the glareshield annunciator panel, is installed to alert the crew that the PITCH TRIM indicator pointer is not within the T.O. segment when the aircraft is on the ground. The light will be extinguished whenever the indicator pointer is set within the T.O. segment. The light is disabled during flight operations.

SYSTEM TEST SWITCH —TRIM MONITOR FUNCTION

The rotary-type system test switch, located on the pilot's instrument panel, is used to test the trim system monitor. The monitor is tested by rotating the system test switch to TRIM MON and depressing the switch PRESS TEST button. When the PRESS TEST button is depressed, a signal simulating an electrical ground fault to the pitch trim actuator is applied to the trim monitor and the monitor will illuminate the PITCH TRIM light.

SYSTEM TEST SWITCH — TRIM OVERSPEED FUNCTION

The rotary-type system test switch, located on the pilot's instrument panel, is used to test the trim speed monitor. The monitor test is initiated by rotating the system test switch to TRIM OVRSPD, initiating primary pitch trim through either control wheel trim switch, and then depressing the switch PRESS TEST button. When the PRESS TEST button is depressed, a flaps down signal is applied to the trim speed controller and a flaps up signal is applied to the trim speed monitor simulating the high trim rate with the trim speed monitor in the low trim rate mode. This will cause the trim speed monitor to illuminate the PITCH TRIM light.

PITCH TRIM INDICATOR

Horizontal stabilizer position is indicated by the PITCH TRIM indicator located in the trim indicator panel on the pedestal. The indicator face has markings for 2° to 11° of horizontal stabilizer travel; however, only the T.O. range markings are labeled. N DN and N UP mark-

ings indicate the direction of trim travel for airplane nose down and airplane nose up respectively. The T.O. (takeoff) segment is marked from 5.75° to 8.75°. The indicator receives horizontal stabilizer position inputs from a potentiometer installed in the horizontal stabilizer pitch trim actuator. The indicator operates on 28 VDC supplied through the 2-amp TRIM-FLAP IND circuit breaker on the copilot's circuit breaker panel.

TRIM-IN-MOTION AUDIO CLICKER

A trim-in-motion audio clicker system is installed to alert the crew of horizontal stabilizer movement. The system will annunciate continuous movement of the horizontal stabilizer by producing a series of audible clicks through the headsets and cockpit speakers. The system consists of a potentiometer in the horizontal stabilizer pitch trim actuator, a trim-in-motion detector box, and associated aircraft wiring. As the horizontal stabilizer actuator drives the stabilizer, the output signal from the potentiometer is altered. The change in potentiometer signal is sensed by the detector box. After approximately 1/4 second of continuous stabilizer movement, the detector box will produce the speaker and headset clicks. The trim-in-motion audio clicker system is wired through the flap position switches and will not sound if the flaps are lowered beyond 3°. The trim-in-motion audio clicker may or may not sound during mach trim or autopilot trim due to the duration of the trim inputs. Power for system operation is 28 VDC derived from the 5-amp WARN HORNS circuit breaker on the copilot's circuit breaker panel.

ROLL TRIM SYSTEM

Roll trim is accomplished by positioning the aileron trim tab on the inboard trailing edge of the left aileron through actuation of the roll trim actuator. The roll trim actuator is an electrically-operated, rotary-type actuator connected to the aileron trim tab by a push-pull rod. The system is controlled through the pilot's and copilot's control wheel trim switches. Trim tab position information is displayed on a pedestal mounted indicator. The roll trim system operates on 28 VDC supplied through the 7.5-amp ROLL TRIM circuit breaker on the pilot's circuit breaker panel.

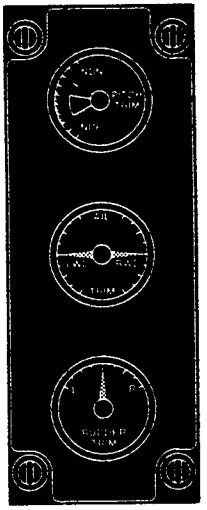
CONTROL WHEEL TRIM SWITCHES — ROLL FUNCTION

Each control wheel trim switch is a dual-function (trim and trim arming) switch which controls roll trim and primary pitch trim. One switch is located on the outboard horn of each control wheel. Each switch has four positions: LWD, RWD, NOSE UP, and NOSE DN. The

arming button on top of the switch must be depressed for trim motion to occur. Actuation of either control wheel trim switch to LWD or RWD will signal the aileron trim tab actuator to move the tab as required to lower the appropriate wing. Actuation of the pilot's switch will override actuation of the copilot's switch. Actuation of either switch to any of the four positions (LWD, RWD, NOSE UP, or NOSE DN) with the trim arming button depressed will disengage the autopilot if an autopilot CWS switch is not depressed.

AILERON TRIM INDICATOR

Aileron trim tab position indication is provided by the AIL TRIM indicator located in the trim indicator panel on the pedestal. Two semicircular scales and pointers present the trim tab position in terms of LWD (left wing down) and RWD (right wing down). The scale markings represent increments of trim tab travel. The indicator receives aileron trim tab position inputs from a potentiometer in the roll trim actuator. The indicator operates on 28 VDC supplied through the 2-amp TRIM-FLAP IND circuit breaker on the copilot's circuit breaker panel.



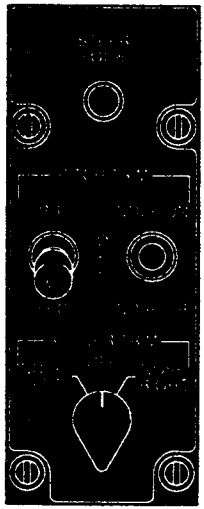
TRIM INDICATOR PANEL
Figure 5-4

YAW TRIM SYSTEM

Yaw trim is accomplished by positioning the rudder trim tab on the lower trailing edge of the rudder through actuation of the yaw trim actuator. The yaw trim actuator is an electrically-operated, rotary-type actuator connected to the rudder trim tab by a push-pull rod. Yaw trim is pilot controlled through the RUDDER TRIM switch on the pedestal. Trim tab position information is displayed on a pedestal mounted indicator. The yaw trim system operates on 28 VDC supplied through the 7.5-amp YAW TRIM circuit breaker on the pilot's circuit breaker panel.

RUDDER TRIM SWITCH

Yaw trim is pilot controlled through the RUDDER TRIM switch located on the pedestal trim control panel. The switch has three positions: NOSE LEFT, OFF, and NOSE RIGHT. The switch knob is split and both halves must be rotated simultaneously to initiate yaw trim motion. When the switch is released, both halves will return to the center OFF position. Actuation of the RUDDER TRIM switch to NOSE LEFT or NOSE RIGHT will signal the yaw trim actuator to move the rudder trim tab in the appropriate direction.



PEDESTAL TRIM CONTROL PANEL
Figure 5-5

RUDDER TRIM INDICATOR

Rudder trim tab position indication is provided by the RUDDER TRIM indicator located in the trim indicator panel on the pedestal. A semi-circular scale and pointer indicates the direction (L or R) of yaw trim. The scale markings represent increments of rudder trim tab travel. The indicator receives rudder trim tab position inputs from a potentiometer in the rudder trim actuator. The indicator operates on 28 VDC supplied through the 2-amp TRIM-FLAP IND circuit breaker on the copilot's circuit breaker panel.

AUTOPILOT/FLIGHT DIRECTOR SYSTEM

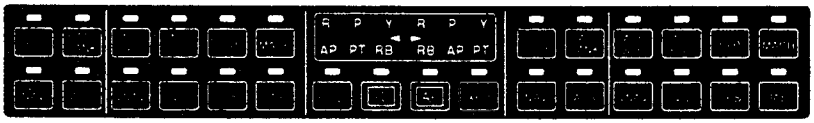
The Bendix/King KFC 3100 Flight Control System is installed to provide automatic flight control and/or flight guidance for climb, cruise, descent and approach. The system is fully integrated with the aircraft's air data system, attitude heading reference system (AHRS), and electronic flight instrument system (EFIS). The system's dual flight computers provide separate pilot and copilot flight guidance in the pitch and roll axes. Either pilot's or copilot's flight guidance steering commands may be coupled to the autopilot. Pitch and roll axis change, when commanded by the autopilot, is effected through elevator and aileron servos. The autopilot also provides pitch trim commands to the secondary trim system motor of the horizontal stabilizer pitch trim actuator. The system's pitch authority is limited to 10° nose down and 20° nose up and roll authority is limited to 25° bank. The autopilot controller, located on the glareshield, provides for engagement, mode selection and status annunciation. Pilot inputs to the flight control system are accomplished through the autopilot controller, control wheel switches, Altitude/Vertical Speed Indicator, and the EFIS controls. The pilot's autopilot/flight guidance system operates on 28 VDC supplied through the 5-amp AP 1, and 5-amp FLT DIR 1 circuit breakers, and 115 VAC supplied through the 1-amp AP 1 MON circuit breaker on the pilot's circuit breaker panel. The copilot's autopilot/flight guidance system operates on 28 VDC supplied through the 5-amp AP 2, and 5-amp FLT DIR 2 circuit breakers and 115 VAC supplied through the 1-amp AP 2 MON circuit breaker on the copilot's circuit breaker panel. Yaw damper and rudder boost systems are also integrated into the KFC 3100 Flight Control System. Refer to YAW DAMPER SYSTEM and RUDDER BOOST SYSTEM.

The system initiates a self-test sequence when the system is powered up (both AC and DC power). If the self-test sequence is not successfully completed, a failure will be displayed on the autopilot controller and the autopilot will not engage. Also, an "FD" flag will be displayed on the EADI. Flight guidance steering commands are presented on the EADI displays. The pilot may manually fly the airplane to satisfy the steering commands (flight director only operation) or couple the flight guidance system to the autopilot in which case the autopilot will respond to the steering commands.

When the autopilot is engaged and the stick shaker actuates, the autopilot will disengage. Stick shaker has no effect on flight director operation.

AUTOPILOT CONTROLLER

The autopilot controller provides the autopilot and yaw damper engage function, as well as autopilot/flight director mode selection and annunciation. The controller is divided into three sections with the center section providing autopilot/yaw damper selection and engage buttons as well as status annunciation. The section on the left side provides mode selection for the pilot's flight guidance system and the section on the right side provides mode selection for the copilot's flight guidance system. The autopilot controller is located in the center of the glareshield and is easily accessible from either crew position. The controller lights can be dimmed through the pilot's INSTR dimmer switch on the pilot's dimmer panel.



AUTOPILOT CONTROLLER
Figure 5-6

AUTOPILOT/YAW DAMPER ENGAGE FUNCTIONS

AP — The AP pushbutton alternately engages and disengages the autopilot. Pressing this button will couple the autopilot to the selected flight guidance system provided the self test has successfully been completed. A green light above the AP button will illuminate whenever the autopilot is engaged. Engaging the autopilot will also engage the yaw damper and flight director if not already engaged.

XFR — The XFR pushbutton alternately selects between the pilot's and copilot's flight guidance computer for the source of autopilot commands. A green arrow, on the controller, will will indicate the selected flight guidance computer.

SOFT RIDE — The SOFT RIDE pushbutton is used to select the autopilot soft ride mode. When operating in soft ride mode, the autopilot reacts more slowly to commands thus giving a smoother ride. Soft ride is available whenever the autopilot is engaged and Approach Capture mode is not active. A green light above the SOFT RIDE button will illuminate whenever the soft ride mode is engaged.

YD — The YD pushbutton alternately engages and disengages the yaw damper independently of autopilot operation. A green light above the YD button will illuminate whenever the yaw damper is engaged.

AUTOPILOT/FLIGHT DIRECTOR MODES

Autopilot and flight director modes are engaged by depressing the applicable mode selector button on the autopilot controller. A green light above each selector button will illuminate when that particular mode is selected. Flight director only mode selection is accomplished by depressing the applicable mode selector without the autopilot engaged.

Engaged autopilot and flight director modes may be cancelled by depressing the selector button a second time or selecting an incompatible mode.

Refer to the Bendix/King KFC 3100 Flight Control System Pilot's Guide (No. 006-08486-0000) for a detailed description and operation of the autopilot/flight director modes.

Attitude Hold — When the flight director is operating and no vertical mode is selected, pitch attitude hold will automatically be active. When the flight director is operating and no lateral mode is selected, roll attitude hold will automatically be active. These modes are used to maintain a reference pitch and bank angle. The reference angles may be established by manually flying the aircraft to the desired pitch and bank angle while depressing the CWS switch (on the control wheel). When the CWS switch is released, the flight director will generate commands to maintain the existing pitch and roll attitude. The reference values may be changed using the vertical and lateral command function of the control wheel trim switches.

HDG (heading) — When HDG is selected, commands are generated to maneuver the airplane as necessary to fly a heading selected by position of the heading "bug" on the EHSI.

HALF BANK — When HALF BANK is selected, the KFC 3100 control system reduces its maximum roll attitude command to one-half of the normal limit. HALF BANK may be engaged in conjunction with any lateral mode except Approach.

NAV (navigation) — The NAV mode provides commands to capture and track the navigational course selected on the EHSI.

APR (approach) — The APR mode provides commands to capture and track the navigational course selected on the EHSI with approach accuracy. During ILS front course approaches, commands to capture and track the glideslope will be generated after the localizer has been captured.

ALT SEL (altitude select) — The ALT SEL mode provides commands to capture and track the selected altitude shown in the altitude preselect window on the altitude/vertical speed indicator.

ALT HOLD (altitude hold) — The ALT HOLD mode provides commands to track the indicated altitude present at the time of mode engagement. The reference altitude may be changed using the vertical command function of the control wheel trim switches. If ALT SEL mode is used to capture an altitude, the ALT HOLD mode will automatically engage after the selected altitude has been captured.

CLB (climb) — The CLB mode provides commands to maintain a preset speed versus altitude profile. Two climb profiles (Normal and High Speed) have been programmed into the KFC 3100 system. The vertical command function of the control wheel trim switches is used to select the desired climb profile. Engaging the CLB mode will also activate the ALT SEL mode if the preselected altitude is higher than the aircraft's present altitude.

DES (descend) — The DES mode provides commands to maintain a preset speed versus altitude profile. Two descent profiles (Normal and High Speed) have been programmed into the KFC 3100 system. The vertical command function of the control wheel trim switches is used to select the desired descent profile. Engaging the DES mode will also activate the ALT SEL mode if the preselected altitude is lower than the aircraft's present altitude.

MACH (Mach hold) — The MACH mode provides commands to maintain the indicated Mach number present at the time of mode engagement. The reference Mach number may be changed using the vertical command function of the control wheel trim switches.

IAS (indicated airspeed hold) — The IAS mode provides commands to maintain the indicated airspeed present at the time of mode engagement. The reference airspeed may be changed using the vertical command function of the control wheel trim switches.

VNAV (vertical navigation) — The VNAV mode provides commands to capture and track a vertical track angle as defined by a compatible flight management system with vertical navigation capability.

VS (vertical speed hold) — The VS mode provides commands to maintain the vertical speed selected on the altitude/vertical speed indicator. In the absence of a preselected vertical speed, flight director commands will be generated to maintain the vertical speed present at the time of mode engagement. The reference vertical speed may be changed using the vertical command function of the control wheel trim switches or the VS select knob on the altitude/vertical speed indicator.

Go-Around— Go-Around is a flight director only mode. Depressing the GO-AROUND button on the left thrust lever knob disengages the autopilot (if engaged) and commands both flight directors to 9° pitch up and wings level attitude.

STATUS ANNUNCIATORS

The autopilot controller incorporates two identical sets of annunciators to provide the status of the left and right autopilot systems. Additionally, two rudder boost (RB) annunciators are installed to provide the status of the rudder boost system.

R (Roll Axis) — A steady amber R annunciation indicates a roll axis failure. A flashing amber R annunciation indicates a roll mistrim condition.

P (Pitch Axis) — A steady amber P annunciation indicates a pitch axis failure. A flashing amber P annunciation indicates a pitch mistrim condition.

Y (Yaw Axis) — A steady amber Y annunciation indicates a yaw axis failure.

AP (Autopilot) — A red AP annunciation indicates an autopilot failure. The red AP annunciation will accompany any steady annunciation of R, P or Y.

PT (Pitch Trim) — A red PT annunciation indicates a pitch trim failure.

RB (Rudder Boost) — Two separate RB annunciators, one green and one amber, are installed. Illumination of the green RB annunciator indicates the rudder boost system is active. Illumination of the amber RB annunciator indicates a rudder boost system failure.

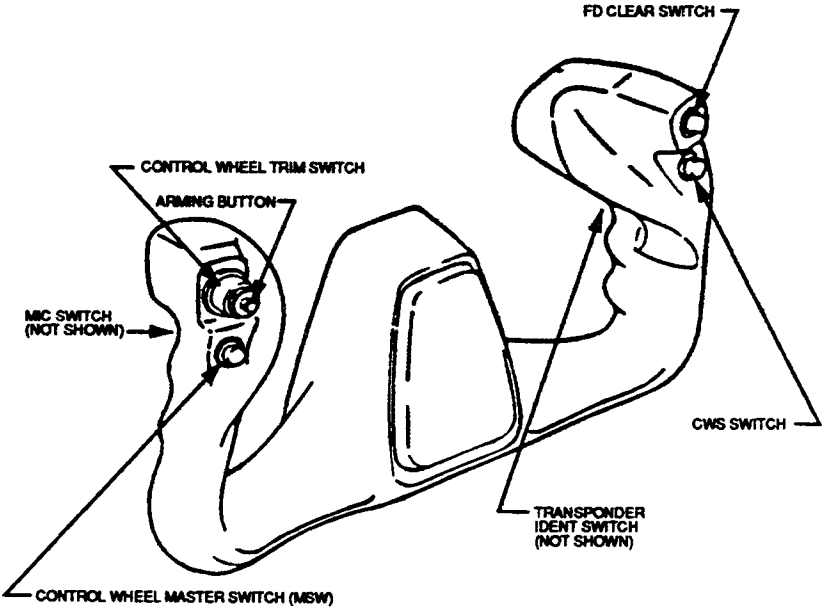
Selected Flight Guidance Computer — One of two green arrows will illuminate and point to the flight guidance system, pilot or copilot, that the autopilot will use as a source of steering commands.

CONTROL WHEEL MASTER SWITCHES — AUTOPILOT FUNCTION

The Control Wheel Master Switches (MSW), located on the outboard horn of the pilot's and copilot's control wheels, may be used to disengage the autopilot. Depressing either the pilot's or copilot's Control Wheel Master Switch (MSW) will apply a signal which cancels the autopilot engage signal. When the autopilot disengages, the green light above the AP button will extinguish and the autopilot disengage tone will sound. When the autopilot is disengaged using the Control Wheel Master Switches (MSW), the flight director will remain active and will display steering information from the flight guidance computer.

PITCH TRIM SELECTOR SWITCH — AUTOPILOT FUNCTION

When the autopilot is engaged, the autopilot maintains aircraft pitch trim through the secondary motor of the horizontal stabilizer pitch trim actuator if the PITCH TRIM selector switch on the pedestal is in the PRI or SEC position. The autopilot will not engage or will disengage if the PITCH TRIM selector switch is moved to the OFF position.



CONTROL WHEEL SWITCHES
(PILOT'S SHOWN, COPILOT'S OPPOSITE)
Figure 5-7

CONTROL WHEEL TRIM SWITCHES — AUTOPILOT/FLIGHT DIRECTOR FUNCTION

The control wheel trim switches, located on the outboard horn of each control wheel, may be used to disengage the autopilot, to make trim adjustments with the autopilot pitch and roll axes inhibited, to make vertical and lateral inputs while in certain modes and to toggle between normal and high speed profiles while operating in CLB or DES mode. When either control wheel trim switch (arming button depressed) is moved to any of the four positions (LWD, RWD, NOSE UP, or NOSE DN) the autopilot will disengage, the green light above the AP button will extinguish and the autopilot disengage tone will sound. When the autopilot is disengaged using the control wheel trim switches, the flight director will remain active and will display steering information from the flight guidance computer. Control wheel trim switches (arming button not depressed), may be used to insert vertical and lateral changes when ALT HOLD, MACH, VS, IAS, Pitch Attitude Hold or Roll Attitude Hold are engaged. To make a vertical command input, the control wheel trim switch (arming button not depressed) is moved to NOSE UP or NOSE DN. To make a lateral command input, the control wheel trim switch (arming button not depressed) is moved to LWD or RWD. When the autopilot is engaged, pitch and roll trim changes can be made by holding the CWS switch and using the control wheel trim switches as discussed in PITCH TRIM SYSTEM and ROLL TRIM SYSTEM.

Vertical Command — In Pitch Attitude Hold, commands a change in the aircraft's pitch attitude; In ALT HOLD, increases or decreases the reference altitude; In MACH, increases or decreases the reference Mach number; In VS, increases or decreases the reference vertical speed; In IAS, increases or decreases the reference indicated airspeed; In CLB or DES, toggles between normal and high speed profiles. Initiating vertical command while operating in the VNAV, Glideslope Capture, Altitude Capture or Go-around mode will cancel those modes and the system will revert to Pitch Attitude Hold mode.

Lateral Command — In Roll Attitude Hold, commands a change in the aircraft's roll attitude. Initiating lateral command while operating in the HDG, NAV Capture or APR Capture mode will cancel those modes and the system will revert to Roll Attitude Hold mode.

PEDESTAL NOSE DN-OFF-NOSE UP SWITCH — AUTOPILOT FUNCTION

The NOSE DN-OFF-NOSE UP switch, located on the pedestal trim control panel, may be used to disengage the autopilot or to make trim adjustments with the autopilot pitch and roll axes inhibited. With the PITCH TRIM selector switch in the SEC position, actuation of secondary pitch trim through the NOSE DN-OFF-NOSE UP switch will disengage the autopilot, extinguish the green light above the AP button, and sound the autopilot disengage tone. When the autopilot is disengaged through the NOSE DN-OFF-NOSE UP switch, the flight director will remain active and will display steering information from the flight guidance computer. When the autopilot pitch and roll axes are inhibited using the control wheel CWS switches, pitch trim changes can be made by using the NOSE DN-OFF-NOSE UP switch as discussed in PITCH TRIM SYSTEM.

CONTROL WHEEL STEERING (CWS) SWITCHES

Depressing the control wheel steering (CWS) switch, located on the inboard horn of each control wheel, uncouples the autopilot servo clutches, if engaged, and allows for flying the aircraft to a new reference value in certain modes. Manual pitch, roll, and trim commands can be made while the switch is depressed. When the switch is released, the system will resynchronize to the existing (new) values in MACH, IAS, ALT HOLD, or Attitude Hold modes. If the flight director is not engaged, depressing the CWS switch activates the system in Pitch and Roll Attitude Hold mode and synchronizes to the values existing at the time of switch release. Depressing the CWS switch will cancel Go-around mode and activate Pitch Attitude Hold mode.

CONTROL WHEEL FD CLEAR SWITCHES

The FD CLEAR switches, located on the inboard horn of each control wheel, are used to stow the on-side flight director command bars.

SYSTEM TEST SWITCH — A/P RESET FUNCTION

The rotary-type system test switch, located on the pilot's instrument panel, is used to reset the autopilot in the event it disengages and cannot be reengaged. The reset sequence is initiated by rotating the system test switch to A/P RESET and then depressing the switch PRESS TEST button. On the ground, both autopilots will test and servos will engage momentarily. In flight, only the selected autopilot will test and the servos will not engage.

YAW DAMPER SYSTEM

The yaw damper augments aircraft stability by opposing uncommanded motion about the yaw axis and provides turn coordination. The yaw damper is provided by the yaw axis of the KFC 3100 flight control system. The yaw damper operates independent of the autopilot.

YAW DAMPER CONTROL

The yaw damper button and annunciator are located in the autopilot controller, and provides yaw damper selection and indicating functions. The yaw damper engages when the autopilot is engaged, or by depressing the YD button on autopilot controller. When the yaw damper is engaged the green light above the YD button will be illuminated. If the yaw damper is already engaged, depressing the YD button will disengage the yaw damper.

CONTROL WHEEL MASTER SWITCHES — YAW DAMPER FUNCTION

The Control Wheel Master Switches (MSW), located on the outboard horn of the pilot's and copilot's control wheels, may be used to disengage the yaw damper. Depressing either the pilot's or copilot's Control Wheel Master Switch (MSW) will apply a signal which cancels the yaw damper engage signal. When the yaw damper disengages the green light above the YD button will extinguish and the yaw damper disengage tone will sound.

RUDDER BOOST SYSTEM

The rudder boost system is installed to provide reduced rudder pedal force, increased directional control effectiveness and improved takeoff performance. With the rudder boost on, minimum control speed-ground (V_{MCG}), takeoff speeds and distances are all lower. The rudder boost system consists of a computer, force sensors, flap position switch, RUDDER BOOST Switch, and associated aircraft wiring. The yaw damper servo provides the "boost" to assist the pilot in moving the rudder in the desired direction. The rudder boost system is supplied 28 VDC through the 7.5-amp RUDDER BOOST circuit breaker on the pilot's circuit breaker panel.

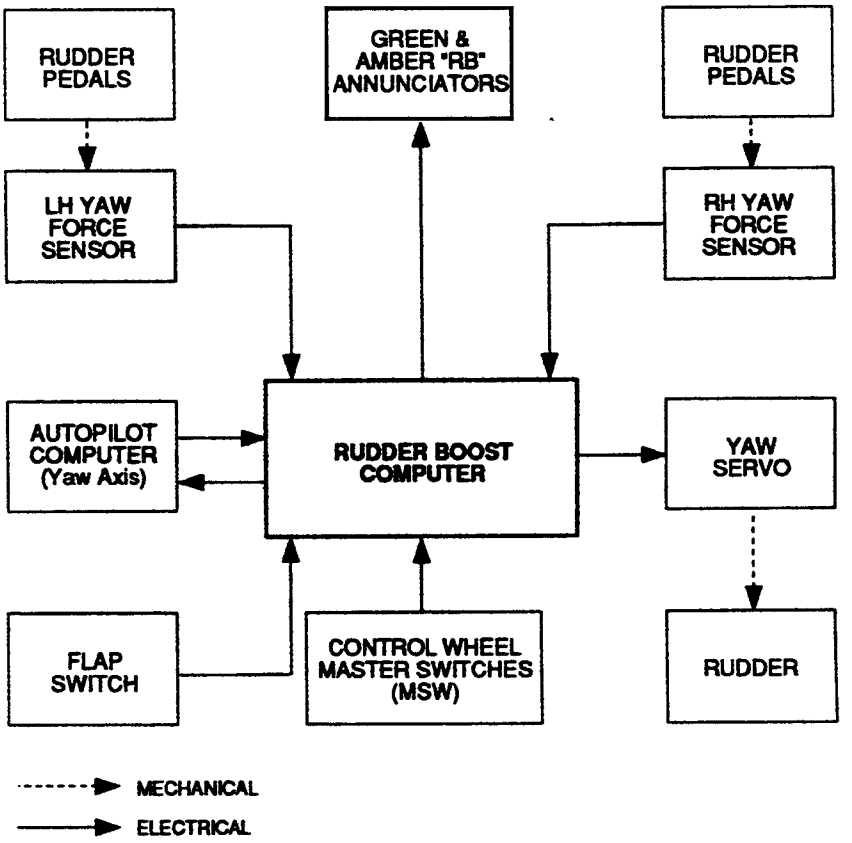
Normally the RUDDER BOOST Switch, on the pilot's switch panel, is left on at all times. Applying approximately 35 pounds of force to either rudder pedal will cause the yaw servo to automatically engage and apply force to the rudder in the same direction as the pilot. As pilot input force is increased, the servo force will also increase up to the maximum yaw servo force. The flap position switch is used to reduce the maximum servo force available when the flaps are up. When the rudder boost engages, the green RB annunciator, on the autopilot controller, illuminates to indicate rudder boost is active. If the yaw damper is on when the rudder boost engages, the system will make a smooth transition from yaw damper to rudder boost. A failure of the system is indicated by illumination of the amber RB annunciator on the autopilot controller. Self-test of the system is initiated during system power-up. Refer to the FAA Approved AFM for self-test and use of the rudder boost system.

RUDDER BOOST SWITCH

Arming of the rudder boost system is controlled by the RUDDER BOOST Switch located on the pilot's switch panel. When the switch is set to ON, the system will be armed. Setting the switch to OFF will disarm the system and the rudder control system will not be assisted by the yaw servo.

CONTROL WHEEL MASTER SWITCHES - RUDDER BOOST FUNCTION

The Control Wheel Master Switches (MSW), located on the outboard horn of the pilot's and copilot's control wheels, may be used to interrupt operation of the rudder boost system. Depressing either the pilot's or copilot's Control Wheel Master Switch (MSW) will disable the rudder boost system while the switch is held.



RUDDER BOOST BLOCK DIAGRAM
Figure 5-8

ATTITUDE HEADING SYSTEM (AHS 1 AND AHS 2)

Aircraft avionics displays and equipment requiring attitude or heading information are supplied attitude and heading information from dual, independent Attitude Heading Reference Systems (AHS 1 and AHS 2). Each system consists of an attitude heading reference unit computer, magnetic slaving unit (flux valve), HEADING control switches, AHS annunciator light and associated aircraft wiring. The attitude heading reference unit computer is composed of inertial instruments, electronics, interface hardware, processing and memory circuits to provide attitude and heading information to other aircraft systems. One magnetic slaving unit is located in each wing tip and is used to sense the earth's magnetic field. The magnetic slaving unit can thus correct the AHS for precession error. The HEADING SLAVE-FREE switch allows the crew to select either Free or Slaved Magnetic Heading mode. The system has two operating modes, normal and basic. During normal operation, a true airspeed input is supplied by the air data system to improve accuracy. If the true airspeed input is lost, the system will continue to operate in the basic mode. AHS operation is automatic and both systems will energize when battery power is applied to the aircraft. Within 60 seconds of power application, the system determines its orientation with the local vertical and magnetic North and performs a series of self-test and calibration functions. The AHS 1 and 2 systems are powered by 28 VDC, 7.5-amp AHS 1 and AHS 2 circuit breakers and 26 VAC, 5-amp AHS 1 and 1-amp AHS 2 circuit breakers located on the pilot's and co-pilot's circuit breaker panels. AHS 2 is operative during EMER BUS mode. In the event of a power loss, 2 to 11 minutes of back-up power (28 VDC) will be supplied to AHS 1 and AHS 2 by EMER BAT 2. This feature makes it unnecessary to reinitialize the system should a momentary power loss be experienced. Should one of the systems fail, the functions of the failed system may be assumed by the remaining system using the AHS 1/AHS 2 reversionary mode. Standby HSI heading data and weather radar antenna stabilization functions are provided by AHS 2 and cannot be assumed by AHS 1.

Attitude/heading data is provided for the following using systems:

EFIS Displays — attitude and heading displays
Autopilot/Flight Director — attitude, heading and acceleration data
Standby HSI — heading display (heading data provided by AHS 2 at all times)
Weather Radar — pitch and roll data provided by AHS 2 for antenna stabilization
Flight Management System — heading data

HEADING CONTROL SWITCHES

The HEADING control switches, located in the AVIONICS group on the pilot's and copilot's switch panels, are used to control the heading output of the associated AHS. The switches on the pilot's side control AHS 1 while the switches on the copilot's side control AHS 2. The SLAVE-FREE switch provides slaving mode selection for the associated AHS heading output. When the switch is set to SLAVE, the associated AHS heading output will be referenced to its magnetic slaving unit and the associated compass cards will reflect this "slaved" alignment. When the switch is set to FREE, the associated AHS heading output will not be referenced to its magnetic slaving unit. The SLAVE L-R switch provides for manual slewing of the associated compass cards. Small heading splits can usually be cleared by cycling the SLAVE-FREE switch to FREE and then back to SLAVE while the aircraft is not turning or accelerating.

AHS 1 AND AHS 2 ANNUNCIATOR LIGHTS

On aircraft 31-035 thru 31-184, illumination of an amber AHS 1 or AHS 2 light indicates a failure of the associated cooling fan in the attitude heading reference unit computer. The AHS will continue to operate for a minimum of 30 minutes under normal temperature conditions.

On aircraft 31-185 and subsequent, the illumination of an amber AHS 1 or AHS 2 light indicates a failure in the attitude heading reference unit computer. For a detailed list of failure modes, refer to the *LITEF Pilots Guide, P/N 142185-0000-311, Revision 1 or later version.*

AHS 1/AHS 2 REVERSIONARY MODE

The AHS 1/AHS 2 switches on the EFIS CONTROL panels are used to select the attitude heading system for the respective EFIS display and autopilot/flight director. On-side AHS is the normal selection indicated by a green annunciation on the switch. Reversionary (cross-side) selection is indicated by an amber annunciation on the switch.

ELECTRONIC FLIGHT INSTRUMENTS SYSTEM (EFIS)

A Bendix/King 5-tube EFS 50 electronic flight instruments system is installed to display airplane attitude data, navigational data, flight director command, mode annunciators, weather, checklist, warnings and diagnostic messages. The EFIS consists of an electronic attitude director indicator (EADI) and electronic horizontal situation indicator (EHSI) on both pilot's and copilot's instrument panels, a multifunction display (MFD) on the center instrument panel, three symbol generators (SG 1, SG 2 & SG 3), joystick (optional) and control panels to operate the system. Cooling for the EFIS displays is provided by fans integral to each display unit and two fans behind the instrument panel. Cooling for the symbol generators is provided by one fan on each symbol generator mounting rack. The pilot's displays are normally driven by SG 1 and the copilot's displays are normally driven by SG 2. Should SG 1 or SG 2 malfunction, SG 3 may be selected to assume the functions of the failed unit. The MFD is driven by SG 3. The system is powered by 28 VDC from the following circuit breakers: 7.5-amp EADI 1 & 2, 5-amp EHSI 1 & 2, 7.5-amp SG 1 EADI, SG 2 EADI & SG 3 EADI, 7.5-amp SG 1 EHSI, SG 2 EHSI & SG 3 EHSI, and 5-amp MFD.

ELECTRONIC ATTITUDE DIRECTOR INDICATOR (EADI)

An EADI is installed at each crew position. Each EADI is a 5-inch, multicolor CRT display. An inclinometer is installed on the face of each EADI to provide slip and skid information. The EADIs provide the following information:

- Pitch and Roll Attitude
- Mode Annunciations
- Radio Altitude & DH Set
- Fast/Slow Indication
- Marker Beacon
- Rate-of-Turn (Optional)
- Flight Director Commands
- Warning Annunciations & Flags
- Glideslope and Localizer Deviation
- Vertical Navigation Deviation
- Heading

ELECTRONIC HORIZONTAL SITUATION INDICATOR (EHSI)

An EHSI is installed at each crew position. Each EHSI is a 5-inch, multicolor CRT display. The EHSIs provide the following information:

- Heading
- Source Annunciations
- Course Deviation
- Selected Heading
- Bearing Pointers
- Weather Radar
- DME Data
- Warning Annunciations & Flags
- Glideslope and Localizer Deviation
- Vertical Navigation Deviation
- Selected Course/Desired Track

EFIS CONTROL PANEL

An EFIS control panel is installed for both the pilot's and copilot's displays. The control panels are located in the pedestal. Each panel controls the functions of the respective EFIS displays. Each panel provides the following functions:

- Decision Height Set
- EFIS Test
- Display Format
- Bearing Pointer Select
- Course Select
- Range Select (weather and map mode)
- Radio Altimeter Test
- Display Brightness
- Navigation Source Select
- Heading Select
- Ground Speed/Time to Station Select

EFIS CONTROL PANEL
Figure 5-9

MULTIFUNCTION DISPLAY (MFD)

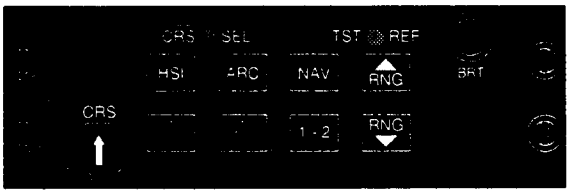
An MFD is installed in the center instrument panel. The MFD is a 5-inch, multicolor CRT display. The MFD provides weather radar display, FMS map display and functions as a third EHSI.

MFD CONTROL PANEL

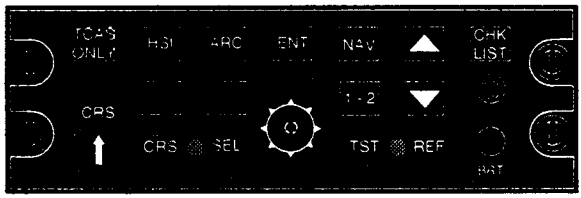
STANDARD (WITHOUT JOYSTICK)

An MFD control panel is installed in the pedestal. The panel controls the functions of the multifunction display. The following functions are provided:

- EFIS Test
- Display Format
- Bearing Pointer Select
- Range Select (weather and map mode)
- Display Brightness
- Navigation Source Select
- Course Select
- Ground Speed/Time to Station Select



(WITHOUT JOYSTICK)



(WITH JOYSTICK)
MFD CONTROL PANEL
Figure 5-10

OPTIONAL (WITH JOYSTICK)

An MFD control panel is installed in the pedestal. The panel controls the functions of the multifunction display. The following functions are provided:

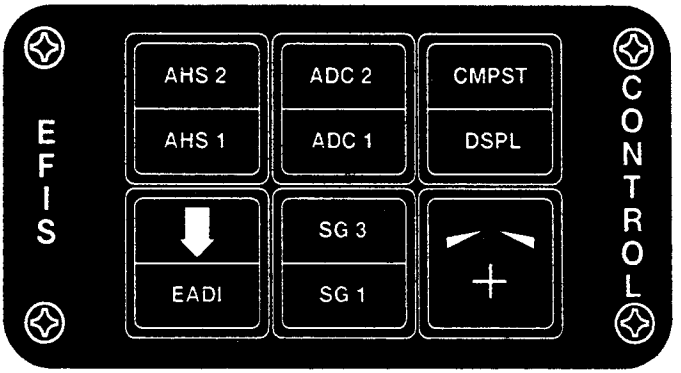
- DisplayFormat
- EFIS Test
- TCAS ONLY Select
- Checklist Select
- Display Brightness
- Course Select
- Navigation Source Select
- Bearing Pointer Select
- RS 232 Communications Port (checklist programming)
- Waypoint Position Entry (joystick)
- Range Select (weather and map mode)
- Ground Speed/Time to Station Select
- Enter Select (waypoint coordinate transfer)

EFIS REVERSIONARY CONTROL PANEL

An EFIS CONTROL panel is installed on both the pilot's and copilot's instrument panel. The panel controls the reversionary functions of the associated EFIS display. The following reversionary functions are provided:

- AHS Select
- SG Select
- Single-cue/Double-cue Select
- ADC Select
- Composite/Display Select
- EADI Down Select

Refer to the FAA Approved AFM for a description and use of each function.



EFIS REVERSIONARY CONTROL PANEL
Figure 5-11

FLIGHT INSTRUMENTS

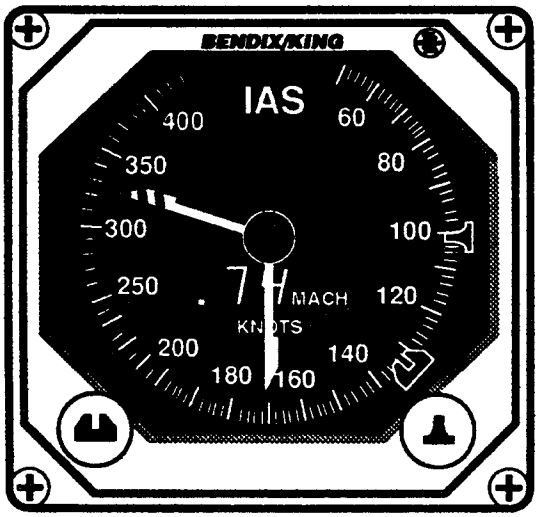
Flight instruments include airspeed/Mach indicators, altitude/vertical speed indicators, speed/temperature indicator, standby HSI, standby attitude gyro, standby airspeed indicator and standby altimeter. Refer to Electronic Flight Instrument System, also.

AIRSPEED/MACH INDICATORS

An airspeed/Mach indicator is installed on both the pilot's and copilot's instrument panel. Each indicator is a Bendix/King unit driven by electrical signals from a remotely located air data computer. Features of the indicator include: circular scale graduated from 50 to 430 knots, airspeed pointer, maximum allowable pointer (barber pole), digital KIAS/MACH display window, moveable Vref bug, moveable reference airspeed bug and failure flag. Power for the indicators is 28 VDC supplied through the 1-amp PILOT A/S and CP A/S circuit breakers. The pilot's airspeed/Mach indicator is operative during EMER BUS mode.

The airspeed pointer positions itself along the graduated scale to indicate the aircraft's airspeed in knots. The maximum allowable pointer aligns with the maximum allowable speed (V_{MO}/M_{MO}) for existing conditions (i.e. altitude and autopilot, and Mach trim status). The digital display window displays speed in knots when Mach number is less than 0.50 M_I, and in Mach when Mach number is greater than 0.50 M_I. A MACH annunciator illuminates when Mach number is dis-

played. The Vref bug is set by the crew with a knob on the face of the indicator. Differences between the Vref bug and actual airspeed will be reflect by the fast/slow scale on the EFIS display. The reference airspeed bug is set by the crew with a knob on the face of the indicator and is for reference purposes only. The failure flag will come into view when the airspeed data is invalid.

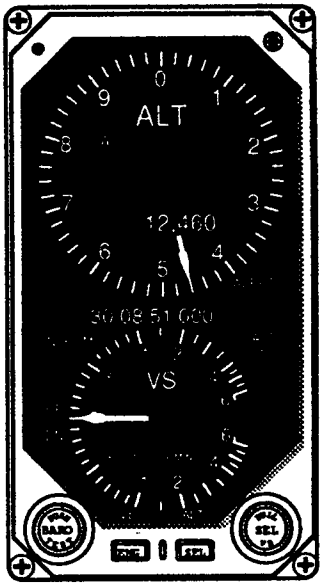


AIRSPEED/MACH INDICATOR
Figure 5-12

ALTITUDE/VERTICAL SPEED INDICATORS

An altitude/vertical speed indicator is installed on both the pilot's and copilot's instrument panel. Each indicator is a Bendix/King unit driven by electrical signals from a remotely located air data computer. Features of the indicator include: circular altitude scale graduated from 0 to 1000 feet in 20-foot increments, circular vertical speed scale graduated from 0 to 6000 feet per minute (UP and DN), altitude pointer, vertical speed pointer, digital altitude display window, altimeter setting window and knob, vertical speed bug and failure flags. The indicator also provides for altitude preselect and altitude alerter functions and the capability to display density altitude. Power for the indicators is 28 VDC supplied through the 2-amp PILOT ALTM VSI and CP ALTM VSI circuit breakers. The pilot's altitude/vertical speed indicator is operative during EMER BUS mode.

A window, on the upper half of the indicator, displays altitude in digital form. Each revolution of the altitude pointer (analog) represents 1000 feet. Vertical speed is displayed on the lower half of the indicator by the vertical speed pointer. The vertical speed bug may be used to set the reference value while VS flight director mode is selected. The altimeter setting window and knob allow for entering the current setting in inches of mercury (IN HG) or millibars (MB). The altitude select/density altitude window displays the selected altitude, in hundreds of feet, to be used with the ALT SEL flight director mode. The selected altitude is set using a knob on the indicator. The window will display density altitude for approximately five seconds at the end of the air data system's self-test or at any time by pressing the PUSH BARO TEST knob twice in rapid succession. The ALT and VS failure flags will come into view when the associated data is invalid. The ENG button may be used to engage the VS flight director mode and the SEL button may be used to engage the ALT SEL flight director mode. Altitude alerter visual and aural cues are provided which alert the crew that the selected altitude is being approached or the aircraft has deviated from the selected altitude. The visual cues are provided by both pilot and copilot indicators. The aural cue is triggered by the pilot's indicator.



ALTITUDE/VERTICAL SPEED INDICATOR
Figure 5-13

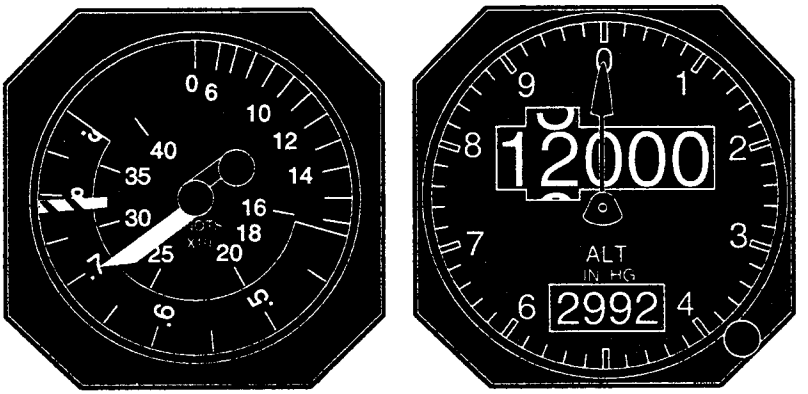
SPEED/TEMPERATURE INDICATOR

A speed/temperature indicator is installed on the pilot's instrument panel. The indicator is a Bendix/King unit driven by electrical signals from a remotely located air data computer. Features of the indicator include: digital readout of true airspeed (TAS) in knots and static air temperature (SAT) or total air temperature (TAT) in degrees Celsius. The S/T button is used to toggle between static air temperature and total air temperature. Power for the indicator is 28 VDC supplied through the 1-amp SAT-TAS circuit breakers on the pilot's circuit breaker panel.

SPEED/TEMPERATURE INDICATOR
Figure 5-14

STANDBY AIRSPEED/MACH INDICATOR

A standby airspeed/Mach indicator is installed on the center instrument panel. The indicator face consists of a stationary, circular airspeed scale reading from 0 to 400 knots, a moveable Mach scale, an airspeed/Mach pointer and a maximum allowable marker (barber pole). The Mach scale rotates with changes in altitude to maintain the correct Mach/airspeed relationship for any given altitude. The maximum allowable marker rotates with the Mach scale and maintains a position at 0.78 M_I. The pointer responds to pitot pressure from the copilot's pitot mast and static pressure from the selected source (L-BOTH-R). The standby airspeed/Mach indicator is used to cross check the electrically-driven pilot and copilot indicators and serves as a back up unit in the event both pilot and copilot indicators become inoperative.



STANDBY AIRSPEED/MACH INDICATOR AND ALTIMETER
Figure 5-15

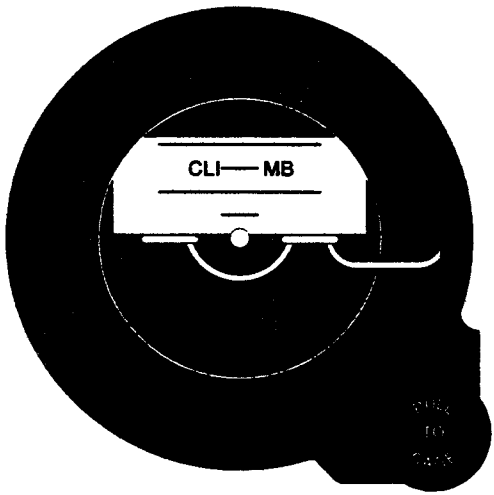
STANDBY ALTIMETER

A standby altimeter is installed on the center instrument panel. The altimeter displays altitude on the counter-drum-pointer presentation. The altimeter dial is graduated in 20-foot increments from 0 to 1000. The pointer makes one complete revolution per 1000 feet of altitude. The counter rotates to produce a digital display of altitude in ten thousands and thousands of feet. The hundreds, tens and units places are fixed zeros. A Kollsman window displays the altimeter setting in inches of mercury (IN HG). The altimeter setting is entered by rotating the set knob on the altimeter bezel. The altimeter responds to static pressure from the selected source (L-BOTH-R). The standby altimeter is used to cross check the electrically-driven pilot and copilot indicators and serves as a back up unit in the event both pilot and copilot indicators become inoperative.

STANDBY ATTITUDE INDICATOR

A standby attitude indicator is installed on the center instrument panel. The indicator will provide 92° of climb, 78° of dive and 360° of roll attitude information. A sky pointer is incorporated to indicate vertical in any roll attitude. Roll index marks at 10°, 20°, 30° and 90° provide measurement of angular displacement from vertical as indicated with the

sky pointer. The two colored pitch drum is directly linked to the spin motor of the gyro to provide direct reading of aircraft attitude in both roll and pitch. The light colored area marked CLIMB represents the sky. The dark colored area marked DIVE represents the earth. A horizontal white line divides the colored areas to represent the horizon. Index marks are incorporated on the drum to indicate every 5° of pitch in both CLIMB and DIVE attitudes. The adjustable miniature airplane symbol indicates aircraft pitch and roll attitude relative to the horizon. The symbol is adjustable through 5° of pitch trim in both CLIMB and DIVE directions using the PULL TO CAGE knob. Rotating the knob moves the symbol and a pointer that indicates symbol pitch trim displacement on a scale marked in 1° increments. The knob is slowly pulled out and rotated clockwise to cage the gyro. When released, the knob will remain in the extended position. A red OFF flag will appear if the gyro is caged, power is not applied or was lost, or the gyro becomes inoperative. The standby attitude indicator is powered by 28 VDC supplied by EMER BAT 1. The standby attitude indicator is used to cross check the pilot and copilot EADIs and serves as a back up unit in the event both pilot and copilot EADIs become inoperative.



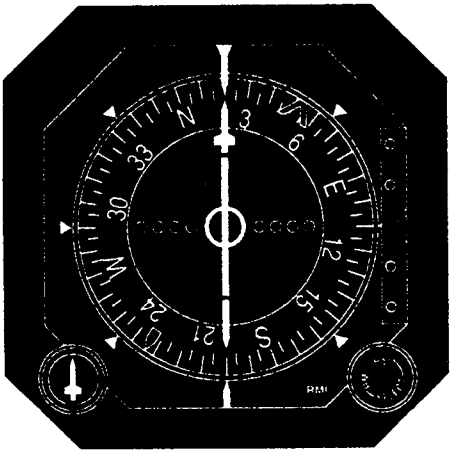
STANDBY ATTITUDE INDICATOR
Figure 5-16

STANDBY HORIZONTAL SITUATION INDICATOR (HSI)

The standby HSI is installed on the pilot's instrument panel. The standby HSI provides the pilot with an additional indicator to display the following data:

- Compass Heading (AHS 2)
- VOR 1 Bearing Pointer
- ADF 1 Bearing Pointer
- VOR 1 Course Deviation
- LOC 1 Course Deviation
- Glideslope Deviation

Pilot's controls consist of an HSI/RMI selector switch and course select knob. In the RMI mode, VOR 1 bearing pointer and ADF 1 bearing pointer are provided. In the HSI mode VOR/LOC 1 course deviation and ADF 1 bearing pointer are provided. In both modes, heading data from AHS 2 is presented. Failure flags will drop into view if the associated data is invalid. The ADF bearing pointer will park at the 3:00 o'clock position with the loss of the ADF signal. With the loss of ADF receiver or DC power, the pointer will park at either the 1:30 o'clock position or its last position. The standby HSI is used to cross check the EHSIs and serves as a back up unit in the event all EHSIs become inoperative. The standby HSI is operative during EMER BUS mode.



STANDBY HORIZONTAL SITUATION INDICATOR
Figure 5-17

PITOT-STATIC SYSTEM

Pitot and static pressure for the standby instruments, air data computers and other using systems is obtained from two pitot-static probes. One probe is located on each side of the nose compartment. Each probe contains a pitot (impact pressure) port and two static pressure ports. The probes also contain electrical heating elements controlled by the L and R PITOT HEAT switches (Refer to PITOT-STATIC AND STALL WARNING ANTI-ICE, Section VI). Five drain valves, located near the nose gear doors, are installed at the system low spots to drain moisture from the system. The pilot's pitot system is completely independent of the copilot's pitot system and utilizes the left pitot-static probe as the source of pitot pressure. The copilot's system utilizes the right pitot-static probe to obtain pitot pressure. The pilot's and copilot's systems each utilize a separate static source on each of the probes. A solenoid-operated shutoff valve is installed in each static source line to assure accurate static pressure in the event one probe becomes clogged or unreliable. The shutoff valves are controlled through the STATIC SOURCE switch on the pilot's switch panel and operate on 28 VDC supplied through the 7.5-amp STATIC SOURCE circuit breaker on the pilot's circuit breaker panel.

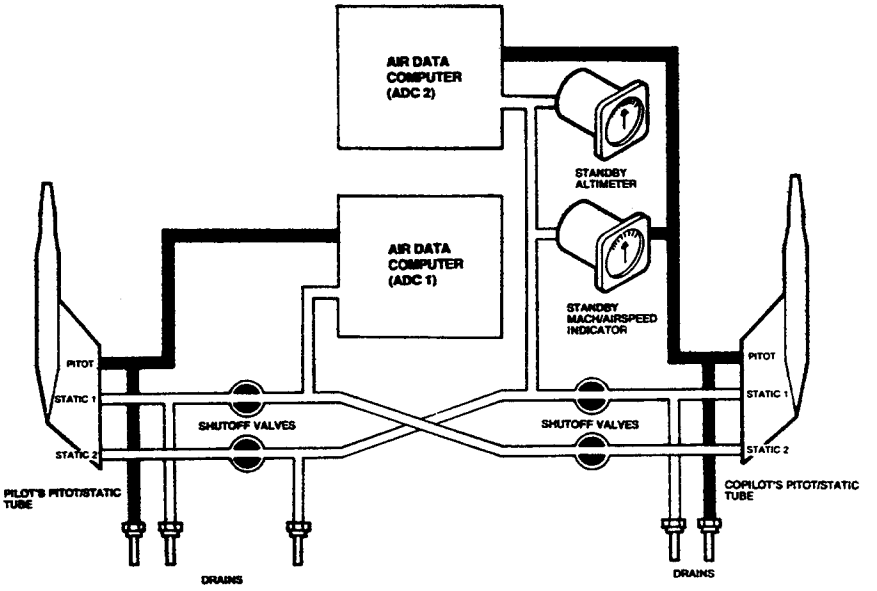
The pilot's pitot source supplies pitot pressure for ADC 1 air data computer. The copilot's pitot source supplies pitot pressure for ADC 2 air data computer, standby airspeed indicator and optional equipment requiring pitot pressure input.

Each pitot-static probe contains two static sources. One static source on each probe is interconnected with a static source on the opposite probe to supply static pressure to ADC 1. The other static source on each probe is interconnected with a static source on the opposite probe to supply static pressure to the standby airspeed indicator, standby altimeter, ADC 2, and optional equipment requiring static pressure input. In the event a static source becomes clogged or unreliable, the affected pitot-static probe's static sources can be isolated, allowing all equipment to be operated from static sources on the opposite probe.

STATIC SOURCE SWITCH

The STATIC SOURCE switch controls solenoid-operated shutoff valves, in the static plumbing, to assure accurate static pressure sensing in the event one of the pitot-static probes become inoperable or unreliable. The STATIC SOURCE switch, located on the pilot's switch

panel, has three positions: L, BOTH, and R. When the switch is in the BOTH position all four shutoff valves are deenergized open and static pressure for the air data instruments and equipment is available from static ports in both pitot-static probes. Normally, the switch is in the BOTH position for all operations. When the switch is set to L or R, the shutoff valves for the opposite pitot-static probe are energized closed, and static pressure will be supplied by the selected pitot-static probe only.



PITOT-STATIC SYSTEM
Figure 5-18

AIR DATA SYSTEM (ADC 1 AND ADC 2)

A dual air data system is installed to provide flight environment air data to instruments and equipment requiring the data for display or operation. The system consists of two air data computers (ADC 1 and ADC 2), pilot's and copilot's airspeed/Mach indicators, pilot's and copilot's altitude/vertical speed indicators, speed/temperature (SAT/TAS) indicator and reversionary mode switch/annunciators. During ground operations, the system can be tested through the SYSTEM TEST switch on the pilot's instrument panel. ADC 1 and ADC 2 operate on 28 VDC supplied through the 3-amp ADC 1 and ADC 2 circuit breakers on the pilot's and copilot's circuit breaker panels respectively. ADC 1 is operative during EMER BUS mode.

The air data computers receive pitot and static pressures from the pitot-static probes and temperature data from the total temperature probe for computation of the flight environment. The computed results of the sensor inputs are converted to electrical signals and transmitted to the associated cockpit displays. Additional outputs from the air data computers are transmitted to the attitude heading system (AHS), EFIS, stall warning system, overspeed warning system, flight management system (FMS), Mach trim system, and autopilot/flight guidance system. The following table summarizes the various computer outputs.

ADC 1 Normal (non-reversionary mode)	ADC 2 Normal (non-reversionary mode)
• Pilot's Instruments Airspeed/Mach Altitude/Vertical Speed SAT/TAS • Altitude Alert • L Stall Warning • Gear Warning • Overspeed profile • AHS 1 (TAS) • Pilot's EFIS • L Flight Guidance • Mach Trim • ATC 1 (encoded altitude) • FMS 1	• Copilot's Instruments Airspeed/Mach Altitude/Vertical Speed • Altitude Alert • R Stall Warning • Gear Warning • Overspeed profile • AHS 2 (TAS) • Copilot's EFIS • R Flight Guidance • ATC 2 (encoded altitude) • FMS 2

Refer to FLIGHT INSTRUMENTS for a description of air data instruments. The reversionary mode switch/annunciators (ADC 1/ADC 2) are used to select the desired air data computer as the source for the on-side instruments and systems. Refer to the FAA Approved AFM for a description and use of the reversionary function.

SYSTEM TEST SWITCH — ADC FUNCTION

During ground operations, the ADC system and instruments are tested through the rotary-type SYSTEM TEST switch on the pilot's instrument panel. With the SYSTEM TEST switch set to ADC, the air data system test is initiated by depressing the TEST button in the center of the switch. The test sequence will test the overspeed warning system, both air data computers, and the air data system instruments. The test sequence is fully described in the Bendix/King KFC 3100 pilot's guide.

TAKEOFF CONFIGURATION MONITOR SYSTEM

The takeoff configuration monitor system consists of a monitor box, throttle quadrant switch, various system switches (provide the input signals to the monitor box), and a T.O. TRIM annunciator. The system is active when the aircraft is on the ground (right squat switch in ground mode). The T.O. TRIM annunciator, located on the glareshield annunciator panel, will illuminate when the pitch trim is not in a safe position for takeoff and the aircraft is on the ground. The annunciator is disabled during flight operations. A takeoff monitor aural warning will sound during ground operations when the right thrust lever is advanced above the 82% N_1 position and one or more of the following conditions exist:

1. Flaps not set for takeoff.
2. Spoilers not retracted.
3. Pitch trim not in a safe position for takeoff.
4. Parking brake not released.
5. Thrust reverser unlocked (if applicable).

AUDIO CONTROL SYSTEM

The audio control system is used to select the desired audio inputs for broadcast through the speakers or headphones. The audio control system is also used to select the desired transmitter to which microphone inputs will be directed. A separate audio control system is provided for pilot and copilot. Each system consists of an audio amplifier and audio control panel. The audio control system operates on 28 VDC supplied through the 5-amp L and R AUDIO circuit breakers on the pilot's and copilot's circuit breaker panels respectively. The audio control systems will operate during EMER BUS mode.

AUDIO CONTROL PANEL

An audio control panel is installed at the outboard end of the pilot's and copilot's instrument panels. Each panel provides the controls necessary to direct audio signals and adjust volume levels. Each panel is used in conjunction with the on-side microphone, headphone and cockpit speaker.

TRANSMIT SELECT SWITCH

The TRANSMIT SELECT Switch is a multi-position rotary-type switch labeled VHF 1, VHF 2, HF and PASS SPKR. This switch provides the proper microphone audio inputs for the respective functions.

VHF 1, VHF 2, and HF Positions — When any of these positions are selected, microphone inputs are provided for the respective transceiver. Microphone must be keyed to transmit.

PASS SPKR Position — When this position is selected, the pilot or copilot, utilizing this function, may speak to the passengers through the passenger speaker. Microphone must be keyed to transmit. PASS SPKR should not be selected on both audio control panels simultaneously as degradation of the volume level may result.

MIC SELECT SWITCH

NORM Position — When the switch is in this position, voice transmissions are accomplished with the headset microphone or handheld microphone.

OXY Position — When the switch is in this position, voice transmissions are accomplished with the oxygen mask microphone. Both cockpit speakers, phone and interphone function (see MIXER SWITCHES) will be active. The microphone must be keyed to transmit to the passengers or via a communications radio.

VOLUME CONTROLS

MASTER VOL — This control regulates the volume level of all audio outputs.

PASS VOL — This control regulates the volume level of the passenger speaker audio.

SPEAKER SWITCH

Speaker Off Position — When the switch is pushed in and any mixer switch is on, audio is fed to the on-side headphones only. Rotating the knob will adjust the volume level to the headphones.

Speaker On Position — When the switch is pulled out and any mixer switch is on, audio is fed to the on-side headphones and on-side cockpit speaker. Rotating the knob will adjust the volume level to the headphones and cockpit speaker. The On (pulled) position is indicated as follows:

- *During daylight* — A white ring on the switch stem will be exposed.
- *During darkness* — The switch will be illuminated.

MIXER SWITCHES

All mixer switches have a volume control which is rotated to regulate the volume level of individual audio inputs. The On (pulled) position of each mixer switch is indicated as follows:

- *During daylight* — A white ring on the switch stem will be exposed.
- *During darkness* — The switch will be illuminated.

Mixer switches on the audio control panel are labeled and perform the following functions:

VHF 1 and VHF 2 Switches — When in the On (pulled) position, provide audio from the VHF 1 and VHF 2 transceivers respectively.

HF Switch — When in the On (pulled) position, provides audio from HF transceiver (if installed).

INPH Switch — When in the On (pulled) position, provides audio from the interphone. The interphone employs a voice-activated hot microphone.

NAV 1 and NAV 2 Switches — When in the On (pulled) position, provide audio from the NAV 1 and NAV 2 receivers respectively.

ADF 1 and ADF 2 Switches — When in the On (pulled) position, provide audio from the ADF 1 and ADF 2 (if installed) receivers respectively.

MKR 1 and MKR 2 Switches — When in the On (pulled) position, provide "marker" audio from the MKR 1 and MKR 2 receivers respectively.

DME 1 and DME 2 Switches — When in the On (pulled) position, provide audio identification signals from the DME receiver(s). DME 1 switch controls audio for the DME channel tuned by the NAV 1 receiver and DME 2 switch controls audio for the DME channel tuned by the NAV 2 receiver.

BOTH/VOICE/IDENT SWITCH

This switch controls the audio filtering for the NAV and ADF receivers.

BOTH Position — When the switch is in this position, both the station identifier and voice transmissions will be heard. The BOTH position is the normal position.

VOICE Position — When the switch is in this position, only voice transmissions will be heard.

IDENT Position — When the switch is in this position, only the station identifier will be heard.

MKR HI/LO SWITCH

HI Position — When the switch is in this position, the marker beacon receiver sensitivity is increased.

LO Position — When the switch is in this position, the marker beacon receiver sensitivity is decreased.

AUDIO CONTROL — FLIGHT OPERATION

1. MASTER VOL Control — Rotate to a comfortable listening level.
2. Applicable Mixer Switches — Pull "on" and rotate to a comfortable listening level. The VHF 1 and VHF 2 volume controls do not affect sidetone levels. The HF volume control will affect the sidetone level on most models since audio and sidetone utilize a common line from the transceivers. Some HF transceivers do not have sidetone capabilities.
3. TRANSMIT SELECT Switch — Rotate to desired position.

FLIGHT MANAGEMENT SYSTEM

The Learjet 31A may be equipped with a flight management system (FMS). The FMS is an integrated navigation management system that provides the pilot the capability for worldwide point-to-point navigation, as well as SIDs, STARS, holding patterns and approaches. Lateral and vertical (descent only) steering is provided for enroute, terminal, and approach operation.

Refer to the applicable FMS operator's manual for further details and operating instructions.

UNS-1B FLIGHT MANAGEMENT SYSTEM/KFC 3100 FLIGHT CONTROL SYSTEM INTERFACE

When the Universal UNS-1B Flight Management System (FMS) is interfaced with the Bendix/King KFC 3100 Flight Control System (FCS) special attention must be given to the operating modes selected on both systems. The different configurations of these two systems can cause the aircraft to react differently when controlled by the autopilot. The following is an explanation and procedures for various phases of flight.

ENROUTE

The FMS may be coupled to the FCS by selecting NAV mode on the flight director. The FCS will capture the FMS if one of the following conditions are met:

- If the FMS is in heading mode, the FCS will be in the forced capture mode when NAV mode is selected on the flight director. This means the FCS will immediately capture and turn towards the current FMS NAV leg regardless of crosstrack deviation.
- If the FMS is in the holding pattern mode, forced capture is active.
- If a Direct-To has been selected, forced capture is active.
- If none of the above conditions exist, selecting NAV mode on the flight director will result in an ARM condition until the crosstrack deviation is reduced to a value which will result in capture by the FCS. The aircraft must be maneuvered to reduce the crosstrack by manual flight or use of flight director NAV/HDG mode.

ENROUTE VNAV

Enroute VNAV or cruise mode is entered if a VNAV flight plan has been created, aircraft altitude is valid and available, and the aircraft is not more than 200 feet below the first vertical waypoint. At this point VNAV mode of the FCS may be armed. Prior to reaching TOD (top of descent), the altitude preselector must be set to a minimum of 200 feet below present altitude. If this is not completed by two minutes prior to TOD message, RESET ALT PRESELECT will be presented. During this two minutes, an FPA CHANGE message is presented. This message must be acknowledged before TOD in order for the FCS to capture VNAV. As the TOD is reached, the FCS VNAV mode will capture and the FMS will enter descent mode.

In VNAV, the altitude preselector has priority over the FMS. If the preselected altitude is higher than the FMS target altitude, the aircraft will level off at the preselected altitude.

A VTO (Vertical Direct To) will cause the VNAV to capture immediately.

APPROACH MODE (LATERAL)

During FMS approach mode, FMS and FCS reaction is dependent on FMS heading mode and the sequence in which this mode and the FCS modes are selected.

If there is a direct link between the enroute/terminal portion of the flight plan (i.e. no GAPs), and the FMS is already coupled, the crew need only ARM the approach on the FMS CDU and the FMS will automatically activate the approach. The crew would then select APR mode on the FCS.

In case of a discontinuity in the flight plan, other means such as FMS Heading Mode or FCS HDG mode would be used to intercept the approach such as:

- If the FMS is coupled to the FCS, and the APR mode is activated on the FMS, the FMS automatically enters heading mode and this may be used to steer the aircraft to intercept the approach.
- If the FMS is not coupled to the FCS, FMS heading mode will be cancelled when the APR mode is activated. This is done to allow the FCS to steer the aircraft, with Approach Mode armed, to intercept the approach. This is the preferred method of operation.

APPROACH MODE (VERTICAL)

VNAV for FMS approach mode is selected via the VNAV button on the FCS. There are several criteria which must be met before VNAV will capture.

If enroute VNAV is selected and captured prior to selecting FMS approach mode, the vertical deviation (altitude error) must be less than ±100 feet. If an error in excess of 100 feet exists, VNAV mode will be cancelled and then can be reselected and intercepted like a normal ILS with the constraints noted below.

- The lateral portion of the approach must first be captured.
- The FMS must not be in heading mode.

In VNAV, the altitude preselector has priority over the FMS. If the preselected altitude is higher than the FMS target altitude, the aircraft will level off at the preselected altitude.