A flight time alarm mode is provided which will flash the clock display when the desired flight time is reached. To set the alarm function, select FT with the SEL button and enter the set mode by pressing both buttons simultaneously. Enter the desired alarm time in the identical manner that GMT or local time is set. When flight time equals the alarm time, the display will flash. If FT is not being displayed when the alarm time is reached, the clock will automatically select FT for display. Pressing either the SEL or CTL button will turn off the alarm and reset the alarm time to zero. Flight time is unchanged and continues counting.

The clock display may be tested when power is on the airplane by holding the SEL button down for three seconds. The display will show 88:88 and activate all four annunciators.

AVIONICS

The standard avionics package includes dual audio control panels, dual VHF COMM transceivers, dual NAVs, ADF, and DME, dual transponders, auto flight system, a two-display Rockwell Collins Pro Line 21 Integrated Avionics System and a GPS long range navigational system. Included as part of the auto flight system is altitude preselect, altitude alerting, and altitude reporting. An optional third flight display is available for the Pro Line 21 system.

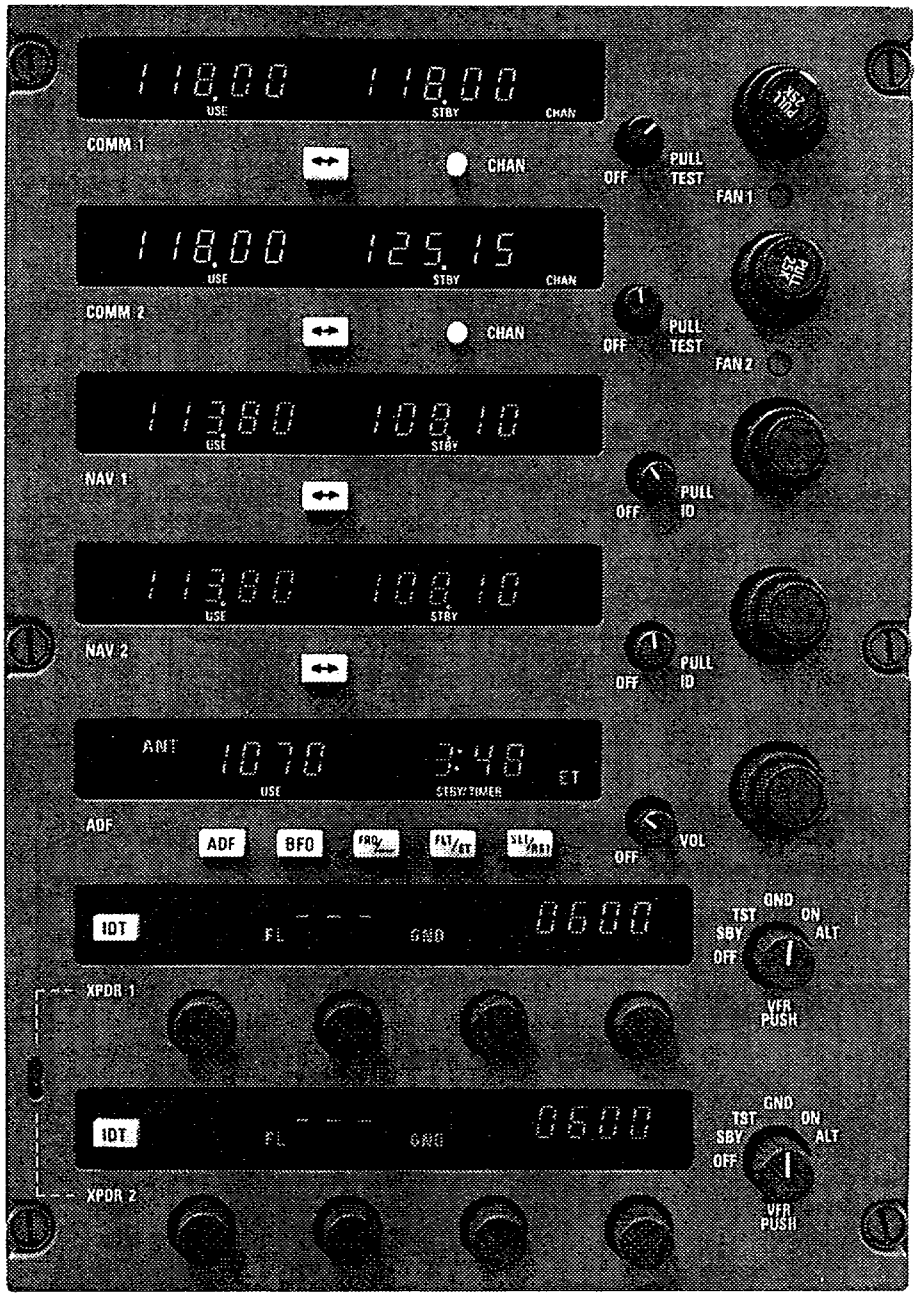
The two COMMs, two NAVs, two transponders, and single ADF receiver are mounted in a stacked arrangement behind the consolidated control panel located in the center instrument panel. Three fans cool the communications rack; fans 1 and 2 (located in the rack) cool the rack and fan 3 (located at floor level) cools the rack in the pedestal. The FAN 1 and FAN 2 annunciators, located at the top right of the panel, will illuminate to warn of a malfunction of the cooling fans. The FAN 1 annunciator monitors the top two fans and will illuminate if one or both of those fans fail. The FAN 2 annunciator will illuminate if the lower cooling fan fails.

VHF COMM TRANSCEIVERS

Dual KY 196A transceivers and controls are mounted at the top of the consolidated control panel located on the center instrument panel. Each radio is a very high frequency (VHF) unit with a frequency range from 118.000 to 136.975 megahertz (MHz) with 25 kHz spacing. The frequency displays are self-dimming seven-segment gas discharge digital readouts. During ground operation, radio transmissions can be blocked by surrounding terrain or structures. This may possibly be overcome by using the other COMM, because of airplane antenna location. The COMM 1 antenna is on the underside of the fuselage and the COMM 2 antenna is on top of the fuselage. When flying through dry precipitation, it is possible for static electricity to build up and cause the VHF COMMs to automatically squelch to a point where reception range is greatly reduced. Disabling the automatic squelch by pulling out the on/off/volume control (OFF PULL/TEST) knob will cause background static in the speaker or headset, but normal reception range will be restored. Pushing the knob back in will restore the automatic squelch. If the headset microphone fails to function properly, check the side console switch in MIC HEADSET, and verify that the hand microphone is fully engaged in its socket.

KY-196A Controls

The KY-196A control uses two digital readouts to display the controlling (USE) frequency and a pilot selected preset (STBY) frequency. It has four modes of operation; Frequency mode; Channel mode; Channel Programming mode; and direct Tuning mode. The frequency mode of operation allows the pilot to tune a frequency in the standby frequency display and then "flip-flop" the standby and active frequencies by pressing the frequency transfer (double arrow) button. The Channel mode allows up to nine frequencies and the corresponding channel numbers to be recalled from memory. During channel mode of operation, the



6385P6003

Figure 3-5. Consolidated Control Panel

channel number is displayed in the CHAN window, and rotation of either the small or large knob will increase or decrease the channel number and the corresponding frequency in the STBY window, one channel at a time. The channel display will "roll over" at either end of the corresponding channel selection. The channel programming mode allows the pilot to program desired frequencies for use in the channel mode of operation. The direct tuning mode is a back-up mode which allows frequency changes to be made directly into the active frequency display. The use (USE) display is the left window and the standby (STBY) display is the right window. Dimming of the digital readouts is automatic and controlled by the background lighting. Refer to Figure 3-5 for a depiction of the COMM controls.

The KY-196's "flip flop" preselect feature enables the pilot to store one frequency in the standby display while operating on another and then interchange them instantly with the touch of a button. Both the active (USE) and the standby (STBY) frequencies are stored in a circuit component called EAROM (Electrical Alterable Read Only Memory) that provides a non-volatile storage of frequencies and programmed channels, so that when the radio is turned off and then back on, channel information is retained.

When the transmitter is in operation an illuminated "T" will appear in the center of the digital display.

Mode/Frequency/Channel Selector

In the frequency mode of operation the outer, larger, selector knob of the two concentric knobs located to the right of the display is used to change the MHz portion of the frequency display; the smaller knob (PULL 25K) changes the kHz portion. This smaller knob is designed to change the indicated frequency in steps of 50-kHz when it is pushed in and in 25-kHz steps when it is pulled out. At either band edge the frequency will "wrap-around;" thus it is not required to move completely across the frequency display in order to select a much lower or higher frequency. In the frequency mode of operation the tuning knobs control the frequency in the STBY window, which may then be transferred to the active (USE) window by pressing the frequency transfer (double arrow) button.

The channel mode of operation is entered by momentarily pressing the CHAN button while in the frequency mode. (Channel programming mode is discussed below.) If there is no activity for approximately five seconds the radio will return to the frequency mode of operation. In this case the channel frequency will be placed in the STBY window. The system may also be returned to the frequency mode by pressing the CHAN button again before five seconds have elapsed, and the status of the frequency mode will remain the same as it was prior to entering the channel mode. When CHAN is selected the last active frequency will remain tuned and displayed in the USE window. The last used channel number (1 to 9) will be displayed in the CHAN window unless no channels have been programmed, in which case the system defaults to channel 1 and dashes are displayed in the STBY window. When either end of the display is reached the display will "roll over" and start again at the respective end of the display.

The CHAN button is pressed and held for three seconds to enter the channel programming mode. The last used channel number will flash in the CHAN window and the last used active frequency will remain displayed in the USE window. Channel numbers from 1 thru 9 can then be selected by rotating either the small or large knob. Pressing the frequency transfer button (double arrow) will cause the frequency associated with that channel to flash; the frequency select knobs will then change the frequency as described in the frequency mode of operation, above, with the exception that between the rollover points dashes are displayed. To exit the channel programming mode, press the CHAN button, or after twenty seconds of no programming activity, the system will automatically exit the mode.

To enter the direct tuning mode of operation, the frequency transfer (double arrow) button must be depressed for more than two seconds. The standby window frequency will disappear, and the window will remain blank; the tuning knobs will then tune the active (USE) frequency directly. Increments and decrements of the tuning knobs will be as explained in the frequency mode of operation, above.

The KY-196 is also equipped with a stuck-microphone indicator. If the mic switch remains keyed for two minutes the display will begin flashing and the transmitter will shut down, preventing jamming of the frequency.

HF KHF-950 WITH KFS 594 CONTROL (Optional)

The KHF-950 with KFS 594 Control is a 150-watt transceiver system that provides 280,000 frequencies at 100 Hz increments with 19 channel preset capability in the HF band (2.0000 to 29.9999.9 MHz). It operates in AM and single sideband. Upper sideband (USB) is normally used for sideband operation, but lower sideband (LSB) is available where that mode may be used.

In TEL (A3J) mode, any of the ITU telephone channels (401 through 2241) may be selected.

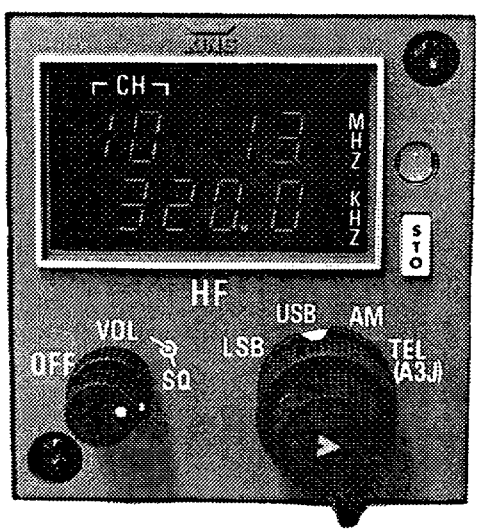


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Figure 3-6. HF COMM KFS 594 Control (Optional)

Controls and Indicators

All controls and indicators are located on the radio set control, which is normally mounted low and to the left on the copilot's instrument panel. The smaller left-most knob controls power to the receiver/transmitter and controls the volume of the received audio. Clockwise rotation turns the unit on and increases the volume.

The larger left-most knob controls the threshold of the received signal above which the audio is enabled (squelch). Turning the knob clockwise reduces the signal threshold (decreases the squelch).

The larger right-most knob selects the emission modes; LSB, lower sideband; USB, upper sideband; AM, amplitude modulation; and TEL (A3J, or ITU mode). When LSB, USB, or AM is selected, the radio is set to the corresponding mode and a frequency is displayed in the control head, which may be directly selected on one of the 19 user programmable channels. When TEL (A3J) is selected, the radio is set to the corresponding mode and an ITU channel is displayed in the control head.

The smaller right-most knob, when pushed in, moves the cursor (represented by a flashing digit) from left to right. One push increments the cursor one digit to enable that digit to be selected as required. When the small knob is turned, it increments or decrements the digit selected by the cursor.

The STO button is used to perform three separate functions. (1) When in the channel mode (NOT in program mode - program mode is annunciated by the flashing dash adjacent to the channel number), pressing and holding the STO button causes the control to display the letters "TX" and the tuned transmit frequency while the receiver monitors the transmit frequency. This enables the pilot to listen for signals on the transmit frequency of duplex channels. (2) If STO is pushed while the microphone is keyed, a 1000 Hz tone is broadcast, which may be used to break the squelch of some stations. In the program mode, selected by incrementing the cursor until the dash appears in flashing mode, the selected frequency may be entered into the channel appearing under the CH designation on the display.

In order to program any one of the 19 user programmable channels, proceed as follows: (1) Select the channel to be programmed. (2) Step the cursor to the frequency digits, as described above, and set in the desired frequency. Changing the displayed frequency of a programmable channel will automatically place the control head in program mode, as indicated by the flashing dash adjacent to the channel number. (3) Press STO to transfer the frequency into the T/R unit receiver. The flashing "TX" will appear in the upper right of the display and the cursor will move to the 10/1 MHz digits. (4) Change the display to the desired transmit frequency (if different from the receive frequency). (5) Press STO again. When the transmit frequency is accepted, the letters "TX" and the cursor will disappear.

If the user desires to operate the radio in the directly tuned mode without a channel number annunciated or a flashing dash, he may tune the channel selector to zero and then tune a frequency. The zero will disappear and the annunciated frequency will be relocated. Other frequencies may be selected in like manner as long as a channel other than zero is not selected.

Photocell activated dimming circuit adjusts the brightness of the display to compensate for changes in the ambient light level.

UNIVERSAL AERO-M SATCOM SYSTEM (OPTIONAL)

The optional Universal Avionics/Thrane & Thrane TT-3000 Series Aero-M SATCOM System provides one channel data/voice/fax telephone communications to the airplane via the INMARSAT satellite network. The Aero-M utilizes spot beams for voice and data services at 2400 bits per second (BPS), one-channel voice coding at 4800 BPS, fax 2400 BPS on two-wire RJ-11 type interface and can be interfaced with a personal computer (PC) via a RS232 serial port for data communication. The system utilizes a intermediate gain, mechanically steered SATCOM antenna with an integrated navigational reference system to enable the Aero-M to be operated independently of the airplane's navigation systems.

The Aero-M SATCOM Telephone must be turned off (Instrument panel PHONE switch in the OFF position) when navigation is based on the ADF.

The TT-5621A handset is the main user interface of the Aero-M system. Handsets are located both in the cockpit and cabin. The individual handset contains a keypad with 21 separate function keys, a built-in liquid crystal display (LCD) for operational and diagnostic readout, four indicator LEDs and a volume control. The handset allows the user to utilize a menu of operations that include placing and receiving calls, forwarding calls, saving and recalling phonebook entries, viewing a phone log and monitoring system operations.

The Aero-M SATCOM system may require an INMARSAT SIM card inserted into the satellite data unit before it will operate correctly. The SIM card contains system IDs and additional stored information (phonebooks). To insert the SIM card into the satellite data unit: (1) loosen the thumbscrew on the SIM card door (located on the front panel of the unit), (2) open the door and insert the SIM card into the slot with the gold contact pointing towards the right, and (3) ensure SIM card is seated properly, then close the card door and tighten the thumbscrew. The Aero-M system utilizes a multi-level PIN code system to limit access to maintenance and configuration levels. Normal usage and operation of the system usually requires only PIN 1.

There are five dialing formats that can be used to initiate a telephone call:

- Standard telephone numbers: Dialing a telephone number by entering call prefixes, area codes and number.
- Short codes (speed dialing): Short codes are two-digit codes that correspond to number addresses in the system phonebook.
- Handset to handset: If an auxiliary handset is connected to the AUX/FAX port it is possible to call handset to handset.
- Last number redial: The handset keeps a list of the last 20 numbers dialed.
- Call handoff: Call handoff is like call transfer on a standard telephone. If an auxiliary handset is used, it is possible to receive a call on either the number 1 or number 2 (Aux) handset and transfer the call to the other handset.

NOTE

SATCOM reception may be interrrupted briefly during turns due to shadowing of the antenna by airplane structure. Continuing the turn or reducing bank angle should restore communication.

AUDIO CONTROL PANELS

Two audio control panels are installed to provide individual audio selection by each pilot. Three-position switches (SPKR-OFF-HDPH) enable all audio inputs to be selected to the speakers or headphones. A two-position IDENT/VOICE switch is used in conjunction with the NAV and ADF switches to monitor either voice or coded identifiers. Two concentric MASTER VOLUME knobs control the headset or speaker volume of all selected audio sources. A PASS SPKR VOLUME knob controls the output volume of the passenger compartment speaker.

A rotary microphone selector switch has four standard positions. COMM 1 or COMM 2 connects the microphone in use to the respective VHF transmitter. PASS SPKR allows for announcements to passengers through the cabin speakers, but in PASS SPKR position, the COMM 1, COMM 2 and HF AUDIO are muted. The EMER/COMM 1 bypasses the audio amplifier, necessitating the use of a headset to receive, and volume control is available only at the radio. Transmitting remains normal from all microphone sources. An optional audio control panel has a fifth position to be used for the HF system, if installed.

A side tone control knob, which is concentric to the passenger speaker volume control knob, is located on the lower left side of the audio control panel. The side tone control allows the pilot and copilot to select individual side tone volumes within certain limits. The side tone cannot be completely removed; some side tone will always remain. When the operator positions the control knob, side tone volume for all of the transmitters being operated from the respective audio control panel, and the interphone side tone, will be set.

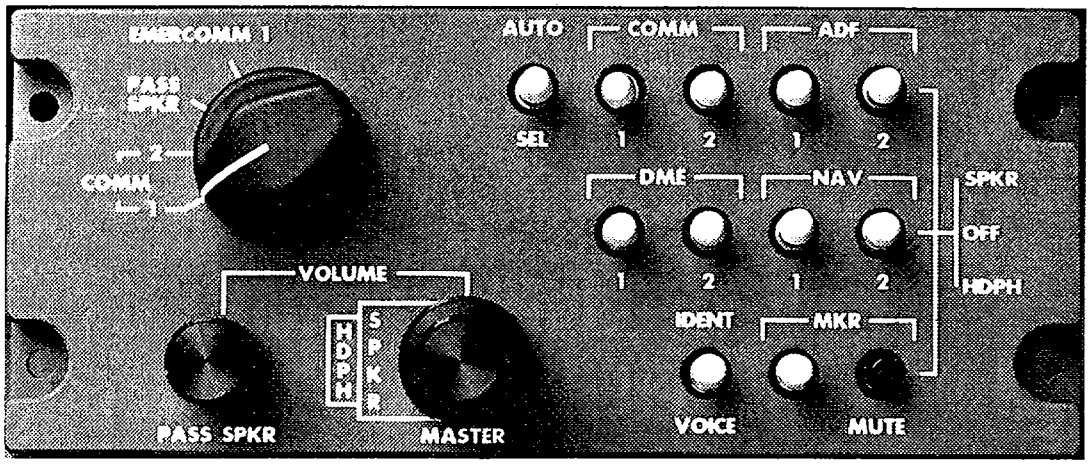

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Figure 3-7. Audio Control Panel (Typical)

A three-position AUTO SEL switch (SPKR-OFF-HDPH) automatically selects the proper speaker or headphone to match the position of the rotary microphone selector switch. All audio sources can be monitored at any time by use of the appropriate SPKR-OFF-HDPH switch regardless of the microphone selector switch or the AUTO SEL switch positions. A MKR MUTE button, when pressed, silences the marker beacon audio for approximately 30 seconds.

A two-position switch on the control wheel has MIC position for keying the transmitters and INPH for interphone communication when using the lip microphone or oxygen mask microphone. If a hand-held microphone is used, transmission is determined by the position of the microphone selector switch.

The copilot's audio panel is powered by the emergency bus, causing battery power to always be available to that panel when the BATT switch is in any position except OFF. In EMER position of the battery (BATT) switch the audio normal/emergency relay relaxes and connects the pilot's audio panel to the emergency bus; thus in case of loss of both generators both audio panels will continue to operate with the battery switch in the EMER position. COMM 1 transmit and audio will be operative and NAV 1 audio may be received.

VHF NAV

Dual KN-53 navigation receivers provide VOR, localizer and glideslope capability. The receivers are mounted with other avionics navigation and communication (NAV/COM) equipment in the center of the consolidated control panel, which is located on the left side of the center instrument panel. The controls/receivers of both NAV radios are one-piece units.

Each system has 200 VOR/LOC operating frequencies and 40 glideslope frequencies. VOR and localizer (VOR/LOC) frequencies are from 108.00 to 117.95 MHz. Glideslope frequencies are from 329.15 to 335.00 MHz. The localizer/glideslope frequencies are paired and are automatically tuned together. When the published localizer frequency is tuned, the glideslope frequency is also tuned. Multiple outputs drive the Flight Director, HSIs, and autopilot. All the basic functions have a built-in self-test.

KN-53 Controls

The KN-53 controls use two seven-digit gas discharge displays for the controlling (USE) frequency and a pilot-selected preset (STBY) frequency. The displays are dimmed automatically by means of automatic photo sensing. Dual concentric frequency select knobs control the display. The larger (outer concentric) knob increments or decrements the MHz portion of the display in one MHz steps. The small tuning knob (inner concentric) increments or decrements in 50 kHz steps. The frequency will roll over or under, as applicable, at the end of the tuning band so that tuning completely across the band to a much higher or lower frequency is not required. Tuning of the NAV frequencies in normal mode of operation is done in the STBY window and then "flip-flopped" into the USE window by pressing the frequency transfer (double arrow) button. This allows the pilot to pretune the desired frequency and then interchange the old and new frequencies with a touch of a button. The STBY window is then available for a new pretuned frequency.

The OFF PULL/ID knob operates as an on/off/volume control as well as a control for selecting voice/code identification (ID), or only code ID signals of VOR stations. Pulling the knob out allows the station identification tone signals to be heard, as well as the station voice announcements. Pushing it in will allow only NAV voice signals to be heard. Rotation of the knob allows volume control of the audio signals; complete counterclockwise rotation turns off power to the NAV receiver.

Interface of the NAV receivers with other equipment which use and display NAV signals is also discussed in the various parts of this sections. Controls and displays of the distance measuring equipment (DME), the copilot's horizontal situation indicator (HSI), and the pilot's primary flight display are discussed separately.

The pilot can select NAV 1 or NAV 2 on the primary flight display by utilizing the line select keys on the NAV SOURCE and BRG SOURCE menus on the PFD. The NAV/BRG button on the display control panel is used to select and deselect the NAV and BRG SOURCE menus on the on-side PFD. The available NAV sources are FMS1/FMS2 and VOR1/VOR2 or LOC1/LOC2. The active NAV source selection is displayed on the PFD in color-coded text as on-side (magenta) or cross-side (yellow). Inactive source legends are displayed in smaller white text.

The PFD displays the active lateral navigation course and deviation information on the compass rose and arc. Lateral navigation course and deviation information is made up of a course pointer, to/from arrow, lateral deviation bar and scale. The course pointer is a single bar arrow that points to the selected course.

To change the NAV source, if the desired source is the partner of a currently selected source, a single press of the adjacent line select key on the PFD will toggle the source selection. If the desired source is an on-side sensor located against a currently not active sensor pair, a single press of the adjacent line select key will select the desired source. A second press of the same line select key will toggle to the cross-side source, if installed. The NAV SOURCE menu is removed either by pressing the NAV/BRG push button, or by pressing R-LSK4 RETURN.

Selecting the active NAV source on the PFD also automatically selects the distance measuring equipment (DME) display to that of the NAV selected. Since the AlliedSignal DME does not provide station identification, no identification is available when VOR or LOC is the active NAV source. The distance display provides distance information in nautical miles to the station. Distance is associated with the active NAV source, thus providing distance to the next waypoint for FMS, distance to the VOR/DME (or VORTAC) station for VOR, and distance to the runway for LOC. Lateral navigation information normally is color-coded as on-side (green) or cross-side (yellow).

The vertical deviation scale on the PFD comes into view between the attitude ball and the altitude scale when a LOC is the active NAV source. The glideslope deviation pointer is diamond shaped, and color follows the active NAV source color. The vertical deviation scale and glideslope pointer are removed from view when a LOC is no longerthe active NAV source.

Refer to Figure 3-5 for a depiction of the KN-53 NAV controls.

KMR-675 MARKER BEACON RECEIVERS

The KMR-675 marker beacon receiver system is remotely mounted in the lower forward part of the nose avionics compartment. The marker beacon receiver provides marker beacon signals to the pilots through the marker beacon presentations on the pilot's primary flight display and the copilot's panel lights. The marker beacon receiver is in operation whenever the avionics power switches are on and power is available. It operates on a frequency of 75.00 MHz.

The annunciators in the pilots' primary flight displays are part time displays. A white box. located in the center right of the display, identifies the location of the marker beacon annunciator when a localizer frequency is tuned. The marker beacons are annunciated by the appropriately colored letters: a blue 0 for outer marker, an amber M for middle marker, and a white I for inner marker. The letters appear in the white box when the marker beacon receiver is activated. A marker beacon tone is transmitted to the audio control panel and will be heard in the speaker/headset, if selected. A 400 Hz tone is heard at the outer marker, a 1300 Hz tone at the middle marker, and a 3000 Hz tone for the inner marker.

The audio muting system (MKR MUTE) provides the pilots with a method of temporarily cutting out the marker beacon audio. When pressed, the marker beacon signal is muted for approximately 30 seconds. The MKR MUTE switches (push buttons) are located on the audio control panels.

The marker beacon antenna is mounted on the upper fuselage.

AUTOMATIC DIRECTION FINDER - KR-87

The KR-87 ADF is a single-unit receiver/control mounted in the consolidated control panel on the left side of the center instrument panel. The digitally tuned automatic direction finder system operates in the frequency range of 200 to 1799 kHz. The KR-87 control panel uses two gas-discharge digital readouts to display the controlling (active) frequency and a pilot-selected preset (STBY) frequency. The system is comprised of a receiver, a built-in electronic timer, and a KA-44B combined loop and sense antenna. The control of audio signals from the ADF is discussed under Audio Control Panels in this section. Refer to Figure 3-5 for a depiction of the ADF control panel.

Power to the system is controlled by the ON/OFF/VOL knob on the control panel Rotating the knob clockwise from the detented position applies power to the ADF. Rotation of the control also adjusts audio volume. Control of the frequency is by the two concentric knobs on the right side of the control panel. The inner knob controls the "1" digits when pulled out, and the "10" digits when pushed in. The outer concentric knob controls the 100 and 1000 digits up to a frequency of 1799 kHz. When FRQ is annunciated in the display the frequency select knobs control the tuning of the standby (STBY) window digits. Once tuned, the standby frequency may then be inserted into the active window by pressing the FRQ (double arrow) button which will "flip-flop" the standby and active frequencies.

Operating Modes

Two modes of operation are selected by the ADF button ("push-in, push-out") on the control face. When the button is out antenna (ANT) mode is selected and will be annunciated. ANT mode provides improved audio signal reception for tuning and is used for identification. In ANT mode the ADF pointer will park at 90-degrees to the airplane heading. When the ADF button is in the depressed position ADF mode is selected and annunciated, and relative bearing will be indicated.

The BFO (beat frequency oscillator) mode is selected by pressing in the BFO button on the face of the control. BFO will then be annunciated. BFO mode is used to better identify coded station identifier signals from stations which are unmodulated.

To perform a pre-flight or in-flight test of the ADF system, tune and identify a station with a strong usable signal and select ADF mode. The pointer should seek the station without hesitation. Wavering, hesitation, or reversals indicate that the station is too weak or that there is a system malfunction.

Timer Operation

The flight timer incorporated into the ADF will always be reset when the power to it is interrupted, either by the ON/OFF switch, the avionics master switch, or the loss of power to the system. Flight time should be read before shutdown for that reason. Flight time may also not be accurate since it is time from electrical power on. The timer has two functions - flight time and elapsed time. Flight time and elapsed time are displayed and annunciated alternately by depressing the FLT/ET button on the control panel. The flight timer continues to count up until the unit is turned off. The elapsed timer may be set back to :00 by pressing the SET/RESET button on the control panel. It will then start counting up again. Pressing the SET/RESET button will reset the elapsed time whether it is being displayed or not. There is also a countdown mode in the elapsed time function. To enter the countdown mode, the SET/RESET button is depressed for about two seconds, or until the ET annunciation begins to flash.

When the annunciation flashes it indicates that the system is in ET set mode and a time of up to 59 hours and 59 minutes may be preset into the elapsed timer, with the concentric knobs. The preset time will be displayed and remain unchanged until SET/RESET is pressed again, which will start the countdown from the preset time. When the timer reaches :00 it will begin to count up and the display will flash for about 15 seconds. While flight time (FLT) or elapsed time (ET) modes are being displayed, the standby frequency is kept in memory. It may be called back by pressing the FRQ button, and then transferred to the active frequency by pressing the FRQ button again.

While FLT or ET is displayed, the in use frequency on the left side of the display may be directly changed by using the frequency select knobs, without any effect on the stored standby frequency or the other modes. This feature is useful when tuning for stations the exact frequency of which the operator may not know.

A second KR-87 ADF may be installed, in which case the first system is duplicated with a second complete system, and operation of the second ADF is identical to the first. If a second ADF is installed, its bearing information may be displayed on the bearing needle on the pilot's or copilot's HSI.

ATTITUDE HEADING REFRENCE SYSTEM (AHRS)

The Collins Attitude Heading Reference System (AHRS), consisting of two attitude heading computers, provides linear acceleration data to the flight control system. In addition, the AHRS supplies attitude and stabilized magnetic (or free gyro) heading to the following subsystems: Electronic Flight Instrument System (EFIS), Integrated Avionics Processor System (IAPS), Weather Radar System (WXR), Lightning Detection System (LDS) and the Flight Management System (FMS). The attitude heading computers, which are physically and functionally separated from each other, utilize inertial sensors to generate digital data to obtain three-axis angle, rate and acceleration information. The computers receive magnetic flux inputs from the flux detector unit, compass compensation from the external compensation unit, and strut switch logic from the integrated avionics processor system. In turn, the attitude heading computers supply attitude, stabilized magnetic (or free gyro) heading and linear acceleration outputs.

The flux detector unit uses a pendulous sensing element to detect the direction of the magnetic field of the earth. This input is utilized for computing stabilized magnetic heading. The external compensation unit provides alignment and compass correction data needed to cancel compass errors caused by misalignment of the flux detector unit and the airplane on the magnetic field of the earth. This data is airplane specific and is obtained during AHRS leveling and compass swing procedures.

For normal operation, no pilot control is required. However, for each AHRS, a switch mounted on the flight deck provides a means to select the directional gyro mode. In addition, switches are provided for left and right slewing. AHRS transfer (reversion) to the cross-side AHRS is also selected via flight deck mounted switches. No other pilot control operation is required.

Encoding Altimeter

The copilot's altimeter is provided with a servoed drum/pointer display of barometrically corrected pressure altitude. The barometric pressure is set manually with the baro knob and is displayed in both inches of mercury and millibars on the baro counters. The altimeter is an encoding altimeter, and provides data to the transponder. The altimeter transponder combination works in pair and the encoding altimeter is not "switchable". When XPDR 1 is selected on the XPDR 1/XPDR 2 switch located on the consolidated control panel, traffic control and altitude information will be supplied by the number one transponder and altitude information is provided by the air data computer. If XPDR 2 is selected, transponder two and the copilot's altimeter will supply the data. If altitude (mode C) data transmission to air traffic control is lost, it will be necessary to select the opposite transponder.

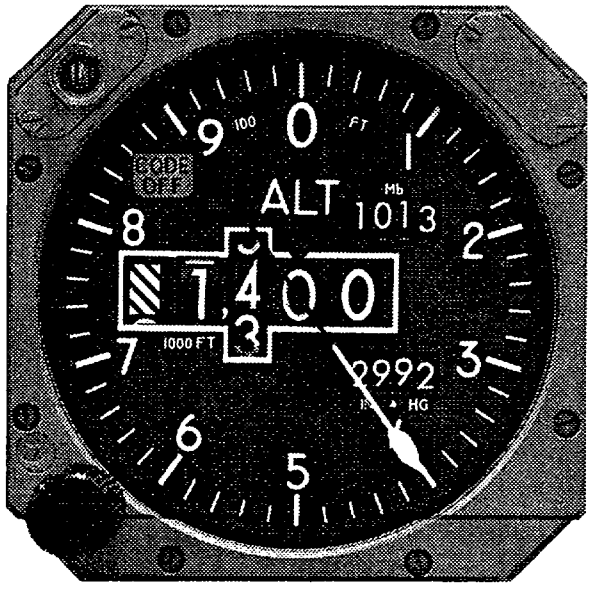

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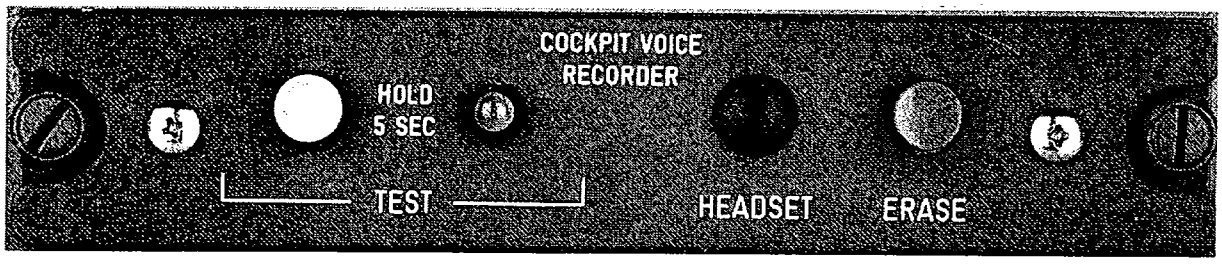
Figure 3-8. Altimeter

The altimeter is equipped with a red CODE OFF warning flag which will show on the face of the altimeter if the transmission of altitude data to its mated transponder fails. If the CODE OFF flag appears, the opposite transponder should be selected. The encoding altimeter receives power from 5-ampere circuit breakers (ENC ALT) on the right circuit breaker panel.

An amber altitude alert light (ALT) on the altimeter bezel illuminates to provide a visual indication when the airplane is within 1000 feet of the preselected altitude and extinguishes when the airplane is within 250 feet of the preselected altitude. After capture, the light will illuminate if the airplane departs more than 250 feet from the selected altitude and a warning tone or the voice annunciator will announce "ALTITUDE".

A200S COCKPIT VOICE RECORDER

A A-200S cockpit voice recorder system provides a continuous 120-minute record of all voice communications originating from the cockpit as well as sounds from warning horns and bells. The system is protected by a 5-ampere circuit breaker located in the tailcone electrical junction box.



S251-1120-00

Figure 3-9

The sensitive microphone is located to the left side of the fire tray. The system is energized when the battery switch is in the BATT position. The control panel, normally located on the right instrument panel, contains a TEST button, and an ERASE button. System operation is checked by pressing the TEST button. When the TEST button is held down for five seconds illumination of the green light on the control panel indicates correct functioning of the voice recorder system. Pressing the ERASE button for approximately 2 seconds will cause the entire record to be erased. Erasure can only be accomplished on the ground with the main entry door opened.

The installation is equipped with a five-G switch which will activate any time the airplane is subjected to a five-G force; this will disable the system's erasure mechanism until a reset button on the G-switch is pressed. The switch, and the unit, are located forward of the tailcone baggage compartment.

ARTEX LOCATOR BEACON

The Artex 110-4 is a second generation emergency locator transmitter (ELT) system which transmits the standard swept tone signal on 121.5 and 243.0 MHz. The system consists of an antenna mounted on top of the fuselage, a transmitter and tray mounted in the tailcone area, and a remote switch mounted on the instrument panel. When transmitting, the cockpit ELT ACTIVATED WHEN LIT light will flash continuously.

The transmitter is activated by one of three methods:

- In the event of a crash (provided the transmitter has been securely mounted and locked in its tray).
- When the cockpit switch is placed in the ON position.
- When the transmitter switch is placed in the ON position.

Once activated, the ELT must be reset using one of the following methods:

- From the cockpit, place the switch to the ON position. Ensure the ELT ACTIVATED WHEN LIT indicator light is illuminated. Immediately place the switch to the ARM position. Ensure the light is extinguished.

- From the transmitter, place the switch to the ON position, and then immediately place the switch to the OFF position.

NOTE

Normal switch configuration is for the transmitter switch to be placed in the OFF position and the cockpit switch to be placed in the ARM position. It is impossible to disarm the ELT by improper placement of the cockpit (or transmitter) switches.

System testing is accomplished by placing the cockpit switch in the ON position, observing steady illumination of the ELT ACTIVATED WHEN LIT indicator light for the first three seconds, and confirming audio tone through a COMM radio tuned to either 121.5 or 243.0 MHz. Once testing is complete, ELT must be reset.

FLIGHT GUIDANCE

ROCKWELL COLLINS PRO LINE 21 FLIGHT CONTROL SYSTEM

The Rockwell Collins Pro Line 21 Flight Control System (FCS) is an integrated three-axis autopilot with yaw damper, flight guidance, and automatic pitch trim. The FCS provides fail-safe autopilot and dual flight guidance functions. The system consists of two identical FGC-3000 Flight Guidance Computers (FGCs), three SVO-3000 Primary Servos, an APP-85 Autopilot Panel, and a MSP-85 Mode Select Panel. The latest revision of the Rockwell Collins pilot's guide is provided with the airplane and must be on board the airplane immediately available to the crew.

The FCS consists of an autopilot panel (APP), two flight guidance computers (left and right FGC), one two-mode select panels (left and right MSP), and three primary servos. The FGC receives Flight Director mode select data from the MSP and vertical speed/pitch wheel input, autopilot engage logic from the APP, attitude and heading data from the onside Attitude Heading Computer, and cross-side data from the opposite FGS. The APP provides engage clutch power to the servos and autopilot engage inputs to both FGCs. The controls integrated in the APP include the ROLL knob, vertical speed/pitch wheel, autopilot engage lever, yaw damper engage lever, TURB and AP XFR controls. Control inputs from the APP are applied to both FGCs.

Command of the FCS is accomplished using the APP-85 Autopilot Panel controls and the MSP-85 Mode Select Panel push button mode selectors, along with yoke-mounted SYNC (vertical synchronization), AP DISC (autopilot disconnect) switches and a throttle-mounted GA (go-around) switch. When the flight director is active and the autopilot is disengaged, the pilot manually maneuvers the airplane in response to the selected flight guidance by observing the flight director display. When the autopilot is engaged, the autopilot maneuvers the airplane in response to the selected flight guidance, and the pilot monitors the flight path by observing the commands displayed by the flight director.

The yaw damper provides yaw damping and turn coordination. The automatic pitch trim system trims out sustained elevator forces when the autopilot is engaged. Whether the autopilot is engaged or disengaged, the flight control system provides commands to:

- Hold a pressure altitude.
- Hold a vertical speed.
- Hold an indicated speed.
- Capture and track a selected altitude.
- Capture and track a selected heading.
- Capture and track a selected radio course (VOR, LOC,G/S).
- Capture and track a lateral navigation course.
- Maintain a wings-level, fixed pitch-up attitude for go-around.

NOTE

The APS-3000 is available with a single flight director avionics package designed for single-pilot operation and a dual FD avionics package for dual pilot operation.

The two FGCs are installed within the IAPS card cage located in the nose compartment of the airplane. Computation circuits in the left FGC receive discrete control data from cockpit switches, attitude and heading data from the left AHC, concentrator data from both IOCs, crosstalk data from the right FGC, and flight director mode select/engage data from the left MSP. The right FGC operates in the same way, except that it functions with right side circuits. The two systems operate together to drive the servos and the electric trim.

Mode Selection

The MSP-85 Mode Select Panel (MSP) provides push buttons used by the pilot to select and deselect flight guidance modes. The lateral and vertical mode select controls as well as the flight director on/off control are located on this panel. A mode cannot be selected unless all conditions required by that mode are present. The left MSP is used by the pilot to set the flight director modes for the left side flight guidance system. The optional right MSP is used by the copilot to set the flight director modes for the right side flight guidance system. Control inputs from the MSP are applied to both FGCs. A mode interlock within each individual FGC illuminates the MSP annunciators.

Several additional flight controls are external to the APP and MSP. These include an AP DISC switch, GA switch, pitch synchronization switch (AP Sync), and pitch trim control. The SVO-3000 servos physically position the airplane control surfaces (elevator, ailerons, and rudder).

For single PFD installations, all flight director steering commands displayed on the PFD come from the left FGC. No XFR side arrow is displayed and there is no AP XFR switch. For the optional second PFD configuration, a copilot side flight director is provided. Additional hardware on the copilot's side includes an MSP and an APP with an autopilot transfer button. The pilot's and copilot's flight director modes are synchronized so that either pilot may select the new mode from the associated MSP. The exception to this is when in an APPR and GA mode, where independent guidance information is provided to each pilot. With dual PFDs, the pilot selects which FGS is in control via the AP XFR switch located on the APP-85. A XFR arrow in each PFD indicates which FGS is active. Each PFD displays the FD commands from the FGS computer selected with the SFR switch, except for go-around (GA) and approach (APPR) modes. The APPR and GA modes are referred to as independent modes, and only the on-side FGS is used by the respective PFD for independent modes.

NOTE

Except for Overspeed mode, turning off the flight directors and disengaging the autopilot cancels the active mode.

The following is a summary of flight guidance modes:

- Flight Director Mode - The flight director is the flight control system; steering commands and mode annunciations are displayed on the PFD.
- Roll Hold Mode - Roll hold is the basic lateral operating mode. Roll hold is active when no other lateral mode is active. Roll hold has no mode select button.
- Heading Select Mode - The HDG button on the mode select panel is used to select heading-select mode (push-on/push-off). Heading select mode generates commands to capture and track the heading reference.
- Navigation Mode - The NAV button on the mode select panel is used to select navigation mode (push-on/push-off). Navigation mode generates commands to capture and track guidance for enroute navigation and non-precision approaches.
- Approach Mode (Lateral and Vertical) - Approach mode, activated by the APPR button on the mode select panel, is capable of performing course captures from intercepts, which differ from the selected course by 90 degrees. When armed, lateral and vertical approach modes monitor airplane closure rate toward the selected course/glide path and calculates the optimum capture point.
- Back Course Mode - Selection of B/C provides the arm, automatic capture and tracking of the non-precision approach localizer/MLS back course beam.
- Half Bank Mode - When active, half bank mode limits the maximum commanded roll angle to 15 degrees. The half bank mode is automatically selected when climbing through the half bank transition altitude of 18,000 feet.
- Pitch Mode - Pitch mode is the basic vertical operating mode, and is active when no other vertical mode is active.
- Altitude Select Mode - Altitude select mode, which is armed whenever a flight director is active or the autopilot is engaged, preselects altitudes of 0 feet to 55,000 feet from vertical rates of plus or minus 12,000 feet per minute.
- Overspeed Mode - Overspeed mode is automatically selected when a significant overspeed occurs from all vertical modes except altitude select capture or track, and altitude hold.

Autopilot Control Panel

The APP-85 autopilot control panel, mounted on the center pedestal, provides the means of engaging the autopilot and yaw damper, as well as manually controlling the autopilot through the turn knob and pitch wheel. The autopilot (AP) engage switch is used to engage the autopilot and yaw damper. Push the AP engage lever up and hold for one second to select the autopilot mode for the flight guidance system. If no faults are detected during the pre-engage test, the autopilot mode will engage and the lever will remain up in the ENGAGE position. If a fault is detected, the autopilot will not engage and the lever will drop to the DISENGAGE position.

If the flight guidance system turns the autopilot off, the AP engage lever will drop and the green AP on the primary flight display changes to flashing yellow. Push the yoke-mounted AP/YD DISC switch to turn the autopilot off.

NOTE

Engaging the autopilot also engages the yaw damper, if not already engaged. Disengaging the autopilot does not disengage the yaw damper.

The AP XFER button switches control of the autopilot from the pilot's flight director to the copilot's flight director. To operate, push the button once to switch control from the pilot's to copilot's side. Push the button again to switch control of the autopilot back from the copilot's flight director to the pilot's flight director. The AP XFER indicator is illuminated if the autopilot is being controlled by the copilot's flight director system. If the indicator is not illuminated, the autopilot is being controlled by the pilot's flight director system.

The pitch wheel allows manual pitch control of the airplane proportional to the rotation of the wheel and in the direction of wheel movement. Rotate the pitch wheel to change the existing vertical command reference to the flight guidance system. Rotating the wheel toward UP increases the existing reference value. Rotating the wheel toward DN decreases the existing reference value. The wheel is spring loaded and will return to the center detent if released.

The APP-85 autopilot system features a turbulence mode that is used to soften the airplane ride in turbulent weather conditions. When in turbulence mode, the aileron and elevator channel gains are reduced. The mode is activated by pushing the TURB button once, and pushing again to deactivate the mode. The TURB indicator is illuminated if the turbulence mode is a selected flight guidance mode. The indicator is not illuminated if turbulence mode is not selected.

The turn knob is used to input a bank command to the flight guidance system. The amount of airplane bank is proportional to the amount of knob rotation. The knob is not spring loaded and will remain in the position selected by the pilot.

NOTE

If the TURN knob is out of detent when the autopilot is engaged, the existing airplane heading will be maintained and the autopilot will not accept the turn knob input until the knob is first centered to the detent position.

The YD engage lever is used to select the yaw damper mode for the flight guidance system. Push the lever up and hold for one second to engage the mode. If no faults are detected during a pre-engage test the yaw damper mode will engage, the lever will remain up in the ENGAGE position, and a green YD is shown on the PFD. If a fault is detected, the yaw damper will not engage and the lever will drop to the DISENGAGE position.

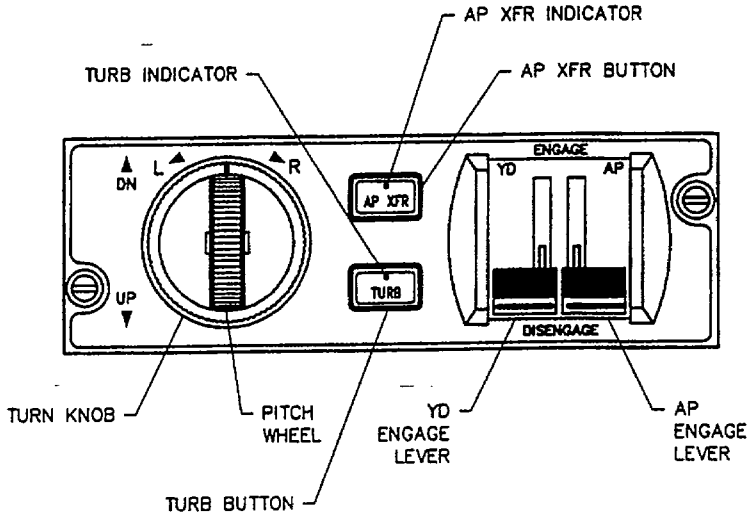


Figure 3-10. APP-85 Autopilot Control Panel Displays and Controls

If the flight guidance system turns the yaw damper off in automatic yaw damper disconnect, the lever will drop and the green YD on the primary flight display changes to flashing yellow. Push the yoke mounted AP/YD DISC switch to change YD to steady white. For manual yaw damper disconnect, push the YD engage lever down or push the yoke-mounted AP/YD DISC switch to turn the yaw damper off.

NOTE

Engaging the yaw damper does not engage the autopilot. Disengaging the yaw damper also disengages the autopilot, if not already disengaged.

The CHP-3000 Course Heading Panel, located in the center pedestal, is used to input desired course, altitude, and heading reference to the flight guidance system. The ALT (altitude) knob sets the desired altitude reference in the left and right side (if installed) flight guidance system. Clockwise rotation of the knob increases the selected altitude value. The CRS knob sets the desired course reference in the left side flight guidance system. Clockwise rotation of the knob increases the selected heading value. The PUSH 100 FT CANCEL switch deactivates the 100 foot altitude warning margin. The PUSH DIRECT switch automatically selects a course direct to the tuned left side NAV station and returns the left side course deviation to zero. The PUSH SYNC switch is used to synchronize the heading reference to the current airplane heading. This switch simultaneously synchronizes the heading bug on the left PFD and right PFD (if installed).

The CKP-3000 Course Knob Panel is located on the instrument panel below the right Display Control Panel. The course knob panel is used by the copilot to input the desired course reference to the right side flight guidance system. Desired altitude and heading references to the right side flight guidance are input using the course heading panel. Rotate the CRS (course) knob to set the desired course reference in the right side flight guidance system. Clockwise rotation of the knob increases the selected course value. The PUSH DIRECT switch automatically selects a course direct to the tuned right side NAV station and is used to return the right side course deviation to zero.

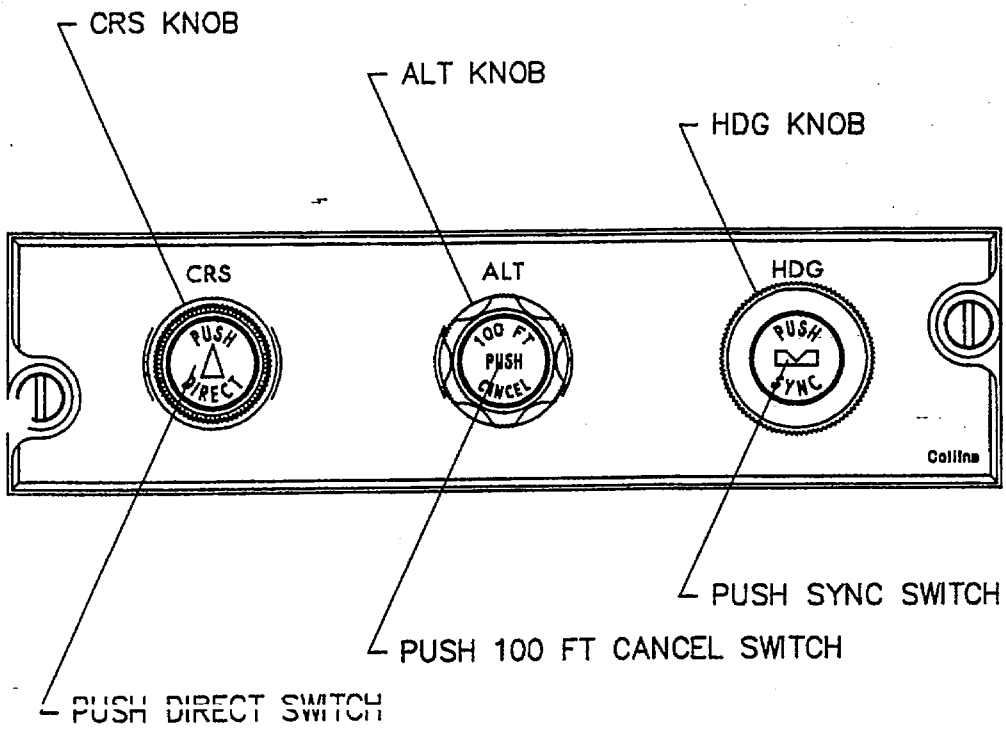


Figure 3-11. CHP-3000 Course Heading Panel

Display Control Panel/Controls

The left DCP-3000 Display Control Panel is located on the instrument panel between the left primary flight display and the left multifunction display. The left display control panel controls the data being shown on the left PFD and left MFD. The optional right DCP-3000 Display Control Panel is located on the instrument panel next to the optional right PFD. The right display control panel controls the data being shown on the right PFD. The -002 version is used when the weather radar autotilt feature is desired and the -102 version is installed on airplanes without autotilt weather radar.

The BARO knob is used to change the barometric pressure correction value. This barometric correction value is shown below the PFD altitude scale. The GCS button is pushed to start the ground clutter suppression circuitry in the weather radar system. Push the GCS button again to close the ground clutter suppression circuitry. The MENU SET knob changes the value of the selected (boxed) menu item. Clockwise rotation of the knob increases the reference value.

Push the NAV/BRG button to display the BRG SOURCE and NAV SOURCE menus on the PFD. The BRG SOURCE menu shows a single-bar pointer and a double-bar pointer. Repeatedly pushing the associated line selects the key to cycle through the possible bearing pointer selections. Possible bearing sources are: OFF, FMS, VOR, and ADF. The enlarged annunciation is the active source. The NAV SOURCE menu shows the possible active navigation sources. FMS1 and FMS2 annunciations are adjacent to the top right line select key. VOR1/LOC1 and VOR2/LOC2 annunciations are adjacent to the second right side line select key. Push the line select key to select the active on-side navigation source. Pushing the line select key again toggles source to the cross-side sensor. The enlarged annunciation is the active source. Pushing the RETURN line select key removes the NAV SOURCE menu.

The PUSH MENU ADV switch moves the highlight (box) to the next menu item. The PUSH STD switch selects the standard barometric pressure correction oF 29.92 inches of mercury or 1013 hecto Pascals. The barometric pressure correction is always shown as a numeric readout. The desired range for radar coverage is selected by the RANGE knob. Clockwise rotation increases the range, depicted in nautical miles.

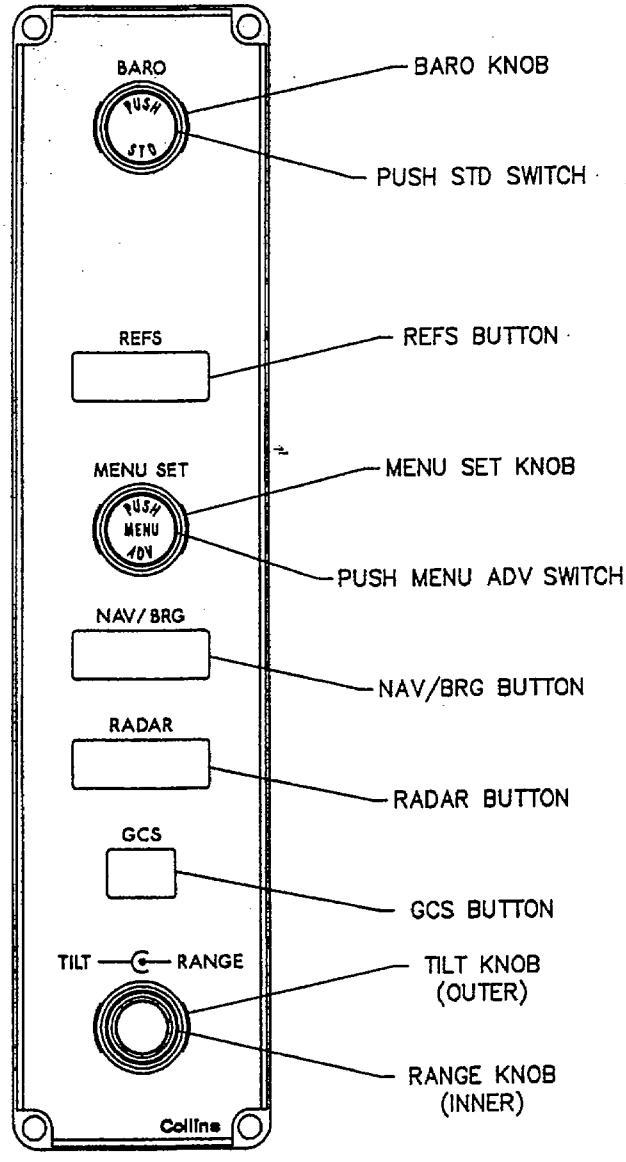


Figure 3-12. DCP-3000 Display Control Panel

RADAR Button: Shows the weather radar menus on the PFD. The left side RADAR menu shows GAIN, SEC (sector) scan, STAB (stabilization), TGT (target alert), and TEST. The right side RADAR menu displays the radar modes: STBY, WX, WX + T, MAP, and TURB.

GAIN: The current gain setting is shown in a box next to the GAIN legend. Turn the MENU SET knob to set the gain at NORM, plus or minus 1, 2, or 3.

SEC: The sector scan function (WXR-852 only) is toggled between ON or OFF by pushing the SEC line select key. The enlarged annunciation is the active state.

STAB: The stabilization function is toggled between ON or OFF by pushing the STAB line select key.

TGT: The target alert function (WXR-852 only) is toggled between ARM or OFF by pushing the TGT line select key.

TEST: The test display pattern can be selected by pushing the TEST line select key. The TEST annunciation is enlarged while active.

STBY mode: Push the STBY line select key to select the weather radar standby mode. The STBY annunciator is enlarged while active.

WX and WX + T modes: Push the WX line select key to select the weather mode. The WX annunciation is enlarged while active.

Push the WX line select key again to select the weather and turbulence detection mode (WXR-852 only). The WX + T annunciation is enlarged while active.

MAP mode: Push the MAP line select key to select the ground mapping mode. The MAP annunciation is enlarged while active.

TURB mode: When the WX + T mode is selected the RETURN annunciation changes to TURB. Push the TURB line select key to show turbulent weather only. After 10 seconds, this mode returns to the WX + T mode.

Push the RETURN line select key to remove the RADAR menu.

REFS Button: Push the REFS button to show the V speed reference menu, the minimum radio altitude, the minimum barometric altitude, and the N_1 reference setting. Push the associated line select key to box a value and then turn the MENU SET knob to set the selected value.

The V speed reference menu shows the current V_T, V_2, V_R, and V_1 values on the left side of the PFD.

The minimum radio altitude, the minimum barometric altitude, and the N_1 REF values show on the right side of the PFD.

Push the RETURN line select key to remove the REFS menu.

TILT Knob Turn the TILT knob to adjust the weather radar antenna tilt up and down. Clockwise rotation tilts the antenna up.

Mode Select Panel/Controls

The MSP-85 Mode Select Panel, located in the center pedestal, is used to select the lateral and vertical modes of operation for the flight guidance system.

1/2 BANK Button: Selects half-bank mode, which is used at higher altitudes to reduce the maximum airplane bank angle. If the conditions required for this mode are met, the mode becomes active.

1/2 BANK Indicator: Illuminates only if 1/2 bank mode is active.

ALT Button: Selects altitude hold mode. If the conditions required for this mode are met, the mode becomes active.

ALT Indicator: Illuminates only if altitude mode is active.

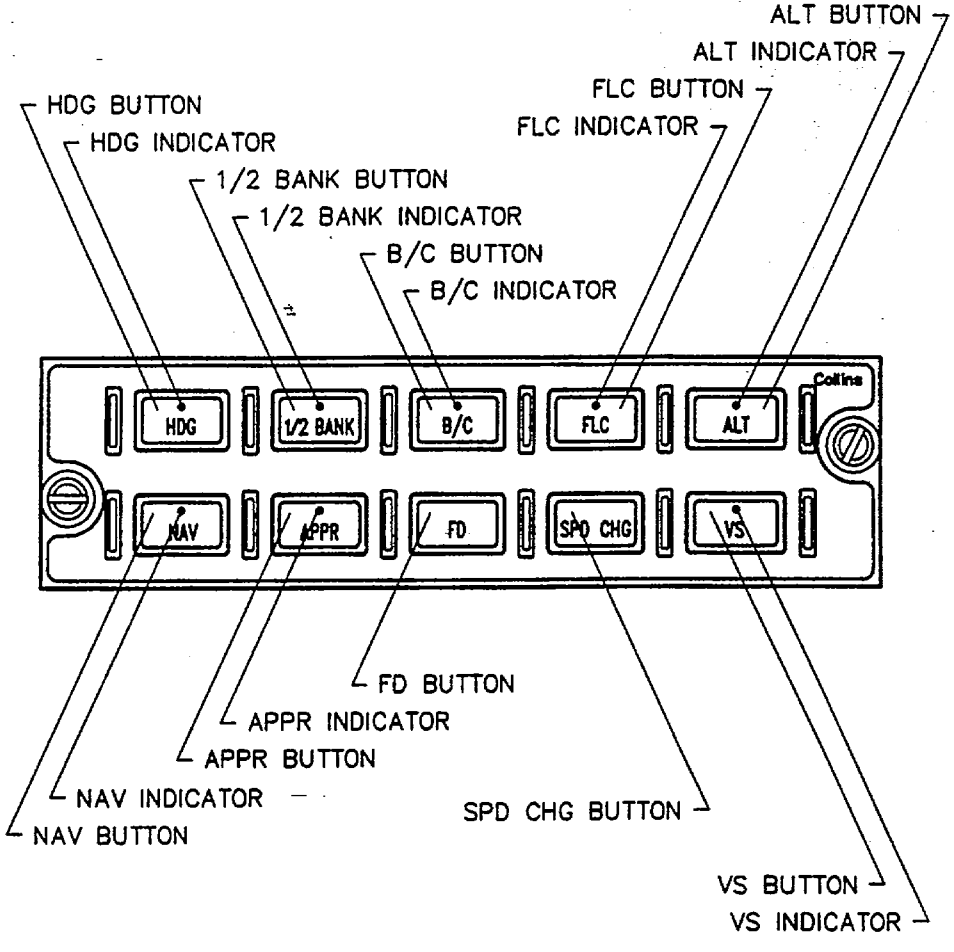


Figure 3-13. MSP-85 Mode Select Panel

APPR Button:	Selects approach mode. If the conditions required for this mode are met, the mode becomes active.
APPR Indicator:	Illuminates only if approach mode is active.
B/C Button:	Selects the back-course mode. If the conditions required for this mode are met, the mode becomes active.
B/C Indicator:	Illuminates only if approach mode is active.
FD Button:	Selects flight director mode. If the conditions required for this mode are met, the mode becomes active.
FLC Indicator:	Selects flight level change mode. If the conditions required for this mode are met, the mode becomes active.
FLC Indicator:	Illuminates only if flight level change mode is active.
HDG Button:	Selects heading mode. If the conditions required for this mode are met, the mode becomes active.
HDG Indicator:	Illuminates only if heading mode is active.
NAV Button:	Selects navigation mode. If the conditions required for this mode are met, the mode becomes active.
NAV Indicator:	Illuminates only if navigation mode is active.
SPD CHG Button:	Selects speed change mode. Push the HDG button to select heading mode. If the conditions required for this mode are met, the mode becomes active.
VS Button:	Selects vertical speed mode. If the conditions required for this mode are met, the mode becomes active.
VS Indicator:	Illuminates only if vertical speed mode is active.

COPILOT'S ATTITUDE INDICATOR (SMITHS)

The copilot's Smiths attitude indicator (AI) is an electrically-driven instrument which allows 360 degrees of roll without tumbling. The three-inch instrument is supplied attitude information by the copilot's AHRS. There is no flight director capability.

Pitch attitude reference marks of 10, 20 and 30 degrees up and down are marked on the attitude sphere. Bank angle increments of 10, 20, 30, 45, 60 and 90 degrees are provided. The symbolic sky is blue and the ground is brown. A conventional inclinometer is attached to the bottom of the instrument.

An ATT button on the lower left side of the instrument case may be used to test the indicator. Pressing and holding the ATT button will cause the indicator to assume a 30-degree right bank and 15-degree nose up attitude, which indicates proper operation.

A red ATT warning flag will appear in the top of the instrument to warn of instrument power failure. The attitude indicator will operate any time the battery switch is in the BATT position, and the Avionics Master switch is ON.

COPILOT'S (AND STANDBY) HORIZONTAL SITUATION INDICATOR

The standby horizontal situation indicator (HSI) is a three-inch instrument located on the left side of the center instrument panel. In the two-PFD standard panel configuration, a second HSI is situated on the copilot's side of the panel. Dual glide slope pointers are provided, one on each side of the instrument, without digital readouts of course or distance.

The HSI displays compass heading, glideslope and localizer deviation, and airplane position relative to VOR radials. The compass card is graduated in 5-degree increments and a lubber line is fixed at the forward position. Azimuth markings are fixed at 45, 135, 225, and 315 degrees on the compass face. A fixed reference airplane is in the center of the HSI, aligned longitudinally with the lubber line markings.

The heading cursor and course cursor are set by knobs located on the instrument. Once set, the heading and course cursors rotate with the compass card.

A heading flag (HDG) will appear in the instrument when the compass system is OFF, the heading signal from the directional gyro becomes invalid, primary power to the indicator is lost, or the error between the displayed heading and the received signal becomes excessive.

The course knob sets the course cursor. The course deviation bar, which forms the inner segment of the course cursor, rotates with the course cursor. Like the HDG cursor, the course cursor rotates in its set position with the compass card.

The course deviation bar moves laterally in the HSI in relation to the course cursor. Course deviation dots in the HSI act as a displacement reference for the course deviation bar. When tracking a VOR, the outer dot represents 10 degrees, while on an ILS localizer it represents 2-1/2 degrees. White TO-FROM flags point to or from a station along the VOR radial when operating on a VOR. A red NAV warning flag comes into view when power is OFF, when NAV information is unreliable, or when signals from the NAV receiver are not valid. The copilot's HSI normally can display only NAV 2 information. A NAV 1/NAV 2 switch is available, and if installed, is mounted adjacent to the copilot's HSI.

PULSE EQUIPMENT

KT-70 TRANSPONDERS

The KT-70 Mode S transponder system consists of two panel mounted-units, two external antennas mounted on the bottom of the airplane nose section, and a control wheel mounted XPDR IDNT switch for each pilot. Transponder one receives its altitude encoding information from the air data computer and transmits coded pulse-train replay signals on 1090 MHz. It can reply to Mode A (aircraft identification) and Mode C (altitude reporting) interrogations on a selective reply basis on any of 4096 information code selections. Transponder two obtains its altitude data from the copilot's pneumatic altimeter. The altitude reporting capability is provided by the mated altitude source to each transponder set. The transponders have mode S capability, which enables the ground station to individually select the airplane by its preprogrammed aircraft address, which is assigned to the airplane by the FAA. A XPDR 1/XPDR 2 switch, located on the control panel to the left of the two transponder controls, selects which transponder is operating. The non-selected transponder is placed in forced standby mode so that it can be selected at a moment's notice, if required. A landing gear squat switch removes power from the transponder circuit when the airplane is on the ground and disables both mode A and mode C, so that it is not necessary to select SBY on the ground. Refer to Figure 3-5 for an illustration of the transponder control panel.

KT-70 Control Panel

The KT-70 uses a digital readout to display the pilot selected transponder code. The four-digit code is set into the display by four knobs - one for each digit. A photocell on the face of the control automatically dims the display according to ambient cabin light. Power and mode of operation are controlled by the power and mode switch which has OFF, SBY, TST, GND, ON and ALT positions. OFF removes power from the system. SBY applies power to the system for warmup and allows momentary power interruptions which may be desired without having to turn the system OFF. When a transponder is in standby, either because of the SBY position being selected on the power and mode switch or because of the selection on the XPDR 1/XPDR 2 switch, SBY will be annunciated in the center of the digital display. In ON, the transmitter is enabled for normal operation, except that the altitude information of the mode C reply and the altitude fields of the mode S reply are suppressed. ALT position causes transmission of uncorrected barometric altitude (based on a barometric pressure of 29.92, which is supplied by the encoding altimeter) in mode C and mode S interrogations. ON or ALT will be annunciated respectively when either of those selections are made.

The TST position initiates a system self-test. To test the system, select the desired transponder and turn the selector to TST position. The TST position causes the selected transponder to respond to internal interrogation, verifying memory data and making hardware and squitter checks. The transmitter is disabled. All display segments will illuminate. Should a squitter error occur, the transmitter is considered inoperative and the message "FO 1" will appear in the altitude display. Should a memory error occur, the message "FO 2" (internal) or "FO 3" (external) will appear. Should a failure occur, normal operation is prohibited and "FO 4" will appear. If no errors are detected, the unit will remain in the test mode.

GND mode is designed to be used only when the airplane is on the ground. GND position turns the set on and enables the transponder to transmit Mode S reply pulses. The ID 4096 code is shown on the right side of the display with altitude shown on the left side. "GND" is annunciated in the display in this mode. Mode A and C interrogations are inhibited.

An IDT switch (button) is located on the front of each transponder control. These switches perform the same function as the XPDR IDNT switches on the pilots' control wheels. Pressing either button (control wheel or IDT button on active transponder) will cause a distinctive return to appear on a ground controller's radar screen for approximately 30 seconds after the IDENT button is pressed and released. It should not be depressed unless requested by a ground controller.

When the transponder is turned from OFF to any other selection the unit will display the installer programmed aircraft address and maximum airspeed, in three two-second segments, according to a preprogrammed sequence.

The function selector has a PUSH VFR function which may be preprogrammed. Momentarily depressing the function selector knob causes the preprogrammed VFR code to supersede whatever code was previously entered. The ID code will immediately be accepted for interrogation reply sequence. The VFR code is programmed by the following sequence: 1) Place the unit in standby mode (SBY); 2) Select the desired code, (VFR, 1200, for instance); and 3) Depress the VFR pushbutton (function select knob) while holding the IDT button depressed.

If the VFR pushbutton (function select knob) is inadvertently pressed, the previous non-programmed 4096 code may be retrieved by pressing the VFR pushbutton again for three seconds.

The KT-70 transponder has an altitude (FL) display in the left side of the digital readout. It is in hundreds of feet and FL is annunciated to indicate that the display is of a "flight level", which is an altitude which corresponds to an altitude above sea level (above the "standard datum plane") with the altimeter set at 29.92 inches of mercury. It corresponds to the altitude which is being transmitted to air traffic control, and will seldom agree exactly to the indicated altitude on the altimeter. The altitude display will only be active when altitude reporting is enabled in ALT and GND modes.

An "R" reply indicator is also on the digital display. The R will illuminate when the transponder is replying to a valid interrogation by a ground station, and will illuminate for approximately 18 seconds after the initiation of an "ident".

DISTANCE MEASURING EQUIPMENT

KN-63 With KDI-574 Indicators

The standard DME installation consists of one KN-63 receiver-transmitter, one KN-574 indicator, and an antenna mounted on the bottom of the fuselage below the cockpit. The KN-574 is installed on the right side of the left-hand instrument panel. The DME is turned ON and OFF by the illuminated DME ON/DME OFF (green/white, push on/push off) switch on the center instrument panel. Dual DMEs and dual indicators may be installed as an option.

The KN-63 transmits interrogating pulse pairs on 200 channels between 1041 MHz and 1150 MHz; it receives associated ground-to-air replies between 978 MHz and 1213 MHz. The KN-574 digitally displays distances in nautical miles, groundspeed in knots, and time-to-station in minutes. All displays are in self-dimming gas discharge numerics.

The VOR/DME tuning is controlled by the KN-53 NAV receiver on the consolidated control panel. When a VOR station is tuned the DME frequency is automatically tuned. The DME ident can be verified by selecting the appropriate DME on the DME selector switch on the audio control panel. The NAV (1 or 2) selected is displayed in the KDI-574 indicator to the right of the nautical mile (NM) display. Channel 1 always refers to NAV 1 and channel 2 always refers to NAV 2. The DME ON/DME OFF switch below the indicator turns the DME on and off.

DME information is also displayed on the pilot's PFD by pressing the NAV button on the display controller. If the pilot selects NAV 1 on the display controller, the DME information displayed on the EHSI and the KN-574 DME indicator will be from NAV 1, and so annunciated on the PFD. If NAV 2 is selected the DME will be tuned to NAV 2, and NAV 2 will be displayed and annunciated on the EFIS and the KN-574 DME indicator. Pressing the NAV button alternately selects NAV 1 and NAV 2 for display. If the pilot selects NAV 2 on the display controller the NAV annunciation (VOR 2) will be in amber, to indicate selection of the off-side NAV. The selected DME will always be the same as the NAV source (VOR).

If dual DMEs are installed, dual KN-574 DME indicators will be installed; usually one on the pilot's instrument panel and one on the copilot's instrument panel. The pilot's KN-574 will be permanently connected to the number one NAV and the copilot's KN-574 will be permanently connected to the number two NAV. Only number two NAV can be displayed on the copilot's HSI. An external switch is required to determine which NAV is channeling the DME. Since DME is not displayed on the HSI, a separate switch is necessary for a single DME installation to determine which NAV is channeling the DME.

Distance Measuring Equipment (DME) groundspeed or time to station readouts are only accurate when the airplane is proceeding directly to or from the selected station. Since it is slant range that is computed, groundspeed or time to station accuracy increases with distance from the station. The readouts can be considered reasonably close to actual speed or time when distance from the station in miles is equal to or greater than the airplane altitude in thousands of feet. The distance display on the DME indicator is in 0.1 nautical mile increments up to 99.9 nautical miles, then in increments of one nautical mile to a maximum of 389 nautical miles. The groundspeed display can indicate a maximum range of 999 knots, and the time-to-station indication has a maximum indication of 99 minutes.

If the pilot desires to retune the KN-53 NAV control but to retain the DME readout of the present station, HOLD is selected by pressing the DME HOLD/SELECTED illuminated switch located just below the DME indicator before the set is retuned. The switch will illuminate in amber and the DME will hold on the previously tuned frequency. "H1" or "H2" (as applicable) will be annunciated in the KN-574 display to warn the pilot that the DME is in the hold mode. "H" will also be annunciated in amber to the left of the distance display on the PFD to indicate the DME frequency and information is being held.

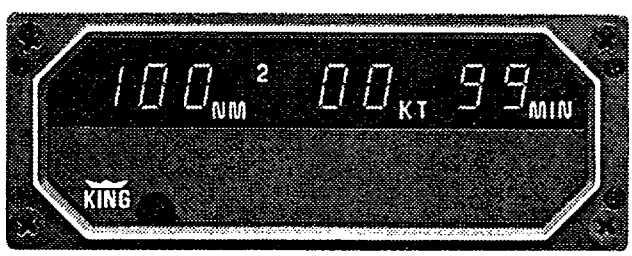


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Figure 3-14. KN-574 Indicator

If optional dual KN-63 DMEs are installed the respective DMEs will interfere with each other when the NAV frequencies differ by 5.3 MHz (for example, 108.00 MHz and 113.3 MHz). This interference results in premature flags or loss of "lock-on". Should this occur, one of the KN-63s should be either turned off or tuned to a different NAV frequency so that the 5.3MHz difference is eliminated.

RADIO ALTIMETER

COLLINS ALT-55B

The Collins ALT-55B radio altimeter displays radio altitude at all times up to an absolute altitude of 2500 feet. The system becomes operational when the airplane electrical system is powered up and it remains operational throughout the flight. Radio altitude is displayed in green digits located in the bottom center of the attitude sphere in the ADI displays.

The altitude display in the ADIs operates from -20 to 2500 feet. Between 200 and 2500 feet, the display is in ten feet increments. Below 200 feet, it is in 5-foot increments. Above 2500 feet, the display will disappear.

Radio altitude, radio altitude-based decision height (DH, referred to as RADIO), and a decision height alert are displayed on the PFD. The RADIO value is set via the REFS (reference) menu on the PFD. The REFS menu is selected with the REFS button on the DCP. Turn the rotary test switch to "Annunciator Test" to test the radio altimeter. No other pilot control operation is required.

The decision height warning tone is controlled only by the DH setting in the pilot's PFD. The copilot's attitude sphere decision height selection has no effect on the sounding of the DH warning horn.

When the airplane descends below an altitude of 1000 feet above the selected radio altitude decision height, a black box with a white background appears in the upper left side of the ADI. When the decision height is reached, an amber MIN appears inside the box. The display flashes for ten seconds and then goes steady.

A "low altitude awareness display," which is a brown strip along the right side of the PFD, is used as a visual annunciation of the airplane's nearness to the ground. The low altitude awareness display is inside the bottom part of the altitude display and begins to appear when a radio altitude of less than 550 feet is reached. At touchdown, the low altitude awareness display reaches the horizon line. The yellow line, which divides the brown area from the rest of the display will disappear at a radio altitude below 60 feet.

If radio altimeter information is invalid, the radio altitude display will be amber dashes, and the low altitude awareness display will not appear.

Functional testing of the radio altimeter system and the ADI display digital readout is accomplished on the ground by turning the rotary test knob to the ANNUN position. The following displays will occur: a radio altitude of 50, +5, -5 feet will be indicated until the button is released, at which time the actual altitude will be displayed. The radio altitude decision height display shows dashes when the rotary test knob is moved. The radio altimeter TEST cannot be accomplished when APR CAP function of the flight director is selected. The radio altitude decision height tone check will depend on the radio altitude selection (RA) set on the pilot's ADI display.

While taxiing over ice or snow, the radio altimeter may fluctuate as much as 50 feet. Outputs from the radio altimeter system are used to desensitize the flight director and autopilot as the airplane passes 1100 feet AGL with the glideslope engaged during an ILS approach. If the radio altitude is invalid, gain programming becomes a function of glideslope capture, time, and airspeed.

WEATHER RADAR

WXR-800 WEATHER RADAR OVERLAY

WARNING

THE RADAR WILL TRANSMIT ON THE GROUND IF SELECTED TO THE ON POSITION. THE AREA WITHIN THE SCAN AREA AND WITHIN 15 FEET OF AN OPERATING WEATHER RADAR SYSTEM CONSTITUTES A HAZARDOUS AREA. DO NOT OPERATE THE RADAR SYSTEM WITHIN 15 FEET OF PERSONNEL OR FLAMMABLE OR EXPLOSIVE MATERIAL OR DURING FUELING OPERATIONS. FOR GROUND OPERATION OF A RADAR SYSTEM, POSITION THE AIRPLANE FACING AWAY FROM BUILDINGS OR LARGE METAL STRUCTURES THAT ARE LIKELY TO REFLECT RADAR ENERGY BACK TO THE AIRPLANE.

The Collins Pro Line 21 Weather Radar System, or the RTA-800, is a fully integrated radar system that utilizes the airplane's Electronic Flight Instrument Systems (EFIS) equipment to provide the pilot and/or copilot with a video display of radar indications relative to outside moisture precipitation. Weather radar targets and mode information are available for display on both pilot side MFD and PFD as well as the optional copilot side PFD. Radar overlay is selected for display with the RDR line select key (R2). The RTA-800 operates on X-band frequency and is capable of detecting wet precipitation along the flight path and in front of the airplane within an arc of the heading angle plus or minus 60 degrees, at a selectable display range of up to 300 nautical miles.

An optional installation configuration, the RTA-852, is physically and functionally identical to the RTA-800 except for featuring auto-tilt operation and the additional capability of detecting moisture-based turbulence. The RTA-800 and RTA-852 accept radar control data from the left PFD/MFD The RTA-800 can also accept radar control data from the right PFD. The weather radar system may be operated in a split mode, where the radar functions like two independent radars, each updating on alternate sweeps of the antenna.

WARNING

THE SYSTEM PERFORMS ONLY THE FUNCTIONS OF WEATHER DETECTION AND GROUND MAPPING. IT SHOULD NOT BE USED OR RELIED UPON FOR PROXIMITY WARNING, ANTI-COLLISION OR TERRAIN AVOIDANCE.

The weather radar system, located in the airplane's radome, operates on a nominal output of 25 watts. The integrated physical components consist of a receiver-transmitter attached to a 12-inch flat plate antenna and a pedestal-base assembly. Scan and tilt motors within the pedestal assembly are activitated by respective circuits to sweep the antenna horizontally and vertically. The tilt function controls the antenna assembly up or down 30 degrees above or below the horizon.

Preflight Checks

The following preflight may be accomplished on the ground prior to takeoff and prior to energizing the radar:

WARNING

IN ORDER TO PREVENT POSSIBLE SERIOUS INJURY TO GROUND PERSONNEL OR IGNITION OF FLAMMABLE OR EXPLOSIVE MATERIALS, THE FOLLOWING TESTS MUST BE ACCOMPLISHED WITH THE MODE CONTROL SWITCH IN THE STBY OR TEST POSITIONS.

1. RADAR on DCP - STBY (Standby) mode. Selecting STBY mode applies power to the RTA-800, and within a few seconds executes a short initialization process. The antenna is driven to the boresight position (0° degrees azimuth and 0 degrees tilt) and remains in this position as long as STBY is selected.
2. TEST Mode - The self-test function appears, with the word TEST displayed on the MFD.

   The radar self-test display consists of six colored arcs evenly spaced across the full sector of the display. Each arc verifies the system's ability to process and display the precipitation intensity level or other display data represented by that color.
3. MODE Select - STBY.

The following preflight may be accomplished on the ground prior to takeoff, however the radar will be energized and the following warning must be observed:

WARNING

THE AIRPLANE MUST BE OUTSIDE WHEN THE TRANSMITTER IS TURNED ON. BE CERTAIN THAT NO PERSONNEL OR COMBUSTIBLE MATERIALS ARE WITHIN 60 FEET OF THE HAZARDOUS AREA IN FRONT OF THE AIRPLANE.

1. Ensure safety precautions have been observed.
2. MODE Select - WX. ADJUST range to 10 or 25 and make sure GCS is not selected.
3. TILT Knob - ADJUST so that ground return is shown at or near max distance. Note display of ground return.

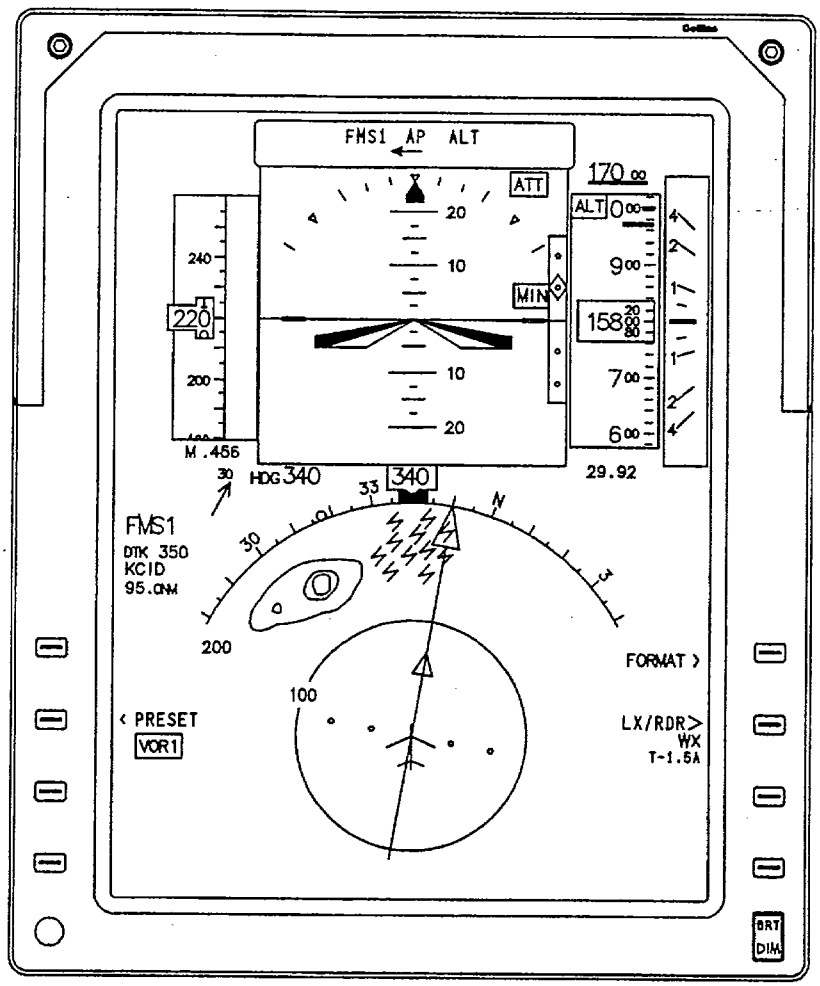


Figure 3-15. PFD with Lightning Data Display

4. STB Mode - RELEASE (STAB off). Ground return moves back to earlier position and USTB is annunciated.
5. STB Switch- PRESS IN (STAB on). Ground return position does not change and USTB is not annunciated.
6. Pitch Control - APPLY 4 degrees to 8 degrees UP input. Ground return moves closer to the apex of display.
7. Pitch Control - SET to zero (null) Ground return moves moves back to earlier position.
8. STB Switch (On WXP-800A/B) - PRESS IN (STAB off). Ground return moves back to original position and USTB is annunciated.
9. Roll Control - SET to zero (null) and press STB Switch (STAB on). Ground return remains and USTB is not displayed.

Operational Notes

The controls and special features of the WXR-800 control panel are defined in Figure 3-17.

CAUTION

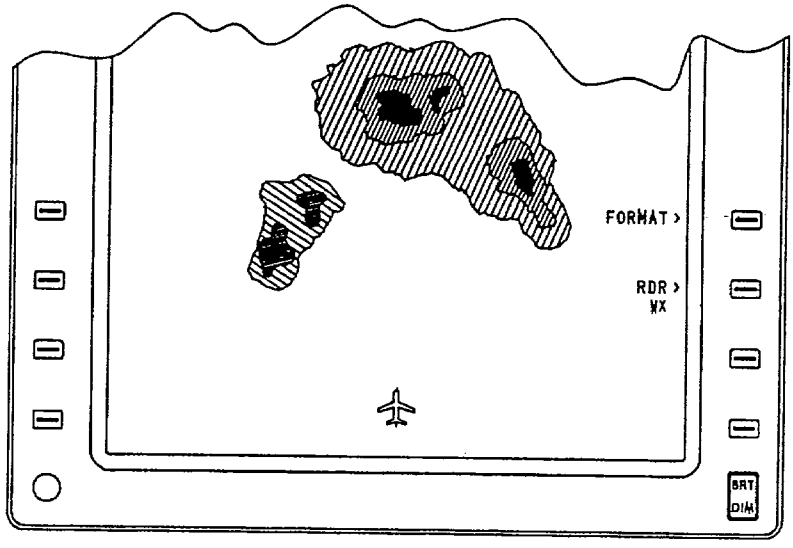
NOT ALL FAULT CONDITIONS CAN BE MONITORED. THE PILOT MUST CONTINUALLY ASSESS REASONABLENESS OF DATA DISPLAYED.

NOTE

An experienced pilot can use GAIN control for estimating precipitation greater than levels 3 (red) or 5 (magenta). Targets continuing to display after reduced gain imply hail and/or heavy rainfall likely.

PFD or MFD DISPLAY	RATE of RAIN FALL (In/hr)	STORM CATEGORY	VIP (Video Integrated Processor) LEVEL	RATE of RAIN FALL (in/hr)	REMARKS
Magenta	Greater than 2.0 inches per hour (32.77 ml)	Extreme	6	Greater than 5.0 inches per hour (81.93 ml)	Severe turbulence, large hail, lightning, extensive wind gusts
		Intense	5	2.0 to 5.0 inches per hour (32.77 to 81.93 ml)	Severe turbulence, lightning, wind gusts, hail likely
Red	0.47 to 2.0 inches per hour (7.70 to 32.77 ml)	Very Strong	4	1.02 to 1.97 inches per hour (16.71 to 32.28 ml)	Severe turbulence likely, lightning
		Strong	3	0.48 to 0.98 inches per hour (7.86 to 16.06 ml)	Severe turbulence possible, lightning
Yellow	0.16 to 0.47 inches per hour (2.62 to 7.70 ml)	Moderate	2	0.10 to 0.48 inches per hour (1.64 to 7.86 ml)	Light to moderate turbulence possible, lightning
Green	0.04 to 0.16 inches per hour	Weak	1	0.01 to 0.10 inches per hour (0.164 to 1.64 ml)	
Black	Less than 0.04 (0.65 ml)				

Figure 3-16. WXR-800 Color Display Versus Rate of Rainfall



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WEATHER RADAR DISPLAY

Controls

MODE CONTROL KNOB Selects choice of operating modes of the WXR-800 system.

- OFF - Primary power is removed from the system. The word "OFF"is displayed on the PFD/MFD.
- STBY - (Standby) Applies power to RTA-800. The letters "STBY" displays on the PFD/MFD within 20 seconds.
- TEST - Runs self-test for radar. The word "TEST" displays on the PFD/MFD.
- MAP - Automatically disables PAC (Path Attenuation Correction) and GCS (Ground Clutter Suppression). PAC Alert arc displays in yellow at perimeter of PFD/MFD.
- WX - Places unit in weather detection mode. Precipitants that are detectable display in one of four colors, lease reflective to most reflective. Green - least reflective, Yellow - increasing, Red - increasing, Magenta - most reflective.

Figure 3-17. WXR-800 Radar (Sheet 1 of 2)

GAIN	CAL -	Calibrates receiver with pre-set value. Displays G+0 upper left on MFD. In MAP mode and GAIN position, MFD shows 4 colors.
	-1,-2,-3 -	Reduces receiver sensitivity by value selected. Displays upper left on MFD.
	+1, +2, +3 -	Increases receiver sensitivity by value selected. Displays upper left on MFD.
TILT	With STB off -	Allows vertical aim adjustment 15 degrees up to 15 degrees down. Displays on MFD within one-fourth degree of exact tilt angle.
	With STB on -	Allows vertical aim adjustment 30 degrees up to 30 degrees down. Displays on MFD within one-fourth degree of exact tilt angle.
RANGE		Allows selection of desired range of operation from zero to 300 nautical miles. Displays on MFD or PFD with 1/2 scale at right end of range arc and full scale at left end.
GCS		Helps to differentiate weather returns from ground returns (WX mode only). Enables for 12 seconds, followed by return of normal operation mode. Displays on MFD.
STB		Enables/Disables pitch and roll stabilization circuitry. Displays on MFD as NSTB (not stabilized) or STB (stabilized).
FAULT MONITOR		Built in RTA as an automatic function should any faults be detected in system. Displays on MFD as flashing FAULT if system malfunction, and as non-flashing FAULT if communications malfunction.

Figure 3-18. Radar (Sheet 2)

LONG RANGE NAVIGATION

KLN 900 GLOBAL POSITIONING SYSTEM (GPS) RECEIVER

The AlliedSignal KLN 900 is a single-unit panel or pedestal mounted, long range, Global Positioning System (GPS) based airborne navigation system with a database. Besides the panel or pedestal mounted GPS receiver, the system is comprised of a KLN 900 configuration module and a KA 92 antenna mounted on top of the forward fuselage. All output data is read from the unit front panel display, and all input to the unit is via the front panel controls. The primary purpose of the equipment is to provide the pilot with present position information and to display guidance information with respect to a flight plan defined by the pilot.

Flight plan information is entered by the pilot via various knobs and buttons on the front panel The screen display normally is divided into five segments defined by vertical and horizontal lines on the screen. The larger top left segment is called the left page and the larger top right segment is the right page. The lower left segment displays the name of the left page being displayed while the small lower right segment displays the name of the right page being displayed. The lower middle segment displays the mode of operation, for example "ENG-LEG" is Enroute-Leg mode which is the normal mode for enroute operations. There are eight types of pages tht may be displayed on the left side of the screen and 10 types of pages that may be displayed on the right side. The abbreviations for these page types are displayed around the outside of the left and right outer knobs. Some types of pages, such as NAV, have more than one page. Once the type of page is selected using the outer knob, the inner knob is used to select the specific page.

The information stored in the database eventually becomes out of date; therefore, to provide a means of updating the information, the database is housed in a PCMCIA card which plugs directly into the front of the KLN 900. It is designed so that there are two ways for the operator to keep the database current The first method of database update is to remove the old card and insert a current card. This method involves returning the old card to AlliedSignal. The second is to electronically update the database by means of 3.5-inch diskettes supplied by AlliedSignal and a laptop computer. This method does not involve removing the KLN 900 from the airplane. A data port on the front of the KLN 900 provides a means of interfacing the unit with the computer via an interface cable. For more information on updating the database of the KLN 900 refer to the KLN 900 Pilot's Guide.

WARNING

THE ACCURACY OF THE DATABASE INFORMATION IS ASSURED ONLY IF IT IS USED BEFORE THE EXPIRATION DATE. USE OF OUT-OF-DATE DATA BASE INFORMATION IS DONE AT THE OPERATOR'S OWN RISK.

Instrument Panel Annunciators

The approach annunciator indicates the KLN 900 mode of operation while in the approach environment and allows for the manual selection of the APPROACH ARM mode of operation. The APPROACH ARM mode will automatically engage when the airplane is within 30 nm of the destination airport and an approach has been loaded into the active flight plan. When the APPROACH ARM mode is engaged, the FMS switches from the Enroute Mode of operation to the Terminal Mode of operation. The CDI sensitivity on the EHSI will change respectively from ± 5.0 nm to ± 1.0 nm for full scale deflection.

The APPROACH ACTIVE mode cannot be manually selected. The APPROACH ACTIVE mode will engage only when the following criteria are satisfied; the aircraft is approximately 2.0 nm from the final approach fix (FAF), the Leg Mode is selected, RAIM is available, the aircraft is heading toward the FAF, and the FAF is the active waypoint. When the APPROACH ACTV mode is engaged, the FMS switches from the Terminal Mode of operation to the Approach Mode of operation. CDI sensitivity on the EHSI will change from ±1.0 nm to ±0.3 nm for full scale deflection. APPR will display in the upper left quadrant of the PFD.

At the missed approach point (MAP), the missed approach holding waypoint will not be automatically sequenced. KLN 900 guidance to the missed approach holding waypoint can be initiated by pressing the DIRECT TO button with the missed approach holding waypoint highlighted on the FPL0 page and following the normal KLN 900 DIRECT TO procedures.

Direct input air data, temperature and heading bug are automatically provided to the KLN 900 data. Absence of these inputs, or improper inputs will not affect the navigational accuracy of the system. Otherwise, data must be manually entered for KLN 900 functions using this information, i.e. TAS, wind computation, range, etc. KLN 900 calculations using temperature input are based on RAT..

Operator's Manual

For detailed operating information, consult the KLN 900 GPS Pilot's Guide, P/N 006-08796-0000 dated July, 1996 or later revision. The Pilot's Guide, as applicable to the specific software modification status and sensor installation, must be immediately available to the flight crew whenever navigation is predicated on the use of the system. The Bendix/King Operator's Manual is generic to many aircraft installations. The Operational Revision Status (ORS) of the Pilot's Guide must match the ORS level annunciated on the Self Test page. All functions discussed in the manual may not be available in the Model 525A installation.

GNS-X_{LS} FLIGHT MANAGEMENT SYSTEM (Optional)

The GNS-X_{LS} Flight Management System is a comprehensive navigation management system which integrates multiple systems and sensors into an integrated whole, which is capable of precise navigation and aircraft performance computations. The system takes information from various navigation sources (DME and GPS sensors), considers the strengths, weaknesses and signal strengths of each system and sensor in use, and computes a most likely position for the airplane. The GPS sensor has priority unless degraded sensor accuracy has been detected by the system. It accomplishes these computations with a minimum of attention by the flight crew, and advises them of components or systems requiring attention, as well as other irregularities such as loss of enough sensors to compute a valid position. In the latter situation, if sensor loss endures over a set length of time, the system will enter DR (dead reckoning) mode and so inform the pilot through a message on the control display unit (CDU) and display a red boxed "FMS" on the MFD.

GNS-X_{LS} CONTROL DISPLAY UNIT

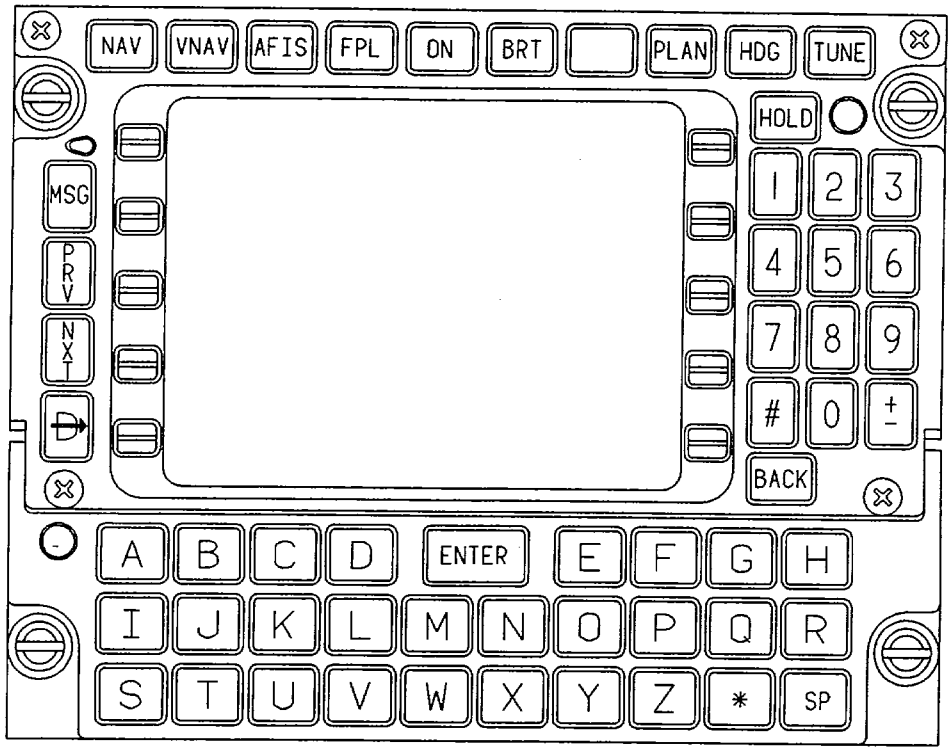

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Figure 3-18

The GNS-X_{LS} provides steering information to the pilot through the primary flight display (PFD). When connected to the autopilot, it provides roll steering commands. The NAV computer additionally computes fuel flow information, providing a current fuel status and airplane gross weight throughout the flight, if the fuel and gross weight are updated prior to takeoff.

The system also provides navigation data outputs which enable the active flight plan to be displayed on the multifunction display (MFD).

The following components comprise the GNS-X_{LS} system: a control display unit (CDU) which houses its own global positioning system (GPS) sensor, a configuration module unit, and an antenna. The GPS antenna is mounted on top of the fuselage near the cabin door.

The CDU is the heart of the system, possessing the computer, the navigation data bank, and the memory capability, as well as the GPS receiver. The NDB maintains 50,000 navigation points in its data base as well as up to 999 operator generated waypoints. Fifty-six flight plans with up to fifty waypoints each may be stored. The NAV data base must be updated every twenty-eight days by means of a memory card. The card is inserted into in a personal Computer Memory card International Association (PCMCIA) slot under the lower portion of the alpha keyboard on the CDU.

Operator's Manual

For detailed operating information, consult Revision 5 of the Global GNS-X_{LS} Flight Management System Operator's Manual, Report Number 006-08845-0000, Revision 5, issued 5 September, 1997 or later revision.

Limitations

The single installation of the GNS-X/LS, with GPS sensor, is not approved as a sole means of navigation; therefore, when the GNS-X_{LS} is to be used as the primary means of navigation, or when coupled to the autopilot, flight director or primary flight display (PFD), the navigation equipment required by the FARs applicable to the specified type of operation being conducted must be installed and operating. Refer to the airplane flight manual for additional limitations and operating information.

AIRBORNE FLIGHT INFORMATION SYSTEM (AFIS)

The Global Airborne Flight Information System (AFIS) interfaces the flight planning and performance management functions of the standard GNS-X_{LS} Flight Management System with Global Data Center Computers. AFIS interfaces with various VHF and satellite communications facilities, thereby providing the computer data link between the airplane and the Global Data Center, by which transfer of digital data concerning flight plans, weather, and message traffic is possible.

The Model 525A AFIS installation consists of a Data Management Unit (DMU), a configuration module, a data transfer unit (DTU), a satellite communications unit (SCU), an antenna switching unit (in installations having a shared antenna), and an antenna. The Global Data Center, with its VHF/satellite/ground telephone system interface, makes up the ground portion of the system. The global data system provides the services of flight planning, aviation, weather, and flight related message forwarding, thru its "mainframe" computers which accept and process digital data, and provides the requested information on a real time basis.

NOTE

The AFIS interface is installed by special equipment request (SER).

Operator's Manual

For detailed operating information, consult Section Seven of the Global GNS-X_{LS} Flight Management System Operator's Manual (Revision 5), Report Number 006-08845-0000, issued 5 September, 1997 or later revision. This section constitutes the Airborne Flight Information System and Satellite Data Communications System Supplement for the AFIS system.

UNIVERSAL UNS-1K FLIGHT MANAGEMENT SYSTEM (Optional)

The Universal UNS-1K is a fully integrated navigation management system designed to provide the pilot with centralized control for the airplane's navigation sensors, computer based flight planning, and fuel management. The FMS accepts primary position information from short and long-range navigation sensors. The primary position data received from the sensors is filtered within the FMS to derive a 'Best Computed Position' (BCP). It accomplishes these computations and advises the flight crew of components or systems requiring attention, as well as other irregularities, such as loss of enough sensors to compute a valid position. In the latter situation, if sensor loss endures over a set length of time, the system will enter Dead Reckoning (DR) mode and so inform the pilot through a message on the control display unit (CDU) and display a red boxed "FMS" on the MFD.

The UNS-1Csp provides lateral steering information to the pilot through the PFD. When connected to the autopilot, it provides roll steering commands. The VNAV function provides vertical steering information displayed on the UNS-1K CDU. The NAV computer additionally computes fuel quantity information, providing a current fuel status and airplane gross weight throughout the flight if the fuel and gross weight are updated prior to takeoff.

NOTE

The CDI sensitivity depicted by the UNS-1K changes with respect to the mode of operation (Enroute, Terminal, and Approach). The CDI may display some momentary fluctuations during the transition from Terminal to Approach modes. It should be noted that the command bars still provide accurate guidance, and the autopilot does not attempt to follow the CDI.

The UNS-1K database incorporates SIDs, STARs, and approaches including GPS approaches. These procedures may be flown coupled to the autopilot or flight director. The internal database must be updated to the latest revision every 28 days; updating to be accomplished with the Universal Avionics update disk or equivalent.

Operator's Manual

For detailed operating information, consult the Universal UNS-1K Pilot's Operating Manual, Universal Systems report number 2423sv602, latest change. The software status stated in the Pilot's Manual must match that displayed on the FMS Control Display Unit (CDU).

UNIVERSAL UNS-1K FLIGHT MANAGEMENT SYSTEM

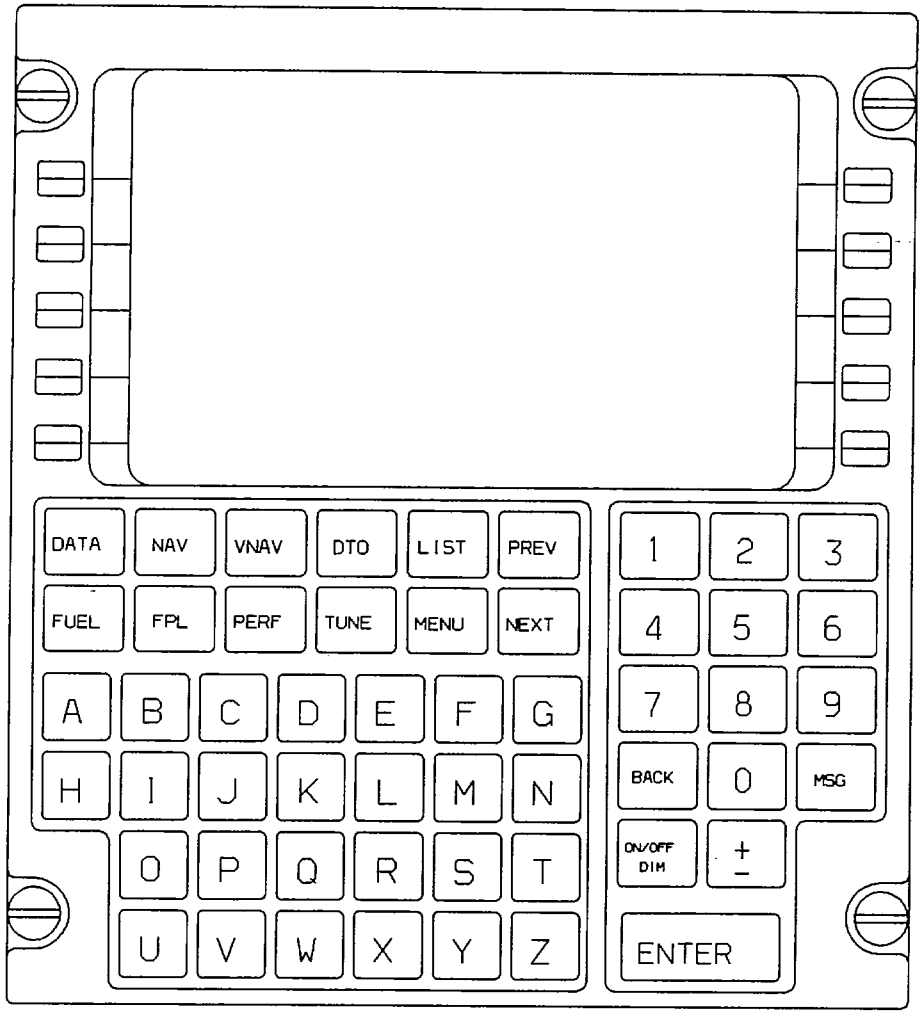

Figure 3-19