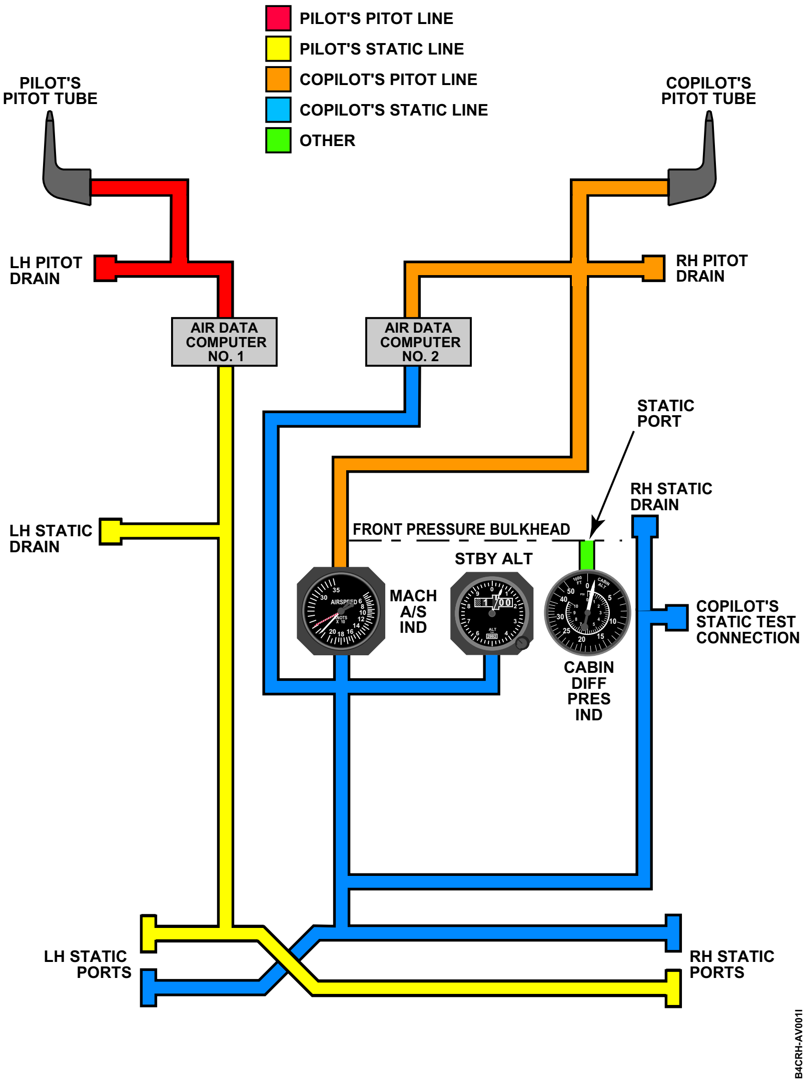
Pitot/Static System



Avionics

This chapter provides an overview of the various avionics systems installed on the Beechjet 400A aircraft. Please refer to the applicable Aircraft Flight Manual supplements and Pilot's Manuals for operating procedures and complete system descriptions.

Pitot/Static Systems

The pitot/static system supplies dynamic and static pressure from pitot heads and static vents to the flight instruments and avionics equipment. The system consists of two pitot tubes, one for each subsystem, and five static ports, four of which are used for the two static systems. The fifth static port, located on the forward pressure bulkhead venting to the unpressurized nose compartment, is used for the cabin altitude/differential pressure indicator.

Two pitot tubes on the left and right sides of the aircraft nose supply ram air pressure. The left pitot tube supplies air pressure to the No. 1 air data computer (ADC) and the computer generates electric signals to operate the pilots airspeed indicator. The right pitot tube supplies air pressure for the No. 2 ADC, and the standby Mach/airspeed indicator.

Sources of static air are two dual static ports on either side of the aircraft fuselage. One static port on each side is for the pilot's system and the other on each side is for the copilot's system. By having a port on each side for each system, they will receive a balanced static pressure.

The pilot's system uses the upper left and lower right static ports. The pilot's static system provides static air for the ADC only, as the computer generates electrical signals to operate the airspeed and attitude displays on the primary flight display (PFD).

The copilot's system uses the upper right and lower left static ports. It provides static pressure for the No. 2 ADC, standby airspeed indicator and a standby altimeter.

Manually operated pitot/static drains, located on the forward lower fuselage, permit draining of accumulated moisture from the system.

Electrically powered heating elements in each pitot head and static port prevent ice formation (see the Ice and Rain Protection chapter).

Standby Flight Instruments

The standby flight instrument system consists of a standby airspeed indicator, a standby altimeter and a standby attitude indicator. All are mounted on the upper portion of the pilot’s instrument panel.

The standby airspeed indicator is a two-inch mechanical indicator and includes a variable V_{MO} indicator. The scale is marked from 60 to 350 knots. 28 V DC electrical power is provided by the airplane's electrical system or standby instruments emergency battery for illumination. The total pressure source for the indicator is the copilot’s pitot tube. The static source is the copilot's static ports.

The standby altimeter is a two-inch mechanical indicator incorporating three drums and a pointer. 28 V DC electrical power is provided from the airplane's standby bus or standby instruments emergency battery for illumination and for an internal vibrator. The static source is the copilot's static ports.

The standby attitude indicator is a two-inch internal gyro indicator, operating on 28 V DC from the standby bus. It functions on an emergency battery during a complete electrical failure. It will function and maintain ±6 degree accuracy for approximately nine minutes after removal of all electrical power, including the emergency battery.

Stall Warning System

The stall warning system warns of an impending stall by simulating airframe buffeting by means of an electromechanical control column-shaker. The airplane has a dual installation with independent systems for the pilot and copilot. The system consists of two angle-of-attack (AOA) transmitters, two stall warning computers, two column shakers, two flap follow-up switch units, and two pressure transducers. An AOA indicator and AOA indexer are included for the pilot's system.

The respective stall warning systems are powered through the L and R STALL WARN circuit breakers located in the FLT INST group on the forward circuit breaker panel.

The stall warning system can be tested by selecting L STALL or R STALL with the test switch in the TEST area of the overhead switch panel. The system remains in the test mode until the test switch is rotated out of the stall test position. A zero flap position is necessary for the system operational check.

The Supplementary Stall Recognition System (installed in conjunction with the Stall Warning System) provides dual shroud mounted STALL annunciators and an aural stall warning for both headphones and speakers. This system gives an alert at the precise angle-of-attack when the full stall occurs.

The AOA transmitters are located on both sides of the forward fuselage and are aligned to the horizontal axis of the aircraft. Each transmitter is mounted through the aircraft skin with an angled airfoil vane on the outside. The vane is rotated by the airflow around it. This rotation positions the internal section of the transmitter and produces a signal that is transmitted to the AOA computers.

Heaters are provided in both the airfoil vane and transmitter cases to prevent icing. The heaters are thermostatically regulated, and controlled by the AOA HEATER switches located on the overhead switch panel. The stall warning computers located in the nose electronic compartment provide a power output to drive the column shakers when the airplane angle-of-attack exceeds a predetermined value. A flap position signal and pressure altitude signal are used to change the shaker actuation point so that shaker operation occurs at the prescribed angle of attack. The flap follow-up switch units, located in each wing, provide the flap position signals for the stall-warning computer to distinguish flap configurations.

Shakers, located on each control column, are used to warn of an impending stall. When the shakers actuate, the stall warning ignition relay is energized, and ignition power is provided to both engines to prevent flameout at high AOA.

The AOA indicator is mounted on the pilot’s instrument panel and provides a continuous display of normal angle-of-attack. Normal AOA is a linear display of the values between AOA for zero lift and AOA for maximum lift, and is indicated on a scale numbered from 0 to 1.0. An indication of 0 means that the combination of airplane configuration and AOA is such that the aerodynamic lift is zero (0%). At 1.0, the lift is at a maximum (100%) and any further increases in AOA will result in a stall. The AOA indicator scale is marked with green, yellow, and red arcs. The green arc (0 to 0.6) is the normal operating area. The yellow arc (0.6 to 0.85) is a caution area and identifies a critical AOA. The red arc (0.85 to 1.0) is a warning area and represents the beginning of stall buffet.

The AOA indicator has a reference set knob that positions the AOA reference pointer corresponding to the desired multiple of stall speed (V/VS). The V/VS pointer moves in unison with the setting of the AOA reference mark. Normally, the V/VS pointer is set to 1.2 V/VS for takeoff and 1.3 V/VS for landing operations. The AOA indicator has an OFF flag, which appears when indicator power is absent.

Collins AMS-5000 Aircraft Management System

This section provides a brief overview of the Collins AMS-5000 aircraft management system and its components. The AMS-5000 combines the functions of flight director, navigation, autopilot and communication into a fully integrated system that reduces total crew workload.

The AMS-5000 components include:

- integrated avionics processor system (IAPS)
- flight management system (FMS)
- electronic flight instrument system (EFIS)
- attitude and heading reference system (AHRS)
- air data system (ADS)
- radio sensor system (RSS)
- automatic flight control system (AFCS)

The various line replacable units (LRU) in the system interface with each other using several 2-wire digital data buses. A data bus is a wire which allows various avionics systems to intercommunicate. Each bus has a unique name. The buses are primarily ARINC 429 format, with some private RS-422 buses and an ARINC 453 bus for the radar.

Integrated Avionics Processor System (IAPS)

The IAPS does part of the integration function required to interface the various avionics systems on the airplane. It may be thought of as part of the wiring harness that physically houses some avionics LRUs. The IAPS is partitioned to provide signal redundancy and independent power distribution. The IAPS also concentrates data by reading several avionics buses and distributing data words to the LRUs and line replacable modules (LRM) requiring that information.

The ICC-4008 card cage houses the IAPS modules. An internal mother board provides interconnection between all units that reside in the card cage.

There are two IEC-4001 IAPS environmental controllers within the card cage. The modules monitor the card cage temperature sensors and operate heaters or cooling fans to control the IAPS environment.

NOTE: These cooling fans draw air in from around the units. The screens should be checked periodically for blockage by a certified maintenance technician.

The LHP-4000/4001 modules contain the IAPS input/output connectors, and provide protection interface between the LRMs and all external units.

The four IOC-4000 input/output data concentrator modules (DCM) process inputs from the left and right side air data computers (ADC), attitude/heading computers (ATC), flight control computers (FCC), flight management computers (FMC), com/nav/pulse radios, large displays, radio altimeter and data acquisition unit. The output data supplies the appropriate data words to each large display, weather radar assembly, sensor display driver, radio tuning unit (RTU), primary com/NAV radio, air data computer, flight control computer, flight management computer and data acquisition unit.

The four power modules independently power the left and right flight control computers and the left and right flight management computers. Each PWR module also powers one data concentrator. The roll trim coupler receives both left and right side power from two PWR modules.

There are two CSU-4000 configuration strapping units (CSU) on the IAPS. Both contain a strapping matrix that sets the left and right IAPS configurations for the Beechjet 400A installation. The number 1 CSU provides configuration strapping for the DCMs 1A and 1B, the number 1 FCC, number 1 FMC and the MDC. The number 2 CSU provides configuration strapping for the IOC 2A and 2B modules, the number 2 FCC, number 2 FMC and the ATC.

The MDC-4000 maintenance diagnostic computer (MDC) provides computation and storage of maintenance parameters for the avionic LRUs. Additional storage is available for engine trend/exceedance data and maintenance data from other airplane systems. The MDC also interfaces with the DBU-4100 data loader to download maintenance data to a diskette or upload maintenance diagnostic equations from a diskette.

Flight Management System (FMS)

The FMS is an integrated navigation system that provides worldwide point-to-point and great circle navigation. It provides lateral and vertical navigation guidance from a combination of DME, VOR/DME, dual VOR, global positioning system (GPS), and DR. The system also provides navaid database storage and several control/planning functions. The FMS system includes:

- two navigation computers
- two control display units (CDU)
- a data loader

The FMS must be initialized each time the system is placed in use. The first type of initialization for the system is the factory start. The second type of initialization is cold start and the third type of initialization is warm start. To initialize the FMS, depress the line-key next to INITIALIZE SYSTEM on either CDU.

Collins ProLine 4 Electronic Flight Instrument System (EFIS)

The cockpit EFIS display will vary, depending on whether the three-tube or four-tube system is installed.

The three-tube display system contains the following:

- two primary flight displays (PFDs)
- one multifunction display (MFD), and
- two sensor display units (SDUs).

The four-tube display system includes the same displays as the three-tube system, plus an additional tube on the pilot's instrument panel which can be either another MFD or a navigation display (ND).

The display switches are located above each PFD. On airplanes with the enhanced ground proximity warning system (EGPWS) installed, the display switches are located on the sides of the instrument panel. The switches control the source of primary data and the mode of operation for their respective displays.

The joystick select switch is installed in airplanes with the four-tube display only and is located on the center pedestal. It selects the joystick operation on the pilot's or copilot's MFD.

The Altitude Awareness Panels, located below the SDUs, provide the controls for minimum descent altitude (MDA), reporting altitude (RPT), radio altimeter self test (RA) and decision height (DH).

The control heading panel (CHP) contains the course, heading, and joystick controls for the MFD, FMS, AFCS, and VOR.

There are four controls:

- course knobs CRS 1 and CRS 2
- heading select knob
- joystick

Primary Flight Display (PFD)

The PFD displays attitude, flight director, airspeed, altitude, vertical speed, heading, navigation and mode information. It also shows attitude indicator (ADI) and slip/skid indication, flight director (FD) steering command bars, FCS mode annunciation, auto pilot (AP) engage annunciation, mistrim annunciation, glide slope (GS) deviation and marker beacon indication. The following features provide more information and make it easier to interpret:

- Radio altitude is displayed any time the airplane is under 2,500 ft AGL.
- Rather than OFF flags, if a glideslope or course signal is not received, the pointer will not appear.
- If any data source fails, both the pointer and the scale disappear and a warning appears.
- If the PFD fails, the entire display can be moved to the MFD by selecting the PFD annunciator switch to the REV mode.

Multifunction Display (MFD)

As its name indicates, the MFD can display many different functions to assist the pilot in performing certain operations in an organized and efficient manner.

The MFD can display the following:

- NORMAL PROCEDURES checklist
- ABNORMAL PROCEDURES checklist
- EMERGENCY PROCEDURES checklist
- PLANNING MAP
- FMS
- AVIONICS STATUS
- MAINTENANCE

The MFD performs a built-in test (BIT) upon initial power application and then displays the MFD index. If the BIT fails, the display remains blank.

The MFD has six line-keys on the left bezel, six line-keys on the right bezel, and six line-keys on the bottom bezel to select the display or function desired. To display any item, depress the line-key on the bezel adjacent to the corresponding label on the MFD index. Some line-keys will have nothing adjacent to them on the screen, which means they have no function in that display.

Checklist line items are displayed in three colors as follows:

Green . . . . Completed items

Magenta. . . . . Current items

Cyan . . . . Unaccomplished items

Navigation Display (ND)

On airplanes with the four-tube display only, an ND is installed on the pilot side of the instrument panel and the MFD is installed on the copilot side of the instrument panel. It provides display map data, weather radar and HSI formats. It is also a reversion backup for the left PFD.

The following features are available:

- The formats horizontal situation indicator (HSI), MAP DATA, and RDR are selected on the Display Control Panel (DCP).
- The status line is displayed with all three formats.
- The DATA window is selectable with any of the three formats.

Normal control inputs come from the CDU, DCP and the CHP. The CDU and DCP are used to set display modes, NAV and bearing pointer source, and radar mode. The CHP has dual course set knobs, allowing separate courses, and a single heading selector.

Navigation signals come from the FMS, left and right attitude heading computers (AHC), left and right ADCs and the TCAS. This is done with the NAV SRC and BRG SRC push buttons on the DCP and the appropriate line key on the CDU.

In all three formats, the radar mode line, status line, and data window are common. When the HSI format is selected, navigation information is displayed in the traditional 360 degree compass rose format. The MAP format displays a dynamic navigational picture of the flight as it occurs. The radar targets may be superimposed onto the map display. The radar overlay updates with each antenna sweep. Terrain can also be overlayed.

Sensor Display Units (SDU)

The SDU-640A sensor displays are identical, high resolution, monochrome cathoid ray tubes (CRT) that replace conventional RMIs. They incorporate four selectable formats: RMI, VLF, VOR and DME. The format is selected by rotation of the FORMAT knob. The selected format is annunciated above the left index mark. A circular arrow above the right index mark indicates the direction to turn the FORMAT knob to select a different format.

Attitude Heading Reference System (AHRS)

The AHRS consists of an attitude heading computer, internal compensation unit (ICU), and flux detector units.

The attitude heading computer provides the roll, pitch, and stabilized magnetic heading data for the displays and the automatic flight control system (AFCS). Instead of the traditional high-speed gyros and synchro-transmitters, the computer uses relatively slow turning motion detectors with piezo-electric transducers. Magnetic heading inputs come from flux detectors located in each wing tip. IAS and VS inputs come from the air data computer. If either left or right AHRS fails, either PFD can display information provided by the operational AHRS.

The ICU calibrates the flux detector outputs for an individual airplane. The flux detectors sense the horizontal component of the earth's magnetic field and generate output signals proportional to the airplane's magnetic heading.

Selecting a lateral or vertical mode activates the flight director, bringing the command cue into view. If a mode is selected and the airplane is not in position to track that mode, the mode arms. Armed modes are displayed in white to the right of active modes, which are green. During an ILS approach, the glideslope will not arm until the localizer is captured.

The pilot's reversionary panel is located below the PFD and the copilot's reversionary panel is on the outboard side of the copilot's instrument panel.

Air Data System (ADS)

The ADS is a dual system that senses and processes data derived from the air around the airplane. Both the pilot's and copilot's systems contain an air data computer (ADC) and air data select (ADS) panels. There is a single SIA-850 signal interface adapter installed. All air data information is displayed on the PFDs.

Air data computers provide converted data to the AHRS and IAPS, including the autopilot and flight director.

The air data select panels provide the controls that are used to set the airspeed references, vertical speed references, preselect altitude, barometric pressure correction and temperature display format.

Radio Sensor System (RSS)

The RSS is a dual communication and navigation system. The communication portion of the system has left and right side VHF COM transceivers and MODE-S transponders. The navigation portion of the system utilizes left and right side VHF NAV receivers, DME transceivers, ADF receivers, a radio altimeter and a VLF/Omega NAV receiver. A single, integrated control head provides on-side COM/NAV radio tuning and control.

The RTUs provide direct manual control of the VHF communication receivers, VHF and ADF navigation receivers and the transponder. The RTUs contain a CRT to display COMM/NAV designations and frequencies/codes. Each RTU allows for storing four frequencies in memory, one preselect frequency and the active frequency. The reversionary panel on the pedestal below the copilot's CDU selects RTU reversion functions, radio remote tune disable, active transponder, and marker beacon sensitivity.

The VHF-422A is a multi-channel VHF voice transceiver. The system is normally tuned by the left RTU, but also may be tuned by the right RTU or burst tuned by the IAPS. The VIR-432 is a VHF navigation receiver performing VOR/LOC, glideslope (GS), and marker beacon (MB) functions. The DME-442 is 3-channel distance measuring equipment. Channel one is manually tuned by the left RTU, but also may be tuned by the right RTU. Channels two and three are automatically tuned by the FMS and are used for multi-sensor navigation. The TDR-94/94D is a mode-A (ident), mode-C (altitude), and mode-S (select) transponder. This transponder is active when the remote ATC switch is set to 1. When selected, the TDR-94/94D responds to all valid ATC radar interrogations with coded identification and/or reporting altitude reply; this reply is used by the ATC controller to locate and identify the airplane.

The TDR-94D also provides mode-S identification and expansion capabilities for TCAS and data link functions. This mode-S (select) code allows the tower to automatically interrogate a specific airplane.

NOTE: In some installations a TDR-90 with a CAD-870 adapter may be installed instead of a TDR-94/94D. These installations do not provide mode-S operation.

The ADF-462 is a low-frequency automatic direction finder and is normally tuned by the left RTU, but also may be tuned by the right RTU). The ALT-55B radio altimeter is a swept frequency modulated concentrated wave (FMCW) altimeter that measures direct radio height for use by the FCC computers and for display on the PFDs. The ALT-55B transmits a reference signal, receives the reflected signal, and compares the two signals to determine the airplane radio altitude.

The CMA-764 is a receiver that uses VLF and Omega navigation signals to determine geographic position. The CMA-764-1 also receives GPS navigation signals. The CMA is used by the FMS as a multi-sensor navigation input. It monitors heading, control, and station select data from IAPS group buses.

An audio control panel is located at the lower outboard corner of each instrument panel. The rotary audio output switch allows the pilot to connect his microphone output to COMM 1, COMM 2, HF (if installed), or the CABIN PA system. A number of audio ON-OFF toggle switches are located across the top of this panel to allow each pilot to select individual radios. A volume control panel is located on the pedestal below the pilot's CDU. It enables the crew to adjust the individual audio output levels of their labeled receivers (COMM 1, COMM 2, NAV, MKR BCN, DME and ADF).

The TCAS-94 system is designed to protect a volume of airspace around the aircraft, using the mode C and S signals of nearby aircraft and then display the surrounding aircrafts bearing, altitude and rate of climb on the MFD and PFDs. Aural and visual indication is given for all resolution advisory (RA) and traffic advisory (TA) if the traffic is within 15 to 48 seconds of impact. The system consists of receiver/transmitter, directional antenna, MFD and PFD displays, mode C and S transponders and a radio tuning unit (RTU) control panel.

NOTE: The TCAS-94 system gives an aural RA over the airplane cockpit audio system, or an independent speaker system, in addition to the displayed RA. For a list of the aural annunciations and their descriptions, refer to the Pilot's Operating Manual, Section 3.

The TCAS computer analyzes traffic information and divides the traffic into four categories: other traffic, proximity traffic, traffic advisory and resolution advisory and is displayed on the MFD. The TFC line select on the MFD selects the TCAS Traffic Map display. The radar display can be overlayed onto the traffic map by selecting the TFC display, radar operating mode and then pressing RDR ON. To overlay the Present Positioning Map with the TCAS traffic map, select the Present Positioning Map and toggle the TFC line select to ON. If TCAS issues a Traffic Advisory (TA) or Resolution Advisory (RA), TRAFFIC is displayed on the PFD. TRAFFIC is red if an RA is present or yellow if a TA is present.

The GPS-4000 GPS Navigation Receiver system processes the GPS signals to provide navigation data outputs. The GPS system contains two GPS receivers and two antennas. The GPS Navigation Receiver processes the GPS signals received from the antenna together with inputs from other aircraft sensors to provide position, velocity and time outputs through the IOCs to the FMS system.

Weather Radar System

The weather radar system (WXR) is a fully integrated radar system. The entire system is a single unit that is mounted on a precisely aligned surface in the radome. The receiver detects wet precipitation and moisture-based turbulence in front of the aircraft. The display control panel and the CDUs provide radar mode control and the display range is selectable up to 300 nm. Detected radar targets are displayed on the MFD or ND and may be superimposed onto the map display of the ND or MFD. The radar overlay updates with each antenna sweep. Two-channel operation allows the ND and MFD to show different displays. The radar display presents a forward view of 120 degrees, 60 degrees either side of the airplane heading.

NOTE: In the TURB ONLY mode, the radar is not a storm-scope, it detects changes in rain direction which would be caused by wind shifts.

NOTE: Loss of the No. 1 AHRS will cause the radar stabilization to turn OFF.

Enhanced Ground Proximity Warning System (EGPWS)

The EGPWS is a terrain awareness and alerting system that provides terrain alerting and display functions. The system uses inputs for geographic position, attitude, altitude, airspeed and glideslope. These inputs are used in conjunction with internal terrain, obstacles and airport databases to predict a possible conflict between the flight path of the airplane and the terrain or obstacle. Any such conflict will result in a visual and aural caution or warning alert. The EGPWS also provides alerts for excessive glideslope deviation, too low with flaps, or gear not in landing configuration.

The EGPWS compares the position of the aircraft to an internal database to provide additional alerting and display capabilities.

There are seven basic modes of operation.

Mode 1 provides alerts for excessive descent rates with respect to altitude AGL and is active for all phases of flight. This mode has two alert boundaries: an outer boundary for caution lights and aural alerts and an inner boundry for warning lights and aural alerts.

The Mode 2 alert helps protect the aircraft from impacting the ground when rapidly rising terrain is detected. It exists in Mode 2A and Mode 2B forms.

- Mode 2A is active during climbout, cruise, and initial approach (flaps not in the landing configuration and the aircraft not on glideslope centerline). If the aircraft penetrates the caution envelope, an aural “TERRAIN, TERRAIN” message is generated and caution lights will illuminate. If the aircraft continues through to the warning envelope, the warning lights will illuminate and the aural warning message “PULL UP” is repeated until the airplane exits the warning envelope.

- Mode 2B provides a desensitized alerting envelope to permit normal landing approach maneuvers close to terrain without unwanted alerts. Mode 2B is automatically selected with flaps in the landing configuration (landing flaps or flap override selected) or when making an ILS approach with Glideslope and Localizer deviation less than 2 dots. It is also active during the first 50 seconds after takeoff.

Mode 3 provides alerts for significant altitude loss after takeoff or low altitude go-around (less than 245 ft AGL) with gear or flaps not in landing configuration. This protection is available until the EGPWS determines that the aircraft has gained sufficient altitude that it is no longer in the takeoff phase of flight.

Mode 4 provides alerts for insufficient terrain clearance with respect to phase of flight, configuration, and speed. It exists in Mode 4A, 4B, and 4C forms.

- MODE 4A is active during cruise and approach with gear and flaps up. This provides alerting during cruise for inadvertent flight into terrain when either the terrain is not rising significantly or the aircraft is not descending excessively. It also provides alerting for protection against an unintentional gear-up landing. For either type of Mode 4A alert, further alert messages will occur if penetration of the envelope increases by 20%. EGPWS caution lights extinguish and aural messages will stop once the aircraft exits alert envelope.
- MODE 4B is active during cruise and approach, with gear down and flaps not in the landing configuration. Below 1000 ft AGL and above 159 kts airspeed, the aural alert is “TOO LOW TERRAIN”. Below 245 ft AGL and less than 159 kts airspeed, the aural alert is “TOO LOW FLAPS”.

- Mode 4C is intended to prevent inadvertent controlled flight into terrain during takeoff climb that produces insufficient closure rate for a Mode 2 alert. Required terrain clearance increases up to a maximum of 1,000 feet. It is active after takeoff when gear or flaps are not in landing configuration. It is also active during a low altitude go-around if the aircraft has descended below 245 ft AGL.

There are two levels of alerting for Mode 5. The first level of alert occurs when the airplane is below 1000 ft Radio Altitude and descends 1.3 dots or more below glideslope. This will illuminate the caution lights and is called a soft alert because the audio message “GLIDESLOPE” is enunciated at half volume. The second level alert occurs when the airplane is below 300 ft Radio Altitude and there are 2 dots or greater glideslope deviation. This is called a hard alert because the “GLIDESLOPE, GLIDESLOPE” message is enunciated louder and every 3 seconds continuing until the hard envelope is exited.

Mode 6 provides EGPWS advisory callouts for descents below predefined altitudes or excessive bank angles. These callouts consist of voice callouts or tones. There is no visual alerting provided with these callouts.

Mode 7 is designed to provide alerts if the aircraft encounters windshear. Two alerting envelopes provide either a Windshear Caution alert or a Windshear Warning alert each with distinctive aural and visual indications to the flight crew.

Windshear Caution alerts are given if an increasing headwind (or decreasing tailwind) and/or a severe updraft exceeds a defined threshold. These are characteristic of conditions *preceding* an encounter with a microburst.

Windshear Warning alerts are given if a decreasing headwind (or increasing tailwind) and/or a severe downdraft exceeds a defined threshold. These are characteristic of conditions *within or exiting* an encounter with a microburst.

There are a number of enhanced functions.

Envelope Modulation provides improved alert protection and expanded alerting margins at identified key locations throughout the world. No flight crew action is required.

The Terrain Clearance Floor (TCF) function enhances the basic GPWS Modes by alerting the pilot to descent below a defined Terrain Clearance Floor, regardless of the aircraft configuration. The TCF alert is a function of the aircraft's Radio Altitude and the distance to the center of the nearest runway in the database.

Terrain look ahead alerting is the ability to look ahead of the aircraft and detect terrain or obstacle conflicts with greater alerting time. This is accomplished utilizing the aircraft position, flight path angle, track, and speed, relative to the terrain database image forward of the aircraft.

The EGPWS Terrain Alerting and Display (TAD) provides an image of the surrounding terrain represented in various colors and intensities. There are two types of TAD displays. The first, called Standard, provides a terrain image only when the aircraft is 2,000 ft or less above the terrain (standard). A second, called Peaks, enhances the standard display characteristics to provide a higher degree of terrain awareness independent of the aircraft's altitude. Terrain and obstacles forward of the aircraft are displayed in both instances. Obstacles are presented on the cockpit display as terrain, employing the same display-coloring scheme.

NOTE: With respect to Standard or Peaks display, terrain and or obstacle presentation is always based on (and scaled for) the geographic area available for display. Consequently, terrain and/or obstacles outside of the selected display range and defined display sweep have no effect on the displayed image.

NOTE: When a TAD caution or warning alert is active, the display image (cells) surrounding the target are enlarged (surrounding cells are illuminated). This allows a smaller terrain or obstacle (e.g., a single tower) to be better seen on the display.

TAD/TCF functions may be inhibited by manual selection of a cockpit Terrain Inhibit switch. Neither loss nor inhibited TAD/TCF will affect the basic GPWS functions (modes 1-7).

Geometric Altitude is based on GPS altitude and is a computed altitude designed to reduce or eliminate errors potentially induced in Corrected Barometric Altitude by temperature extremes, non-standard pressure altitude conditions, and altimeter miss-sets. This ensures an optimal EGPWS Terrain Alerting and Display capability. Geometric Altitude also allows EGPWS operations in Corrected Barometric Altitude Relative to Field Elevation (QFE) environments without custom inputs or special operational procedures.

Automatic Flight Control System (AFCS)

The Automatic Flight Control System is a dual independent, fail passive autopilot, which provides dual independent flight directors, a 3-axis autopilot, and automatic pitch and roll trim control. The AFCS controls consist of the autopilot panel, two mode select panels, disengage and sync push buttons on the control wheels, and a GO AROUND push button on the left thrust lever.

The system incorporates two Flight Control Computers (FCC) which are semi-independent. Both must be working to engage the autopilot, but each operates its own flight director independently. If one FCC fails, the AFCS will disengage, but the operative FCC will continue to operate its flight director.

The system operates in the following modes:

- Pitch and Roll Hold

- Heading Select
- Navigation
- Approach
- Altitude Hold
- Altitude Preselect
- LVL Change
- Speed
- Vertical Speed
- Go-around

The autopilot panel is located at the bottom of the control pedestal. The autopilot is engaged when the A/P Lever is raised. A green AP ← at the upper left corner of each PFD annunciates autopilot engagement. To disengage the autopilot:

- Depress the red autopilot disconnect switch on either control wheel (the yaw damper is also disengaged).
- Depress the GO AROUND switch on the left thrust lever (yaw damper remains engaged).
- Actuate the center button on the control wheel trim switch (yaw damper remains engaged).
- Move the AP engage lever to the disengaged position (yaw damper remains engaged).

The yaw damper (YD) is engaged when the YD lever is raised. When engaged, if the FCC detects a yaw damper failure, it disengages the YD. If the condition causing the disengagement was momentary, the pilot can reengage the YD after the condition passes. To disengage the yaw damper:

- Depress the red autopilot disconnect switch on either control wheel.
- Move the YD engage lever to the disengaged position.

The A/P XFR push button transfers control of the mode select panel and flight director between the pilot and the copilot.

The TURB push button adapts the autopilot pitch and roll responses to compensate for turbulence. It is automatically cleared if a localizer is captured or if the autopilot is disengaged.

The pitch knob commands AFCS pitch changes. Displacing the switch clears any vertical mode except glideslope capture and returns the AFCS to the pitch mode.

The turn knob commands AFCS turns. Moving it clears any lateral mode except approach or localizer capture, returns the AFCS to roll mode, and commands a roll angle (up to 30 degrees), proportional to the knob position. Localizer capture disables the turn knob.

The mode select panel (MSP) contains the autopilot mode select switches. All switches toggle their functions on and off with indicator lights above them to verify switch selection status. Also, mode selections and transitions (i.e. armed to capture) are displayed on the PFD by flashing the mode for 5 seconds before becoming steady. Lateral and vertical modes are independent of each other. The lateral mode selections are:

- HDG
- APPR
- 1/2 BANK
- NAV

CAUTION: Do not select approach until aircraft heading is within 90 degrees of the inbound course. Otherwise the aircraft may intercept the back course.

The vertical mode selections are:

- VS
- VNAV
- LVL CHG
- SPEED
- ALT
- FD OFF

The FCCs receive flight director mode select data from the MSPs, analog bleed air pressure from both engines, attitude and heading data from the AHCs and manual pitch/roll command and engage logic from the autopilot panel. It applies this data to be displayed on the PFDs. Flight director commands and autopilot mode/status indications are also displayed on the PFDs. Instrument panel annunciator and rudder boost data is sent to the digital annunciator unit (DAU) for processing.

The primary servos run to position the aircraft pitch, roll and yaw axis control surfaces in response to the autopilot commands.

The automatic trim coupler (ATC) monitors the aileron servo motor drive from the FCCs and autopilot engage status. It provides arm and command outputs to the roll trim system that automatically run and null the aerodynamic forces that the primary servo is required to hold.

The rudder boost switch, located on the center pedestal, is a fail-passive system that deflects the rudder to compensate for asymmetrical thrust. Asymmetrical thrust is determined by four pressure transducers (two on each engine) that sense chamber pressure. If both transducers for each engine send like signals to the autopilot computer, the rudder is not deflected.

Indicating/Recording Systems

Flight Hour Meter

The flight hour meter, located on the right side panel, records operating time of the airplane, from takeoff to touchdown, and displays the operating time in hours and tenths. It operates whenever the battery switch is ON, the applicable circuit breakers are engaged and the main gear strut is extended.

Clock

Digital clocks with two displays are installed on the pilot's and copilot's instrument panels. The left display presents universal time in hours, minutes and seconds. The right display shows flight time (FT), elapsed time (ET), local time (LT) and universal time (UT).

Cockpit Voice Recorder (CVR)

The cockpit voice recorder provides a continuous 30/120-minute record of all cockpit voice communications and aural warnings. A cockpit microphone is located in the center of the lower side of the shroud panel. The system is operable when the BATTERY switch is placed in the ON or EMER position.

The pilot's and copilot's boom mics and oxygen mask mics, when selected, are recorded by the CVR. Transmissions from the hand-held mic are recorded only when the mic is keyed.

The control panel contains a green TEST button for checking CVR operation. A jack, located on the CVR panel, can be used with a headset, to check microphone operation, aural communications, and to monitor the self-test (a low-pitched tone), and erase functions. A red ERASE button will start the erase cycle when it is released after being depressed for 3 seconds. The erase cycle takes approximately 12 seconds. A 400-Hz tone is available to the headset jack during the erase cycle. The erase button is inoperative in flight.

Master Warning/Caution System

A master warning/caution system is provided to monitor the operating status of various airplane systems. This system consists of an annunciator panel and shroud indicator panel that utilize lights to provide operational information and visual indications of fault conditions. The annunciator panel is located on the center instrument panel and has a 52 annunciator capability. Illuminated red annunciators identify warning malfunctions which require immediate corrective action by the flight crew. Illuminated amber annunciators identify caution malfunctions which require corrective action, but not necessarily immediate action. Once illuminated, these annunciators will remain illuminated until the malfunction is corrected. Refer to the FAA Approved Airplane Flight Manual for corrective action to be initiated.

The shroud indicator panels have an 18 annunciator capability. Four different colored lights are used on the indicator panel: red for warning, amber for caution, green for advisory, and white for annunciation of a system condition.

A master test switch tests the integrity of eight primary systems by simulating system failures. The master test switch is located in the TEST group on the overhead panel. Using this switch to select a system energizes the test relay of the selected system to test the system's integrity. The output signal is sent to the system test GO/NO GO sense relay resulting in illumination of the respective light on the overhead panel according to the condition of the system.

Airshow 400 Cabin Video Information System

The Airshow 400 uses an LCD monitor to display a series of maps of varying resolution to show passengers the aircraft's present position, where the aircraft has been, and estimated time of arrival. Present position is shown by a white aircraft symbol with appropriate heading, while previous flight path is shown by a series of red squares. Individual Airshow functions, selected by controls on the VIP panel, include MAP, INFO, LOGO, and AUTO. In MAP mode, the computer automatically selects and displays local area maps. INFO mode processes real time flight information from the Flight Management System. Information presented includes altitude, outside air temperature, groundspeed in miles per hour, and time to destination. AUTO mode is designed to continually cycle all of the desired information available.

Emergency Locator Transmitter (Optional)

An Emergency Locator Transmitter (ELT) is provided. The ELT consists of a transmitter and a battery that provides 9 V DC power to the transmitter. The antenna(s) are located in the dorsal fin. The ELT is controlled by a two-position toggle switch placarded ON/TEST and AUTO located at the lower right corner of the copilot's instrument panel.

The transmitter broadcasts a warble tone simultaneously on emergency frequencies 121.5 and 243.0 MHz when activated. Federal regulations authorize an approximately one-second test of this system only between the hour and five minutes after the hour. Transmission can be verified by monitoring either the COM 1 or COM 2 receiver.

Since the battery pack inspection and replacement schedule is time-usage critical, system tests should be held to a minimum. Refer to the Beechjet 400/400A Maintenance Manual for complete test and logging procedures.