Section 1 - General

The aircraft is equipped with a Garmin GFC 700 Automatic Flight Control System (AFCS) which is fully integrated within the Cirrus Perspective Integrated Avionics System architecture. Refer to Section 7 - System Description and the Cirrus Perspective Pilot's Guide for additional description of the AFCS and operating procedures..

Determining status of Autopilot Underspeed Protection (USP) and Hypoxia Detection and Automatic Descent

If Perspective System software load 0764-09 or later is installed, the aircraft has these functions installed. Software load is displayed in the upper RH corner of the first MFD screen presented after power-up.

Determining status of Electronic Stability and Protection (ESP)

If the aircraft is equipped with ESP (software load 0764-09 or later), it is identified and displayed on the second MFD splash screen presented after power-up. This page will state "This aircraft is equipped with Electronic Stability & Protection" if installed.

Software load 0764-20 or later also supports Discrete-Triggered Low Speed ESP.

Section 2 - Limitations

1. The appropriate revision of the Cirrus Perspective Cockpit Reference Guide (p/n 190-00821-XX, where X can be any digit from 0 to 9) must be immediately available to the pilot during flight. The system software version stated in the reference guide must be appropriate for the system software version displayed on the equipment.
2. Minimum Autopilot Speed ..... 80 KIAS
3. Maximum Autopilot Speed ..... 185 KIAS
4. Autopilot Minimum-Use-Height:
   a. Takeoff and Climb ..... 400 feet AGL
   b. Enroute and Descent ..... 1000 feet AGL
   c. Approach (GP or GS Mode) ..... Higher of 200 feet AGL or Approach MDA, DA, DH.
   d. Approach (IAS, VS, PIT or ALT Mode)...Higher of 400 feet AGL or Approach MDA.
5. Yaw Damper must be turned off for takeoff and landing.

Section 4 - Normal Procedures

• Note •

Normal operating procedures for the GFC 700 Automatic Flight Control System are described in the Cirrus Perspective Pilot's Guide.

PreFlight Inspection

1. A self test is performed upon power application to the AFCS. A boxed AFCS annunciator will appear on the PFD in white text on a red background, followed by a boxed PFT in black text on a white background. Successful completion is identified by all Mode Controller annunciations illuminating for two seconds.

Before Taxiing

1. Manual Electric Trim .....TEST

   Press the AP DISC button down and hold while commanding trim. Trim should not operate either nose up or nose down.
2. Autopilot .....ENGAGE (press AP button)
3. Autopilot Override .....TEST
   Move flight controls fore, aft, left and right to verify that the Autopilot can be overpowered.
4. Autopilot .....DISENGAGE (press AP button)
5. Trim ..... SET FOR TAKEOFF

Enabling/Disabling ESP (Optional)

1. Turn the large FMS Knob to select the AUX page group
2. Turn the small FMS Knob to select the System Setup Page.
3. Press the SETUP 2 Softkey.
4. Press the FMS Knob momentarily to activate the flashing cursor.
5. Turn the large FMS Knob to highlight the 'Status' field in the Stability & Protection Box.
6. Turn the small FMS Knob to select 'ENABLED' or 'DISABLED'.
7. Press the FMS Knob momentarily to remove the flashing cursor.

GFC 700 AUTOMATED FLIGHT CONTROL SYSTEM (AFCS)

1. DESCRIPTION

This section covers those systems and components which use inputs to the system to automatically control the flight path of the aircraft through adjustment to the pitch and roll (or optionally, pitch, roll, and yaw) axes or wing lift characteristics and provide visual cues for flight path guidance. This includes the Garmin GFC 700 Autopilot system.

The Garmin GFC 700 digital Automatic Flight Control System (AFCS) Autopilot system is a fully digital, dual channel, fail-passive digital flight control system composed of multiple Line-Replaceable Units (LRUs) and servos. The GFC 700 is fully integrated within the Cirrus Perspective Integrated Avionics System architecture and is used to stabilize the aircraft pitch, roll, and yaw (optional) axes. Pitch autotrim provides trim commands to the pitch trim servo to relieve any long-term effort required by the pitch servo. The system consists of the following components:

- GMC 705 Automatic Flight Control System (AFCS) Mode Controller
- GCU 478 Flight Management System (FMS) Keyboard
- Pitch Servo
- Roll Servo
- Yaw Servo (Optional)
- Dual GIA 63W Integrated Avionics Computers
- GTA 82 Pitch Trim Adapter
- Autopilot Disconnect Switch
- 4-Way Trim Switch
- Take-Off/Go-Around (GA) Switch

The GIA 63W Integrated Avionics computer contains Autopilot/Flight Director algorithms and the MFD/PFD provides autopilot annunciation. The GRS 77 AHRS provides valid attitude, angular rate and acceleration information. The GDC 74A ADC provides air data for flight instrumentation. The GSA 80 and GSA 81 servos are used in the pitch, roll, and yaw (optional) axes. The servos position the aircraft controls in response to commands generated by the internal GIA 63W autopilot calculations. The GTA 82 pitch trim adapter drives the pitch trim cartridge. The operating controls for the autopilot are located on the mode controller/keyboard. The autopilot disconnect and 4-way trim switches provide input to disconnect/override autopilot guidance. (See Figure 22-121)

The GFC 700 AFCS with optional Yaw Damper can be divided into three primary operating functions:

Flight Director - The Flight Director provides pitch and roll commands to the AFCS system and displays them on the PFD. With the Flight Director activated, the pilot can hand-fly the aircraft to follow the path shown by the command bars. Flight Director operation takes place within GIA 63W Integrated Avionics Units and provides:

- Mode annunciation
- Vertical reference control
- Pitch and roll command calculation
- Pitch and roll command display

Autopilot - The Autopilot controls the aircraft pitch, roll, and if installed, yaw attitudes, while following commands received from the Flight Director. Autopilot operation occurs within the trim servos and provides:

- Autopilot engagement and annunciation
- Autopilot command and control

- Auto-trim operation
- Manual electric trim
- Two axis airplane control (pitch and roll), including approaches
- Level (LVL) mode engagement command of zero roll and zero vertical speed

Optional Yaw Damper - The yaw damper reduces dutch roll tendencies and coordinates turns. It can operate independently of the autopilot and may be used during normal hand-flight maneuvers. A GSA 80 servo provides the control surface interface and the mode selection occurs via the GMC 705 controller. Yaw Damper operation is provided by the yaw servo and supplies:

- Yaw Damper engagement and annunciation
- Yaw axis airplane control

For maintenance practices pertinent to the MFD/PFD, see Central Display Systems. (Refer to 31-60)

For maintenance practices pertinent to the AHRS, see Attitude and Direction. (Refer to 34-20)

For maintenance practices pertinent to the ADC, see Flight Environmental Systems. (Refer to 34-10)

For maintenance practices pertinent to the FMS keyboard, see Flight Management Computing. (Refer to 34-60)

For maintenance practices pertinent to the GIA 63W Integrated Avionics Computer, see Central Computers. (Refer to 31-40)

For additional information on the autopilot system integration, see the Cirrus Perspective Integrated Avionics System Pilot's Guide. (Refer to 05-10)

The GFC 700 AFCS is integral to the Perspective Integrated Avionics system. For an overview of the Perspective Avionics system, refer to Chapter 42, Integrated Modular Avionics. (Refer to 42-20)

A. GMC 705 Automatic Flight Control System (AFCS) Mode Controller - *Serials w/ Perspective Avionics*

The GFC 705 AFCS Mode Controller, located in the upper section of the center console, provides primary control of autopilot modes and, if installed, yaw damper engagement. A pitch wheel is included for adjustment of pitch mode reference. Through the mode controller, the GIA 63W Integrated Avionics computer serves the function of converting operator commands to logic signals for the roll and pitch computer functions.

28 VDC for mode controller operation is supplied through the 5-amp KEYPADS / AP CTRL circuit breaker on Main Bus 1.

B. GTA 82 Pitch Trim Adapter - *Serials w/ Perspective Avionics*

The Pitch Trim Adapter, located below the passenger seat, takes input from the trim switches, Integrated Avionics Units, and the pitch servo to allow the GFC 700 to drive the pitch servo. The trim adapter interfaces with the dual GIA 63W Integrated Avionics computers through serial communication on separate RS-485 ports. Trim commands from the yoke switches are routed through the GTA 82 when autopilot is disconnected.

28 VDC for pitch trim adapter operation is supplied through the 2-amp PITCH TRIM circuit breaker on Main Bus 1.

C. Pitch Servo - *Serials w/ Perspective Avionics*

The pitch servo, located below the baggage compartment at access panel CF5, provides automatic control of the pitch axis. The pitch computer receives signal inputs to compute pitch commands for stabilization, turns, radio intercepts, heading and tracking.

The pitch servo is an electromechanical unit that provides automatic control of the pitch flight axis. The pitch servo receives data from dual GIA 63W Integrated Avionics computers containing Autopilot/Flight

Director algorithms. The GRS 77 AHRS and the GDC 74A Air Data Computer are fed inputs used to drive autopilot. The pitch servo consists of a GSA 81 Servo Actuator and GSM 85A/86 Servo Mount.

The servo actuator contains a motor-control circuit board, monitor circuit board, solenoid, and motor. The motor-control board processes data and drives the motor as required for axis control. The monitor board monitors servo speed, monitors output torque, and controls engagement of the drive-clutch solenoid.

The servo mount contains a capstan and slip-clutch. The capstan transfers the output torque of the servo actuator to the mechanical flight control surface linkage for pitch axis. The slip-clutch allows the pilot to override operation of the servo actuator. Sufficient force applied to the capstan overcomes the slip-clutch setting, allowing the capstan to rotate independently of the servo actuator.

28 VDC for pitch servo operation is supplied through the 5-amp AP SERVOS circuit breaker on Main Bus 1.

D. Roll Servo - *Serials w/ Perspective Avionics*

The roll servo, located below the passenger seat at access panel CF4C, provides automatic control of the roll axis. The roll computer receives signal inputs to compute roll commands for stabilization, turns, radio intercepts, heading and tracking.

The roll servo is an electromechanical unit that provides automatic control of the roll flight axis. The roll servo receives data from dual GIA 63W Integrated Avionics computers containing Autopilot/Flight Director algorithms. The GRS 77 AHRS and the GDC 74A Air Data Computer are fed inputs used to drive autopilot. The roll servo consists of a GSA 81 Servo Actuator and GSM 85A/86 Servo Mount.

The servo actuator contains a motor-control circuit board, monitor circuit board, solenoid, and motor. The motor-control board processes data and drives the motor as required for axis control. The monitor board monitors servo speed, monitors output torque, and controls engagement of the drive-clutch solenoid.

The servo mount contains a capstan and slip-clutch. The capstan transfers the output torque of the servo actuator to the mechanical flight control surface linkage for roll axis. The slip-clutch allows the pilot to override operation of the servo actuator. Sufficient force applied to the capstan overcomes the slip-clutch setting, allowing the capstan to rotate independently of the servo actuator.

28 VDC for roll servo operation is supplied through the 5-amp AP SERVOS circuit breaker on Main Bus 1.

E. Yaw Servo - *Serials w/ Perspective Avionics and Three-Axis Configuration*

The yaw servo, located in the empennage avionics bay at access panel RE3, provides automatic control of the yaw axis. The yaw computer receives signal inputs to compute yaw commands for stabilization, turns, radio intercepts, heading and tracking.

The yaw servo is an electromechanical unit that provides automatic control of the yaw flight axis. The yaw servo receives data from dual GIA 63W Integrated Avionics computers containing Autopilot/Flight Director algorithms. The GRS 77 AHRS and the GDC 74A Air Data Computer are fed inputs used to drive autopilot. The yaw servo consists of a GSA 80 Servo Actuator and GSM 85A/86 Servo Mount.

The servo actuator contains a motor-control circuit board, monitor circuit board, solenoid, and motor. The motor-control board processes data and drives the motor as required for axis control. The monitor board monitors servo speed, monitors output torque, and controls engagement of the drive-clutch solenoid.

The servo mount contains a capstan and slip-clutch. The capstan transfers the output torque of the servo actuator to the mechanical flight control surface linkage for yaw axis. The slip-clutch allows the pilot to override operation of the servo actuator. Sufficient force applied to the capstan overcomes the slip-clutch setting, allowing the capstan to rotate independently of the servo actuator.

28 VDC for yaw servo operation is supplied through the 3-amp YAW SERVO circuit breaker on Main Bus 3.