

Pilot's Operating Handbook and  
FAA Approved Airplane Flight Manual  
Supplement  
for

# GFC 700 Automatic Flight Control System

(Aircraft Serials w/ Perspective Avionics Only)

When the GFC 700 Automatic Flight Control System is installed on the aircraft, this POH Supplement is applicable and must be inserted in the Supplements Section of the basic Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic Pilot's Operating Handbook.

• Note •

This POH Supplement Change, dated Revision 02: 01-06-10, supersedes and replaces the Revision 01 release of this POH Supplement dated 08-26-09.

FAA Approved Joseph C. Mies Date Jan 06 2010  
for Charles Smalley, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## Section 1 - General

The aircraft is equipped with a Garmin GFC 700 digital 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 Automatic Flight Control System and operating procedures.

## Section 2 - Limitations

1. Minimum Autopilot Speed .....80 KIAS
2. Maximum Autopilot Speed ..... 185 KIAS
3. 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.
4. Yaw Damper must be turned off for takeoff and landing
5. The autopilot may not be engaged beyond the Engagement Limits. If the autopilot is engaged beyond the command limits (up to engagement limits) it will be rolled or pitched to within the command limits and an altitude loss of 1000 feet or more can be expected while attitude is established in the selected mode.

Axis	Autopilot Engagement Limit
Pitch	± 30°
Roll	± 75°

6. The autopilot and flight director will not command pitch or roll beyond the Command Limits.

Axis	Autopilot Command Limit
FD Pitch Command Limits	+20°, -15°
FD Roll Command Limits	± 25°

7. Use of VNAV is not supported during an approach with a teardrop course reversal. VNAV will be disabled at the beginning of the teardrop.

## Section 3 - Emergency Procedures

### Autopilot Malfunction

Refer to *Electric Trim/Autopilot Failure* procedure in the basic Pilot's Operating Handbook. Do not reengage the autopilot until the malfunction has been identified and corrected. The autopilot may be disconnected by:

1. Pressing the A/P DISC on the control yoke.

or

2. Pulling the AP SERVOS circuit breaker on MAIN BUS 1.

Altitude lost during a roll or pitch axis autopilot malfunction and recovery:

Flight Phase	Bank Angle	Altitude Loss
Climb	45°	300 ft
Cruise	45°	300 ft
Maneuvering	45°	300 ft
Descent	45°	300 ft
Approach	45°	70 ft

## Section 3A - Abnormal Procedures

### Autopilot Miscompare

#### *AP MISCOMP Caution*

AP MISCOMP

Autopilot miscompare, autopilot is not available.

1. Continue flight without autopilot.

### Autopilot and PFD Using Different AHRSs

#### *AP/PFD AHRS Caution*

AP/PFD AHRS

The autopilot and PFD are using different Attitude and Heading Reference Systems.

1. Continue flight without autopilot. Monitor Standby Instruments.  
Pilot may manually select other AHRS if installed.

### No Autopilot ADC Modes Available

#### *NO ADC MODES Caution*

NO ADC MODES

Autopilot air data modes are not available.

1. Autopilot may only be engaged in pitch (PIT) mode.

### No Autopilot Vertical Modes Available

#### *NO VERT MODES Caution*

NO VERT MODES

Autopilot vertical modes are not available.

1. Autopilot may only be engaged in lateral mode.

## Altitude Selection Deviation

### *ALTITUDE SEL Advisory*

**ALTITUDE SEL**

The pilot has programmed the autopilot to climb or descend away from the selected altitude. Typically done unintentionally.

1. Altitude Selection ..... CORRECT, AS REQUIRED

## Course Selection Track Error

### *COURSE SEL Advisory*

**COURSE SEL**

The pilot has selected an autopilot mode (ROL) and engaged a NAV mode (VLOC or GPS) and the current aircraft track will not intercept the selected course. Typically done unintentionally.

1. Course Heading ..... CORRECT, AS REQUIRED

## 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 Automatic Flight Control System. 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 of the self test is identified by all Mode Controller annunciator lights illuminating for approximately two seconds.

*Continued on following page.*

## 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

## Section 5 - Performance

• **WARNING** •

The autopilot may not be able to maintain all selectable vertical speeds. Selecting a vertical speed that exceeds the aircraft's available performance may cause the aircraft to stall.

The autopilot will disconnect if the Stall Warning System is activated.

## Section 6 - Weight & Balance

Refer to Section 6 - Weight and Balance of the basic POH for current weight and balance data.

## Section 7 - System Description

This airplane is equipped with a GFC 700 - a two axis (three axis optional), fully digital, dual channel, fail passive Automatic Flight Control System (AFCS). The system consists of the GFC 705 AFCS Mode Controller, Flight Management System Keyboard, Roll Servo, Pitch Servo, Yaw Servo (optional), Integrated Avionics Units, Pitch Trim Adapter, Autopilot Disconnect Switch, Take Off / Go Around Button, Electric Pitch-Trim and Roll-Trim Hat Switch. 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 the #1 Integrated Avionics Unit and provides:

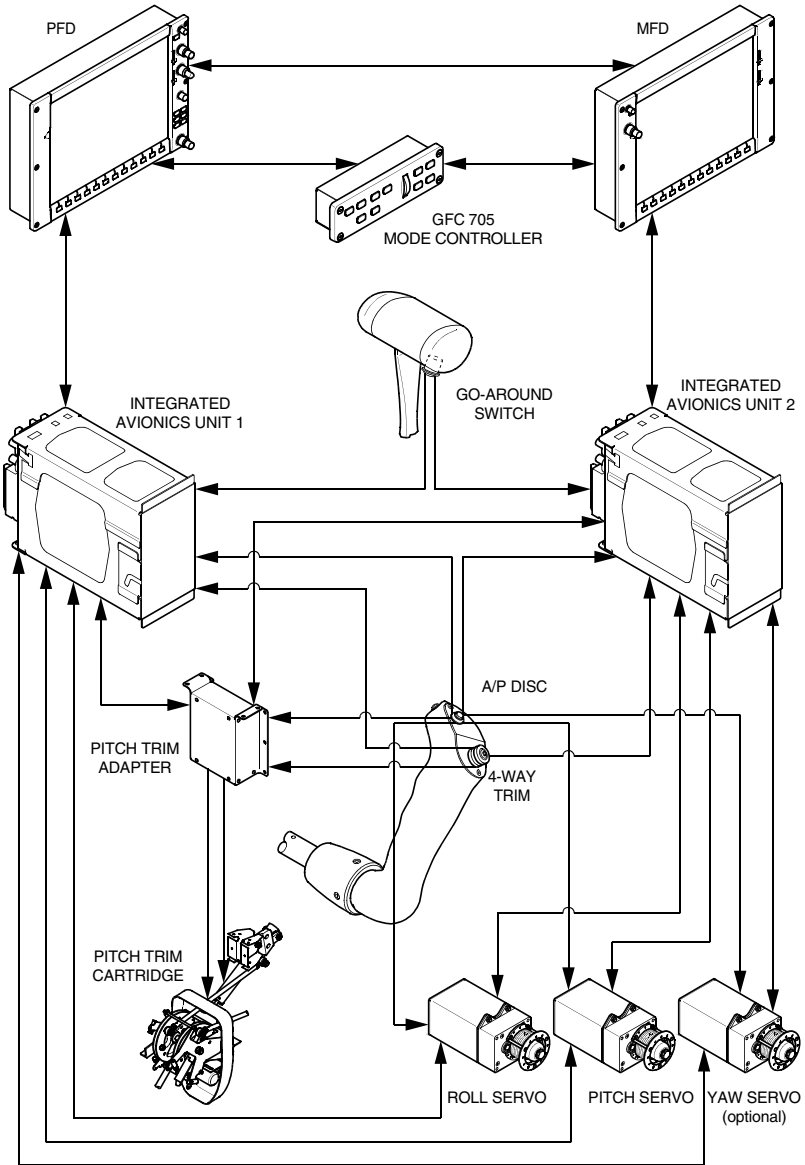
- Mode annunciation
- Vertical reference control
- Pitch and roll command calculation
- Pitch and roll command display

**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** - Yaw Damper operation is provided by the yaw servo and supplies:

- Yaw Damper engagement and annunciation
- Yaw axis airplane control



SR22\_FM09\_2919

**Figure - 1**  
**GFC 700 Automatic Flight Control System Schematic**

## **GFC 705 AFCS Mode Controller**

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. 28 VDC for GFC 705 AFCS Mode Controller operation is supplied through 5-amp KEYPADS / AP CTRL circuit breaker on MAIN BUS 1. All Autopilot mode selection is performed by using the mode select buttons and pitch wheel on the controller. Available functions are as follows:

### ***HDG - Heading Button***

The HDG hold button selects/deselects the Heading Select mode. Heading Select commands the flight director to follow the heading bug (selected with the HDG knob).

### ***NAV - Navigation Button***

The NAV button selects/deselects the Navigation mode. This provides lower gains for VOR enroute tracking and disables glideslope coupling for localizer or back course approaches and glideslope coupling for GPS approaches. This button is also used to couple to the GPS.

### ***APR - Approach Button***

The APR button selects the Approach mode. This provides higher gains for VOR approach tracking and enables glideslope coupling for ILS approaches and GPS coupling for LPV (Localizer Performance with Vertical Guidance) and LNAV +V approaches.

### ***AP - Autopilot Button***

The AP button engages/disengages the autopilot.

### ***LVL - Level Button***

The LVL button engages the autopilot (within the Autopilot Engagement Limits if not already engaged) and commands roll to zero bank angle and pitch to zero vertical speed. The LVL button will not engage, or will disengage, if the Stall Warning System is activated.

### ***FD - Flight Director Button.***

The FD button toggles the Flight Director activation. It turns on the Flight Director in the default pitch and roll modes if no modes were previously selected. Pressing the FD button with command bars in view, will deactivate the Flight Director and remove the command bars

unless the autopilot is engaged. If the autopilot is engaged, the FD button is deactivated.

***YD - Yaw Damper Button (Optional)***

The YD button engages/disengages the yaw damper.

• Note •

The yaw damper is automatically engaged when the autopilot is engaged with the AP button.

***UP/DN - Pitch Wheel***

The Pitch UP/DN Wheel on the controller is used to change the flight director pitch mode reference value. Each click of the wheel results in a step increase or decrease in the flight director pitch mode by the amount shown in the table below. The Pitch Wheel controls the reference for Pitch Hold (PIT), Vertical speed (VS), and Indicated Airspeed (IAS) FD modes. The reference value is displayed next to the active mode annunciation on the PFD. Go-Around and Glidescope modes are not controlled by the nose Pitch Wheel, however, use of the Pitch Wheel during Go-Around mode will cause reversion to Pitch Hold mode. The Pitch Wheel controls altitude reference when in altitude hold mode.

<b>Flight Director Mode</b>	<b>Step Value</b>
Default Pitch Hold (PIT)	0.50 Degree
Vertical speed (VS)	100 Feet per Minute
Indicated Airspeed (IAS)	1 Knot
Altitude Hold (ALT)	10 Feet

***IAS - Indicated Airspeed Hold Button***

The IAS button selects/deselects the Indicated Airspeed Hold mode.

***ALT - Altitude Button***

The ALT hold button selects/deselects the Altitude Hold mode.

***VS - Vertical Speed Button***

The VS button selects/deselects the Vertical Speed mode.

***VNV - VNAV Button***

The VNV button selects/deselects the Vertical Navigation mode.

## Flight Management System Keyboard

The Flight Management System Keyboard, found in the center console below the AFCS mode controller, is the primary means for data entry for the MFD and is used to control NAV/COM Radios, transponder, and flight management system entry. Heading, course and altitude select are also provided.

28 VDC for Flight Management System Keyboard operation is supplied through the 5-amp KEYPADS / AP CTRL circuit breaker on MAIN BUS 1.

AFCS related functions are as follows:

### ***HDG - Heading Knob.***

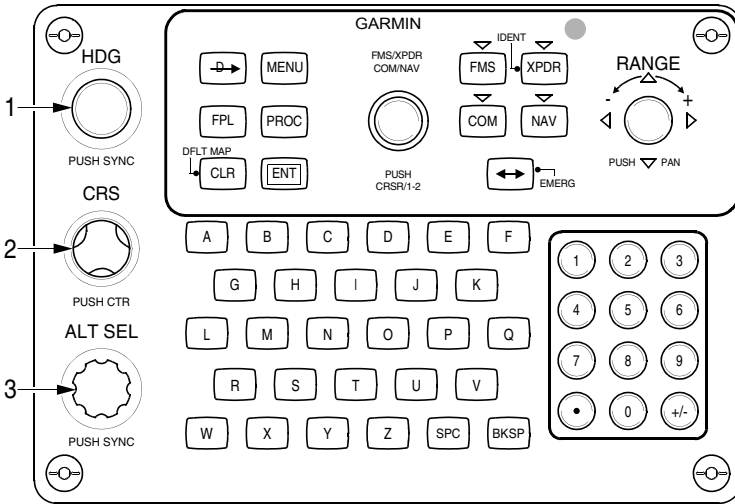
The HDG knob controls the selected heading bug on the HSI portion of the PFD. It provides the reference for heading select mode. Pushing the HDG knob synchronizes the selected heading to the current heading.

### ***CRS - Course Knob***

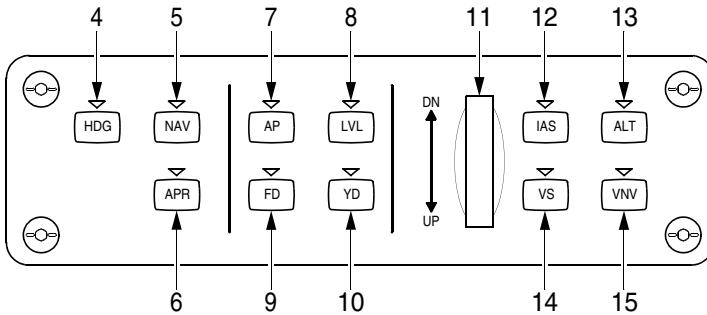
The CRS knob controls the course pointer on the HSI portion of the PFD. It provides the reference for FD navigation modes when the Flight Director is selected. Pushing the CRS knob re-centers the CDI and returns the course pointer to the bearing of the active waypoint or navigation station.

### ***ALT SEL - Altitude Select Knob***

The ALT knob controls the Selected Altitude, which is used as the reference for the altitude alerter and the altitude capture function. Pushing the ALT SEL knob synchronizes the selected altitude to the displayed altitude to the nearest 10 ft.



Flight Management System Keyboard



GFC 705 Mode Controller

**Legend**

- |                        |                              |
|------------------------|------------------------------|
| 1. Heading Selection   | 9. Flight Director           |
| 2. Course Selection    | 10. Yaw Damper (optional)    |
| 3. Altitude Selection  | 11. Pitch Wheel              |
| 4. Heading Select Mode | 12. Indicated Airspeed Hold  |
| 5. Navigation Mode     | 13. Altitude Hold            |
| 6. Approach Mode       | 14. Vertical Speed Mode      |
| 7. Autopilot           | 15. Vertical Navigation Mode |
| 8. Wings Level         |                              |

SR22\_FM09\_2921

**Figure - 2**  
**FMS Keyboard and GFC 705 AFCS Mode Controller**

## Roll, Pitch and Optional Yaw Servo

The Roll Servo, located below the passenger seat, the Pitch Servo, located below the baggage compartment, and the optional Yaw Servo, located in the empennage avionics bay, position the aircraft flight controls in response to commands generated by the Integrated Avionics Units autopilot calculations.

28 VDC for Roll and Pitch Servo operation is supplied through the 5-amp AP SERVOS circuit breaker on MAIN BUS 1.

28 VDC for Yaw Servo operation is supplied through the 3-amp AP YAW SERVO circuit breaker on MAIN BUS 3.

## Integrated Avionics Units

The Integrated Avionics Units located behind the MFD and instrument panel, function as the main communication hubs to the Avionics System and GFC 700, linking the systems to the PFD and MFD displays. Each Integrated Avionics Unit receives air and attitude data parameters from the Air Data Computer and Attitude and Heading Reference System. Each Integrated Avionics Unit contains a GPS WAAS receiver, VHF COM/NAV/GS receivers, and system integration microprocessors. The AFCS function within the Integrated Avionics Units control the active and armed modes for the Flight Director, as well as autopilot engagement. The Flight Director commands for the active modes are calculated and sent to the PFD for display and mode annunciation. The sensor data and Flight Director commands are also sent to the servos over a common serial data bus.

28 VDC for Integrated Avionics Unit 1 operation is supplied through the 7.5-amp COM 1 and 5-amp GPS NAV1 circuit breakers on the ESS BUS 1. 28 VDC for Integrated Avionics Unit 2 operation is supplied through the 7.5-amp COM 2 and 5-amp GPS NAV2 circuit breakers on the MAIN BUS 2.

## **Autopilot Disconnect Switch**

The yoke mounted Autopilot Disconnect Switch disengages the autopilot and may also be used to mute the aural alert associated with an AP disconnect.

## **Take Off / Go Around Button**

The remote TO/GA switch, located on the left side of the power lever, disengages the autopilot and selects the Takeoff or Go Around mode on the Flight Director. When the aircraft is on the ground, pressing the TO/GA switch engages the Flight Director command bars in Takeoff mode. When the aircraft is in the air, pressing the TO/GA switch engages the Flight Director command bars in Go Around mode. Pressing the TO/GA switch will disengage the autopilot and cancel all armed modes except ALT ARM (ALTS). After TO/GA engagement, other roll modes may be selected and subsequent autopilot engagement is allowed. However, an attempt to modify the pitch attitude with the Pitch Wheel will result in a reversion to PIT mode. Additionally, if in Approach mode, pressing the TO/GA switch resumes automatic sequencing of waypoints by deactivating the “SUSP” mode.

## **Pitch Trim Adapter**

The Pitch Trim Adapter, located below the passenger seat, takes input from the trim switches, Integrated Avionics Units, and the pitch servos to allow the GFC 700 to drive the pitch trim cartridge.

28 VDC for Pitch Trim Adapter operation is supplied through the 2-amp PITCH TRIM circuit breaker on Main Bus #1.

## **Electric Pitch/Roll-Trim Hat Switch**

The yoke mounted Electric Pitch Trim and Roll Trim Hat Switch allows the pilot to manually adjust aircraft trim when the autopilot is not engaged.

## Annunciation System

• Note •

Refer to the Cirrus Perspective Pilot's Guide for a detailed description of the annunciator system and all warnings, cautions and advisories.

### ***Crew Alerting System***

AFCS alerts are displayed in the Crew Alerting System (CAS) window located to the right of the altimeter and VSI. AFCS annunciations are grouped by criticality and sorted by order of appearance with the most recent message on top. The color of the message text is based on its urgency and required action:

- Warning (red) – Immediate crew awareness and action required.
- Caution (yellow) – Immediate crew awareness and future corrective action required.
- Advisory (white) – Crew awareness required and subsequent action may be required.

In combination with the CAS Window, the system issues an audio alert when specific system conditions are met and an expanded description of the condition is displayed in the Alerts Window located in the lower RH corner of the PFD.

• Note •

For specific pilot actions in response to AFCS alerts, refer to Section 3A - Abnormal Procedures.

### ***AFCS Status Box and Mode Annunciation***

Flight director mode annunciations are displayed on the PFD when the flight director is active. Flight director selection and autopilot and yaw damper statuses are shown in the center of the AFCS Status Box. Lateral flight director modes are displayed on the left and vertical on the right. Armed modes are displayed in white and active in green.

AFCS status annunciations are displayed on the PFD above the Airspeed and Attitude indicators. Only one annunciation may occur at a time. Messages are prioritized by criticality.

## **Section 8 – Handling, Service, & Maintenance**

No Change.

## **Section 10 – Safety Information**

No Change.