

**Pilot's Operating Handbook and  
FAA Approved Airplane Flight Manual  
Supplement  
for the  
GFC 700 Automatic Flight Control System**

(Aircraft Serials w/ Perspective Avionics Only)

***Including optionally installed Electronic Stability and Protection (ESP), Underspeed Protection (USP), and Hypoxia Detection and Automatic Descent functions.***

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 04: 09-08-14, supersedes and replaces the Revision 03 release of this POH Supplement dated 12-14-10.

FAA Approved

*Ronald A. McElroy*  
\_\_\_\_\_

Date

Sept 8, 2014

for Timothy Smyth, Manager  
Chicago Aircraft Certification Office, ACE-115C  
Federal Aviation Administration

## 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.

6. 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	$\pm 30^\circ$
Roll	$\pm 75^\circ$

7. 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	$\pm 25^\circ$

8. Use of VNAV is not supported during an approach with a teardrop course reversal. VNAV will be disabled at the beginning of the teardrop.
9. For aircraft with optional USP or optional Discrete-Triggered Low Speed ESP, if Stall Warning is inoperative, Autopilot Underspeed Protection will not be provided in Altitude Critical Modes (ALT, GS, GP, TO and GA), and Low Speed ESP will not be available.

## Section 3 - Emergency Procedures

### Autopilot Malfunction

Refer to *Electric Trim/Autopilot Failure* abnormal procedure in the basic POH. 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

### Altitude Miscompare

#### *ALT MISCOMP Caution*

**ALT MISCOMP**

For dual ADC installations, altitude difference is greater than 200 feet between ADC1 and ADC2.

1. Altitude ..... CROSS-CHECK ADC1 against Standby Altimeter
2. ADC2 ..... SELECT
  - a. Press SENSOR softkey on PFD, followed by ADC2 softkey
  - b. Expect USING ADC2 message on PFD
3. Altitude ..... CROSS-CHECK ADC2 against Standby Altimeter
4. ADC ..... SELECT more reliable
  - a. Press SENSOR softkey, then select the ADC that provided the most reliable altitude indication

### Airspeed Miscompare

#### *IAS MISCOMP Caution*

**IAS MISCOMP**

For dual ADC installations, airspeed difference is greater than 7 knots between ADC1 and ADC2.

1. Airspeed ..... CROSS-CHECK ADC1 against Standby Airspeed Indicator
2. ADC2 ..... SELECT
  - a. Press SENSOR softkey on PFD, followed by ADC2 softkey
  - b. Expect USING ADC2 message on PFD
3. Airspeed ..... CROSS-CHECK ADC2 against Standby Airspeed Indicator
4. ADC ..... SELECT more reliable
  - a. Press SENSOR softkey, then select the ADC that provided the most reliable airspeed indication

## Heading Miscompare

### *HDG MISCOMP Caution*

**HDG MISCOMP**

For dual AHRS installations, heading difference is greater than 6° between AHRS 1 and AHRS 2.

1. Heading.....CROSS-CHECK AHRS1 against Magnetic Compass
2. AHRS2 ..... SELECT
  - a. Press SENSOR softkey on PFD, followed by AHRS2 softkey
  - b. Expect USING AHRS2 message on PFD
3. Altitude .....CROSS-CHECK AHRS2 against Magnetic Compass
4. AHRS ..... SELECT more reliable
  - a. Press SENSOR softkey, then select the AHRS that provided the most reliable heading indication

## Pitch Miscompare

### *PIT MISCOMP Caution*

**PIT MISCOMP**

For dual AHRS installations, pitch difference is greater than 5° between AHRS 1 and AHRS 2. Flight Director, Autopilot, and ESP (if installed) will not be available when pitch miscompare exists.

1. Pitch .....CROSS-CHECK AHRS1 against Stdby Attitude Indicator
2. AHRS2 ..... SELECT
  - a. Press SENSOR softkey on PFD, followed by AHRS2 softkey
  - b. Expect USING AHRS2 message on PFD
3. Pitch .....CROSS-CHECK AHRS2 against Stdby Attitude Indicator
4. AHRS ..... SELECT more reliable
  - a. Press SENSOR softkey, then select the AHRS that provided the most reliable pitch indication
5. UNRELIABLE AHRS CIRCUIT BREAKER ..... PULL

Pulling circuit breaker for unreliable AHRS will clear miscompare condition, but will result in 'NO PIT/ROLL/HDG COMPARE'

advisory since backup source is not available for comparison. Flight Director, Autopilot and ESP will become available when unreliable AHRS CB is pulled.

## Roll Miscompare

### *ROLL MISCOMP Caution*

**ROLL MISCOMP**

For dual AHRS installations, roll (bank) difference is greater than 6° between AHRS 1 and AHRS 2.

1. Roll.....CROSS-CHECK AHRS1 against Stdby Attitude Indicator
2. AHRS2..... SELECT
  - a. Press SENSOR softkey on PFD, followed by AHRS2 softkey
  - b. Expect USING AHRS2 message on PFD
3. Roll.....CROSS-CHECK AHRS2 against Stdby Attitude Indicator
4. AHRS..... SELECT more reliable
  - a. Press SENSOR softkey, then select the AHRS that provided the most reliable roll indication
5. UNRELIABLE AHRS CIRCUIT BREAKER..... PULL  
Pulling circuit breaker for unreliable AHRS will clear miscompare condition, but will result in 'NO PIT/ROLL/HDG COMPARE' advisory since backup source is not available for comparison. Flight Director, Autopilot and ESP will become available when unreliable AHRS CB is pulled.

## Autopilot Miscompare

### *AP MISCOMP Caution*

**AP MISCOMP**

Autopilot miscompare, Autopilot is not available.

1. Continue flight without Autopilot or isolate and remove the unreliable sensor to clear the MISCOMP as described for ROLL or PIT MISCOMP checklists to restore the 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

## Autopilot Hypoxia Detection System (Optional)

### *ARE YOU ALERT? Advisory*

**ARE YOU ALERT?**

No pilot activity has been detected over a prescribed interval of time, interval decreases as altitude increases.

1. Actuate any Integrated Avionics System softkey or knob to reset system.

### *HYPOXIA ALERT Caution*

**HYPOXIA ALERT**

No pilot response to the ARE YOU ALERT? annunciation detected after one minute.

1. Actuate any Integrated Avionics System softkey or knob to reset system.

**AUTO DESCENT Warning**

**AUTO DESCENT**

No pilot response to the HYPOXIA ALERT annunciation detected after one minute. Warning remains until pilot responds. Automatic descent begins after one minute of unanswered Warning. Once it begins, automatic descent will commence to 14,000 feet for 4 minutes, then to 12,500 feet thereafter. Once descent begins, only a decouple of the Autopilot will interrupt this process.

1. If within 60 seconds of AUTO DESCENT Warning (prior to descent):
  - a. Actuate Integrated Avionics System softkey or knob to reset.
2. If greater than 60 seconds of AUTO DESCENT Warning:
  - a. Autopilot..... DISCONNECT
  - b. Situation..... ASSESS

**• WARNING •**

Pilot should carefully assess aircraft state, altitude, location, and physiological fitness to maintain continued safe flight.

- c. ATC.....COMMUNICATE SITUATION
  - d. ALT Bug..... RESET to desired
  - e. Autopilot.....ENGAGE
- If hypoxia suspect:*
- f. Oxygen Masks or Cannulas ..... DON
  - g. Oxygen System ..... ON
  - h. Oxygen Flow Rate ..... MAXIMUM
  - i. Blood Oxygen Saturation Level ..... CHECK

## Underspeed Protection Recovery (Optional)

### **UNDERSPEED PROTECT ACTIVE Warning**

**UNDERSPEED PROTECT ACTIVE**

Autopilot engaged and airspeed has fallen below minimum threshold.

Recovery may be initiated in one of three ways:

1. Power Lever ..... INCREASE  
as required to correct underspeed condition.  
*or*
1. Autopilot AP DISC Switch ..... SELECT  
and manually fly aircraft.  
*or*
1. Autopilot ..... CHANGE MODES  
to one in which the AFCS can maintain.

## 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 annunciators 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.

## Temporary Interrupt of ESP (Optional)

Although ESP is only provided when AFCS Autopilot is disengaged, the AFCS and its servos are the source of ESP guidance. When the AP Disconnect button is pressed and held, the servos will provide no ESP control force feedback. Upon release of the AP Disconnect button, ESP will be restored.

1. AP Disconnect .....PRESS and HOLD until maneuver complete

## 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.

If AFCS Underspeed Protection function is not installed, 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.

## 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:

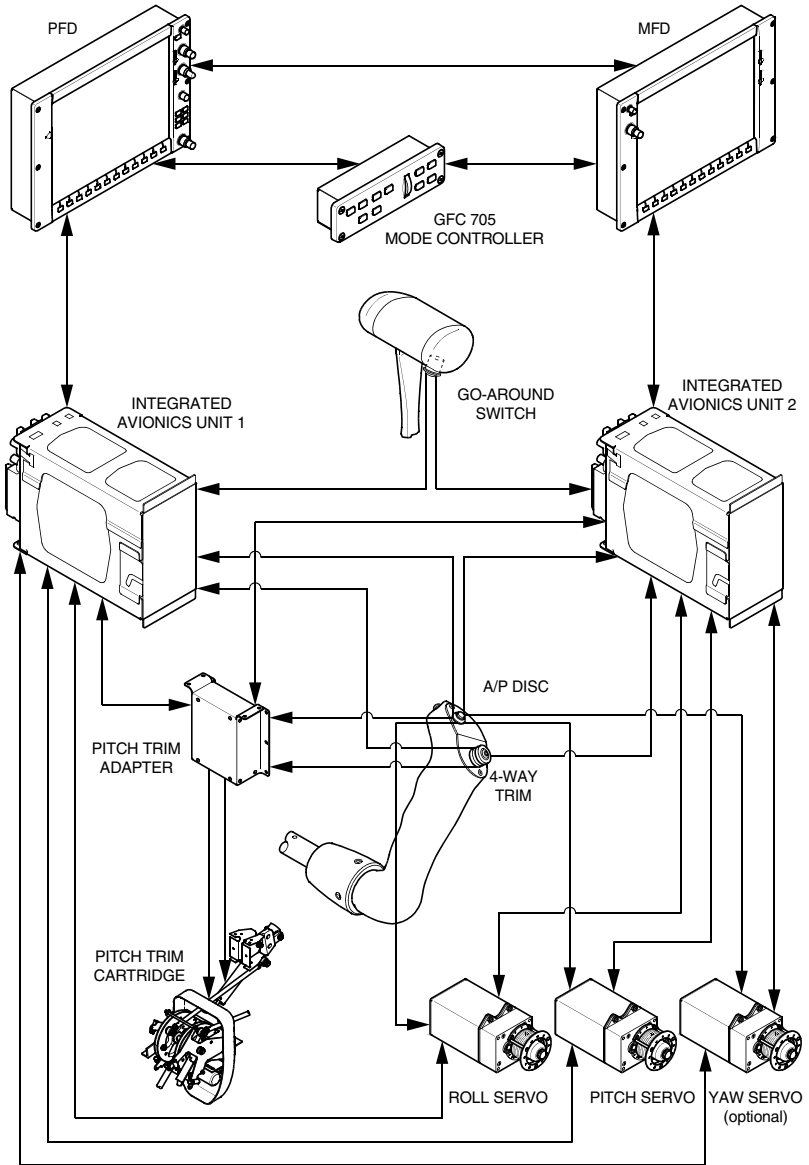
- Mode annunciation
- Vertical reference control
- Pitch and roll command calculation
- Pitch and roll command display

**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.***

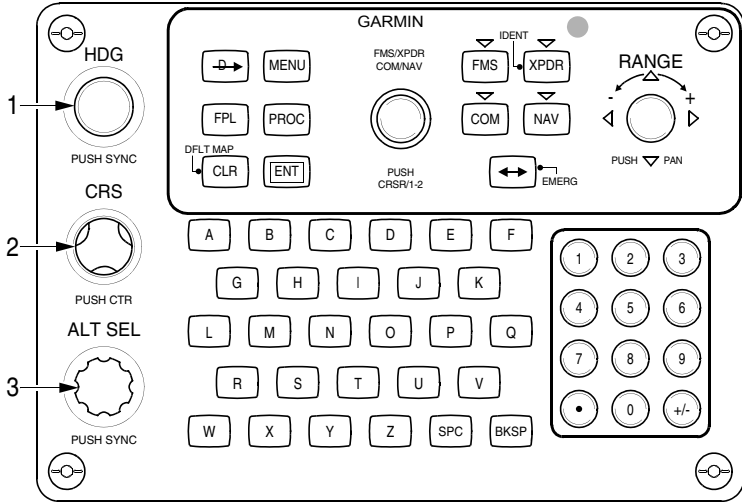
The HDG knob controls the selected heading bug on the HSI portion of the PFD. It provides the reference for heading select mode. Pushing the HDG knob synchronizes the selected heading to the current heading.

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

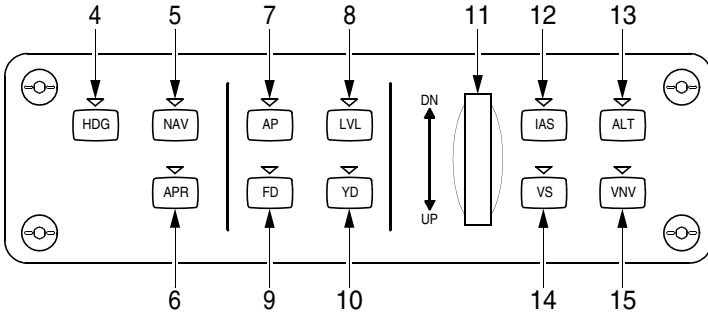
The CRS knob controls the course pointer on the HSI portion of the PFD. It provides the reference for FD navigation modes when the Flight Director is selected. Pushing the CRS knob re-centers the CDI and returns the course pointer to the bearing of the active waypoint or navigation station.

### ***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 (AP DISC) Switch disengages the Autopilot and may also be used to mute the aural alert associated with an Autopilot Disconnect.

For ESP equipped aircraft, the Autopilot Disconnect Switch will also temporarily suspend the servo's from providing ESP correction forces, thus having an "interrupt" function. This may be useful to alleviate

control forces if intentional maneuvers are necessary beyond ESP's engagement threshold (i.e., isolated training maneuvers).

## Take Off / Go Around Button

The remote TO/GA switch, located on the left side of the power lever, 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 (TO) mode. When the aircraft is in the air, pressing the TO/GA switch engages the Flight Director command bars in Go Around (GA) mode and cancels all armed modes except ALT ARM (ALTS).

### • Note •

For aircraft *without* USP, selection of the TO/GA switch will also disengage the autopilot.

For aircraft *with* USP, selection of TO/GA switch will not change autopilot engagement (i.e., if initially engaged, autopilot will remain engaged; if initially not engaged, autopilot will remain not engaged).

After TO/GA engagement, other roll modes may be selected and 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.

For aircraft with optional USP function, if power is insufficient to maintain go-around attitude, the Autopilot will enter Underspeed Protection 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.

## Electronic Stability and Protection (Optional)

When installed, Electronic Stability and Protection (ESP) assists the pilot in maintaining the airplane in a safe flight condition. Through the use of the GFC 700 AFCS sensors, processors, and servos, ESP provides control force feedback, i.e. a “soft barrier”, to maintain the aircraft within the pitch, roll, and airspeed flight envelope by automatically engaging one or more servos when the aircraft is near the defined operating limit.

This feature is only active when in flight and the GFC 700 Autopilot is off. The ESP engagement envelope is the same as the Autopilot engagement envelope and is not provided beyond the Autopilot engagement limits.

The pilot can interrupt ESP by pressing and holding the Autopilot Disconnect (AP DISC) button. If frequent maneuvers are necessary beyond the engagement threshold, such as commercial pilot training, the system can be disabled from AUX/SETUP 2 page. Disabling will cause the ESP OFF advisory to annunciate. The system can be re-enabled from the same page, or is automatically re-enabled at the next system power-up.

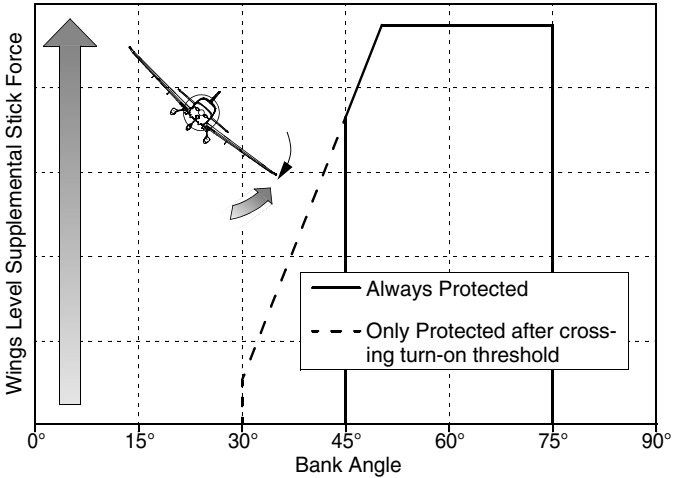
### ***Pitch and Roll Modes***

When the aircraft reaches the pitch and/or roll engagement limit, the system commands the servos to apply a supplemental stick force back toward the nominal attitude range. If the aircraft continues to pitch and/or roll away from the nominal attitude range, stick forces will increase with increasing attitude deviation until the maximum Autopilot engagement limits are reached - at which point ESP will disengage.

ESP attempts to return the aircraft to the nominal attitude range not to a specific attitude. As the attitude returns to the nominal range, the stick forces and attitude rate change are reduced until the aircraft reaches the disengagement threshold and ESP becomes inactive. The disengagement threshold is sized so that the transition from ESP being active to being inactive is transparent to the pilot.

Roll protection engagement limits are annunciated on the PFD as double ticks at 45° roll attitude. If the aircraft exceeds 45° roll attitude ESP becomes engaged and these indicators migrate to 30° roll attitude denoting the disengagement threshold - the point at which stick forces will be removed. No PFD annunciation is provided during pitch ESP engagement.

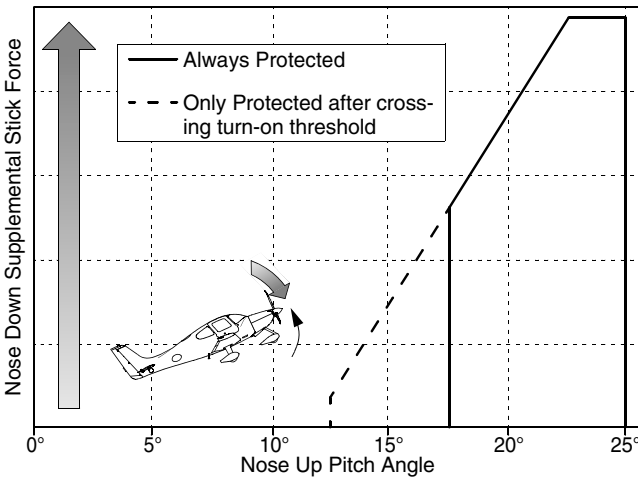
Roll Protection Limits:



SR22\_FM09\_3399

- Engagement Limit: ..... 45°
- Maximum Stick Force attained at: ..... 50°
- Disengagement Threshold (Zero Stick Force) ..... 30°

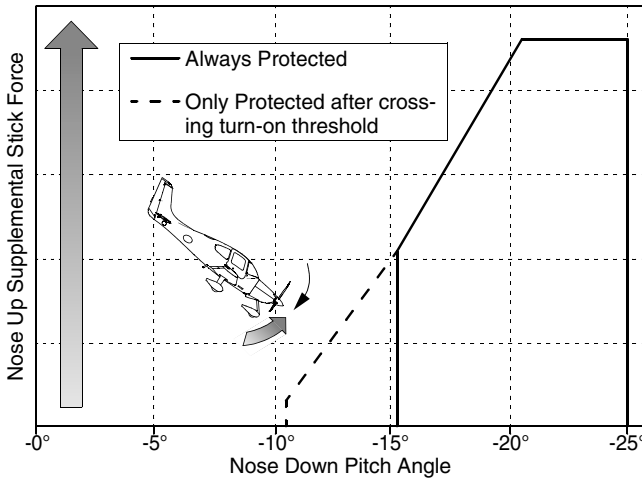
High Pitch Protection Limits



SR22\_FM09\_3403

- Engagement Limit: ..... +17.5°
- Maximum Stick Force attained at: ..... +22.5°
- Disengagement Threshold (Zero Stick Force): ..... +12.5°

Low Pitch Protection Limits



SR22\_FM09\_3426

Engagement Limit: ..... -15.5°

Maximum Stick Force attained at: ..... -20.5°

Disengagement Threshold (Zero Stick Force): ..... -10.5°

**High Airspeed Mode**

To protect against an overspeed condition, the High Airspeed Mode uses engagement limits, thresholds, and stick forces similar to those used for the pitch and roll modes, but is instead triggered by airspeed and controlled by pitch attitude. When the aircraft reaches the ESP engagement limit, the system commands the pitch servo to apply a supplemental stick force back toward the nominal airspeed range.

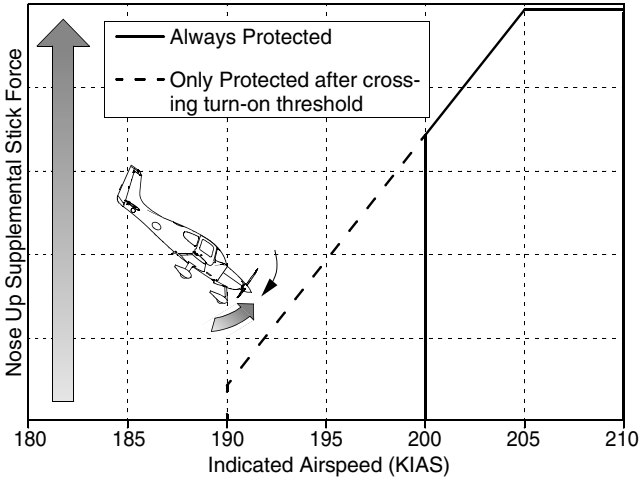
• Note •

For turbocharged equipped aircraft,  $V_{ne}$  reduces above 17,500 ft PA to follow a Mach limit of 0.42.

At high altitudes Mach number determines the threshold.



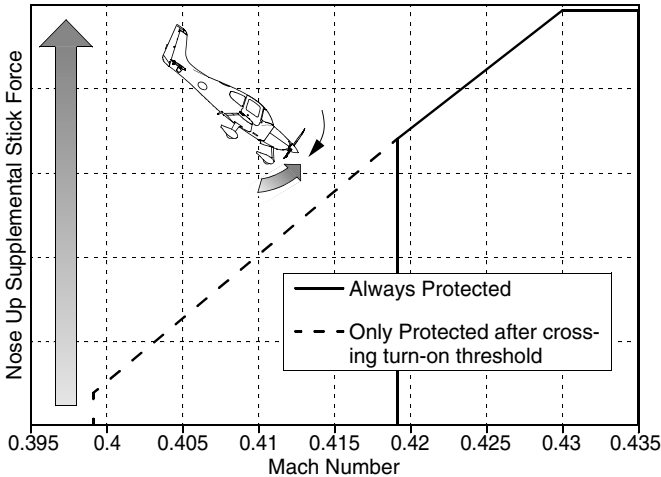
High Airspeed Protection Limits - Below 17,500 ft PA



SR22\_FM09\_3405

Engagement Limit: ..... 200 KIAS  
 Maximum Stick Force attained at: ..... 205 KIAS  
 Disengagement Threshold (Zero Stick Force): ..... 190 KIAS

High Airspeed Protection Limits - Above 17,500 ft PA



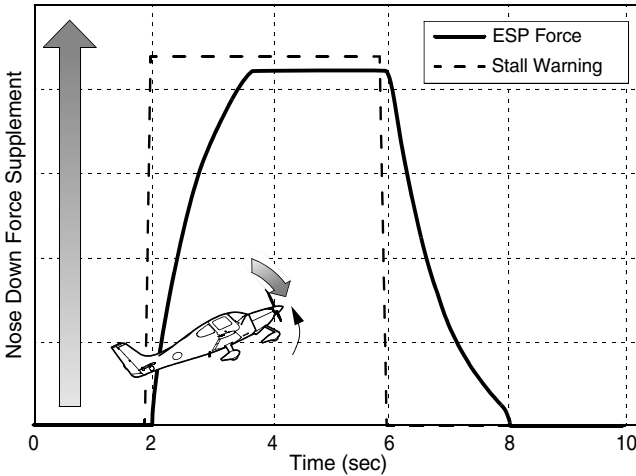
SR22\_FM09\_3428

Engagement Limit: ..... Mach 0.419  
 Maximum Stick Force attained at: ..... Mach 0.430  
 Disengagement Threshold (Zero Stick Force): ..... Mach 0.399

### Serials w/ Discrete-Triggered Low Speed Mode (Optional)

To protect against an impending stall, the Discrete-Triggered Low Speed Mode uses stick forces, similar to those used for the pitch and roll modes, to control the pitch attitude. These stick forces are triggered by the stall warning system. Upon stall warning system activation, the system commands the pitch servo to apply a nose-down supplemental force. The maximum stick force is attained approximately 1.5 seconds after the stall warning signal is activated, and is maintained as long as the stall warning system is active. If the stall warning system becomes inactive, the supplemental force is smoothly removed over approximately 2 seconds.

#### Low Speed Protection



SR22\_FM09\_3659

Engagement Limit: ..... Stall warning  
 Maximum Stick Force attained at: .. 1.5 seconds after stall warning  
 Disengagement Threshold: ..... Stall warning deactivated  
 Zero Stick Force: ..... 2 seconds after stall warning deactivated

### Underspeed Protection Mode (Optional)

When installed, to discourage aircraft operation below minimum established airspeeds the AFCS will automatically enter Underspeed Protection Mode when the Autopilot is engaged and airspeed falls below the minimum threshold. If aircraft stall warning system is not operational, autopilot underspeed protections that depend on that system will also not be functional (affects altitude critical modes only: ALT, GS, GP, TO, and GA).

As described in the following table, when the aircraft reaches predetermined airspeeds a yellow MINSPD annunciation will appear above the airspeed indicator and a single aural “AIRSPEED” will sound to alert the pilot to an impending underspeed condition.

Anti-Ice System	Flaps	MINSPD Annunciations	Aural Alert Annunciations
OFF	0%	80 KIAS	85 KIAS
	50%	76 KIAS	80 KIAS
	100%	70 KIAS	80 KIAS
ON	0%	85 KIAS	90 KIAS
	50%	81 KIAS	85 KIAS

The system differentiates two types of vertical modes based on which vertical Flight Director mode is selected; Altitude-Critical - where terrain hazards are more probable and minimized altitude loss is critical and Non-Altitude Critical - which generally correspond with activities that can afford exchange of altitude for airspeed without introducing terrain hazards.

**Altitude-Critical Mode (ALT, GS, GP, GA, TO)**

Upon stall warning system activation, the AFCS will abandon its Flight Director and Autopilot reference modes and sacrifice altitude for airspeed. The system will hold wings level and airspeed will progressively increase by 1 knot per second until stall warning becomes inactive. The system will then increase airspeed an additional 2 knots above the speed at which the stall warning discontinued. Recovery may be initiated in one of three ways:

1. Add sufficient power to recover to a safe flight condition.  
 If a small power addition is made, the AFCS will pitch the aircraft to maintain speed reference. If a large power addition is made the AFCS recognizes it via acceleration and the AP/FD will transition to a nose-up pitch to aggressively return to original altitude or glidepath/slope.
2. Disengage Autopilot via AP DISC and manually fly.
3. Change Autopilot modes to one in which the AFCS can maintain (such as VS with a negative rate).

### ***Non-Altitude Critical Mode (VS, PIT, VNAV, LVL, IAS)***

For all non-altitude critical modes the Autopilot will maintain its original reference (VS, PIT, etc...) until airspeed decays to a minimum airspeed (MINSPD). Crew alert and annunciation during a non-altitude critical underspeed event are similar to an altitude-critical event, except that;

- Stall warning may not be active. Depending on load tolerances, the AP/FD may reach the minimum airspeed reference and take underspeed corrective action before stall warning occurs. If stall warning does coincide or precede the aircraft reaching its minimum airspeed reference, it has no influence - only airspeed affects the AP/FD in non-altitude critical events.
- The originally selected lateral mode remains active.

Upon reaching minimum airspeed, the AFCS will abandon its Flight Director and Autopilot reference modes and maintain this airspeed until recovery. As with altitude-critical modes, available options for recovery are add power, decouple/manually fly, or change Autopilot modes.

When adding power, unlike the altitude-critical modes, which performs an aggressive recovery, the AP/FD will maintain MINSPD until the original reference can be maintained. Non-altitude critical modes will maintain the originally selected lateral mode (HDG, NAV, etc...).

### ***Coupled Go-Around***

Airplanes equipped with Underspeed Protection Mode are capable of flying fully coupled go-around maneuvers. Pressing the GA button on the throttle will not disengage the Autopilot. Instead, the Autopilot will attempt to capture and track the Flight Director command bars. If insufficient airplane performance is available to follow the commands, the AFCS will enter Altitude-Critical Mode when the stall warning sounds.

## Hypoxia Detection and Automatic Descent (Optional)

When installed, the AFCS Hypoxia Detection and Automatic Descent function monitors pilot inputs to the Integrated Avionics System to identify if a pilot has become incapacitated due to hypoxia, and upon determination, automatically descends to a lower altitude where pilot recovery is more probable. The feature is only available when the GFC 700 Autopilot is engaged and the aircraft is above 14,900 ft PA.

### ***Mode of Operation***

Pilot interaction with the Integrated Avionics System is monitored by detecting key presses and turns of the knobs. If the pilot has not made a system interaction within a defined interval - based on altitude and time of useful consciousness - the AFCS prompts the pilot for a response with an ARE YOU ALERT? CAS Advisory.

If no pilot response to the Advisory is detected, after one minute the AFCS annunciates an HYPOXIA ALERT Caution and a double chime aural alert.

After one minute, if no response to the Caution is detected the system annunciates an AUTO DESCENT Warning and continuous aural warning tone.

Lack of response after one minute of Warning annunciation is considered evidence of pilot incapacitation. The AFCS will automatically engage emergency descent mode (EDM) as follows:

1. EDM will annunciate in the AFCS status window.
2. The altitude bug will be automatically set to 14,000 ft indicated.
3. The airspeed bug will be set to the maximum commandable Autopilot speed - i.e., the lesser of 185 KIAS or Mach 0.420.
4. The Autopilot vertical mode will change to IAS, and initiate a descent to intercept 14,000 ft indicated.

Once descent begins only Autopilot Disconnect (AP DISC) will interrupt this process. Autopilot lateral mode remains unchanged throughout the descent and the aircraft will continue on its previously selected course or heading. After reaching 14,000 ft indicated, the aircraft will maintain this flight level for 4 additional minutes. If the pilot does not acknowledge the Warning and resume control of the aircraft, the AFCS will automatically perform a secondary descent to 12,500 ft PA at 185 KIAS. An altitude of 12,500 ft PA will be maintained if the pilot remains unresponsive

## 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.

Intentionally Left Blank