

**SUPPLEMENT A01**

**TO THE AIRPLANE FLIGHT MANUAL**

**DA 40 NG**

**Garmin G1000 Avionics System**

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## **1. GENERAL**

This Supplement supplies the information necessary for the efficient operation of the airplane when the Garmin G1000 avionics system is installed. The information contained within this Supplement is to be used in conjunction with the complete AFM.

This Supplement is a permanent part of this AFM and must remain in this AFM at all times when the Garmin G1000 avionics system is installed.

### **1.8 SOURCE DOCUMENTATION**

This Section lists documents, manuals and other literature that were used as sources for the Supplement, and indicates the respective publisher. However, only the information given in the Airplane Flight Manual and Supplement are valid.

#### **1.8.3 AVIONICS SYSTEM**

Address:               Garmin International, Inc.  
                              1200 East 151<sup>st</sup> Street  
                              Olathe, Kansas 66062  
                              USA

Phone:                 +1-(913)-3978200

Fax:                    +1-(913)-3978282

Website:              www.garmin.com

Documents:           G1000 Cockpit Reference Guide  
                              P/N 190-00953-00, Rev. A or later

                              G1000 Pilot's Guide  
                              P/N 190-00952-00, Rev. A or later

## **1.9 G1000 AVIONICS SYSTEM**

1. The G1000 integrated avionics system is a fully integrated flight, engine, communication, navigation and surveillance instrumentation system. The system consists of a Primary Flight Display (PFD), Multi-Function Display (MFD), audio panel, Air Data Computer (ADC), Attitude and Heading Reference System (AHRS), engine sensors and processing unit (GEA), and integrated avionics (GIA) containing VHF communications, VHF navigation, and GPS (Global Positioning System).
2. The primary function of the PFD is to provide attitude, heading, air data, navigation, and alerting information to the pilot. The PFD may also be used for flight planning. The primary function of the MFD is to provide engine information, mapping, terrain information, autopilot operation, and for flight planning. The audio panel is used for selection of radios for transmitting and listening, intercom functions, and marker beacon functions.
3. The primary function of the VHF communication portion of the G1000 is to enable external radio communication. The primary function of the VOR/ILS receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.
4. Provided a Garmin G1000 GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:
  - (a) VFR/IFR enroute, oceanic, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System in accordance with AC 20-138A.

- (b) RNAV (GPS) approaches - The G1000 GPS meets the requirements of AC 20-138(A) for GPS based RNAV approaches. This includes RNAV approaches labeled as RNAV (GPS), provided GPS sensor data is valid.
- (c) The system meets the accuracy of RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138A, EASA AMC 20-4, and FAA Order 8110.60 for oceanic and remote airspace operations, provided it is receiving usable navigation information from the GPS receiver.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the GPS operated by the United States of America.

## **2. LIMITATIONS**

### **2.15 LIMITATION PLACARDS**

If Autopilot GFC 700 is installed:

LIMITATIONS FOR GFC 700 AUTOPILOT SYSTEM: DO NOT USE AP IF "ALTERNATE STATIC" IS OPEN. CONDUCT AP AND TRIM CHECK PRIOR TO EACH FLIGHT (SEE AFM). AUTOPILOT OFF DURING TAKE-OFF AND LANDING. MAXIMUM SPEED FOR AUTOPILOT OPERATION IS 165 KIAS. MINIMUM SPEED FOR AUTOPILOT OPERATION IS 70 KIAS. MINIMUM ALTITUDE FOR AUTOPILOT OPERATION: CRUISE, CLIMB, DESCENT AND MANEUVERING: 800 FEET AGL APPROACH: 200 FEET AGL
--

On the Instrument Panel:

GPS NOT APPROVED FOR WAAS OPERATIONS
---

### **2.16 OTHER LIMITATIONS**

#### **2.16.8 GARMIN G1000 AVIONICS SYSTEM**

1. The Garmin G1000 Cockpit Reference Guide, 190-00953-00, appropriate revision must be immediately available to the flight crew.
2. The G1000 must utilize the software Garmin 010-00915-01 approved software in accordance with the mandatory service bulletin DAI MSB 40NG-003, latest version.

Software	Approved Version	Function
<b>System</b>	for approved version, see DAI MSB 40NG-003, latest version	
010-00915-( )		
<b>Manifest</b>		
006-B0093-( )		GPS1, GPS2
006-B0172-( )		GTX1-GIA1, GTX1-GIA2
006-B0190-( )		GIA1, GIA2
006-B0193-( )		GEA1-GIA1; GEA1-GIA2
006-B0203-( )		GMA1-GIA1, GMA1-GAI2
006-B0223-( )		GRS1-GIA1, GRS1-GIA2
006-B0224-( )		GMU1
006-B0319-( )		PFD1, MFD1
006-B0328-( )		
006-B0329-( )		
006-C0048-( )		GMU1 FPGA
006-C0049-( )		GRS1 FPGA
006-C0055-( )		GDC1 FPGA
006-D0159-( )		GRS1 MV DB
006-D0202-( )		
006-B0261-( )		GDC1-GIA1
006-B0081-( )		COM1, COM2
006-B0083-( )		GS1, GS2
006-B0082-( )		NAV1, NAV2

### NOTE

The database version is displayed on the MFD power-up page immediately after system power-up and must be acknowledged. The remaining system software versions can be verified on the AUX group sub-page 5, "AUX-SYSTEM STATUS".

3. IFR enroute, oceanic and terminal navigation predicated upon the G1000 GPS receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected way point for accuracy by reference to current approved data.
4. Instrument approach navigation predicated upon the G1000 GPS receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle.

### NOTE

Not all published approaches are in the FMS database. The pilot must ensure that the planned approach is in the database.

- (a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the final approach fix.
- (b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the G1000 GPS receiver is not authorized.
- (c) Use of the G1000 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the display.

- (d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the airplane must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.
  - (e) VNAV information may be utilized for advisory information only. Use of VNAV information for instrument approach procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land.
  - (f) RNAV (GPS) approaches must be conducted utilizing the GPS sensor.
  - (g) RNP RNAV operations are not authorized, except as noted in Chapter 1 of this Supplement.
5. If not previously defined, the following default settings must be made in the "SYSTEM SETUP" menu of the G1000 prior to operation (refer to Pilot's Guide for procedure if necessary):
- (a) DIS, SPD : nm, kt (sets navigation units to "nautical miles" and "knots")
  - (b) ALT, VS : ft, fpm (sets altitude units to "feet" and "feet per minute")
  - (c) POSITION : deg-min (sets navigation grid units to decimal minutes)

### NOTE

Navigation Information is referenced to WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conforms to WGS-84 or equivalent.

6. When AHRS is required to meet the items listed in the minimum operational equipment (serviceable) table in Section 2.13 of the AFM, operation is prohibited in the following areas:
- (a) North of 72° N latitude at all longitudes.
  - (b) South of 70° S latitude at all longitudes.
  - (c) North of 65° N latitude between longitude 75° W and 120° W (Northern Canada).
  - (d) North of 70° N latitude between longitude 70° W and 128° W (Northern Canada).
  - (e) North of 70° N latitude between longitude 85° E and 114° E (Northern Russia).
  - (f) South of 55° S latitude between longitude 120° E and 165° E (Region south of Australia and New Zealand).

When day VFR operations are conducted in the above areas, the MFD must be in a non-heading up orientation.

7. The fuel quantity, fuel remaining, range and endurance functions on the Fuel Page (displayed when pushing the FUEL button as shown in Section 7.9) of the FMS are supplemental information only and must be verified by the flight crew.
8. The GPS is not approved for WAAS operations:
- (a) The G1000 integrated avionics system is NOT approved for GPS WAAS operations including GPS WAAS approach procedures such as "LPV", "LNAV/VNAV", and "LNAV +V".
  - (b) SBAS (WAAS & MSAS & EGNOS) functionality must be disabled on the G 1000 GPS Status page (refer to the G1000 Pilot's Guide for procedure).



9. The availability of SafeTaxi<sup>®</sup>, ChartView, or FliteCharts<sup>®</sup> in electronic form on the G1000 is for information purposes only, it is still mandatory to carry another source of charts on-board the airplane.

#### **2.16.9 AUTOPILOT LIMITATIONS (IF AUTOPILOT GFC 700 IS INSTALLED)**

1. It is the responsibility of the pilot in command to monitor the autopilot when it is engaged. The pilot should be prepared to immediately disconnect the autopilot and to take prompt corrective action in the event of unexpected or unusual autopilot behavior.
2. The autopilot must be disconnected (using the DISC button) during take-off and landing.
3. Following an autopilot or electric trim malfunction, re-engaging the autopilot or manual electric trim, or resetting the AUTOPILOT circuit breaker is prohibited until the cause of the malfunction has been determined and corrected.
4. The Garmin G1000 Cockpit Reference Guide for the Diamond DA 40 NG approved revision must be immediately available to the flight crew.
5. ILS approaches using the GFC700 / flight director are limited to Category I approaches.
6. Autopilot maximum airspeed: 165 KIAS  
Autopilot minimum airspeed: 70 KIAS
7. The autopilot must be disengaged:
  - below 200 ft AGL during approach,
  - below 800 ft AGL for all other phases of flight.
8. Overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage or press CWS while maneuvering.)

9. The GFC 700 components must utilize the following or later approved software versions:

Sub-System	Software Version
GDU	v9.03
GDC 74	v3.02
GEA 7X	v2.07
GPS	v3.03
GIA 6X	v5.65
GIA Audio	v2.03
GMAX347	v4.01
GMU44	v2.01
GRS 77	v2.11
GTX 33X	v5.01
GDL 69	v3.20.00
GSA 8X	v2.20
GFC 700	v2.00

The system software versions can be verified on the AUX group sub-page 5, "AUX-SYSTEM STATUS".

10. The GFC 700 AFCS pre-flight test must be successfully completed prior to use of the autopilot, flight director, or manual electric trim. Use of the autopilot or manual electric trim system is prohibited if the preflight test is not satisfactorily completed.
11. A pilot with the seat belt fastened must occupy the left pilot's seat during all operations.

### **3. EMERGENCY PROCEDURES**

#### **3.1 INTRODUCTION**

##### **3.1.3 SELECTING EMERGENCY FREQUENCY**

In an in-flight emergency, depressing and holding the Com transfer button  $\leftrightarrow$  on the G1000 for 2 seconds will tune the emergency frequency of 121.500 MHz. If the display is available, it will also show it in the "Active" frequency window.

#### **3.9 OTHER EMERGENCIES**

##### **3.9.4 AUTOPILOT OR ELECTRIC TRIM MALFUNCTION / FAILURE (IF INSTALLED)**

#### **NOTE**

If the autopilot GFC 700 is not installed, the following checklist is not valid and the airplane must be trimmed manually.

**CONTINUED**

**NOTE**

An autopilot or electric trim malfunction may be recognized by an unexpected deviation from the desired flight path, abnormal flight control or trim wheel movement, or flight director commands which cause unexpected or contradictory information on the other cockpit displays. It may be accompanied by the aural autopilot disconnect tone, a red AFCS, red PTCH, red ROLL, red AP or yellow AP indication on the PFD, or a yellow CHECK ATTITUDE on the PFD. The autopilot and AHRS monitors normally detect failures and automatically disconnect the autopilot.

Failure of the electric pitch trim, indicated by a red boxed PTRM flashing on the PFD, may not cause the autopilot to disconnect. Be alert to possible autopilot out of trim conditions (see AUTOPILOT OUT OF TRIM procedure below), and expect residual control forces upon disconnect. The autopilot will not re-engage after disconnect with failed pitch trim. If AUTOPILOT OUT OF TRIM ELE indication is present, expect substantial elevator forces on autopilot disconnect.

**NOTE**

Accomplish items 1 and 2 simultaneously!

1. Airplane control stick . . . . . grasp firmly and regain airplane control
  
2. AP DISC switch . . . . . DEPRESS AND HOLD

**CONTINUED**

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- 3. Trim ..... retrim airplane manually as required
- 4. AUTOPILOT circuit breaker ..... pull
- 5. AP DISC switch ..... RELEASE

**NOTE**

When the AUTOPILOT circuit breaker is pulled, the manual electric trim and autopilot autotrim systems will be disabled.

**WARNING**

Do not attempt to re-engage the autopilot following an autopilot, autotrim, or manual electric trim malfunction until the cause for the malfunction has been corrected.

**END OF CHECKLIST**

## **3.10 AIRPLANE RELATED G1000 WARNINGS**

### **3.10.1 WARNINGS / GENERAL**

<b>CHARACTERISTICS</b>	Means that the non-observation of the corresponding procedure leads to an immediate or important degradation in flight-safety.  Red color coded warning text.  Warning chime tone of 1.5 second duration which repeats without delay until acknowledged by the crew.
------------------------	--

### **3.10.2 ENG TEMP**

<b>ENG TEMP</b>	Engine coolant temperature is in the upper red range (too high / above 105 °C).
-----------------	---

Proceed according to:

AFM Section 3.2.1 - ENGINE TEMPERATURE.

### **3.10.3 OIL TEMP**

<b>OIL TEMP</b>	Engine oil temperature is in the upper red range (too high / above 140 °C).
-----------------	---

Proceed according to:

AFM Section 3.2.2 - OIL TEMPERATURE.

### 3.10.4 OIL PRES

<b>OIL PRES</b>	Engine oil pressure is in the lower red range (too low / below 0.9 bar).
-----------------	--

Proceed according to:

AFM Section 3.2.3 - OIL PRESSURE.

### 3.10.5 GBOX TEMP

<b>GBOX TEMP</b>	Engine gearbox temperature is in the upper red range (too high / above 120 °C).
------------------	---

Proceed according to:

AFM Section 3.2.4 - GEARBOX TEMPERATURE.

### 3.10.6 L/R FUEL TEMP

<b>L/R FUEL TEMP</b>	Fuel temperature is in the upper red range (too high / above 60 °C).
----------------------	--

Proceed according to:

AFM Section 3.2.5 - L/R FUEL TEMPERATURE.

### 3.10.7 FUEL PRESS

<b>FUEL PRESS</b>	Engine fuel pressure is low.
-------------------	------------------------------

Proceed according to:

AFM Section 3.2.6 - FUEL PRESSURE.

### 3.10.8 ALTN AMPS

<b>ALTN AMPS</b>	Engine alternator output is in the upper red range (too high / above 70 A).
------------------	---

Proceed according to:

AFM Section 3.2.7 - ALTERNATOR AMPS.

### 3.10.9 ALTN FAIL

<b>ALTN FAIL</b>	Engine alternator has failed.
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An alternator failure is indicated by a warning light (ALTN FAIL) on the G1000 system.

Proceed according to:

AFM Section 3.2.8 - ALTERNATOR FAIL.



**3.10.10 STARTER**

<b>STARTER</b>	Engine starter is engaged.
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Proceed according to:

AFM Section 3.4.3 - STARTER MALFUNCTION.

**3.10.11 DOOR OPEN**

<b>DOOR OPEN</b>	Canopy and/or rear door are/is not closed and locked.
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Proceed according to:

AFM Section 3.9.3 - UNLOCKED DOORS.

### **3.11 G1000 SYSTEM WARNINGS**

#### **3.11.1 RED X**

A red X through any display field, such as COM frequencies, NAV frequencies, or engine data, indicates that display field is not receiving valid data.

#### **3.11.2 ATTITUDE FAIL**

<b>ATTITUDE FAIL</b>	The display system is not receiving attitude reference information from the AHRS; accompanied by the removal of sky / ground presentation and a red X over the attitude area.
----------------------	---

Revert to the standby attitude indicator.

#### **3.11.3 AIRSPEED FAIL**

<b>AIRSPEED FAIL</b>	The display system is not receiving airspeed input from the air data computer; accompanied by a red X through the airspeed display.
----------------------	---

Revert to the standby airspeed indicator.

#### **3.11.4 ALTITUDE FAIL**

<b>ALTITUDE FAIL</b>	The display system is not receiving altitude input from the air data computer; accompanied by a red X through the altimeter display.
----------------------	--

Revert to the standby altimeter.

**3.11.5 VERT SPEED FAIL**

<b>VERT SPEED FAIL</b>	The display system is not receiving vertical speed input from the air data computer; accompanied by a red X through the vertical speed display.
------------------------	---

Determine vertical speed based on the change of altitude information.

**3.11.6 HDG**

<b>HDG</b>	The display system is not receiving valid heading input from the AHRS; accompanied by a red X through the digital heading display.
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Revert to the emergency compass.

## **3.12 G1000 FAILURES**

### **3.12.1 NAVIGATION INFORMATION FAILURE**

If Garmin G1000 GPS navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

### **3.12.2 PFD OR MFD DISPLAY FAILURE**

1. DISPLAY BACKUP button on audio panel . . push

#### Automatic Entry of Display Reversionary Mode

If the PFD and MFD have automatically entered reversionary mode, use the following procedure.

- (a) DISPLAY BACKUP button on audio panel ..... PUSH (button will be OUT)

#### **NOTE**

After automatic entry of reversionary mode, the pilot must press the DISPLAY BACKUP button on the audio panel. After the DISPLAY BACKUP button has been pushed, the system will remain in reversionary mode even if the problem causing the automatic entry of reversionary mode is resolved. A maximum of one attempt to return to normal mode is approved using the following procedure.

#### **CONTINUED**

(b) DISPLAY BACKUP button on audio panel ..... PUSH (button will be IN)

- If the system returns to normal mode, leave the DISPLAY BACKUP button IN and continue.
- If the system remains in reversionary mode, or abnormal display behavior such as display flashing occurs, then return the DISPLAY BACKUP button to the OUT position.

**END OF CHECKLIST**

**3.12.3 AHRS FAILURE**

**NOTE**

A failure of the Attitude and Heading Reference System (AHRS) is indicated by a removal of the sky/ground presentation and a red X and a yellow "AHRS FAILURE" shown on the PFD. The digital heading presentation will be replaced with a yellow "HDG" and the compass rose digits will be removed. The course pointer will indicate straight up and course may be set using the digital window.

1. Use standby attitude indicator, emergency compass and navigation map
2. Course ..... set using digital window

**END OF CHECKLIST**

### 3.12.4 AIR DATA COMPUTER (ADC) FAILURE

#### **NOTE**

Complete loss of the air data computer is indicated by a red X and yellow text over the airspeed, altimeter, vertical speed, TAS and OAT displays. Some FMS functions, such as true airspeed and wind calculations, will also be lost.

1. Use standby airspeed indicator and altimeter.

#### **END OF CHECKLIST**

### 3.12.5 ERRONEOUS OR LOSS OF ENGINE AND FUEL DISPLAYS

#### **NOTE**

Loss of an engine parameter is indicated by a red X through the data field. Erroneous information may be identified by indications which do not agree with other system information. Erroneous indications may be determined by comparing a display with other displays and other system information.

1. Set power based on throttle lever position, engine noise and speed.
2. Monitor other indications to determine the health of the engine.
3. Use known power settings and performance data, refer to AFM Section 5.3.2 - FUEL FLOW TABLE for approximate fuel flow values.
4. Use other system information, such as annunciator messages, GPS, fuel quantity and flow, to safely complete the flight.

#### **END OF CHECKLIST**

### **3.12.6 ERRONEOUS OR LOSS OF WARNING/CAUTION ANNUNCIATORS**

#### **NOTE**

Loss of an annunciator may be indicated when engine or fuel displays show an abnormal or emergency situation and the annunciator is not present. An erroneous annunciator may be identified when an annunciator appears which does not agree with other displays or system information.

1. If an annunciator appears, treat it as if the condition exists. Refer to Chapter 3 - EMERGENCY PROCEDURES or Chapter 4B - ABNORMAL OPERATING PROCEDURES.
2. If a display indicates an abnormal condition but no annunciator is present, use other system information, such as engine displays, GPS fuel quantity and flow, to determine if the condition exists. If it cannot be determined that the condition does not exist, treat the situation as if the condition exists. Refer to Chapter 3 - EMERGENCY PROCEDURES or Chapter 4B - ABNORMAL OPERATING PROCEDURES.

**END OF CHECKLIST**

## **4A. NORMAL OPERATING PROCEDURES**

### **4A.1 INTRODUCTION**

#### **NOTE**

Readability of the G1000 PFD and MFD displays may be degraded when wearing polarizing sunglasses.

#### **NOTE**

Normal operating procedures for GFC 700 are described in the Garmin G1000 Cockpit Reference Guide, P/N 190-00953-00, Rev. A or later and the Garmin G1000 Pilot's Guide for the Diamond DA 40 NG, P/N 190-00952-00, Rev. A or later.



## **4A.5 CHECKLISTS FOR NORMAL OPERATING PROCEDURES**

### **4A.5.21 GFC 700 OPERATION (IF AUTOPILOT GFC 700 IS INSTALLED)**

#### **WARNING**

It is the responsibility of the pilot in command to monitor the autopilot when it is engaged. The pilot should be prepared to immediately disconnect the autopilot and to take prompt corrective action in the event of unexpected or unusual autopilot behavior. Do not attempt to manually fly the airplane with the autopilot engaged. The autopilot servos will oppose pilot input and will trim opposite the direction of pilot input (pitch axis only). This could lead to a significant out-of-trim condition. Disconnect the autopilot if manual control is desired. The pilot in command must use proper autopilot modes and proper engine power settings to ensure that airplane speed is maintained between 70 KIAS and 165 KIAS. It will be necessary to change engine power to maintain the desired rate of descent when operating at 165 KIAS. Observe the minimum autopilot operating speed of 70 KIAS Operation in pitch (PIT) or vertical speed (VS) modes below this speed can result in an airplane stall. If indications of an airplane stall are present, including stall warning horn, loss of control effectiveness or airframe buffet, disconnect the autopilot and manually return the airplane to stabilized flight prior to re-engaging the autopilot.

GFC 700 Operation During Climb (If Autopilot GFC 700 is installed)

**NOTE**

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to airplane movement. The NOSE UP button will increase the reference pitch attitude, increase the reference vertical speed and decrease the reference airspeed. Likewise, the NOSE DN button will decrease the reference pitch attitude, decrease the reference vertical speed, and increase the reference airspeed.

*a) Vertical Speed (VS)*

1. Altitude preselect . . . . . set to desired altitude
2. Mode controller . . . . . select VS on mode controller
3. Vertical speed reference . . . . . adjust using NOSE UP and  
NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . note on PFD
5. Green ALT . . . . . verify upon altitude capture

**NOTE**

If the altitude preselect is not changed before selecting VS, the autopilot may re-capture the current altitude immediately after entering VS mode. Always ensure that the altitude preselect is adjusted prior to selecting VS.

The vertical speed mode is limited to 1500 ft/min climb and 3000 ft/min descent. Use engine power to maintain appropriate airplane speed. If the CWS switch is used while in VS mode, the VS reference will change to the vertical speed when the CWS switch is released.

**END OF CHECKLIST**

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*b) Flight Level Change (FLC)*

1. Altitude preselect . . . . . set to desired altitude
2. Mode controller . . . . . select FLC on mode controller
3. Airspeed speed reference . . . . . adjust using NOSE UP  
and NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . note on PFD
5. Green ALT . . . . . verify upon altitude capture

**NOTE**

If the altitude preselect is not changed before selecting FLC, the autopilot may re-capture the current altitude immediately after entering FLC mode. Always ensure that the altitude preselect is adjusted prior to selecting FLC.

If the airspeed reference cannot be maintained without deviating away from the selected altitude, the system will maintain level flight until the power or reference is changed to allow climbing or descending towards the selected altitude.

The FLC mode is limited to airspeeds between 70 KIAS and 165 KIAS. Use engine power to maintain appropriate vertical speed. If the CWS switch is used while in FLC mode, the airspeed reference will change to the airspeed when the CWS switch is released.

**END OF CHECKLIST**

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*c) To Capture a Selected Altitude:*

1. Altimeter setting ..... adjust to appropriate value
2. Altitude preselect ..... set to desired altitude
3. Vertical mode and reference ..... select on mode controller
4. White ALT(altitude preselect armed) ..... note on PFD
5. Green ALT ..... verify upon altitude capture

**NOTE**

In ALT mode, the autopilot will maintain the reference altitude shown in the autopilot window of the PFD regardless of the altitude in the altitude preselect window or the altimeter's barometric pressure setting. If the altimeter setting is changed, the autopilot will climb or descend to maintain the reference altitude.

**END OF CHECKLIST**

*d) Altitude Hold*

To maintain a selected altitude:

1. Altimeter setting ..... adjust to appropriate value
2. Reaching desired altitude ..... select ALT on mode controller
3. Green ALT ..... verify on PFD

**END OF CHECKLIST**

*e) Navigation Capture and Track:*

1. Navigation source ..... select VOR or GPS using  
CDI button on PFD
2. Course bearing pointer ..... set using course knob  
(VOR only)
3. Intercept heading ..... establish in HDG or ROL  
mode (if required)
4. Mode controller ..... select NAV on mode controller
5. Green or white VOR or GPS annunciation ... note on PFD
6. Vertical mode and reference ..... select on mode controller

**NOTE**

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the NAV mode and indicate VOR or GPS in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV button is pressed and annunciate VOR or GPS in green on the PFD.

**END OF CHECKLIST**

GFC 700 Operation During Cruise (If Autopilot GFC 700 is installed)

**NOTE**

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to airplane movement. The NOSE UP button will increase the reference pitch attitude, increase the reference vertical speed and decrease the reference airspeed. Likewise, the NOSE DN button will decrease the reference pitch attitude, decrease the reference vertical speed, and increase the reference airspeed.

*a) Vertical Speed (VS):*

1. Altitude preselect . . . . . set to desired altitude
2. Mode controller . . . . . select VS on mode controller
3. Vertical speed reference . . . . . adjust using NOSE UP and  
NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . note on PFD
5. Green ALT . . . . . verify upon altitude capture

**NOTE**

If the altitude preselect is not changed before selecting VS, the autopilot may re-capture the current altitude immediately after entering VS mode. Always ensure that the altitude preselect is adjusted prior to selecting VS.

The vertical speed mode is limited to 1500 ft/min climb and 3000 ft/min descent. Use engine power to maintain appropriate airplane speed. If the CWS switch is used while in VS mode, the VS reference will change to the vertical speed when the CWS switch is released.

**END OF CHECKLIST**

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*b) Flight Level Change (FLC):*

1. Altitude preselect ..... set to desired altitude
2. Mode controller ..... select FLC on mode controller
3. Airspeed speed reference ..... adjust using NOSE UP  
and NOSE DN buttons
4. White ALT (altitude preselect armed) ..... note on PFD
5. Green ALT ..... verify upon altitude capture

**NOTE**

If the altitude preselect is not changed before selecting FLC, the autopilot may re-capture the current altitude immediately after entering FLC mode. Always ensure that the altitude preselect is adjusted prior to selecting FLC.

If the airspeed reference cannot be maintained without deviating away from the selected altitude, the system will maintain level flight until the power or reference is changed to allow climbing or descending towards the selected altitude.

The FLC mode is limited to airspeeds between 70 KIAS and 165 KIAS. Use engine power to maintain appropriate vertical speed. If the CWS switch is used while in FLC mode, the airspeed reference will change to the airspeed when the CWS switch is released.

**END OF CHECKLIST**

*c) To Capture a Selected Altitude:*

1. Altimeter setting ..... adjust to appropriate value
2. Altitude preselect ..... set to desired altitude
3. Vertical mode and reference ..... select on mode controller
4. White ALT(altitude preselect armed) ..... note on PFD
5. Green ALT ..... verify upon altitude capture

**NOTE**

In ALT mode, the autopilot will maintain the reference altitude shown in the autopilot window of the PFD regardless of the altitude in the altitude preselect window or the altimeter's barometric pressure setting. If the altimeter setting is changed, the autopilot will climb or descend to maintain the reference altitude.

**END OF CHECKLIST**

*d) Altitude Hold:*

To maintain a selected altitude:

1. Altimeter setting ..... adjust to appropriate value
2. Reaching desired altitude ..... select ALT on mode controller
3. Green ALT ..... verify on PFD

**END OF CHECKLIST**



*e) Navigation Capture and Track:*

1. Navigation source ..... select VOR or GPS using  
CDI button on PFD
2. Course bearing pointer ..... set using course knob  
(VOR only)
3. Intercept heading ..... establish in HDG or ROL  
mode (if required)
4. Mode controller ..... select NAV on mode controller
5. Green or white VOR or GPS annunciation . . . note on PFD
6. Vertical mode and reference ..... select on mode controller

**NOTE**

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the NAV mode and indicate VOR or GPS in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV button is pressed and annunciate VOR or GPS in green on the PFD.

**END OF CHECKLIST**

GFC700 Operation During Descent (If Autopilot GFC 700 is installed)

**NOTE**

The NOSE UP and NOSE DN buttons on the mode controller on the MFD are referenced to airplane movement. The NOSE UP button will increase the reference pitch attitude, increase the reference vertical speed and decrease the reference airspeed. Likewise, the NOSE DN button will decrease the reference pitch attitude, decrease the reference vertical speed, and increase the reference airspeed.

*a) Vertical Speed (VS):*

1. Altitude preselect . . . . . set to desired altitude
2. Mode controller . . . . . select VS on mode controller
3. Vertical speed reference . . . . . adjust using NOSE UP and  
NOSE DN buttons
4. White ALT (altitude preselect armed) . . . . . note on PFD
5. Green ALT . . . . . verify upon altitude capture

**NOTE**

If the altitude preselect is not changed before selecting VS, the autopilot may re-capture the current altitude immediately after entering VS mode. Always ensure that the altitude preselect is adjusted prior to selecting VS.

The vertical speed mode is limited to 1500 ft/min climb and 3000 ft/min descent. Use engine power to maintain appropriate airplane speed. If the CWS switch is used while in VS mode, the VS reference will change to the vertical speed when the CWS switch is released.

**END OF CHECKLIST**

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*b) Flight Level Change (FLC):*

1. Altitude preselect ..... set to desired altitude
2. Mode controller ..... select FLC on mode controller
3. Airspeed speed reference ..... adjust using NOSE UP  
and NOSE DN buttons
4. White ALT (altitude preselect armed) ..... note on PFD
5. Green ALT ..... verify upon altitude capture

**NOTE**

If the altitude preselect is not changed before selecting FLC, the autopilot may re-capture the current altitude immediately after entering FLC mode. Always ensure that the altitude preselect is adjusted prior to selecting FLC.

If the airspeed reference cannot be maintained without deviating away from the selected altitude, the system will maintain level flight until the power or reference is changed to allow climbing or descending towards the selected altitude.

The FLC mode is limited to airspeeds between 70 KIAS and 165 KIAS. Use engine power to maintain appropriate vertical speed. If the CWS switch is used while in FLC mode, the airspeed reference will change to the airspeed when the CWS switch is released.

**END OF CHECKLIST**

*c) To Capture a Selected Altitude:*

1. Altimeter setting ..... adjust to appropriate value
2. Altitude preselect ..... set to desired altitude
3. Vertical mode and reference ..... select on mode controller
4. White ALT(altitude preselect armed) ..... note on PFD
5. Green ALT ..... verify upon altitude capture

**NOTE**

In ALT mode, the autopilot will maintain the reference altitude shown in the autopilot window of the PFD regardless of the altitude in the altitude preselect window or the altimeter's barometric pressure setting. If the altimeter setting is changed, the autopilot will climb or descend to maintain the reference altitude.

**END OF CHECKLIST**

*d) Altitude Hold:*

To maintain a selected altitude:

1. Altimeter setting ..... adjust to appropriate value
2. Reaching desired altitude ..... select ALT on mode controller
3. Green ALT ..... verify on PFD

**END OF CHECKLIST**

*e) Navigation Capture and Track:*

1. Navigation source ..... select VOR or GPS using  
CDI button on PFD
2. Course bearing pointer ..... set using course knob  
(VOR only)
3. Intercept heading ..... establish in HDG or ROL  
mode (if required)
4. Mode controller ..... select NAV on mode controller
5. Green or white VOR or GPS annunciation ... note on PFD
6. Vertical mode and reference ..... select on mode controller

**NOTE**

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the NAV mode and indicate VOR or GPS in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV button is pressed and annunciate VOR or GPS in green on the PFD.

**END OF CHECKLIST**

GFC700 Operation During Approach (If Autopilot GFC 700 is installed)

a) VOR:

1. Navigation source . . . . . select VOR using CDI  
button on PFD
2. Course bearing pointer . . . . . set using course knob
3. Intercept heading . . . . . establish in HDG or ROL  
mode (if required)
4. Mode controller . . . . . select APR on mode controller
5. Green or white VAPP annunciation . . . . . note on PFD
6. Vertical mode and reference . . . . . select on mode controller

**NOTE**

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the VAPP mode and indicate VAPP in white on the PFD. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the APR button is pressed and annunciate VAPP in green on the PFD.

**END OF CHECKLIST**

b) ILS:

1. Navigation source . . . . . select LOC using CDI  
button on PFD
2. Course bearing pointer . . . . . set using course knob
3. Intercept heading . . . . . establish in HDG or ROL  
mode (if required)
4. Mode controller . . . . . select APR on mode controller
5. Green or white LOC and GS annunciation . . note on PFD
6. Vertical mode and reference . . . . . select on mode controller

**NOTE**

When the selected navigation source is a valid ILS, glideslope coupling is automatically armed when tracking the localizer. The glideslope cannot be captured until the localizer is captured. The autopilot can capture the glideslope from above or below the glideslope.

**END OF CHECKLIST**

c) GPS:

1. Navigation source ..... select GPS using CDI  
button on PFD
2. Approach ..... load in FMS and ACTIVATE
3. Intercept heading ..... establish in HDG or ROL  
mode (if required)
4. Mode controller ..... select APR on mode controller
5. Green or white GPS annunciation ..... note on PFD
6. Vertical mode and reference ..... select on mode controller

**END OF CHECKLIST**



d) *Back Course (BC):*

1. Navigation source . . . . . select LOC using CDI button on PFD
2. Course bearing pointer . . . . . set to ILS front course using course knob
3. Intercept heading . . . . . establish in HDG or ROL mode (if required)
4. Mode controller . . . . . select NAV on mode controller
5. Green or white BC annunciation . . . . . note on PFD

**NOTE**

The course pointer must be at least 115° from the current magnetic heading before BC will be annunciated in the lateral mode field. Until that point, LOC will be annunciated.

Selecting NAV mode for back course approaches inhibits the glideslope from coupling.

6. Vertical mode and reference . . . . . select on mode controller

**END OF CHECKLIST**

GFC700 Operation During Go-Around (If Autopilot GFC 700 is installed)

1. Control stick ..... GRASP FIRMLY
2. GA button ..... PUSH - Verify GA/GA on PFD  
in lateral and vertical mode fields

**NOTE**

After the GA button is pressed, the autopilot disconnects and the flight director indicates a 7° pitch up attitude.

3. Balked landing ..... execute
4. Missed approach procedure ..... execute (as applicable)
5. Altitude preselect ..... set to appropriate altitude

*At an Appropriate Safe Altitude:*

6. Autopilot mode controller ..... select appropriate lateral  
and vertical mode on controller
7. Autopilot ..... RE-ENGAGE if desired

**NOTE**

If the missed approach procedure requires tracking the localizer outbound from the airport, use NAV mode to prevent inadvertent coupling to glideslope.

**END OF CHECKLIST**

## **4A.6 ADVISORY ALERTS ON THE G1000**

The G1000 provides the following advisory-alerts on the PFD in the alert area:

### **4A.6.1 ADVISORY / GENERAL**

<b>CHARACTERISTICS</b>	White color coded text.
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### **4A.6.2 GLOW ON**

<b>GLOW ON</b>	Engine glow plug active.
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### **4A.6.3 FUEL XFER**

<b>FUEL XFER</b>	Fuel transfer from auxiliary to main tank is in progress.
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### **4A.6.4 PFD/MFD/GIA FAN FAIL**

<b>PFD FAN FAIL</b>	Cooling fan for the PFD is inoperative.
<b>MFD FAN FAIL</b>	Cooling fan for the MFD is inoperative.
<b>GIA FAN FAIL</b>	Cooling fan for the GIA is inoperative.

The flight may be continued, but maintenance action is required after landing.

## **4B. ABNORMAL OPERATING PROCEDURES**

### **4B.9 ENGINE INSTRUMENT INDICATIONS OUTSIDE OF GREEN RANGE ON THE G1000**

#### **4B.9.1 RPM**

Proceed according to:

AFM Section 4B.2.1 - RPM.

#### **4B.9.2 COOLANT TEMPERATURE**

Proceed according to:

AFM Section 4B.2.2 - COOLANT TEMPERATURE.

#### **4B.9.3 OIL TEMPERATURE**

Proceed according to:

AFM Section 4B.2.3 - OIL TEMPERATURE.

#### **4B.9.4 OIL PRESSURE**

Proceed according to:

AFM Section 4B.2.4 - OIL PRESSURE.

| **4B.9.5 GEARBOX TEMPERATURE**

Proceed according to:

AFM Section 4B.2.5 - GEARBOX TEMPERATURE.

| **4B.9.6 FUEL TEMPERATURE**

Proceed according to:

AFM Section 4B.2.6 - FUEL TEMPERATURE.

| **4B.9.7 VOLTAGE**

Proceed according to:

AFM Section 4B.2.7 - VOLTAGE.

| **4B.9.8 CURRENT**

Proceed according to:

AFM Section 4B.2.8 - CURRENT.

## **4B.10 CAUTION-ALERTS ON THE G1000**

The G1000 provides the following CAUTION-alerts on the PFD in the ALERT area.

### **4B.10.1 CAUTIONS / GENERAL**

<b>CHARACTERISTICS</b>	<ul style="list-style-type: none"><li>* Yellow color coded text.</li><li>* Single warning chime tone of 1.5 seconds duration.</li></ul>
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### **4B.10.2 ECU A FAIL**

<b>ECU A FAIL</b>	<ul style="list-style-type: none"><li>* Engine ECU A has failed</li></ul> or <ul style="list-style-type: none"><li>* is being tested during FADEC test procedure before take-off check.</li></ul>
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Proceed according to:

AFM Section 4B.3.1 - ECU A FAILURE.

### **4B.10.3 ECU B FAIL**

<b>ECU B FAIL</b>	<ul style="list-style-type: none"><li>* Engine ECU B has failed</li></ul> or <ul style="list-style-type: none"><li>* is being tested during FADEC test procedure before take-off check.</li></ul>
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Proceed according to:

AFM Section 4B.3.2 - ECU B FAILURE.

**4B.10.4 FUEL LOW**

<b>FUEL LOW</b>	Left fuel quantity is low.
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Proceed according to:

AFM Section 4B.3.3 - FUEL QUANTITY LOW.

**4B.10.5 LOW VOLTAGE CAUTION (LOW VOLTS)**

<b>VOLTS LOW</b>	Bus voltage is less than 25 Volts.
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Proceed according to:

AFM Section 4B.2.7 -VOLTAGE.

**4B.10.6 COOL LVL**

<b>COOL LVL</b>	Engine coolant level is low.
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Proceed according to:

AFM Section 4B.3.4 - COOLANT LEVEL.

**4B.10.7 PITOT FAIL / HT OFF**

<b>PITOT FAIL</b>	Pitot heating system has failed.
<b>PITOT HT OFF</b>	Pitot heating system is OFF.

1. PITOT HEAT ..... check ON / as required

**NOTE**

The Pitot heating caution message is displayed when the Pitot heating is switched OFF, or when there is a failure of the Pitot heating system. Prolonged operation of the Pitot heating on the ground can also cause the Pitot heating caution message to be displayed. In this case it indicates the activation of the thermal switch, which prevents overheating of the Pitot heating system on the ground. This is a normal function of the system. After a cooling period, the heating system will be switched on again automatically.

Proceed according to:

AFM Section 4B.3.5 - PITOT HEATING FAILURE.

**END OF CHECKLIST**



**4B.10.8 LOI**

<b>LOI</b>	GPS integrity is insufficient for the current phase of flight.
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**(a) Enroute, Oceanic, Terminal, or Initial Approach Phase of Flight**

If the LOI annunciation is displayed in the enroute, oceanic, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the G1000 GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the G1000 VOR/ILS receiver or another IFR-approved navigation system.

**(b) Final Approach**

If the LOI annunciation is displayed while on the final approach segment, GPS based navigation will be aborted.

**END OF CHECKLIST**

**4B.10.9 AHRS ALIGNING - KEEP WINGS LEVEL**

<b>AHRS ALIGN: Keep Wings Level</b>	The AHRS (Attitude and Heading Reference System) is aligning.
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Keep wings level using standby attitude indicator.

**END OF CHECKLIST**

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**4B.11 FAILURES IN THE GFC 700 AUTOPILOT SYSTEM (IF  
INSTALLED)**

**4B.11.1 AUTOPILOT DISCONNECT (yellow AP flashing on PFD)**

1. AP DISC switch ..... DEPRESS AND RELEASE  
(to cancel disconnect tone)
  
2. Pitch trim ..... retrim if necessary, using  
the trim wheel

**NOTE**

The autopilot disconnect may be accompanied by a red boxed PTCH (pitch) or ROLL on the PFD, indicating the axis which has failed. The autopilot cannot be re-engaged with either of these annunciations present.

**END OF CHECKLIST**

**4B.11.2 AUTOPILOT OVERSPEED RECOVERY (yellow MAXSPD on PFD)**

1. POWER lever ..... reduce power

*When Overspeed Condition is Corrected:*

2. Autopilot ..... reselect VERTICAL MODE  
(if necessary)

**NOTE**

Overspeed recovery mode provides a pitch up command to decelerate the airplane at or below the maximum autopilot operating speed (165 KIAS). Overspeed recovery is not active in altitude hold (ALT) or glideslope (GS) modes.

**END OF CHECKLIST**

**4B.11.3 LOSS OF NAVIGATION INFORMATION (Yellow VOR, VAPP, GPS or LOC flashing on PFD)**

**NOTE**

If a navigation signal is lost while the autopilot is tracking it, the autopilot will roll the airplane wings level and default to roll mode (ROL).

1. Autopilot . . . . . select HDG on mode controller
2. Nav source . . . . . select a valid NAV source
3. Autopilot . . . . . select NAV on mode controller

*If on an Instrument Approach at the Time the Navigation Signal is Lost:*

4. Missed approach procedure . . . . . EXECUTE (as applicable)

**END OF CHECKLIST**

**4B.11.4 AUTOPILOT OUT OF TRIM (Yellow ←AIL, →AIL, ↑ELE, ↓ELE on PFD)**

For ↑ELE, or ↓ELE Indication:

**WARNING**

Do not attempt to overpower the autopilot in the event of a pitch mistrim. The autopilot servos will oppose pilot input and will cause pitch trim to run opposite the direction of pilot input. This will lead to a significant out-of-trim condition resulting in large control stick force when disengaging the autopilot.

**CAUTION**

Be prepared for significant sustained control forces in the direction of the annunciation arrow. For example, an arrow pointing down indicates nose down control stick force will be required upon autopilot disconnect.

**NOTE**

Momentary illumination (5 sec or less) of the ↑ELE, or ↓ELE indication during configuration or large airspeed changes is normal.

*If the Annunciation Remains:*

1. AP DISC switch ..... DEPRESS AND HOLD  
while grasping control stick firmly
2. Airplane attitude ..... maintain/regain airplane control  
use standby attitude indicator  
if necessary

**CONTINUED**

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- 3. Pitch trim ..... retrim if necessary, using  
the trim wheel
- 4. AUTOPILOT circuit breaker ..... PULL
- 5. AP DISC switch ..... RELEASE

**WARNING**

Following an autopilot, autotrim or manual electric trim system malfunction, do not engage the autopilot or operate the manual electric trim until the cause of the malfunction has been corrected.

**END OF CHECKLIST**

For ←AIL, AIL→ Indication:

1. Rudder trim ..... Center slip/skid indicator

**NOTE**

Observe the maximum fuel imbalance limitation.

*If Annunciation Remains:*

2. Control stick ..... GRASP FIRMLY with both hands

**CAUTION**

Be prepared for sustained control forces in the direction of the annunciation arrow. For example, an ←AIL indicates that sustained right wing down control stick force will be required upon autopilot disconnect.

3. AP DISC switch ..... DEPRESS
4. Autopilot ..... RE-ENGAGE if lateral trim is re-established

**END OF CHECKLIST**

**4B.11.5 FLASHING YELLOW MODE ANNUNCIATION**

**NOTE**

Abnormal mode transitions (those not initiated by the pilot or by normal sequencing of the autopilot) will be annunciated by flashing the disengaged mode in yellow on the PFD. Upon loss of a selected mode, the system will revert to the default mode for the affected axis, either ROL or PIT. After 10 seconds, the new mode (PIT or ROL) will be annunciated in green.

**Loss of Selected Vertical Mode (FLC, VS, ALT, GS)**

1. Autopilot mode controls . . . . . select another vertical mode

*If on an Instrument Approach:*

2. Autopilot . . . . . DISCONNECT and continue manually or execute missed approach

**END OF CHECKLIST**

**Loss of Selected Lateral Mode (HDG, NAV, GPS, LOC, VAPP, BC):**

1. Autopilot mode controls . . . . . select another lateral mode

*If on an Instrument Approach:*

2. Autopilot . . . . . DISCONNECT and continue manually or execute missed approach

**END OF CHECKLIST**



**4B.11.6 EFFECTS OF G1000 LOSSES UPON AUTOPILOT OPERATION**

G1000 System Loss	Effect upon Autopilot Operation
AHRS	The autopilot disconnects and autopilot flight director is inoperative. Manual electric trim is available.
HDG function of AHRS	The autopilot will remain engaged with the loss of the HDG mode.
MFD	The autopilot will remain engaged with limited functionality.
PFD	The autopilot disconnects and autopilot and flight director are inoperative. Manual electric trim is available.
GIA No. 1	The autopilot disconnects and autopilot, flight director and manual electric trim are inoperative.
GIA No. 2	The autopilot disconnects and autopilot and manual electric trim are inoperative. Flight director is available.
GPS No. 1 and 2	The autopilot and flight director operates in NAV modes only (LOC, BC, VOR, VAPP) with reduced accuracy.
ADC	The autopilot disconnects and autopilot is inoperative. The flight director is available except for air data modes (ALT, VS, FLC). Manual electric trim is available.

## **5. PERFORMANCE**

No change.

## **6. MASS AND BALANCE**

No change.

## 7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

### 7.9 POWER PLANT

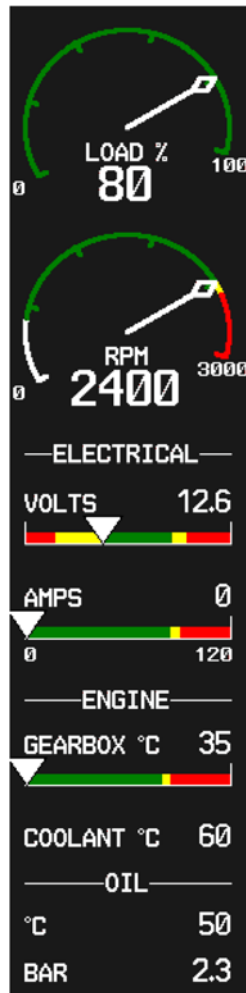
#### 7.9.8 ENGINE INSTRUMENTS

The engine instruments are displayed on the Garmin G1000 MFD. Also refer to this Supplement Section 7.13.3 - MULTI-FUNCTION DISPLAY (MFD).

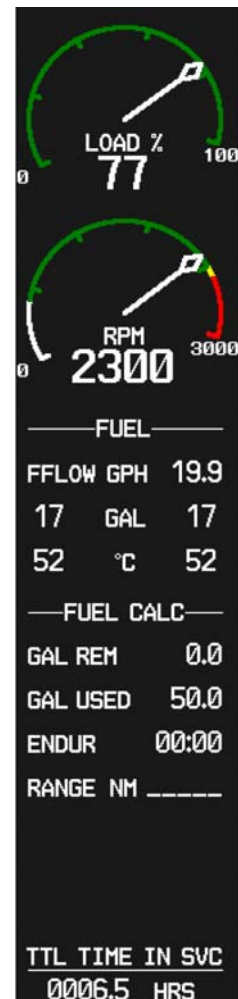
Default page  
Engine



Display when pushing  
the SYSTEM button



Display when pushing  
the FUEL button



**NOTE**

The figure on previous page is a general demonstration of a typical G1000 MFD to show the different display modes. The pictured engine instrument markings may not stringently agree with the current engine limitations of the DA 40 NG.

**NOTE**

The fuel calculations on the FUEL CALC portion do not use the airplane's fuel quantity indicators. The values shown are numbers which are calculated from the last fuel quantity update done by the pilot and actual fuel flow data. Therefore, the endurance and range data is for information only, and must not be used for flight planning.

Designation	Indication	Unit
LOAD	Available power	%
RPM	Propeller RPM	1/min
VOLT	Volts	V
AMPS	Ampère	A
COOLANT TEMP	Coolant temperature	°C
GEARBOX	Gearbox temperature	°C
OIL TEMP	Engine oil temperature	°C
OIL PRES	Oil pressure	bar
FUEL QTY	Fuel quantity	US gal
FFLOW	Fuel flow	US gal/hr
FUEL TEMP.	Fuel temperature	°C

## **7.10 ELECTRICAL SYSTEM**

### **7.10.3 WARNING, CAUTION AND ADVISORY MESSAGES**

#### Crew Alerting System (CAS)

The G1000 crew alerting system (CAS) is designed to provide visual and aural alerts to the flight crew. Alerts are divided into three levels as follows:

WARNING

CAUTION

ADVISORY

Crew alerts will appear in the alerts window on the PFD. In this window warnings will appear at the top, followed by cautions and advisories, respectively. Within the criticality levels, messages will appear from newest (top) to oldest (bottom).

At the low right corner of the display there is a MSG (message) soft key. The MSG key provides two functions in the CAS:

1. Pressing the MSG key acknowledges a new master warning / caution / advisory indication.
2. An additional MSG key press with no master alert indication active will open a pop-up auxiliary flight display (AFD) page that contains information for all active alerts.

This structure allows the crew to scroll through all system alerts if the alerts window overflows. This approach displays the most critical alerts close to the pilot's primary field of view at all times, with the option of allowing lower criticality alerts to overflow and be accessible from the pop-up AFD page/window.

Alert Levels

Level	Text Color	Importance	Audible Tone
Warning	Red	May require immediate corrective action	Warning chime tone which repeats without delay until acknowledged by the crew
Caution	Yellow	May require future corrective action	Single warning chime tone
Annunciation Advisory	White		None
Message Advisory	White		None
Safe Operation Annunciation	Green	Lowest	None

Warning, Caution and Advisory Alerts

A list of all alerts is given in AFM Section 2.6 - WARNING, CAUTION AND STATUS LIGHTS.

## **7.13 GARMIN G1000 INTEGRATED AVIONICS SYSTEM**

### **7.13.1 GENERAL**

A remote avionic box is located behind the aft baggage compartment frame. A push-to-talk (PTT) button for the COM portion of the G1000 is mounted on the end of each control stick. There are connection facilities for up to 4 headsets between the front seats.

Refer to the Garmin G1000 Cockpit Reference Guide, Garmin P/N 190-00953-00 and Pilot's Guide, P/N 190-00952-00 for complete descriptions of the G1000 system and operating procedures.

### **NOTE**

Near the DME ground station, it can happen under certain adverse conditions that the Bendix/King KN 63 DME loses the direct signal from the ground station and locks onto an "echo". This will result in an inaccurate indication of the distance.

### 7.13.2 PRIMARY FLIGHT DISPLAY (PFD)

The primary flight display (PFD; see figure below) typically displays airspeed, attitude, altitude, and heading information in a traditional format. Slip information is shown as a trapezoid under the bank pointer. One width of the trapezoid is equal to a one ball width slip. Rate of turn information is shown on the scale above the compass rose; full scale deflection is equal to a standard rate turn. The following controls are available on the PFD (clockwise from top right):

- \* Communications frequency volume and squelch knob
- \* Communications frequency set knobs
- \* Communications frequency transfer button
- \* Altimeter setting knob (baro set)
- \* Course knob
- \* Map range knob and cursor control
- \* FMS control buttons and knob
- \* PFD softkey buttons, including master warning/caution acknowledgment
- \* Altitude reference set knob
- \* Heading bug control
- \* Navigation frequency transfer button
- \* Navigation frequency set knobs
- \* Navigation frequency volume and identifier knob





The PFD displays the crew alerting (annunciator) system. When a warning or caution message is received, a warning or caution annunciator will flash on the PFD, accompanied by an aural tone. A warning is accompanied by a repeating tone, and a caution is accompanied by a single tone. Acknowledging the alert will cancel the flashing and provide a text description of the message. Refer to AFM Chapter 3. - EMERGENCY PROCEDURES, 4B. - ABNORMAL OPERATING PROCEDURES and Section 7.10.3 - WARNING, CAUTION AND ADVISORY MESSAGES of this Supplement.

Advisory messages related to G1000 system status are shown in white and are accompanied by a white flashing ADVISORY alert. Refer to the G1000 Pilot's Guide and Cockpit Reference Guide for descriptions of the messages and recommended actions.

Trend vectors are shown on the airspeed and altimeter displays as a magenta line predicting 6 seconds at the current rate. The turn rate indicator also functions as a trend indicator on the compass scale.

The PFD can be displayed in a composite format for emergency use by pressing the DISPLAY BACKUP button on the audio panel. In the composite mode, the full crew alerting function remains, but no map functions are available.

### **7.13.3 MULTI-FUNCTION DISPLAY (MFD)**

The multi-function display (MFD) typically displays engine data, maps, terrain, traffic and topography displays, and flight planning and progress information. The display unit is identical to the PFD and contains the same controls as previously listed. Additionally the MFD incorporates the controls for the autopilot system, if installed.

Engine instruments are displayed on the MFD. Discrete engine sensor information is processed by the Garmin Engine Airframe (GEA) sub-system. When an engine sensor indicates a value outside the normal operating range, the legend will turn yellow for caution range, and turn red and flash for warning range.

Also refer to this Supplement, Section 7.9.8 - ENGINE INSTRUMENTS.

#### **7.13.4 AUDIO PANEL**

The audio panel contains traditional transmitter and receiver selectors, as well as an integral intercom and marker beacon system. The marker beacon lights appear on the PFD. In addition, a clearance recorder records the last 2 ½ minutes of received audio. Lights above the selections indicate what selections are active. Pressing the red DISPLAY BACKUP button on the audio panel causes both the PFD and MFD to display a composite mode.

#### **7.13.5 ATTITUDE AND HEADING REFERENCE SYSTEM (AHRS)**

The attitude and heading reference system (AHRS) uses GPS, rate sensors, air data, and magnetic variation to determine pitch and roll attitude, sideslip and heading. Operation is possible in a degraded mode if the system loses any of these inputs. Status messages alert the crew of the loss of any of these inputs. The AHRS will align while the airplane is in motion, but will align quicker if the wings are kept level during the alignment process.

#### **7.13.6 AIR DATA COMPUTER (ADC)**

The air data computer (ADC) provides airspeed, altitude, vertical speed, and air temperature to the display system. In addition to the primary displays, this information is used by the FMS and TIS systems.

## **7.14 AVIONICS**

### **7.14.1 AUTOPILOT SYSTEM (IF AUTOPILOT GFC 700 IS INSTALLED)**

#### General

The GFC 700 Automatic Flight Control System (AFCS) is a two axis autopilot and flight director system which provides the pilot with the following features: Altitude Preselect and Altitude Hold (ALT); Flight Level Change with Airspeed Hold (FLC); Vertical Speed Hold (VS); Navigation Tracking for VOR (NAV) and GPS (GPS); Heading Hold (HDG); Approach mode and Go-Around (GA) pitch/roll guidance. The system consists of autopilot controls on the multi-function display (MFD), servos with autopilot processing logic, Flight Director processing logic in the GIA's, a control stick-mounted elevator trim switch, a control stick mounted trim interrupt and autopilot disconnect switch, a control stick mounted CWS (Control Wheel Steering) switch, a power lever mounted GA (go-around) switch, and PFD/MFD-mounted altitude preselect, heading, and course knobs.

The GFC 700 autopilot contains an electric pitch trim system which is used by the autopilot for automatic pitch trim during autopilot operation and by the pilot for manual electric pitch trim when the autopilot is not engaged. The manual electric pitch trim is operated by a split switch on the pilot's control stick.

The GFC 700 autopilot and manual electric trim (MET) will not operate until the system has satisfactorily completed a preflight test. The preflight test begins automatically with initial power application to the autopilot (AVIONIC MASTER switch is set to the ON position).

The following conditions will cause the autopilot to automatically disconnect:

- Electrical power failure
- Internal autopilot system failure
- AHRS malfunction
- Loss of air data computer information

The GFC 700 may be manually disconnected by any of the following means:

- Depressing the red AP DISC button on the pilot's or copilot's control stick
- Moving the left (outboard) side of the manual electric trim switch on the pilot's control stick
- Pushing the AP button on the autopilot mode controller when the autopilot is engaged
- Depressing the GA button on the left side of the POWER lever
- Pulling the AUTOPILOT circuit breaker
- Turning off the AVIONICS MASTER switch
- Turning off the ELECTRIC MASTER key switch

In addition, the CWS (control wheel steering) switch on the pilot's control stick will disconnect the autopilot servos from the airplane flight controls as long as the CWS switch is depressed.

Power to the GFC 700 autopilot and electric trim system is supplied through the AVIONIC MASTER switch and the AUTOPILOT circuit breaker. The AVIONIC MASTER switch can be used as an additional means to disable the autopilot and electric trim system. The red AP DISC switch on the pilot's control stick will interrupt power to the manual electric trim for as long as the switch is depressed.

Loss of instruments or components of the G1000 system will affect the GFC 700 AFCS as follows:

- Loss of the AHRS will cause the autopilot to disconnect. The autopilot and flight director will be inoperative. Manual electric trim will be available.
- Loss of the heading function of the AHRS will result in loss of the HDG mode. If in HDG mode at the time heading is lost, the autopilot will revert to basic roll mode (ROL).
- Loss of the MFD will not cause the autopilot to disconnect, and will remain engaged with limited functionality, but the autopilot cannot be re-engaged after disconnect by the pilot.

- Loss of the PFD will cause the autopilot to disconnect. The autopilot and flight director will be inoperative. Manual electric trim will be available.
- Loss of air data computer information will cause the autopilot to disconnect. The autopilot will be inoperative. The flight director will be available except for air data modes (ALT, VS, FLC). Manual electric trim is available.
- Loss of GIA #1 will cause the autopilot to disconnect. The autopilot, flight director and manual electric trim will be inoperative. Loss of GIA #2 will also prevent autopilot and manual electric trim operation, but flight director will be available.
- Loss of the standby airspeed indicator, standby attitude indicator, standby altimeter, or compass will have no effect on the autopilot.
- Loss of both GPS systems will cause the autopilot and flight director to operate in NAV modes (LOC, BC, VOR, VAPP) with reduced accuracy. Course intercept and station crossing performance may be improved by executing intercepts and station crossings in HDG mode, then reselecting NAV mode.

### **WARNING**

Following an autopilot or electric trim malfunction do not re-engage the autopilot or manual electric trim or reset the AUTOPILOT circuit breaker until the cause of the malfunction has been determined and corrected.

The GFC 700 Automatic Flight Control system (AFCS) installed in the Diamond DA 40 NG consists of the following components:

- One GDU which contains the following mode control buttons:
  - AP (Autopilot engage/disengage)
  - FD (Flight director On/Off)
  - HDG (Heading mode On/Off)
  - NAV (Nav mode On/Off)
  - APR (Approach mode On/Off)
  - ALT (Altitude hold mode On/Off)
  - VS (Vertical speed mode On/Off)
  - FLC (Flight level change mode On/Off)
  - NOSE UP and
  - NOSE DN (Vertical mode reference change)
  - VNV (Vertical navigation mode On/Off)

This GDU is installed as the MFD.

- Servos with autopilot processing logic in the pitch, roll, and pitch trim control systems
- Servo mounts and brackets
- Flight director processing logic in the GIAs
- Control stick-mounted manual electric trim (MET) switch (split switch) for pitch trim
- Control stick-mounted trim interrupt and autopilot disconnect switch
- Control stick-mounted CWS (Control Wheel Steering) switch
- Remote-mounted go-around switch (on the left side of the POWER lever knob)
- PFD/MFD mounted altitude preselect knob (ALT)
- PFD/MFD mounted heading select knob (HDG)

Flight director commands and autopilot modes are displayed on the PFD. Full AFCS functionality is only available with both displays operating, and will disconnect under certain reversionary conditions.

Upon initial system power-up, the system undergoes a preflight test. At the end of the test, the autopilot disconnect tone sounds and the PFT and AFCS annunciations are removed. Successful completion of the preflight test is required for the autopilot and manual electric trim to engage.

Annunciation of the flight director and autopilot modes is shown in the lower status field of the PFD. In general, green indicates active modes and white indicates armed modes. When a mode is directly selected by the pilot, no flashing of the mode will occur. When automatic mode changes occur, they will be annunciated with a flashing annunciation of the new mode for ten seconds in green. If a mode becomes unavailable for whatever reason, the mode will flash for ten seconds in yellow and be replaced by the new mode in green.

Normal autopilot disconnects are annunciated with a yellow flashing AP on the PFD accompanied by a two second autopilot disconnect tone. Normal disconnects are those initiated by the pilot with the AP DISC switch, the MET switch, the AP button on the MFD mode controller, or the GA button. Abnormal disconnects will be accompanied by a red flashing AP on the PFD accompanied by a continuous autopilot disconnect tone. The disconnect tone and flashing alert may be cancelled by pressing the AP DISC switch or the left side of the MET switch.

Refer to the Garmin G1000 Cockpit Reference Guide, P/N 190-00953-00, Rev. A or later, and Garmin G1000 Pilot's Guide for the Diamond DA 40 NG, P/N 190-952-00, Rev. A or later, for complete descriptions of the G1000 system and operating procedures.



### Power Supply

The AVIONIC MASTER switch supplies power to the avionics bus bar of the radio circuit breakers and the autopilot circuit breaker.

The following circuit breaker is used to protect the following element of the GFC 700 autopilot:

Circuit Breaker	Function
<b>AUTOPILOT</b>	Supplies power to the autopilot pitch, roll, and pitch trim servos.

**7.14.2 AUTOMATIC FLIGHT CONTROL SYSTEM ANNUNCIATIONS AND ALERTS  
(IF AUTOPILOT GFC 700 IS INSTALLED)**

Automatic Flight Control System (AFCS) Status Alerts

The following annunciations can appear on the PFD above the airspeed and attitude indicators. Only one annunciation occurs at a time, and messages are prioritized by criticality.

Warning Alerts on the Automatic Flight Control System (AFCS)

Warning Alerts	Meaning / Cause
PFT	PREFLIGHT TEST - Preflight system test failed; aural alert sounds at failure.
AFCS	SYSTEM FAILURE - AP and MET are unavailable; FD may still be available.
PTCH	PITCH FAILURE - Pitch axis control failure; AP inoperative.
ROLL	ROLL FAILURE - Roll axis control failure; AP inoperative.
PTRM	PITCH TRIM FAILURE (or stuck AP TRIM switch) If AP engaged, take control of the airplane and disengage AP.  If AP disengaged, move AP TRIM switches separately to release.

Caution Alerts on the Automatic Flight Control System (AFCS)

Caution Alerts	Meaning / Cause
↑ELE	ELEVATOR MISTRIM UP - Pitch servo providing sustained force in the indicated direction.
↓ELE	ELEVATOR MISTRIM DOWN - Pitch servo providing sustained force in the indicated direction.
←AIL	AILERON MISTRIM LEFT - Roll servo providing sustained force in indicated direction.
AIL→	AILERON MISTRIM RIGHT - Roll servo providing sustained force in indicated direction.

Advisory Alerts on the Automatic Flight Control System (AFCS)

Advisory Alerts	Meaning / Cause
PFT	PREFLIGHT TEST - Performing preflight system test; aural alert sounds at completion. Do not press the AP DISC switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.

## 8. AIRPLANE HANDLING, CARE AND MAINTENANCE

No change.