GARMIN™

Integrated Flight Deck

Guide for Designated Pilot Examiners and Certified Flight Instructors

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INTRODUCTION

Technology, such as that found in the Garmin Integrated Flight Deck System (GIFD) has the potential to bring a higher level of safety to general aviation (GA). However, this can only occur if pilots operating aircraft with such equipment are properly trained and held accountable to the Practical Test Standards (PTS). The purpose of this document is to provide both an overview of the typical potential GIFD failure modes and sample system operation/failure mode scenarios that correspond to the applicable sections of FAA-S-8081-4D, Instrument Rating Practical Test Standards, so that the Designated Pilot Examiner (DPE) and Certified Flight Instructor–Instrument (CFII) can properly prepare pilots for the instrument rating by simulating realistic failures and teaching appropriate failure response plans.

The system recommendations provided in this document are Garmin's recommendations only and are superseded by the aircraft manufacturer's recommendations and FAA-approved documentation for each aircraft model. The basic GIFD System architecture is similar across many aircraft models. However, the location of the actual components of the system, the location and grouping of the circuit breakers and the engine instrumentation presentations vary between aircraft. Therefore, it is important to review the aircraft manufacturer documentation for each aircraft model.

NOTE: As part of Garmin's commitment to flight safety, any specific questions or recommendations about both this document and the GIFD System as it is to be used for the instrument check-ride can be sent via e-mail to CFI_Tools@garmin.com. For general questions, visit http://www.garmin.com/support to correspond with Garmin's aviation technical support specialists.

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GIFD SYSTEM OVERVIEW

The GIFD System consolidates all communication, navigation, surveillance, primary flight instrumentation, engine indication system, and annunciations on two (or three) liquid crystal displays (LCDs) and one (or two) Audio Panels. All the components of the GIFD System are Line-replaceable Units (LRUs). This modular approach allows the various components to be mounted either behind each of the displays or in remote locations in the aircraft, based upon the needs of the aircraft manufacturer. Figure 1 is a sample system schematic that shows the GIFD components used in a typical single-engine GA aircraft.

NOTE: Autopilot interfaces vary by aircraft and are not indicated in Figure 1.

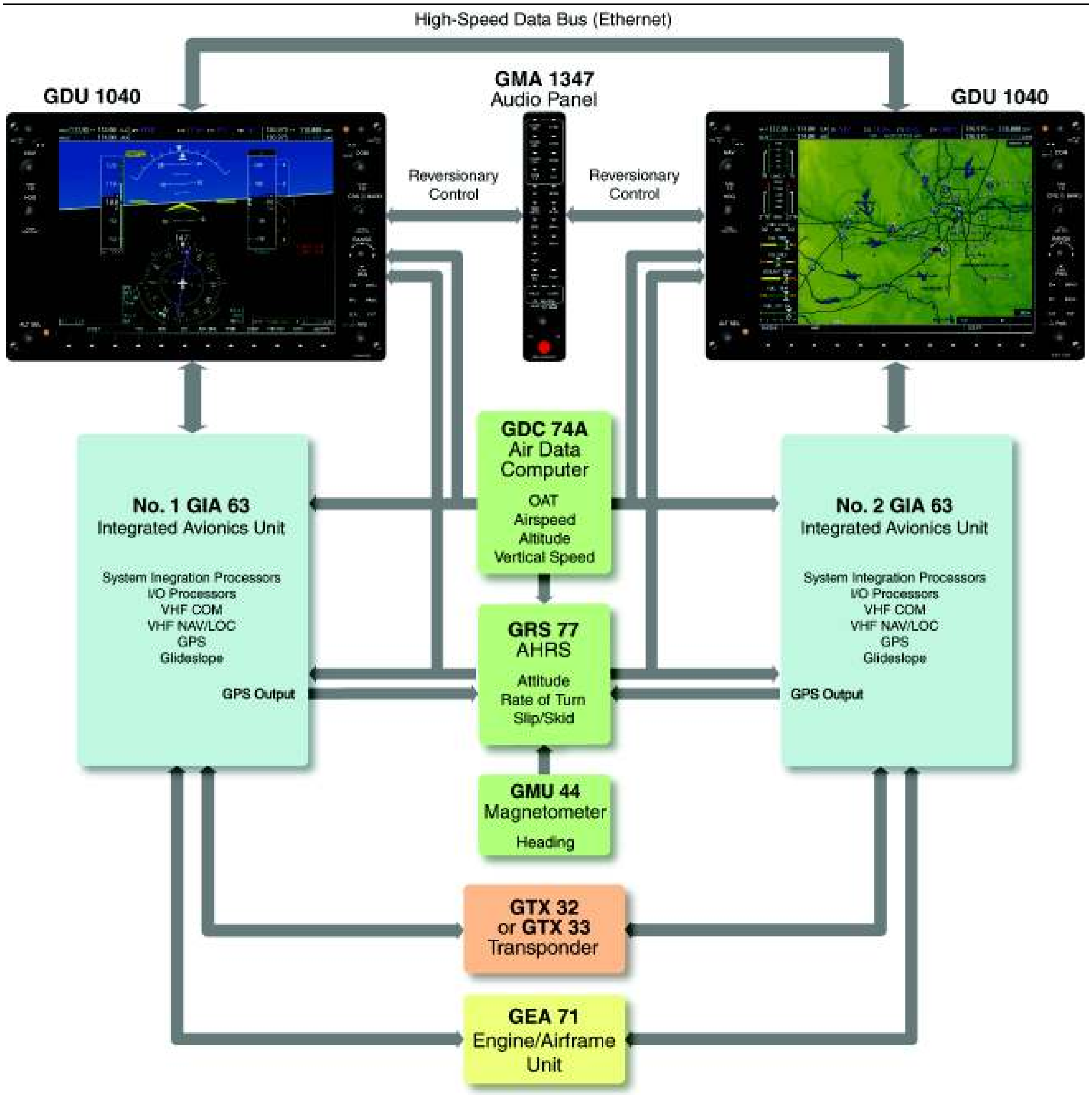

Figure 1 GIFD System

GIFD SYSTEM COMPONENTS

The main components of the GIFD System are the two GDU 1040-series displays used for the Primary Flight Display (PFD) and the Multi Function Display (MFD), and the two GIA 63 Integrated Avionics Units (IAUs). These components are interfaced with each other via a proprietary Ethernet-based, high-speed digital databus system. All other components, such as the Attitude and Heading Reference System (AHRS), Air Data Computer (ADC), transponder and Engine/Airframe Interface units, use combinations of RS-232, ARINC 429 and RS-485 interfaces.

GDU 1040 Displays

Both GDU 1040 displays are identical in hardware, although for aircraft configured with a GFC 700 Automatic Flight Control System, the MFD may be a GDU 1042, 1043, 1044, or 1045 (include AFCS controls on the left side of the display). The aircraft wiring harness determines whether the display functions as a PFD or an MFD (see Figure 2). A configuration module within the PFD connector contains aircraft-specific backup configuration data.

Figure 2 GDU 1040 Primary Flight Display (PFD)

Failure Mode(s)

If one display fails, the primary flight instruments and Engine Indication System (EIS) are displayed on the remaining screen. No moving map is presented in this mode (see Figure 3). This operating mode is called "Reversionary Mode" and may be either detected automatically by the system, or initiated manually via the red **DISPLAY BACKUP** Button located on the lower portion of the Audio Panel.

Figure 3 Reversionary Mode

GIA 63 Integrated Avionics Units

The GIA 63 units serve as the main interface hub for the individual components of the GIFD System. All key components, such as the GRS 77 AHRS, GDC 74A ADC, GTX 33 Mode-S transponder, and GEA 71, provide inputs to both GIA 63 units. This allows for a higher level of system redundancy and integrity as data is cross-checked to ensure proper system operation. The only component that is not connected directly to the GIA 63 units is the GMU 44 magnetometer, which interfaces directly with the GRS 77 AHRS to provide magnetic heading input. The GIA 63 units also contain the communication and navigation radios and the VOR/LOC/GS and GPS receivers.

Failure Mode(s)

If a GIA 63 unit fails, the associated COM/NAV/GPS receiver data is no longer available and is automatically replaced by the COM/NAV/GPS receiver data from the other GIA 63 unit. The operative GPS receiver automatically takes over any active GPS navigation (without pilot action). A red "X" appears over the COM/NAV frequencies to indicate GIA 63 failure (see Figure 4) and an alert annunciation appears to the right of the Altimeter and Vertical Speed Indicator on the PFD. The remaining GIA 63 continues to provide all interface and system integrity functions. If both GIA 63 units fail, the AHRS and ADC continue to provide data directly to the displays, although no navigational or communication capabilities are available. Partial failures in the GIA 63 units (such as failure of the COM component) are more likely to occur than full component failures since the COM/NAV/GPS and interface components inside the GIA 63 are independent.

Figure 4 GIFD System Failure Annunciations

GDC 74A Air Data Computer

The GDC 74A is the ADC for the system and receives the standard pitot and static system inputs as well as the outside air temperature (OAT) input. This allows the system to automatically perform calculations such as true airspeed (TAS) and density altitude.

Failure Mode(s)

If the GDC 74A fails, the PFD presentations of the airspeed, altitude, vertical speed, OAT, and true airspeed (TAS) display a red "X", as shown in Figure 4. In this case, the pilot should refer to the standby altitude and airspeed indicators installed in the aircraft. Certain obstructions of the pitot static system can be verified by cross-checking the associated PFD indications with the standby instruments. These PFD indications should be consistent with the readings found in non-GIFD-equipped aircraft (zero airspeed on takeoff, etc.). If the OAT probe fails, a red "X" appears over both the TAS and OAT, and calculations based on these should be completed manually. Pressure altitude reporting for the transponder is also lost—the transponder can only work in Mode A and can no longer provide the information necessary for operating in Class C and B airspace.

GRS 77 Attitude Heading and Reference System and GMU 44 Magnetometer

The GRS 77 AHRS provides attitude and turn-rate presentation on the PFD and interfaces with the GMU 44 magnetometer. The GMU 44 is a tri-axial magnetometer which allows the system to measure both the horizontal and vertical components of the earth's magnetic field.

Both the GRS 77 and GMU 44 are solid-state components that require very little initialization time (less than one minute) and that can initialize while moving during taxi and in flight at bank angles of up to 20°. The GRS 77 AHRS can still operate in the absence of other reference inputs such as those from the GPS receiver, ADC, or magnetometer.

Failure Mode(s)

In-flight initialization of AHRS when operating without any valid source of GPS data and at true air speed values of more than 200 knots is significantly improved, but is not guaranteed. Under these rare conditions, it is possible for in-flight AHRS initialization to take an indefinite amount of time which would result in an extended period of time where valid AHRS outputs are unavailable. In such circumstances, hazardously misleading attitude and/or heading information are not displayed.

If the system detects that the GRS 77 is not operating properly when compared to other aircraft sensors, such as the GPS receiver, ADC, or magnetometer, all attitude presentations are removed from the PFD and are replaced with a large, red "X" and the words "Attitude Fail" (see Figure 4). Failure indications are designed to be displayed before any hazardous or misleading information (HMI) is presented to the pilot. This represents a significant improvement over conventional mechanical gyro systems. If the GMU 44 fails, only the stabilized heading data is lost.

GTX 33/GTX 32 Transponder

The GTX 33 Mode-S and GTX 32 Mode-C transponders provide ground radar surveillance capability to the GIFD System. Both transponders are solid-state units and require no warm-up time. As installed in most aircraft, these units transition to an ALT reporting mode at a ground speed of 30 knots. This is designed to minimize pilot workload when at the threshold of the runway. Proper operation can be verified by noting that in the Transponder Data Box on the PFD, the appropriate modes are displayed in green and that an 'R' indication appears (the system is being interrogated). Typically, only one Mode-S or Mode-C transponder is installed per aircraft. The GTX 33 Mode-S Transponder also receives and presents (if selected) airborne traffic, using the FAA-provided Traffic Information System (TIS). For more information on TIS, refer to the FAA website at http://www.tc.faa.gov/act310/projects/modes/tis.htm.

Failure Mode(s)

If the transponder fails, a red "X" appears over the Transponder Data Box (see Figure 4) and an advisory message appears.

GEA 71 Engine/Airframe Unit

The GEA 71 Engine/Airframe Unit is the main processor for all engine instrumentation data, including manifold pressure, engine speed (RPM), oil temperature/pressure, electrical system parameters, exhaust gas temperature (EGT), cylinder head temperature (CHT), fuel, and vacuum system parameters, depending upon the aircraft. The EIS can also provide aircraft system annunciations such as those associated with doors and canopies.

Failure Mode(s)

If the GEA 71 fails, all engine/airframe data is lost. However, a much more likely scenario would be one in which the EGT/CHT probes would fail, or in which other engine/airframe sensors would become inoperative. Instruments affected by loss of these sensors would display a red "X" to indicate this type of failure (see Figure 4). EIS-related advisories may also appear, depending upon the aircraft.

GMA 1347 Audio Panel

The GMA 1347 is a solid-state digital Audio Panel that integrates NAV/COM audio, an intercom system, and a marker beacon receiver. Unit operation is conventional to that of other available Audio Panels. The Reversionary Mode (**DISPLAY BACKUP**) button for the displays is located on the lower portion of the GMA 1347.

Pressing a **COM/MIC** Key selects the corresponding COM radio for transmitting and receiving communications. Pressing a **COM** Key only allows the selected COM radio to be monitored. Pressing a **NAV** Key activates/deactivates the audio for the corresponding NAV radio. The intercom controls are located on the lower portion of the Audio Panel; the small knob controls pilot volume and the large knob controls copilot and passenger volume. The Audio Panel is auto-squelch enabled and has clearance recorder capability.

Failure Mode(s)

In the event of failure, the GMA 1347 has an analog emergency mode that automatically connects the pilot to COM1. This allows the pilot to retain communication capabilities over one COM radio, even if the Audio Panel/intercom system has become inoperative.

GCU 476 MFD/PFD Control Unit

The GCU 476 is a remotely-mounted control unit available for certain installations of the GIFD System. It provides full PFD or MFD control access, and can simplify data entry with its alphanumeric keypad. From the control unit, softkeys can be selected, COM and NAV radios can be tuned, and flight planning functions accessed.

Failure Mode(s)

The GCU 476 is directly connected to each of the displays (PFD, MFD). If a communication path fails between the GCU 476 and one of the displays, an advisory message appears on the PFD. The GCU 476 can still be used to control either display through a back-up path. For a single path failure, all operations continue to work normally (e.g., if a direct communication path between the GCU 476 and the MFD fails, the GCU 476 and MFD will communicate through the HSDB connection between PFD and MFD). If both paths are lost, the GCU 476 cannot be used to control the PFD or MFD.

GDL 69/69A Data Link Receiver

The GDL 69 is a remote receiver for broadcast weather data from XM Satellite Radio. This highly reliable, near real-time weather information is transmitted to the PFD and MFD. The GDL 69A receiver is able to receive XM WX weather services and XM digital audio entertainment, which provides over 130 channels of music, news, talk, sports, and information. The aircraft owner must activate a monthly subscription to XM Radio in order to access GDL 69/69A capability.

The number of products available for display depends on the subscription package. Refer to the XM Radio website for details on subscriptions. The available and currently subscribed weather products are listed on the MFD AUX – XM Information Page. Weather products available from XM Weather which can be displayed on the GIFD include:

- High-resolution NEXRAD weather data and radar coverage
- METARs (in graphical or textual format)
- TAFs
- TFRs
- Winds aloft (at altitude)
- Surface analysis (fronts)
- Precipitation type
- Echo tops
- Cloud tops
- Lightning
- Storm-cell data (size, speed, and direction)
- AIRMETs
- SIGMETs
- City forecast
- County warnings

The ages/dates for each of the enabled products are displayed in the top right corner of the MFD Navigation Map and Weather Data Link pages. It is important to understand the age, date/time stamp, and the actual age for each weather product. When data for a weather product has aged more than half the product's expiration time, the displayed product age changes from light blue to yellow. Current weather products' ages are displayed in minutes. Forecast weather products use a date/time stamp.

Times are based on Zulu times when the data was assembled by the weather data provider (WxWorx), not on the time the data was received by the GDL 69/69A, nor the time the data was complied by various weather providers such as NWS. For example, METAR information is broadcast every 12 minutes, but new information is not displayed by the GIFD until updated information (such as special or new METARs) is collected and broadcast, typically at the end of every hour. If there is an update in the 12 minute broadcast cycle, this new information is displayed on the MFD.

Failure Mode(s)

If the GDL 69/69A fails, all weather data will be lost. The pilot can perform some quick troubleshooting steps to find the possible cause of a failure:

- Check the circuit breaker to ensure the GDL 69/69A has power applied.
- Ensure that the owner/operator of the aircraft in which the GDL 69/69A is installed has subscribed to XM Radio
- Ensure the XM Radio subscription has been activated (or not been lost)

To confirm subscription activation:

1) On the MFD, open the AUX – XM Information Page:
2) Select the fifth of six pages in the Auxiliary Page group.
3) Press the **INFO** Softkey.
4) The appropriate service class subscription title (e.g., “Aviator”) should be displayed.
5) Check that the boxes beside the weather products are green.

If a failure still exists, advisory messages may provide insight as to the failure's cause (GDL 69/69A advisory messages and their descriptions can be found in the GIFD Pilot's Guide).

For troubleshooting purposes, locate and verify that the unique Data Radio ID (for the GDL 69 and GDL 69A) and Audio Radio ID (GDL 69A only) are displayed on the AUX - XM Information Page. If these unique ID(s) are displayed, the GDL 69/69A has an adequate connection to the MFD. GDL 69/69A status, serial number, and software version number are displayed in the LRU Information Box on the AUX- System Status Page.

GWX 68 Airborne Weather Radar

WARNING: Begin transmitting only when it is safe to do so. If it is desired to transmit while the aircraft is on the ground, no personnel or objects should be within 9.16 feet of a 10 inch antenna or 11 feet of a 12 inch antenna.

Garmin's GWX 68 Airborne Weather Radar provides the ability to distinguish potentially dangerous thunderstorm cells by measuring the radar return strength. Airborne ground mapped radar operation is also provided for distinguishing landscape features and bodies of water based on the return signal strength. Each radar mode (weather or ground mapping) uses a separate color system.

The GWX 68 radar antenna tilt is automatically stabilized based on pitch and roll inputs. Manual adjustment of vertical tilt, gain, and range can be made. Scanning in 20-, 40-, or 60-degree sections is also available.

Another interesting feature is WATCH: Weather ATtenuated Color Highlight. This feature puts gray shading where the radar signal has been significantly attenuated and can indicate areas where the displayed return intensity could be less than the real intensity.

Tips for using GWX 68 Airborne Weather Radar:

- Tilting the radar up 5 degrees may help reduce ground clutter when scanning for storms.
- To scan a storm, first align the radar bearing to the storm using the horizontal scan, then scan vertically.
- Check the vertical scan of a storm to view the height of the thunderhead. Taller thunderheads may have significant turbulence.
- Become accustomed to scanning the entire sky by adjusting tilt up and down. Always using too high a tilt can overshoot storms that may be in the aircraft flight path. Similarly, using too low a tilt may detect only storms at a short range and miss storms farther away.

Failure Mode(s)

The following conditions cause the MFD Weather Radar Page to display "RADAR FAIL" in yellow in the center of the screen and clear previously drawn weather data:

Condition	PFD Advisory Message
The MFD isn't receiving data or stopped receiving data from the radar (e.g., the radar is unable to receive the reflected signal, such as if the aircraft radome is damaged)	GWX FAIL: GWX is inoperative
Radar configuration doesn't match PFD/MFD configuration	GWX CONFIG: GWX configuration error. Config service req'd.
Radar reports a failure	GWX SERVICE: GWX needs service. Return unit for repair

Table 1 GWX 68 Failure Conditions and Advisory Messages

GFC 700 Automatic Flight Control System

The GFC 700 Automatic Flight Control System (AFCS) is available in certain airframes as an option for the Garmin Integrated Flight Deck. For details on a particular GFC 700 AFCS installation, refer to the GIFD Pilot's Guide for that aircraft. GFC 700 functionality is distributed across the GIFD Line Replaceable Units (LRUs) listed in Table 2. Functions provided by the GFC 700 may include:

- Two or three-axis digital flight control
- Flight director
- Attitude-based autopilot
- Yaw damper
- Auto trim
- Manual electric trim

LRU	GFC 700 Functionality
GDU	Provide navigational database parameters
MFD	AFCS control keys are located on the left side of the MFD
PFD	Displays AFCS mode annunciations and flight director command bars
GIA 63	Provides GPS, VOR, and ILS navigational data #1 GIA 63 performs mode logic, flight director computation, and servo management
GRS 77 GMU 44	Provide attitude information
GDC 74	Provides air data information
GSA 81 GSM 85	Perform autopilot, trim, and yaw damping computations and self-monitoring and actuate control surfaces

Table 2 GFC 700 Functionality

Failure Mode(s)

LRU Failure	Result		
	Autopilot	Flight Director	MET
PFD	Unavailable	Unavailable	Available
MFD	No immediate change in operation Autopilot cannot be re-engaged if disengaged following MFD failure	No immediate change in operation Loss of mode selection capability; default (Pitch and Roll Hold) and Go Around modes available	Available
#1 GIA 63	Unavailable	Unavailable	Unavailable
#2 GIA 63	Unavailable	Available	Unavailable
GRS 77	Unavailable	Unavailable	Available
GDC 74	Unavailable	Available	Available

Table 3 GFC 700 Fail

GSA 81 Servo and GSM 85 Servo Mount

GSA 81 low-torque servos use DC brushless motors for long servo life. The servos are directly connected to the GIAs, and each servo contains dual processors for motor control self-monitoring. The motor control processor calculates autopilot commands for motor control. The monitor processor monitors motor control, controls the engage clutch, and controls power to motor.

Each servo mounts on a GSM 85; a capstan assembly is connected directly to the servo mount. The servo can be detached from the mount without de-rigging the capstan assembly. An independent servo enable signal connects each servo to the **AP DISC** Switch to provide a reliable servo disable operation in the even of system failure. This input supplies the power for the motor and engages the solenoid.

Failure Mode(s)

Each servo contains dual processors, which provide autopilot function and monitoring for its control axis. Active failures within the servo detected by one of both of these processors cause removal of power the motor and engagement of the solenoid. Servo speed and torque authority is also electronically monitored and limited. The **AP DISC** Switch also supplies power for the motor and engage solenoid power in all servos, giving the pilot complete override capability. Failure of the servos causes loss of autopilot functionality.

SAMPLE SYSTEM OPERATION/FAILURE MODE SCENARIOS FOR FAA-S-8081-4D

The GIFD System allows for realistic failures to be simulated safely and does not require a substantial change to the administration of the practical examination. Aircraft system knowledge is still important in order to both understand the various failure modes and take appropriate corrective action.

NOTE: Recommendations from individual aircraft manufacturers supersede any guidance provided in this document. Detailed system data can be obtained from the aircraft Pilot Operating Handbook (POH) and/or Aircraft Flight Manual Supplement (AFMS).

With the emphasis on Single Pilot Resource Management (SRM), Aeronautical Decision Making (ADM), and Risk Management (RM), certain operational aspects of the GIFD System should be evaluated. These aspects are covered in FAA-S-8081-4D under the "Special Emphasis Areas" in the categories of collision avoidance, controlled flight into terrain (CFIT), ADM, and RM, and include the following items:

- Knowledge and use of the operation and limitations of the terrain awareness system that is part of the GIFD System
- Knowledge and use of the operation and limitations of TIS traffic awareness in aircraft equipped with a GTX 33 Mode-S transponder
- Use of weather-related systems, such as either lightning detection devices or the Garmin GDL 69/69A Data Link Receivers

Approaches with vertical guidance (APVs) are mentioned in the section concerning the "Aircraft and Equipment Required for the Practical Test". APVs can be ILS-like in their lateral and vertical navigation cues, yet the associated minimums are not sufficient for these approaches to be considered precision approaches. APVs require a TSO C-146 GPS/WAAS navigator.

NOTE: Please refer to the Aeronautical Information Manual (AIM) for more information on the Wide Area Augmentation System (WAAS) and APVs.

Currently, all aircraft with the Garmin Integrated Flight Deck are also equipped with an attitude indicator, altimeter, and airspeed indicator as standby, or backup, instruments. This is a departure from the mantra "altitude, airspeed, and needle and ball". The main advantage to using a standby attitude indicator is the ability to control the aircraft by providing a direct indication of pitch and bank. With no yaw indication in the event of an AHRS failure, the applicant should be evaluated on the ability to maintain positive control, as well as on prudent aircraft maneuvering, when compensating for the lack of yaw information. Within the turbine community, it has been the practice for years to use only an attitude indicator for backup pitch and bank information without reference to yaw. By all accounts, this practice has shown good results.

In the same section, the applicant is required to demonstrate the ability to utilize an autopilot and/or flight management system (FMS). In the GIFD System, FMS functions are very similar to those available on Garmin 400/500 series units. This should help pilots become familiar with these units to easily transition to the GIFD System. FMS functionality includes creating flight plans, direct-to navigation, and selecting, loading and activating approach procedures. Autopilot operation is dependent on the make and model of the autopilot installed and is only covered in this document in reference to the operational modes consistent with those listed in "Designee Update, Special Edition on Testing in Technologically Advanced Aircraft" by the AFS-600 (the FAA Regulatory Support Division).

Normal preflight practices still apply in the various Areas of Operation. This includes knowledge of aircraft systems, flight instruments and navigation equipment as well as the instrument cockpit check. However, the PTS diverge in the Areas of Operation IV and VII-D. The following subsections help provide guidance on the method with which to evaluate and simulate system failures.

Areas of Operation Section IV: Recommendations for Failure Simulation

NOTE: It is important to follow the aircraft manufacturer's recommendations for failure simulation, for they supersede any guidance provided in this document.

The tasks listed in this section cover flight by reference to instruments. According to the PTS, the examiner is expected to evaluate the applicant's use of the backup instruments with both a full panel and a partial panel.

In the case of GIFD-equipped aircraft, failures can be simulated in two ways. The preferred method is to use the dimming controls on the GIFD System combined with selecting display Reversionary Mode using the button on the Audio Panel. Using the dimming controls and the Reversionary Mode is straightforward. Table 4 shows typical configurations using the display dimming function to simulate failures.

The other, less desirable, method consists of pulling various circuit breakers. Table 5 gives recommendations on simulating various partial panel configurations by pulling circuit breakers.

Dimming the displays:

1) Press the **MENU** key on the PFD (while no other data windows are active) to display the Setup Menu window.
2) Turn the large **FMS** knob to select the display to be dimmed ('PFD DSPL' or 'MFD DSPL').
3) Turn the small **FMS** knob to switch dimming from 'AUTO' to 'MANUAL' mode and press the **ENT** key.
4) Turn the small **FMS** knob counterclockwise to decrease the display brightness.

Putting the displays in Reversionary Mode:

Press the **DISPLAY BACKUP** button on the bottom of the GMA 1347 Audio Panel.

Failure to Be Simulated	Examiner Action	Applicant Action
Loss of primary flight instruments on the PFD (AHRS, ADC failure)	Dim PFD	Control the aircraft by reference to the backup attitude, altitude and airspeed indicators
Complete loss of PFD	Dim PFD	Manually initiate Reversionary Mode and control aircraft via Reversionary Mode presentation on the MFD
Loss of MFD	Dim MFD	Manually initiate Reversionary Mode and control aircraft via Reversionary Mode presentation on the PFD

Table 4 Display Dimming for Failure Simulation

NOTE: Appropriate use of the autopilot should be observed to reduce pilot workload and maintain positive control of the aircraft. It is important to verbally quiz the applicant on the operation of the autopilot based on the data presented in Table 5.

NOTE: Due to the differences in autopilot interfaces, the recommendations for autopilot engagement are generic and may not be suitable for all aircraft.

Failure to Be Simulated	Examiner Action	Applicant Action
Loss of AHRS and ADC* (simulates loss of all primary flight instruments)	Pull AHRS and ADC circuit breakers	Control the aircraft by reference to the backup attitude, altitude, and airspeed indicators; engage the autopilot if it is rate-based and has its own gyro source in roll mode
Loss of AHRS (attitude and heading)	Pull AHRS circuit breaker	Control the aircraft by reference to the backup attitude indicator; engage the autopilot if it is rate-based and has its own gyro source in roll mode
Loss of ADC (airspeed, altitude and vertical speed)*	Pull ADC circuit breaker	Control the aircraft by reference to the PFD attitude presentation and the backup airspeed and altitude indicators; engage the autopilot in roll, HDG, or NAV mode
Loss of PFD	Pull PFD circuit breakers (This action prevents the tuning of the COM1/NAV1 frequencies; COM2 must be tuned to the proper frequency and must be in use)	Control the aircraft by reference to the MFD in Reversionary Mode (this mode also removes all moving map presentations)

*When the ADC has failed, pressure altitude data is no longer available to the transponder. As a result, the transponder loses its Mode C (i.e., altitude reporting) capability. Therefore, without the required coordination with the appropriate air traffic control facility, failing the ADC should be avoided in Class B and C airspaces, or within the Mode C veil of Class B airspace.

Table 5 Recommendations for Pulling Circuit Breakers to Simulate Failures

Areas of Operation Section IV: Recommendations for Failure Simulation (Cessna NAV III)

Cessna does not recommend pulling circuit breakers as a means of simulating failures on the GIFD. Pulling circuit breakers—or using them as switches—has the potential to weaken the circuit breaker to a point at which it may not perform its intended function. Using circuit breakers as switches is also discouraged in Advisory Circulars 120-80, 23-17B, and 43.13-1B. Additionally, a circuit breaker may be powering other equipment (such as avionics cooling fans), and pulling such a circuit breaker could affect the safe operation of other equipment.

Failure to Be Simulated	Examiner Action	Applicant Action
Loss of AHRS and ADC* (simulates loss of all primary flight instruments)	**1)** Press the **MENU** Key on the PFD. The PFD DSPL field is highlighted **2)** If the PFD DSPL field is not highlighted, activate the cursor by pressing the small **FMS** Knob. Turn the large **FMS** Knob to highlight 'AUTO'. **3)** Turn the small **FMS** Knob to select 'MANUAL' and press the **ENT** Key. The cursor moves to the backlighting percentage field. **4)** Turn the small **FMS** Knob counterclockwise; adjust the backlighting value to the lowest value (0.14%).	Control the aircraft by reference to the backup attitude, altitude and airspeed indicators; engage the autopilot in roll mode.
Loss of PFD	**1)** Press the **DISPLAY BACKUP** Button on the Audio Panel. **2)** Press the **MENU** Key on the MFD and use the method described above to dim the PFD.	Control the aircraft by reference to the MFD in Reversionary Mode (this mode also removes all moving map presentations).
Loss of MFD	**1)** Press the **DISPLAY BACKUP** Button on the Audio Panel. **2)** Press the **MENU** Key on the MFD. **3)** Use the large **FMS** Knob to move the cursor to the MFD DSPL field. Use the procedures above to dim the MFD.	Control the aircraft by reference to the PFD in Reversionary Mode (this mode also removes all moving map presentations).

*The simulated loss of AHRS and ADC cannot be accomplished individually in Cessna NAV III aircraft. In this case, the applicant must simulate navigation on a desired course during en-route or approach operations by using the moving map display. In order to determine more precisely the horizontal distance from the desired active leg, the applicant or the examiner may select the cross-track (XTK) data bar field option on the MFD.

Table 6 Display Dimming Instructions for Simulating Various Failures

Area of Operation Section VII, D: Recommendations for Failure Simulation

According to the PTS, this area only applies both to Task D and unless weather and other circumstances dictate that a precision approach be used. Information from Table 6 can be used to create a realistic scenario. As noted in the "Designee Update, Special Edition on Testing in Technologically Advanced Aircraft" by the AFS-600 (the FAA Regulatory Support Division), appropriate use of the autopilot should be evaluated either via verbal questioning or, in the case of an AHRS failure, via actual demonstration by the applicant.

NOTE: The use of a rate-based autopilot during an AHRS failure typically limits the autopilot to operation in roll mode.

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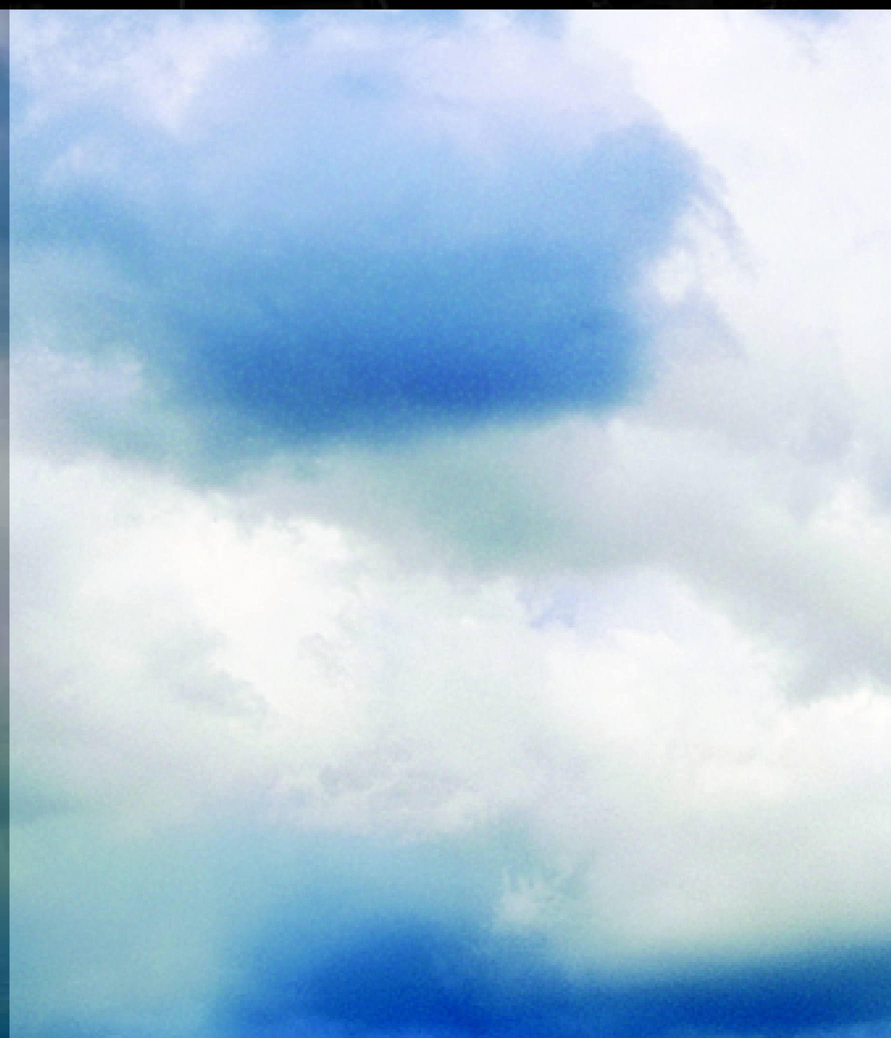

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