

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

March 30, 2015

Garmin Integrated Avionics (GIA) Units

Specialist's Factual Report
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1. EVENT

Location: Gaithersburg, Maryland
Date: December 8, 2014
Aircraft: Embraer S.A. EMB-500
Registration: N100EQ
Operator: Sage Aviation LLC.
NTSB Number: DCA15MA029

On December 8, 2014, about 1041 Eastern Standard Time (EST), an Embraer S.A. EMB-500 (Phenom 100), N100EQ, impacted terrain and houses about 0.75 miles short of runway 14 while on approach to Montgomery County Airpark (GAI), Gaithersburg, Maryland. The airline transport rated pilot and two passengers were fatally injured as well as three persons on the ground. The airplane was destroyed during the impact and ensuing fire. Marginal visual meteorological conditions prevailed at the time and the flight was operating on an instrument flight rules (IFR) flight plan. The airplane was registered to and operated by Sage Aviation LLC., of Chapel Hill, North Carolina, under the provisions of 14 *Code of Federal Regulations* Part 91 as a personal flight. The flight originated from Horace Williams Airport (IGX), Chapel Hill, North Carolina, with GAI as its intended destination..

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices:

Device 1: Garmin Integrated Avionics (GIA) 63W
Device 1 Serial Number: 15W009334
Device 2: GIA 63W
Device 2 Serial Number: 15W008763¹

2.1. GIA 63W Device Description

The GIA 63W is a microprocessor-based input-output line replaceable unit (LRU) used in the Garmin G1000 product line of integrated cockpit systems. The GIA works as an

¹ Serial number was damaged on dataplate and it was determined through review of the data log download.

information hub; sending and receiving information to the displays. The unit contains no cockpit interface. The unit records two logs to non-volatile memory² identified as assert and fault logs; these logs are used for maintenance and advanced diagnostic purposes. The logs may be downloaded using the manufacturer's proprietary software via Ethernet or serial interfaces, using manufacturer custom cabling. The text logs contain date and time stamps, along with coded, proprietary information.

2.1.1. GIA 63W Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the units had sustained minor damage, as shown in figure 1. With assistance from the manufacturer, the information was downloaded using custom cables and software.

Figure 1. GIA 63W units.



2.1.2. Garmin GIA 63W Data Description

Assert and fault log data from GIA serial number 15W009334 contained data from calendar year 2009 through the accident flight; data from this unit is contained in attachment 1. Assert and fault log data from GIA serial number 15W008763 contained data from calendar year 2009 through the accident flight (however, the assert log only

² Non-volatile memory is semiconductor memory that does not require external power for data retention.

contained data from the accident date of December 8, 2014, as explained below); data from this unit is contained in attachment 2.

With assistance from the manufacturer, the downloaded information recorded on December 8, 2014 was reviewed. Most log entries were consistent with operational diagnostic messages and expected faults.

A recurring assert recorded by GIA serial number 15W008763 filled the assert log to capacity. The logged assert message was: “msg:7.09 DIAG: Measured clock frequency too far [redacted]”³. According to the manufacturer, this message is logged to indicate that the frequency generated by the local oscillator on the GPS/WAAS⁴ receiver in the GIA has drifted excessively. The condition is logged for maintenance purposes and a drift could explain excessive acquisition times on future power ups.

A fault in GIA serial number 15W009334 recorded “PRMTR:FD FMS VNAV engaged MODE:VPTH Arm Parameter lost.” According to the manufacturer:

While the flight director is in an armed mode it will monitor navigation parameters from the FMS [flight management system]. The armed mode is a mode where the flight director is initialized for engagement but not actually engaged and not actually providing flight guidance to the pilot. While monitoring navigation parameters as suggested by the fault log entry, the vertical navigation parameters that are needed to compute vertical flight guidance were not received by the flight director (from the FMS). These vertical navigation parameters are the set of parameters that define the vertical path (VPTH) that the flight director will provide guidance to track/fly when it engages. The loss of the parameters can be associated with a variety of conditions including pilot action to disengage the vertical navigation or to change the flight plan in the FMS.

No other log entries indicated anything unusual.

³ In accordance with 49 CFR 831.6, information deemed proprietary redacted from this report is noted as [redacted].

⁴ Global Positioning System and Wide Area Augmentation System, respectively.