

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

May 19, 2020

Electronic Devices

Specialist's Factual Report by Nick Swann

1. EVENT

Location: Fullerton, CA
Date: April 18, 2019
Aircraft: Beech B60
Registration: N65MY
Operator: Private
NTSB Number: WPR19FA115

On April 18, 2019, at 1953 Pacific daylight time a Beech B60, N65MY, collided with the ground after takeoff from Fullerton Municipal Airport (FUL), Fullerton, California. The private pilot sustained fatal injuries and the airplane was destroyed. The airplane was registered to KMA Technology Solutions LLC., and operated as a personal flight by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91. The flight had a planned destination of Heber City Municipal Airport - Russ McDonald Field (HCR), Heber, Utah. Visual meteorological conditions prevailed and an instrument flight rules (IFR) flight plan had been filed.

2. DETAILS OF INVESTIGATION

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

Device 1: **Insight G4 Engine Monitor**
Device 1 Serial Number: **Unknown**

Device 2: **Avidyne IFD 540**
Device 2 Serial Number: **M152059942**

Device 3: **Avidyne IFD 550**
Device 3 Serial Number: **M173114512**

2.1. Insight G4 Engine Monitor Device Description

The Insight G4 is an engine data monitor device. It is capable of monitoring engine parameters including, but not limited to, cylinder head temperature (CHT), exhaust gas temperature (EGT), fuel flow information, and acceleration data. Data is stored on an SD memory card installed in the front panel of the device.

2.1.1. Insight G4 Engine Monitor Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had suffered severe fire and impact damage. There was significant charring on the exterior of the device as shown in figure 1. The SD card containing the recorded information was in the front of the device as shown in figure 2 and showed signs of fire damage as shown in figure 3. The SD card was removed from the device and after a visual and x-ray inspection the SD card was determined to be in likely in working order as shown in figure 4. The SD card was then read using lab equipment.



Figure 1. Exterior Damage to Insight G4.

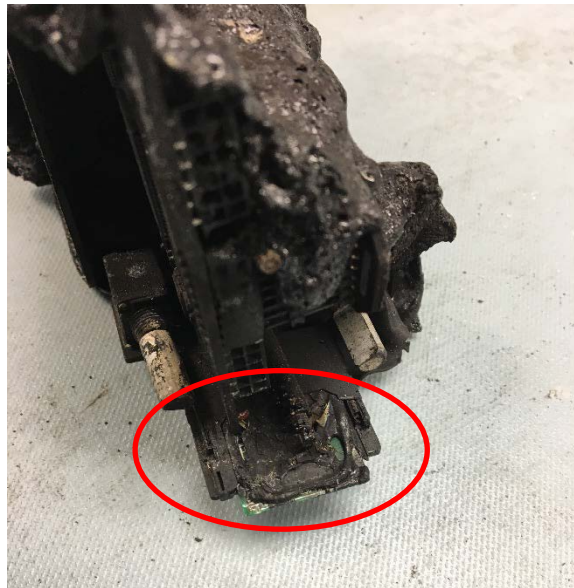


Figure 2. Location of SD Card in damaged G4.



Figure 3. Exterior Damage of SD Card.

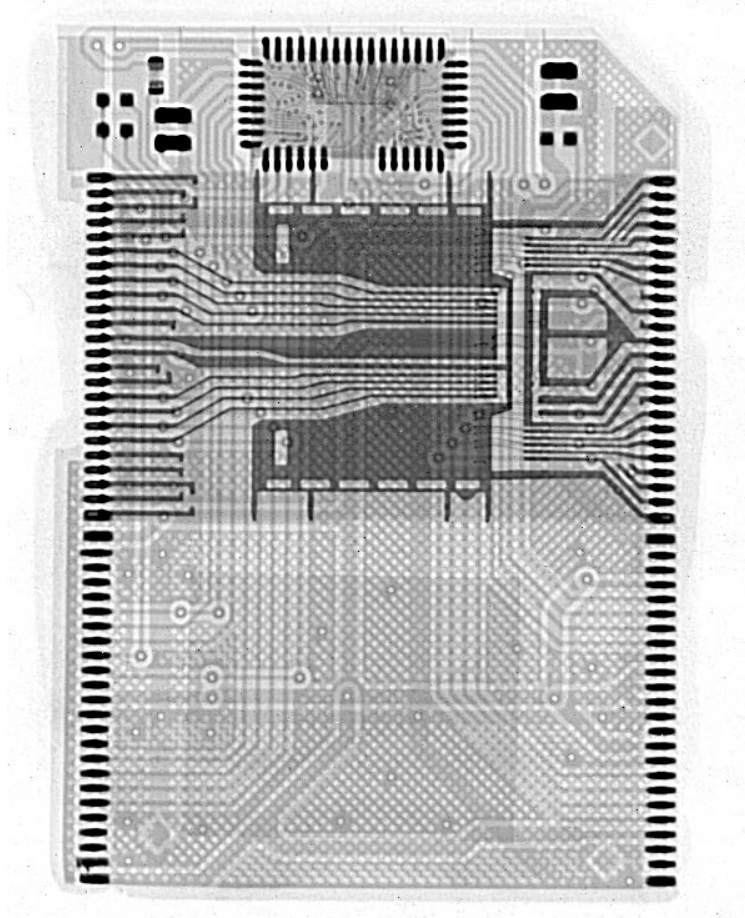


Figure 4. X-ray image of SD card.

2.1.2. Insight G4 Engine Monitor Data Description

The data extracted included 473 sessions from January 1, 2000, through April 18, 2019. The accident flight was the last session, recorded starting at 21:37:10 recorded time and ending at 21:58:01 recorded time on April 18, 2019 (1,252 total data points). The recording labeled as January 1, 2000, is believed to be the result of an error in the clock mechanism. The next recording chronologically is from March 30, 2015, and is believed to be the earliest recording with a valid date.

2.2. Avidyne IFD 540 Device Description

The Avidyne IFD 540 is a Flight Management System (FMS), GPS, and Navigator. It is capable of monitoring, displaying, and recording navigational information and records parameters including, but not limited to, heading, latitude, and longitude. Additionally, the IFD 540 can be connected to external measurement devices to record other parameters such as attitude, attitude rates, body accelerations, pressure altitude, and airspeed. If configured properly, the IFD 540 can also record engine parameters as provided to the unit by external engine monitors. The IFD 540 stores its historical logs on an internal compact flash (CF) card.

2.2.1. Avidyne IFD 540 Data Recovery

Upon arrival at the NTSB Vehicle Recorder Laboratory, the IFD 540 showed extensive signs of fire damage as shown in figure 5. Although the outside of the unit showed signs of fire damage, the inside of the unit had minimal charring as shown in figure 6. Figure 6 also demonstrates the location of the CF card inside the IFD 540.



Figure 5. Exterior damage to IFD 540.



Figure 6. Interior damage and location of CF card.

2.2.2. Avidyne IFD 540 Data Description

The data extracted included 103 sessions from November 27, 2017 Universal Coordinated Time (UTC), to April 8, 2019 UTC. Additionally, after those sessions the system date becomes unreliable and indicates recorded sessions from August 23, 1999, to September 3, 1999. This discrepancy in date can possibly be attributed to a failure to update the operating software to account for the change in the epoch type measurement of GPS date. The accident flight was the 102nd session, with the last session recorded being the historical record of the power cycle required to download the data from the CF card. The accident flight recording starts at 02:31:16 UTC and ends at 02:50:55 UTC and includes 5,955 data points. The data from the IFD 540 is downloaded already in engineering units. No further conversions were done for this report.

2.3 Avidyne IFD 550 Device Description

The Avidyne IFD 550 is a Flight Management System (FMS), GPS, and Navigator. It is capable of monitoring, displaying, and recording navigational information and records parameters including, but not limited to, heading, latitude, and longitude. The IFD 550 uses wide area augmentation system (WAAS) and satellite-based augmentation system (SBAS). The IFD 550 also includes a synthetic vision system and can internally measure and record attitude. Additionally, the IFD 550 can be connected to external measurement devices to record other parameters such as body accelerations, pressure altitude, and airspeed. If configured properly, the IFD 550 can also record engine parameters as

provided to the unit by external engine monitors. The IFD 550 stores its historical logs on an internal compact flash (CF) card.

2.3.1 Avidyne IFD 550 Data Recovery

Upon arrival at the NTSB Vehicle Recorder Laboratory, the IFD 550 showed significant signs of fire damage as shown in figure 7. Although the outside of the unit showed signs of fire damage, the inside of the unit only showed minimal charring. The CF card was located and is shown in figure 8.



Figure 7. Exterior damage to IFD550.



Figure 8. Interior damage to IFD550 and location of CF Card.

2.3.2 Avidyne IFD 550 Data Description

The data extracted included 56 sessions from January 4, 2018, to April 8, 2019. Additionally, after those sessions the system date becomes unreliable and indicates recorded sessions from August 23, 1999, to September 3, 1999. This discrepancy in date can possibly be attributed to a failure to update the operating software to account for the change in the epoch type measurement of GPS date. The accident flight was the 55th session, with the last session recorded being associated with the power cycle required to download the data from the CF card. The accident flight recording starts at 02:31:16 UTC and ends at 02:50:55 UTC and includes 5,956 data points. The data from the IFD 550 is downloaded already in engineering units. No further conversions were done for this report.

2.4 Time Correlation

The Avidyne IFD 540 and 550 record time in UTC. In order to align the data from the Insight G4 with that recorded by the IFD 540 and 550, the longitudinal acceleration that was recorded by the G4 and the longitudinal acceleration recorded by the IFD system were compared and aligned. This process is demonstrated in the figures below. When aligned at the end of the accident, it was noted that there was a dilation of one of the data sets. The data was found to be offset such that every 60 seconds of recorded data from the IFD was approximately 61.2 seconds of recorded data from the Insight G4. Due to this time dilation, both data sets are plotted independently, but the data from the Insight G4 has been aligned at the end of the recording to be as close to UTC as possible. In the figures below, the time base for each plot will be denoted by UTC_IFD or UTC_G4 depending on the source of the data.

2.5 Plots and Corresponding Tabular Data

The following figures contain data recorded during the accident flight. Relevant parameters recorded by the IFD 540 and IFD 550 were compared and found to be redundant. Therefore, the data shown from those flight displays in the following figures is from the IFD 550 as it contained additional parameters. The data used to create these plots are attached to this report in electronic (*.csv) form.

Figure 9 is a plot of the engine data from the accident flight. The fuel flow parameter from the left engine is believed to be invalid from approximately 02:33:00 (UTC_G4) onward as it does not correlate with the left engine exhaust gas temperatures or cylinder head temperatures.

Figure 10 is a plot of the engine data from the end of the accident flight.

Figure 11 is a plot of the data recorded by the IFD from the accident flight. The parameters are oriented such that movements of the aircraft to the left are up the page and movements to the right are down the page.

Figure 12 is a plot of the data recorded by the IFD from the end of the accident flight. The data indicates the aircraft entered a steep left roll and downward pitch.

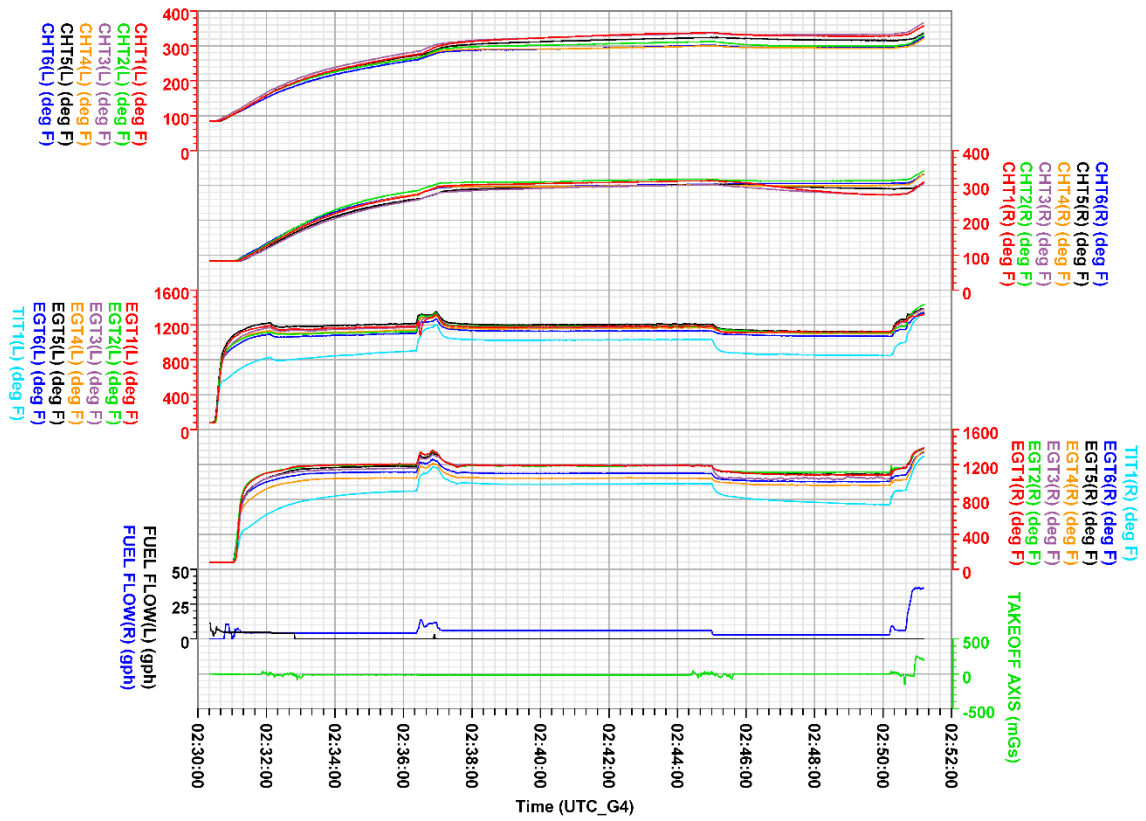


Figure 9. Engine Data for Full Accident Flight.

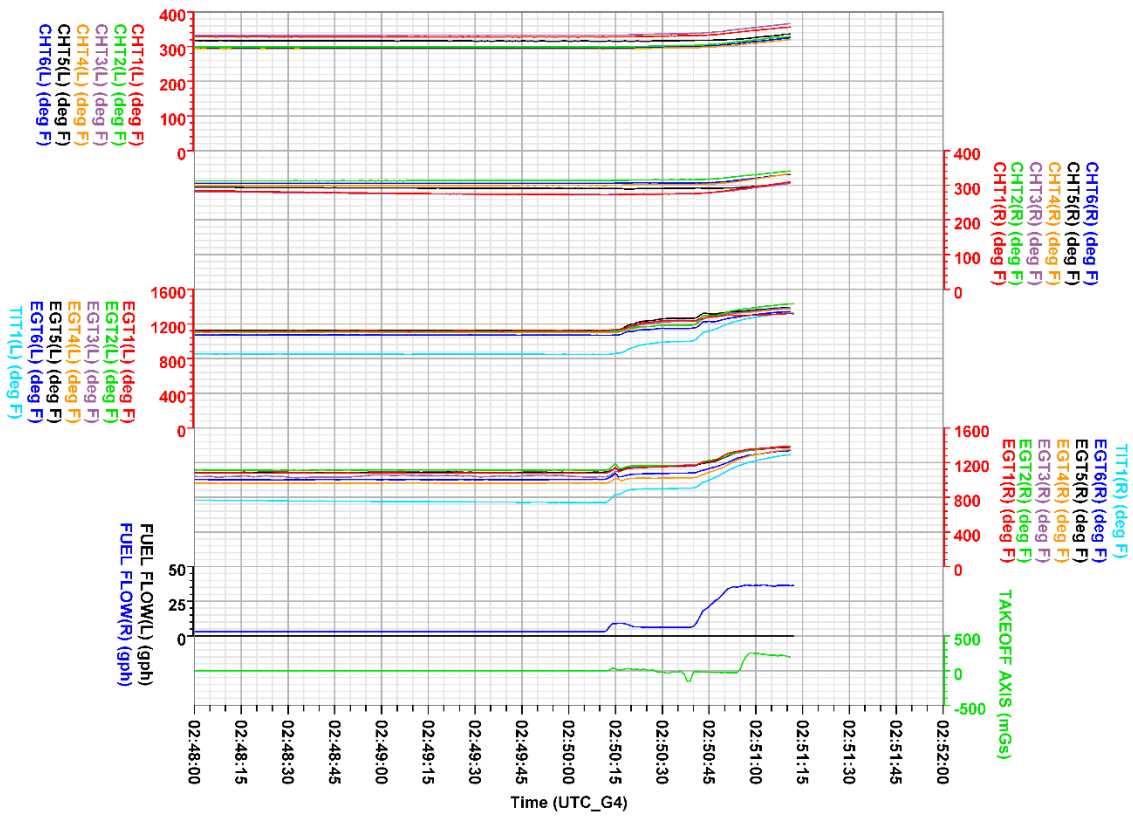


Figure 10. Engine Data for End of Accident Flight.

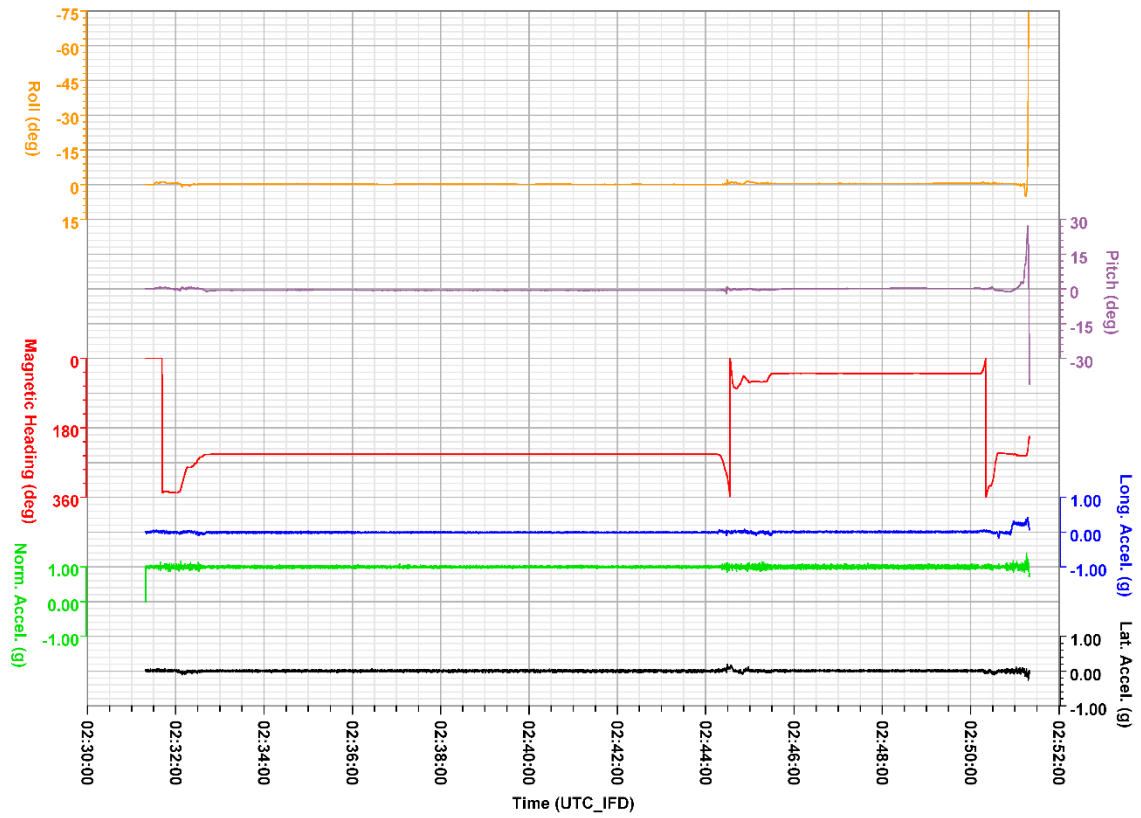


Figure 11. Data from IFD for Full Accident Flight.

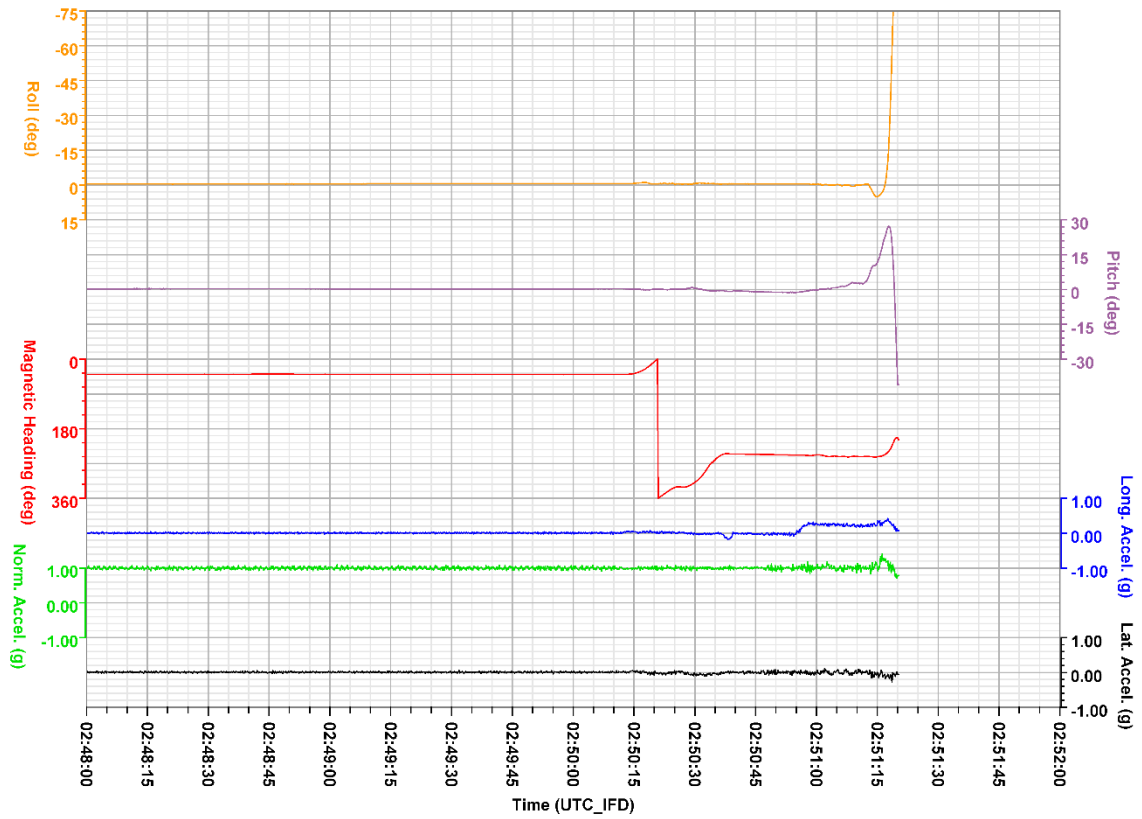


Figure 12. Data from IFD for End of Accident Flight.