

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



WPR23FA301

ELECTRONIC FLIGHT INSTRUMENT SYSTEM (EFIS)

Specialist's Factual Report

February 8, 2024

A. ACCIDENT

Location: Idaho City, Idaho
Date: August 4, 2023
Time: 1010 mountain daylight time (MDT)
1610 coordinated universal time (UTC)
Airplane: Glasair Glastar, private operator, N617G

B. ELECTRONIC FLIGHT INSTRUMENT SYSTEM SPECIALIST

Specialist: Steven Smith
Mechanical Engineer (Recorder Specialist)
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A group was not convened. The NTSB Vehicle Recorder Division received the following electronic flight instrument systems:

Recorder Manufacturer/Model: Advanced Flight Systems
Part Number: AF-6600
Recorder Serial Number: 74095

Recorder Manufacturer/Model: Advanced Flight Systems
Part Number: AF-6600
Recorder Serial Number: 74098

1.0 Advanced Flight Systems AF-6600 Description

The AF-6600 is a flight and navigation instrumentation system that provides information to a pilot via 10.4-inch touchscreen panel-mounted display. The displays can be configured as either a primary flight display (PFD), showing only information critical to flight, or a multifunction display (MFD) capable of showing a variety of system, navigation, and weather information screens. The units can record dynamic flight information on internal flash non-volatile memory (NVM) at a pilot selectable interval.¹ The unit records approximately 50 discrete data parameters to the internal NVM.

¹ Non-volatile memory is semiconductor memory that does not require external power for data retention.

1.1 Advanced Flight Systems AF-6600 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, the two EFIS's exhibited clear signs of impact damage. Figure 1 is AF-6600 with serial number 74095, and was able to power up normally, but the display screen was too damaged to navigate any of the menus. Figure 2 is AF-6600 with serial number 74098 which arrived with the display screen not attached to the unit. Therefore, both 16 GB M.2 SATA SSD cards (data storage) were removed and were downloaded normally using laboratory tools. Figure 3 shows the M.2 SATA card placement on the circuit board in the AF-6600.

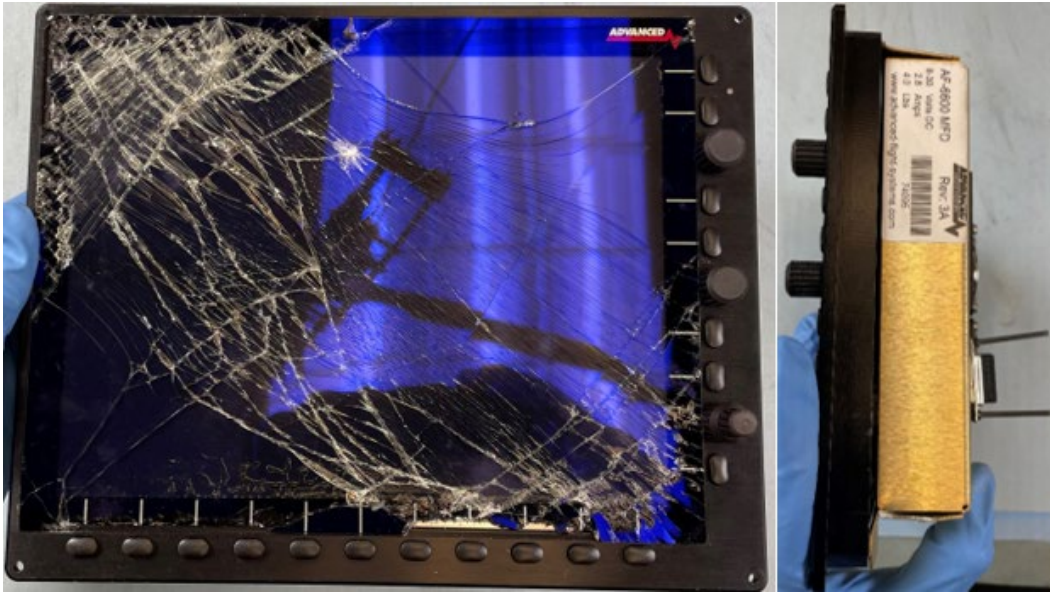


Figure 1. AF-6600 serial number 74095 as received by the Vehicle Recorder's Lab.



Figure 2. AF-6600 serial number 74098 as received by the Vehicle Recorder's Lab.

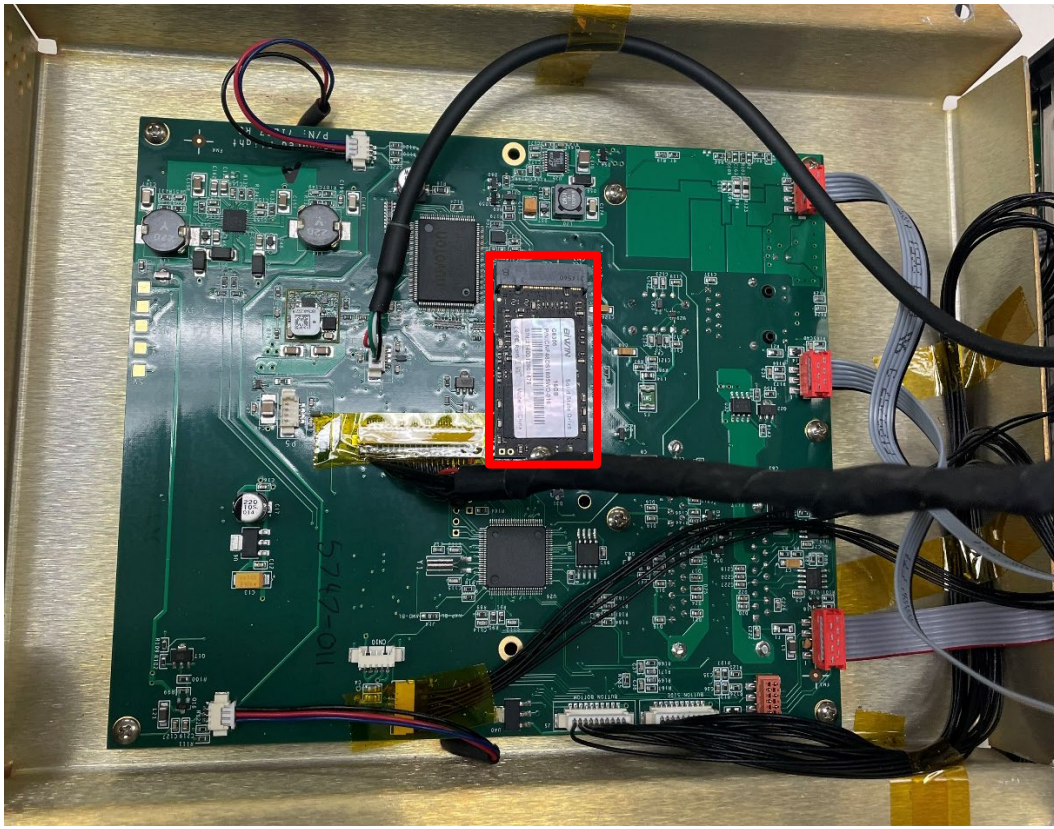


Figure 3. Internal circuit board of AF-6600 unit. The M.2 SATA card is boxed in red.

1.2 Advanced Flight Systems AF-6600 Recording Description

The data extracted included flight logs from July 28, 2023,² through August 4, 2023. The event occurred on August 4, 2023. The data extracted contained flight logs captured at 8 Hz. The 8 Hz logs were in comma separated value (CSV) format. The data extracted also contained 1 Hz flight logs that were in binary. These flight logs were provided to the manufacturer to parse into engineering units. The flight logs were from May 2, 2023, through August 4, 2023.

Both sets of data were examined around the time of the accident. There were no data pertinent to the event recorded on the device. The last recorded sample from the 8 Hz logs was 16:04:42.012 UTC. The last recorded sample from the 1 Hz logs was 16:04:41 UTC.

The taxi prior to the accident was the last recording on both devices. The 8 Hz recording duration on AF-6600 with serial number 74098 was approximately 3 minutes and 29 seconds and the duration on AF-6600 with serial number 74095 was approximately 4 seconds shorter. Therefore, the data presented in this report will be from AF-6600 with serial number 74098.

² All dates and times are referenced to coordinated universal time (UTC).

The previous recording contained the morning flight from Caldwell Executive Airport (KEUL) to Idaho City Airport (KU98). The duration of that recording was approximately 30 minutes.

1.3 Advanced Flight Systems AF-6600 Time Correlation

The AF-6600 data was recorded in UTC. The difference between MDT (local time) and UTC is 6 hours. The taxi data prior to the accident and the previous flight has been offset from the recorded AF-6600 time to MDT by subtracting 6 hours. Therefore, for the rest of this report, all times are listed as MDT.

1.3.1 Advanced Flight Systems AF-6600 Parameters Provided

The AF-6600 records parameters in engineering units; therefore, no conversions were necessary. Table 1 lists the Advanced Flight Systems AF-6600 parameters verified and provided in this report.

Table 1. AF-6600 parameters verified.

Parameter Name (units)	Parameter Description (units)
CHT_# ³ (degF)	Cylinder Head Temperature (degrees Fahrenheit)
EGT_# (degF)	Exhaust Gas Temperature (degrees Fahrenheit)
ENGINE (rpm)	Engine Revolutions per Minute (revolutions per minute)
FUEL_FLOW (gpm)	Fuel Flow (gallons per minute)
FUEL_PSI (psi)	Fuel Pressure (pounds per square inch)
GND_SPD (kts)	Ground Speed (knots)
GPS_ALT (ft)	GPS Altitude (feet)
HDG (deg)	Magnetic Heading (degrees)
IAS (kts)	Indicated Airspeed (knots)
LATITUDE (deg)	Present Latitude (degrees)
LONGITUDE (deg)	Present Longitude (degrees)
MANIFOLD (inHg)	Manifold Pressure (inches of Mercury)
OIL_PSI (psi)	Oil Pressure (pounds per square inch)
OIL_TEMP (degF)	Oil Temperature (degrees Fahrenheit)
PRIMARY_VOLTS (VDC)	Primary Voltage (volts direct current)
UTC TIME (HH:MM:SS.000)	Coordinated Universal Time (Hours:Minutes:Seconds.000)

³ Depending on aircraft configuration, the number of cylinders that are instrumented varies. In the data plots, the “#” is replaced with the appropriate cylinder ID.

D. FIGURES AND TABULAR DATA

Figures 4 to 6 contain data recorded from the day of the event on August 4, 2023. All the parameters listed in table 1 are plotted except UTC Time, Latitude, and Longitude.

Figure 4 is a time history plot of engine parameters during the taxi prior to the event. The first and last data samples are 10:01:12.724 MDT and 10:04:42.012 MDT, respectively.

Figure 5 is a graphical overlay generated using Google Earth presenting the entire taxi at KU98 prior to the accident. Weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 6 is a time history plot of engine parameters from the morning flight (previous flight before the accident) from KEUL to KU98. The first and last data samples are 07:43:57.919 MDT and 08:13:45.028 MDT, respectively.

The data show the following:

- **10:01:12.724 MDT:** The unit began recording. The barometric setting was 30.07 inHg and did not change for the entire recording.
- **10:02:51.351 MDT:** Groundspeed was 1 knot and began to slowly increase.
- **10:04:30.946 MDT:** Groundspeed was 0 kts for approximately 5 seconds.
- **10:04:36.412 MDT:** Groundspeed began to increase more rapidly.
- **10:04:42.012 MDT:** Groundspeed was 12 kts and the magnetic heading was 213 deg. End of recorded data.

The corresponding tabular data used to create figures 4 and 5 are provided in electronic CSV format as attachment 1 to this report. The corresponding tabular data used to create figure 6 are provided in electronic CSV format as attachment 2 to this report.

Submitted by:

Steven Smith
Mechanical Engineer (Recorder Specialist)

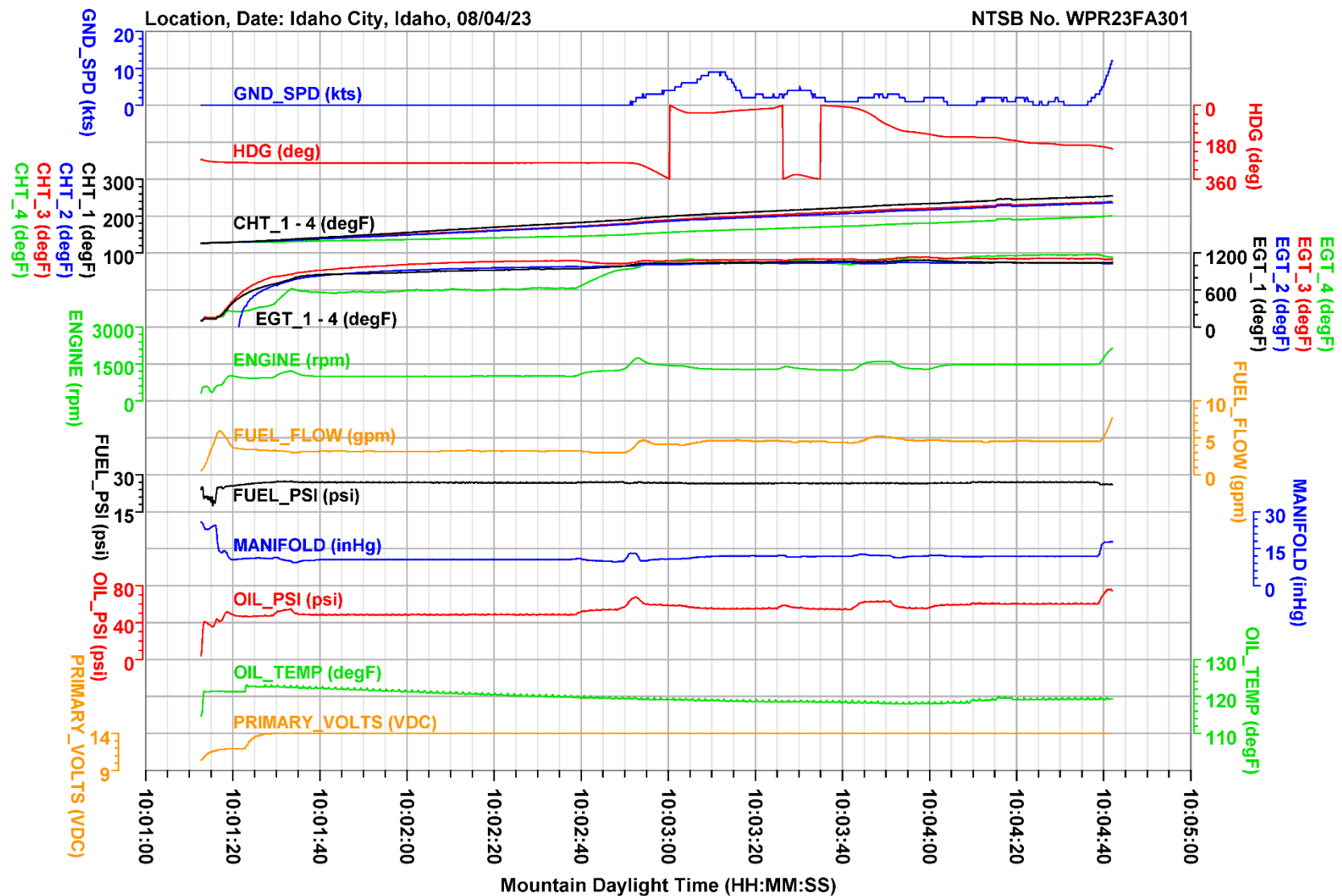


Figure 4. Time history plot of engine parameters during taxi prior to the accident.



Figure 5. Google Earth overlay of the event data. Note: the green point is the first data point, and the red point is the last data point.

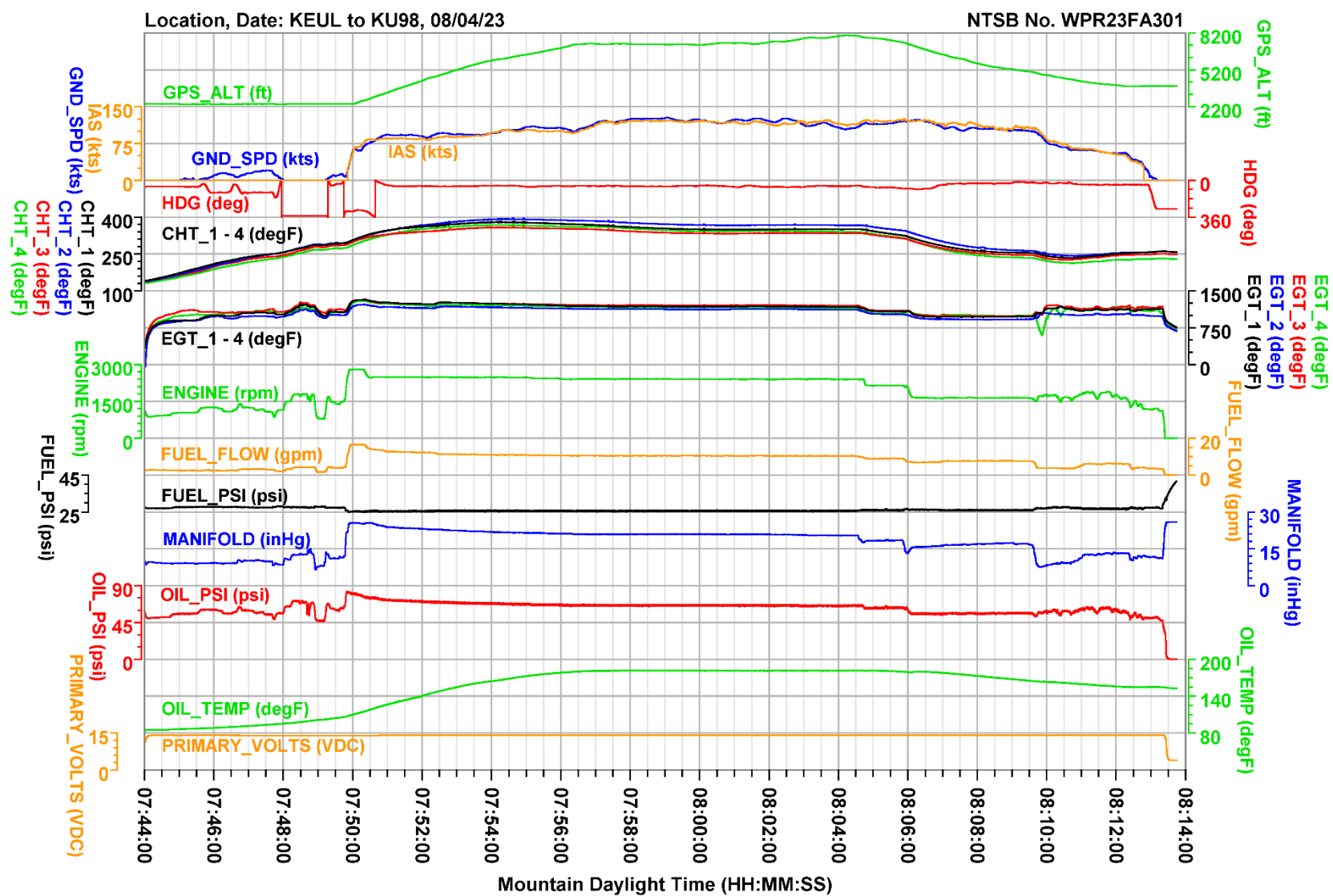


Figure 6. Time history plot of engine parameters from the morning flight from KEUL to KU98.