

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN23LA419

ELECTRONIC DEVICES

Specialist's Factual Report

April 23, 2024

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. ELECTRONIC DEVICES SPECIALIST	3
C. DETAILS OF THE INVESTIGATION	3
1.0 INSIGHT G4 DESCRIPTION	3
1.1 Insight G4 Data Recovery	4
1.2 Insight G4 Data Description	4
2.0 GARMIN GDU 1060 DESCRIPTION.....	4
2.1 Garmin GDU 1060 Data Recovery.....	5
2.2 Garmin GDU 1060 Data Description.....	5
3.0 GARMIN G5 DESCRIPTION.....	6
3.1 Garmin G5 Data Recovery	6
D. FIGURES AND TABULAR DATA.....	7

A. ACCIDENT

Location: El Dorado, Arkansas
Date: September 23, 2023
Time: 1623 central daylight time (CDT)
2123 coordinated universal time (UTC)
Airplane: Beech A36, N67CD

B. ELECTRONIC DEVICES SPECIALIST

Specialist: Gerald Kawamoto
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 devices:

Recorder Manufacturer/Model: Insight G4 SD card
Recorder Serial Number: N/A

Recorder Manufacturer/Model: Garmin GDU 1060 SD card
Recorder Serial Number: N/A

Recorder Manufacturer/Model: Garmin G5
Recorder Serial Number: 4JQ034916

1.0 Insight G4 Description

The Insight G4 is an engine monitor capable of displaying engine parameters on a color display. Parameters may include, but are not limited to, manifold pressure, exhaust gas temperature (EGT), cylinder head temperature (CHT), turbine inlet temperature, fuel flow, RPM, oil temperature, and oil pressure. Engine data is recorded on a front mounted SD card (non-volatile memory) in comma separated value (CSV) format.¹

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

1.1 Insight G4 Data Recovery

Data were extracted normally from the Insight G4 SD card shown in Figure 1.



Figure 1. Insight G4 SD card as received.

1.2 Insight G4 Data Description

Data included files recorded from July 7, 2023, through September 23, 2023. An offset of 14,091 seconds was applied to the data such that it displays in UTC. The offset was determined by correlating the application of takeoff power from G4 engine parameters to GPS data from the Garmin GDU data. Data were sampled at 1 Hz. Table 1 describes Insight G4 parameters provided and verified in this report.

Table 1. Verified and provided Insight G4 parameters.

Parameter Name	Parameter Description
EGT # (degF)	Exhaust Gas Temperature # ² (degrees Fahrenheit)
CHT # (degF)	Cylinder Head Temperature # (degrees Fahrenheit)
TIT (degF)	Turbine Inlet Temperature (degrees Fahrenheit)
FUEL FLOW (gph)	Fuel Flow (gallons per hour)
FUEL USED (gal)	Fuel Used (gallons)
MP (inHg)	Manifold Pressure (inches of Mercury)
POWER ROP (%)	Rich of Peak EGT (percent)
POWER LOP (%)	Lean of Peak EGT (percent)
OIL PRESS (psi)	Oil Pressure (pounds per square inch)
OIL TEMP (degF)	Oil Temperature (degrees Fahrenheit)
TAKEOFF AXIS (Gs)	Longitudinal Acceleration (Gs)
TACH (rpm)	Tachometer (revolutions per minute)
LATERAL AXIS (Gs)	Lateral Acceleration (Gs)
VERTICAL AXIS (Gs)	Vertical Acceleration (Gs)

2.0 Garmin GDU 1060 Description

The Garmin GDU 1060 is marketed under the TXi product line. The GDU-1060 is a versatile Electronic Flight Instrument System (EFIS) that can serve as a primary flight display (PFD), Multi-Function Display (MFD), Engine Information System (EIS), or a combination of all, depending on configuration. The unit comes in a variety of

² Depending on aircraft configuration, number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.

display sizes and orientations and utilizes a color, touch-screen interface. The unit contains an Attitude Heading Reference System (AHRS) device and is capable of providing attitude information and air data information. The unit interfaces with a number of other compatible products and can display navigation, terrain, engine, weather, traffic and other parametric data streams. The unit is synthetic vision capable. The unit records internally to a non-volatile memory chip on an internal board, as well as externally, on an SD card when installed.

2.1 Garmin GDU 1060 Data Recovery

Data were extracted normally from the Garmin GDU 1060 SD card shown in Figure 2.



Figure 2. Garmin GDU 1060 SD card as received.

2.2 Garmin GDU 1060 Data Description

Data included files recorded from January 8, 2020, through September 23, 2023 Coordinated Universal Time (UTC). The accident session started at 18:52:31 UTC and ended at 21:23:17 UTC on September 23, 2023. Table 2 describes Garmin GDU 1060 parameters provided and verified in this report.

Table 2. Verified and provided Garmin GDU 1060 parameters.

Parameter Name	Parameter Description
AltPress (ft)	Pressure Altitude (feet)
AltGPS (ft)	GPS Altitude (feet)
AltB (ft)	Baro Altitude (feet)
AltMSL (ft)	MSL Altitude (feet)
GndSpd (kts)	Groundspeed (knots)
IAS (kts)	Indicated Airspeed (knots)
TAS (kts)	True Airspeed (knots)
HDG (deg)	Magnetic Heading (degrees)
TRK (deg)	Ground Track (degrees)
Roll (deg)	Roll Angle (degrees)
Pitch (deg)	Pitch Angle (degrees)
VSpd (fpm)	Vertical Speed (feet per minute)
LatAc (G)	Lateral Acceleration (Gs)
NormAc (G)	Normal Acceleration (Gs)

3.0 Garmin G5 Description

The Garmin G5 is an electronic flight instrument with a 3.5-inch color display that can be installed as an attitude display indicator (ADI) and/or horizontal situation indicator (HSI). The G5 contains integrated attitude and air data sensors and can also be interfaced with external sensors. Data is recorded to a front mounted microSD card.

3.1 Garmin G5 Data Recovery

Figure 3 shows the Garmin G5 as received. The device did not have a microSD card installed, thus, no data were recovered.



Figure 3. Garmin G5 as received.

D. FIGURES AND TABULAR DATA

Figures 4 through 6 are Google Earth overlays of the accident flight recorded on Garmin GDU 1060. MSL Altitude and groundspeed are depicted for data points shown. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the accident flight. Figure 4 shows the entire flight. Figure 5 shows approximately the last 10 minutes of the flight. Figure 6 shows approximately the final 20 seconds of the flight.

Figure 7 is a plot of parameters of the entire accident flight recorded on the Garmin GDU 1060. The time displayed is 18:50:00 to 21:25:00 UTC.

Figure 8 is a plot of parameters for the final 10 minutes of the accident flight recorded on the Garmin GDU 1060. The time displayed is 21:14:00 to 21:24:00 UTC. Not all parameters recorded until the final data point at 21:23:17 UTC.

Values for EGT 1 and CHT 4 from previous recorded data were reviewed and trended similarly to the behavior shown in Figures 9 through 11.

Figure 9 is a plot of parameters of the entire accident flight recorded on the Insight G4. The time displayed is 18:50:00 to 21:25:00 UTC.

Figure 10 is a plot of parameters for the final 10 minutes of the accident flight recorded on the Insight G4. The time displayed is 21:14:00 to 21:24:00 UTC.

Figure 11 is a plot of parameters for approximately the final 2 minutes and 30 seconds of the accident flight recorded on the Insight G4. The time displayed is 21:21:05 to 21:23:35 UTC.

The corresponding tabular data used to create figures 4 through 8 are provided in CSV format as attachment 1 to this report. Data used to create figures 9 through 11 are provided in CSV format as attachment 2 to this report.

Submitted by:

Gerald Kawamoto
Recorder Specialist

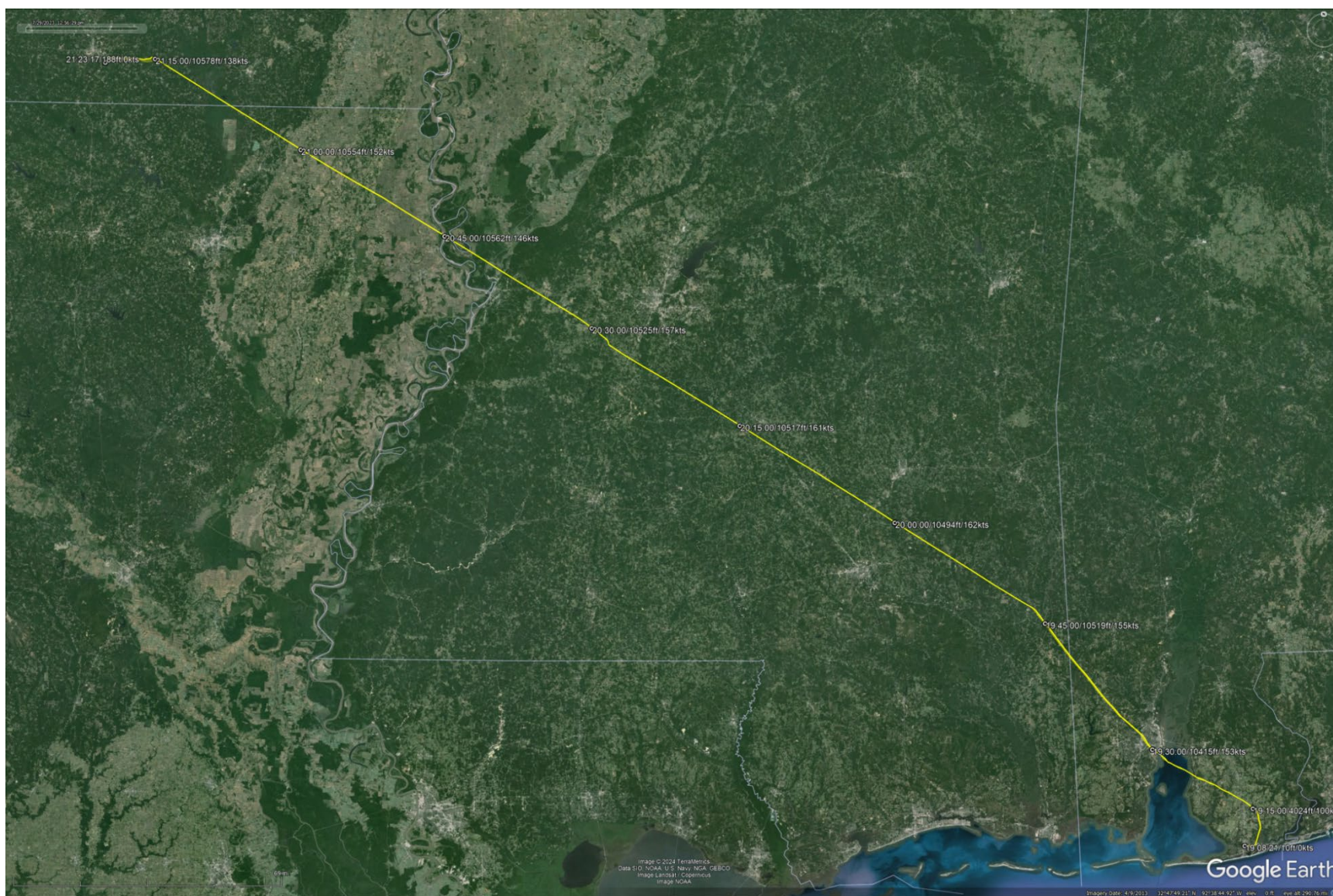


Figure 4. Google Earth overlay of the entire accident flight recorded on the Garmin GDU 1060. MSL Altitude and Groundspeed are depicted.



Figure 5. Google Earth overlay of approximately the final 10 minutes of the accident flight recorded on the Garmin GDU 1060. MSL Altitude and Groundspeed are depicted.



Figure 6. Google Earth overlay of approximately the final 20 seconds of the accident flight recorded on the Garmin GDU 1060. MSL Altitude and Groundspeed are depicted.

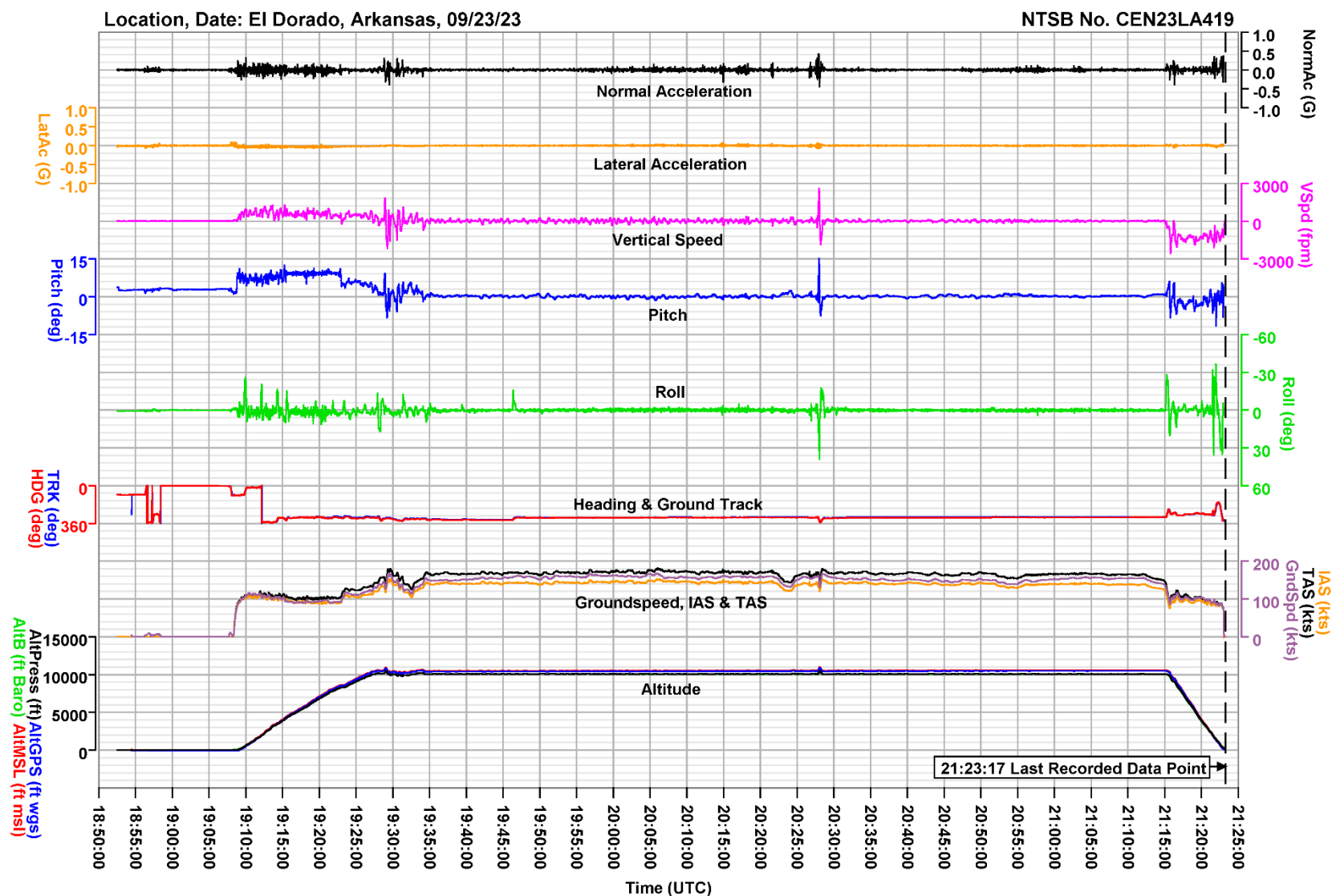


Figure 7. Plot of parameters recorded on the Garmin GDU 1060 for the entire accident flight.

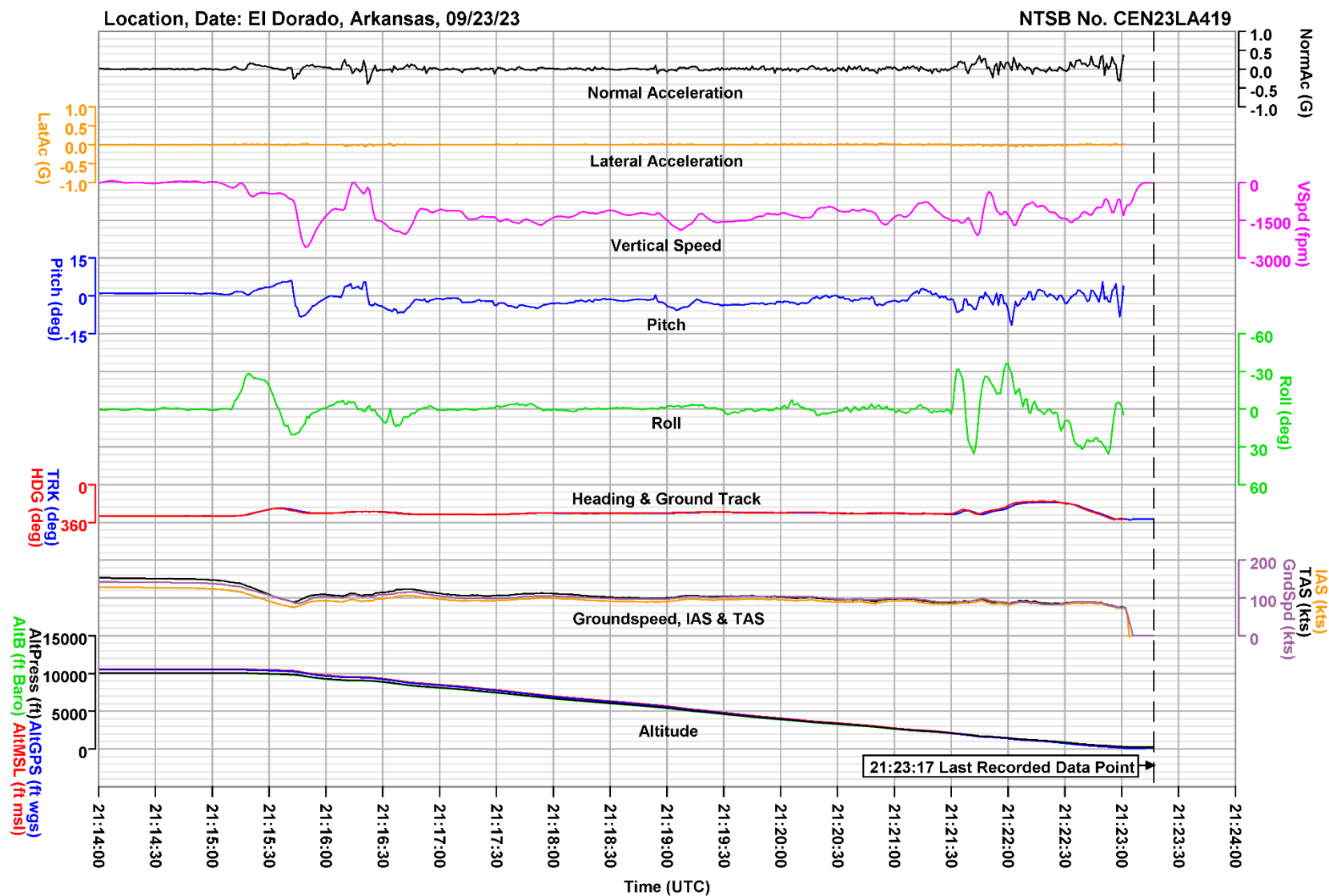


Figure 8. Plot of parameters recorded on the Garmin GDU 1060 for the final 10 minutes of the accident flight.

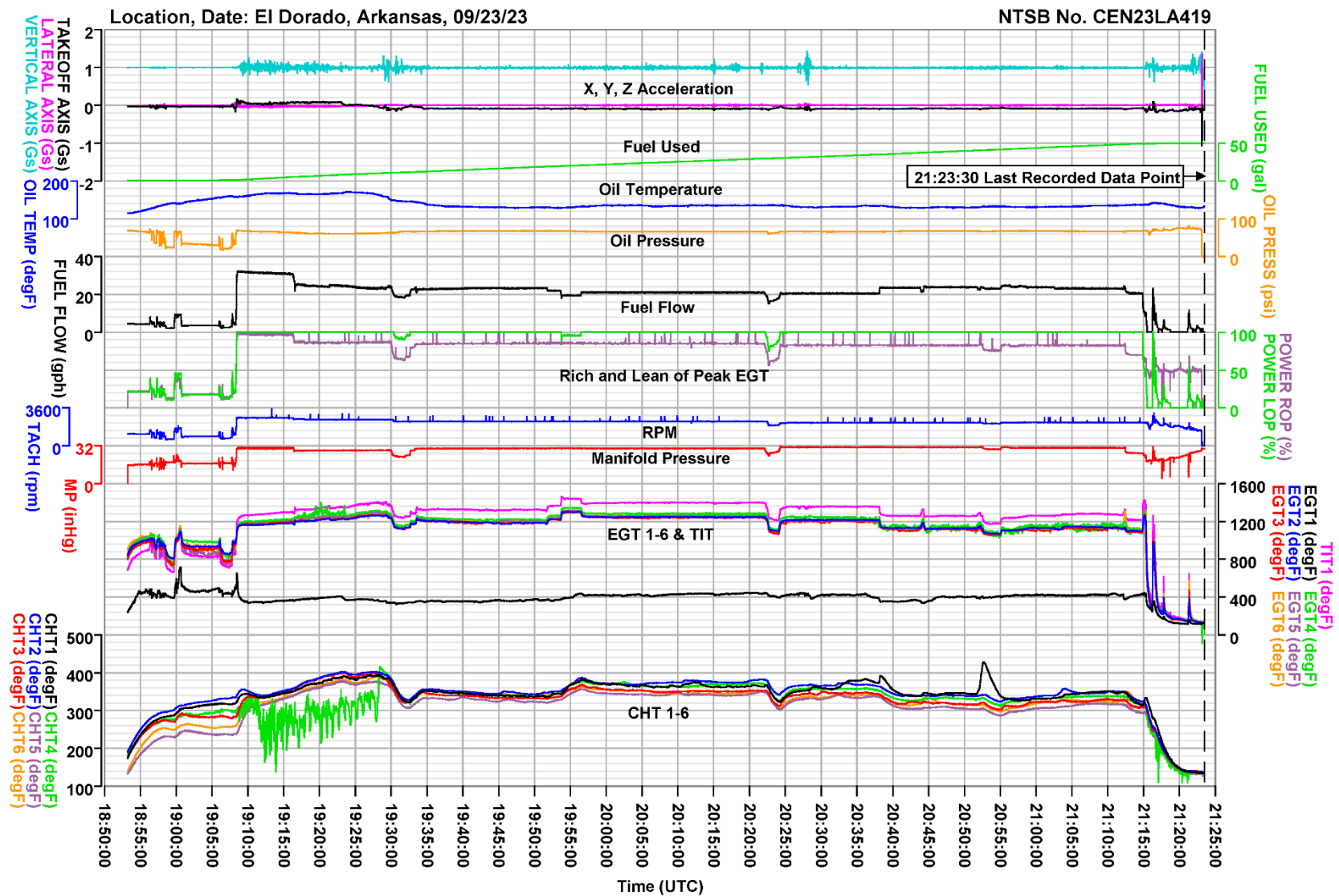


Figure 9. Plot of parameters recorded on the Insight G4 for the entire accident flight.

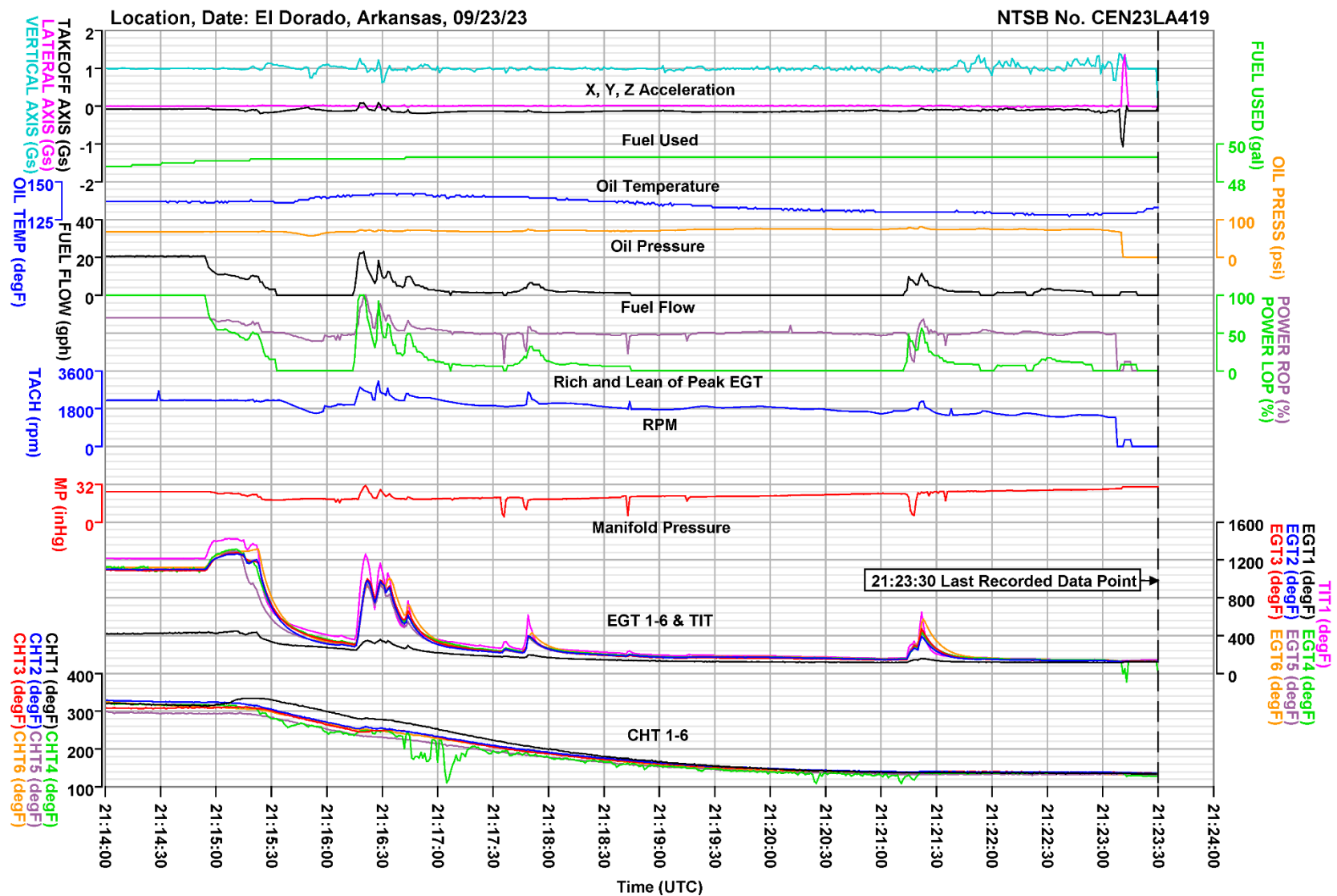


Figure 10. Plot of parameters recorded on the Insight G4 for the final 10 minutes of the accident flight.

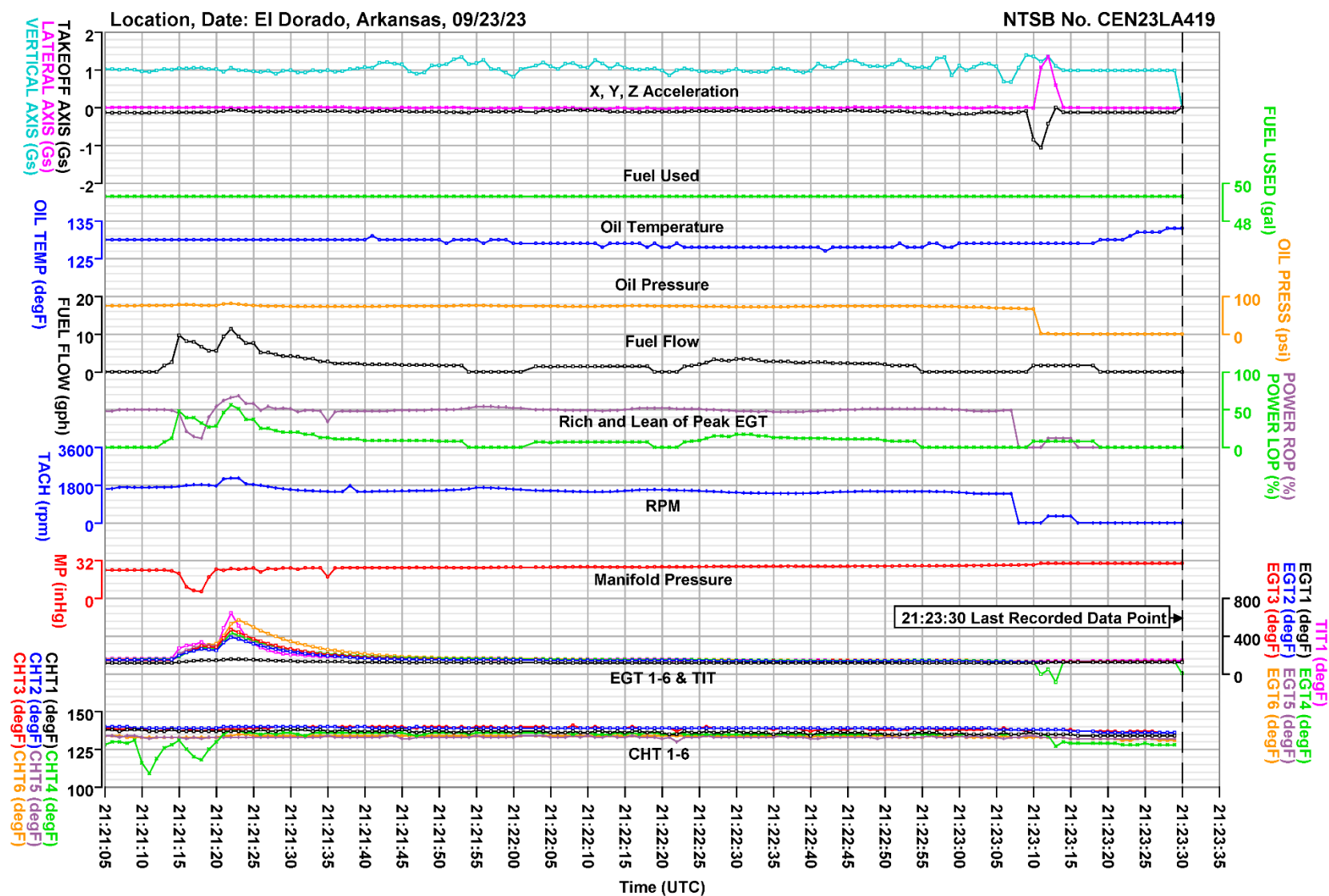


Figure 11. Plot of parameters recorded on the Insight G4 for approximately the final 2 minutes and 30 seconds of the accident flight.