

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23LA011

COCKPIT DISPLAY

Specialist's Factual Report

December 13, 2022

A. ACCIDENT

Location: Fort Myers, FL
Date: October 8, 2022
Time: 18:00 eastern daylight time (EDT)
Helicopter: Bell Textron Canada LTD 505, N5DF

B. COCKPIT DISPLAY SPECIALIST

Specialist Sean Payne
Sr. Engineer
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A cockpit display group was not convened. The NTSB Vehicle Recorder Division received the following cockpit display:

Recorder Manufacturer/Model: Garmin GDU-1050H
Part Number: 011-03470-90
Recorder Serial Number: 494905082

1.0 Device Description

The Garmin GDU-1050H is a 10.4-inch high-definition cockpit display. The device can be configured to perform as a Primary Flight Display (PFD) or a Multi-Function Display (MFD). In a helicopter installation, typically the right side unit is configured as the PFD and the left side unit is configured as a MFD. The devices can communicate with each other through other Garmin avionics over a high speed data bus connection. The device has the ability to record CAS¹ and CMC² messages that occur while the aircraft is on the ground or in flight. These data can include engine trend exceedance and flight phase transition data. The device can also store 1 Hz flight and engine data in comma separated format (.CSV) to an externally removable SD card. In this configuration (Bell), the device has the ability to record up to a 5Hz data log internally.

1.1 Data Recovery

The GPS was in good condition and the data were downloaded normally using the manufacturer's procedure. The device is shown in figure 1. The device was

¹ CAS - Crew Alerting System

² CMC - Central Maintenance Computer

powered on a bench top with a DC power supply. The device was booted into maintenance mode with a maintenance SD card inserted which was supplied by Bell. The maintenance log menu was entered, the following data were downloaded:

- Exceedance Log
- Fault Logs
- Power Assurance Check Log
- 5 Hz Log
- CAS History
- Garmin Alerts

The majority of this report discusses the 5Hz data log, which recorded engine, AHRS and air data related to the accident. If necessary, other log data will be discussed as noted.



Figure 1. Photo of Garmin GDU-1050H.

1.2 Recording Description

The data extracted included a number of logged sessions. The accident flight recording was logged on October 8, 2022. In addition, previous flight data was reviewed. The review of previous flight data showed that nominal flight operations and was not pertinent to the investigation.

Note, that this particular unit had an additional log that recorded 5hz data near the time of the accident. This data was exported and appended to the unit's normal

dataset, however, the 5 Hz log contained an inaccurate timestamp. The timing of this data was corrected by accounting for the number of milliseconds the unit recorded, and creating a custom timestamp.

1.3 Parameters Provided

Table 1 describes data parameters provided by the device. Only reviewed and validated parameters are included in this report. Other valid parameters may be available in the dataset that were not included in this report as they were determined to be non-pertinent to the event. These data appear in along with plotted data in the Attachment 1 to this report.

Table 1. Cockpit Display Data Parameters.

Parameter Name	Parameter Description
Airspeed (kts)	Airspeed (knots)
Altitude (ft)	Altitude (feet MSL)
Ground Speed (kts)	Ground Speed (knots)
Coll Pitch CHA Value (%)	Collective Pitch (percent)
NR Value (%)	Rotor RPM percent (percent)
Q CH A Value (Nm)	Torque (newton meters)
Eng Oil Press CH A Value (PSI)	Engine Oil Pressure (pounds per square inch)
Eng Oil Temp CH A Value (C)	Engine Oil Temperature (pounds per square inch)
Fuel Flow (PPH)	Fuel Flow (pounds per hour)
Fuel Press CH A Value (PSI)	Fuel Pressure (pounders per square inch)
MGT CH A Value (C)	Main Gear Box Temperature (degrees Celsius)
NG CH A Value (%)	Gas Generator Speed (percent)
XMSN Oil Press Value (PSI)	Transmission Oil Pressure (pounds per square inch)
XMSN Oil Temp Value (C)	Transmission Oil Temperature (degrees Celsius)
Eng Chip Det 1	Chip Detector 1 (N/A)
Eng Chip Det 2	Chip Detector 2 (N/A)
Fuel Qty (lbs)	Fuel Quantity (pounds)
GPS Lat (deg)	Latitude (degrees)
GPS Lon (deg)	Longitude (degrees)
Lateral Accel (g)	Lateral Acceleration (g)
Longitudinal Accel (g)	Longitudinal Acceleration (g)
Magnetic Heading_Corr ()	Magnetic Heading Corrected (degrees)
Normal Accel (g)	Normal Acceleration (g)
OAT (C)	Outside Air Temperature (degrees Celsius)
Pitch Angle (deg)	Pitch (degrees)
Roll Angle (deg)	Rolls (degrees)

D. OVERLAYS AND TABULAR DATA

Data obtained from the device was used to produce the following overlays and tabular data. All times are given in EDT.

Figure 2 is a graphical overlay generated using Google Earth for the accident flight. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 3 is a graphical overlay using Google Earth for the final portion of the accident flight. The GPS tracklog is shown in the vicinity of the immediate accident site. The helicopter circled the municipal building and then took a 282 degree heading toward the accident site. The last portion of the tracklog shows a rapid descent and a transit of the equipment toward a nearby pond.

Figure 4 is a close in Google Earth overlay of the immediate accident site.

Figure 5 is a close in Google Earth overlay of the immediate accident site from an alternate viewpoint.

Figure 6 is a plot of basic engine, air and flight control data for the entire flight. The time range displayed is from 17:42:00 to 18:03:00 EDT.

Figure 7 is a plot of basic engine, air and flight control data for a portion of the flight covering the helicopter's descent. The time range displayed is from 18:00:00 to 18:02:05 EDT.

Figure 8 is a plot of basic engine, air and flight control data for the final portion of the accident flight. The time range displayed is from 18:01:45 to 18:02:00 EDT.

Figure 9 is a plot of expanded engine parameters and basic air data for the entire flight. The time range displayed is from 17:42:00 to 18:03:00 EDT.

Figure 10 is a plot of expanded engine parameters and basic air data for the decent portion of the accident flight. The time range displayed is from 17:59:00 to 18:02:05 EDT.

Figure 11 is a plot of expanded engine parameters and basic air data for the final portion of the accident flight. The time range displayed is from 18:01:45 to 18:02:00 EDT.

The data plots show the helicopter had made a circling descending approach to the accident site starting around 18:00:00. The helicopter circled to the right while

descending, its indicated airspeed and corresponding groundspeed were decreasing at this time. By approximately 18:01:05, the helicopter was tracking approximately 282 degrees toward the accident site at an altitude of around 300 feet MSL. Around 18:01:52, the helicopter began a rapid yaw to the right. The data in this area is fluctuating, however, the data show the helicopter yawing and descending, indicated airspeed had decreased to around 0 knots at this time (just prior to the yaw onset).

During the accident sequence, review of the engine data show the helicopter's components operating normally. During the rapid descent, the data show the collective position was raised³ and corresponding parameters, such as torque and Nr (rotor RPM) changed correspondingly in an expected response.

The corresponding tabular data used to create figures 2 to 11 are provided in electronic comma separated value (CSV) format as attachment 1 to this report.

Submitted by:

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Sr. Engineer

³ The data set was coarse, but the overall response showed some positive collective movement.

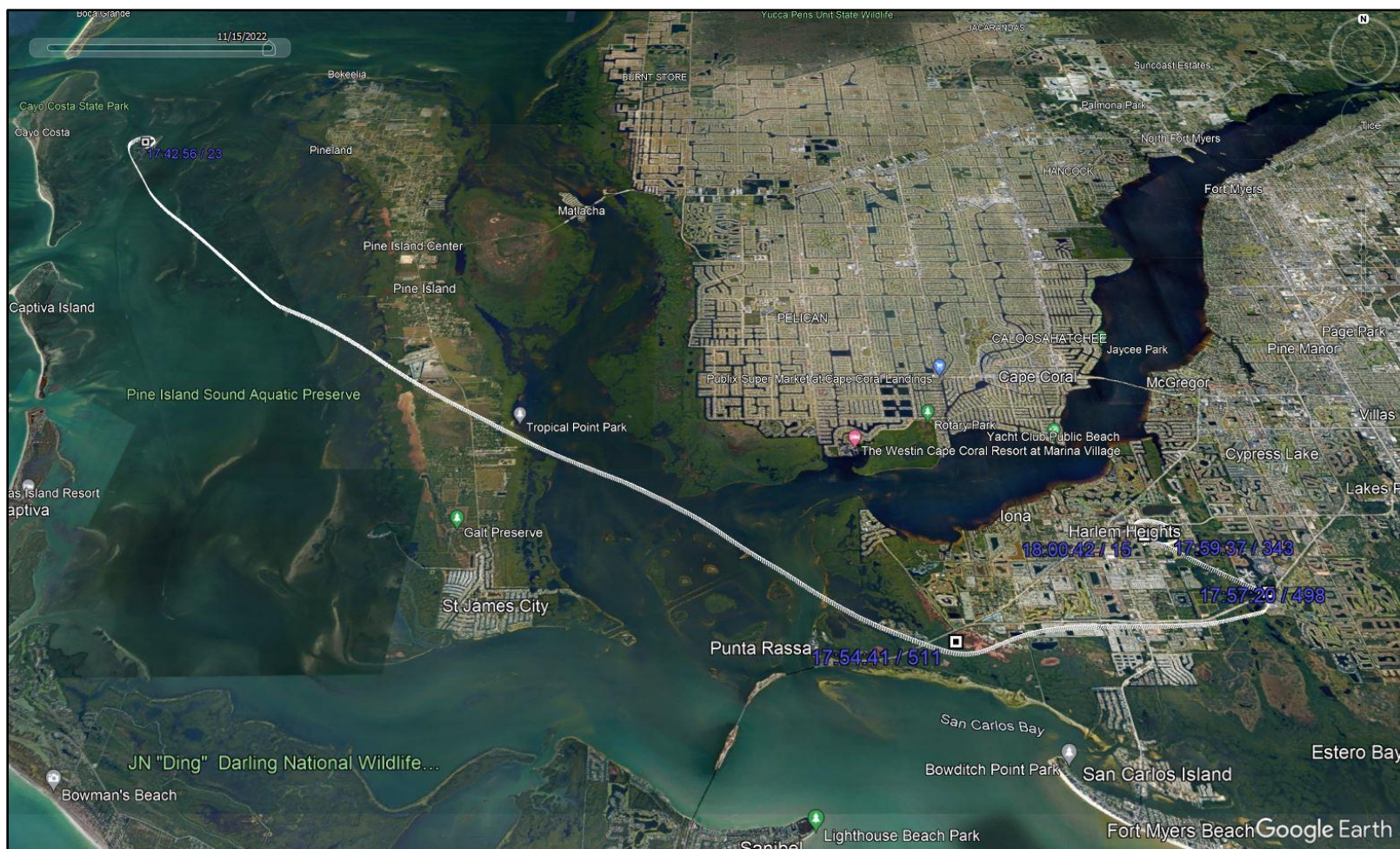


Figure 2. Google Earth overlay for the entire accident flight.

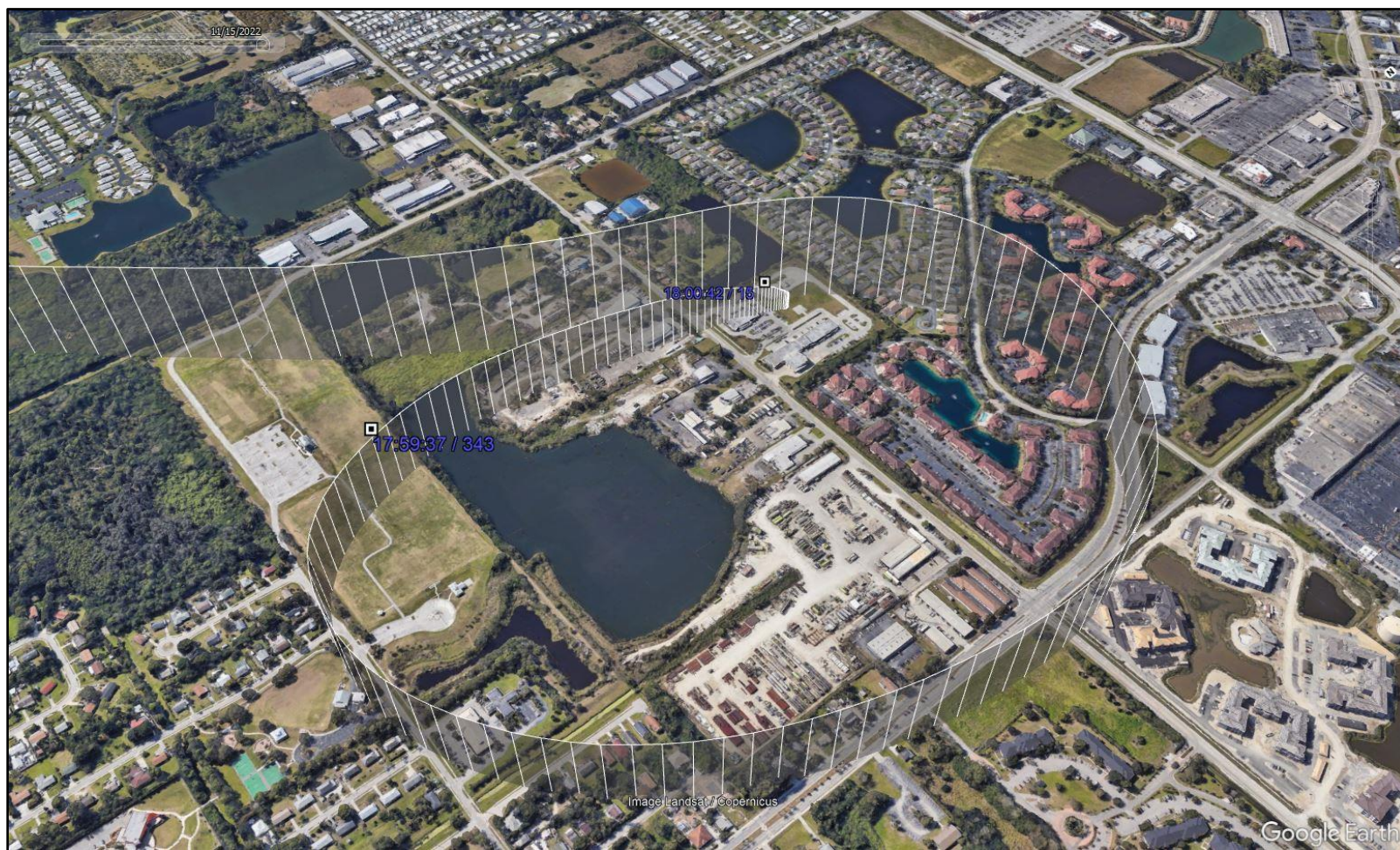


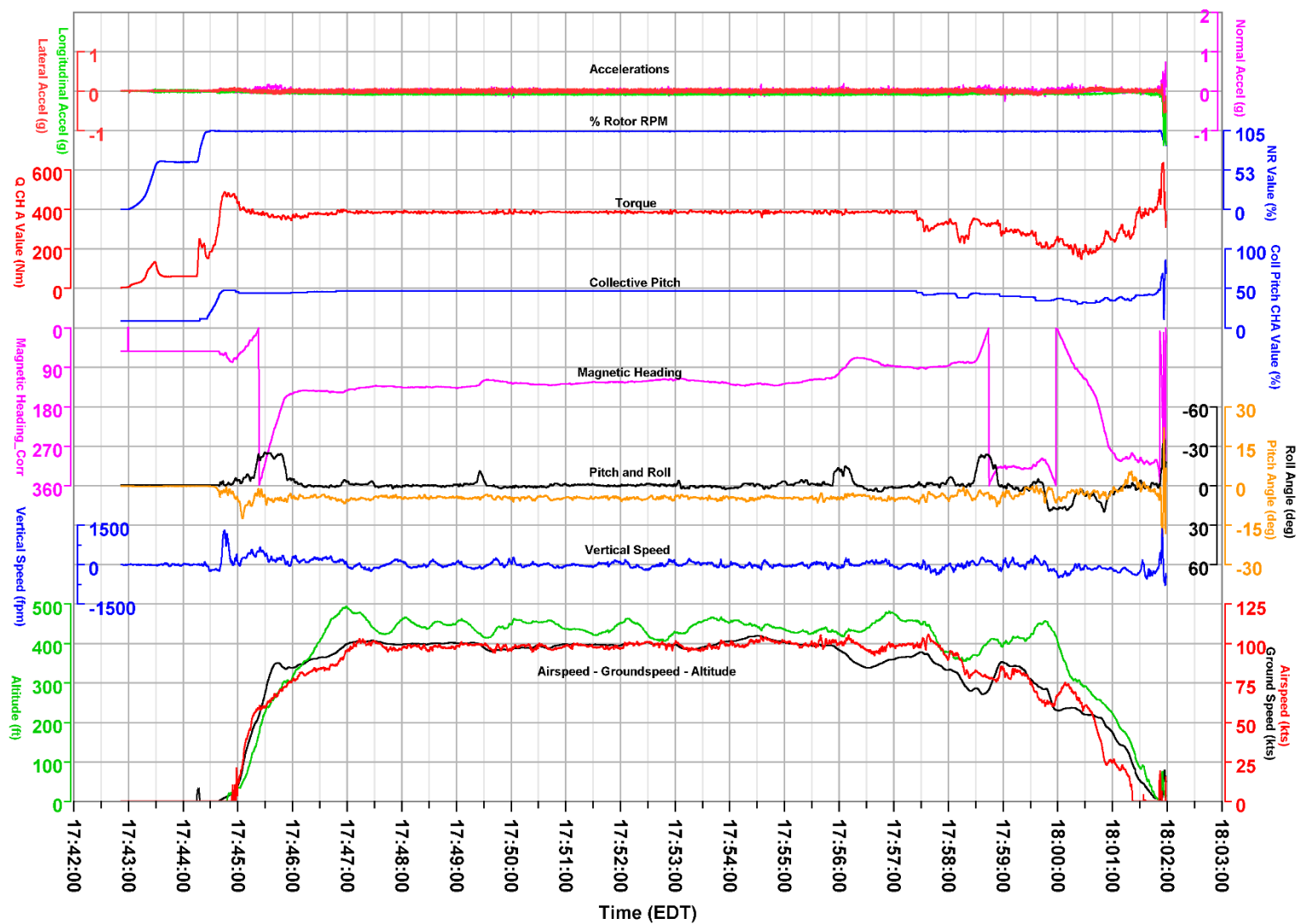
Figure 3. Google Earth overlay for the helicopter's approach and descent prior to the accident. Note that the orientation of the plot is not north up.



Figure 4. Google Earth overlay for the accident portion of the flight. Note that the orientation of the plot is not north up.



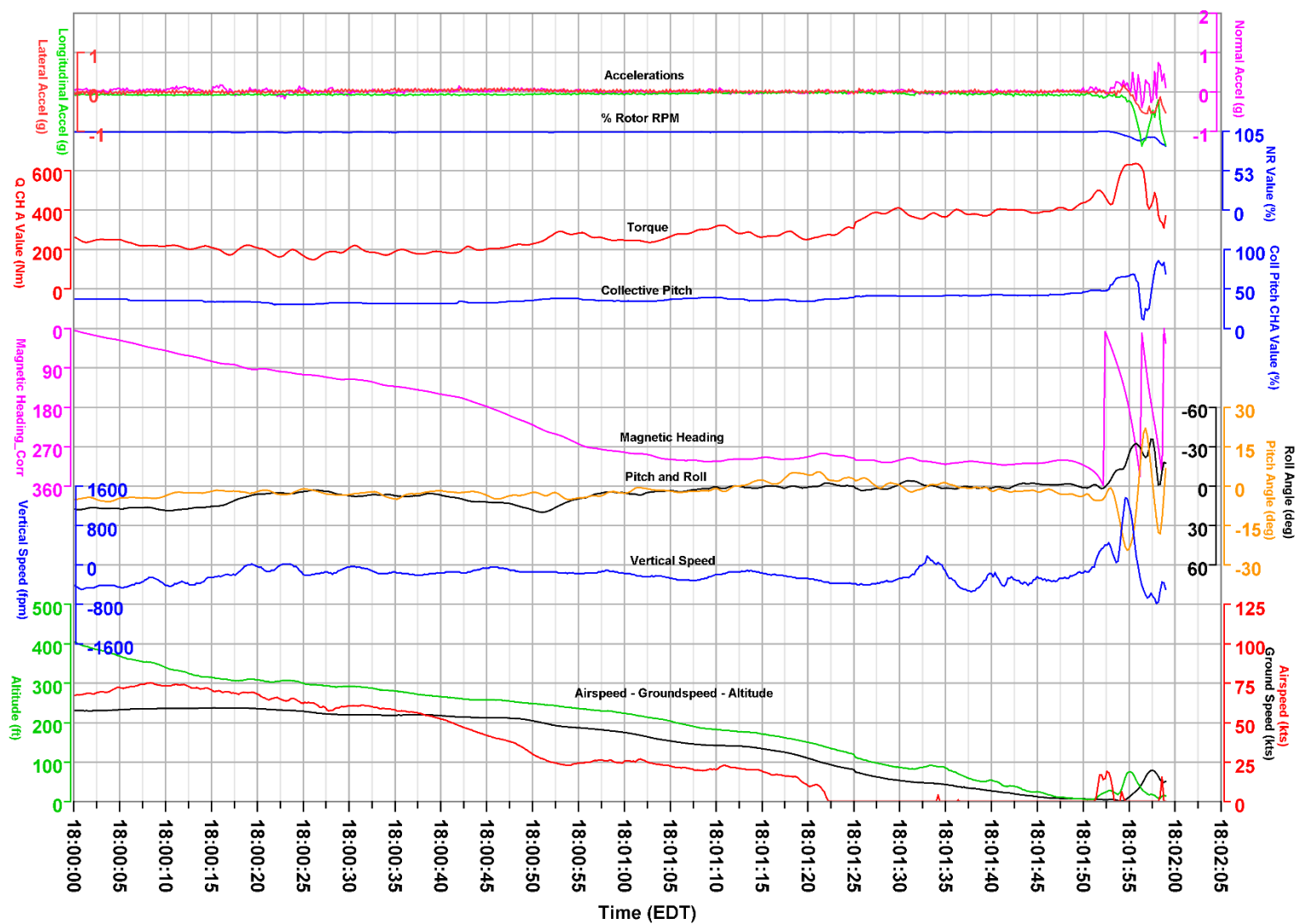
Figure 5. Google Earth overlay for the accident portion of the flight from an alternate view point. Note that the orientation of the plot is not north up.



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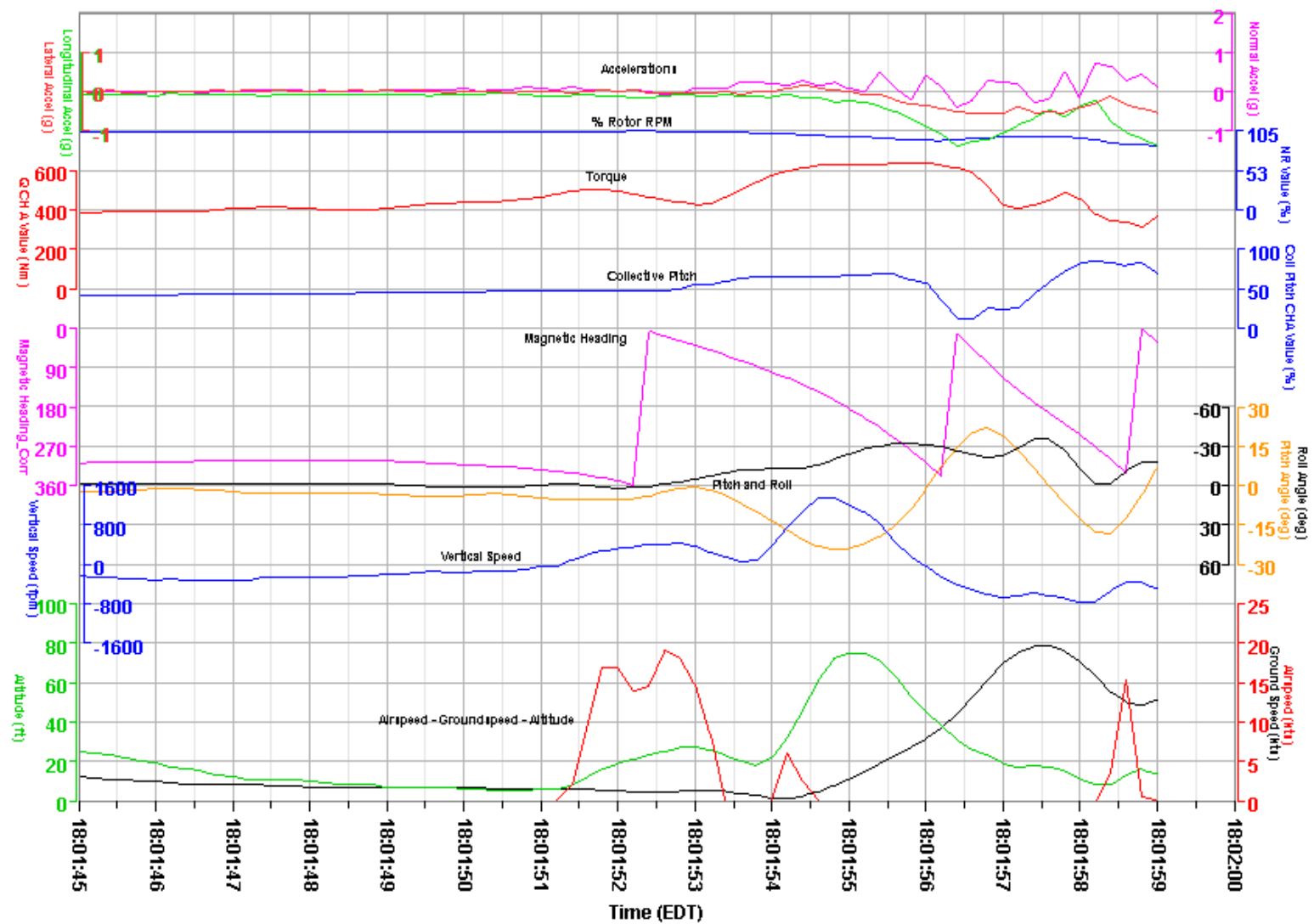
Figure 6. A plot of basic engine, air and flight control data for the entire flight.



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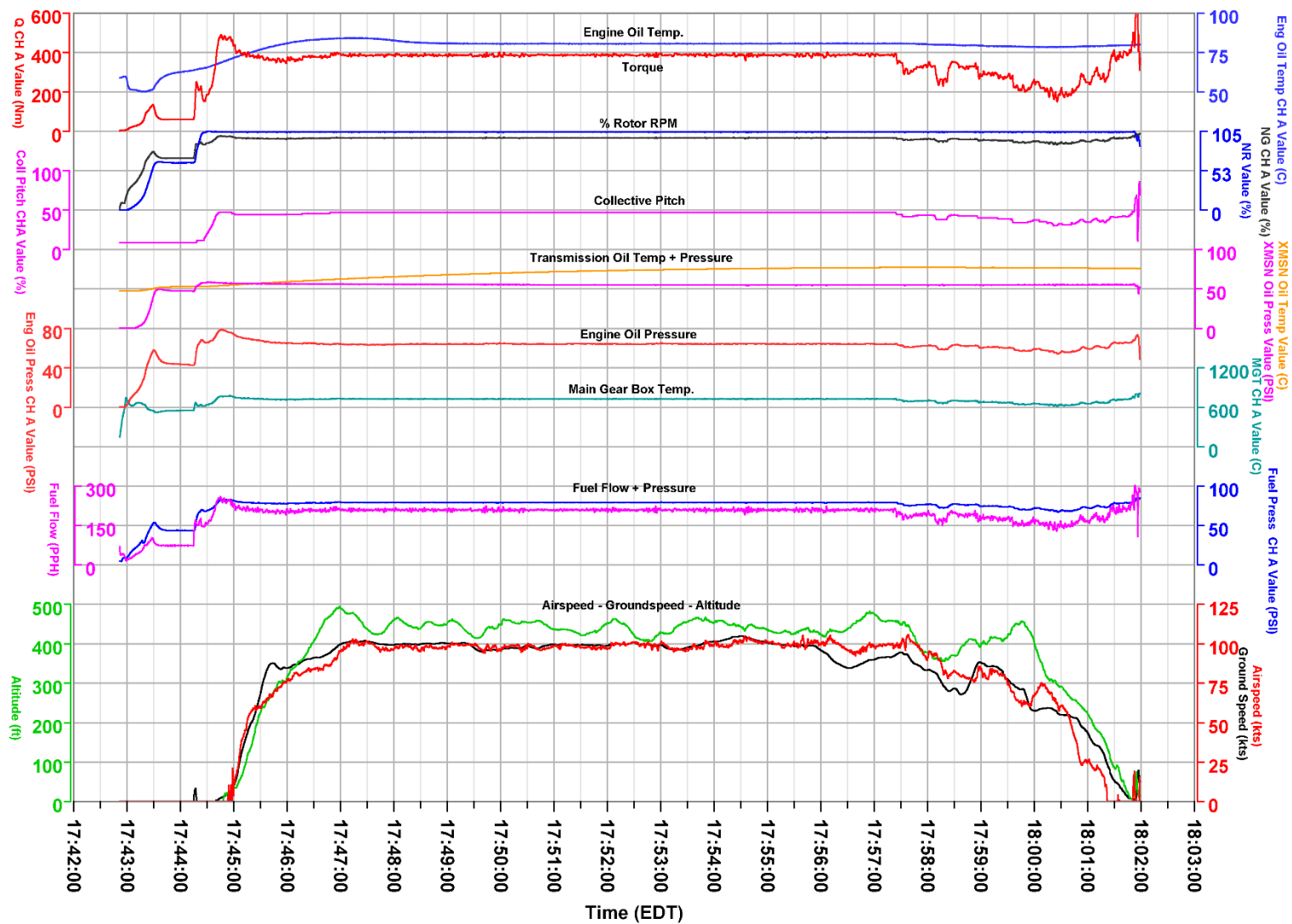
Figure 7. A plot of basic engine, air and flight control data for the descent portion of flight.



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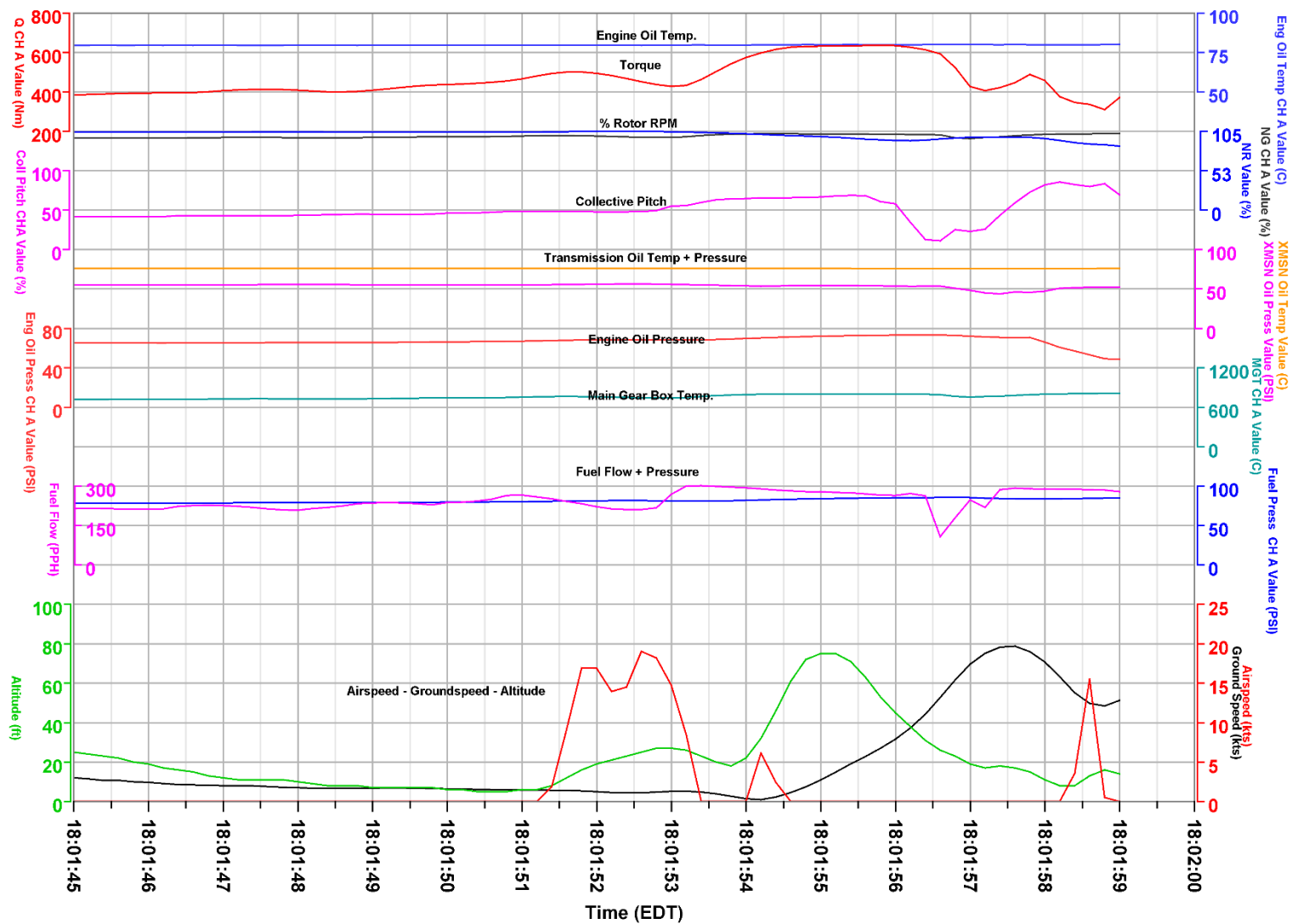
Figure 8. A plot of basic engine, air and flight control data for the final portion of flight.



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Figure 9. A plot of expanded engine parameters for the entire flight.



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Figure 11. A plot of expanded engine parameters for the final portion of the flight.