

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

June 28, 2021

Cockpit Displays – Recorded Flight Data

Specialist's Factual Report
By Michael Portman

1. EVENT SUMMARY

Location: Centerville, Maryland
Date: September 28, 2020
Aircraft: Tecnam P92
Registration: N562TU
Operator: Chesapeake Sport Pilot
NTSB Number: ERA20LA341

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was not convened.

3. DETAILS OF INVESTIGATION

The accident aircraft was equipped with dual Garmin G3X displays, each of which contained removable memory cards. The following removable memory cards were sent to the National Transportation Safety Board (NTSB) Vehicle Recorder Division for analysis:

Recorder Manufacturer/Model: **SD Memory Card**
Recorder Serial Number: **Unk**

Recorder Manufacturer/Model: **SD Memory Card**
Recorder Serial Number: **Unk**

3.1. Garmin G3X Display Description

The Garmin G3X is a series of displays certified to be installed on FAR 23 Class I certified aircraft. The model comes in 10.6" and 7" inch display versions. The unit employs a touch-screen user interface and can be utilized as a Primary Flight Display (PFD), Multi-Function Display (MFD), Engine Monitoring Device (EDM), or a combination of all, depending on how the unit is integrated with other compatible avionics products. The unit has the ability to record data via an externally removable SD card mounted under the center of the screen, or internally on a series of non-volatile memory (NVM) chips.

If not disabled, the unit is capable of logging historical information at a variable rate of about 10 Hertz to internal non-volatile memory. Historical logs may be copied to a standard SD card inserted into the slot provided on the front of the unit, starting the unit in configuration mode, and selecting the touchscreen option "Copy to SD Card." Data is exported in engineering units, in a comma-delimited value (CSV) format. Each record contains

coordinated universal time (UTC) date and time, as well as an integer number of milliseconds since the unit was last powered.

3.1.1. Garmin G3X Data Recovery

The removable memory cards were in good condition and the data were downloaded without difficulty.

3.1.2. Garmin G3X Data Description

Upon evaluation of the recovered data, it was determined that both removable memory cards contained identical data. The recordings contained records of 100 power cycles. The accident flight was associated with the 99th and 100th power cycles.¹ The combined duration of the 99th and 100th power cycles was approximately 1 hour and 16 minutes. Timing of the Garmin G3X data is recorded in UTC.

3.1.3. Garmin G3X Engineering Units Conversions

Display data were recorded in engineering units; therefore, no conversions were applied.

Where applicable, changes to the conversions have been made to ensure the parameters conform to the Safety Board's standard sign convention that climbing right turns are positive (CRT=+).²

Appendix A lists the parameters verified and provided in this report.

3.2. Time Correlation

Display data was recorded in UTC. The difference between the local eastern daylight time (EDT) and UTC is four hours, or 14,400 seconds. The incident flight data has been offset from recorded display time to EDT by subtracting 14,400 seconds. Therefore, for the rest of this report, all times are referenced as EDT, not recorded time.

3.3. Plots and Corresponding Tabular Data

The following six figures contain data recorded during the 9/28/2020 event.

Figures 1 and 2 are graphical overlays generated using Google Earth showing the entire incident flight and the end of the flight, respectively. Weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 3 shows a plot of basic parameters during the entire incident flight.

Figure 4 shows a detail view of the same basic parameters for the end of the flight.

¹ During the normal data retrieval process, power is applied to the display. Therefore, the accident data is not necessarily the last power cycle recorded.

² CRT=+ means that for any parameter recorded that indicates a climb or a right turn, the sign for that value is positive. Also, for any parameter recorded that indicates an action or deflection, if it induces a climb or right turn, the value is positive. Examples: Right Roll = +, Left Aileron Trailing Edge Down = -, Right Aileron Trailing Edge Up = +, Pitch Up = +, Elevator Trailing Edge Up = +.

Figure 5 shows a plot of engine and electrical parameters during the entire incident flight.

Figure 6 shows a detail view of the same engine and electrical parameters for the end of the flight.

In all the above figures, a gap in data is noticeable toward the end of the flight. This is due to a probable power interruption to the displays. The power interruption caused the displays to write the remaining flight data to a separate file, and this process resulted in a gap in recorded data.

The corresponding tabular data used to create the six plots are provided in electronic (*.csv) format as Attachment 1 to this report.³

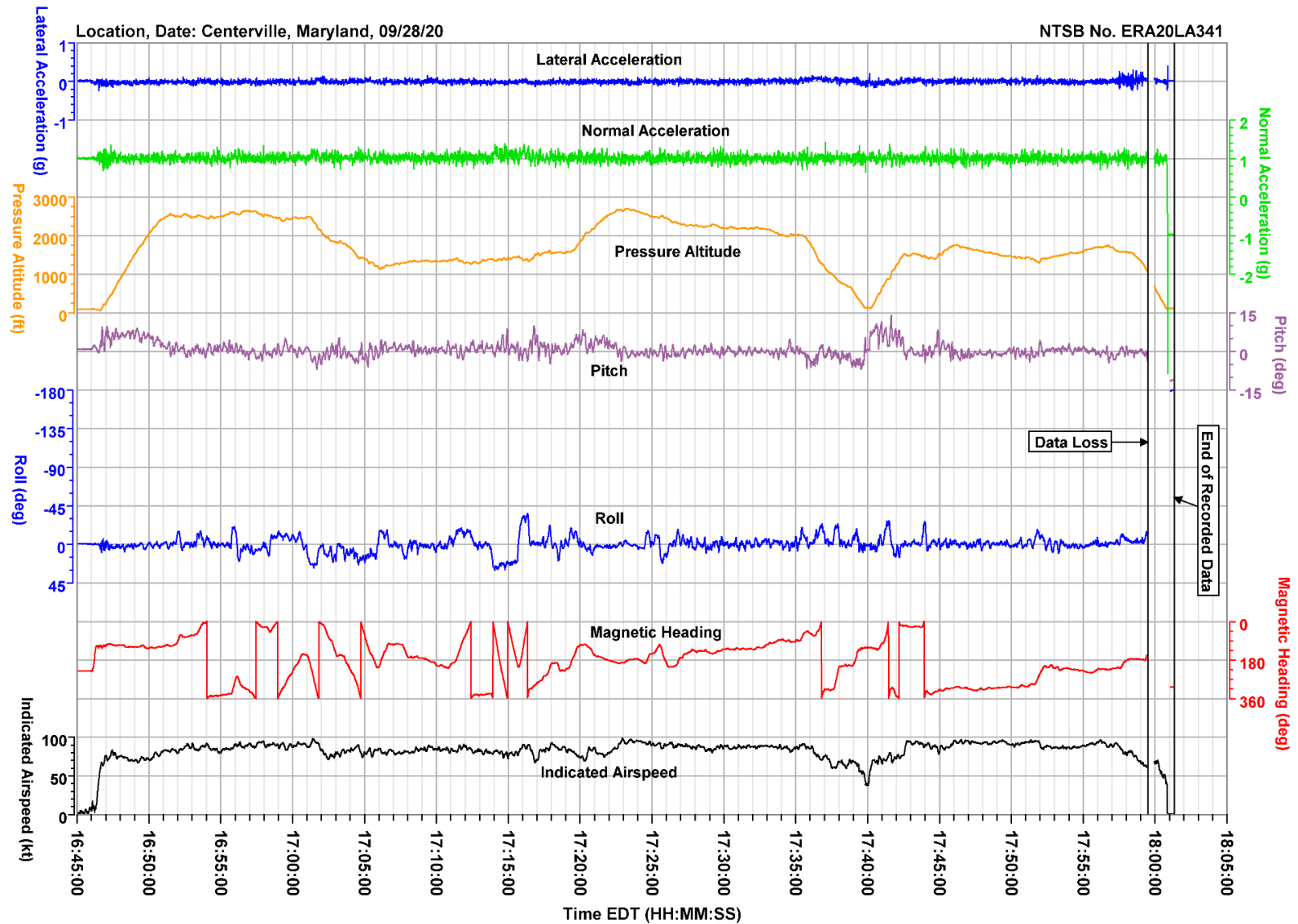
³ Comma Separated Value format.



Figure 1. Graphical overlay generated using Google Earth showing the entire incident flight.



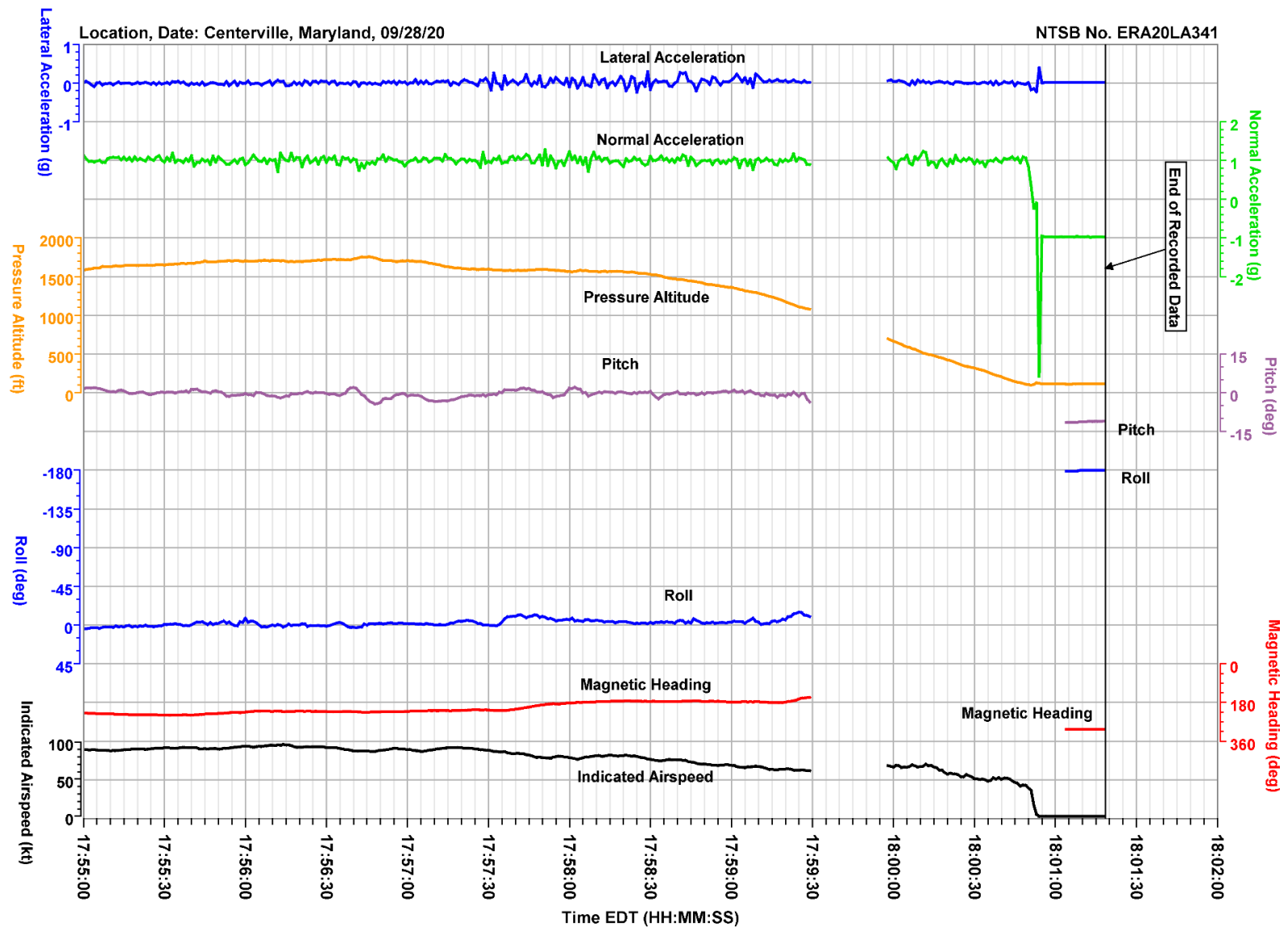
Figure 2. Detail view of the final moments of the accident flight along with the approximate wreckage location.



Chesapeake Sport Pilot, Tecnam P92, N562TU

National Transportation Safety Board

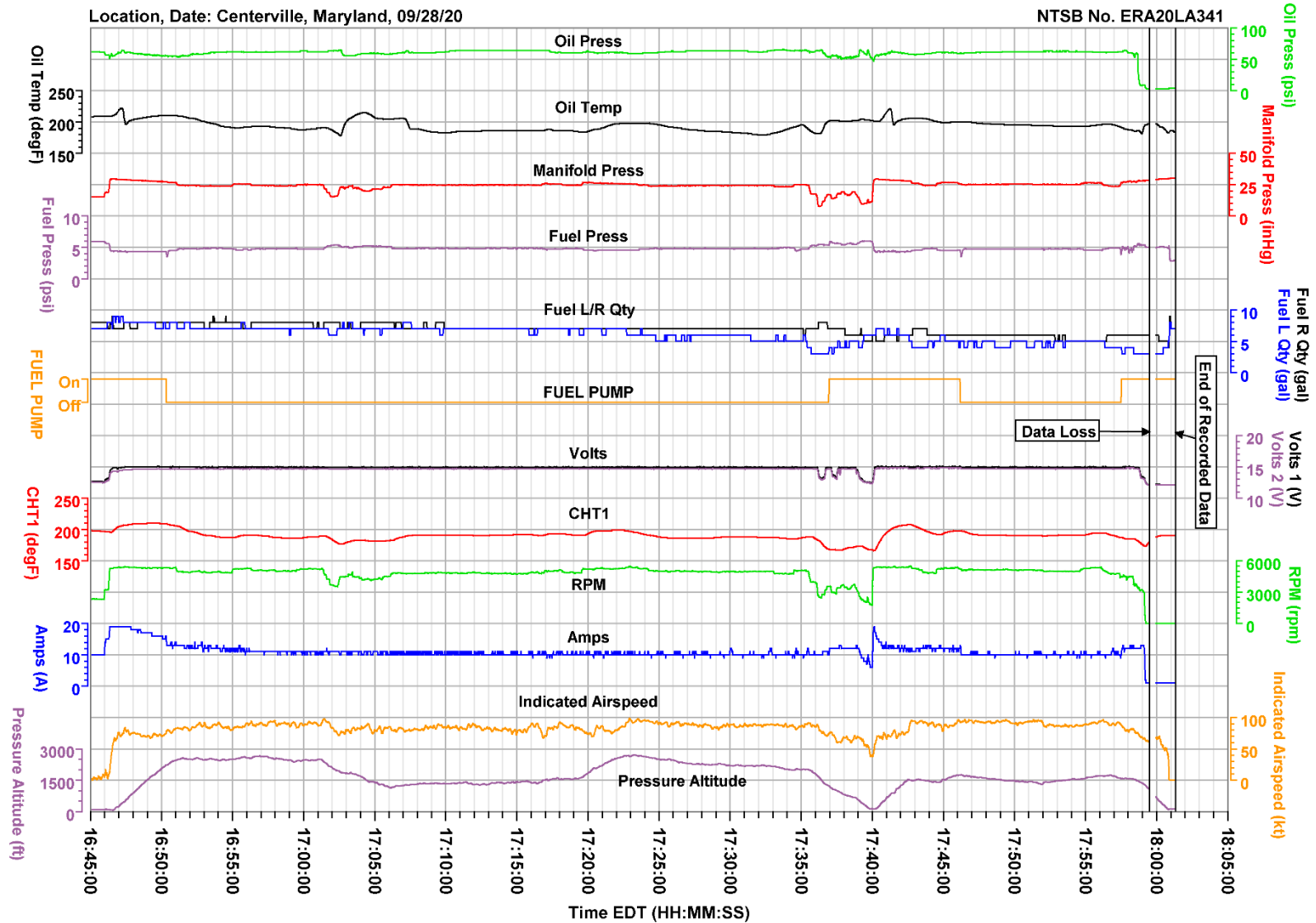
Figure 3. Plot of basic parameters during the entire incident flight.



Chesapeake Sport Pilot, Tecnam P92, N562TU

National Transportation Safety Board

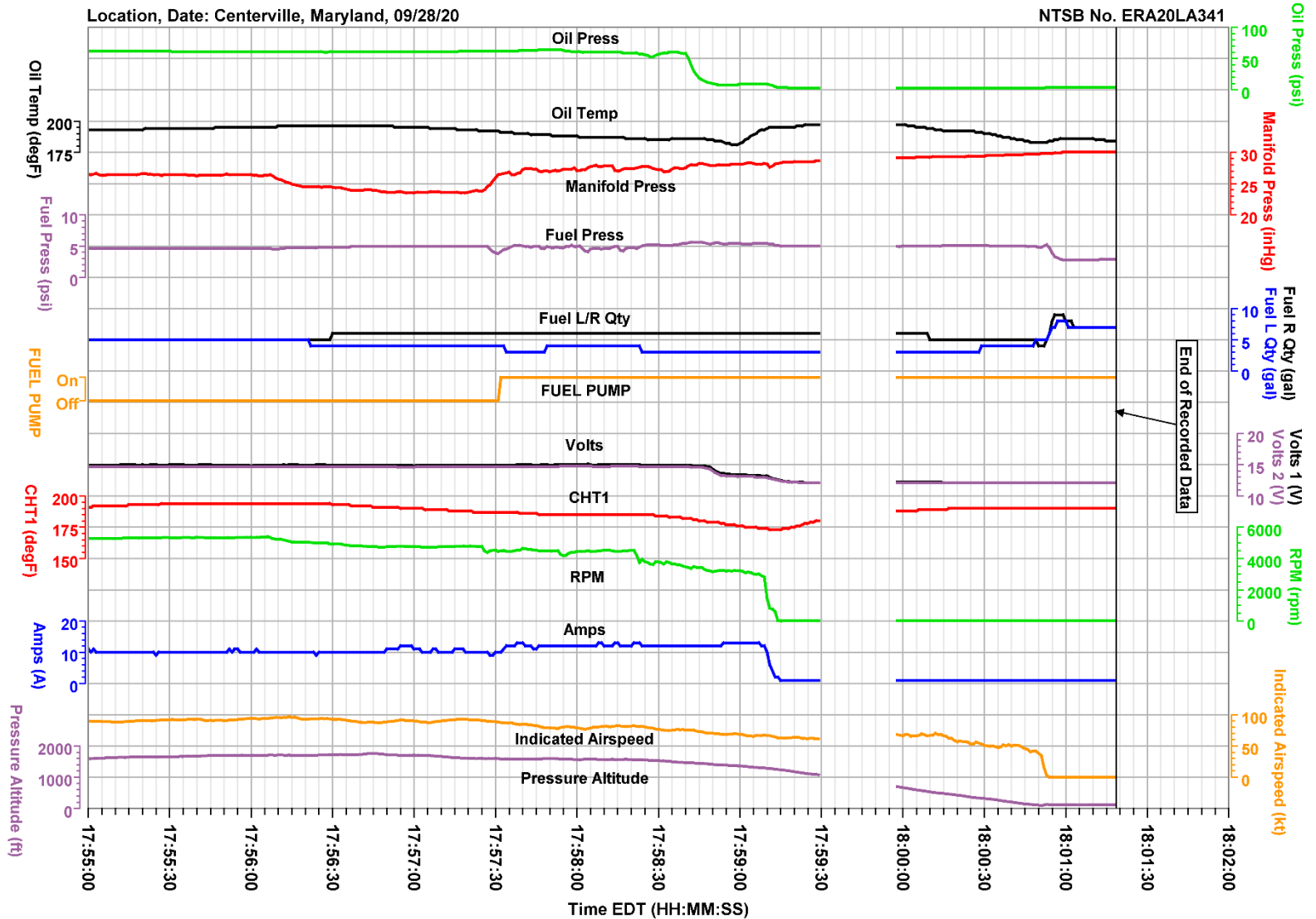
Figure 4. Detail view of basic parameters for the end of the flight.



Chesapeake Sport Pilot, Tecnam P92, N562TU

National Transportation Safety Board

Figure 5. Plot of engine and electrical parameters during the entire incident flight.



Chesapeake Sport Pilot, Tecnam P92, N562TU

National Transportation Safety Board

Figure 6. Detail view of engine and electrical parameters for the end of the flight.

APPENDIX A - Display Parameters

This appendix describes the parameters provided and verified in this report. Table A-1 lists the display parameters and unit abbreviations used in this report.

Table A-1. Verified and provided parameters.

Parameter Name (Units)	Parameter Description (Units)
Amps (A)	Amps (Ampere)
CHT1 (degF)	Cylinder Head Temperature – Cylinder #3 (degrees Fahrenheit) ⁴
Fuel L Qty (gal)	Fuel Quantity – Left Tank (gallons)
Fuel Press (psi)	Fuel Pressure (pounds per square inch)
FUEL PUMP	Fuel Pump (discrete)
Fuel R Qty (gal)	Fuel Quantity – Right Tank (gallons)
Indicated Airspeed (kts)	Indicated Airspeed (knots)
Lateral Acceleration (g)	Lateral Acceleration (g)
Latitude (deg)	GPS Latitude Position (degrees)
Longitude (deg)	GPS Longitude Position (degrees)
Magnetic Heading (deg)	Magnetic Heading (degrees)
Manifold Press (inHg)	Manifold Pressure (inches of Mercury)
Normal Acceleration (g)	Normal Acceleration (g)
Oil Press (psi)	Oil Pressure (pounds per square inch)
Oil Temp (degF)	Oil Temperature (degrees Fahrenheit)
Pitch (deg)	Pitch Attitude (degrees)
Pressure Altitude (ft)	Pressure Altitude (feet)
Roll (deg)	Roll Attitude (degrees)
RPM (RPM)	Engine RPM (revolutions per minute)
Volts 1 (V)	Bus 1 Volts (Volts DC)
Volts 2 (V)	Bus 2 Volts (Volts DC)

The display records pressure altitude, which is based on a standard altimeter setting of 29.92 inches of mercury (in Hg). The pressure altitude information presented in the plots and in the electronic data has not been corrected for the local altimeter setting at the time of the event.

NOTE: For parameters with a unit description of discrete, a discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.

⁴ This display records Cylinder Head Temperature for cylinder number 3 only.