

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN23LA061

ELECTRONIC FLIGHT INFORMATION SYSTEM (EFIS)

Specialist's Factual Report

June 1, 2023

A. ACCIDENT

Location: St. Louis, Missouri
Date: December 5, 2022
Time: 1728 central standard time (CST)
Airplane: Orlican S R O M-8 Eagle airplane, N602TG

B. ELECTRONIC FLIGHT INFORMATION SYSTEM (EFIS) SPECIALIST

Specialist: W. Deven Chen
Electrical Engineer – Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A recorder group was not convened. The NTSB Vehicle Recorder Division received electronic data files from the following EFIS on the accident airplane:

Manufacturer/Model:	Dynon SkyView HDX1100
Serial Number:	Unknown

1.0 Recorder Description

The Dynon SkyView HDX1100 has a 10" screen with both a touchscreen and softkey interface. The device can serve as either a primary flight display (PFD) or a multifunction display (MFD) depending on the installation. The unit has a solid-state air data and attitude heading reference system (ADAHRS) and displays aircraft parameter data including altitude, airspeed, attitude, vertical speed, and heading. The unit also has external pitot/static inputs for altitude, airspeed, and vertical speed information. The device contains an internal flash memory device. Depending on the configuration, the flash memory can store information sampled at 16 Hz for the last two hours of flight in a file called a "BLACK_BOX_LOG_DATA," detailed alert logs that show both caution, warning and aural alerts generated by the display in a file called "ALERT_DATA," as well as a flight history log which is sampled at a lower rate that can record more hours of operation. The flight history is recorded in a file called "USER_LOG_DATA" and is sampled at 4 Hz.

1.1 Recording Description

The received data files contained sessions recorded from October 15, 2022, to December 8, 2022. The last recorded session was not the accident flight. The session recorded on December 5, 2022, was determined to be associated with the accident flight. For the accident flight recording, the BLACK_BOX_LOG_DATA file had a

sampling frequency of 16 Hz, but only recorded the last portion of the accident flight. The USER_LOG_DATA file had the entire flight recording but had only a 4 Hz sampling frequency. The data from the BLACK_BOX_LOG_DATA and USER_LOG_DATA were combined for this report. The combined log for the accident flight recording consisted with data from 16:34:35 to 17:11:33 CST in 4 Hz sampling frequency and the rest in 16 Hz until the last recorded data point at 17:28:31.94 CST. The ALERT_DATA file contained warning events triggered during the flight.

1.1.1 Parameters Provided

Table 1 lists the recorder parameters verified and provided in this report.

Table 1. Dynon SV HDX1100 data parameters provided.

Parameter Name (unit)	Parameter Description
Amps	Circuitry bus current (ampere)
CHT L/R (deg F)	Cylinder head temperature left/right (degrees Fahrenheit)
EGT L/R (deg F)	Exhaust gas temperature left/right (degrees Fahrenheit)
FF (gal/hr)	Fuel flow rate (gallons per hour)
Fuel L/R (gal)	Fuel level at left/right tank (gallons)
Fuel P (PSI)	Fuel pressure (pounds per square inch)
Gnd Spd (kts)	Average groundspeed between current and previous data point (knots)
GPS Alt (ft)	Geometric altitude above Mean Sea Level (feet)
Heading (deg)	Direction relative to magnetic north (degrees)
IAS (kts)	Airspeed read from airspeed indicator onboard (knots)
Latitude (deg)	Geographic latitude (degrees)
Lateral Accel (g)	Lateral acceleration (g)
Longitude (deg)	Geographic longitude (degrees)
MP (inHg)	Manifold pressure (inches of mercury)
Oil P (PSI)	Oil pressure (pounds per square inch)
Oil T (deg F)	Oil temperature (degrees Fahrenheit)
Pitch (deg)	Pitch angle (degrees)
Pres Alt (ft)	Altitude recorded at barometric pressure setting (feet)
Roll (deg)	Roll angle (degrees)
RPM	Engine revolution per minute
TAS (kts)	Airspeed corrected for temperature and pressure altitude (knots)
Track (deg)	Path on the surface of the Earth directly below aircraft (degrees)
Vertical Accel (g)	Vertical acceleration (g)
Volts	Circuitry bus voltage (volts)
Vspd (ft/min)	Aircraft vertical speed (feet per minute)

1.2 Time Correlation

The data was recorded in coordinated universal time (UTC) and converted to CST, the local time of the event.

D. FIGURES AND TABULAR DATA

Figures 1 to 10 contain data recorded during the accident flight on December 5, 2022. All the parameters listed in table 1 are plotted except latitude and longitude.

Figures 1 to 8 are parameter plots of the accident flight. Figures 1 to 4 are basic parameter plots, and figures 5 to 8 are engine parameter plots. These figures are configured such that right turns are indicated by the trace moving toward the bottom of the page, left turns towards the top of the page, and nose up attitudes towards the top of the page. Alert data from the ALERT_DATA file is overlaid on the plots. At 17:28:21.82 CST, the Dynon SkyView system played "EMS¹_RPM" audio alert.

Figures 9 and 10 show Google Earth overlays of 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.

The corresponding tabular data used to create figures 1 to 10 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report. The ALERT_DATA file is provided as attachment 2 to this report. Not all parameters in the attachment have been validated by the specialist.

Submitted by:

W. Deven Chen
Electrical Engineer - Recorder Specialist

¹EMS - Dynon SkyView Engine Monitoring System.

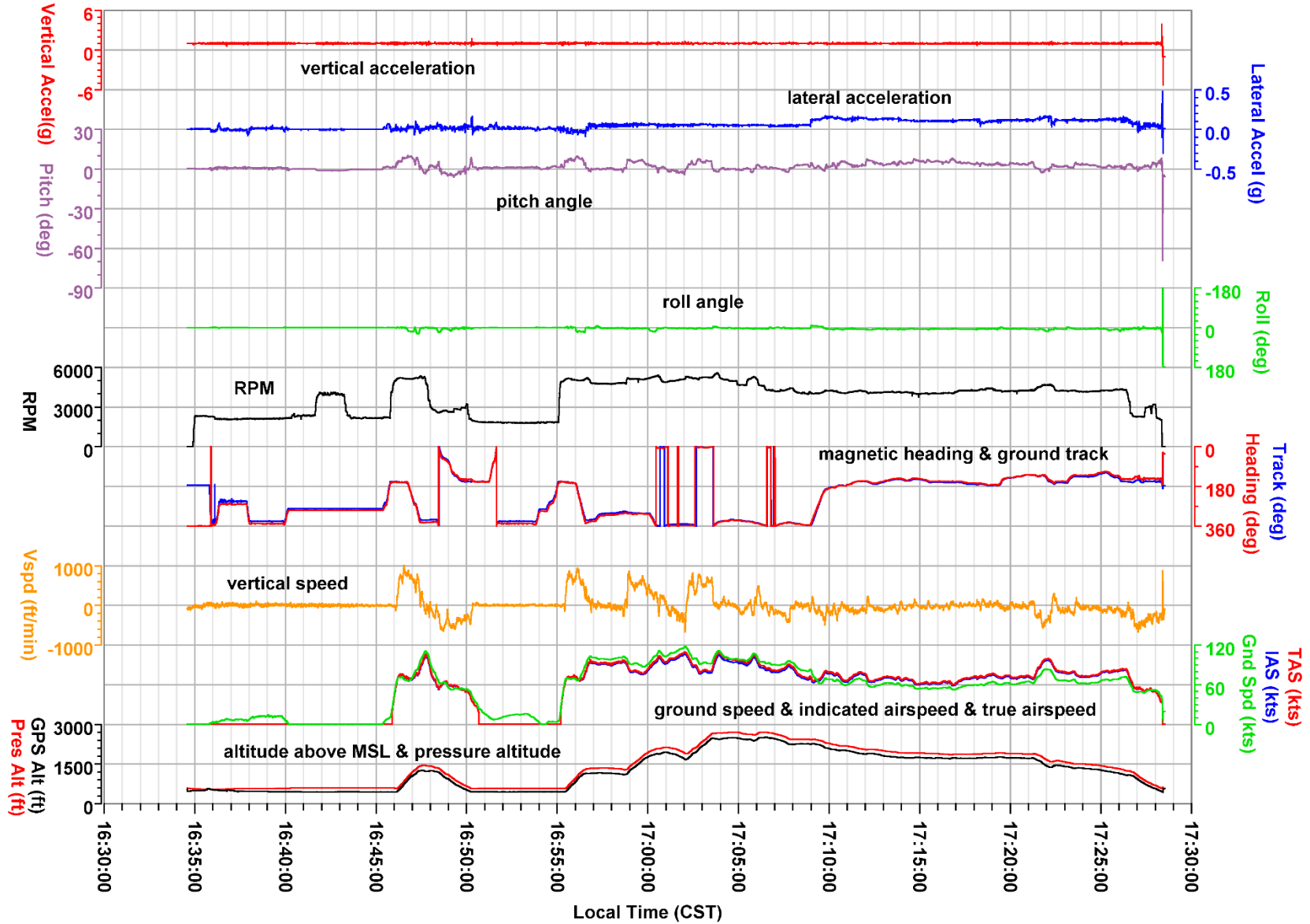


Figure 1. Plot of basic parameters for the entire accident flight recording.

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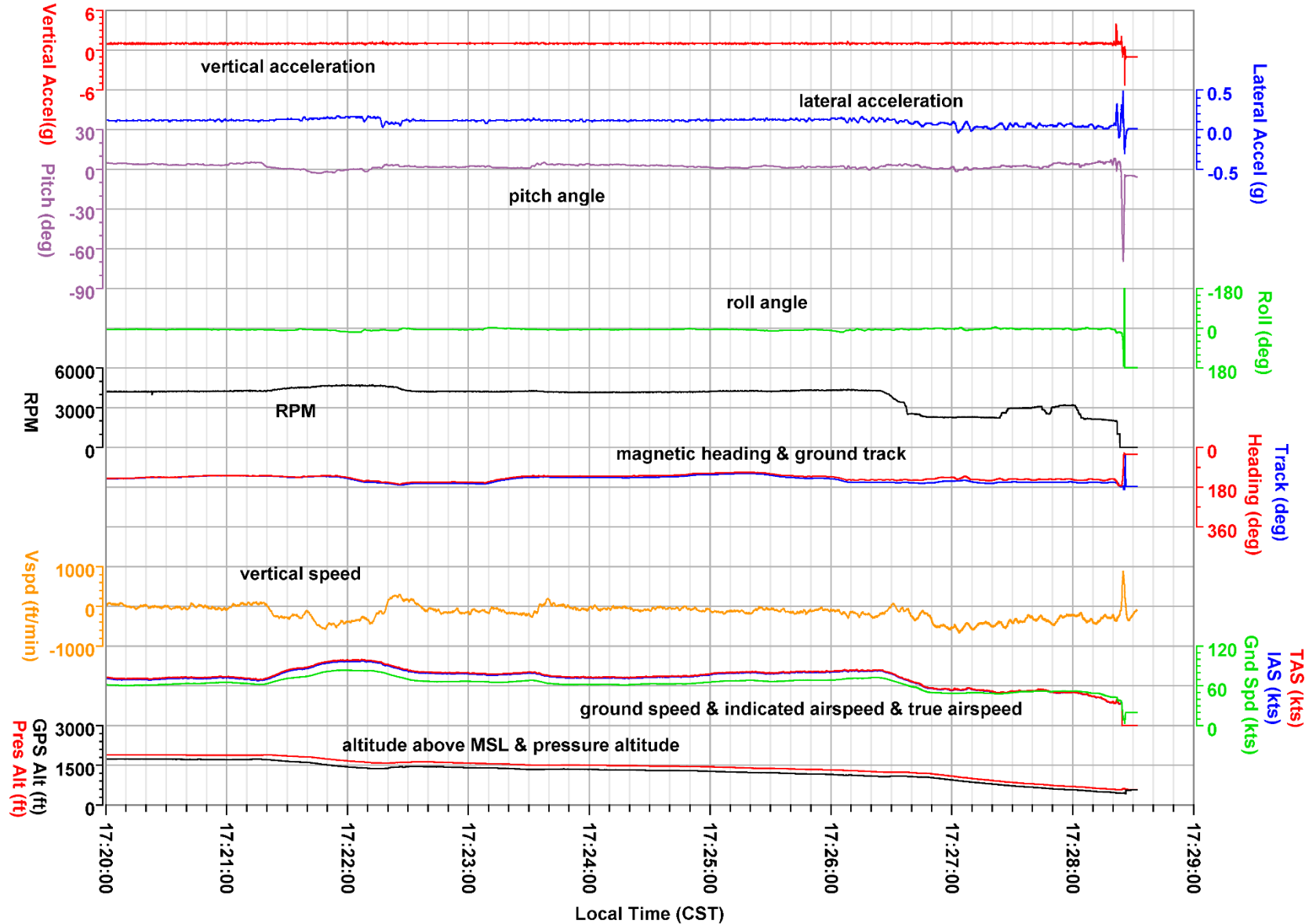


Figure 2. Plot of basic parameters for the session between 17:20:00 and the last recorded point.

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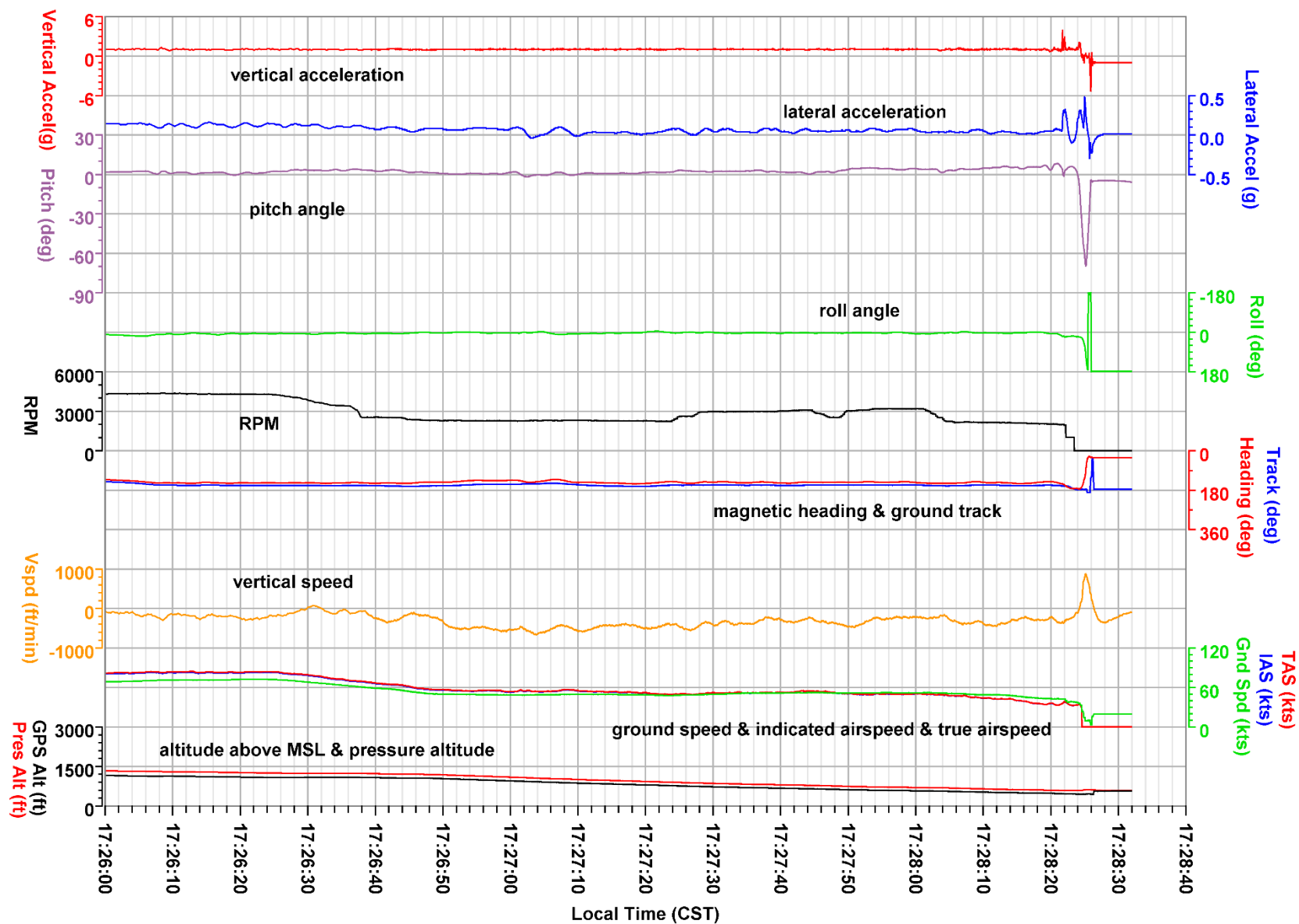


Figure 3. Plot of basic parameters for the session between 17:26:00 and the last recorded point.

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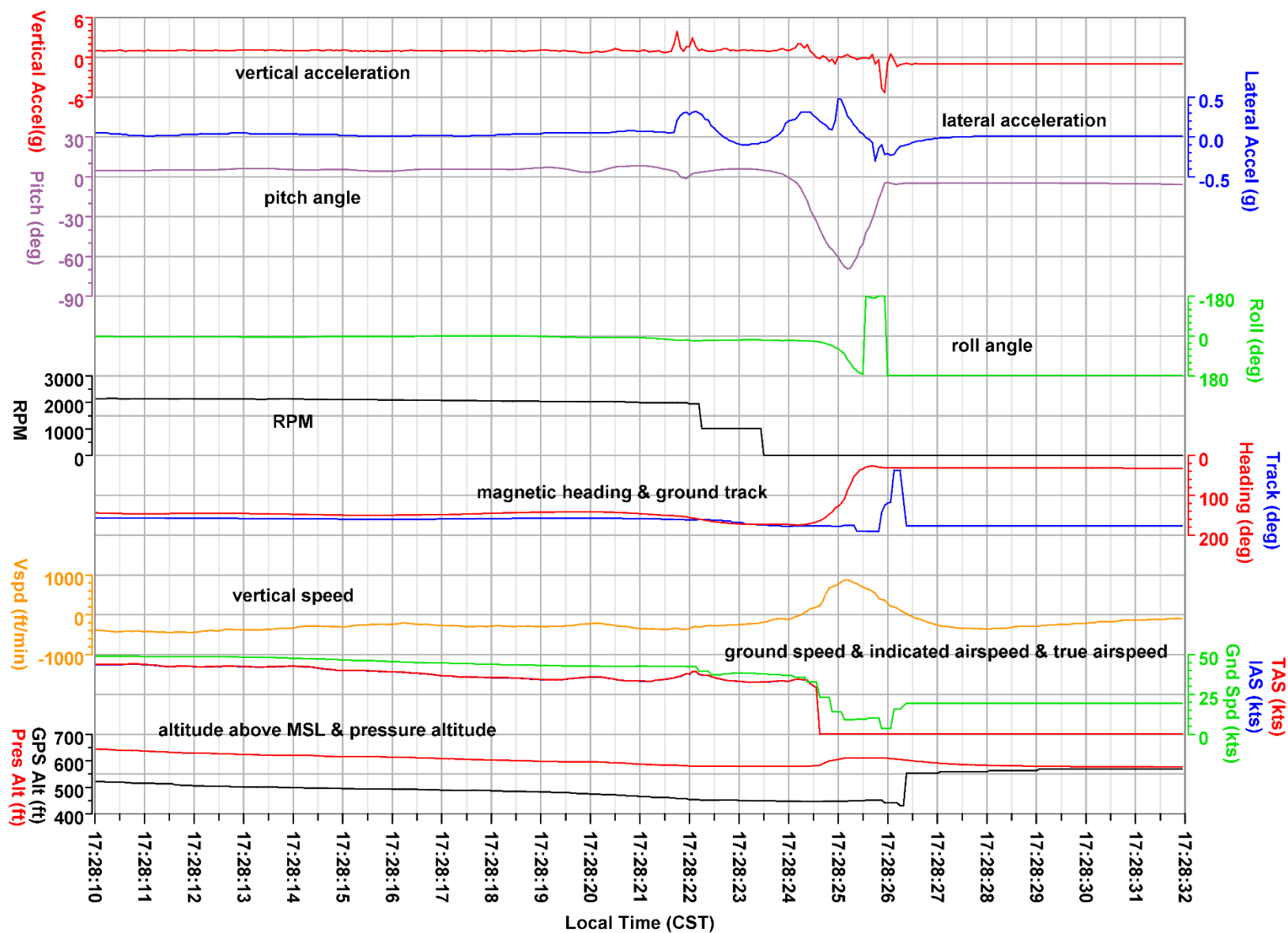


Figure 4. Plot of basic parameters for the session between 17:28:10 and the last recorded point.

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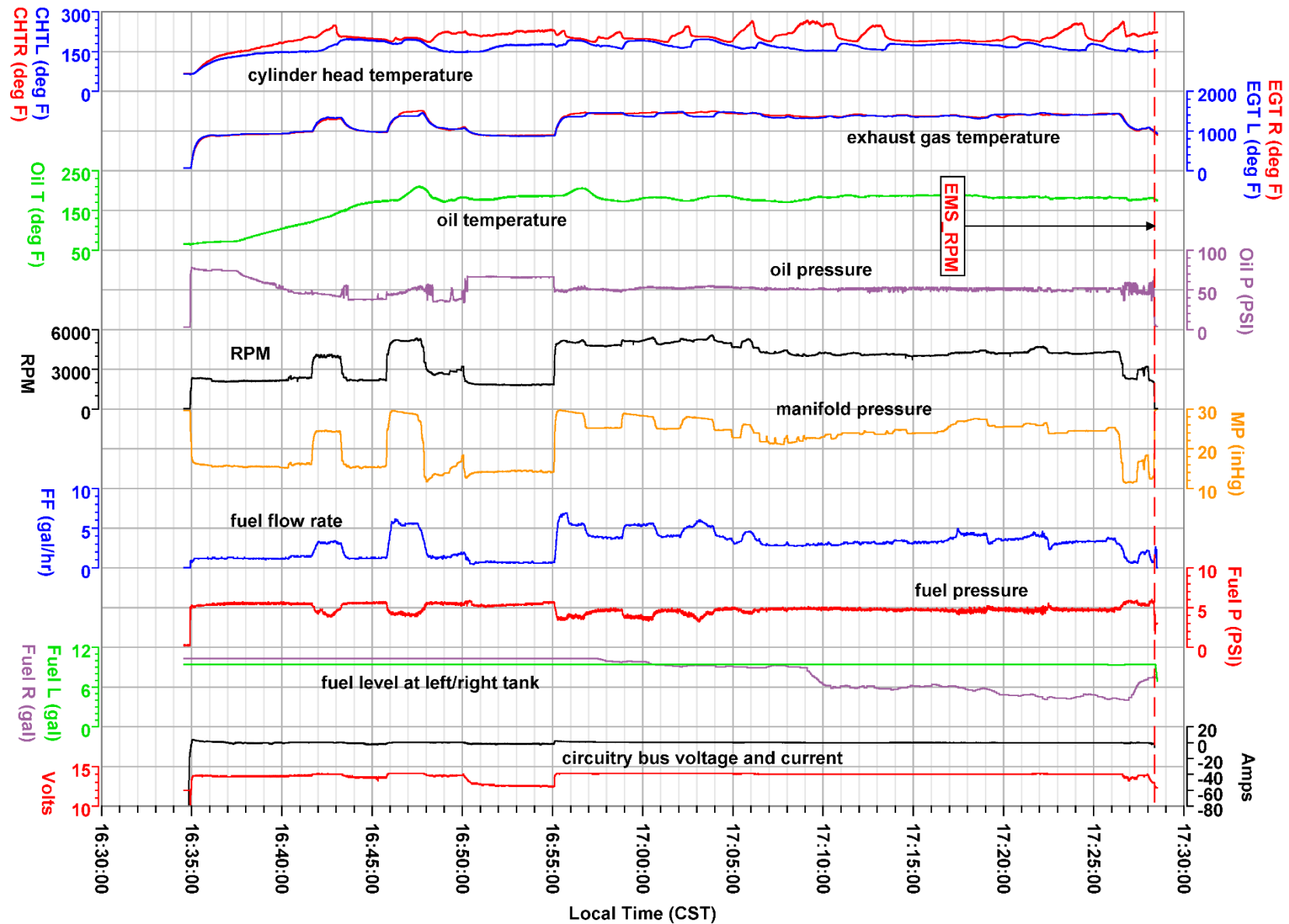


Figure 5. Plot of engine parameters for the entire accident flight recording. The warning EMS-RPM is shown at 17:28:21.82.

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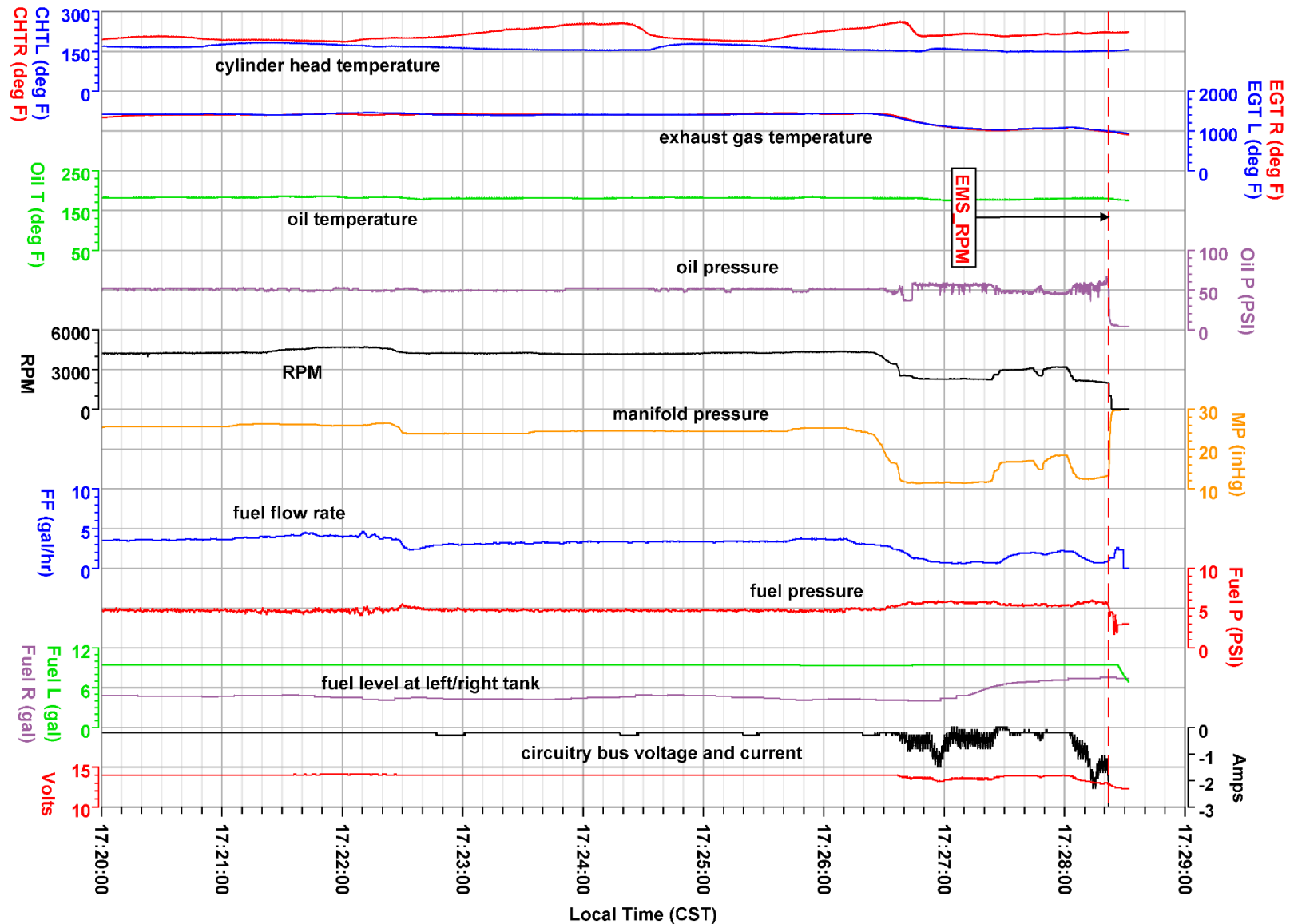


Figure 6. Plot of basic parameters for the session between 17:20:00 and the last recorded point. The warning EMS-RPM is shown at 17:28:21.82.

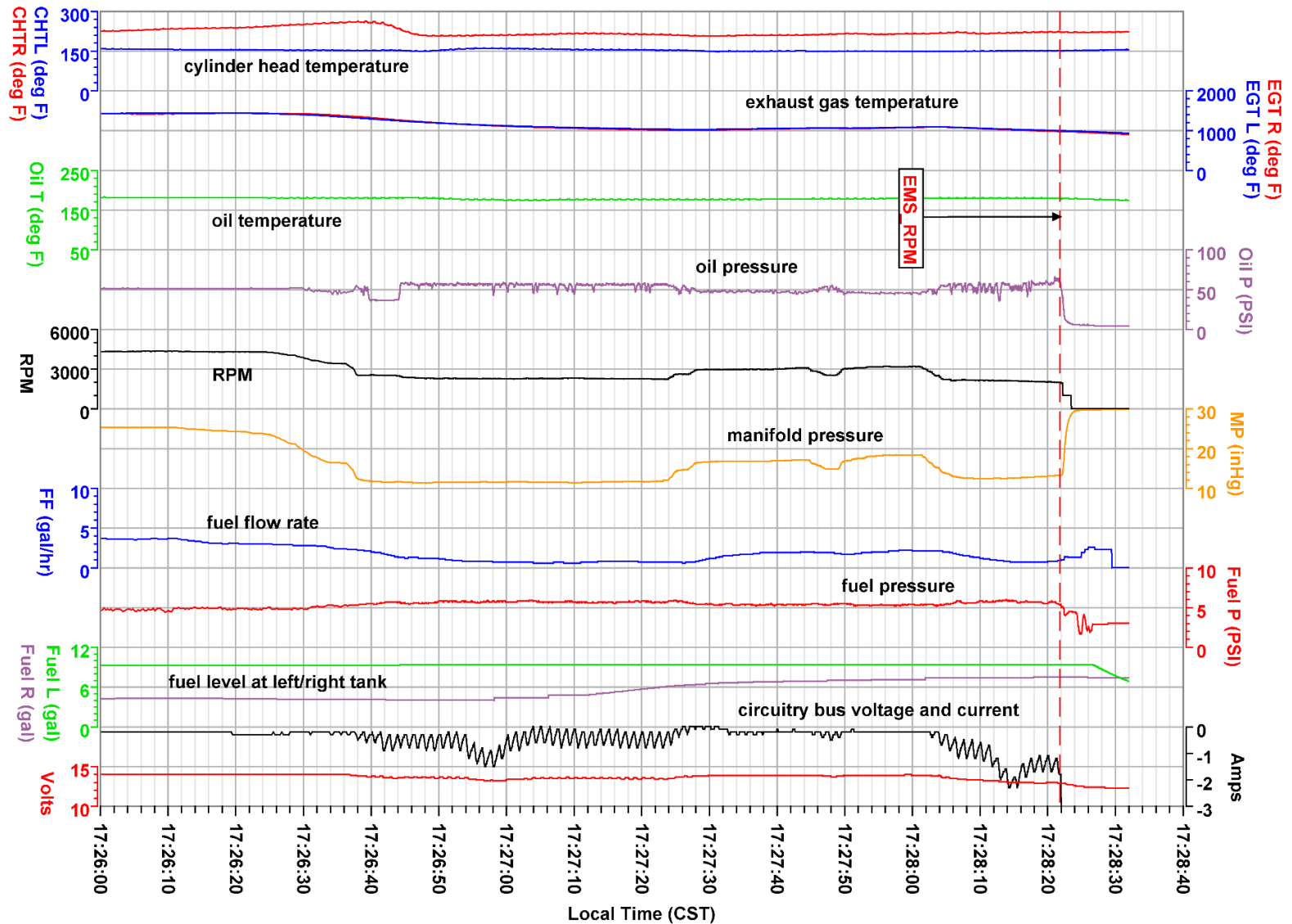


Figure 7. Plot of engine parameters for the session between 17:26:00 and the last recorded point. The warning EMS-RPM is shown at 17:28:21.82.

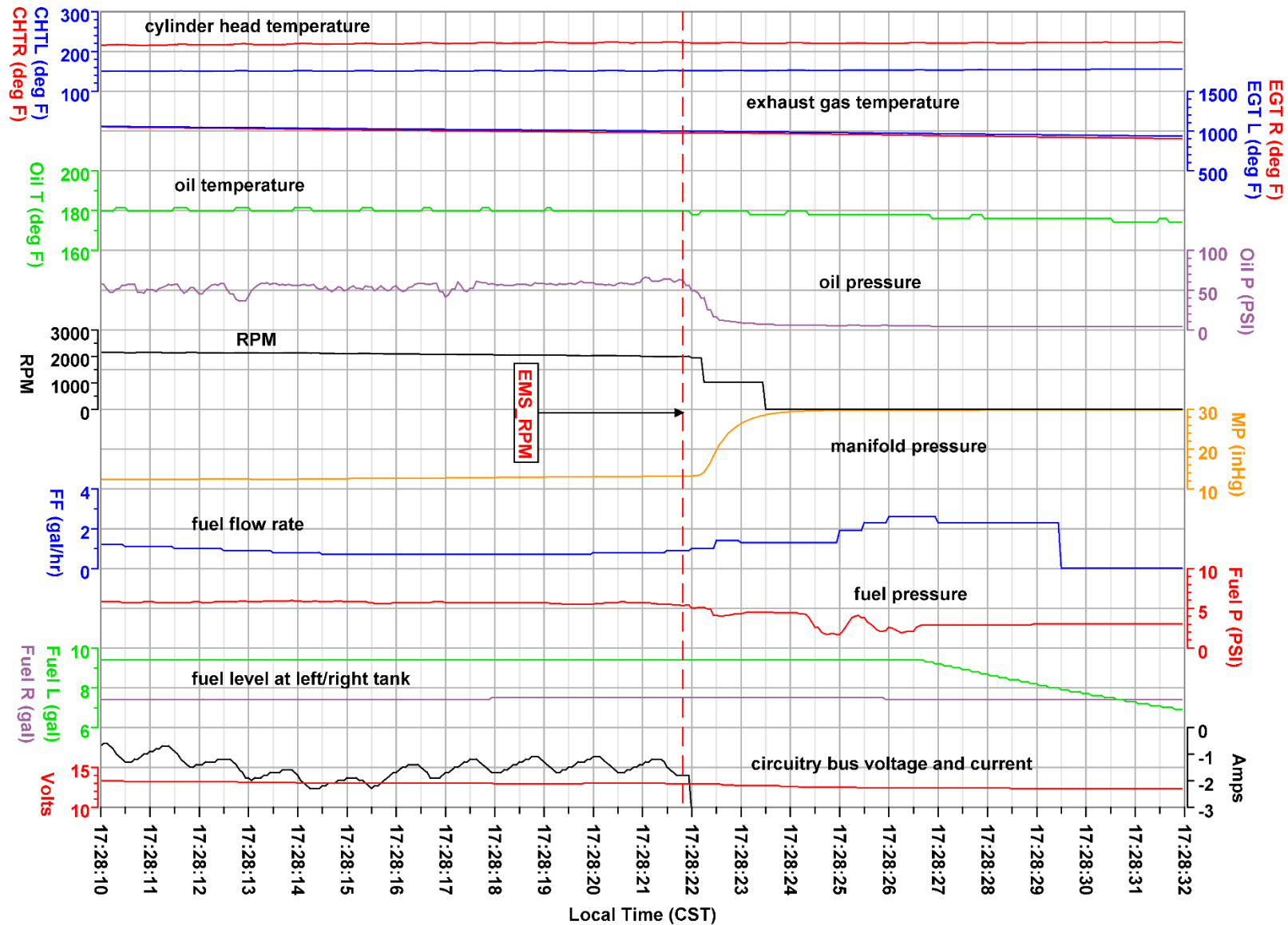


Figure 8. Plot of engine parameters for the session between 17:28:10 and the last recorded point. The warning EMS-RPM is shown at 17:28:21.82.

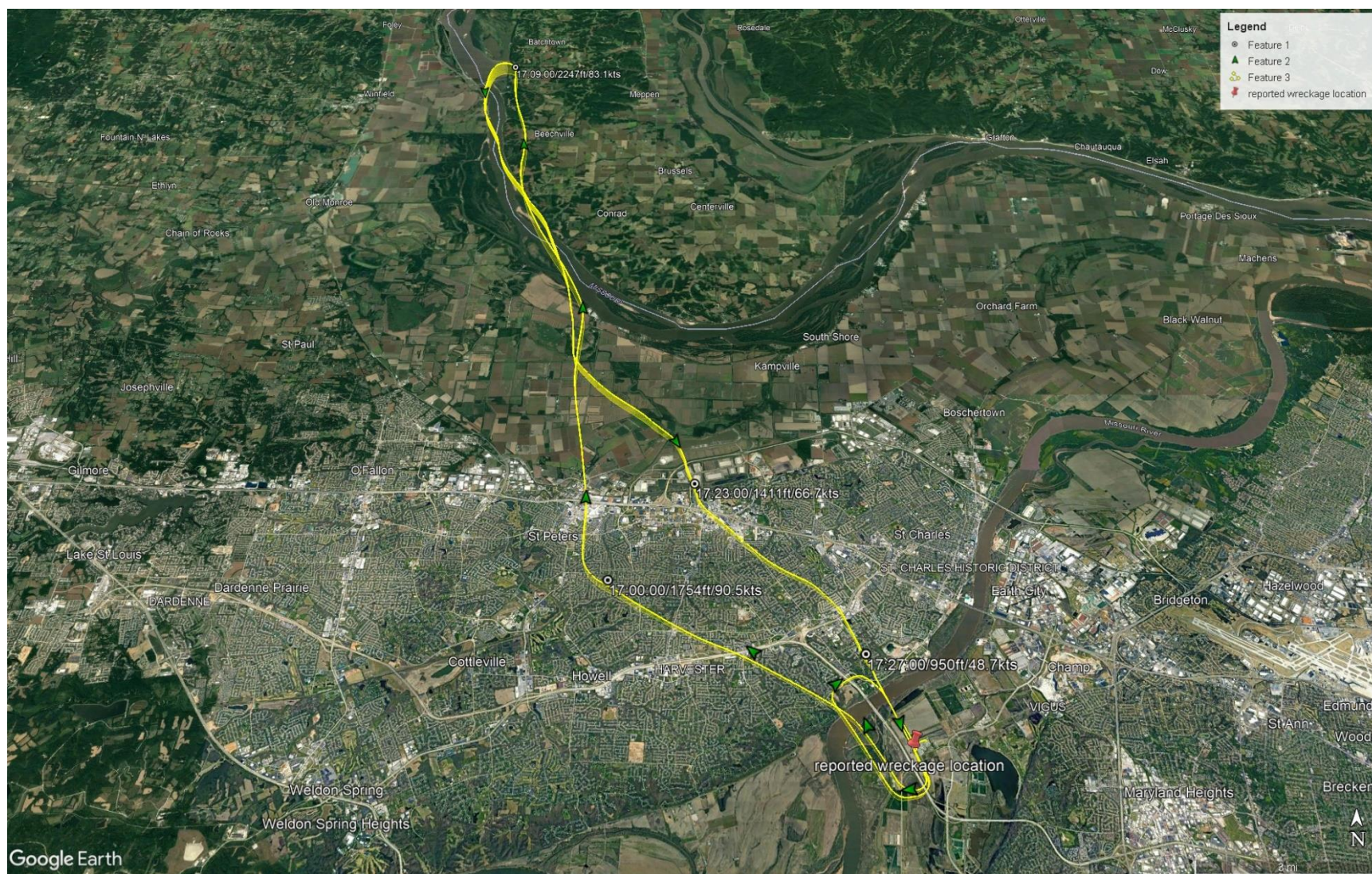


Figure 9. Google Earth overlay of the entire accident flight.



Figure 10. Google Earth overlay of the final portion of the accident flight.