

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



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ELECTRONIC DEVICES

Specialist's Factual Report

May 12, 2025

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A. ACCIDENT

Location: Union City, Tennessee
Date: November 15, 2023
Time: 1042 central standard time (CST)
Airplane: XtremeAir XA42, private operator, N42XM

B. ELECTRONIC DEVICES 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 devices:

Recorder Manufacturer/Model: Electronic International MVP-50
Part Number: MVP-50P-XA42
Recorder Serial Number: 161053

Recorder Manufacturer/Model: Garmin GPSMAP 695
Part Number: 10R-024616
Recorder Serial Number: 1H9001183

1.0 Electronics International MVP-50P Description

The EI (Electronics International Inc.) MVP-50P is a panel-mounted, color, electronic engine display allowing the operator to monitor and record parameters related to engine operations and user customizable parameters. Depending on the installation, parameters monitored may include oil pressure and temperature, outside air temperature, propeller revolutions per minute (RPM), fuel flow, fuel levels, and battery voltage and amperage. User customizable parameters may be defined by installation, examples include but are not limited to sensors for door states, annunciators, and flight control positions.

The unit contains non-volatile memory (NVM) for data storage of the recorded and calculated parameters.¹ The rate at which the data is stored is selectable by the operator. The recording function also records minimum and maximum values for each flight. The data is stored in engineering units in comma-separated value (CSV)

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

format on an internal microSD card or compact flash card, using a Linux file system format. The data can be downloaded to a USB memory device via a USB port on the front of the unit or by removing the internal microSD card. Each set of recorded data is grouped by power cycle and identified by an MVP-50P assigned sequential flight number.

1.1 Electronics International MVP-50P Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, it was evident that the EI MVP-50P sustained impact damage as shown in figure 1. The device was taken apart and the internal compact flash card was removed and downloaded via commercially available data forensics software.



Figure 1. EI MVP-50P as received by the NTSB Vehicle Recorder Lab.

1.2 Electronics International MVP-50P Recording Description

The data downloaded from the device included 273 sessions from June 15, 2015, to November 15, 2023. The last session recorded from 9:39:58 CST to 10:39:50 CST on November 15, 2023, was identified as the accident flight. The data were sampled at 3 Hz.

1.2.1 Electronics International MVP-50P Parameters Provided

Table 1 lists the EI MVP-50P parameters verified and provided in this report.

Table 1. EI MVP-50P data parameters provided.

Parameter Name (unit)	Parameter Description (unit)
CHT # (degF)	Engine Cylinder Head Temperature # ² (degrees Fahrenheit)
EGT # (degF)	Engine Exhaust Gas Temperature # (degrees Fahrenheit)
ENGINE HOURS (hrs)	Total Engine Hours (hours)
ENGINE RPM (RPM)	Engine Revolutions per Minute (revolutions per minute)
F.FLOW (gph)	Fuel Flow (gallons per hour)
F.REM (gal)	Fuel Remaining (gallons)
FUEL P (psi)	Fuel Pressure (pounds per square inch)
G-METR (g)	Vertical Acceleration (unit of gravitational acceleration)
HP (%)	Engine Horsepower (percentage)
M.P. (inHg)	Engine Manifold Pressure (inches of Mercury)
OIL P (psi)	Oil Pressure (pounds per square inch)
TACH TIME (hrs)	Total Tachometer Time (hours)

1.2.2 Electronics International MVP-50P Engine and Tachometer Hours

Table 2 lists the total engine and tachometer hours for the recorded accident flight session.

Table 2. Engine and Tachometer hours for the accident flight.

Parameter	First Recorded Sample	Last Recorded Sample
ENGINE HOURS	73.21 hrs	74.20 hrs
TACH TIME	56.18 hrs	57.09 hrs

1.3 Electronics International MVP-50P Time Correlation

The EI MVP-50P recorded data in CST, the local time of the accident. The timing is set by the operator, as opposed to GPS time. A time correlation between the Garmin GPSMAP 695 was performed to align the data to GPS time. An offset of 136 seconds was applied to the EI-MVP-50P such that it displays in local time, CST. The offset was determined by correlating the application of takeoff power from the EI MVP-50P data parameters to the GPS data from the Garmin GPSMAP 695.

2.0 Garmin GPSMAP 695 Description

The Garmin GPSMAP 695 is a portable GPS receiver capable of storing date, route-of-flight, and flight-time information for up to 50 flights. A detailed tracklog, including latitude, longitude, altitude, date, time, and groundspeed information, is

² This aircraft engine is configured with 6 cylinders. In the data plots, the '#' is replaced with the appropriate cylinder ID.

stored within the unit whenever the receiver has a lock on the GPS navigation signal. All recorded data is stored in non-volatile memory. The unit contains hardware and software permitting the download of recorded waypoint, route, and tracklog information to a PC via a built-in serial port. The unit can also communicate with external devices such as a computer using a built in USB port. An internal button-battery is used to back-up power to the internal memory and real-time clock during those periods when main power is removed.

2.1 Garmin GPSMAP 695 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, it was evident that the Garmin GPSMAP 695 sustained impact damage as shown in figure 2. The device was able to power on, and the data were downloaded normally using the manufacturer's procedure.



Figure 2. Garmin GPSMAP 695 as received by the NTSB Vehicle Recorder Lab.

2.2 Garmin GPSMAP 695 Recording Description

The data extracted included 14 track logs. The recorded date for all sessions was 1024 weeks (7168 days) offset from the actual recorded dates, a phenomenon known as GPS week number rollover. Software not coded to anticipate the rollover may be set back 20 or 40 years. The recorded dates ranged from March 27, 2004, through March 31, 2004. The last recorded session corresponded to the accident

event and was 7168 days offset from the event date. The last recorded sample does not align with the reported wreckage location. The last recorded data point on the Garmin GPSMAP 695 was approximately 970 feet from the reported wreckage location. In addition to the accident flight, two previous flights were determined to be of interest and are included in this report.

2.2.1 Garmin GPSMAP 695 Parameters Provided

Table 3 describes data parameters provided by the GPS device. Date, Time, Latitude, Longitude, and GPS Altitude are recorded by the device. Groundspeed and Track are derived from the recorded parameters.

Table 3. GPSMAP 695 data parameters provided.

Parameter Name (unit)	Parameter Description (unit)
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time (UTC) for recorded data point (HH:MM:SS)
Latitude (deg)	Recorded Latitude (degrees)
Longitude (deg)	Recorded Longitude (degrees)
GPS Alt (ft)	Recorded GPS Altitude (feet)
Groundspeed (kts)	Average derived groundspeed (knots)
Track (deg)	Average derived true course (degrees)

2.3 Garmin GPSMAP 695 Time Correlation

Correlation of the data to the event local time, CST, was established by using the recorded time and then applying an additional 6 hour offset to change coordinated universal time (UTC) to CST. Therefore, for the rest of this report, all times are referenced as CST.

D. FIGURES AND TABULAR DATA

Figures 3 to 9 contain data recorded during the event on November 15, 2023. All the parameters listed in tables 1 and 3 are plotted except ENGINE HOURS, TACH TIME, Time, Date, Latitude, and Longitude.

Figures 3 and 4 present the same EI MVP-50P parameters for the entire accident flight and the final 2.3-minute portion of the recording. Figures 5 and 6 present the same Garmin GPSMAP 695 and EI MVP-50P parameters for the entire accident flight and the final 2.3-minute portion of the recording.

The electronic devices data indicated the following sequence of events:

- **09:50:32 CST:** The aircraft began takeoff roll from Everett-Stewart Regional Airport, Union City, Tennessee (KUCY), runway 19.

- **09:51:21 CST:** GPS altitude was 1158 ft. The aircraft began a climbing 180 deg left turn.
- **09:56:37 CST:** The aircraft was approximately 3.33 nautical miles west of Fulton Airport, Fulton, Kentucky (1M7).
- **09:56:57 CST - 10:07:05 CST:** The aircraft GPS data was consistent with the aircraft performing aerobatics.
- **10:09:26 CST:** The aircraft conducted a touch-and-go landing (TGL) at 1M7.
- **10:13:15 CST:** The aircraft conducted a second TGL at 1M7.
- **10:13:46 CST:** GPS altitude was 1014 ft and the track was 270 deg. The aircraft began to make a climbing left turn south towards KUCY.
- **10:19:25 CST:** GPS altitude was 1394 ft and the derived groundspeed was 171 kts. The aircraft entered the aerobatic practice area at KUCY.³
- **10:19:25 CST - 10:40:22 CST:** The aircraft flew north-south and south-north patterns throughout the aerobatic practice area.
- **10:40:22 CST:** The aircraft completed an aerobatic maneuver and was at a GPS altitude of 2497 ft.
- **10:40:57 CST:** The aircraft began a rapidly climbing and descending left turn, consistent with turning back into the aerobatic practice area.
- **10:41:51 CST:** Just prior to entering the last maneuver, the aircraft GPS altitude was recorded at a minimum of 1135 ft.
- **10:41:59 CST:** The last recorded Garmin GPSMAP 695 data point. GPS altitude was 1693 ft and the derived groundspeed was 49 kts.
- **10:42:06 CST:** The last recorded EI MVP-50P data point. Engine parameters were consistent with similar previous aerobatic flights.

Figures 7 through 9 are graphical overlays derived from the Garmin GPSMAP 695 data and generated using Google Earth presenting the entire accident flight, TGL at 1M7 and maneuvers consistent with aerobatic flight, and the accident location, respectively. 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 3 to 9 are provided in electronic CSV format as attachment 1 to this report.

Figure 10 presents EI MVP-50P parameters for the entire first previous flight. Figure 11 presents Garmin GPSMAP 695 and EI MVP-50P parameters for the entire first previous flight. This flight departed on a local flight from KUCY runway 19 and

³ An aerobatic practice area is defined as a volume of airspace in which an aircraft must remain while performing an aerobatic sequence.

landed on runway 1. The corresponding tabular data used to create figures 10 and 11 are provided in electronic CSV format as attachment 2 to this report.

Figure 12 presents EI MVP-50P parameters for the entire second previous flight. Figure 13 presents Garmin GPSMAP 695 and EI MVP-50P parameters for the entire second previous flight. This flight departed on a local flight from KUCY runway 1 and landed on the same runway. The corresponding tabular data used to create figures 12 and 13 are provided in electronic CSV format as attachment 3 to this report.

Submitted by:

Steven Smith
Mechanical Engineer (Recorder Specialist)

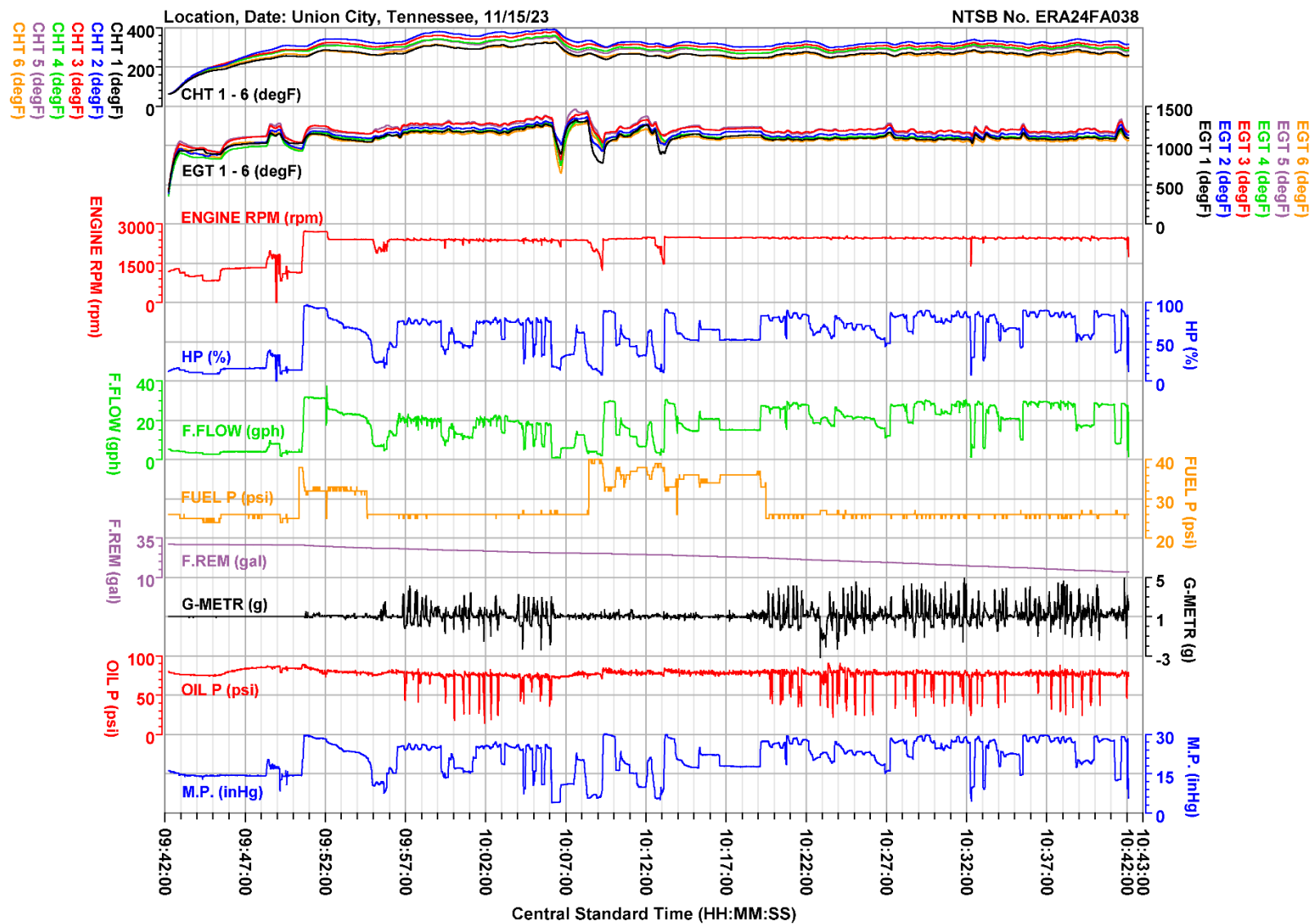


Figure 3. Time history plot of EI MVP-50P parameters for the entire accident flight.

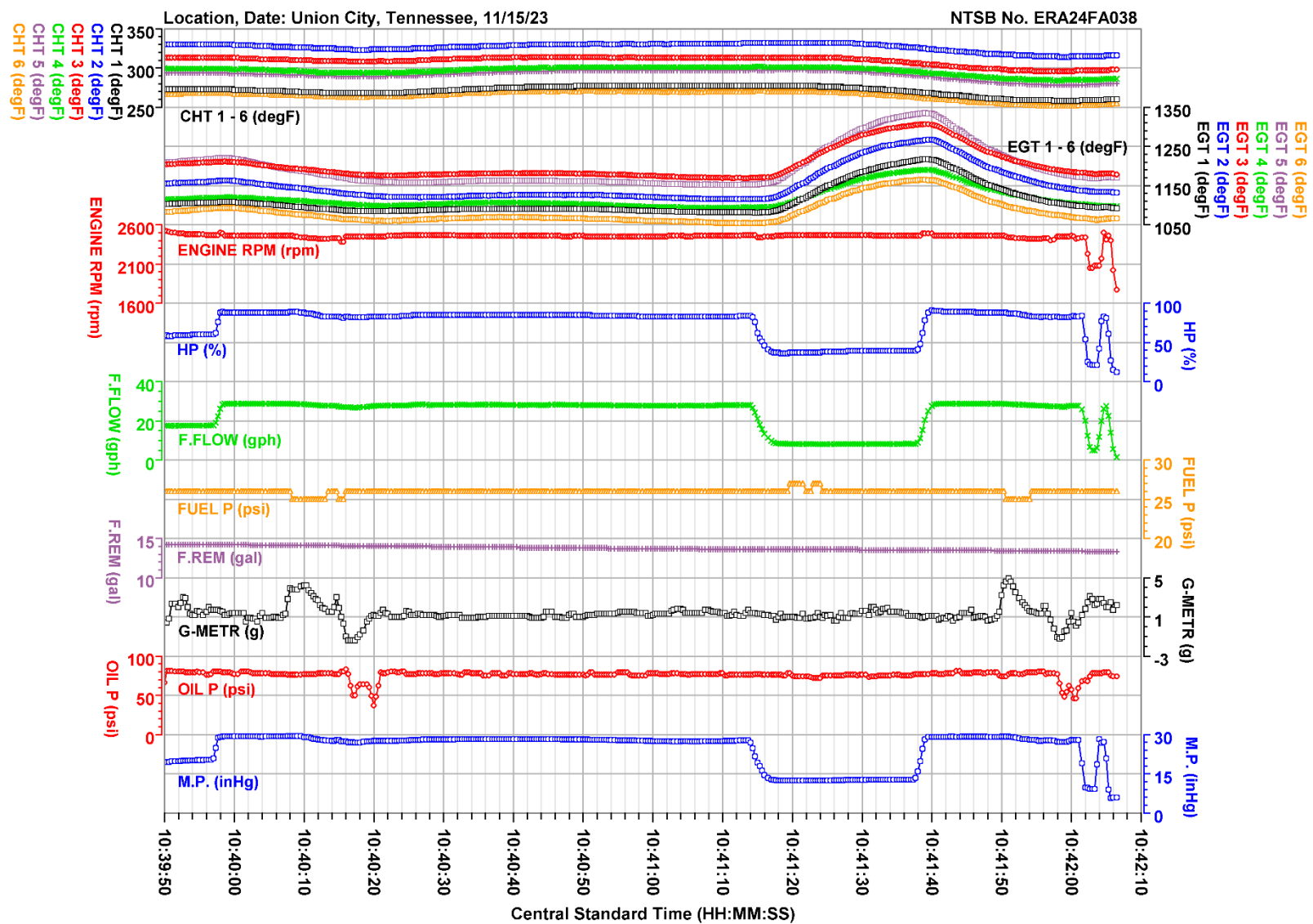


Figure 4. Time history plot of EI MVP-50P parameters for the final 2.3-minute portion of the accident flight.

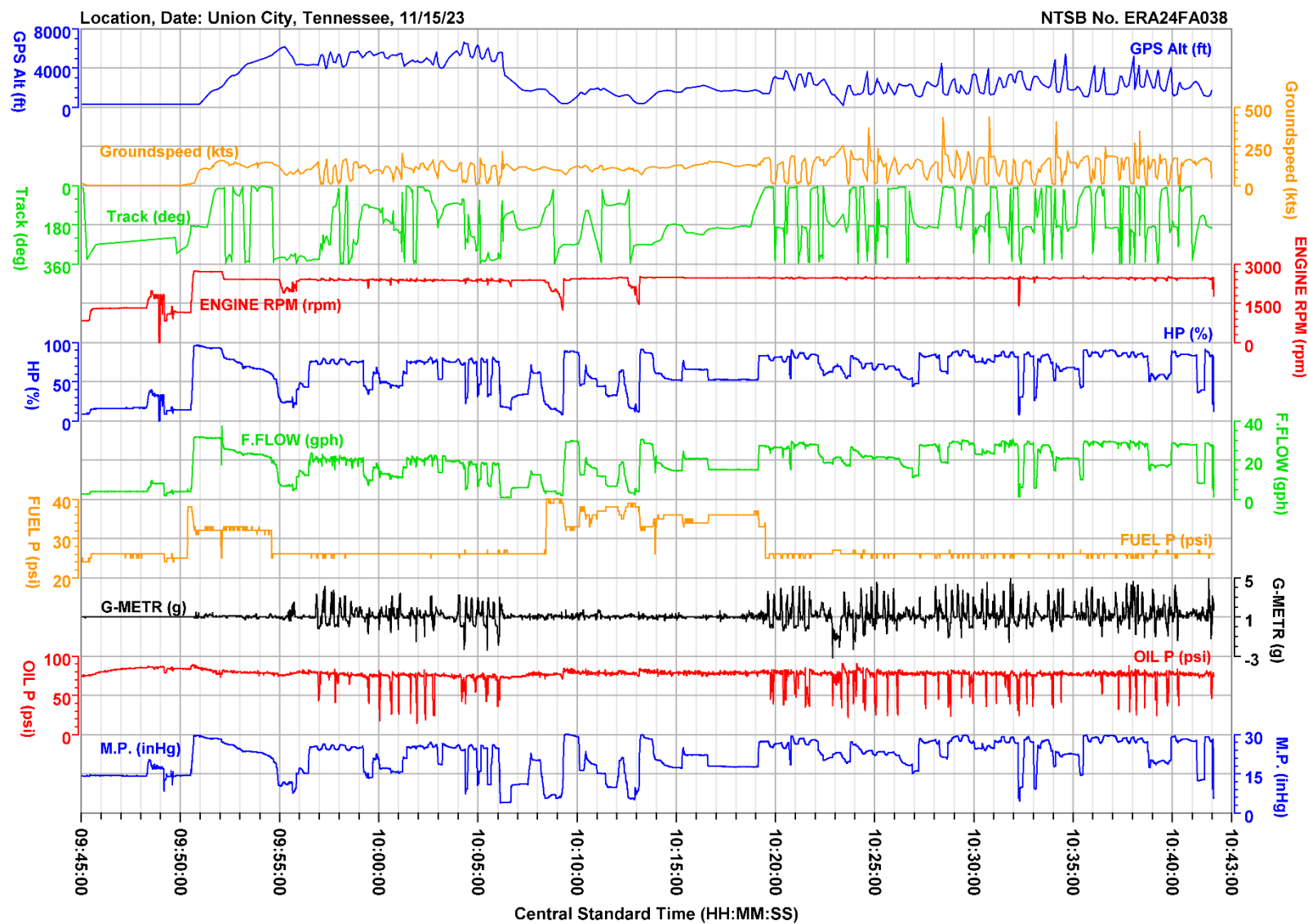


Figure 5. Time history plot of Garmin GPSMAP 695 and EI MVP-50P parameters plotted for the entire accident flight.

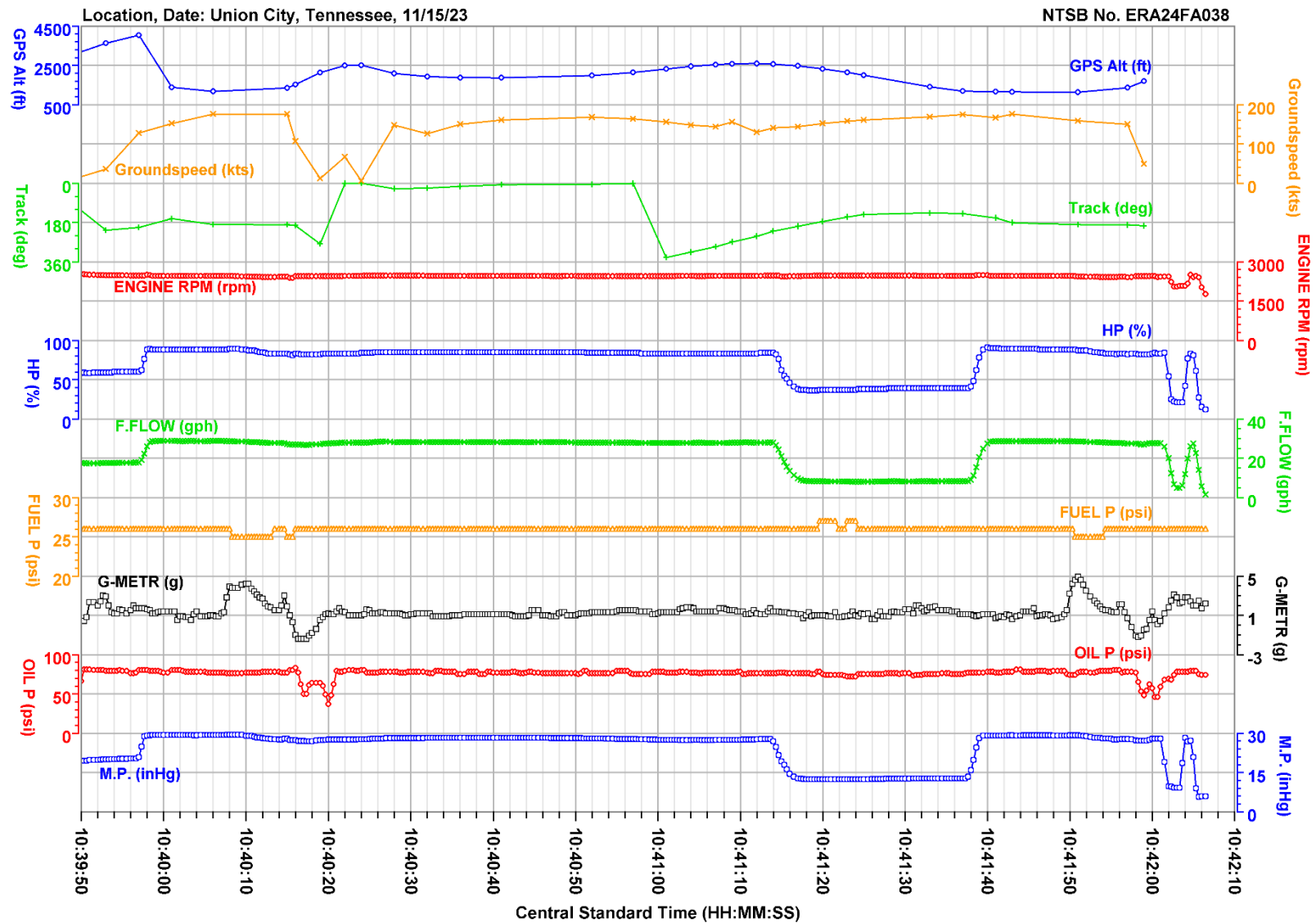


Figure 6. Time history plot of Garmin GPSMAP 695 and EI MVP-50P parameters plotted for the final 2.3-minute portion of the accident flight.

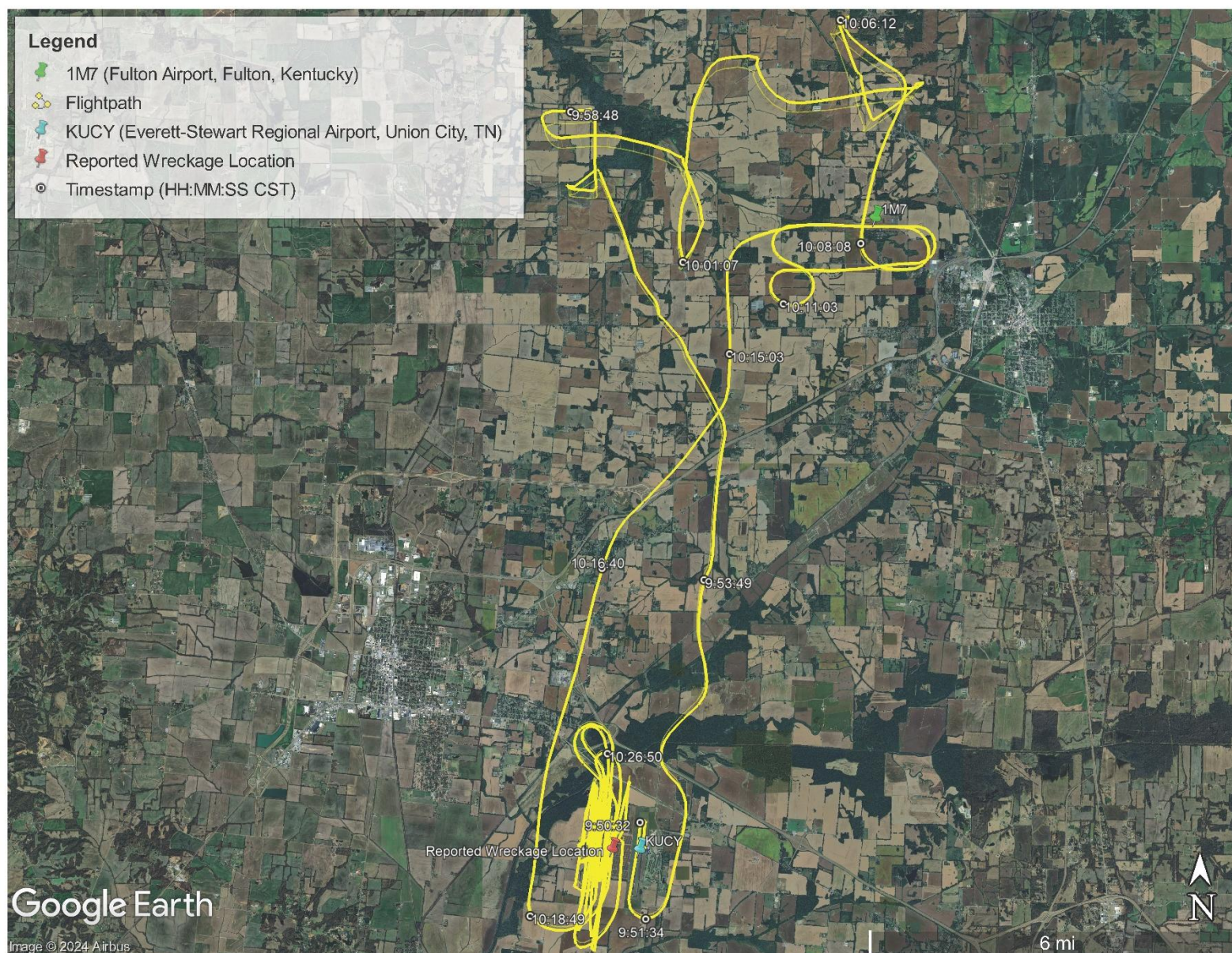


Figure 7. Google Earth overlay of the entire accident flight.



Figure 8. Google Earth overlay of TGL at 1M7 and maneuvers consistent with aerobatic flight.

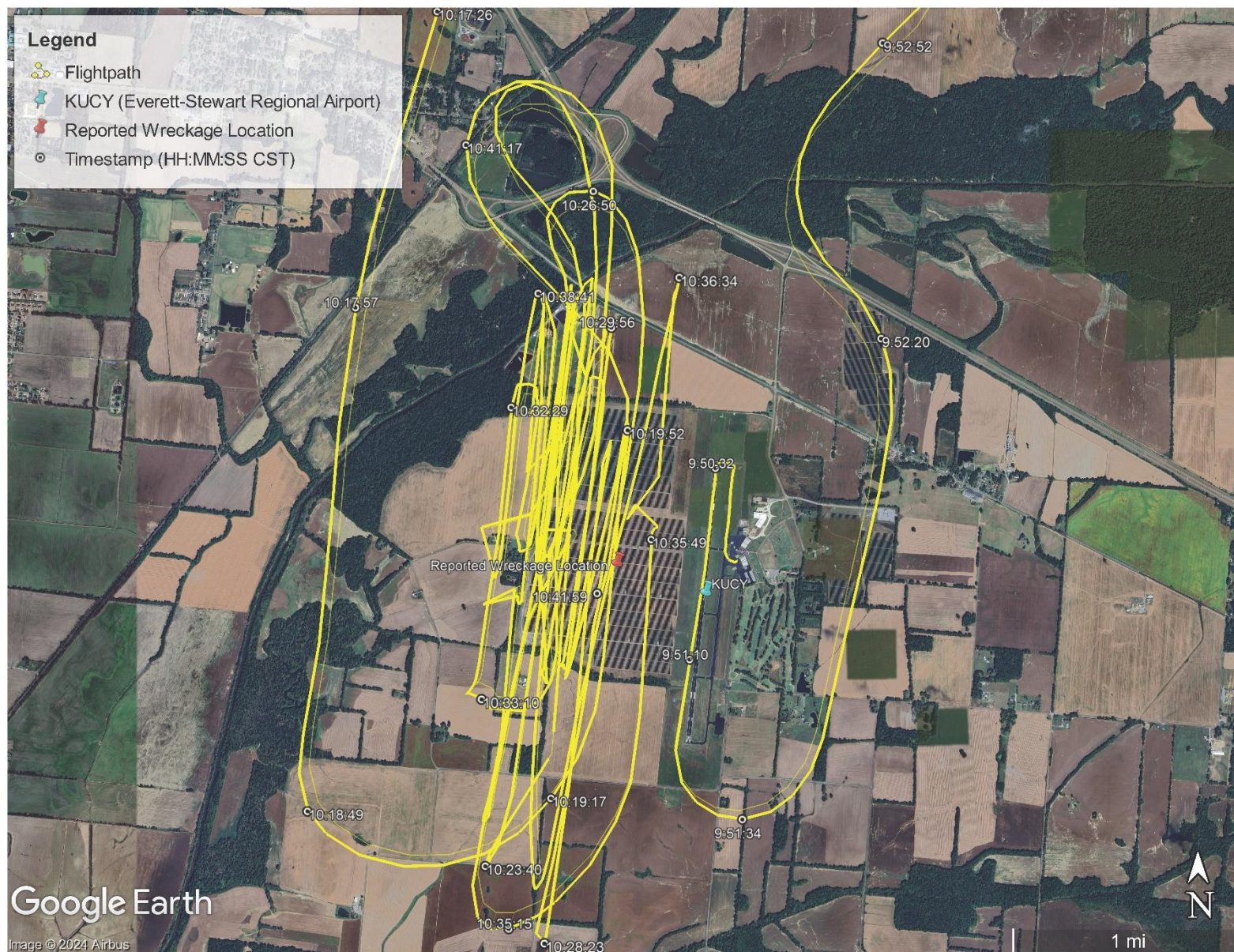


Figure 9. Google Earth overlay of the accident location.

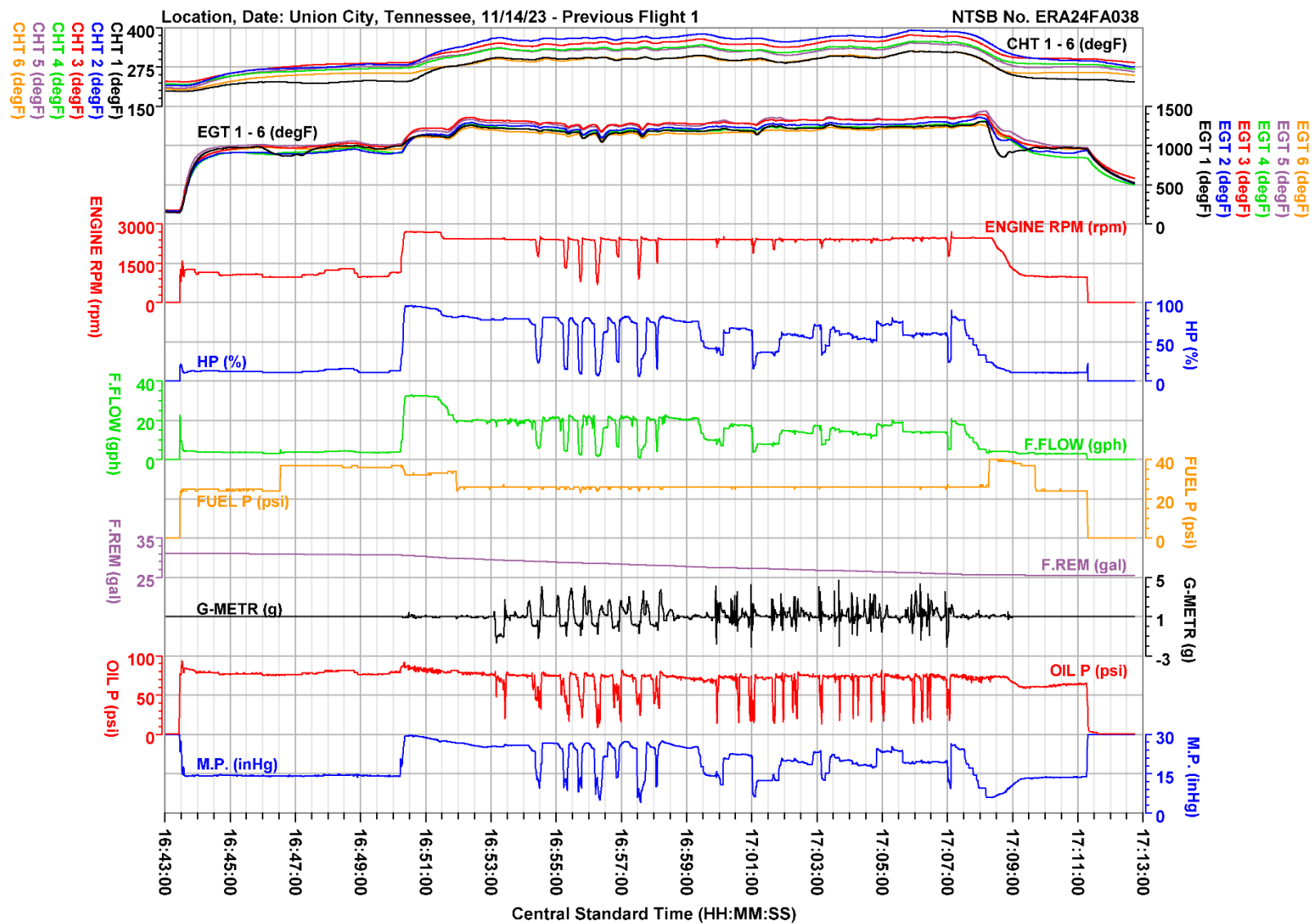


Figure 10. Time history plot of EI MVP-50P parameters for the entire first previous flight.

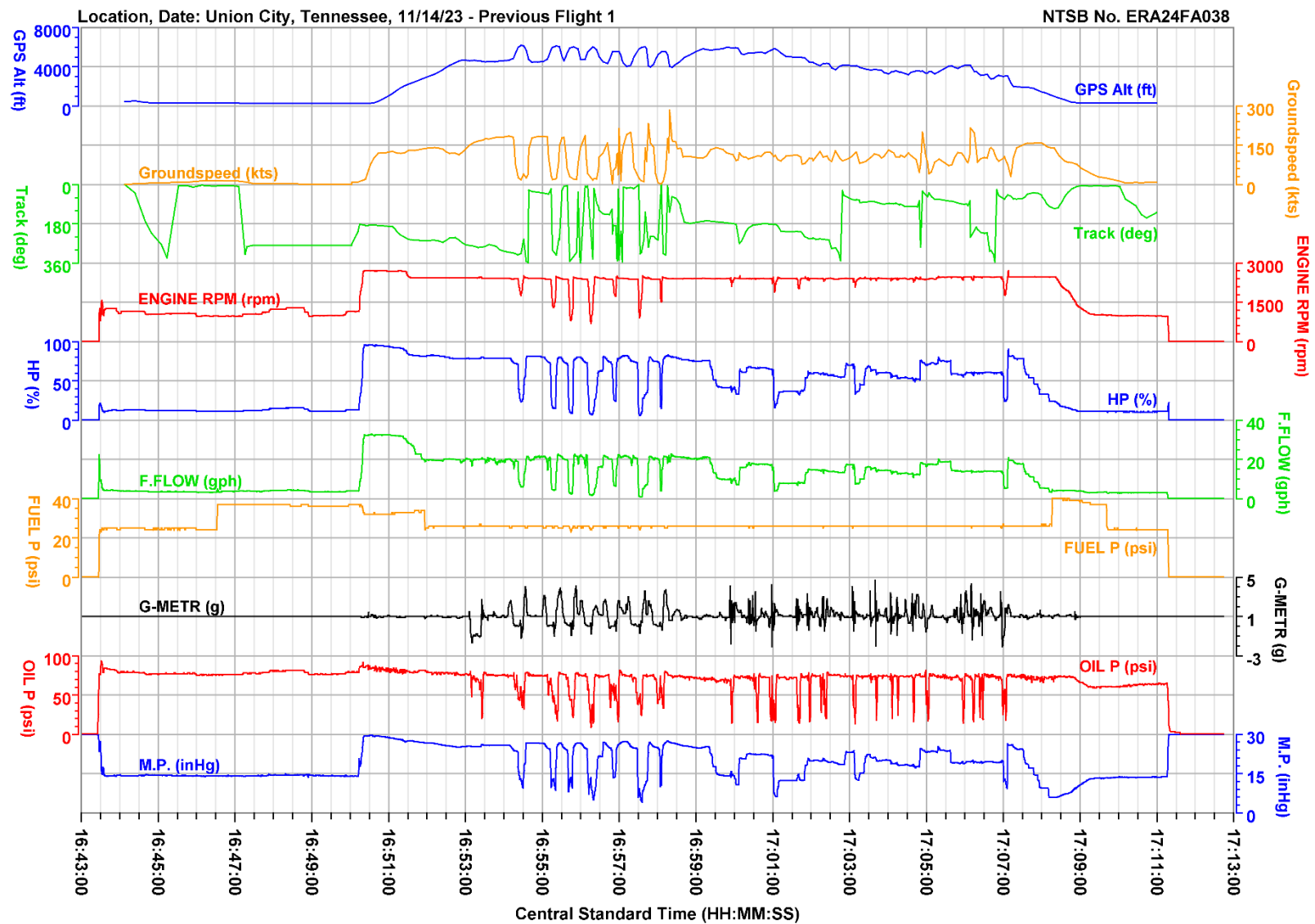


Figure 11. Time history plot of Garmin GPSMAP 695 and EI MVP-50P parameters plotted for the entire first previous flight.

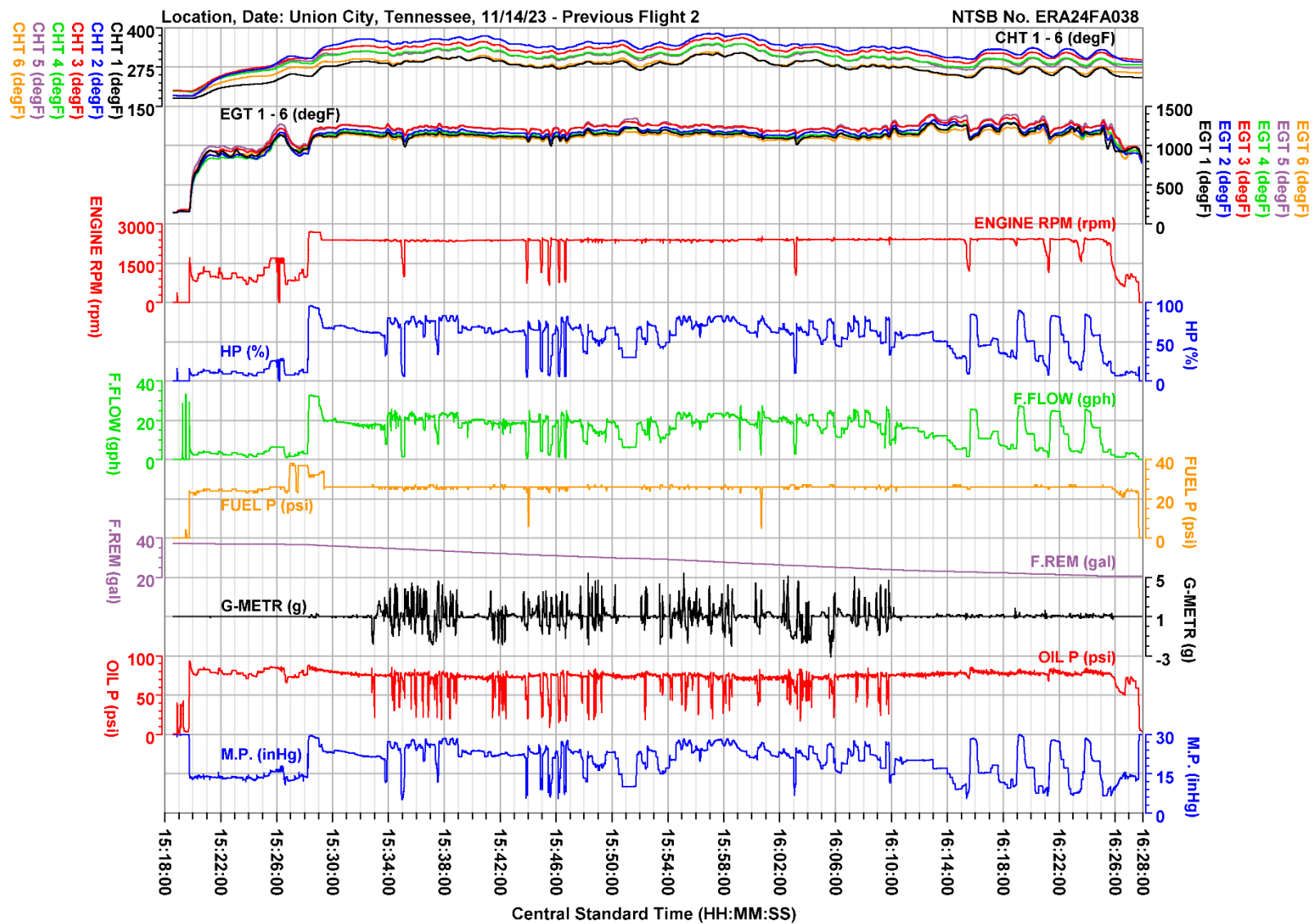


Figure 12. Time history plot of EI MVP-50P parameters for the entire second previous flight.

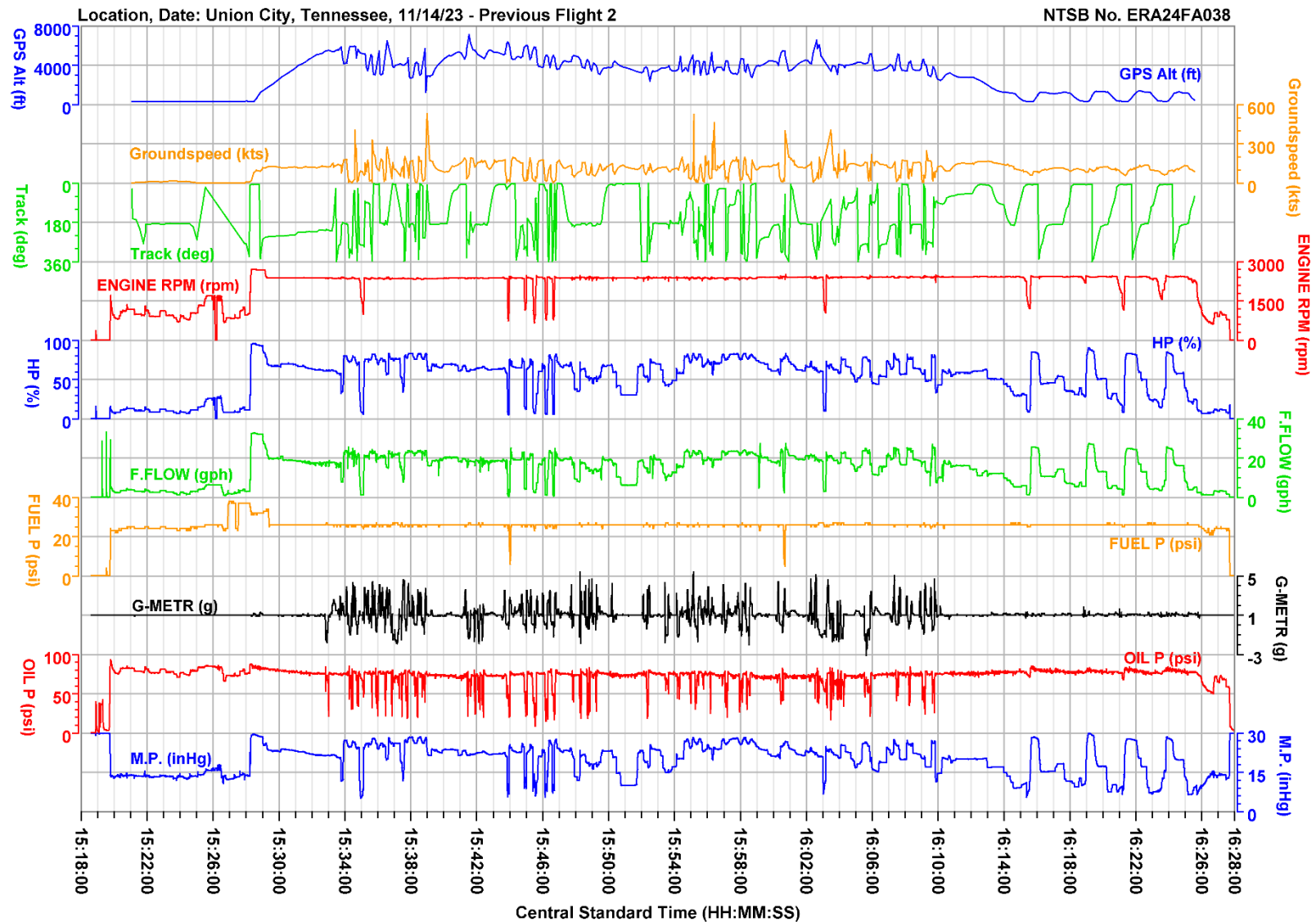


Figure 13. Time history plot of Garmin GPSMAP 695 and EI MVP-50P parameters plotted for the entire second previous flight.