

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22FA376

ELECTRONIC RECORDER DEVICES

Specialist's Factual Report

February 7, 2023

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A. EVENT SUMMARY

Location: Glendora, Mississippi
Date: August 19, 2022
Time: 10:30 central daylight time (CDT)
Airplane: Air Tractor AT-602 (N602PB)

B. ELECTRONIC RECORDER DEVICES SPECIALIST

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C. DETAILS OF THE INVESTIGATION

A recorder group was not convened. The NTSB Vehicle Recorder Division received the following electronic devices:

Recorder Manufacturer/Model:	Satloc M3 Bantam
Recorder Serial Number:	1111-14033-0015
Recorder Manufacturer/Model:	EI MVP-50T
Recorder Serial Number:	162270

1.0 Satloc M3 Bantam - Description

The Satloc M3 Bantam is part of an on-board GPS system designed to programmatically control agricultural, aerial spray operations based on vendor and user specified prescription maps. The Satloc device can drive a cockpit mounted lightbar guidance system and a real-time graphic moving map display providing visual guidance to the pilot. Flow rates can be pilot selected or based on mapping created using a proprietary software package called MapStar that runs on a desktop computer. The Satloc device can record historical information to an internal, compact flash (CF) card or flash drive depending on user configuration.

1.1 Satloc M3 Bantam - Condition and Data Recovery

The Satloc M3 Bantam had sustained minor damage upon arrival at the Vehicle Recorder Division, as shown in figure 1. The internal CF card was recovered from the device, and data were extracted normally from the CF card using laboratory forensic tools.



Figure 1. The Satloc M3 Bantam as received.

1.2 Satloc M3 Bantam - Recording Description

The data extracted from the CF card included 1,548 sessions, from December 4, 2019, to August 19, 2022. There were two sessions recorded on August 19, 2022, the date when the event occurred. The first session included two flights, recorded from 7:40:55 to 8:11:15 CDT. The second session included two flights; the first flight (previous flight) was recorded from 9:12:24 to 9:59:25 CDT, and the second flight, with three minutes and 5 seconds in duration, recorded from 10:02:31 to 10:05:36 CDT, was determined to be related to the event. Table 1 shows a summary of the recordings on the event date. All those recordings are all included in this report. The data were recorded with a sampling rate of approximately 0.5 Hz.

Table 1. Summary of recordings on August 19, 2022, from the Satloc M3 Bantam.

First Recording Session		Second Recording Session	
First Flight	Second Flight	First Flight (previous flight)	Second Flight (event flight)
7:40:55 - 7:58:10	8:01:15 - 8:11:15	9:12:24 - 9:59:25	10:02:31 - 10:05:36

1.2.1 Satloc M3 Bantam - Parameters Provided

Table 2 lists the Satloc M3 Bantam parameters verified and provided in this report.

Table 2. Satloc M3 Bantam data parameters provided.

Parameter Name (unit)	Parameter Description
Alt (ft)	Geometric altitude above mean sea level (feet)
Hdg (deg)	Aircraft heading with reference to magnetic North (degrees)
Lat (deg)	Geographic latitude (degrees)
Lon (deg)	Geographic longitude (degrees)
Speed (kts)	Average groundspeed between current and previous data point (knots)
Spray	Discrete spray status (On or Off)

1.3 Satloc M3 Bantam - Time Correlation

The Satloc M3 Bantam recorded data in CDT, the local time of the event.

2.0 EI MVP-50T - Description

The EI (Electronics International Inc.) MVP-50T 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 for data storage of the parameters recorded and calculated. 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) format on an internal microSD 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-50T assigned sequential flight number.

2.1 EI MVP-50T - Condition and Data Recovery

Figure 2 shows the condition of the EI MVP-50 upon arrival at the Vehicle Recorder Division. The device did not power up. The internal microSD card was recovered, and its data were downloaded using laboratory forensic tools.



Figure 2. The front and back view of the EI MVP-50T as received.

2.2 EI MVP-50T - Recording Description

The data extracted from the internal microSD card included 1,516 sessions, from January 15, 2019, to August 19, 2022. There were two sessions recorded on August 19, 2022, but it did not contain the event flight. The first session included two flights, and the recording matched what were recorded on the Satloc M3 Bantam for those two flights. The second session, which was the last recording session, recorded from 9:11:02 to 10:01:32 CDT, was one completed flight. This completed flight matched the previous flight (the flight before the event flight) recorded on the Satloc M3 Bantam. Table 3 shows a summary of the recordings on the event date. Those recordings are all included in this report. The data were recorded with a sampling rate of approximately 1.7 Hz.

The reason why the event flight, with approximately three minutes of duration, was not recorded could be due to the data buffering mechanism of the EI MVP-50T.

Table 3. Summary of recordings on August 19, 2022, from the EI MVP-50T.

First Recording Session			Second Recording Session
First Flight	Second Flight	Engine Idling	Sole Flight (previous flight)
7:38:53 – 8:00:00	8:02:00 – 8:13:30	8:13:30 – 8:32:02	9:11:02 – 10:01:32

2.2.1 EI MVP-50T - Parameters Provided

Table 4 lists the EI MVP-50T parameters verified and provided in this report.

Table 4. EI MVP-50T data parameters provided.

Parameter Name (unit)	Parameter Description
AMPS (A)	Electric bus current (amperes)
F.FLOW (GPH)	Fuel flow rate (gallons per hour)
FUEL L (GAL)	Fuel quantity at left tank (gallons)
FUEL P (PSI)	Fuel pressure (pounds per square inches)
FUEL R (GAL)	Fuel quantity at right tank (gallons)
HP (HP)	Engine output power (horsepower)
ITT (degF)	Interstage turbine temperature (degrees Fahrenheit)
NG (%)	Engine linearized speed (percentage)
NP (RPM)	Engine rotational speed (revolutions per minutes)
OAT (degF)	Outside air temperature (degrees Fahrenheit)
OIL P (PSI)	Oil pressure (pounds per square inches)
OIL T (degF)	Oil temperature (degrees Fahrenheit)
TORQ (FT-LB)	Engine output torque (foot-pounds)
VOLTS (V)	Electric bus voltage (volts)

2.3 EI MVP-50T - Time Correlation

The EI MVP-50T recorded data in CDT, the local time of the event.

D. FIGURES AND TABULAR DATA

Figures 3 to 9 contain data recorded on the Satloc M3 Bantam on the event day, August 19, 2022. Figures 10 and 11 contain data recorded on the EI MVP-50T on the event date.

Figure 3 shows a plot of GPS data parameters of the first recording session from the Satloc M3 Bantam on the event date. Figure 4 shows a plot of GPS data parameters of the second recording session on the event date. Figures 5 and 6 show plots of GPS data parameters of the previous flight and event flight from the second recording session, respectively.

Figures 7 to 9 show Google Earth overlays of the previous flight and event flight. Figure 8 shows Google Earth overlays of the event flight. Figure 9 shows Google Earth overlays of the final portion of the event 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 10 shows a plot of engine data parameters of the first recording session from the EI MVP-50T on the event date. Figure 11 shows a plot of engine data parameters of the second recording session – the previous flight.

The corresponding tabular data used to create figures 3 to 11 are provided in electronic comma-separated value (CSV) format to this report. Attachments 1 and 2 are the first and second recording sessions from the Satloc M3 Bantam – GPS device, respective. Attachments 3 and 4 are the first and second recording sessions from the EI MVP-50T – engine monitor, respectively.

Submitted by:

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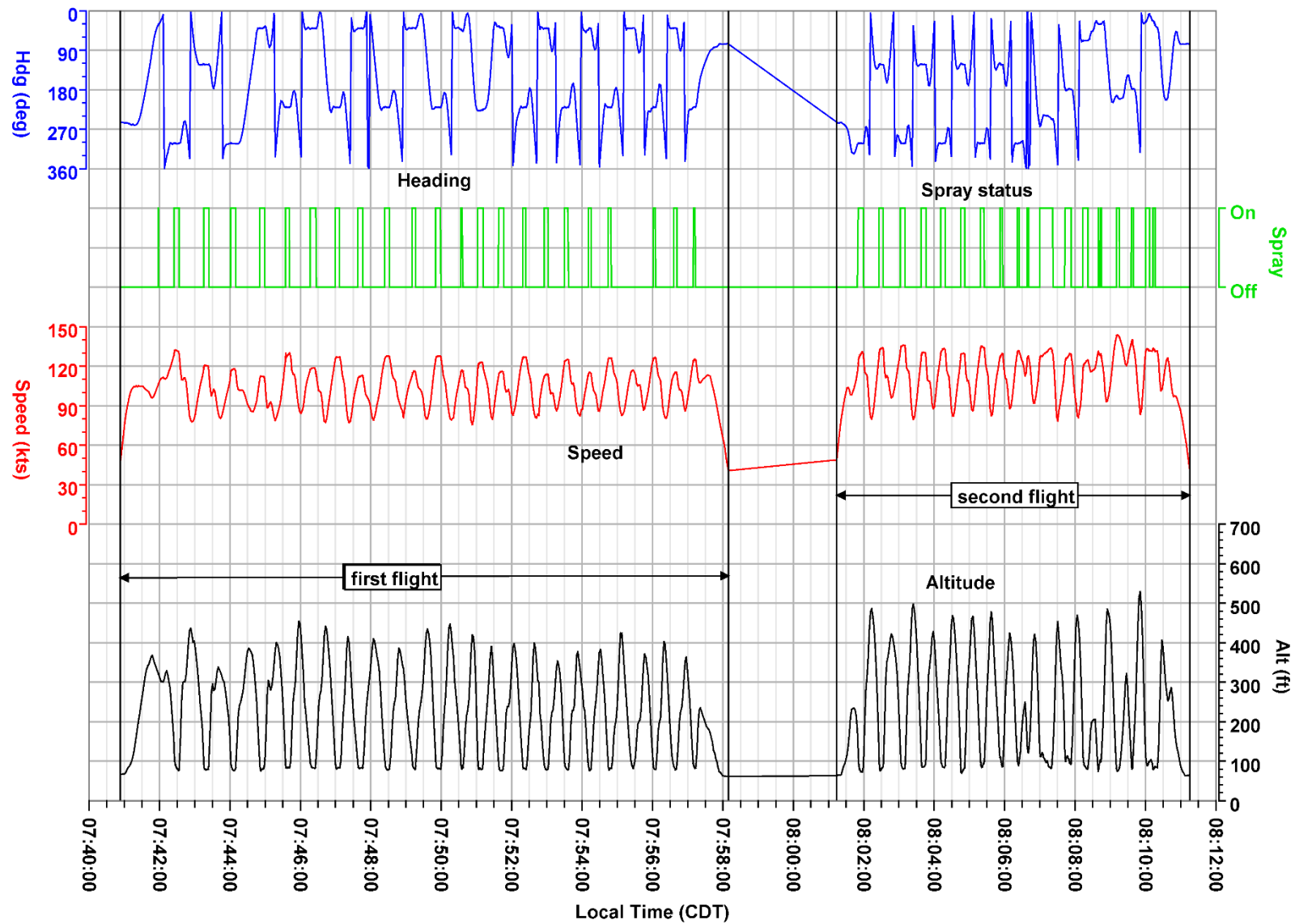


Figure 3. Plot of data parameters of the first recording session on the event date from the Satloc M3 Bantam.

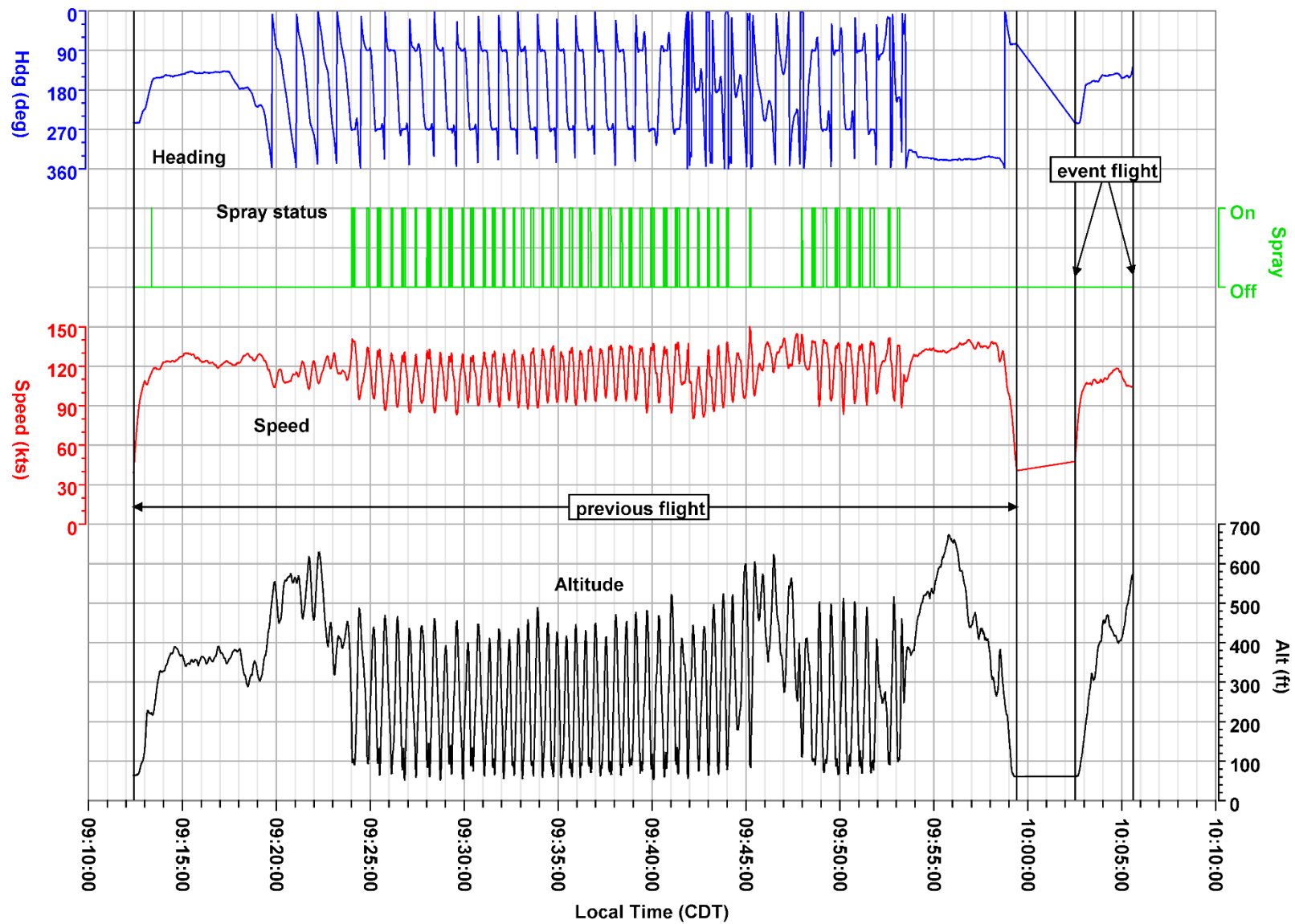


Figure 4. Plot of data parameters of the second recording session from the Satloc M3 Bantam including the previous flight and event flight.

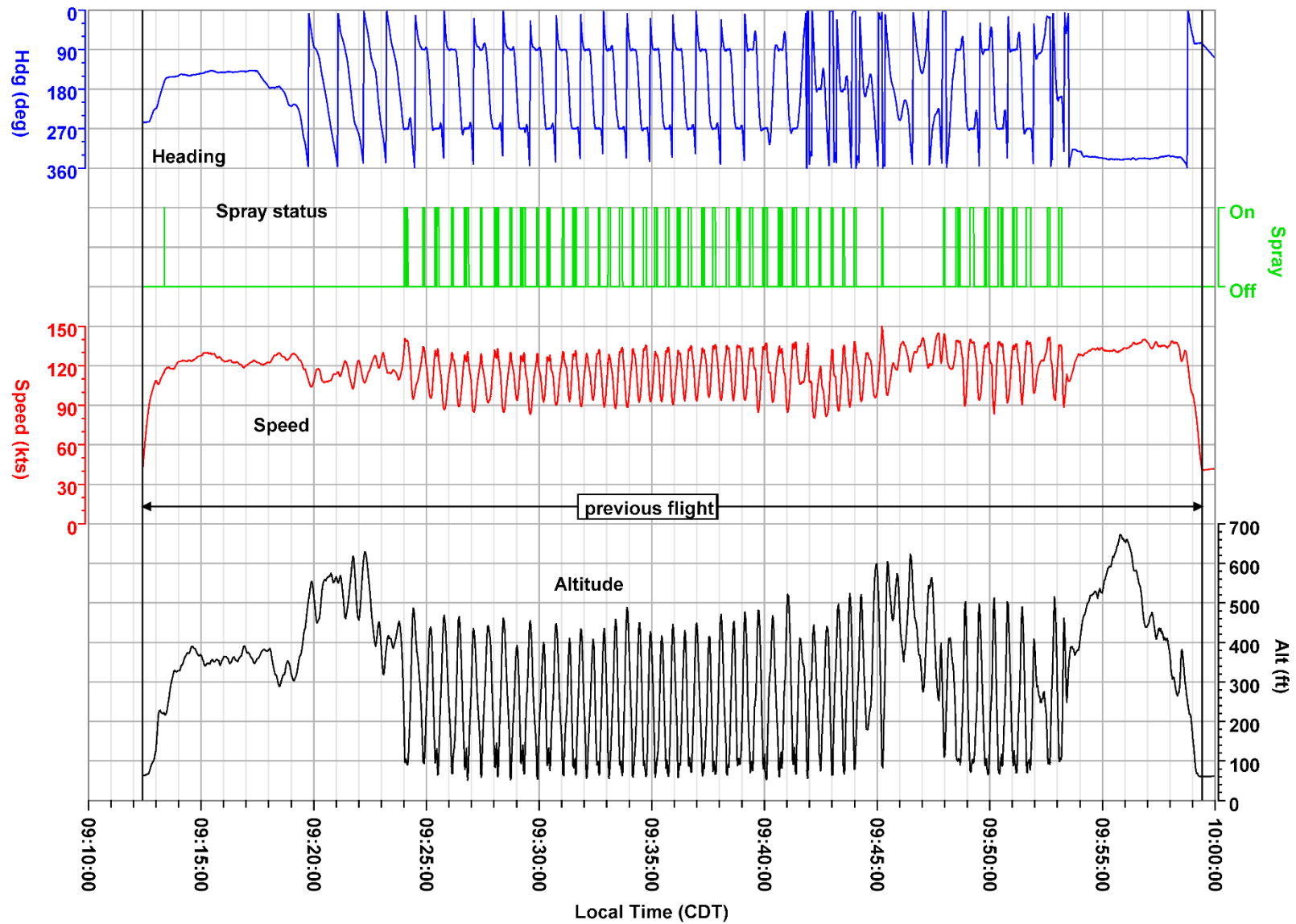


Figure 5. Plot of data parameters of the second recording session from the Satloc M3 Bantam showing only the previous flight.

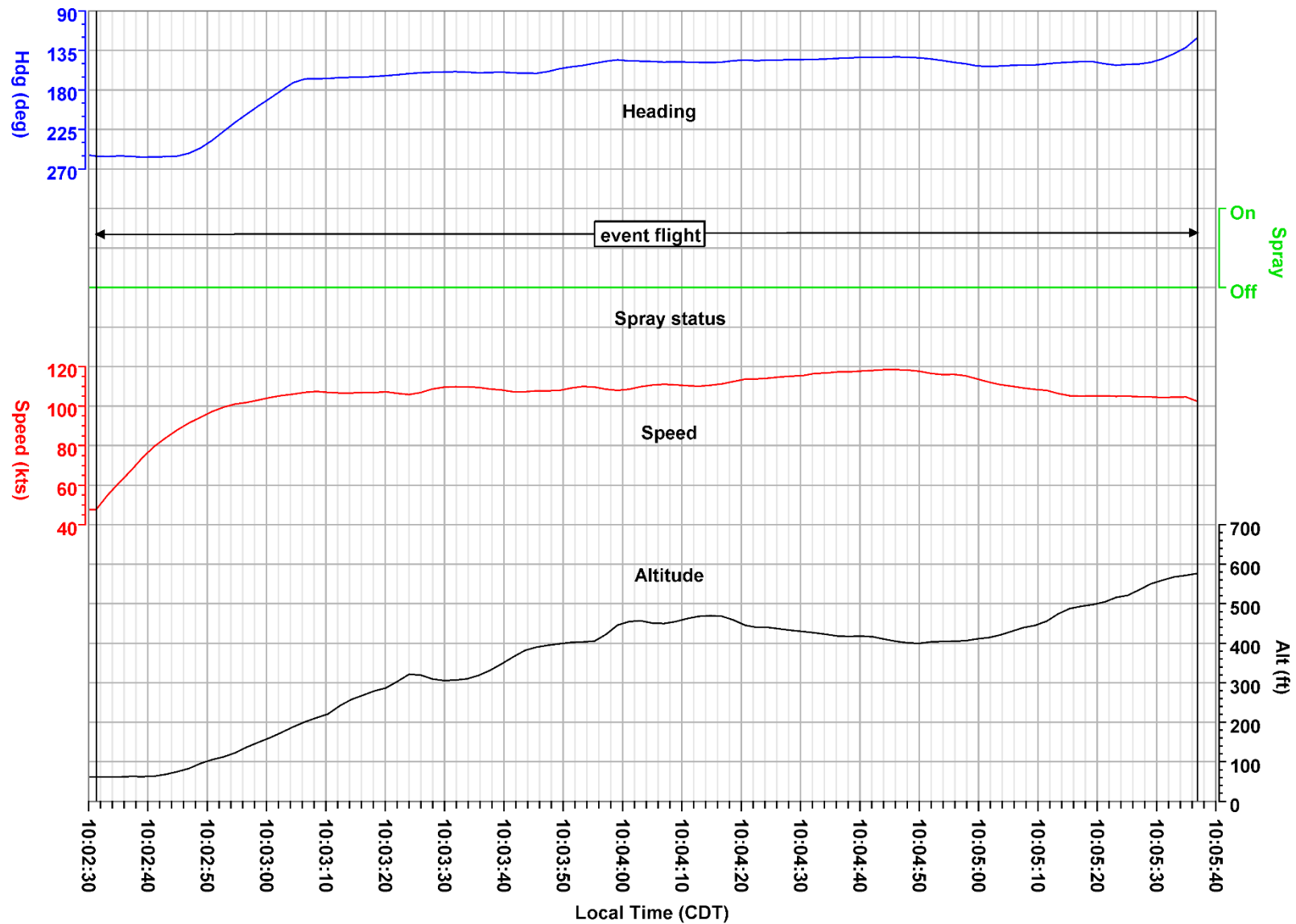


Figure 6. Plot of data parameters of the second recording session from the Satloc M3 Bantam showing only the event flight.

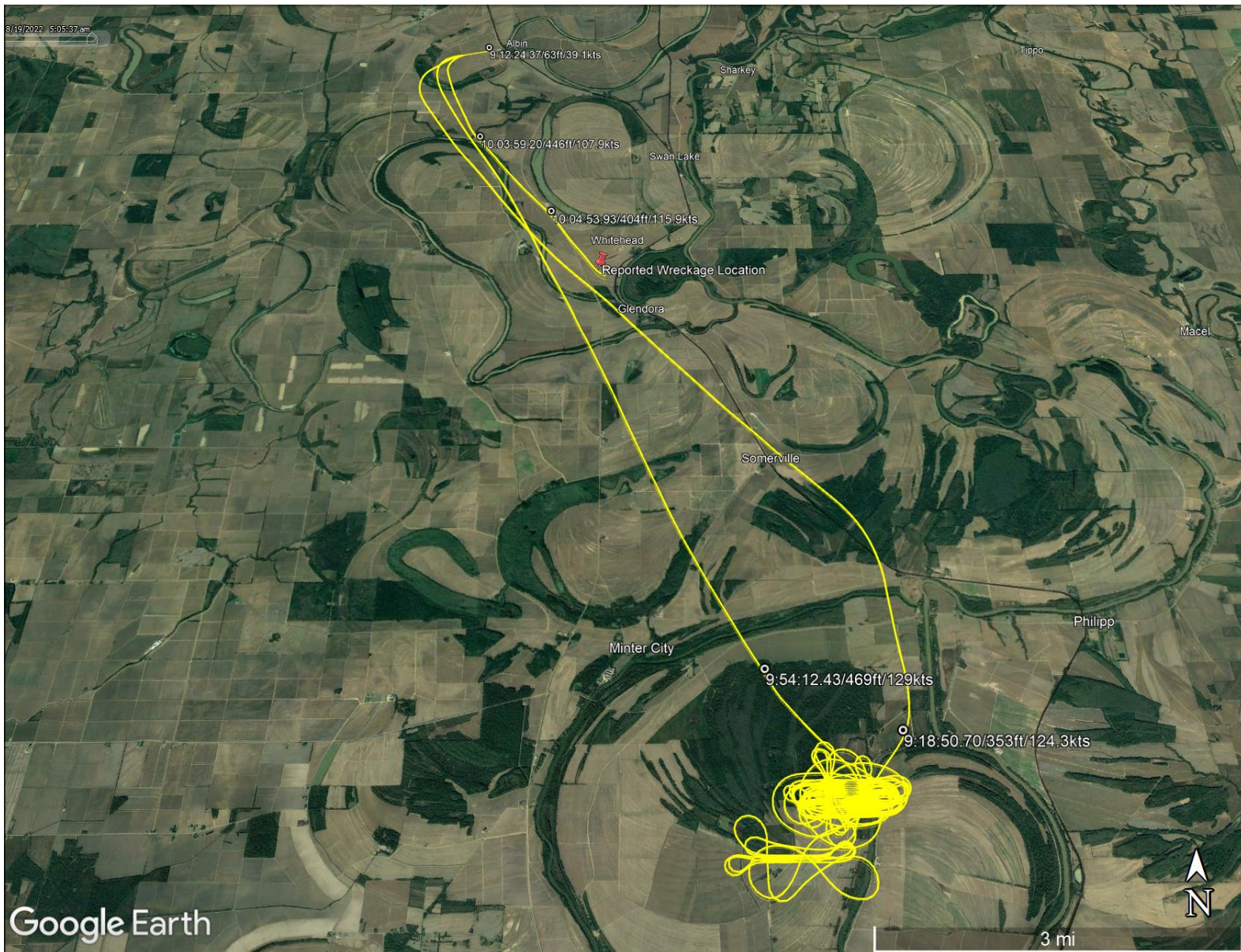


Figure 7. Google Earth overlay of the second recording session from the Satloc M3 Bantam including the previous flight and event flight.



Figure 8. Google Earth overlay of the recording session from the Satloc M3 Bantam showing the event flight portion.



Figure 9. Google Earth overlay of the recording session from the Satloc M3 Bantam showing the final portion of the event flight.

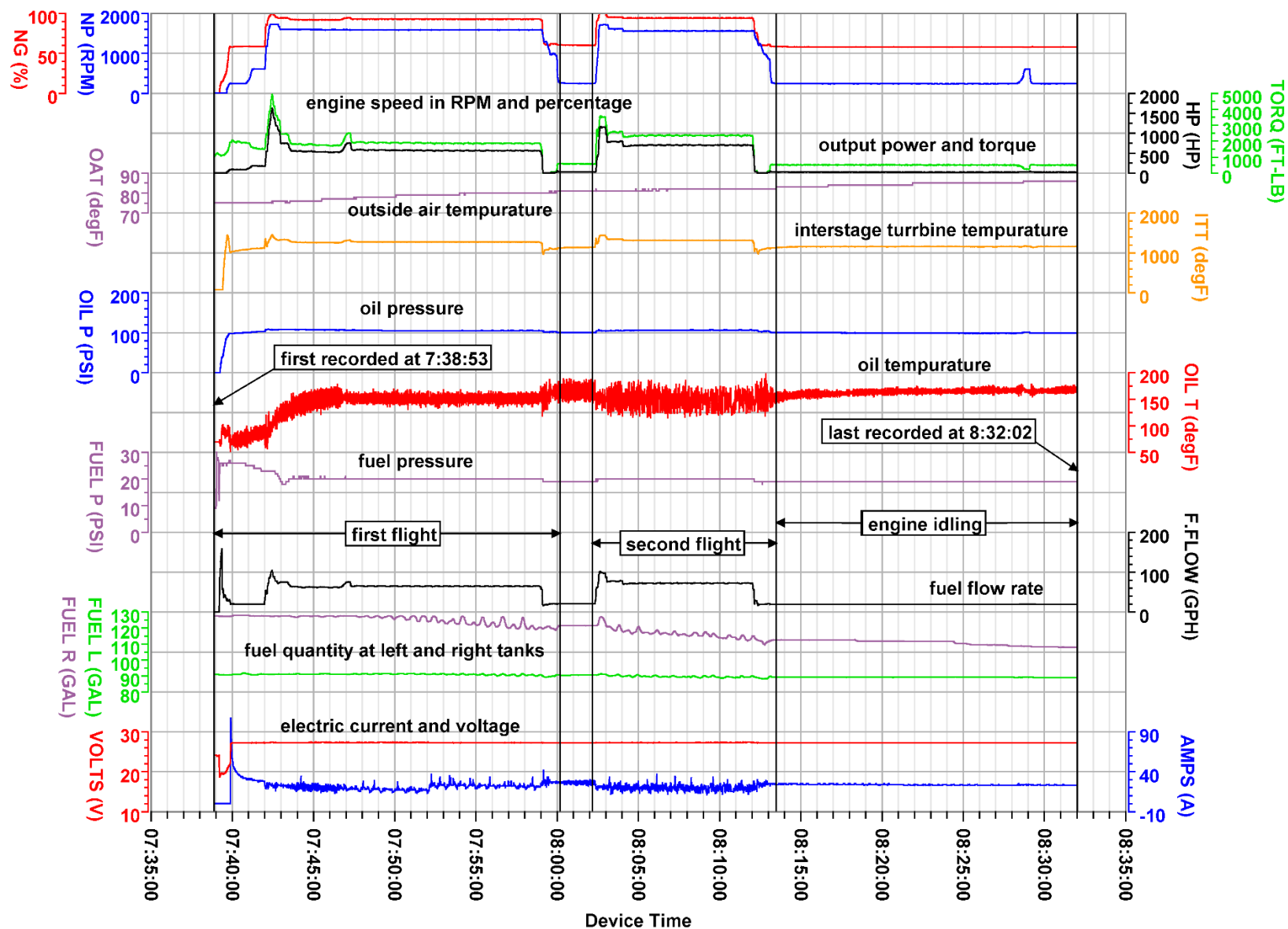


Figure 10. Plot of data parameters of the first recording session on the event date from the EI MVP-50T.

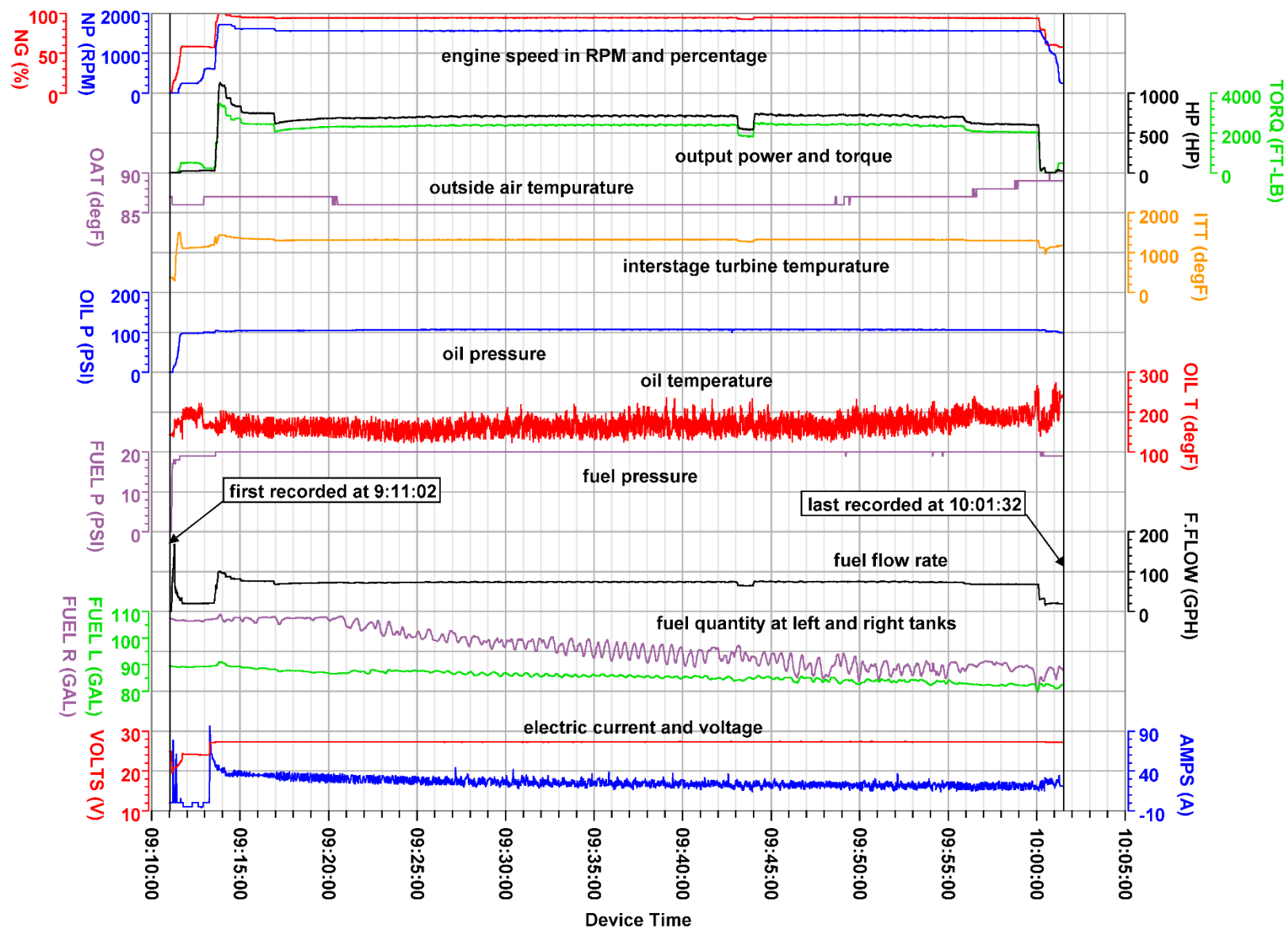


Figure 11. Plot of data parameters of the second recording session on the event date from the EI MVP-50T showing the previous flight.