

National Transportation Safety Board

Office of Research and Engineering

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ERA22FA405

ELECTRONIC DEVICES

Specialist's Factual Report

August 1, 2024

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A. ACCIDENT

Location: Hartwell, Georgia
Date: September 10, 2022
Time: 1237 eastern daylight time (EDT)
1637 coordinated universal time (UTC)
Airplane: Beech 95-B55, N3670D

B. ELECTRONIC DEVICES SPECIALIST

Specialist Michael Portman
Sr. Aerospace Engineer – Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

An electronic devices group was not convened.

The NTSB Vehicle Recorder Division received the following electronic devices:

Recorder Manufacturer/Model: Garmin GTN 750
Part Number: Unknown
Recorder Serial Number: Unknown

Recorder Manufacturer/Model: JPI EDM 790
Part Number: 760000
Recorder Serial Number: 06907

1.0 Garmin GTN 750 Description

The Garmin GTN 750 is a panel-mounted GPS receiver featuring a 6.9-inch color liquid crystal (LCD) display. It has a GPS/SBAS engine and is TSO-C146c certified for primary domestic, oceanic, and remote navigation including en route, terminal, and non-precision approaches, and approaches with vertical guidance, such as LPV and LNA/VNAV. The unit can simultaneously display approach information and weather and traffic data in relation to their position on a large, color moving map display. Its color moving map features a built-in database that shows cities, highways, railroads, rivers, lakes, and coastlines. The unit has a slot on the front for purchased electronic databases containing all airports, VORs, NDBs, Intersections, FSSs, Approaches, DPs/STARs and SUA information. A flight plan composed of multiple waypoints, including user-defined waypoints, can be programmed in the unit. The GTN 750 also includes a TSO approved airborne VHF communications transceiver and TSO approved airborne VOR/Localizer and Glideslope receivers. The unit contains an internal SD card storing flight log data, which can be accessed through the slot in the right side of the unit. If the unit is equipped

with a firmware v6.50 or later, the internal SD card will store a limited set of flight data information.

1.1 Garmin GTN 750 Data Recovery

An SD card was retrieved from the accident site and was received by the Vehicle Recorder lab in good condition. The data were downloaded using the manufacturer's procedure. Review of the recovered data determined that this SD card was the supplemental data card, which contains navigation information, but does not store flight data. No other cards were recovered from the site. Therefore, no investigation pertinent data were recovered from this device.

2.0 EDM

2.1 EDM 790 Description

The J. P. Instruments EDM-790 is a panel mounted gauge that the operator can monitor and record up to 24 parameters related to twin engine operations. Depending on the installation engine parameters monitored, for both engines, can include:

- Exhaust Gas Temperature (EGT)
- Cylinder Head Temperature (CHT)
- Oil Pressure and Temperature
- Manifold Pressure
- Outside Air Temperature
- Turbine inlet Temperature
- Engine Revolutions per Minute
- Compressor Discharge Temperature
- Fuel Flow
- Carburetor Temperature
- Battery Voltage

The unit can also calculate, in real-time, horsepower, fuel used, shock cooling rate and EGT differentials between the highest and lowest cylinder temperatures. The calculations are also based on the aircraft installation.

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 from 2 to 500 seconds per sample. The memory can store up to 20 hours of

data at a 6 second sample rate. The data can then be downloaded by the operator using the J.P. Instruments software.

2.2 EDM Data Recovery

The EDM was in good condition and the data were downloaded using the manufacturer's procedure.

2.3 EDM Data Description

The EDM recording contained 147 recordings between September 26, 2020, and September 10, 2022. The event flight was the last flight of the recording, and its duration was approximately 3 hours and 7 minutes. In addition to the engine parameters, the unit also recorded GPS altitude, position, and ground speed.

2.3.1 EDM Engineering Unit Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM.

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

2.4 EDM Time Correlation

The EDM records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. Correlation of the EDM data to the event local time, EDT, was established by comparing the recorded altitude to ADS-B data, which was recorded in UTC, and applying an offset. Therefore, for the rest of this report, all times are referenced as EDT, not recorded time.

D. FIGURES AND TABULAR DATA

Figures 1 to 5 contain EDM data recorded during the event on September 10, 2022. All the parameters listed in table 1 are plotted.

Figures 1, 2, and 3 show EDM data for the entire flight, descent portion of the flight, and final approximately seven minutes of the flight, respectively. Figures 4 and 5 are graphical overlays of the flight track for the entire flight and final portion of the flight, respectively. The graphical map overlays were 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.

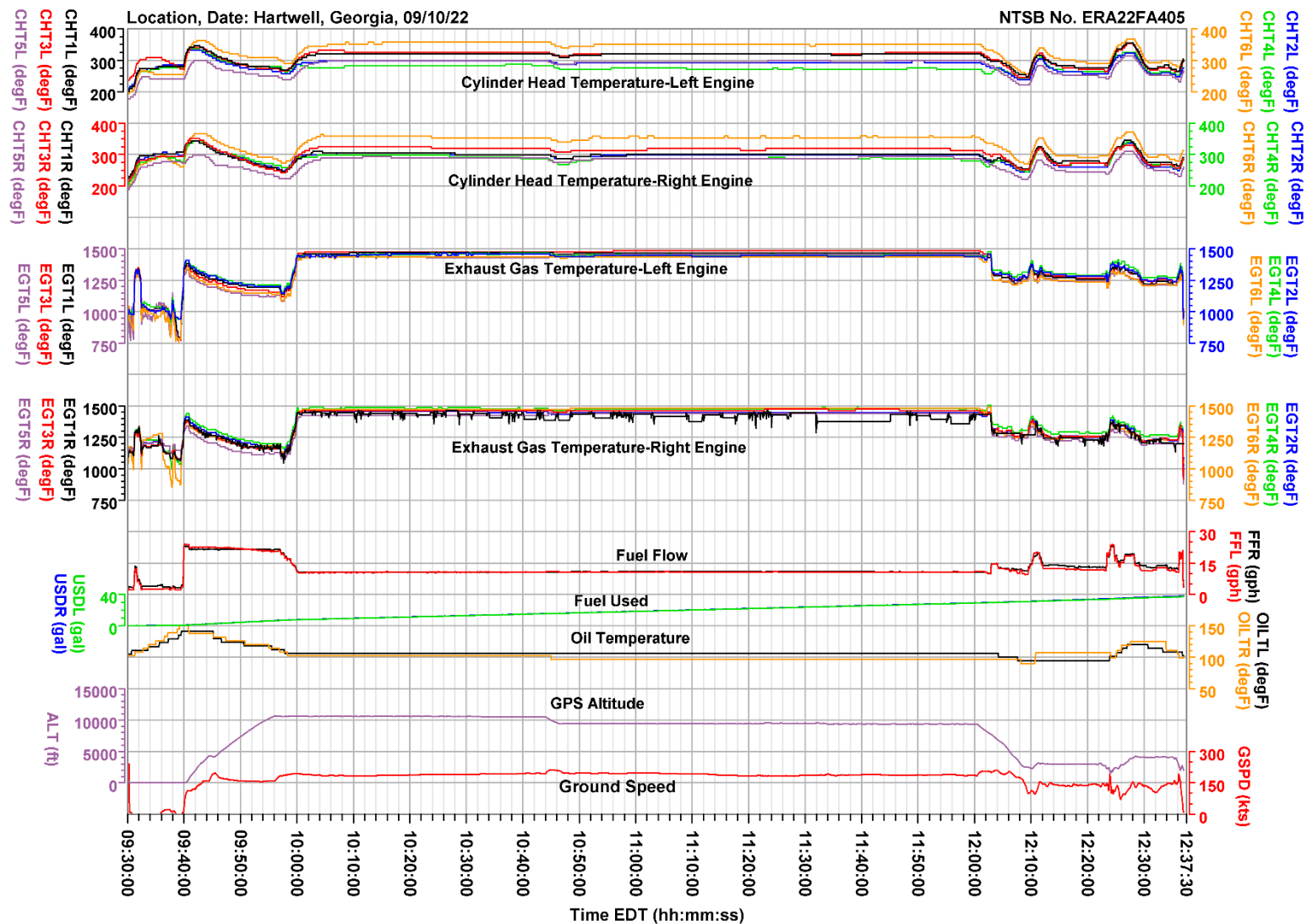
The EDM showed an increase in GPS altitude, consistent with takeoff, at approximately 09:40. The aircraft began descending at approximately 12:00, to an altitude of approximately 2,500 ft during its initial approach, before climbing back to

3,000 ft. The aircraft descended again to approximately 1,600 ft before climbing back to 4,000 ft. The aircraft's final recorded descent began at 12:35:45. The recording ended at 12:37:05. No engine abnormalities were noted.

The corresponding tabular data used to create figures 1 to 5 are provided in electronic comma separated value (CSV) format as attachment 1 to this report.

Submitted by:

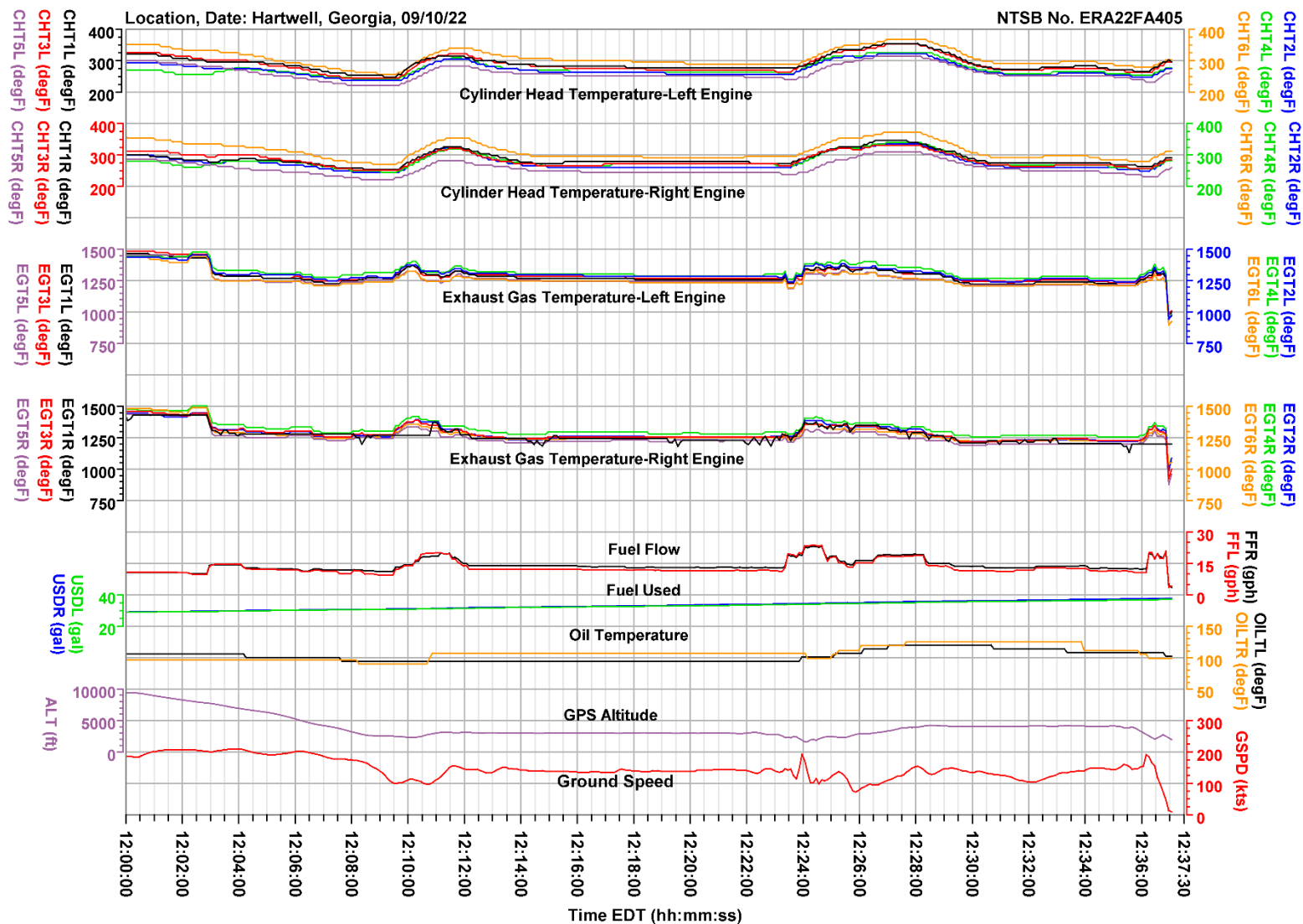
Michael Portman
Senior Aerospace Engineer – Recorder Specialist



Private, Beech 95-B55, N3670D

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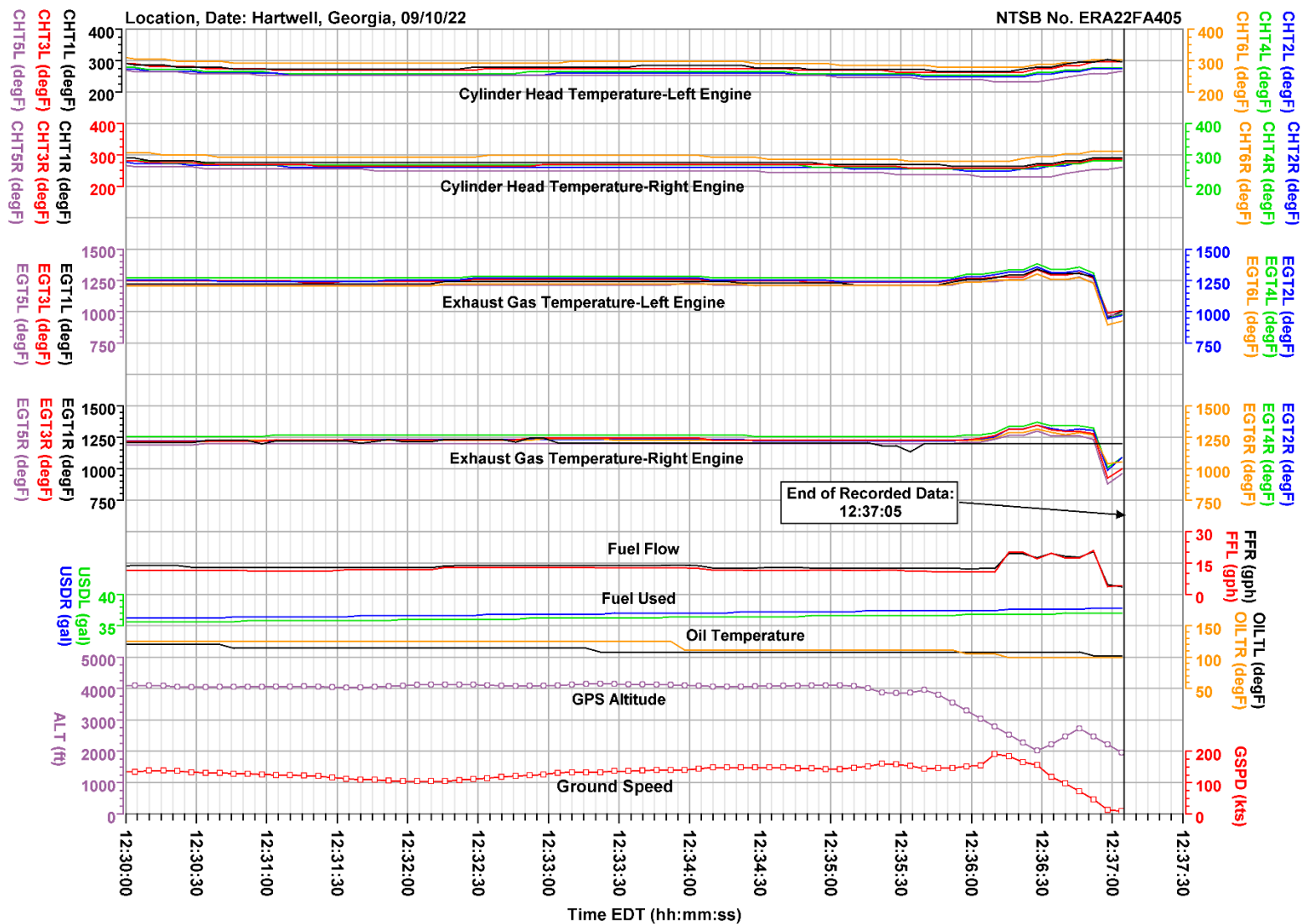
Figure 1. Plot of EDM parameters for the entire flight.



Private, Beech 95-B55, N3670D

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Figure 2. Plot of EDM parameters during the descent portion of the flight.



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Figure 3. Plot of EDM parameters during the final seven minutes of the flight.

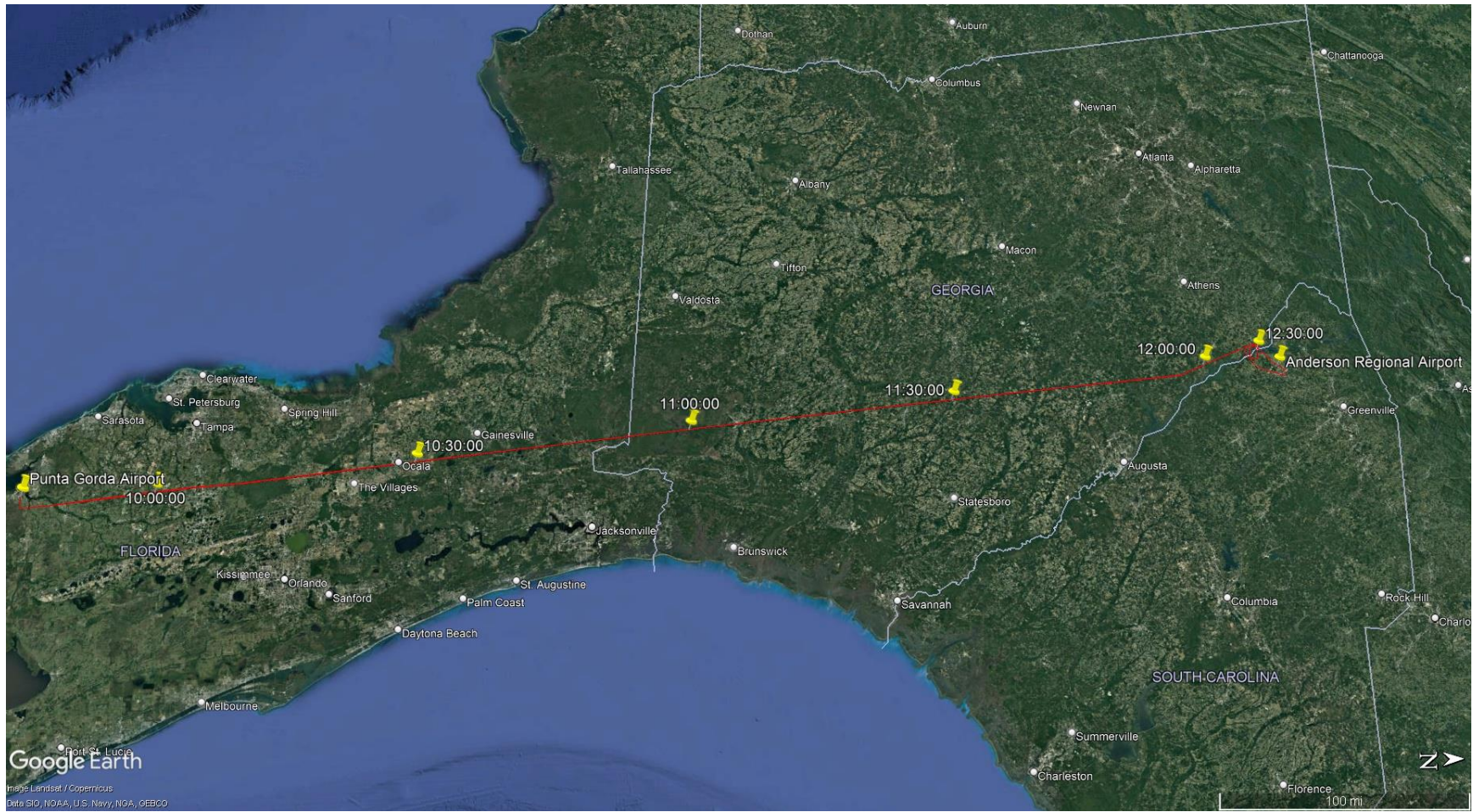


Figure 4. Overview of the flight path in Google Earth.



Figure 5. Final portion of the flight in Google Earth.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

This appendix describes the parameters provided and verified in this report. Table 1 lists the parameters and table 2 describes the unit abbreviations used in this report.

Table 1. Verified and provided parameters.

Parameter Name	Parameter Description
ALT (ft)	GPS Altitude
CHT#L (degF)	Left Cylinder Head Temperature Cylinder # ¹
CHT#R (degF)	Right Cylinder Head Temperature Cylinder # ¹
EGT#L (degF)	Left Exhaust Gas Temperature Cylinder # ¹
EGT#R (degF)	Right Exhaust Gas Temperature Cylinder # ¹
FFL (gph)	Left Engine Fuel Flow
FFR (gph)	Right Engine Fuel Flow
GSPD (kts)	Ground Speed
LAT (deg)	Latitude Position
LON (deg)	Longitude Position
OILTL (degF)	Left Engine Oil Temperature
OILTR (degF)	Right Engine Oil Temperature
USDL (gal)	Left Engine Fuel Used
USDR (gal)	Right Engine Fuel Used

Table 2. Unit abbreviations.

Unit Abbreviations	Descriptions
deg	degrees
degF	Degrees Fahrenheit
ft	feet
gal	gallons
gph	gallons per hour
kts	knots

¹ Depending on aircraft configuration number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.