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

August 26, 2015

# Electronic Devices

**Specialist's Factual Report**
**by George Haralampopoulos**

## EVENT

| | |
|---|---|
| Location: | Gasport, New York |
| Date: | July 5, 2014 |
| Aircraft: | Flight Design GmbH CT-SW |
| Registration: | N508CT |
| Operator: | Private |
| NTSB Number: | ERA14LA329 |

## 1. SUMMARY

On July 5, 2014, about 1104 eastern daylight time, a Flight Design GMBH CT-SW 2006, N508CT, collided with trees then the ground shortly after takeoff from Royalton Airport, Gasport, New York. The private rated pilot, the sole occupant was fatally injured, and the airplane was substantially damaged. The airplane was registered to and operated by a private individual under the provisions of 14 Code of Federal Regulations (CFR) Part 91 as a personal, local flight. Visual meteorological conditions prevailed at the time and no flight plan was filed. The flight was originating at the time of the occurrence.

## 2. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following devices:

| | |
|---|---|
| GPS Manufacturer/Model: | Garmin GPSMAP 396 |
| Serial Number: | 28206565 |
| | |
| Engine Data Monitor Manufacturer/Model: | Rotax FLYdat |
| Serial Number: | 06.0234 |

### 2.1 Garmin GPSMAP 396 Device Description

The Garmin GPSMAP 396 is a battery-powered portable 12-channel GPS receiver with a 256-color TFT LCD display screen. The unit includes a built-in Jeppesen database

and is capable of receiving XM satellite radio for flight information. The unit stores date, route-of-flight, and flight-time information for up to 50 flights. A flight record is triggered when groundspeed exceeds 30 knots and altitude exceeds 250 feet, and ends when groundspeed drops below 30 knots for 10 minutes or more.

A detailed tracklog – including latitude, longitude, date, time, and GPS altitude information for an unspecified number of points – is stored within the unit whenever the receiver has a lock on the GPS navigation signal. Position is updated within the tracklog as a function of time or distance moved, depending on how the unit has been configured. Once the current tracklog memory becomes full, new information either overwrites the oldest information or recording stops, depending on how the unit is configured.

Tracklog storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile memory[1] and can be downloaded to a PC.

### 2.1.1 Garmin GPSMAP 396 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed no noticeable damage to the device (figure 1). The unit was powered on normally and the memory was downloaded using the device manufacturer's recommended procedure.


**Figure 1. Photo of Garmin GPSMAP 396 as received.**

### 2.1.2 Garmin GPSMAP 396 Data Description

The data extracted included 67 sessions from September 18, 2012[2], through July 5, 2014 and consisted of 10,002 total data points. The accident event was located by the

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

recorded date and time on July 5, 2014, from 14:49:23 to 15:49:24 UTC, consisting of 40 data points.

Data from a previous flight on June 26, 2014, from 16:59:56 to 18:05:31 UTC, was evaluated and is included in this report.

### 2.1.3 Garmin GPSMAP 396 Parameters Provided

Table 1 describes data parameters provided by the GPSMAP. Date, Time, Latitude, Longitude, and GPS Altitude are recorded by the device. Groundspeed and Track are derived from the recorded parameters.

**Table 1: GPS Data Parameters**

| Parameter Name | Parameter Description |
|---|---|
| Date | Date for recorded data point (MM/DD/YYYY) |
| Time | Time (UTC) for recorded data point (HH:MM:SS) |
| Latitude | Recorded Latitude (degrees) |
| Longitude | Recorded Longitude (degrees) |
| GPS Alt | Recorded GPS Altitude (feet) |
| Groundspeed | Derived Groundspeed (knots) |
| Track | Derived Track (degrees) |

## 2.2 Rotax FLYdat Device Description

The Rotax FLYdat is an engine data monitor designed for Rotax reciprocating engines. The FLYdat contains eight sensor input ports. When installed, it will display the following 6 parameters; Engine Speed, Cylinder Head Temperature (CHT), Exhaust Gas Temperature (EGT), Ambient Air Temperature, Oil Temperature, and Oil Pressure. The FLYdat is programmed with specific engine operating limits, and the input signals are checked against the limits to warn the pilot of any exceedances.

The FLYdat is programmed to record engine history in its non-volatile memory (NVM) after the engine RPM reaches 1000 revolutions per minute (RPM). The NVM holds the last 4 hours of operation in 5 second intervals. When a parameter is exceeded, an additional data recording is created that contains a total of 3 minutes, one minute before and two minutes after the exceedance.

### 2.2.1 Rotax FLYdat Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the FLYdat sustained negligible impact damage. The FLYdat was sent to the manufacturer, Rotax, located in Canada, for download with oversight by the NTSB (figure 2). The data log was obtained successfully.

[2] All dates and times recorded by the Garmin 396 are referenced to Coordinated Universal Time (UTC).

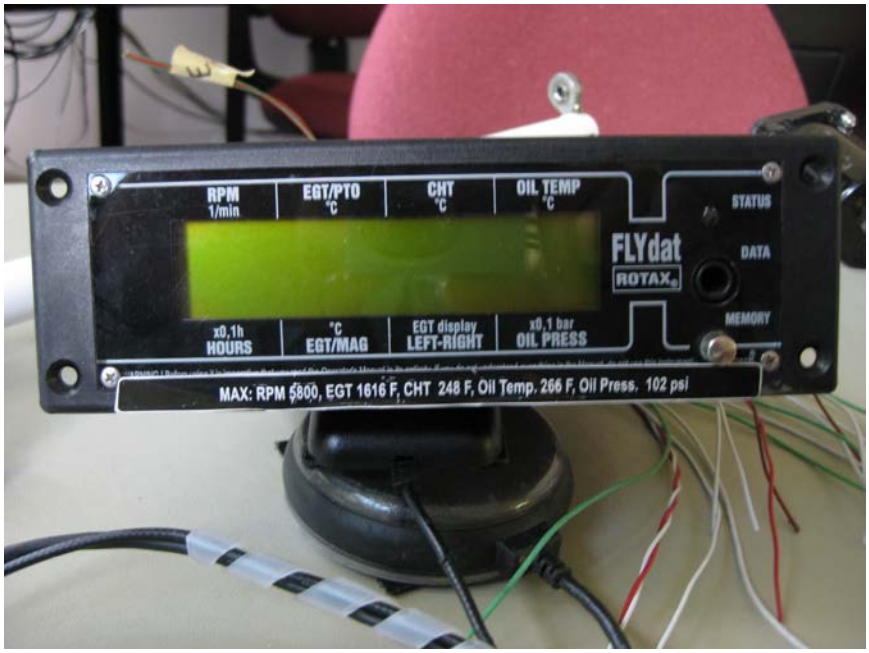


**Figure 2. Photo of Rotax FLYdat.**

### 2.2.2 Rotax FLYdat Data Description

The FLYdat's time stamp records the unit's total operating time (OTR). The data extracted included about 3 hours and 56 minutes of data from its operating time of 316:00:20 to 319:56:50 OTR. The event flight was located as the last power cycle from an operating time of 319:40:30 to 319:56:50 OTR.

Data from a previous flight on June 26, 2014, was identified by observing the earliest record from the event flight that had recorded exhaust gas temperatures consistent with flight and a total flight duration similar to the GPS data's recorded previous flight.

The operating time identified with this flight was from 318:15:45 to 319:19:50 OTR, was evaluated and is included in this report.

No three minute recordings indicating a parameter exceedance were observed during the event flight or previous flight segment.

## 2.3 Time Correlation

Correlation of the event flight FLYdat data from OTR to Coordinated Universal Time (UTC) was established by aligning events from the GPS. At 15:04:02 UTC, the GPS's recorded groundspeed began to increase, which should correspond to an increase in the FLYdat's recorded engine RPM and EGT at 319:56:15 OTR. The FLYdat operating time was set equal to the GPS UTC time with an error of plus or minus 3 seconds. The following correlation between the FLYdats operating time in OTR and UTC was established:

UTC = OTR – 1097533 seconds

The times associated with data identified from the previous flight were not correlated and provided as is.

All correlated times are referenced in UTC for the rest of this report.

## 3. OVERLAYS, PLOTS, AND TABULAR DATA

The following plots and overlays were created from data obtained from the Garmin 396 and FLYdat from the event flight.

Figure 3 is a Google Earth overlay showing the entire event flight.

Figure 4 is a Google Earth overlay highlighting the takeoff portion of the flight. The aircraft's groundspeed began to increase between 15:04:02 and 15:04:10 UTC.

Figure 5 is a plot of the event flight and contains engine and GPS data. Data recorded by the FLYdat ended at 15:04:32 UTC with an RPM of 4590; therefore, the last valid in-flight data point from the GPS was determined to be at 15:04:25 UTC.

Figure 6 is a plot of the previous flight and contains engine and GPS data. The time shown only applies to the GPS and the engine data is aligned for display purposes only.

Tabular data used to generate figures 3 through 6 are included as two separate attachments. Attachment 1 contains data from the FLYDAT unit and Attachment 2 contains data from the GPS. These attachments are provided in electronic comma-delimited (*.CSV) format.

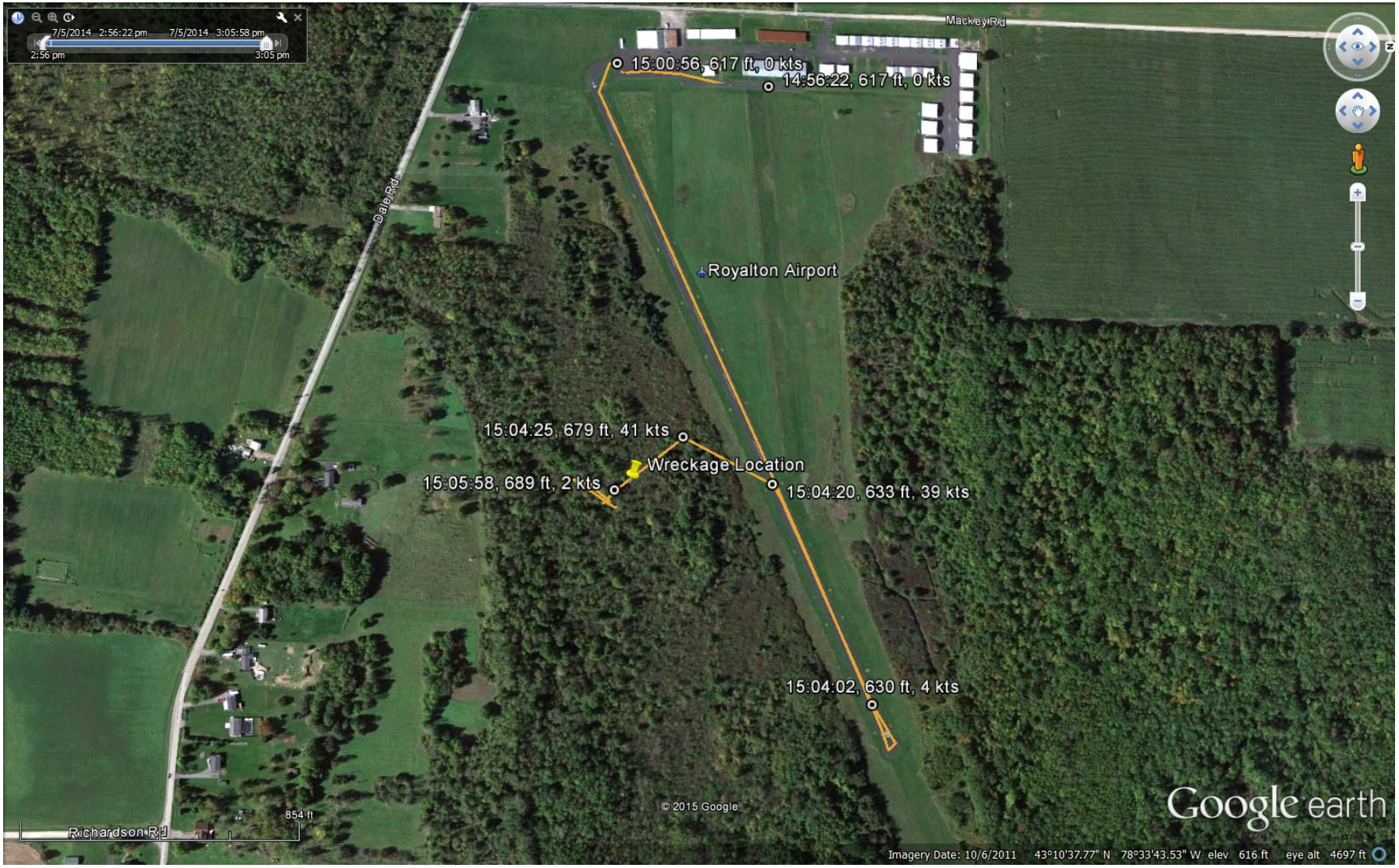


**Figure 3. Topview overlay of event flight.**


**Figure 4. Overlay of takeoff during event flight.**

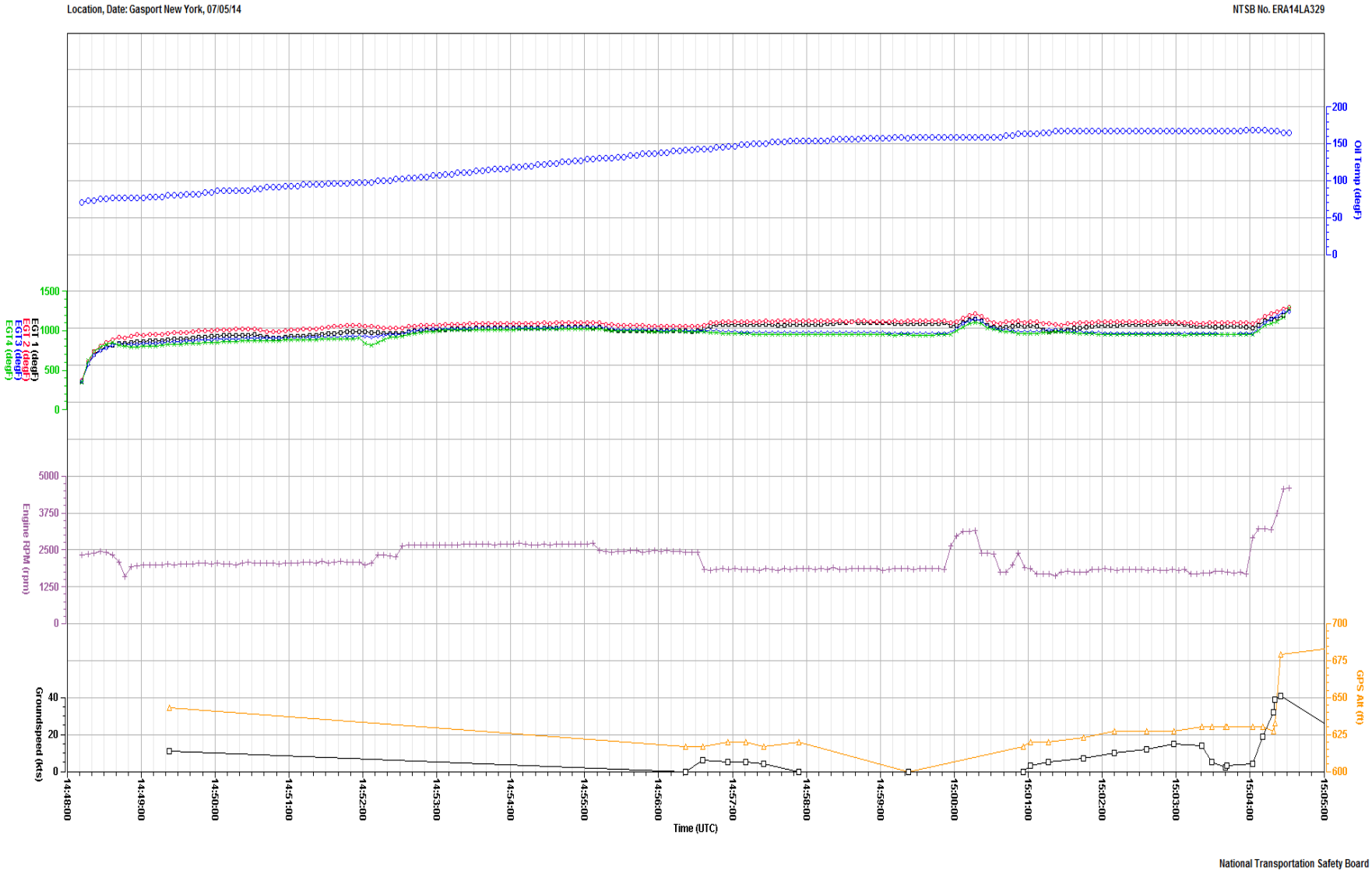


**Figure 5. Plot of engine and GPS parameters during event flight.**

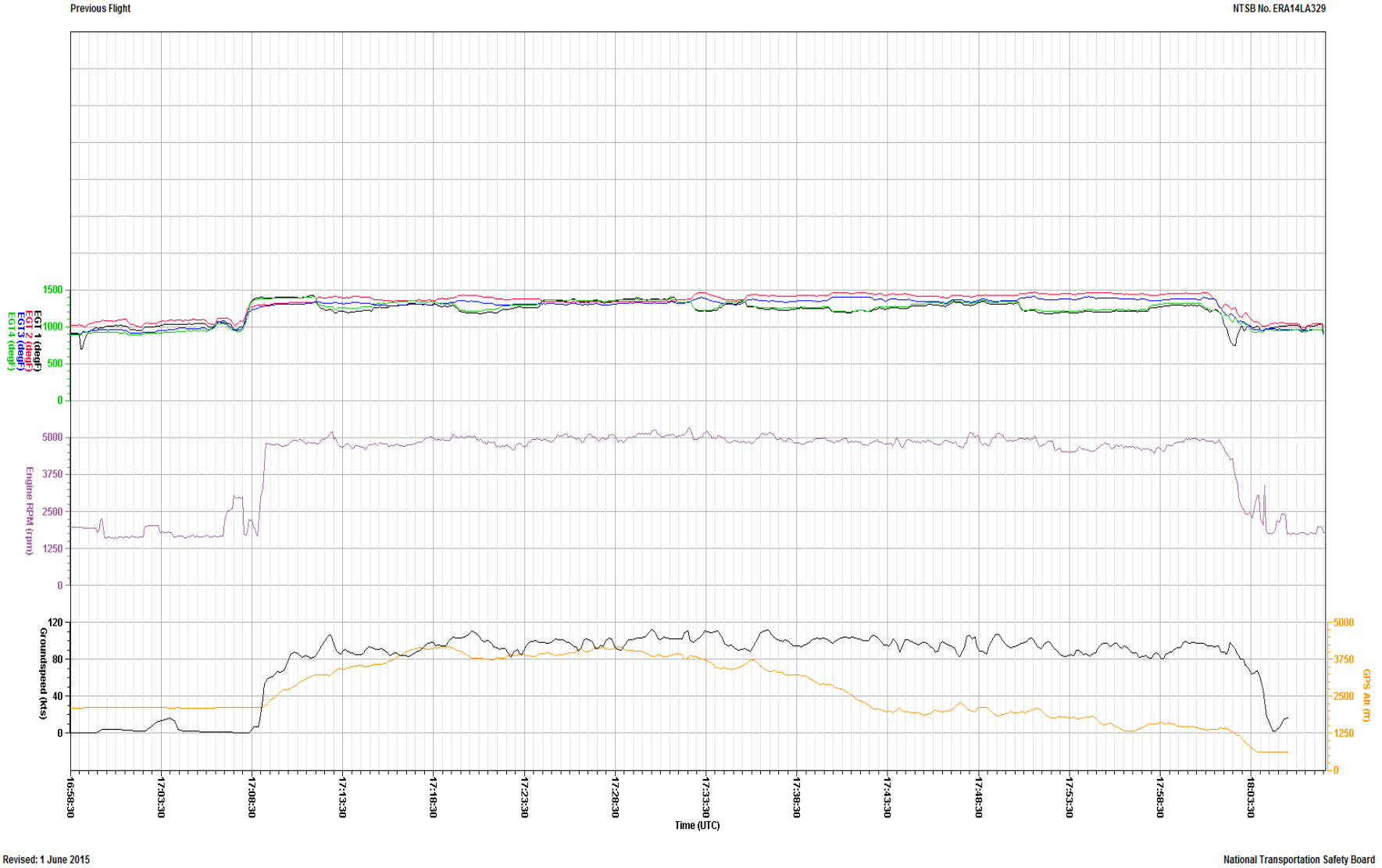


**Figure 6. Plot of engine and GPS parameters for prior flight.**

# APPENDIX A

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

**Table A-1. Verified and provided parameters.**

| Parameter Name | Parameter Description |
|---|---|
| 1. EGT-#[a] (degF) | Engine Exhaust Gas Temperature Cylinder # |
| 2. Oil Temp (degF) | Engine Oil Temperature |
| 3. RPM (rpm) | Crank shaft Rotations per Minute |
| 4. GPS Alt[b] (ft) | GPS altitude |
| 5. Groundspeed[b] (kts) | GPS Groundspeed |
| 6. Engine Time (hhh:mm:ss) | Operating time of FLYDAT |

**NOTE:**

[a] # represents 1 through 4

[b] Source of parameter is from GPS

**Table A-2. Unit abbreviations.**

| Units Abbreviation | Description |
|---|---|
| degF | Degrees Fahrenheit |
| rpm | Rotations per Minute |
| ft | feet |
| kts | Knots |
| hhh:min:ss | hours,minutes,seconds |