

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

November 6, 2019

Electronic Devices

Specialist's Factual Report

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1. EVENT SUMMARY

Location: Eagle Lake, Texas
Date: May 11, 2019
Aircraft: Air Tractor AT-502A
Registration: N713LA
Operator: ANF Air Service, Inc
NTSB Number: CEN19FA140

On May 11, 2019, about 0815 central daylight time (CDT), an Air Tractor AT-502A airplane, N713LA, impacted a grass field while maneuvering about 6.35 miles southwest of Eagle Lake, Texas. The commercial pilot and sole occupant sustained fatal injuries. The airplane was destroyed. The airplane was registered to a private individual and was operated by ANF Air Service, Inc. under the provisions of Title 14 *Code of Federal Regulations (CFR)* Part 137 as a visual flight rules aerial application flight. Day instrument meteorological conditions (IMC) prevailed at the time of the accident, and no flight plan was filed. The flight originated from a private airstrip near Garwood, Texas at 0745.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices:

Device Manufacturer/Model:	Garmin Aera 560
Serial Number:	1qv004780
Device Manufacturer/Model:	SATLOC M3
Serial Number:	N/A

3.1. Garmin Aera 560 Device Description

The Garmin Aera 560 is a portable GPS navigation device employing 4.3-inch touchscreen and color moving map display. The Aera is capable of storing track logs in

non-volatile memory¹ (NVM) that contain GPS position information. This data is stored internally in an industry-standard format and may be exported using the mini-USB port on the device. Once the current track log memory becomes full, new information either overwrites the oldest information or recording stops, depending on how the unit is configured. Track log storage may be activated or de-activated at user discretion.

3.1.1. Garmin Aera 560 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained impact damage, as shown in Figure 1, resulting in the device becoming inoperable. The NVM chip was removed, read out, and converted to engineering units using laboratory equipment.

Figure 1. Garmin Aera 560 as received.



3.1.2. Garmin Aera 560 Data Description

The data extracted included sessions from May 1, 2019², through May 11, 2019. The last session was determined to pertain to the accident and the recording started at 12:39:25 UTC and ended at 13:07:15 UTC on May 11, 2019. The difference between UTC and CDT is 5 hours or 18,000 seconds. Due to data buffering, the data recording may have ended before impact.

3.1.3. Garmin Aera 560 Parameters Provided

Table 1 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.

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

² All dates and times are referenced to Coordinated Universal Time (UTC).

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	Average derived groundspeed (knots)
Track	Average derived true course (degrees)

3.2. SATLOC M3 and Hemisphere GPS R101 Device Description

The SATLOC M3 and Hemisphere GPS R101 Receiver are part of an on-board control system designed to programmatically control agricultural, aerial spray operations based on vendor and user specified prescription maps. The SATLOC M3 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 M3 can record historical information to an internal, compact flash (CF) card. The Hemisphere GPS R101 does not record flight information.

3.2.1. SATLOC M3 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the devices had sustained minor impact damage as shown in Figures 2 and 3. The internally mounted CF card, as shown in Figure 3, was removed from the SATLOC and data was extracted normally using laboratory tools.

Figure 2. SATLOC M3 and Hemisphere GPS R101 as received.



Figure 3. CF card mounted in SATLOC M3.



3.2.2. SATLOC M3 Data Description

The data extracted included log files from February 17, 2018, through May 11, 2019. The last log file was determined to pertain to the accident and the recording started at 05:49:51 and ended at 06:08:35 on May 11, 2019. The recorded time was approximately 6 hours 59 minutes and 40 seconds (25,180 seconds) behind UTC time. The time correlation was determined by correlating latitude and longitude coordinates from the flight track of both the Garmin Aera 560 and the SATLOC M3. Data is buffered in volatile³ memory continuously during the recording and periodically written to the internal flash drive. The length of this data buffer varies depending on the internal processor workload but can be on the order of 10-20 seconds, or longer. Data stored in the buffer and not written to the flash drive is permanently lost when power is interrupted to the SATLOC M3.

3.3. OVERLAYS AND TABULAR DATA

Figure 4 is a graphical overlay 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 flight tracks from both devices are displayed - Garmin is shown in red and the SATLOC is shown in purple. The Garmin recording started approximately 6 minutes before the SATLOC recording and ended approximately 1 minute before the SATLOC recording.

Figure 5 is a graphical overlay generated using Google Earth showing the beginning of the SATLOC recording and the time correlation between the flight tracks.

Figure 6 is a graphical overlay generated using Google Earth showing the end of the flight recordings.

Figure 7 is a plot of parameters for the entire flight recordings from both the Garmin and the SATLOC. The Garmin is shown in green and the SATLOC is shown in black. The time interval shown is 12:39:00 UTC to 13:09:00 UTC.

Figure 8 is a plot of parameters at the end of the flight recordings from both the Garmin and the SATLOC. The time interval shown is 13:05:20 UTC to 13:08:20 UTC.

Tabular data used to generate figures 4 through 8 are included as Attachments 1 and 2 in electronic comma-delimited (.CSV) format.

³ Volatile memory requires a continuous application of power to retain data. Any power interruption will result in irreversible data loss.

Figure 4. Google Earth overlay showing the flight tracks from the Garmin and the SATLOC. Labeled points are from the Garmin.

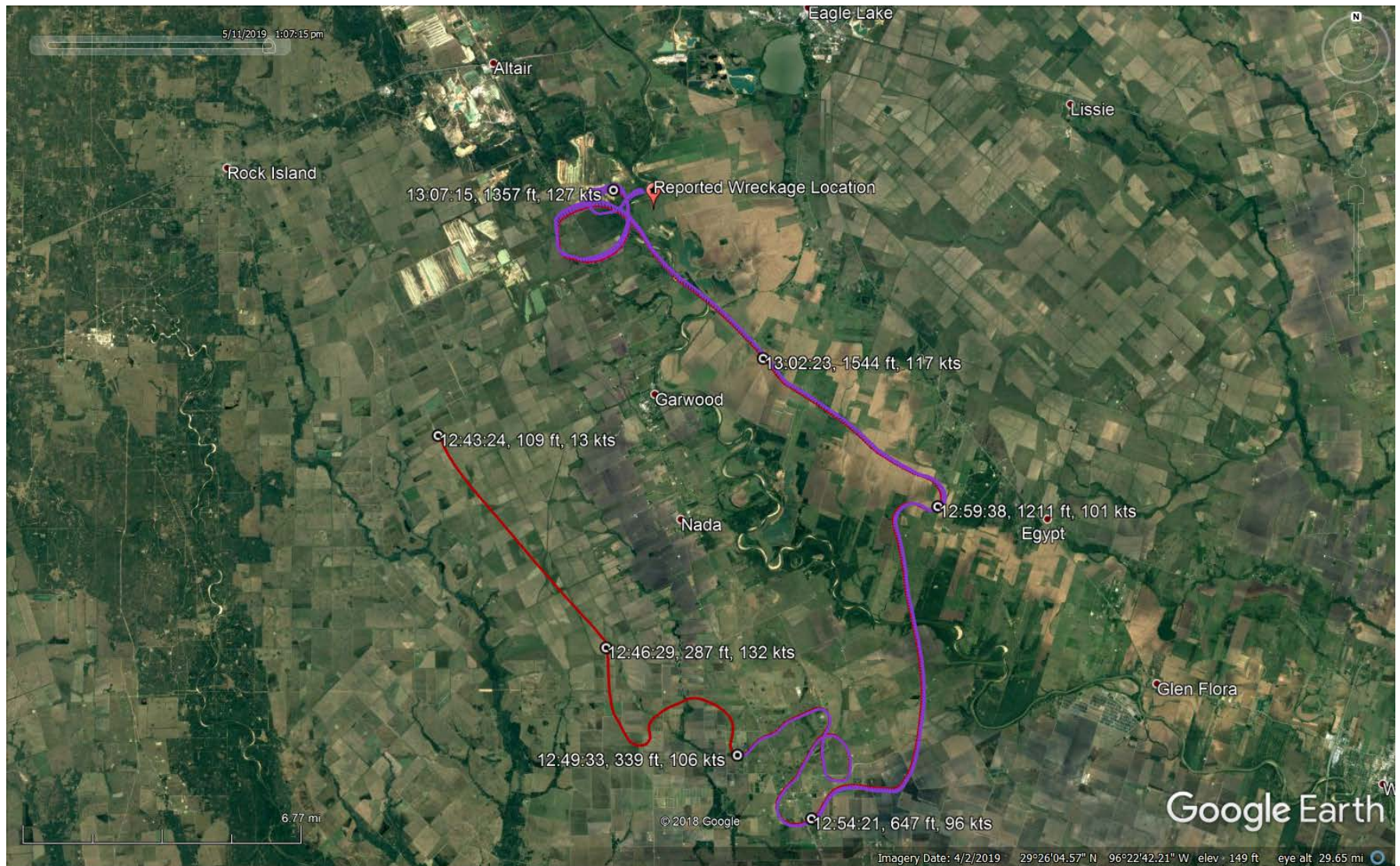


Figure 5. Google Earth overlay showing the start of the SATLOC recording.



Figure 6. Google Earth overlay showing the end of the recordings.

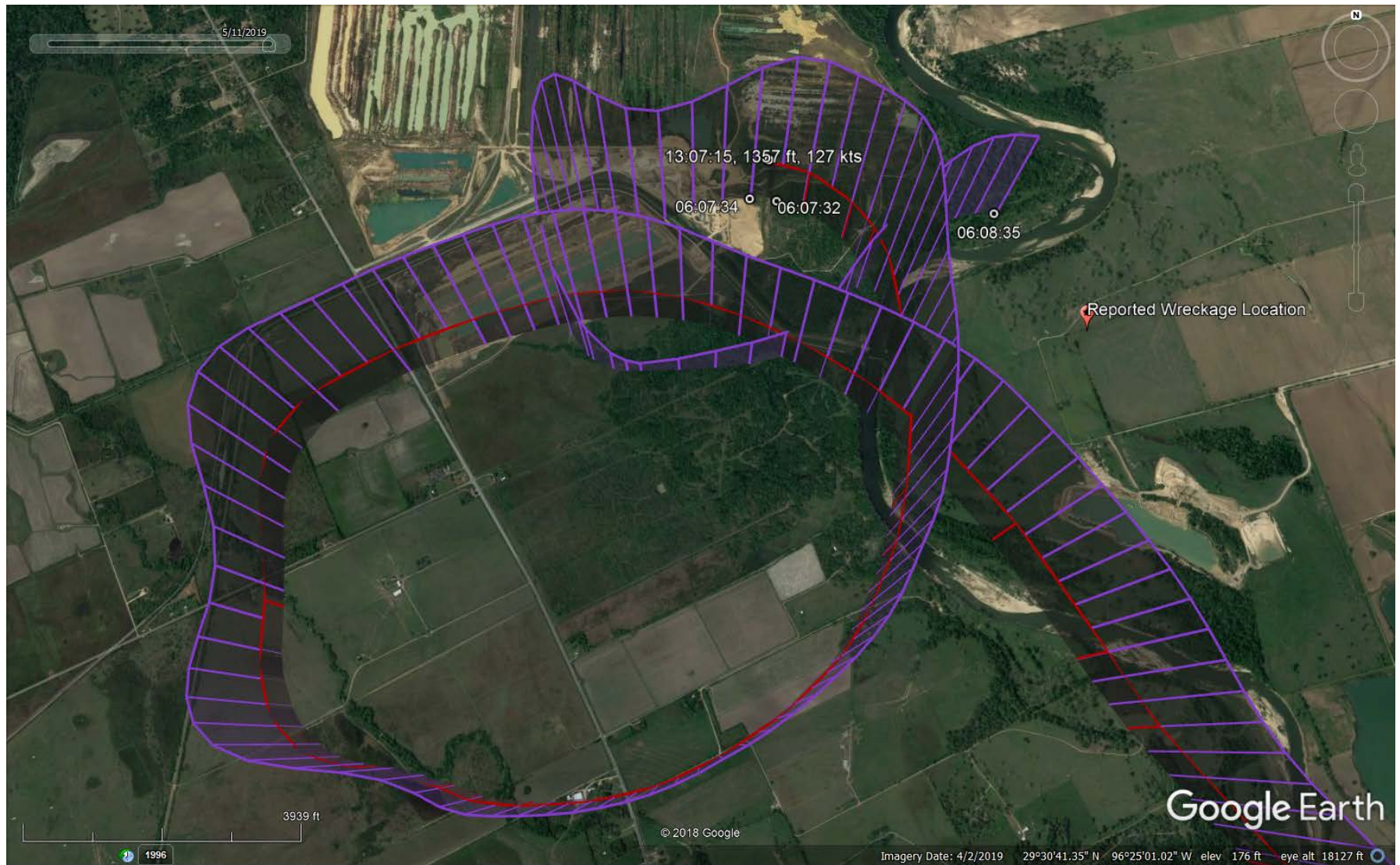


Figure 7. Plot of parameters of the entire flight recordings.



Figure 8. Plot of parameters from the end of the flight recordings.

