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

October 10, 2017

Global Positioning System Device

Specialist's Factual Report
By Bill Tuccio, Ph.D.

1. EVENT SUMMARY

Location:	Farmerville, Louisiana
Date:	July 23, 2017
Aircraft:	Cessna 150F
Registration:	N8661S
Operator:	Private
NTSB Number:	CEN17FA281

On July 23, 2017, about 1715 central daylight time, a Cessna 150F airplane, N8661S, while descending over Lake D'Arbonne, Louisiana, impacted the lake and nosed over. The airline transport pilot, who was the sole occupant, was fatally injured. The airplane sustained substantial fuselage and wing damage during the nose over. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Day visual meteorological conditions prevailed in the area about the time of the accident, and the flight was not operated on a flight plan. The local flight originated from the Union Parish Airport (F87), near Farmerville, Louisiana, at time unknown.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following global positioning system (GPS) device:

Device Manufacturer/Model:	Garmin GPSMAP 295
Serial Number:	98830613

3.1. Device Description

The Garmin GPSMAP 295 is a hand-portable GPS unit equipped with a 16-color LCD display, soft-key controls, and employs a 12-channel receiver. The unit can be operated using external power, or alternatively by using a set of 6 internally mounted AA batteries. An external antenna, attached via a BNC-style connector, is required for normal

operation. The GPSMAP 295 is capable of storing position and altitude information for up to 500 waypoints in non-volatile memory.[1] Twenty routes, each representing a linked list of up to 30 waypoints, may also be stored in memory. A detailed tracklog – composed of latitude, longitude, date, time, and altitude information for approximately 1000 separate data points – can also be stored. Tracklog storage may be activated or de-activated at user discretion. 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 using the NMEA 0183 version 2.0 protocol. 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.

3.2. Data Recovery

According to the Investigator-in-Charge (IIC), the device was recovered from a freshwater lake. Upon receipt, it was evident the unit had suffered water damage, as shown in figure 1. The unit was disassembled and dried in a vacuum oven for 8 hours at 40 degrees Celsius and a half atmosphere. The unit was then reassembled but would not start; attempts to repair the unit were unsuccessful. The non-volatile memory chip was identified, as shown in figure 2. Figure 3 shows the chip after removal from the printed circuit board using a hot air rework tool. The chip was read using a EEPROM programmer and then successfully decoded.

Figure 1. Unit as received.

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

Figure 2. Non-volatile memory chip identified.

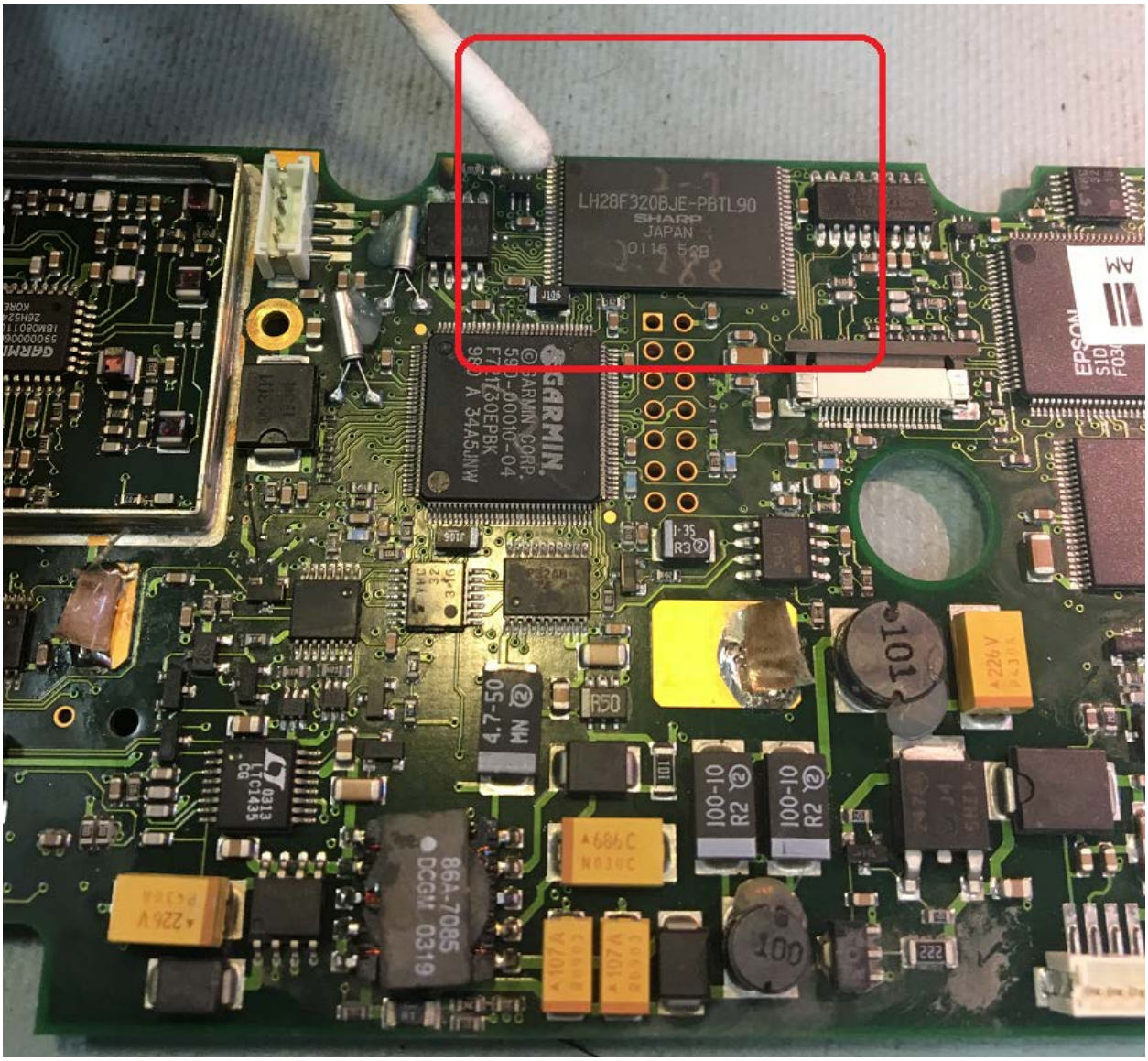

Figure 3. Non-volatile memory chip removed.

3.3. Data Description

The data extracted included 12 track history recording sessions; however, none of the recording session tracks were consistent with the accident description provided by the IIC as a flight from F87 to Lake D'Arbonne. Because the data—in particular, the date/time data—was decoded from a direct read of the chip (known as a chip image), it is possible the date data did not convert properly. Given this limitation, the flights recovered from the device were as shown in table 1. Due to concerns over time conversion, the time zone is

not provided. If the dates are correct, the recording began to overwrite older data when Recording Session 5 began.

Table 1. Recording Sessions.

Recording Session	Start of Recording	End of Recording
0	12/13/2014 20:24:45	12/13/2014 20:40:03
1	04/05/2015 00:23:52	04/05/2015 00:50:41
2	04/05/2015 23:38:28	04/06/2015 00:01:25
3	10/10/2015 13:05:32	10/10/2015 13:15:47
4	10/10/2015 13:33:52	10/10/2015 13:57:19
5	01/21/2017 20:39:02	01/21/2017 20:41:11
6	01/21/2017 20:56:18	01/21/2017 21:06:17
7	03/04/2017 17:15:32	03/04/2017 17:17:46
8	03/04/2017 17:28:51	03/04/2017 17:52:08
9	03/04/2017 18:21:21	03/04/2017 18:43:29
10	03/25/2017 20:20:01	03/25/2017 20:35:23
11	06/03/2017 20:16:32	06/03/2017 21:01:11

3.4. Parameters Provided

Table 2 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 2: GPS Data Parameters

Parameter Name	Parameter Description
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time 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)

3.5. OVERLAYS AND TABULAR DATA

Figures 4 through 8 are graphical overlays generated using Google Earth of flights (not the accident flight) recorded on the device. The weather and lighting conditions shown are not necessarily the weather and lighting conditions present at the time of the recording. Figures 5 through 8 show the overlays on an aviation sectional.

Figure 4 shows all recorded data. Only Recording Sessions 3, 4, and 11 were near the accident location or the F87 airport.

Figure 5 shows Recording Session 4; while this flight overflies the accident location, the departure point was Ruston Regional (RSN), not the F87 airport. Figure 6 shows Recording Session 3, a flight from RSN towards the accident location; again, this flight did not depart from the F87 airport. Figure 7 shows Recording Session 11, a flight operated wholly within the traffic pattern at F87.

Figure 8 shows Recording Session 4, with low-level maneuvering in the vicinity of the accident location. As previously stated, this was not the accident flight based upon the departure airport. Assuming the decoded date is correct, Recording Session 4 happened in October 2015, and was overwritten mid-recording by newer data.[2]

Tabular data used to generate figures 4 through 8 are included as attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

[2] Because the data comes from a portable GPS, the aircraft that made the recording and the pilot flying during the recordings were not determined for this report.

Figure 4. All recorded flights.

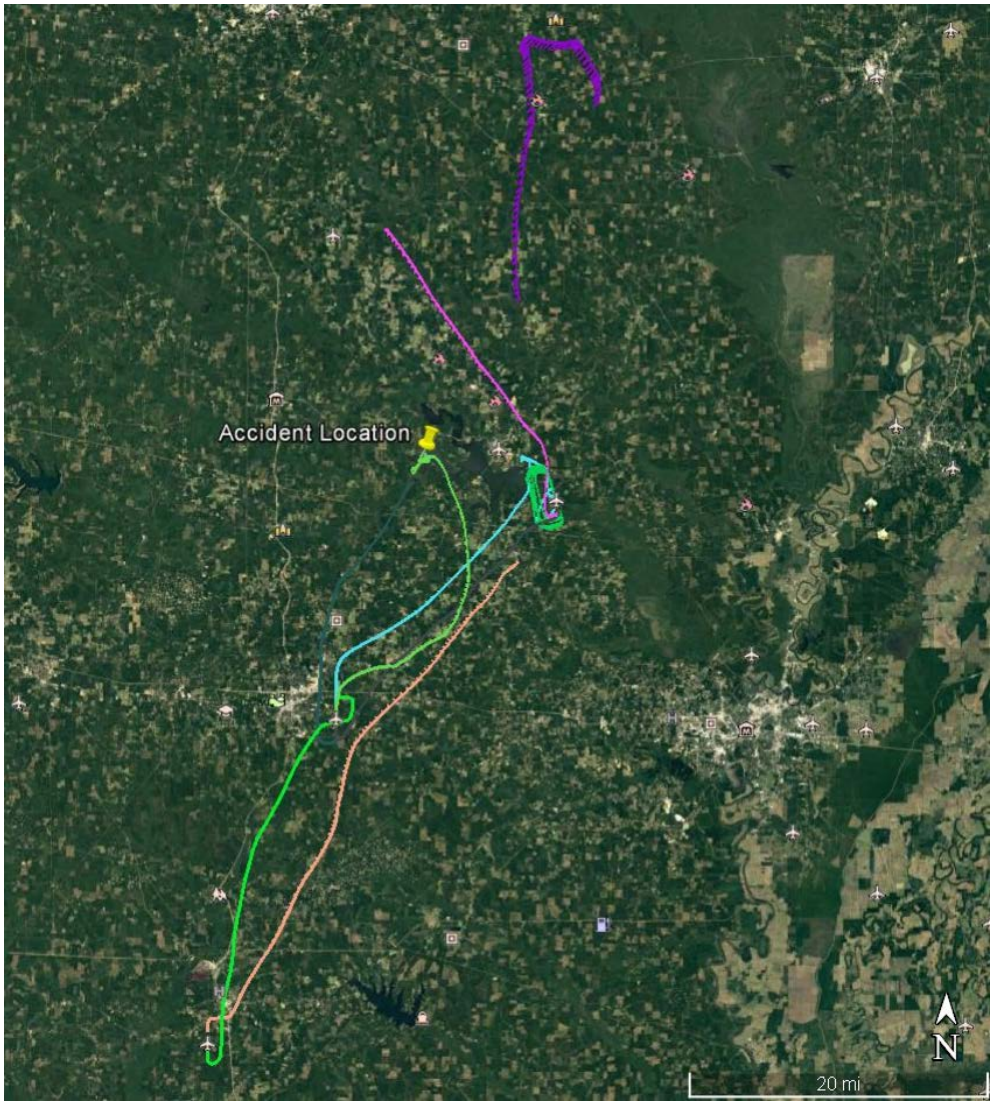

Figure 5. Recording session #4.

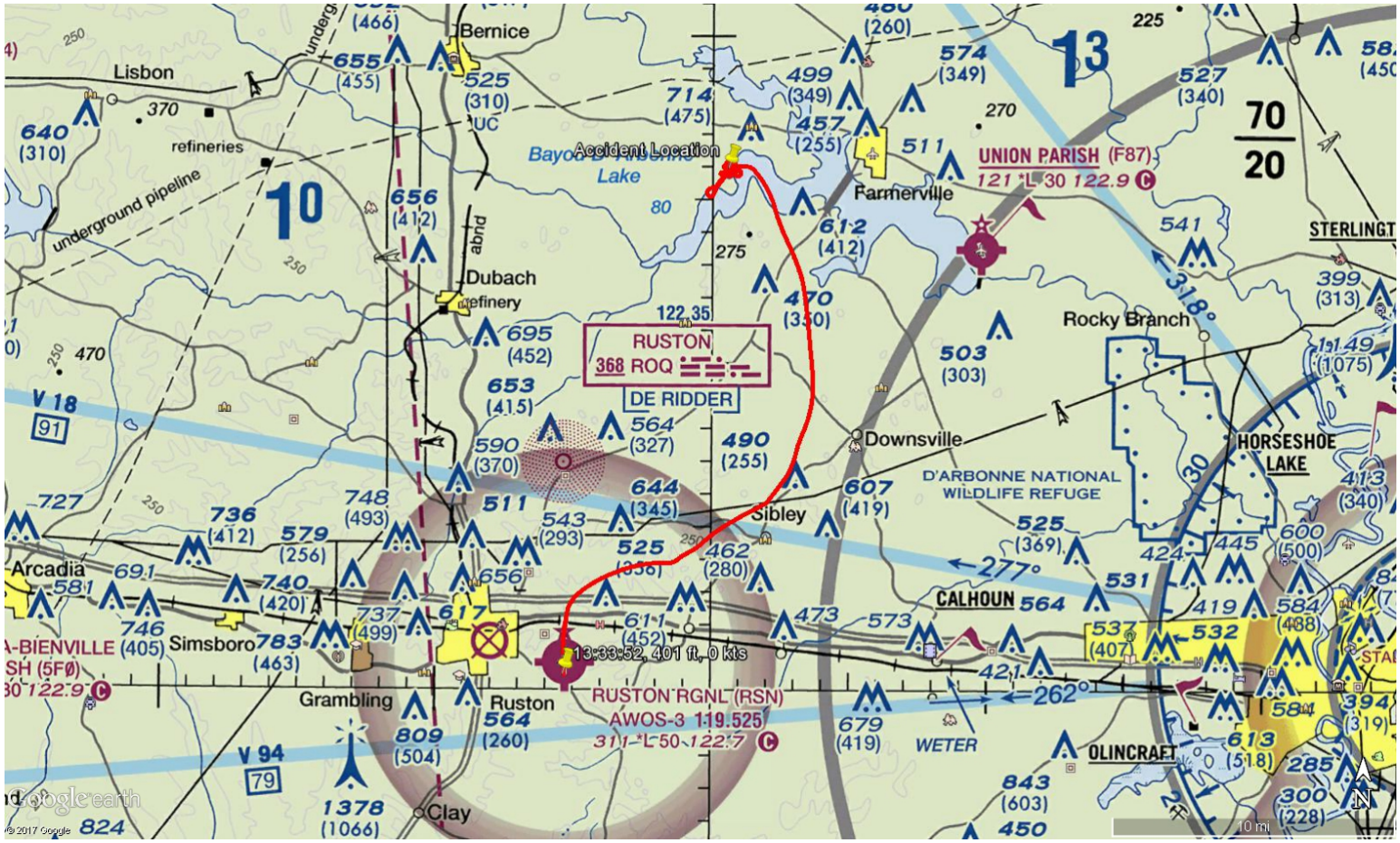

Figure 6. Recording session #3.

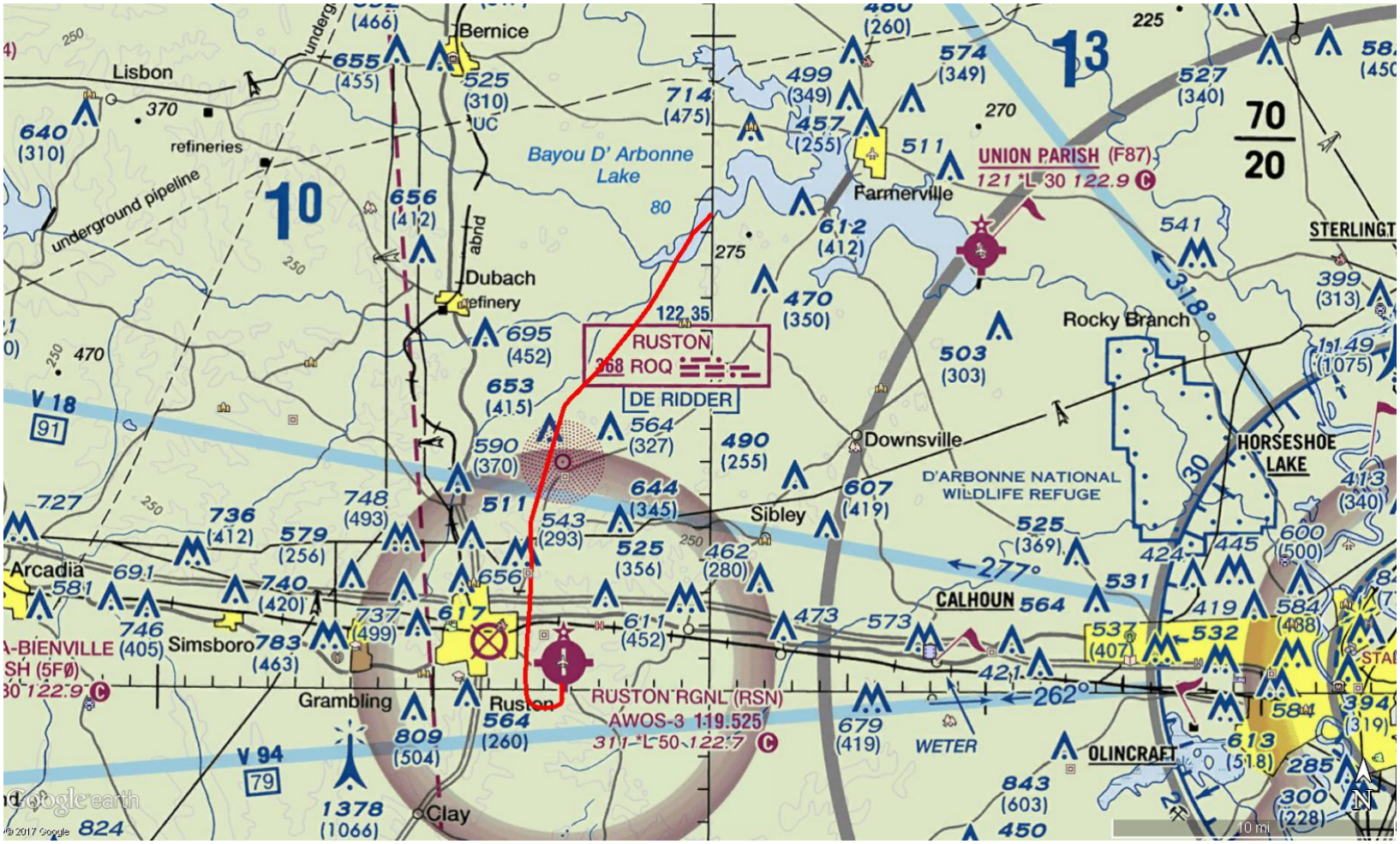

Figure 7. Recording session #11.

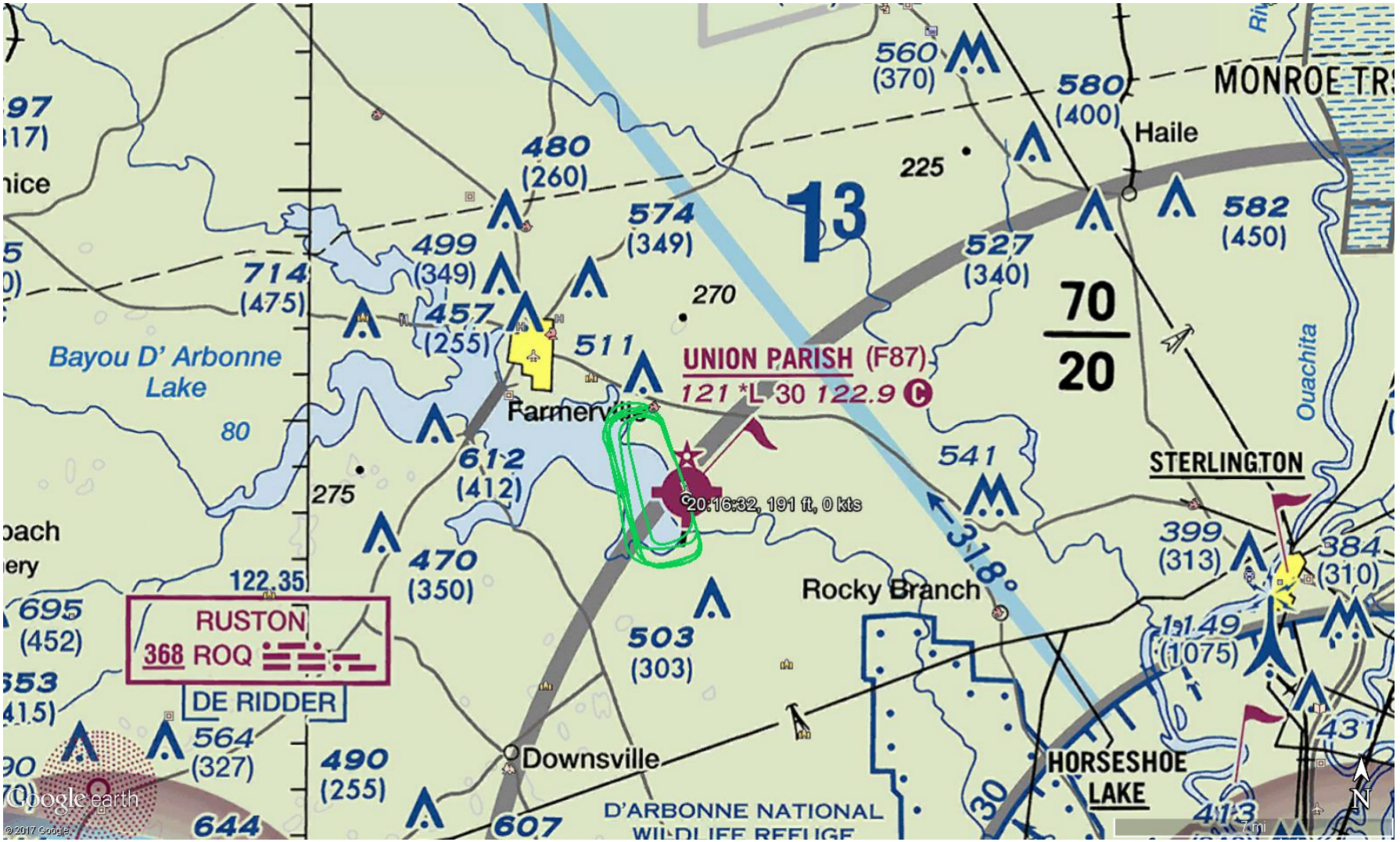

Figure 8. Recording session #4, around accident location.