

National Transportation Safety Board

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CEN22FA168

GLOBAL POSITIONING SYSTEM DEVICE

Specialist's Factual Report

July 14, 2022

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A. EVENT SUMMARY

Location: Marlin, Texas
Date: April 5, 2022
Time: 12:31 central daylight time (CDT)
Airplane: Cessna TU206F, AMS Aviation LLC, N858JA

B. GLOBAL POSITIONING SYSTEM DEVICE SPECIALIST

Specialist Steven Smith
Mechanical Engineer (Recorder Specialist)
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C. DETAILS OF THE INVESTIGATION

A global positioning system (GPS) group was not convened. The NTSB Vehicle Recorder Division received the following GPS device:

Recorder Manufacturer/Model: Garmin GTN 650Xi
Part Number: 011-04631-00
Recorder Serial Number: 5FP005060

1.0 Garmin GTN 650Xi Device Description

The Garmin GTN 650Xi is a panel-mounted GPS receiver featuring a 4.9-inch color liquid crystal (LCD) display. It has a GPS/SBAS engine and is TSO-C146e 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 LNAV/VNAV. The unit can simultaneously give display approach information and weather and traffic data in relation to their position on a 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 a Jeppesen database 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 650Xi 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 left side of the unit. If the unit is equipped with a firmware v6.50 or later, the internal micro-SD card will store a limited set of flight data information.

1.1 Garmin GTN 650Xi Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained minor impact damage as shown in Figure 1. However, with further inspection, the device was able to be powered on. Subsequently, while the device was powered on, specialists were able to navigate to the flight logs and transfer a copy of the memory contents to a removable SD card.



Figure 1. GTN 650Xi from the aircraft after event flight.

1.2 Recording Description

The data extracted included 32 track logs from February 9, 2022, through April 5, 2022.¹ The event flight was recorded starting 10:24:31 CDT and ending 12:31:06 CDT on April 5, 2022.

1.3 Parameters Provided

Table 1 is a list of all recorded parameters on the GTN 650Xi and their definitions. Parameters that did not record information, or were determined to be not valid by the specialist during the event flight were removed.

Table 1. GPS Data Parameters.

Parameter Abbreviation	Description
Latitude	Latitude (degrees)
Longitude	Longitude (degrees)

¹ All dates and times are referenced to Central daylight time (CDT).

Parameter Abbreviation	Description
AltMSL	Altitude above Mean Sea Level (feet)
GndSpd	Groundspeed (knots)
VSpd	Vertical Speed (feet per minute)
TRK	Track (degrees)
AltGPS	GPS Altitude (feet)
MagVar	Magnetic Variation (degrees)

D. OVERLAYS AND TABULAR DATA

Data obtained from the Garmin GTN 650Xi were used to produce the following overlays and tabular data. Figure 2 shows a graphical time history representation of flight parameters for the entire event flight, while Figure 3 shows the last 66 seconds of the recording with the same parameters prior to the event.

The device began recording at approximately 10:24:31 CDT. The last recorded parameter was as at 12:31:06 CDT on April 5, 2022, with a GPS altitude of 464 feet above Mean Sea Level (MSL) and a ground speed of 46 knots. Due to data buffering on the GPS unit, the data recording may have ended before the flight event.

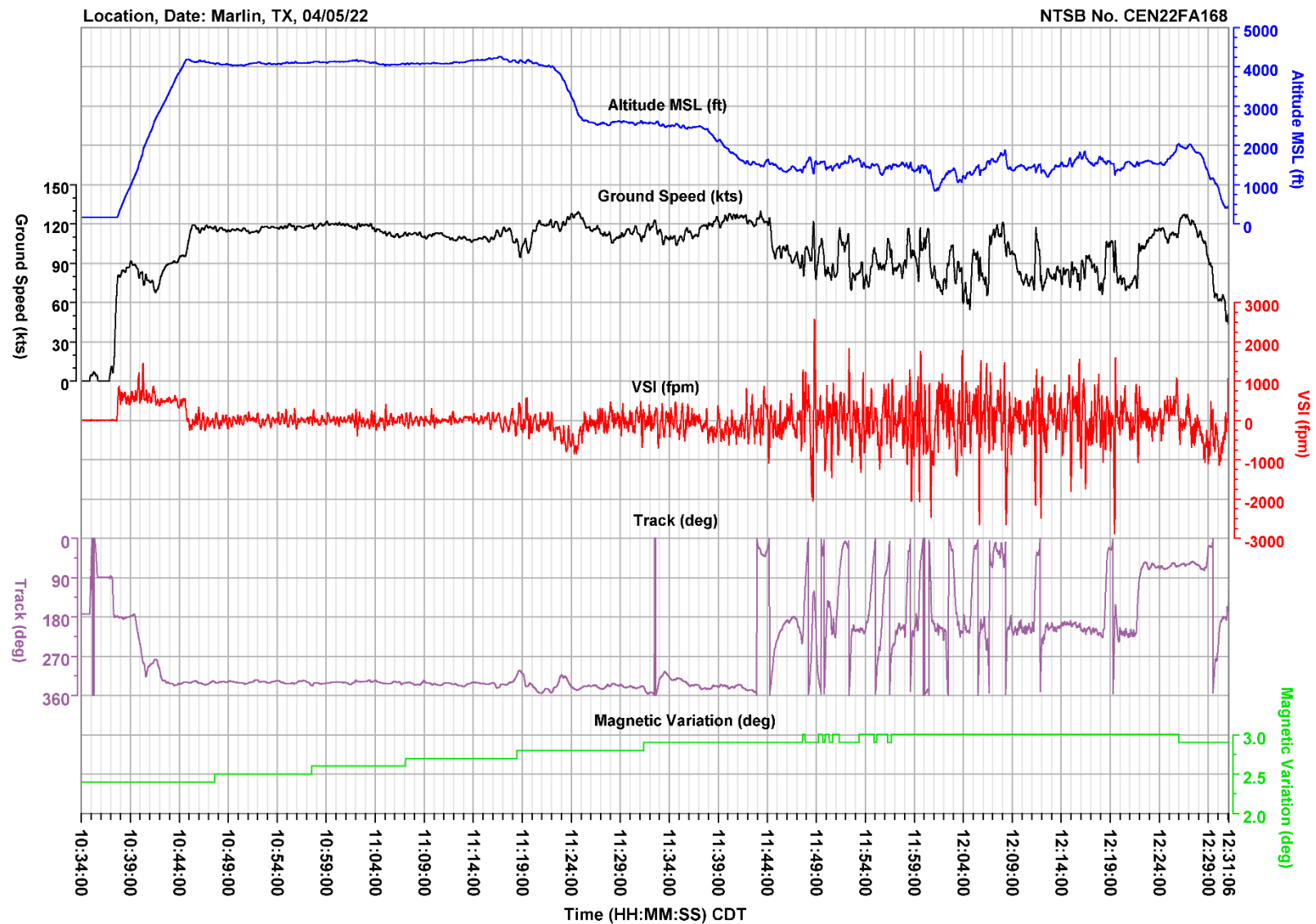
Figure 4 and 5 are graphical overlays generated using Google Earth of the April 5, 2022, flight. Figure 4 provides an overview of the entire flight, and Figure 5 is a zoomed overlay detailing the pattern, approach, landing at Marlin Airport (T15), Marlin, Texas. Note that, the weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 6 and 7 are graphical overlays generated using Google Earth of the April 5, 2022, flight. Figure 6 provides an overview of the runway from a sideview, and Figure 7 shows a top-down view of the runway leading to the event.

Figure 8 is also generated using Google Earth of the event flight. Figure 8 shows a perspective view from the runway threshold to the last recorded data point.

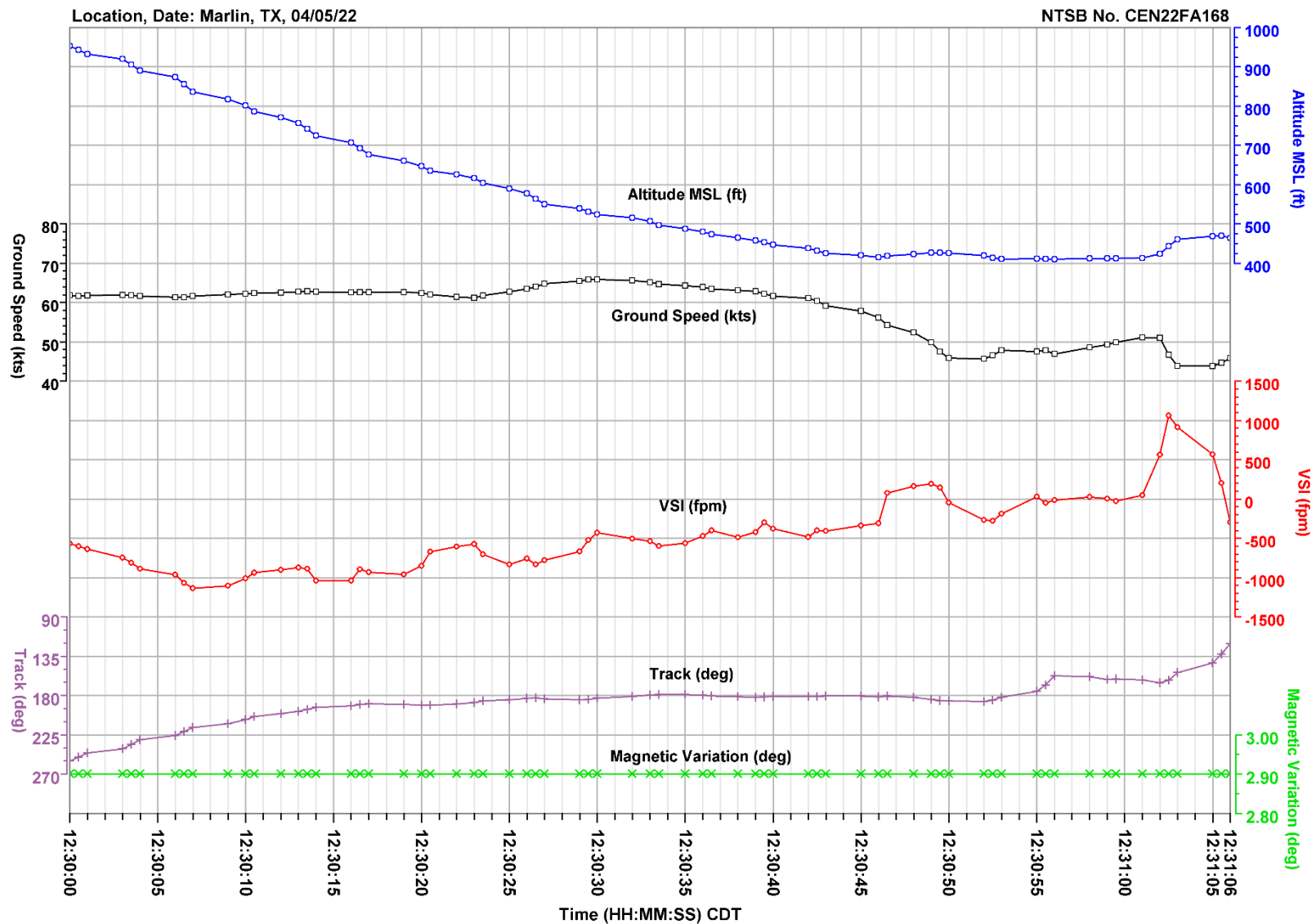
Tabular data used to generate Figure 2 and Figure 8 are included as Attachment 1. This attachment is provided in electronic comma separated (CSV) format. The attachment contains additional parameters that were recorded during the event flight.

Submitted by:
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AMS Aviation LLC, Cessna TU206F, N858JA
Figure 2. Plot of GPS parameters of the entire flight.

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Figure 3. Plot of GPS parameters (last 66 seconds of data recording).

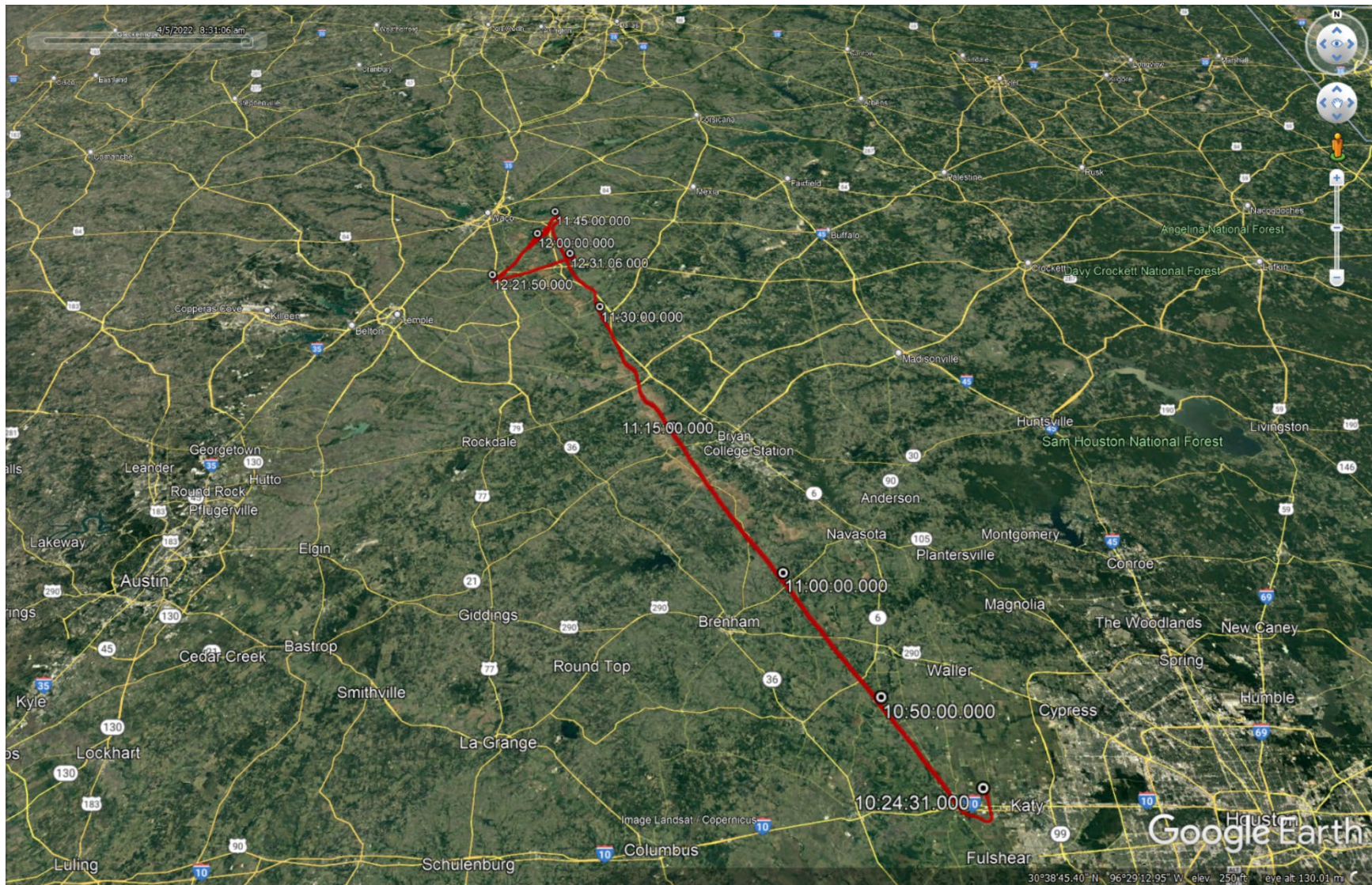


Figure 4. Google Earth overlay showing the entire flight.

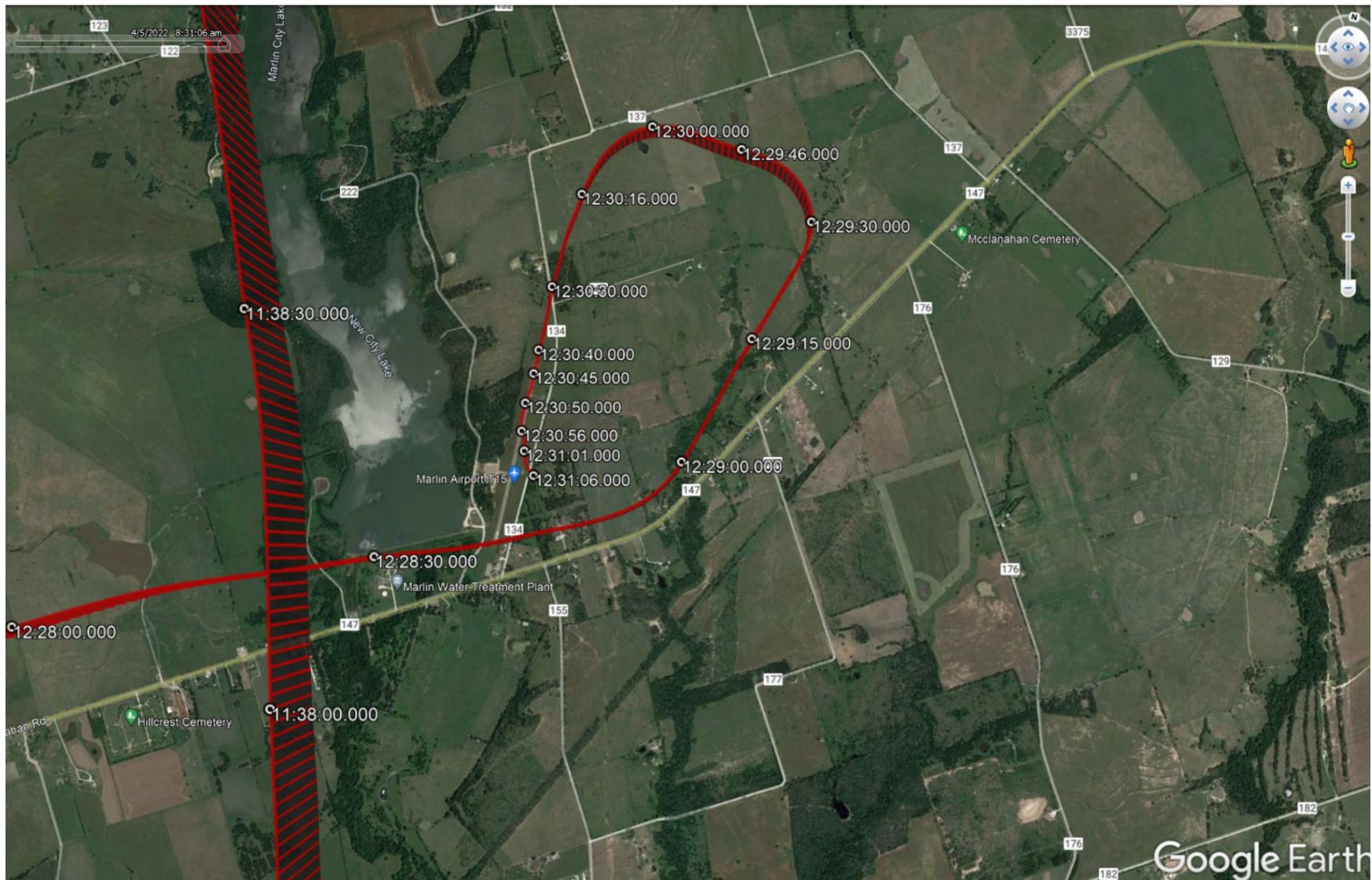


Figure 5. Google Earth overlay showing pattern, approach, and landing.



Figure 6. Google Earth overlay of the runway.



Figure 7. Google Earth overlay of the runway from top view.



Figure 8. Google Earth overlay from the runway threshold to the last recorded data point.