

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

December 28, 2021

Global Positioning System Device

Specialist's Factual Report
By Gerald Kawamoto

1. EVENT SUMMARY

Location: Mentone, Texas
Date: September 10, 2021
Aircraft: Robinson Helicopter R22 Beta
Registration: N292DD
Operator: Private
NTSB Number: CEN21FA410

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 Aera 796
Serial Number:	2CY014389

3.1. Device Description

The Garmin aera 796 is a battery-powered multi-function display and GPS receiver with a 7-inch diagonal high resolution touch screen. The unit includes a built-in Jeppesen database and can receive XM satellite radio for flight information including NEXRAD Radar, lightning, METARs, and TFRs. The unit can also perform and store weight and balance calculations. A built-in AOPA Airport Directory and SafeTaxi airport diagrams are included for selected airfields. With appropriate subscriptions, the unit can store and display geo-referenced VFR and IFR navigation charts, including IFR approach charts. The unit also has a "scratch pad" feature, allowing the user to hand write electronic notes.

The unit stores date, route-of-flight and flight-time information. A detailed track log including latitude, longitude, date, time and GPS altitude information is stored within the unit whenever the receiver has a lock on the GPS navigation signal. Position is updated within the track log as a function of time or distance moved, depending on how the unit has been configured. The current track log can be saved to long-term memory. Track log

storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile memory.¹

The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via a built-in USB port. 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

Upon arrival at the Vehicle Recorder Laboratory, an external examination revealed the device had sustained impact damage, as shown in Figure 1. An internal examination revealed damage to the circuit board, rendering the device inoperable. The non-volatile memory chip was removed, read out, and converted to engineering units using laboratory tools.



Figure 1. Front and Back of the Garmin Aera 796 as received.

3.3. Data Description

The data extracted included 8 sessions from September 5, 2021, through September 10, 2021.² The last session recorded started at 12:43:01 UTC and ended at 14:26:37 UTC on September 10, 2021. Due to data buffering in the device, the end of the session may not have been recorded.

¹ Non-volatile memory is semiconductor memory that doesn't require external power for data retention.

² All dates and times are referenced to Coordinated Universal Time (UTC). The difference between UTC and Central Daylight Time (CDT) is 6 hours.

3.4. 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.

Table 1. GPS Data Parameters

Parameter Name	Parameter Description (units)
Date	Date for recorded data point (MM/DD/YYYY)
Time	Time (UTC) for recorded data point (HH:MM:SS)
Latitude (deg)	Recorded Latitude (degrees)
Longitude (deg)	Recorded Longitude (degrees)
GPS Alt (ft)	Recorded GPS Altitude (feet)
Groundspeed (kts)	Average derived groundspeed (knots)
Track (deg)	Average derived true course (degrees)

3.5. OVERLAYS AND TABULAR DATA

Figures 2 through 4 are graphical overlays generated using Google Earth for the last session recorded. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the recording.

Figure 2 shows an overview of the last session recorded.

Figure 3 shows approximately the final 8 minutes of recorded data and the reported wreckage location. Due to data buffering in the device, the end of the session may not have been recorded. The last recorded data point is approximately 0.6 nautical miles from the reported wreckage location.

Figure 4 is an overlay zoomed in on the final portion of recorded data.

Figure 5 is a plot of parameters recorded on the device for the entire accident session. The time interval plotted is 12:40:00 to 14:30:00 UTC.

Figure 6 is a plot of parameters recorded on the device for the last seven minutes of the accident session. The time interval plotted is 14:20:00 to 14:27:00 UTC.

Tabular data used to generate Figures 2 through 6 are included as Attachment 1 in electronic comma-delimited (.CSV) format.

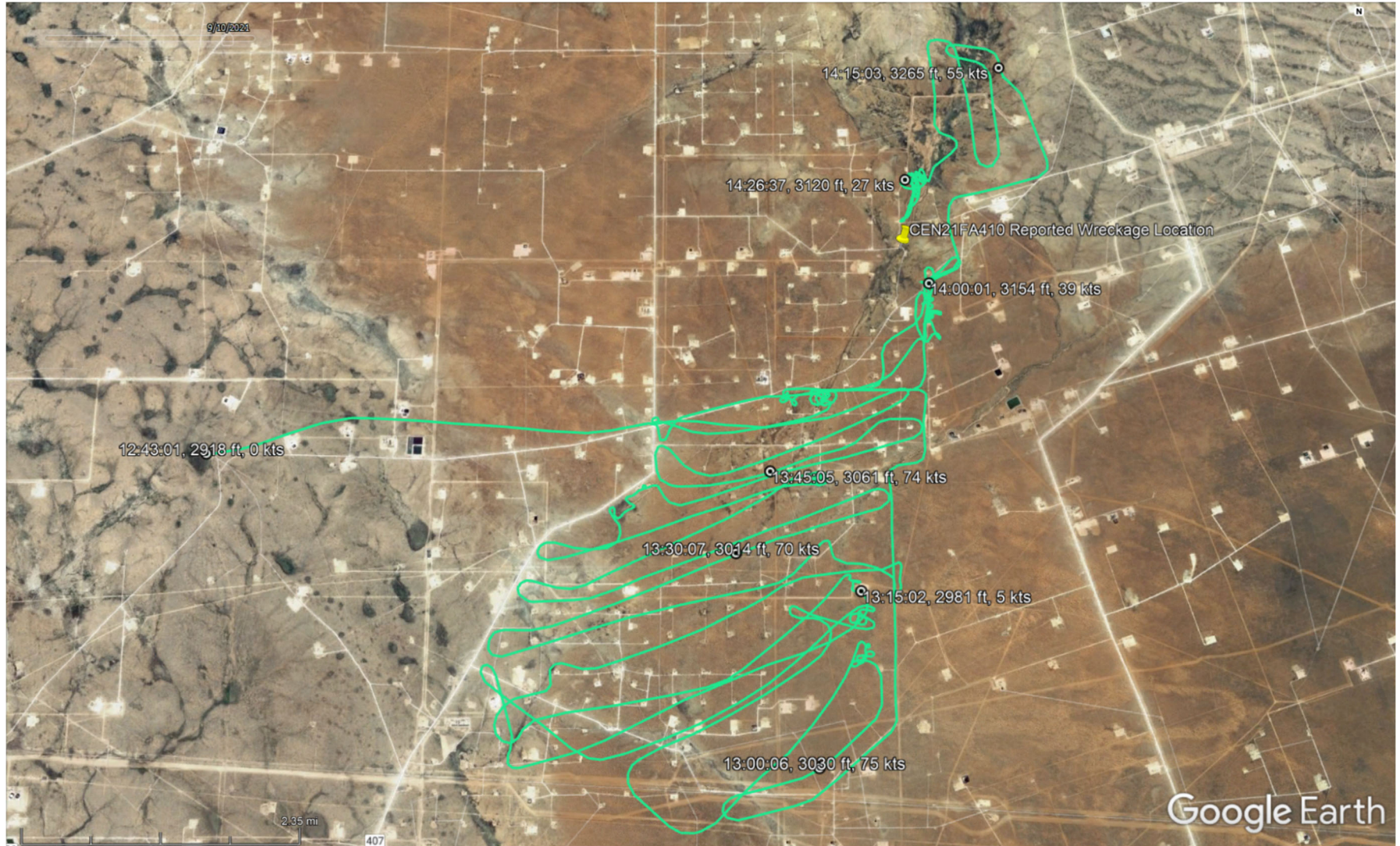


Figure 2. Google Earth overlay of the last session recorded on the Garmin Aera 796.

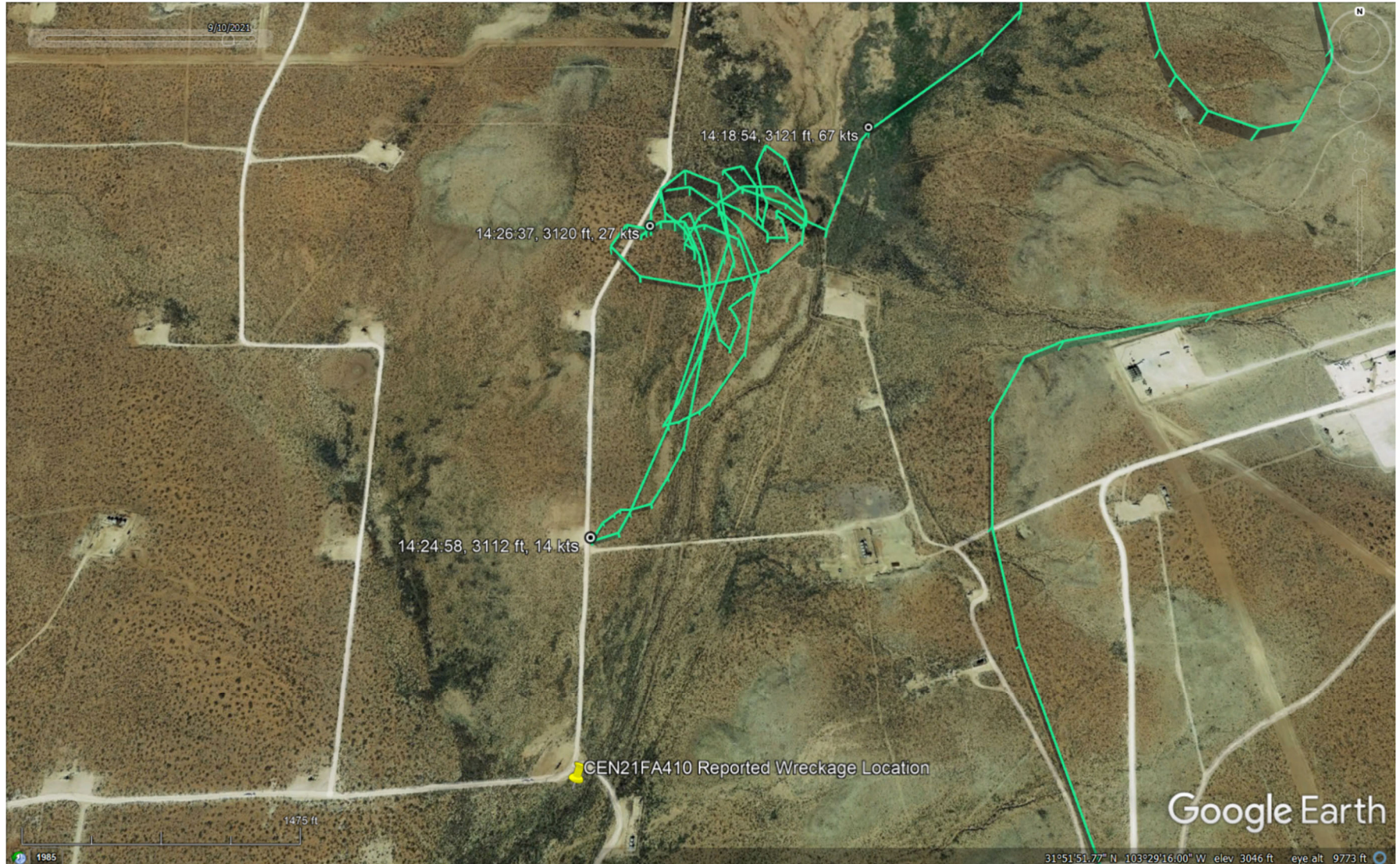


Figure 3. Google Earth overlay of the end of the last session recorded on the Garmin Aera 796 and the reported wreckage location.

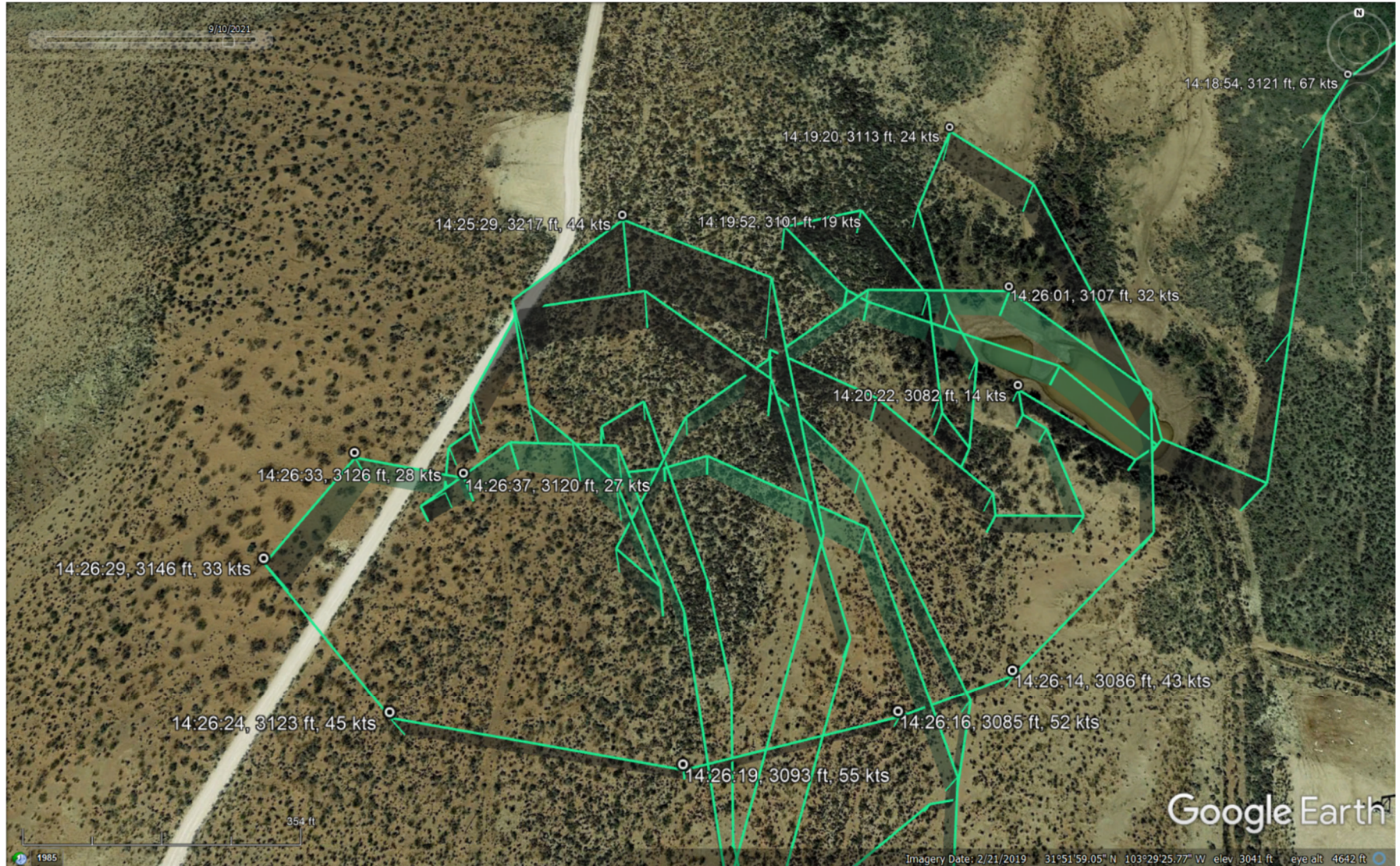


Figure 4. Google Earth overlay zoomed in on the end of the last session recorded on the Garmin Aera.

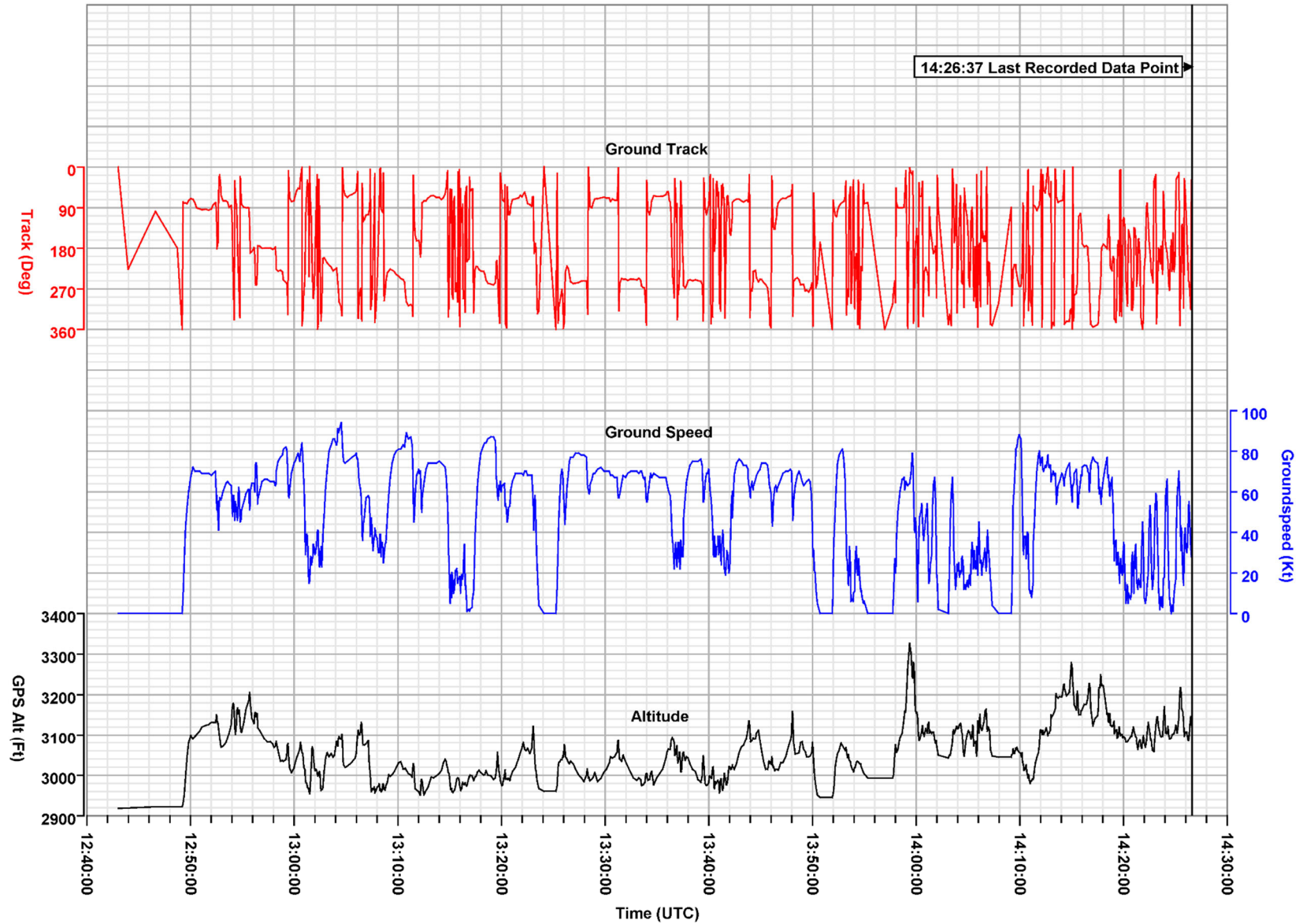


Figure 5. Plot of parameters recorded on the Garmin Aera 796 for the entire accident session.

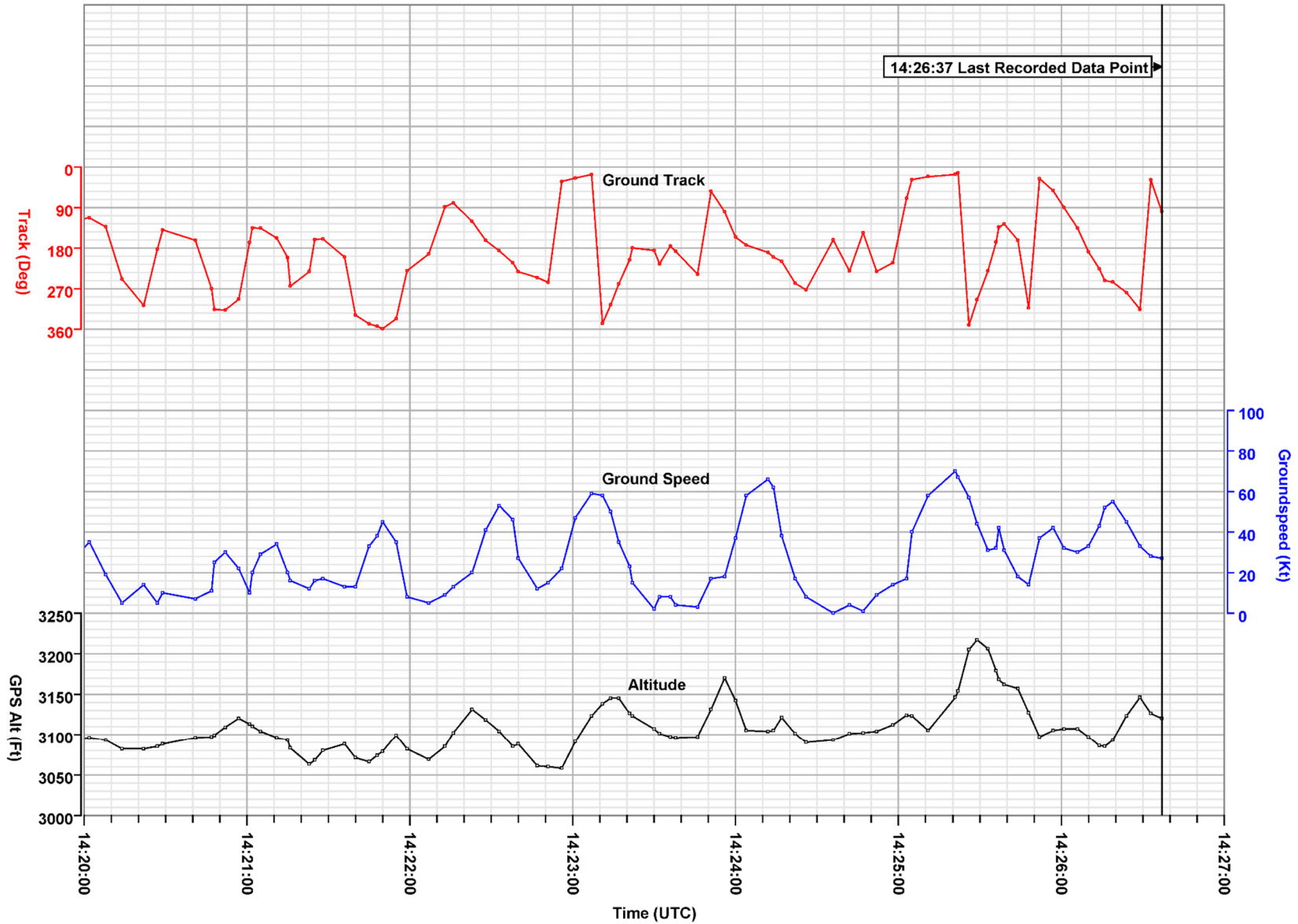


Figure 6. Plot of parameters recorded on the Garmin Aera 796 at the end of the accident session.