

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



CEN23FA220

ELECTRONIC DEVICES

Specialist's Factual Report

February 27, 2024

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A. ACCIDENT

Location: Gibbon, Nebraska
Date: June 2, 2023
Time: 0907 central daylight time (CDT)
1407 coordinated universal time (UTC)
Airplane: Vans RV-7, N977RV

B. ELECTRONIC DEVICES SPECIALIST

Specialist: Gerald Kawamoto
Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A group was not convened. The NTSB Vehicle Recorder Division received the following electronic devices:

Recorder Manufacturer/Model: Apple iPad Mini 2
Part Number: A1490
Recorder Serial Number: F9FR5760FLMJ

Recorder Manufacturer/Model: Grand Rapids Technologies MFD
Part Number: MFD-01-03001
Recorder Serial Number: 0209

Recorder Manufacturer/Model: Dynon EFIS-D10A
Part Number: Unknown
Recorder Serial Number: Unknown

Recorder Manufacturer/Model: Garmin GNS 430
Part Number: 011-01060-40
Recorder Serial Number: 97123794

Recorder Manufacturer/Model: Stratux
Part Number: 451012
Recorder Serial Number: Unknown

1.0 Apple iPad Mini 2

Personal Electronic Devices (PEDs) such as the Apple iPad Mini 2, are a category of devices comprised primarily of portable computing devices and mobile phones. Portable computing devices are typically capable of internet access, email,

messaging services, and can run user-installed applications to perform specific tasks. Depending on the model, mobile phones can perform many of the same tasks as portable computing devices, plus have voice call and text messaging capabilities. PED user and system data is typically stored on non-volatile memory and can be accessed through manufacturer-provided interfaces.¹

1.1 Apple iPad Mini 2 Data Recovery

The device sustained impact damage, as shown in figure 1, rendering it inoperable. The internal components were evaluated and surrogate lab parts were used to power on the device. Upon powering, the most recently opened application was iFly EFB (Electronic Flight Bag) by Adventure Pilot. Four flight trails, each corresponding to a segment of the accident flight were recorded in the application. Table 1 summarizes each flight trail. The time between data points varied throughout the course of each segment. Available ADS-B data from the accident flight started at 12:08:47 UTC and ended at 14:06:59 UTC.² GPS location data from the recorded flight trails aligned with ADS-B data until about 14:06:46 UTC.



Figure 1. Apple iPad Mini 2 as received.

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

² Automatic Dependent Surveillance-Broadcast (ADS-B) is a surveillance technology deployed throughout the national airspace system. The ADS-B system is composed of aircraft avionics and a ground infrastructure. Onboard avionics determine the position of the aircraft by using GPS and transmit its position along with additional information about the aircraft to ground stations for use by air traffic control (ATC) and other ADS-B services. This information is transmitted at a rate of approximately once per second. Operators equipped with ADS-B get additional benefits from ADS-B broadcast services: Traffic Information Service - Broadcast (TIS-B) (traffic information) and Flight Information Service - Broadcast (FIS-B) (weather information).

Table 1. Segments recorded on June 2, 2023 in the iFly EFB mobile application on the iPad Mini 2.

Segment	Time Start (UTC)	Time End (UTC)
1	12:35:07	12:36:14
2	13:10:28	13:11:48
3	13:25:45	13:30:47
4	13:37:57	14:07:19

2.0 Devices with No Data Recovered

No data were recovered from the additional devices. The impact damage sustained, as shown in figures 2 through 5, rendered them inoperable. The internal components of each device were examined to identify potential non-volatile memory.

The Grand Rapids Technologies MFD internal components sustained significant impact damage and no USB drive was recovered with the device, thus, no historical data were recovered. An internal compact flash card was recovered and its contents were limited to database information.

The non-volatile memory chip from the Dynon EFIS-D10A was removed and read out using laboratory tools. The binary image of the chip was examined and no historical flight data were identified, thus no accident-related data were recovered.

The Stratux contained a damaged internal 8GB microSD card, thus, no data were recovered.

The Garmin GNS 430 does not contain internal historical data.



Figure 2. Grand Rapids Technologies MFD as received.



Figure 3. Dynon EFIS D10A as received.

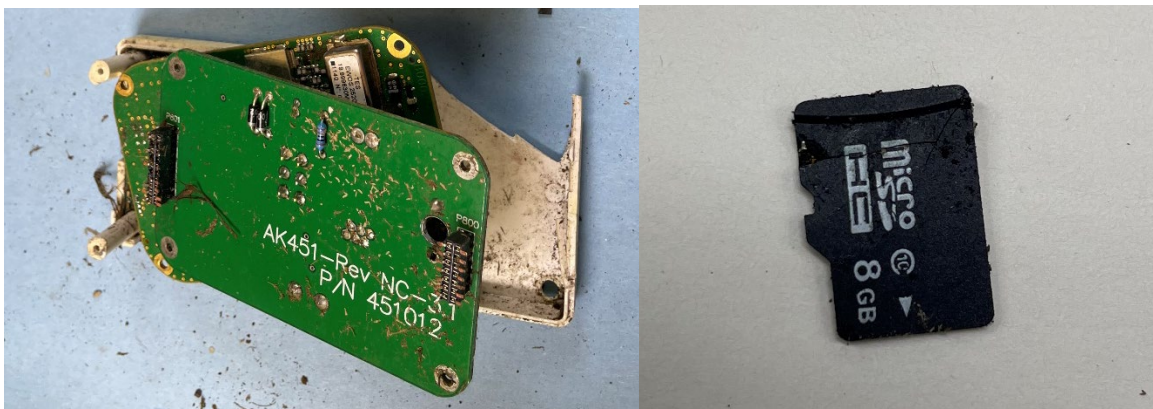


Figure 4. Stratux as received (left). Cracked 8GB microSD card (right).



Figure 5. Garmin GNS 430 as received.

D. FIGURES AND TABULAR DATA

Figures 6 through 9 are Google Earth overlays of the accident flight recorded on the iFly EFB mobile application on the iPad Mini 2. The weather and lighting conditions in Google Earth are not necessarily the weather and lighting conditions present at the time of the accident flight.

Figure 6 is an overview showing the first and last data point of each of the 4 segments of the accident flight recorded to the application's historical flight trails. The flight path was generated from the ADS-B data and the path generated from the iFly EFB data is not shown.

Figure 7 shows the final segment recorded starting at 13:37:57 UTC. The flight path was generated from iFly EFB data.

Figure 8 shows approximately the final 2 minutes of recorded data and the reported wreckage location just south of Interstate 80. The flight path of the iFly EFB data is shown in yellow and the ADS-B data track is shown in green.

Figure 9 shows the final data point where iFly EFB and ADS-B GPS data aligned with each other. The ADS-B data point is marked with the white text box. The flight path of the iFly EFB data is shown in yellow and the ADS-B data track is shown in green.

Figure 10 is a plot of GPS Altitude and Groundspeed recorded on the iFly EFB mobile application for the final segment of the accident flight. The final data point when GPS location data from the recorded flight trails aligned with ADS-B data is shown at 14:06:46 UTC.

Figure 11 is a plot of GPS Altitude and Groundspeed recorded on the iFly EFB mobile application for the final 2 minutes of the accident flight.

The corresponding tabular data used to create figures 6 through 11 are provided in CSV format as attachment 1 to this report.

Submitted by:

Gerald Kawamoto
Recorder Specialist

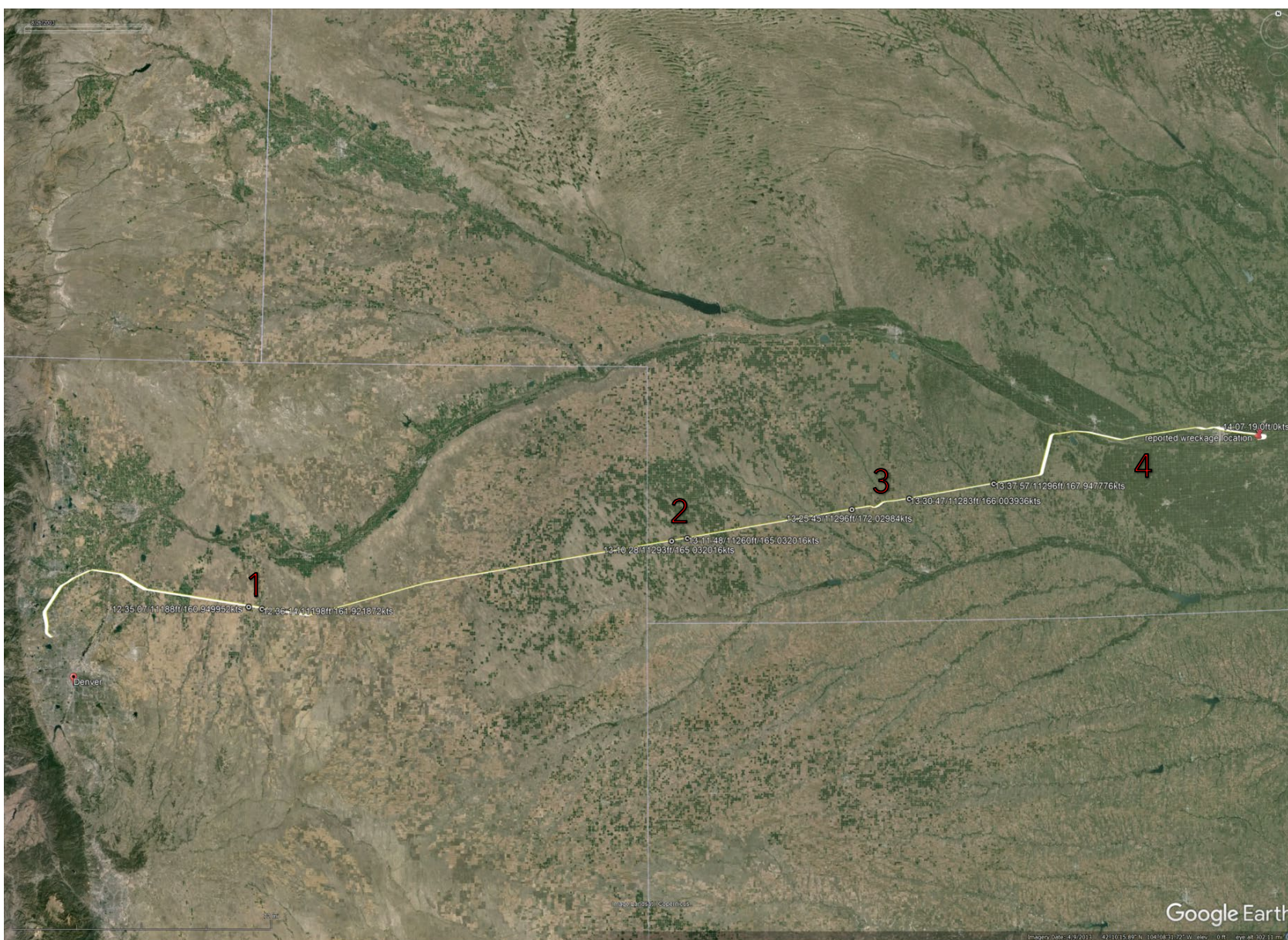


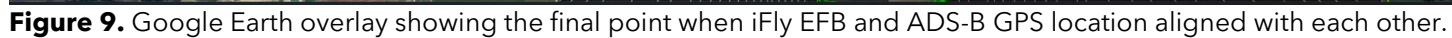
Figure 6. Google Earth overlay of the accident session with each segment recorded on the iFly EFB mobile application notated 1 through 4.



Figure 7. Google Earth overlay of the final segment (4) of the accident flight recorded on the iFly EFB.



Figure 8. Google Earth overlay of the end of the accident flight.



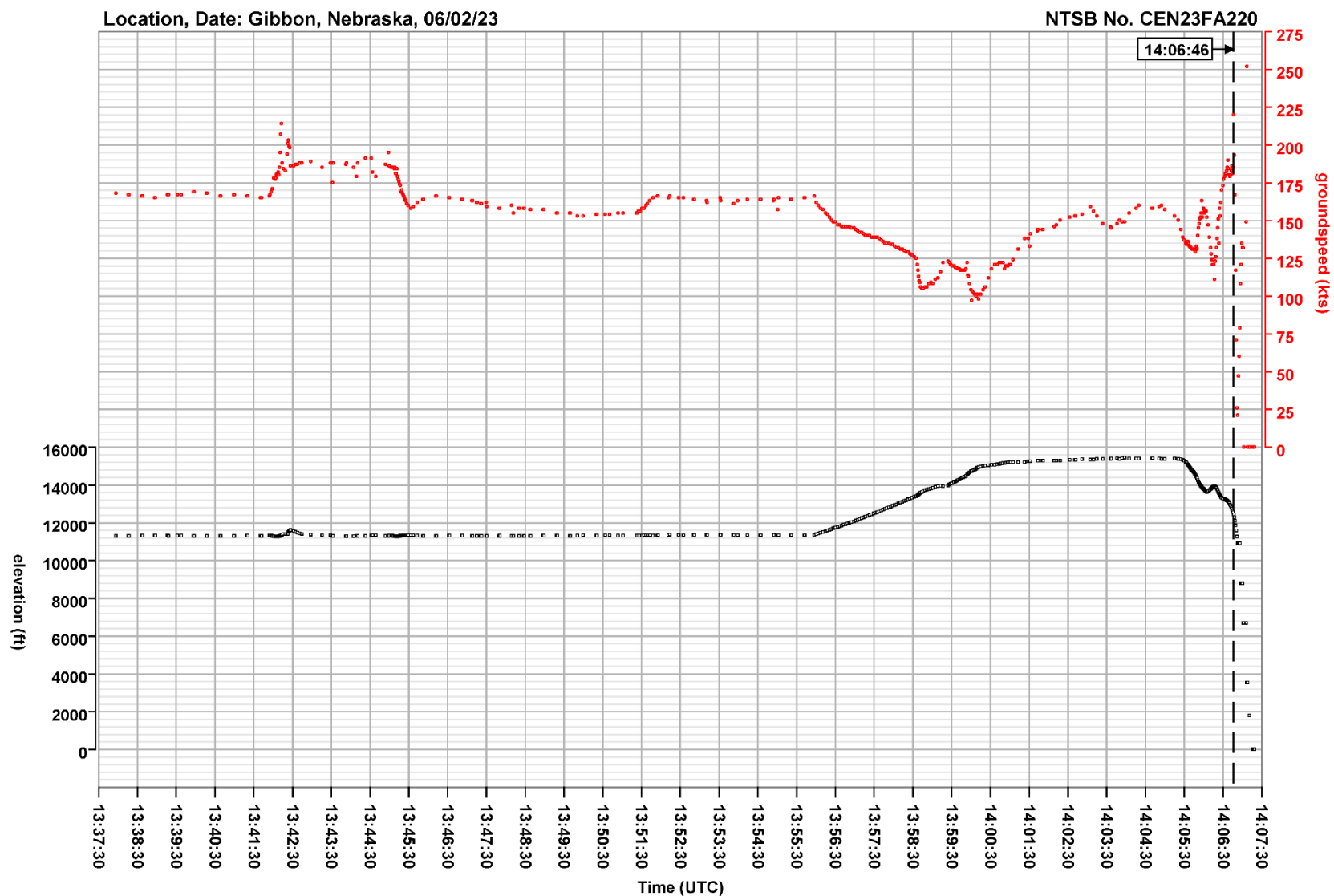


Figure 10. Plot of GPS Altitude and Groundspeed recorded on the iFly EFB mobile application for the final segment of the accident flight.

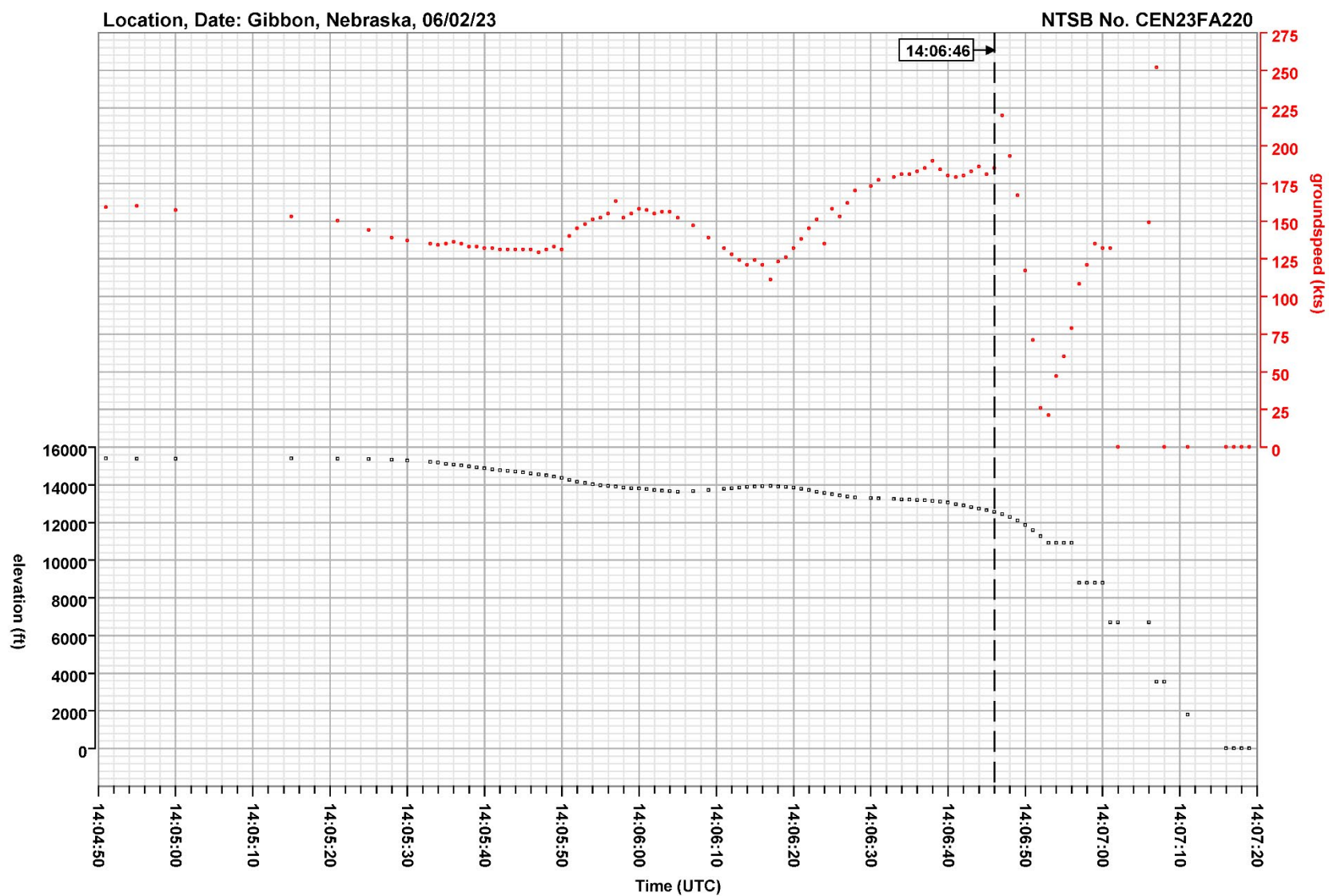


Figure 11. Plot of GPS Altitude and Groundspeed recorded on the iFly EFB mobile application for the final 2 minutes of the accident flight.