

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

August 5, 2021

Global Positioning System Device(s)

Specialist's Factual Report

By Sean Payne

1. EVENT SUMMARY

Location: Palmyra, PA
Date: April 3, 2021
Aircraft: Robinson R66
Registration: N577DD
Operator: Private
NTSB Number: ERA21LA171

On April 3, 2021, about 1630 eastern daylight time, a Robinson R66 helicopter; N577DD, was substantially damaged when it was involved in an accident in Palmyra, Pennsylvania. The pilot was seriously injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

2. DETAILS OF INVESTIGATION

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

Device Manufacturer/Model: **Garmin aera GPS 796**
Serial Number: **2CY007952**

Device Manufacturer/Model: **Garmin aera GPS 796**
Serial Number: **2CY010792**

2.1. Device Description

The Garmin aera 796 is a battery-powered, portable, multi-function display and GPS receiver with a 7-inch diagonal, high-resolution, LCD touch screen display. The unit includes a built-in Jeppesen database and is capable of receiving XM satellite radio for flight information including NEXRAD Radar, lightning, METARs, TAFs, 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 is capable of storing and displaying geo-referenced VFR and IFR navigation charts, including IFR approach charts. The unit also has a "scratchpad" feature, allowing the user to handwrite electronic notes.

The unit stores date, route-of-flight, and flight-time information for up to 50 flights. 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. 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. The current track log can be saved to long-term memory. Track log storage may be activated or deactivated 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.

2.2. Data Recovery

Two identical devices were sent into the lab. The devices arrived at the Vehicle Recorder Division undamaged. One device is shown in Figure 1. Both devices powered up normally and the data were extracted using the manufacturer's software. Both devices produced a nearly identical dataset, only one device's data is discussed in this report as the other device's data was determined to be redundant.



Figure 1. Photo of one of the 796 devices.

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

2.3. Data Description

The data extracted included 55 sessions from November 9, 2019, through April 3, 2021 (the accident day).² The accident flight was recorded starting at 18:46 UTC and ending at 20:37 UTC on April 3, 2021.

2.4. 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
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)

2.5. OVERLAYS AND TABULAR DATA

Figure 2 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 originated at Frederick Municipal Airport (FDK), Frederick, MD, around 19:12 UTC. The helicopter then headed north and made a landing at a private residence in the vicinity of Double D Ranch Heliport (70PA), Mechanicsburg, Pennsylvania, around 20:13 UTC. The helicopter then transited to Reigle Field Airport (58N) Palmyra, Pennsylvania, where the recording ended in the vicinity of a grassy area at 20:36:53 UTC.

Figure 3 is a graphical overlay generated using Google Earth showing the helicopter's approach to 58N.

Figure 4 is a graphical overlay generated using Google Earth showing the helicopter's descent and turn toward a grassy area at 58N.

Figure 5 is a graphical overlay generated using Google Earth showing the helicopter's final tracklog points on the property of 58N.

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

Table 2 is a spreadsheet of the final tracklog points recorded from the 796 device. Note that the values for the ground track are derived and do not necessarily represent the helicopter's heading at any one point in time.

Table 2: GPS Data for the final 15 tracklog points recovered from the GPS.

Time (UTC)	GPS Alt (unit)	Groundspeed (unit)	Track (unit)
20:28:47	725	57	116.7
20:28:55	659	45	120.2
20:29:04	574	33	113.8
20:29:08	548	26	96.1
20:29:16	522	20	68.4
20:29:23	509	15	18.1
20:29:37	495	10	356.9
20:29:51	486	4	10.7
20:30:05	466	1	24.2
20:30:10	466	1	13.7
20:30:15	479	5	151.6
20:30:17	456	7	206.9
20:30:23	466	4	230.7
20:33:10	509	0	87.1
20:36:53	509	0	56.3

Tabular data used to generate figures 2 through 5 are included in Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

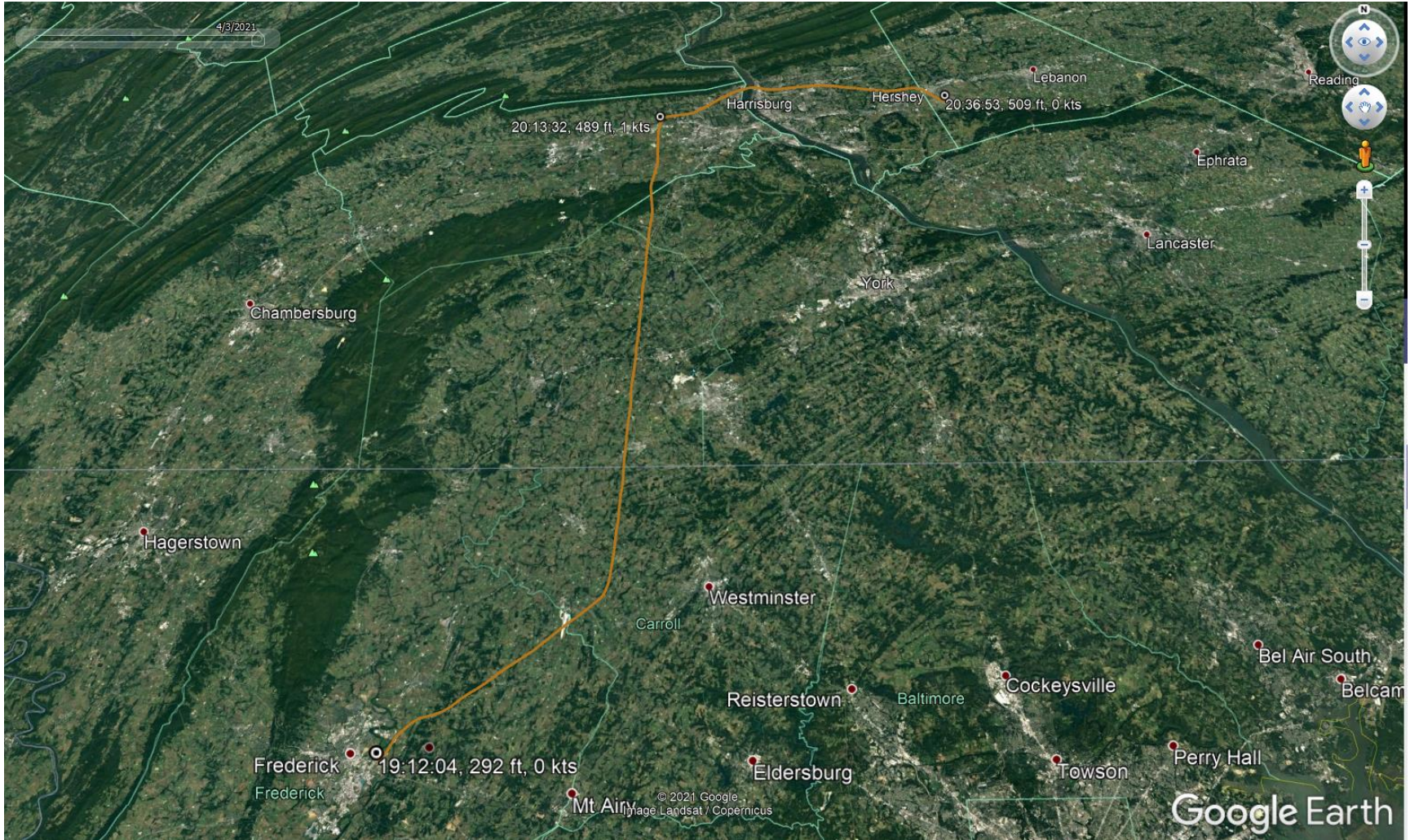


Figure 2. Google Earth overlay showing the entire tracklog file for the accident day.



Figure 3. Google Earth overlay showing the helicopter's approach to 58N.



Figure 4. Google Earth overlay showing a detailed overview of the helicopter's approach segment to 58N.



Figure 5. Google Earth overlay showing the final tracklog points of the helicopter's position relative to 58N.