

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

February 9, 2018

Global Positioning System Device

Specialist's Factual Report

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1. EVENT SUMMARY

Location: Canadensis, Pennsylvania
Date: March 27, 2016
Aircraft: Robinson R44
Registration: N776JM
Operator: Private
NTSB Number: ERA16FA143

On March 27, 2016, about 1135 eastern daylight time, a Robinson Helicopter R44, N776JM, was destroyed when it impacted terrain near Canadensis, Pennsylvania. The private pilot was fatally injured. The flight departed Doylestown Airport (DYL) Doylestown, Pennsylvania about 1100 eastern daylight time, destined for Mountain Bay Airpark (PA49) in Greentown, Pennsylvania, about 60 miles to the north. Instrument meteorological conditions prevailed, and no flight plan was filed for the personal flight which was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91.

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 396
Serial Number:	Unknown

3.1. Device Description

The Garmin GPSMAP 396 is a battery-powered portable 12-channel GPS receiver with a 256-color TFT LCD display screen. 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 stores date, route-of-flight, and

flight-time information for up to 50 flights. A flight record is triggered when groundspeed exceeds 30 knots and altitude exceeds 500 feet, and ends when groundspeed drops below 30 knots for 10 minutes or more. A detailed tracklog – including latitude, longitude, date, time, and GPS altitude information for an unspecified number of points – is stored within the unit whenever the receiver has a lock on the GPS navigation signal. Position is updated within the tracklog as a function of time or distance moved, depending on how the unit has been configured. Once the current tracklog memory becomes full, new information either overwrites the oldest information or recording stops, depending on how the unit is configured. The current tracklog can be saved to long-term memory and 15 saved tracklogs can be maintained in addition to the current tracklog. Tracklog storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile¹ 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. The unit can also communicate with external devices such as a computer using 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 examination revealed the unit had sustained heavy fire and impact damage. The extent of the damage is shown in figures 1 and 2.

Figure 1. Front of device as received.



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

Figure 2. Back of device as received.



The chip containing the unit's non-volatile memory (NVM) was identified. The NVM chip was removed from the board. The chip was found to be in good condition after removal and was restored to working condition so data could be extracted. The chip read out normally using an adapter socket appropriate for the type and model of chip. The read out resulted in a binary file which was converted to engineering units using laboratory software. The binary readout and subsequent conversion produced files consistent with a normally operating GPS device.

3.3. Data Description

The data extracted included 84 track logs from May 24, 2015² through March 27, 2016. The accident flight was recorded starting 15:02:58 UTC and ending 15:47:37 UTC on March 27, 2016.

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.

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

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)

3.5. OVERLAYS AND TABULAR DATA

Figure 3 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 departed Doylestown Airport at approximately 15:09:17 UTC. The last recorded parameter was as at 15:47:37 UTC on March 27, 2016, with a GPS altitude of 2,678 feet above Mean Sea Level (MSL) and a ground speed of 102 knots. Due to accident damage on the GPS unit, the data recording may have ended before the accident event.

Figure 3 is a graphical overlay generated using Google Earth zoomed in on the end of the recorded data.

Tabular data used to generate figure 3 are included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

Figure 3. Google Earth imagery showing full accident flight.



Figure 4. Google Earth Imagery showing end of accident flight data.

