

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

February 6, 2019

Global Positioning System Devices

Specialist's Factual Report

By Christopher Babcock

1. EVENT SUMMARY

Location: Fredericksburg, Virginia
Date: December 14, 2018
Aircraft: Quicksilver MXL II
Registration: N350FT
Operator: Private
NTSB Number: ERA19FA066

On December 14, 2018, at 0740 eastern standard time, an experimental amateur-built Quicksilver MXL II, registration N350FT, was substantially damaged after it impacted terrain near Shannon Airport (EZF), Fredericksburg, Virginia. The commercial pilot was fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight, which originated around 0738. The personal flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91. Two GPS devices were recovered and forwarded to the NTSB Vehicle Recorder Laboratory for evaluation.

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) devices:

Device Manufacturer/Model:	Garmin GPSMAP 296
Serial Number:	10c002202

Device Manufacturer/Model:	iFlyGPS 700a
Serial Number:	mb0c0154

3.1. Device Description

The Garmin GPSMAP 296 is a hand-portable GPS unit equipped with a detachable antenna, a 256 color TFT LCD display, built in base map and an internal Jeppesen

aviation database. The GPSMAP 296 can store date, route of flight, and flight time information for up to 50 individual flights in the form of a flight log. A detailed tracklog 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 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. Tracklog storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile memory.

The iFlyGPS 700a is a portable GPS that may suction-cup mounted to an aircraft. The iFlyGPS 700a can store date, time, and route of flight information on an internal SD card. Position is updated approximately once per second.

3.2. Data Recovery

The Garmin GPSMAP 296 was minimally damaged by impact forces (Figure 1) and data was recovered normally using the manufacturer's software.



Figure 1. Photo of Garmin GPSMAP 296.

The iFlyGPS 700a was heavily damaged by impact forces (Figure 2). Data was recovered by extracting the internal SD card, which was undamaged, and recovering the track log history using a forensic card reader.



Figure 2. Photo of iFlyGPS 700a.

3.3. Data Description

The data extracted from the Garmin GPSMAP 296 included 15 track logs from September 17, 2014,¹ through the accident flight on December 14, 2018. The data extracted from the iFlyGPS 700a included 47 track logs from February 14, 2009, through the accident flight on December 14, 2018. Timing on the iFlyGPS 700a was referenced to an unknown timebase, but the final log matched the data from the Garmin GPSMAP 296.

3.4. Parameters Provided

Table 1 describes data parameters provided by the GPS devices. 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 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)

¹ All dates and times are referenced to Coordinated Universal Time (UTC).

3.5. OVERLAYS AND TABULAR DATA

Figures 3-5 are graphical overlays 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 GPS recording started at 12:12:37 UTC time on the ramp. The aircraft proceeded to complete several taxi runs and short flights along the length of the runway. The aircraft started its takeoff roll on the accident flight at about 12:39 UTC. After departure, the aircraft turned left on a crosswind leg and reached a maximum altitude of 322 feet GPS altitude and 51 knots groundspeed before turning left downwind at about 12:40 UTC. The aircraft slowed and descended and the radius of the turn continued to decrease until the data ended at 12:40:15 UTC at an altitude of 285 feet GPS altitude and 29 knots ground speed.

Figure 3 shows the entire power cycle including the taxi runs along the runway and the accident flight. Figure 4 shows the last 40 seconds of the accident flight and Figure 5 shows the last 30 seconds from an oblique perspective.

Attachment 1 contains the data from both units and is available in the public docket for this accident.

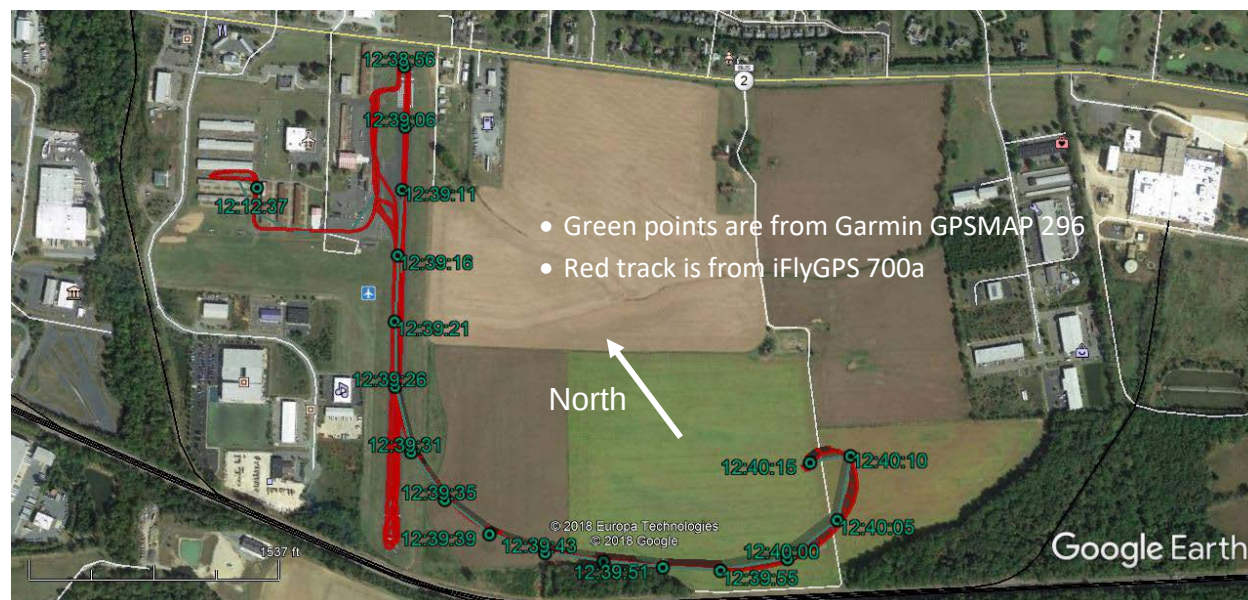


Figure 3. Entire accident power cycle.

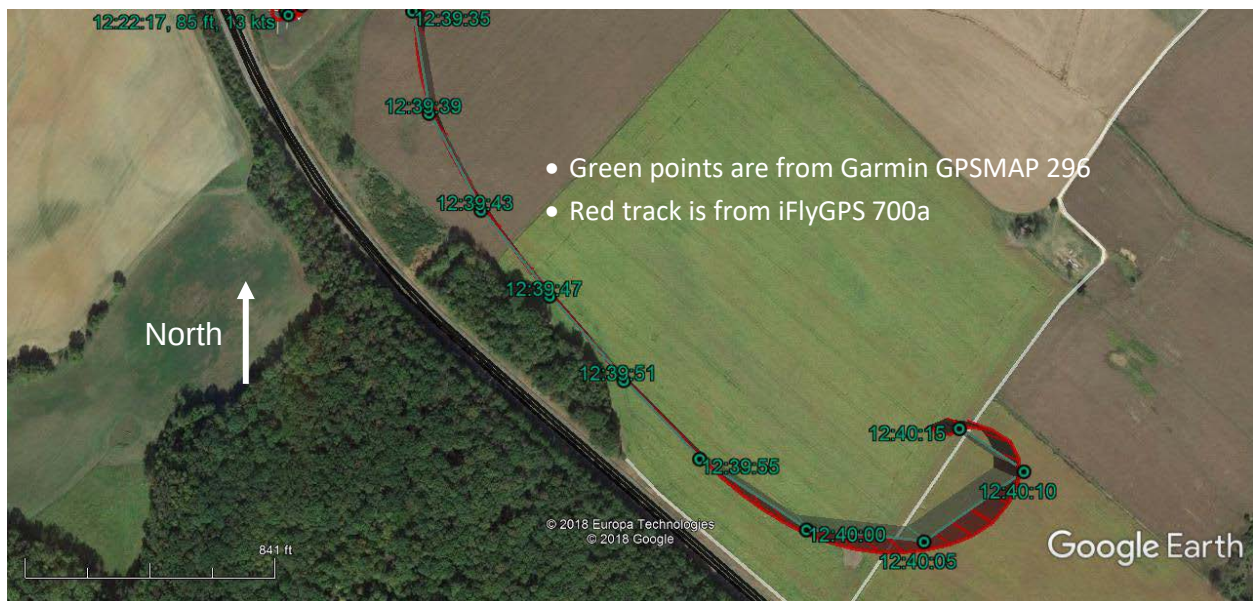


Figure 4. Last 40 seconds of flight.

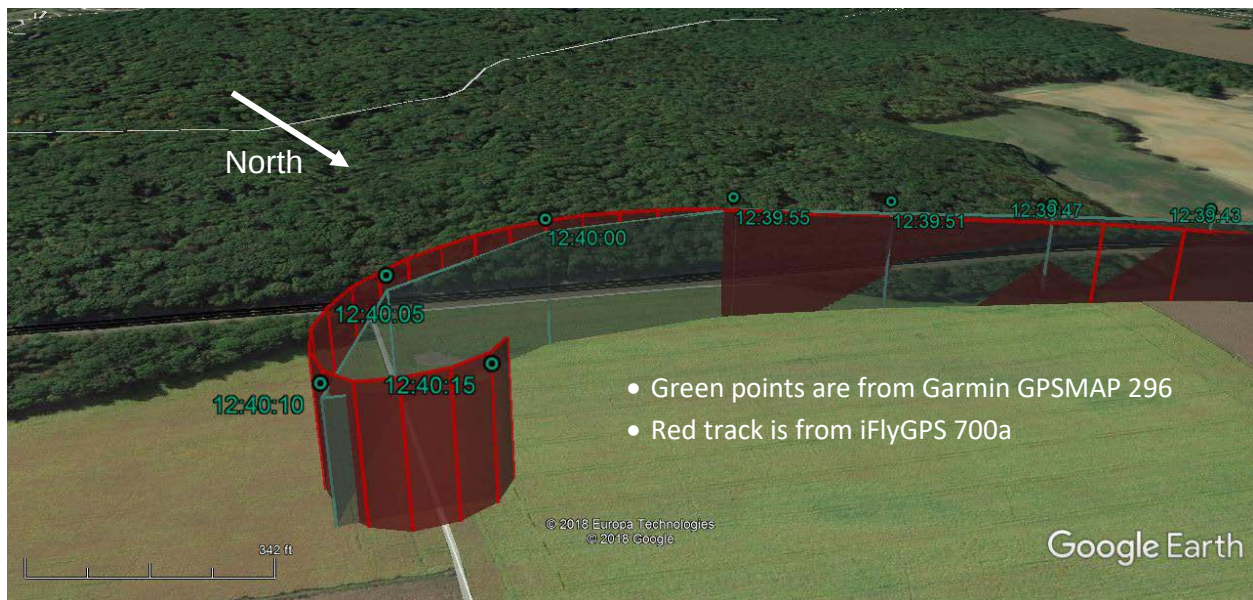


Figure 5. Last 30 seconds of flight.