

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division

Washington, D.C. 20594

June 5, 2018

Global Positioning System

Specialist's Factual Report

by Alice Park

1. EVENT

Location: Portland, Tennessee
Date: August 29, 2017
Aircraft: Grumman AA-1B
Registration: N8866L
Operator: Private
NTSB Number: ERA17FA299

On August 29, 2017 about 1920 central daylight time, a Grumman AA-1B, N8866L, was substantially damaged when it impacted trees and terrain while on approach to the Portland Municipal Airport (1M5), Portland, Tennessee. The private pilot and passenger were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight that departed Lebanon Municipal Airport (M54), Lebanon, Tennessee about 1940. The airplane was owned and operated by the private pilot as a personal flight in accordance with the provisions of 14 *Code of Federal Regulations* Part 91.

2. DETAILS OF DEVICE INVESTIGATION

The National Transportation Safety Board Vehicle Recorder Division received the following Global Positioning System (GPS) device:

Device: Garmin GPSMAP 196
Device S/N: 65425063

2.1. Garmin GPSMAP 196 Device Description

The Garmin GPSMAP 196 is a portable GPS unit equipped with a detachable antenna, and a 320 x 240 12-level grayscale LCD display. The unit is equipped with a built in base map and internal Jeppesen aviation database. The unit employs a parallel 12 channel

WAAS-capable receiver and can be operated using external power, or alternatively by four standard AA-size batteries. The GPSMAP 196 can store date, route of flight, and flight time information for up to 50 individual flights in the form of a flight log. Flight logging begins when the GPS unit senses a speed increase to greater than 30 knots together with an altitude gain of greater than 500 feet. Recorded flight log data is saved when the speed is sensed to decrease to below 30 knots, and a new log is started if more than 10 minutes passes from this time. A detailed track log – 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. Track log position is updated 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.¹ The current track log can be saved to long-term memory and 15 saved track logs can be maintained in addition to the current track log. Track log storage may be activated or de-activated at user discretion. All recorded data is stored in *non-volatile*² memory. The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via a built-in serial port using the NMEA 0183 version 2.0 protocol. 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.

2.1.1. Garmin GPSMAP 196 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed that the unit had no significant damage. Power was applied to the unit, and recorded waypoint, route, and track log data were extracted using Garmin MapSource.

¹ A third “Resolution” setting is available which records a new track point only when the direction and speed have changed significantly. In this mode the unit examines current 2-D position, velocity and ground track once per-second, and calculates a project position. If the unit’s actual position 1-second later differs from the projected position by a set value (25 meters, or 82 feet by default) or if the ground maneuvering flight.

² Non-volatile memory is semiconductor memory that does not require external power for data retention.

Figure 1. External view of the Garmin GPSMAP 196 - front (s/n 65425063).



Figure 2. External view of the Garmin GPSMAP 196 - back (s/n 65425063).



2.1.2. Garmin GPSMAP 196 Data Description

Track log data dated from July 27, 2017 to August 30, 2017 was recovered from the unit. And the accident data was identified with the date and location of the accident.

3. GPS PARAMETERS PROVIDED

Table 1 describes the data parameters provided. Date, Time, Longitude, Latitude, and GPS Altitude are recorded by the device. Groundspeed and Track are derived by the download software using recorded information. Data from the accident flight recorded is provided in tabular format as Attachment 1 to this report.

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 (ft)
Groundspeed	Average groundspeed between current and following data point (knots)
Track	Average true course between current and following data point (degrees)

4. OVERLAYS AND TABULAR DATA

All graphical overlays in this report were generated using Google Earth Pro. Note that the weather and lighting conditions depicted in Google Earth imagery do not necessarily reflect the conditions present during the accident flight.

The most recently recorded track log began at 2331:57 Universal Time Coordinated (UTC) on August 29, 2017, departing at the Portland Municipal Airport (1M5), Portland, Tennessee.

The accident flight flew to south direction from the departing airport. The accident flight had been flying circles over Gallatin and headed to north (see figures 3), and then turned

south approaching to the airport. The last track data of the accident flight was at 0020:56 Universal Time Coordinated (UTC) on August 30, 2017 as shown in Figure 4.

Figure 3. Google Earth overlay of the entire flight of the accident flight (attachment 1). The airport is located with a white circle.
(yellow triangles present the direction of the flight)

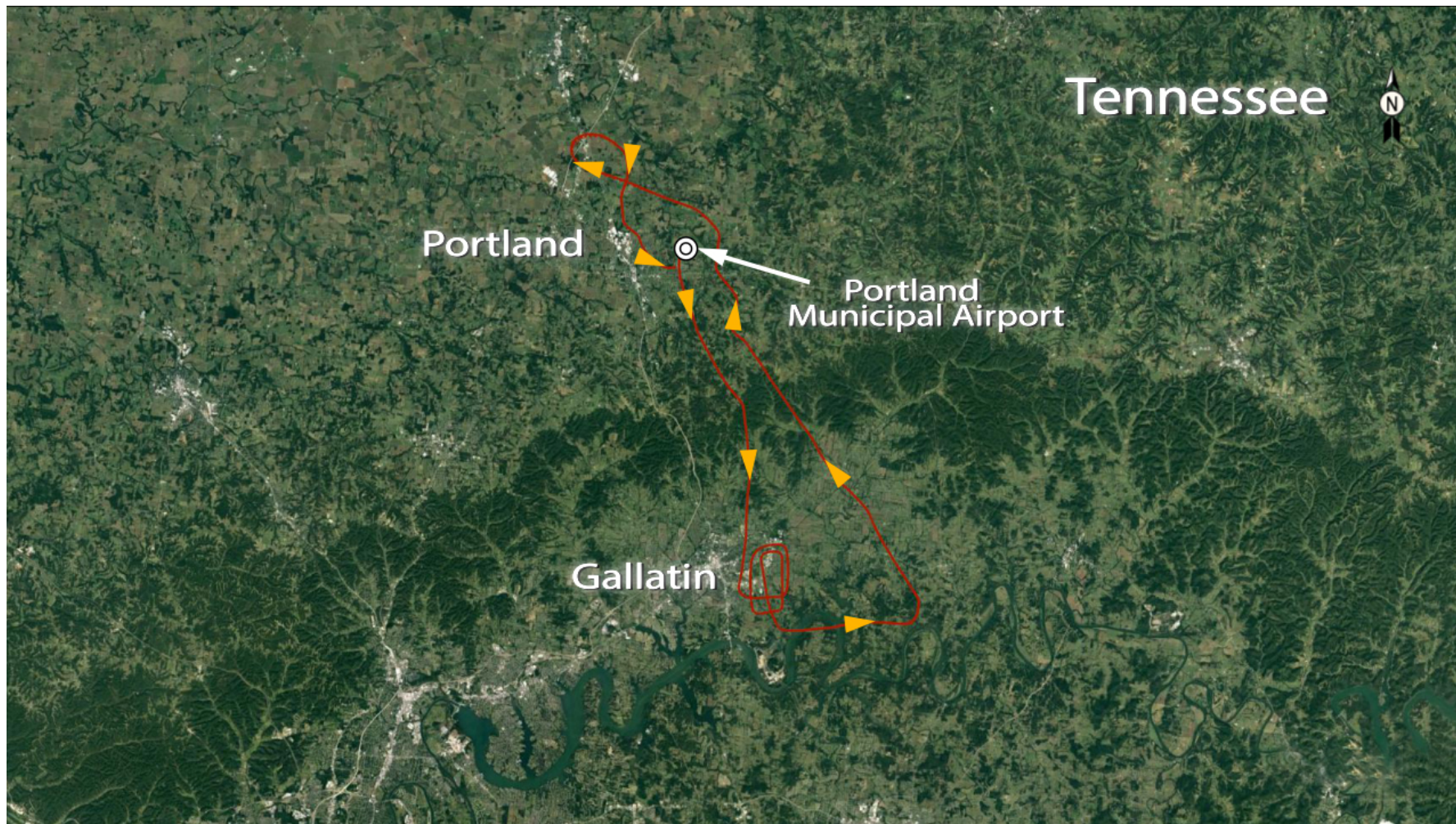


Figure 4. Google Earth overlay of accident flight, immediately prior to accident. The first and final position of the track data was recorded at 2331 and 0020 UTC respectively, with an orange circle.
(yellow triangles present the direction of the flight)

