NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

November 4, 2013

GPS Factual Report

Specialist's Factual Report
by Bill Tuccio, Ph.D.

A. EVENT

Location:	Guntersville, Alabama
Date:	September 8, 2013
Aircraft:	Piper PA-28R-300
Registration:	N8362C
Operator:	Private
NTSB Number:	ERA13LA407

B. GROUP - No Group

C. SUMMARY

On September 8, 2013, about 1656 central daylight time, a Piper PA-32R-300, N8362C, registered to and operated by a private individual, was substantially damaged during a forced landing in a lake short of a runway at Guntersville Municipal Airport-Joe Starnes Field (8A1), Guntersville, Alabama. Visual meteorological conditions prevailed at the time and no flight plan was filed for the 14 *Code of Federal Regulations* (CFR) Part 91 personal, local flight from Northeast Alabama Regional Airport (GAD), Gadsden, Alabama. The airplane sustained substantial damage and the private pilot and one passenger sustained minor injuries.

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model:	Garmin GPSMAP 196
Serial Number:	65412365

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 is capable of storing

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. 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 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 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.

GPS Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, it was reported the unit had been immersed in fresh water. An internal inspection revealed no corrosion or damage. Power was applied to the accident unit and it started normally. Data was downloaded from the unit using Garmin supplied software normally, without difficulty.

GPS Data Description

The track data extracted spanned the time period from October 14, 2011[2] through September 8, 2013. The accident flight was recorded starting at 2101:35 UTC and ending at 2155:47 UTC on September 8, 2013.

GPS 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)

[1] Non-volatile memory is semiconductor memory that does not require external power for data retention.
[2] All dates and times are referenced to Coordinated Universal Time (UTC).

Parameter Name	Parameter Description
GPS Alt	Recorded Altitude (above mean sea level) (feet)
Groundspeed	Average groundspeed between current and previous data point (knots)
Track	Average true course between current and previous data point (degrees)

OVERLAYS AND TABULAR DATA

All overlays were produced using Google Earth. All times are expressed as UTC, and altitudes are GPS recorded altitude.

Figure 1 provides an overview of the accident flight. The recording began at 2103:37 UTC at the GAD airport. By 2111:09 UTC, the aircraft had departed runway 24, was climbing through 1,572 feet, and was turning southbound. After maneuvering south/southeast of GAD, the aircraft proceeded north and passed 8A1 at about 2145 UTC at about 4,300 feet.

Figure 2 shows flight path details north of 8A1. After passing 8A1 northbound, the aircraft paralleled Guntersville Lake northeast bound. At about 2148 UTC, the aircraft turned towards the southwest, still at an altitude of about 4,300 feet, flying parallel and east of Guntersville Lake.

Between 2152:33 UTC and 2152:45 UTC, the groundspeed slowed from 142 knots to 117 knots, and the aircraft altitude decreased from 4,354 feet to 4,262 feet.

Figure 3 shows flight path details for the end of the recording. At 2153:11 UTC, as the aircraft was descending through 3,776 feet at about 91 knots groundspeed, it turned towards the northwest; at this point the aircraft was about 2.2 nautical miles (nm) northeast of the runway 21 threshold at 8A1.

At 2154:03 UTC, as the aircraft was descending through 2,648 feet at about 84 knots groundspeed, it turned towards the west; at this point the aircraft was about 1.7 nm north-northeast of the runway 21 threshold at 8A1.

At about 2154:30 UTC, the aircraft was travelling westerly as it passed through the extended centerline of runway 21 at 2,080 feet; at this point the aircraft was about 1.6 nm north-northeast of the runway 21 threshold at 8A1.

At about 2154:49 UTC, as the aircraft was descending through 1,677 feet at about 82 knots groundspeed, it turned towards the southeast; at this point the aircraft was about 1.3 nm north of the runway 21 threshold at 8A1.

At about 2155:05 UTC, the aircraft was travelling southeasterly as it passed through the extended centerline of runway 21 at 1,280 feet and turned towards the southwest; at this point the aircraft was about 1.1 nm north-northeast of the runway 21 threshold at 8A1.

From 2155:05 UTC until the end of the recording at 2155:47 UTC, the groundspeed slowed from 92 knots to 68 knots and the altitude decreased from 1,280 feet to 604 feet.

The last recorded point was about 0.1 nm north-north east of the runway 21 threshold at 8A1 approximately aligned with the extended centerline of the runway.

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

Figure 1. Google Earth overlay of the entire accident flight recording.

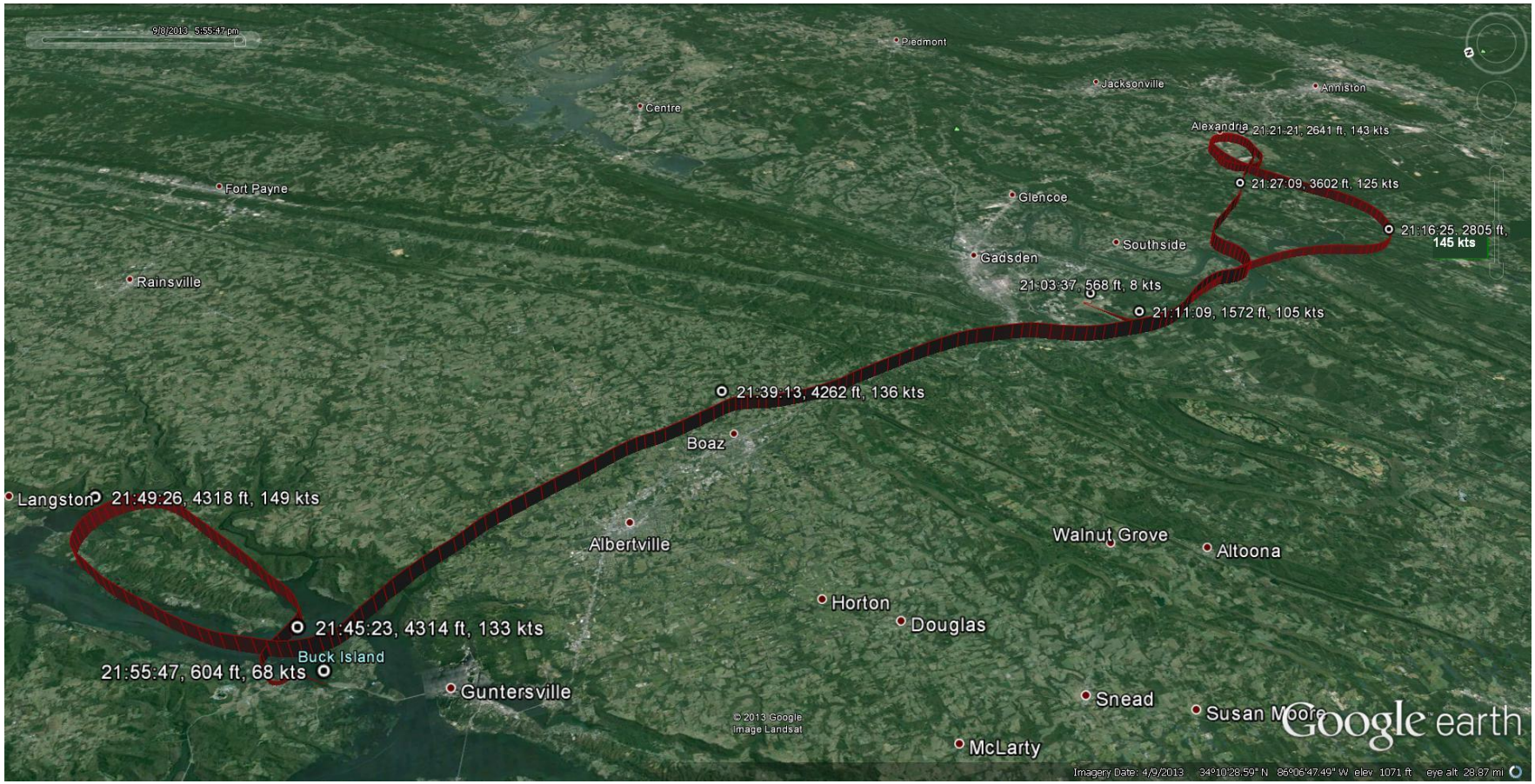

Figure 2. Google Earth overlay near 8A1 airport.

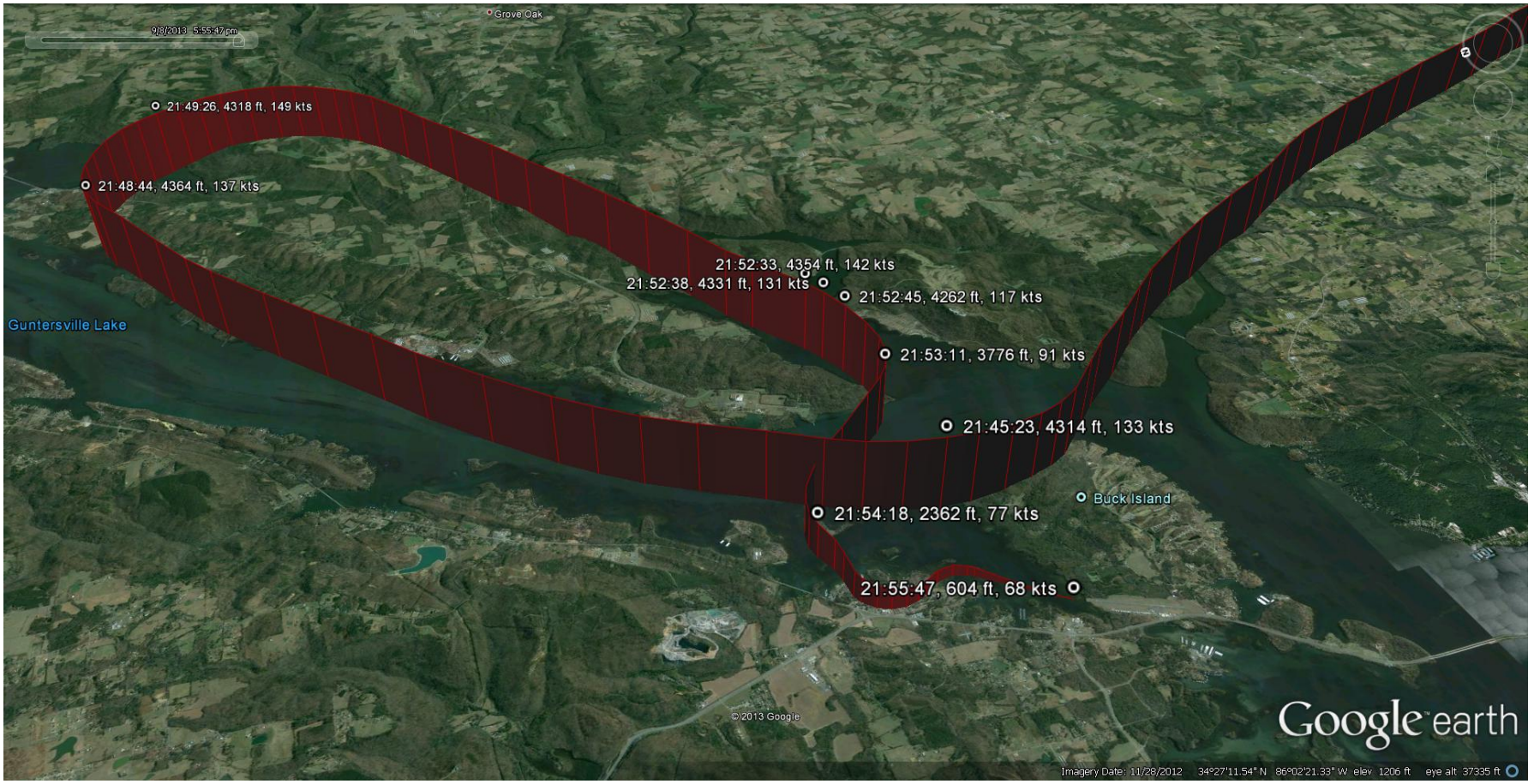

Figure 3. Google Earth overlay of the end of the accident recording.