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

September 26, 2012

17 - GPS Factual Report

Specialist's Factual Report
by Bill Tuccio

A. EVENT

Location:	Tillatoba, Mississippi
Date:	September 2, 2012
Aircraft:	Cessna T210M
Registration:	N761YN
Operator:	Private
NTSB Number:	ERA12LA543

B. GROUP - No Group

C. SUMMARY

On September 2, 2012, about 2030 central daylight time, a Cessna T210M, N761YN, operated by a private individual, was substantially damaged during a forced landing into trees, following a total loss of engine power during cruise flight near Tillatoba, Mississippi. The private pilot was seriously injured. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91. Night visual meteorological conditions prevailed and no flight plan was filed for the flight that departed Suffolk Executive Airport (SFQ), Suffolk, Virginia, about 1500; destined for Olive Branch Airport (OLV), Olive Branch, Mississippi.

D. DETAILS OF INVESTIGATION

On September 14, 2012, the NTSB Vehicle Recorder Laboratory received the following device:

GPS Manufacturer/Model:	Garmin GPSMAP 396
Serial Number:	28202155

Garmin GPSMAP 396 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 NEXTRAD 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-volatile[1] 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.

GPS Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had not sustained any damage. Power was applied to the accident unit and it started normally. Figure 1 shows the startup screen with the database indicating effective dates from August 4, 2005 through September 1, 2005.

The track mode settings on the unit were investigated. As shown in figure 2, the recording of track information was on and set to wrap mode.

Data was downloaded from the unit using Garmin supplied software normally, without difficulty.

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

Figure 1. Photo of Garmin GPSMap 396 startup screen.

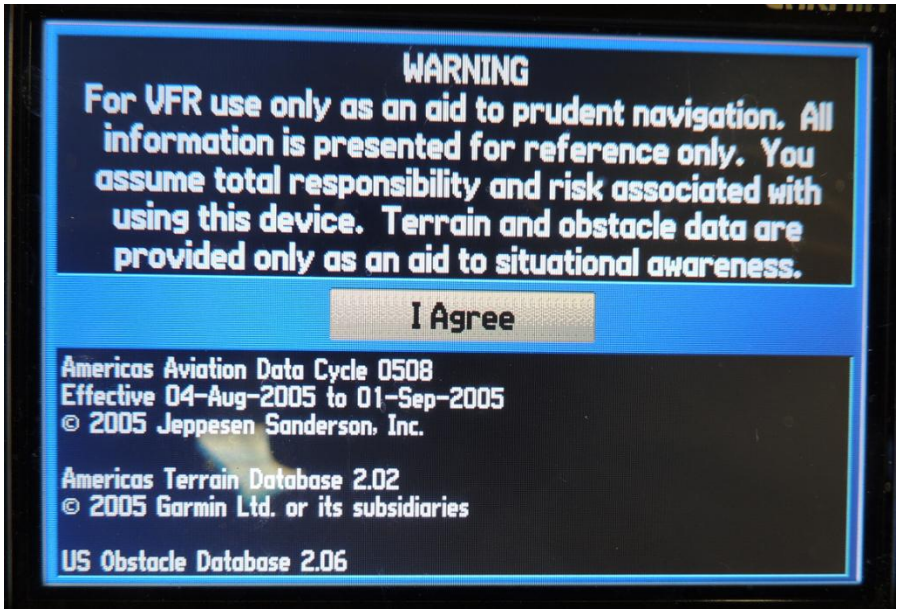

Figure 2. Track mode settings.

GPS Data Description

The data extracted included 10,001 tracklog history data points from November 9, 2010 through September 3, 2012 at 0154:00 UTC. The accident flight was the last flight in the tracklog history, consisting of 409 data points, from September 2, 2012 at 2020:11 to September 3, 2012 at 0154:00 UTC.

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 (UTC) 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 Altitude, above Mean Sea Level (MSL) (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

Figure 3 is a plot of the accident flight showing the GPS Altitude, groundspeed, and true track for the flight. After a taxi of at least 6 minutes, the aircraft departed SFQ at about 2026:39 UTC. The last data point recorded on the GPS was at 01:54:40 UTC, a total duration of 5 hours, 27 minutes, and 23 seconds. The aircraft initially climbed to about 2,500 feet within the first 8 minutes of the flight. About 24 minutes into the flight, the aircraft climbed to about 6,500 feet, taking 11 minutes for the climb segment, achieving 6,500 feet at about 35 minutes into the flight. The aircraft remained at 6,500 feet for about 45 minutes, until about 1 hour, 20 minutes into the flight. The aircraft then climbed to about 9,000 feet, taking about 4 minutes to climb, achieving 9,000 feet at about 1 hour 24 minutes into the flight. The aircraft remained at 9,000 feet for about 3 hours and 20 minutes, until about 4 hours 44 minutes into the flight. The aircraft then descended towards Water Valley, Mississippi. After circling the airport at about 1,300 feet, the aircraft then climbed to about 2,500 feet and proceeded to the Panola County Airport, where the aircraft descended to about 370 feet. The aircraft then climbed to about 1,800 feet until descending once again at the end of the flight.

Figure 4 is a graphical overlay generated using Google Earth for the entire accident flight. The overlay shows the entire aircraft flight path with select points annotated.

Figure 5 is a graphical overlay generated using Google Earth for the segment of the flight when the aircraft descended towards Water Valley, Mississippi, then proceeded to the Panola County Airport, and then south. The overlay shows the aircraft flight path for this segment of the flight with select points annotated. The aircraft first descended to about 1,300 feet and circled once around the Water Valley Municipal Airport. Thereafter, the aircraft climbed to about 2,500 feet and proceeded to the Panola County Airport, descending to about 370 feet on a flight path generally aligned with runway 19. The aircraft then climbed to about 1,800 feet and proceeded in a southerly direction. At about 01:52 UTC, the aircraft began to descend and turned towards the west. The last recorded point was at 0154:00 UTC at 459 feet.

Tabular data used to generate figures 3 through 5 are included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

Figure 3. Plot of accident flight.

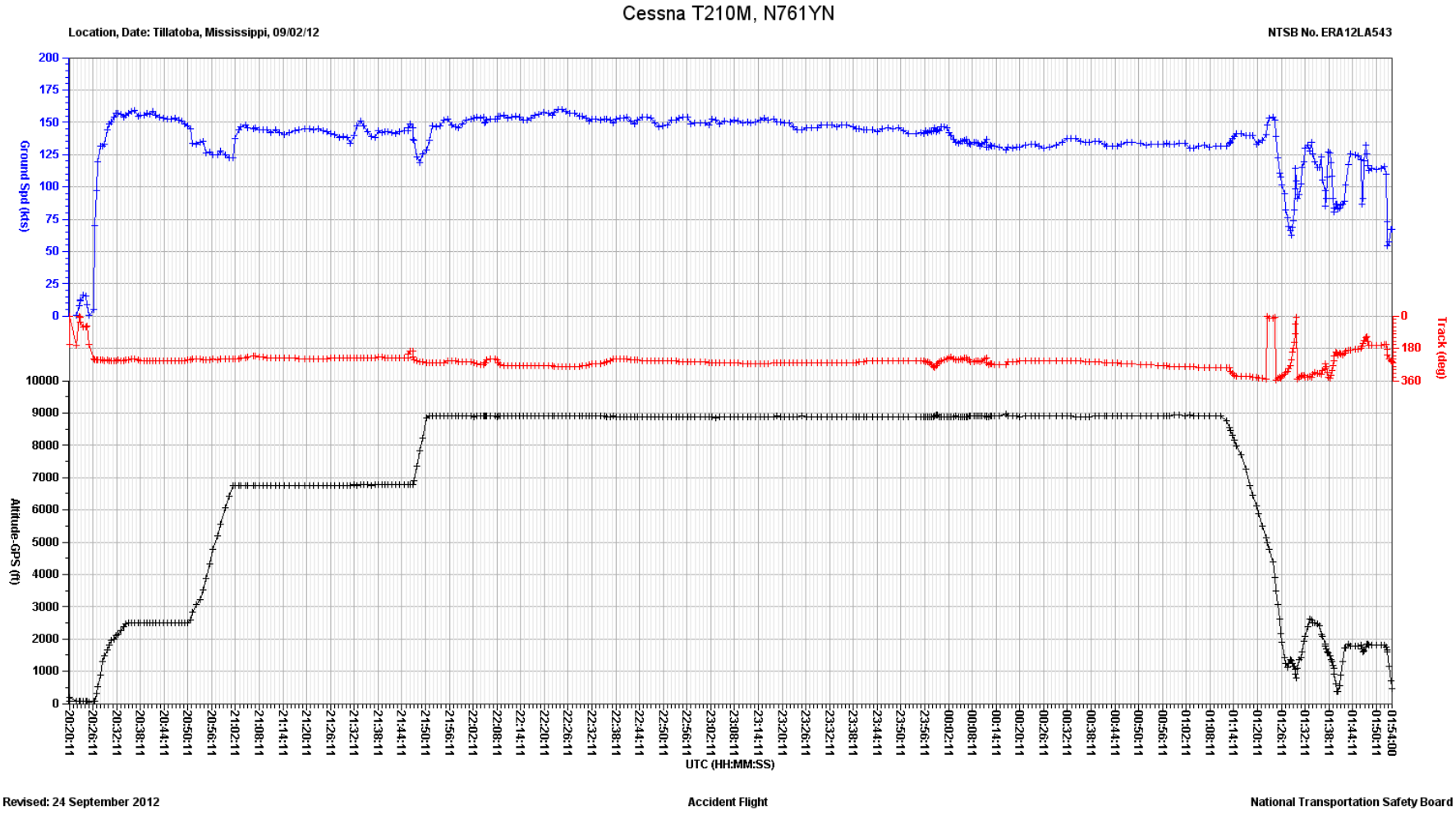

Figure 4. Google Earth overlay, end of accident flight.

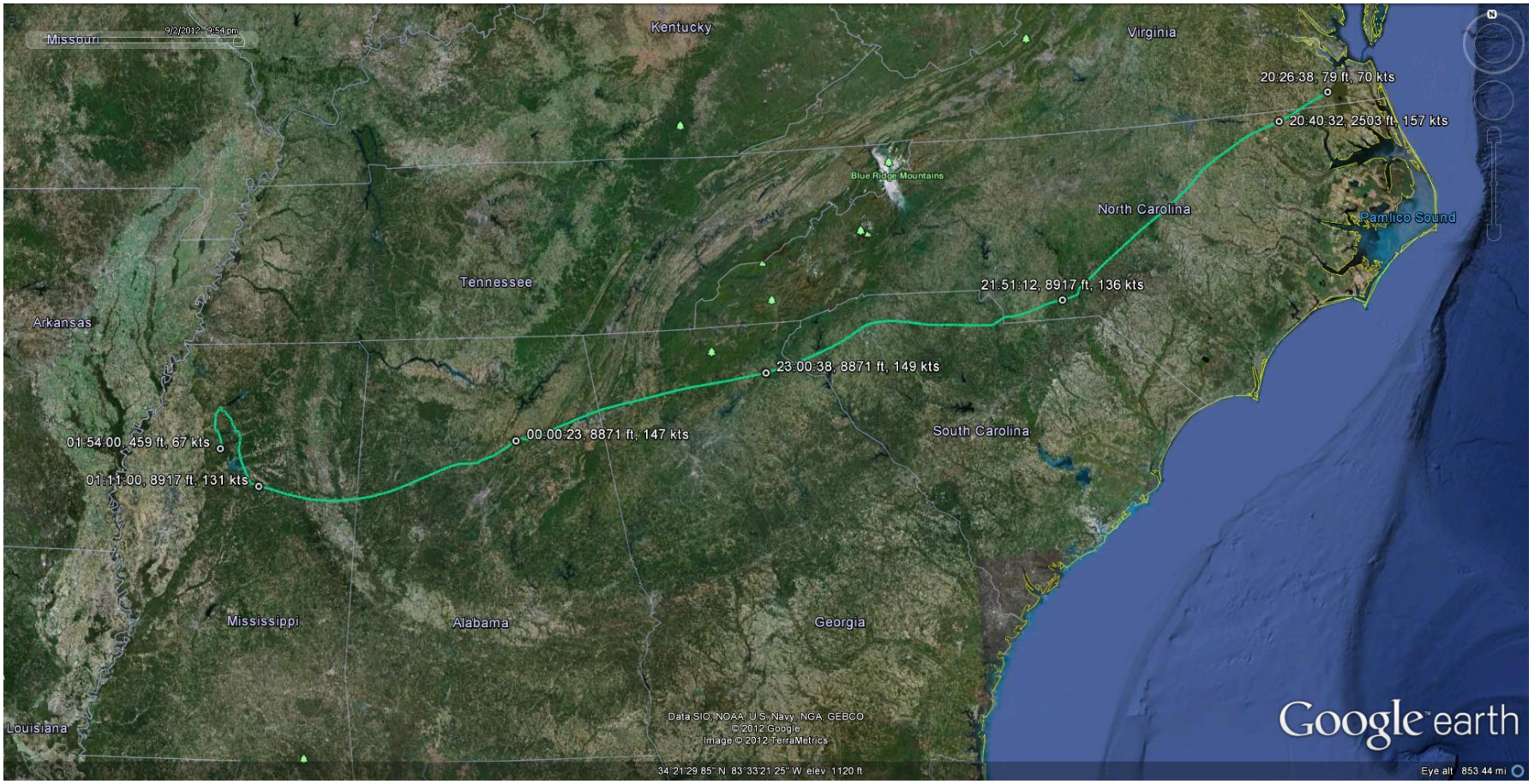

Figure 5. Google Earth overlay, end of accident flight.