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

September 13, 2012

17 - GPS Factual Report

by Bill Tuccio

A. EVENT

Location:	Milner, Colorado
Date:	August 25, 2012
Aircraft:	Piper PA-24-250
Registration:	N7774P
Operator:	Private
NTSB Number:	CEN12FA571

B. GROUP - No Group

C. SUMMARY

On August 24, 2012, at an unknown time, a Piper PA-24-250, N7774P, was substantially damaged when it impacted terrain under unknown circumstances near Milner, Colorado. The pilot was fatally injured. The aircraft was registered to and operated by a private individual under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight, which was being operated without a flight plan. The flight originated from Glenwood Springs Municipal Airport (KGWS), Glenwood Springs, Colorado at an undetermined time.

D. DETAILS OF INVESTIGATION

On August 28, 2012, the NTSB Vehicle Recorder Laboratory received the following device(s):

GPS Manufacturer/Model:	Garmin GPSMAP 696
Serial Number:	1H6012444

Garmin GPSMAP 696 Device Description

The Garmin GPSMAP 696 is a battery-powered portable multi-function display and GPS receiver with a 7-inch diagonal high resolution 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 can also perform and store weight and balance calculations. A built-in AOPA Airport Directory and Safe Taxi Airport Diagrams are included for selected fields. 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 250 feet, and ends when groundspeed drops below 30 knots for 10 minutes or more. 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. Position is updated within the track log 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[1] 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 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 that the unit had sustained minimal damage (see figure 1). An internal inspection revealed the internal button battery was dislodged (see figure 2). The device design was researched, and it was determined the dislodged battery affected the internal clock and some display intensity settings, but did not affect tracklog storage settings or tracklog history. The display screen was replaced, power was applied to the unit, and recorded waypoint, route, and tracklog data was successfully downloaded from the unit via the USB port using both Garmin MapSource software and Garmin Flightlog software.

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

Figure 1. Photo of damaged Garmin 696.

Figure 2. Internal inspection - button battery disconnected.

GPS Data Description

The downloaded data contained no track history information. The device settings were examined. Figure 3 shows the device tracklog record mode was set to “off.” However, the flight log screen, partially shown in figure 4, did reveal a history of flights from May 24, 2012 through August 24, 2012.

Figure 3. Garmin 696 track log settings.

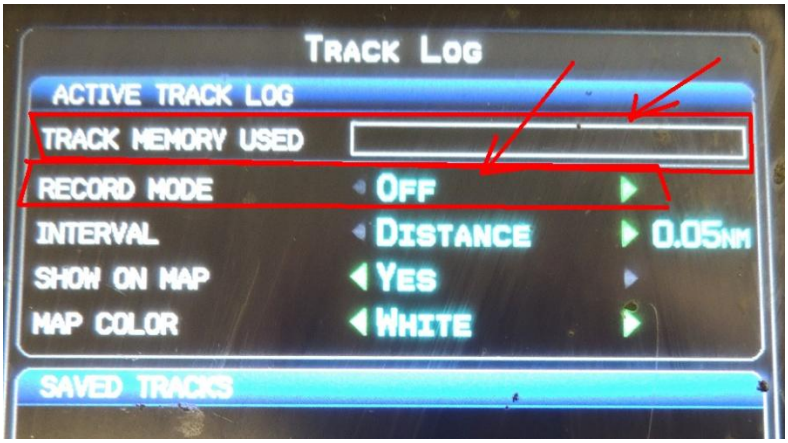

Figure 4. Flight log screen.

GPS Parameters Provided

Table 1 describes data parameters provided by the Garmin Flightlog software download from the device. The software uses unknown algorithms to determine the origin and destination airports. For example, the last flight in the log shows a destination of KSBS; however, the "To (Pos)" latitude and longitude value aligns with the accident location which was about 6 nautical miles from KSBS. Further, the accuracy or logic used to determine max speed and max altitude associated with each flight could not be determined.

Table 1: GPS Data Parameters

Parameter Name	Parameter Description
Date	Date for recorded data point (MM/DD/YYYY)
From	Airport identifier of origin
To	Airport identifier of destination
SEL	Single-Engine Land Time (Hours: Minutes)
Cross-Country	Cross country Time (Hours: Minutes)
Day	Day Time (Hours: Minutes)
Night	Night Time (Hours: Minutes)
PIC	Pilot-in-Command Time (Hours: Minutes)
Total Time	Total Time (Hours: Minutes)
Departure Time (UTC)	Departure time of flight, UTC (Hours: Minutes)
Arrival Time (UTC)	Arrival time of flight, UTC (Hours: Minutes)
From (Name)	Expanded name of airport associated with "From" origin
To (Name)	Expanded name of airport associated with "To" destination

Parameter Name	Parameter Description
From (Pos)	Recorded Latitude and Longitude of origin (degrees)
To (Pos)	Recorded Latitude and Longitude of destination (degrees)
Distance	Flight distance (nautical miles)
Max Speed	Maximum groundspeed of flight (knots)
Max Altitude	Maximum altitude of flight (feet)

OVERLAYS AND TABULAR DATA

Figure 5 shows a Google Earth overlay of the last flight in the flight log.

The flight log tabular data contained maximum groundspeeds and altitudes; however the accuracy and logic used to determine the maximum altitudes was not determined by this report.

Tabular data used to generate figure 5 as well as the flight log from August 23, 2012 through August 24, 2012 is included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

Figure 5. Google Earth overlay showing last entry in flight log.