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

July 17, 2015

GPS Devices Factual Report

by George Haralampopoulos

1. EVENT

Location:	Donnelly, Idaho
Date:	November 6, 2013
Aircraft:	Cessna 206
Registration:	N206KL
Operator:	McCall Aviation Inc
NTSB Number:	WPR14FA044

SUMMARY

On November 6, 2013 about 0910 mountain standard time, a Cessna 206, N206KL, impacted terrain about 10 miles east of Donnelly, Idaho. The commercial pilot and two passengers were fatally injured; the airplane sustained substantial damage. The airplane was registered to Wilderness Aircraft I LLC and operated by McCall Aviation Inc., under the provisions of 14 Code of Federal Regulations Part 135 as a charter flight. Visual meteorological conditions prevailed for the flight, which operated on a company flight plan. The flight originated from McCall Municipal Airport (MYL), McCall, Idaho, at 0900 with a destination of Lower Loon Creek Airport (C53), Challis, Idaho.

2. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Laboratory received the following device(s):

GPS Manufacturer/Model:	Garmin GPSMAP 196
Serial Number:	65512022
GPS Manufacturer/Model:	Garmin GNS 430W
Serial Number:	N/A

2.1. GPSMAP 196 Device Description

The Garmin GPSMAP 196 is a portable GPS unit equipped with a detachable antenna, and a 320 x 240 pixel 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.

2.1.1 GPSMAP 196 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit sustained impact damage to the casing and screen (figure 1). An internal inspection was performed and revealed the unit's integrated circuit board remained intact. A surrogate screen was used in place of the damaged accident screen and external power was supplied to the unit. The unit powered on normally and the memory was downloaded using the manufacturer's recommended procedure.

Figure 1. Photo of Garmin GPSMAP 196 as received.

2.1.2 GPSMAP 196 Data Description

The data extracted included 17 sessions from September 19, 2013[1] through November 6, 2013 and consisted of 3,336 total data points. The accident event was located from data recorded on November 6, 2013 and started from 15:51:34 and 16:10:08 UTC, consisting of 66 data points.

2.1.3 GPSMAP 196 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)
GPS Alt	Recorded GPS Altitude (feet)
Groundspeed	Average groundspeed between current and previous data point (knots)
Track	Average course between current and previous data point (degrees)

2.2. Garmin GNS 430W Device Description

The Garmin Model GNS 430W is a panel-mounted WAAS GPS receiver featuring a 3.3-inch wide by 1.8-inch color liquid crystal (LCD) display and offering navigation and communication data, along with precision and non-precision approach certification in the IFR environment. The unit has a slot for a Jeppesen database (front-loading data card) containing all airports, VORs, NDBs, intersections, Approach, STAR/SIDs and SUA information. A flight plan composed of multiple waypoints, including user-defined waypoints, can be programmed in the unit. However, no provision has been made to record and store position information within the unit. Data related to last known frequency settings and last known GPS location is stored in volatile memory and may be read from the front panel display upon power-up. There are no provisions for downloading stored data to a PC. 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.

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

2.2.1 Garmin GNS 430W Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained impact damage to the front screen (figure 2).

An internal inspection was performed and revealed the unit's integrated circuit board and components remained intact. A surrogate screen was used in place of the damaged accident screen and external power was supplied to the unit; however, the unit did not activate and the data were not recovered.

Figure 2. Photo of Garmin GNS 430W with casing removed.
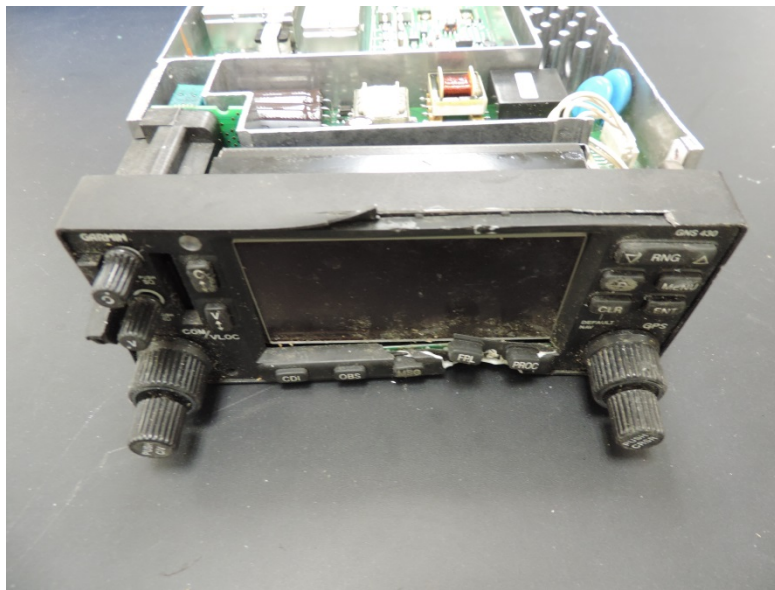
3. OVERLAYS AND TABULAR DATA

The following overlays were created using Google Earth.

Figure 3 is a Google Earth top view overlay of the entire accident event. The first and last recorded data points are shown at 15:51:34 and 16:10:08 UTC, respectively. The track shows the aircraft leaving from McCall Municipal Airport and maneuvering through mountainous terrain before the last recorded data point. The last recorded data point shows a groundspeed of 152 knots.

Figure 4 highlights the last recorded data points from 16:09:20 to 16:10:08 UTC. A circle highlights the period between 16:09:41 and 16:09:47 UTC, where the aircraft track appears to pass through the mountain however; this is due to low sample rate of the GPS.

Tabular data used to generate figures 3 and 4 are included as Attachment 1. This attachment is provided in electronic comma-delimited (*.CSV) format.
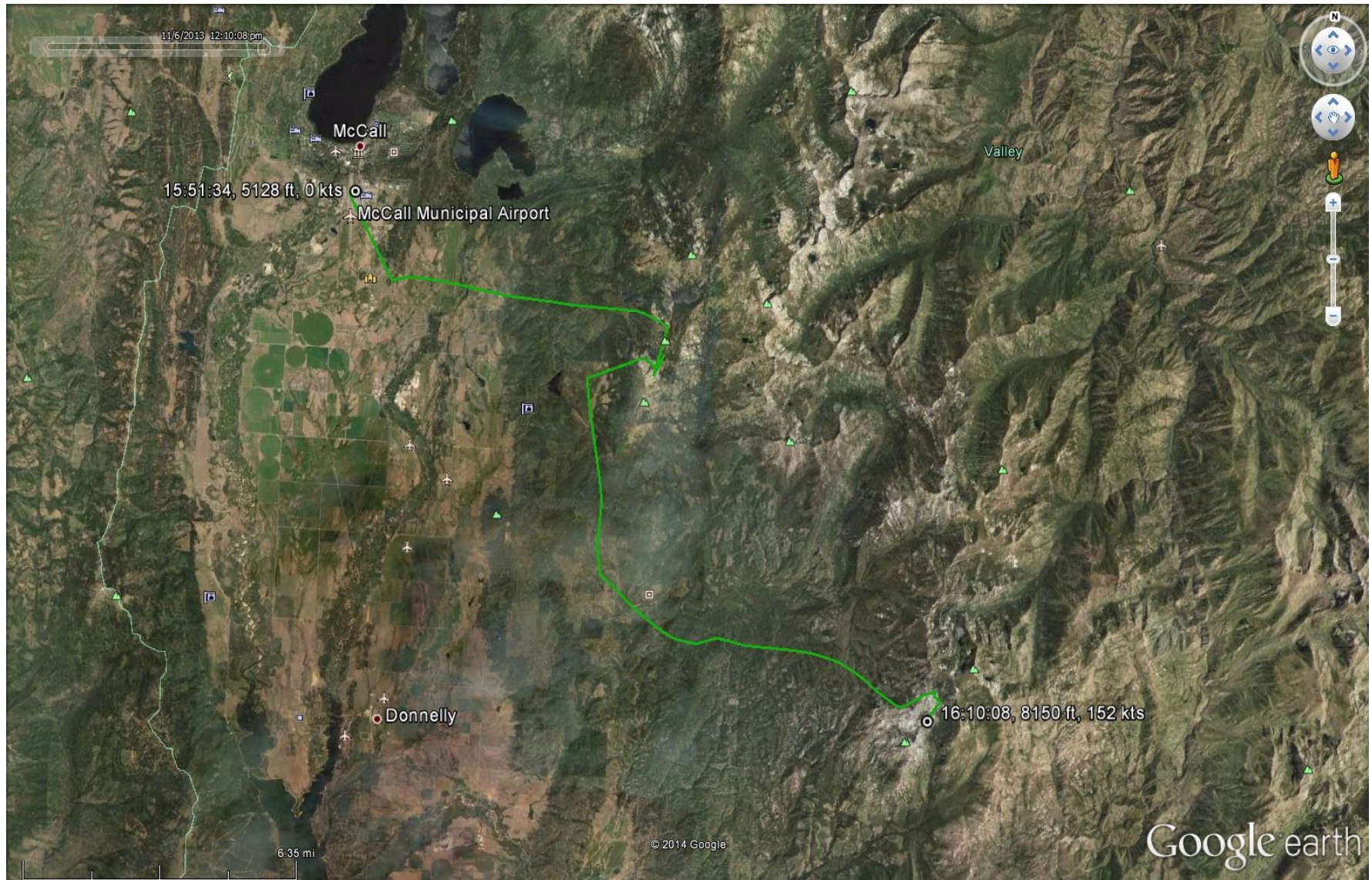
Figure 3. Overlay of entire accident event.

Figure 4. Overlay of last recorded data points.