

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

August 7, 2012

17 - GPS Factual Report

by Bill Tuccio

A. EVENT

Location: Phoenix, Arizona
Date: May 2, 2012
Aircraft: Hughes 269C
Registration: N380TL
Operator: Private
NTSB Number: WPR12FA191

B. GROUP - No Group

C. SUMMARY

On May 2, 2012, about 1130 mountain standard time, a Hughes 269C helicopter, N350TL, was substantially damaged after colliding with a residential home near Phoenix, Arizona. The helicopter was owned and operated by Canyon State Aero of Mesa, Arizona. The certified commercial pilot sustained serious injuries, and the passenger sustained minor injuries. Visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed. The reported photo flight was being operated in accordance with 14 Code of Federal Regulations Part 91, and a flight plan was not filed. The local flight departed Dear Valley Airport (DVT), Phoenix, Arizona, about 1030.

D. DETAILS OF INVESTIGATION

On May 11, 2012, the NTSB Vehicle Recorder Laboratory received the following device(s):

GPS Manufacturer/Model:	Lowrance AIRMAP 2000C
Serial Number:	LL10278C

Lowrance AIRMAP 2000C Device Description

The Lowrance AIRMAP 2000c is a WAAS¹-capable, battery operated hand-portable 12-channel mapping GPS unit equipped with a 320 x 240 pixel color LCD display, soft key controls, and support for custom maps. The unit has the capability of performing E-6B² calculations. It contains a slot for a multi-media card (MMC) or Secure Digital (SD) FLASH³ memory card. This card may be used to transfer and store custom map, waypoint⁴, route⁵, and trail⁶ data to and from a desktop PC to the GPS unit. A serial interface using NMEA 0183⁷ communication protocols is mounted in the back of the GPS unit, but the internal operating software does not support the download of saved data via this serial port.

The Lowrance AIRMAP 2000c can store up to 100 routes composed of up to 100 waypoints each. The unit can also store trail data composed of up to 10,000 latitude-longitude points per trail. Up to 100 individual trails may be named and saved by the user. Once the limit has been reached for recording continuously updated trail data, older latitude/longitude points are overwritten with new data on a first-in, first-out basis. The AIRMAP 2000c may be programmed to update trail data in one of three ways: automatically, by time, or by distance traveled. The default 'automatic' mode only updates trail data when the GPS unit senses that position has changed by at least 0.1 miles, or that direction has changed by 2 degrees or more. Updating by time may be set to record a new latitude / longitude point every 1 to 9,999 seconds. Updating by distance may be set to record a new latitude/longitude point whenever the distance traveled from the last update exceeds anywhere from 0.01 miles to 9.99 miles. All recorded data is stored internally in non-volatile memory⁸, and may be copied to a MMC or SD card inserted in a card slot in the battery compartment. The data is stored in a Lowrance proprietary *.usr file format. This card may be read using a standard desktop PC running the Microsoft Windows operating system.

¹ Wide Area Augmentation System. WAAS is based on a network of approximately 25 ground reference stations that covers a very large service area. Signals from GPS satellites are received by wide area ground reference stations (WRSs). Each of these precisely surveyed reference stations receive GPS signals and determine if any errors exist. Each WRS in the network relays the data to the wide area master station (WMS) where correction information is computed. The WMS calculates correction algorithms and assesses the integrity of the system. A correction message is prepared and uplinked to a geosynchronous satellite via a ground uplink system (GUS). The message is then broadcast from the satellite on the same frequency as GPS (L1, 1575.42MHz) to receivers on board aircraft (or hand-held receivers) which are within the broadcast coverage area of the WAAS. WAAS-capable receivers are capable of basic GPS accuracy to approximately 7 meters vertically and horizontally.

² E-6B refers to mechanical and electronic tools assisting common flight related computations.

³ FLASH Memory is a form of re-writeable, non-volatile memory that can retain data without external power - provided that the chip is not heated beyond the data retention temperature limit as stated in the datasheet.

⁴ Geographical point specified by a set of latitude and longitude data along with descriptive information.

⁵ An ordered list of waypoints.

⁶ Linked list of latitude and longitude data representing the position of the aircraft as a function of time.

⁷ NMEA, National Marine Electronics Association. NMEA Standard 0183 is an ASCII-based serial communication protocol.

⁸ Non-volatile memory is semiconductor memory that does not require external power for data retention.

GPS Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed that the unit had not sustained any damage. The data was downloaded from the unit in accordance with manufacturer instructions normally, without difficulty.

GPS Data Description

The data extracted contained 3,400 tracklog waypoints consisting of latitude and longitude. The logging method of the unit did not include date, time, or altitude of the recorded waypoints.

A comparison of the recorded points with information about the accident flight, provided by the investigator-in-charge, revealed the recorded points did not conclusively capture the accident flight. As such, it was determined the information recorded on the device was not pertinent to the investigation.