

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

January 27, 2020

Global Positioning System Device

Specialist's Factual Report By W. Deven Chen

1. EVENT SUMMARY

Location: Desert Hot Springs, California
Date: February 5, 2019
Aircraft: Cessna 172M
Registration: N20556
Operator: Flying Academy Los Angeles
NTSB Number: WPR19FA080

On February 5, 2019, about 1815 Pacific standard time, a Cessna 172M airplane, N20556, impacted mountainous terrain near Desert Hot Springs, California while on a cross-country flight to North Las Vegas Airport (VGT), Las Vegas, Nevada. The commercial pilot and his non pilot-rated passenger received fatal injuries, and the airplane was destroyed. The airplane was registered to Flying Academy Los Angeles (FALA), and was being operated as a 14 Code of Federal Regulations Part 91 personal flight. Undetermined night meteorological conditions existed at the impact location at the time of the accident. The accident flight leg had originated from San Gabriel Valley Airport (EMT), El Monte, California.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following Global Positioning System (GPS) Device:

Device Manufacturer/Model:	Garmin Aera 660
Serial Number:	4NN007572

3.1. Device Description

Garmin Aera 660 is a battery-powered portable multi-function display and GPS receiver with a sunlight readable 5-inch diagonal touchscreen operation display. The unit includes a built-in Jeppesen database and can receive XM satellite radio for flight information

including NEXRAD 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. The unit has 23 different map ranges available, from 200 feet to 800 nm. 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 configured¹. 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 (NVM)². 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 provide back-up power to the internal memory and real-time clock during those periods when main power is removed.

3.2. Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the device was severely damaged as shown in Figure 1. The device would not power on and was disassembled for further examination.

The Garmin Aera 660 stores recorded data on an eMMC³ FLASH⁴ memory device mounted to the main printed circuit board (PCB), as shown in Figure 2. The memory device was removed from the PCB using a hot air re-work station. A binary raw-data readout of the device was obtained using an eMMC Reader. This raw-data file was decoded using a software program in the laboratory. The converted data contained around 80 flight sessions, however, none of them was relevant to the accident. Thus, no accident related data were recovered from the device.

¹ Changing track log setting can be done in the Main Menu. Track 'Distance' records after a specified distance has been traveled. 'Time' creates after a specified time elapsed track log interval. Recording begins when the speed of the flight exceeds 30 knots and gains 250 feet of altitude. If the flight has landed and ground speed drops below 30 knots, the flight entry is saved, and a new entry is recorded when the flight departs the airport (by default).

² Non-volatile memory is semiconductor memory that does not require external power for data retention.

³ eMMC (embedded Multi-Media Controller) refers to a package consisting of both flash memory and a flash memory controller integrated on the same silicon die.

⁴ FLASH memory is a form of re-writable, non-volatile memory that can retain data without external power.



Figure 1: Front and back of Garmin Aera 660 as received.

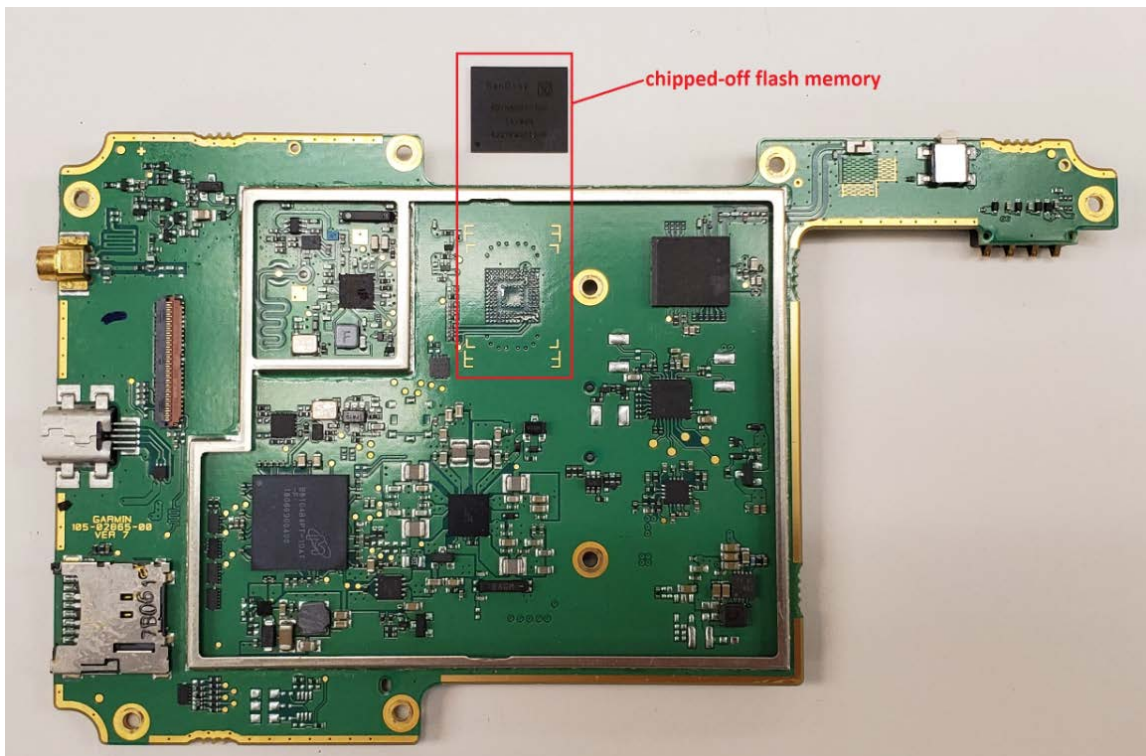


Figure 2: The Garmin Aera 660 main circuit board and chipped-off flash memory.