

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

February 7, 2020

Non-Volatile Memory Devices

Specialist's Factual Report By Ben Hsu

1. EVENT

Location: Chadron, Nebraska
Date: July 24, 2019
Aircraft/ID: Beech 95-B55(T42A)
Registration: N8910U
Operator: Private
NTSB Number: CEN19FA236

2. EVENT SUMMARY

On July 24, 2019, about 1420 mountain daylight time (MDT), a Beech 95-B55 (T42A) airplane, N8910U, impacted trees and terrain about 1/4 mile north of Chadron Municipal Airport (CDR), Chadron, Nebraska. The pilot, pilot-rated-passenger, and one passenger were fatally injured and the airplane sustained substantial damage. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Visual meteorological conditions prevailed at the time of the accident and an instrument flight rules flight plan had been filed. The flight departed Fond du Lac County Airport (FLD), Fond du Lac, Wisconsin, about 1120 central daylight time, and was en route to CDR.

3. DETAILS OF DEVICE INVESTIGATION

The National Transportation Safety Board's (NTSB) Vehicle Recorder Division received the following devices:

Device:	Garmin GPSMAP 396
Device Serial Number:	28214581
Device:	Shadin Fuel Flow Indicator
Device Serial Number:	4947

Figure 1 shows the condition of the Garmin device as it arrived in the laboratory. The device exhibited moderate damage due to impact forces.

Figure 2 shows the condition of the Shadin device as it arrived in the laboratory. The device exhibited substantial damage due to impact forces.

3.1. Garmin Device Description

The Garmin GPSMAP 396 is a portable GPS receiver capable of storing date, route-of-flight, and flight-time information. A detailed tracklog – including latitude, longitude, date, time, and groundspeed information – is stored within the unit whenever the receiver has a lock on the GPS navigation signal. All recorded data is stored in non-volatile memory.¹ 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. The unit can also communicate with external devices such as a computer using a built in USB port. An internal battery is used as back-up power to the internal memory and real-time clock during those periods when main power is removed.

3.2. Garmin Data Description

The Garmin device did not contain any track data. Additionally, the track recording capability of the device had been turned off.

3.3. Shadin Device Description

The Shadin Fuel Flow Indicator is a digital fuel management system designed to provide fuel management information under real-time flight conditions to the flight crew. The unit is connected to the engine fuel flow transducers. The unit is capable of transmitting fuel information to certain GPS receivers for additional calculations and display of fuel management data. The unit does not interface with an aircraft's fuel quantity indicating system. The unit requires the flight crew to enter the initial fuel on board the aircraft. All calculations and data provided by the unit are based on fuel flow. Between power cycles the unit retains the last fuel used and fuel remaining.

3.4. Shadin Data Description

The device showed the value "0.0" for both fuel used and fuel remaining. Due to the extensive damage to the device, the pre-accident operating condition of the device could not be determined.

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



Figure 1. Photo of Garmin GPSMAP 396



Figure 2. Photo of Shadin Fuel Flow Indicator