

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23FA219

MULTIPLE ELECTRONIC DEVICES

Specialist's Factual Report

February 7, 2025

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A. ACCIDENT SUMMARY

Location: Reliance, Tennessee
Date: May 7, 2023
Time: 1849 eastern daylight time (EDT)
2249 coordinated universal time (UTC)
Aircraft: Cessna 182Q, N725AS

B. MULTIPLE ELECTRONIC DEVICES SPECIALIST

Specialist: W. Deven Chen
Electrical Engineer - Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A recorder group was not convened. The NTSB Vehicle Recorder Division received the following electronic devices:

Manufacturer/Model:	Avidyne EX500
Serial Number:	21837505
Manufacturer/Model:	Sandel SN3500-002 EHSI
Serial Number:	1369

1.0 Avidyne EX500 Description

The Avidyne EX500 is a 5.4-inch multifunction display (MFD) that is able to display radar, datalink weather, traffic and terrain information. The MFD allows the pilot to display this information in a series of togglable electronic layers. It can provide XM weather datalink information. It includes a terrain and water basemap with obstacles over 200 feet above ground level (agl). The unit can be configured to interface with a stormscope as well as Honeywell/Bendix/King Enhanced Ground Proximity Warning System (EGPWS) information. The unit can interface with an optional Jeppesen Chart package. The device contains a removable Compact Flash (CF) card which contains configuration files and logs of weather data reception acknowledgement. The device does not record weather data, nor does the device store flight or engine data.

1.1 Avidyne Condition and Data Recovery

Figure 1 shows the Avidyne as received by the NTSB Vehicle Recorders Laboratory. The device showed signs of severe impact damage. A CF card was recovered from the device, and its raw data were read out and sent to the manufacturer for decoding. The manufacturer sent back converted data and

explained that the data indicated the weather receiver of the device was functional during the accident flight. Other than that, the data did not contain other pertinent information to this investigation. The converted data associated with the accident flight is provided in electronic comma-separated value (CSV) format as attachment 1 to this report.



Figure 1. Avidyne EX500 as received by NTSB Vehicle Recorder Laboratory.



Figure 2. CF card recovered from the Avidyne EX500.

2.0 Sandel SN3500 EHSI Description

The Sandel (now Nighthawk Flight System) SN3500 is an electronic horizontal situation indicator (EHSI). The unit performs the functions of a traditional HSI and radio magnetic indicator (RMI)¹, including: heading indicator, course deviation indicator, glideslope indicator, RMI functions, and a heading bug interfaced to an optional autopilot. The EHSI extends traditional HSI functions to include (depending

¹ A traditional RMI presents a course to a ground-based navigation aid superimposed over a compass card (FAA Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25A).

on installation): RMI navigation to GPS waypoints, weather display of lightning and datalink weather, and traffic display.

Data is recorded once per second (1 Hz) to a 24-megabyte circular buffer for manufacturer diagnostic purposes; depending on configuration and power cycles, this equates to about 6 to 12 hours of recorded data. The recorded data derives from two separate channels internal to the unit, channel 1 and channel 2; no time information is recorded by the unit. The data may be downloaded and decoded by the manufacturer.

2.1 Sandel SN3500 EHSI Condition and Data Recovery

Figure 3 shows the Sandel SN3500 EHSI as received by the NTSB Vehicle Recorders Laboratory. Figure 4 shows the condition of the device internal circuit board with four non-volatile memory (NVM²) chips denoted. Those four NVMs which stored the flight data were removed from the damaged circuit board with a computer-aided precision desoldering rework machine and carefully examined. Figure 5 shows the removed and labeled NVMs. Each NVM was read out and imaged successfully. The Vehicle Recorders Laboratory performed reballing for each of the four NVMs in preparation for any further procedure. Figure 6 shows a comparison of a reballed NVM next to one before being reballed.

A formal data recovery support request was sent to the manufacturer. In summary Nighthawk Flight System reported that a custom hardware solution would need to be developed specifically for the SN3500, and that the custom hardware solution could not be used across its product line for future accident recoveries. Furthermore, Nighthawk could not guarantee that this hardware solution would work as surrogate to extract data from the accident device. The NTSB elected not to pursue the creation of the hardware solution due to the uncertainty of the project's success and the limitations that the device could not be used for future recoveries involving other Nighthawk/Sandel products. No data was recovered from the accident device.

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



Figure 3. Sandel SN3500 EHSI as received by NTSB Vehicle Recorder Laboratory.



Figure 4. Sandel SN3500 internal circuit board.

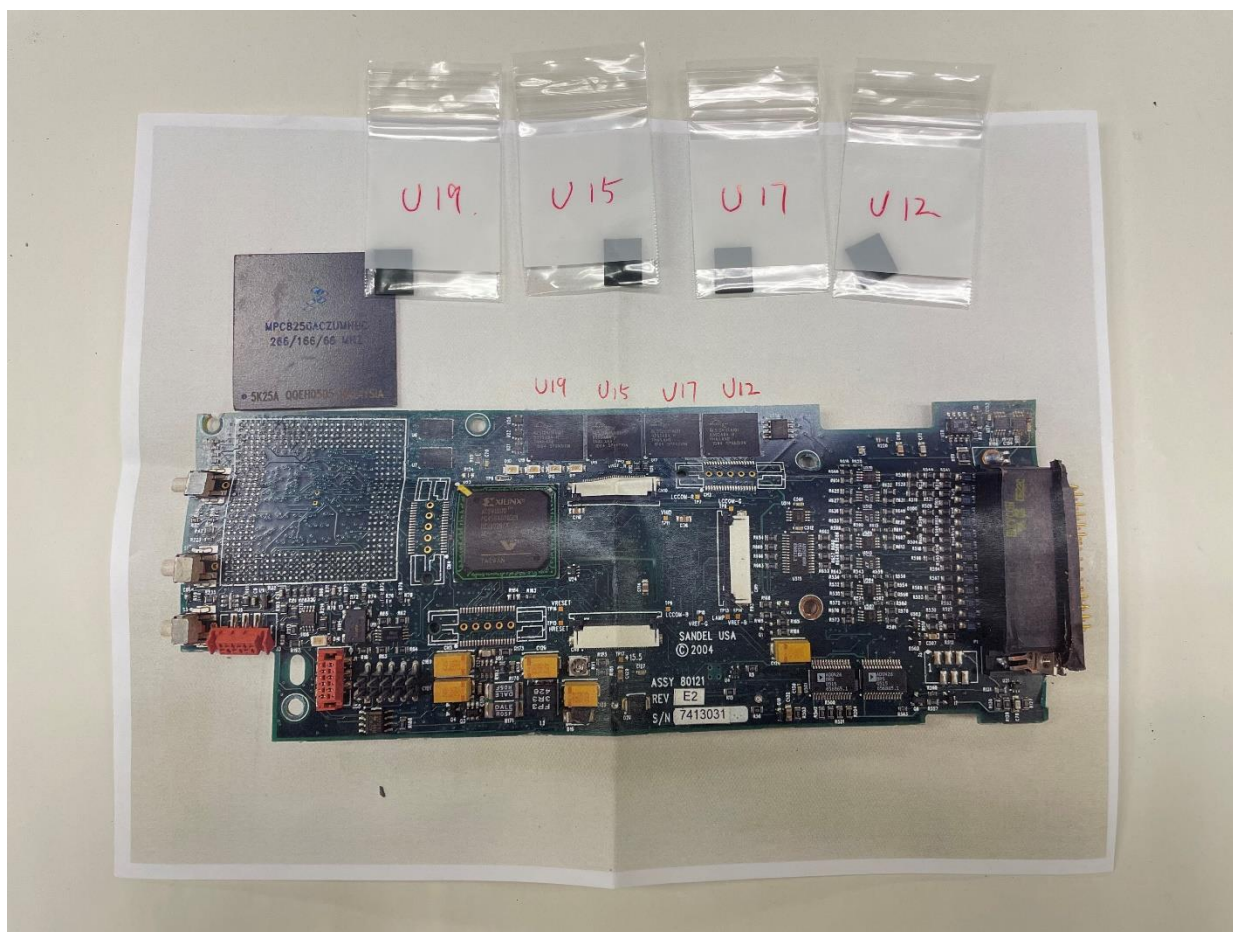


Figure 5. Four memory chips were removed from the circuit board and labeled accordingly.

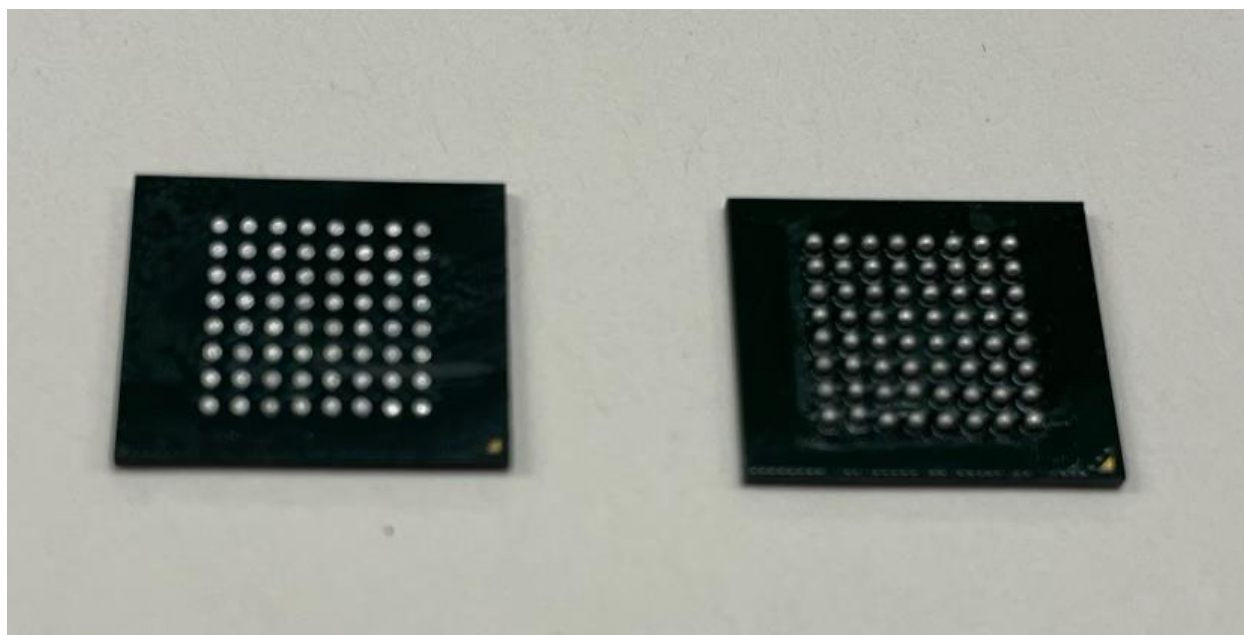


Figure 6. Each of the four memory chips was read-out and re-balled. The chip on the right was re-balled.