

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

November 9, 2021

Electronic Device

**Specialist's Factual Report
by Gerald Kawamoto**

1. EVENT

Location: Bountiful, Utah
Date: August 15, 2021
Aircraft: Cessna 182H
Registration: N8477S
Operator: Private
NTSB Number: WPR21FA321

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following device:

Device: Appareo Stratus 2S
Device Serial Number: 003245

2.1. Device Description

The Appareo Stratus 2S device is a self-contained battery-powered unit that contains an internal AHRS, GPS/WAAS receiver, and ADS-B receiver in one compact unit.^{1, 2, 3} The unit communicates wirelessly with compatible devices to display all the acquired information. In addition to communicating with compatible devices, the Stratus device records GPS position and AHRS information internally on a non-volatile flash memory chip.⁴ Internal memory has the space to store over 13 hours of flight data that are sampled at approximately 5 data records per second (5 Hz).

¹ The Attitude Heading Reference System consists of a set of 3-axis gyroscope, accelerometers and heading reference sensors that enable the unit to compute pitch, roll, and yaw motions.

² The Wide Area Augmentation System (WAAS) is an air navigation aid to augment the Global Positioning System (GPS), by improving its accuracy, integrity, and availability.

³ Automatic Dependent Surveillance-Broadcast (ADS-B) is a surveillance technology deployed throughout the national airspace system. The ADS-B system is composed of aircraft avionics and a ground infrastructure. Onboard avionics determine the position of the aircraft by using the GPS and transmit its position along with additional information about the aircraft to ground stations for use by air traffic control (ATC) and other ADS-B services. This information is transmitted at a rate of approximately once per second. Operators equipped with ADS-B realize additional benefits from ADS-B broadcast services: Traffic Information Service - Broadcast (TIS-B) (traffic information) and Flight Information Service - Broadcast (FIS-B) (weather information).

⁴ Non-volatile memory (NVM) is semiconductor memory that does not require external power for data retention.

2.2. Data Recovery

Upon arrival at the Vehicle Recorder Division, an external examination revealed the device had sustained damage, as shown in Figure 1, rendering it inoperable. The non-volatile memory chip was removed, read out, and converted to engineering units using laboratory tools.



Figure 1. Front and back of the Appareo Stratus 2S as received.

2.3. Data Description

The data extracted included six sessions from August 13, 2021, through August 15, 2021.⁵ Each session was reviewed, and it was determined that the accident flight was not recorded. The first five sessions included data from previous flights over mountainous terrain. The final session was approximately 8.5 hours in duration and recorded at a single location, indicating that the recording did not correspond to a flight event.

⁵ All dates and times are referenced to Coordinated Universal Time (UTC).