

National Transportation Safety Board

Office of Research and Engineering

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ELECTRONIC DEVICES

Specialist's Factual Report

March 1, 2024

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A. ACCIDENT

Location: Panama City, Florida
Date: June 6, 2023
Time: 2017 central daylight time (CDT)
Airplane: Dassault-Breguet Falcon 10, N87RT

B. ELECTRONIC DEVICES SPECIALIST

Specialist: Gerald Kawamoto
Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

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

Recorder Manufacturer/Model: Appareo Stratus 3
Part Number: 153510-000113
Recorder Serial Number: 009060

Recorder Manufacturer/Model: Sandel ST3400
Part Number: ST3400-001
Recorder Serial Number: 1299

1.0 Appareo Stratus 3 Description

The Appareo Stratus 3 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

¹ The Attitude Heading Reference System (AHRS) 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).

Stratus device records GPS position and AHRS information internally on a non-volatile flash memory chip.⁴

1.1 Appareo Stratus 3 Data Recovery

The device was in good condition upon arrival at the Vehicle Recorder Division, as shown in figure 1. The device powered on normally and its contents were reviewed using laboratory tools.



Figure 1. Front and back of the Appareo Stratus 3 as received.

1.2 Appareo Stratus 3 Recording Description

The recorded data included 11 sessions from October 17, 2022, through May 24, 2023, UTC (coordinated universal time). The accident occurred approximately 2 weeks after the last recorded track log, therefore, no accident-related data were recovered from the device.

2.0 Sandel ST3400 Description

The ST3400 is a multi-function display with a self-contained Terrain Awareness Warning System (TAWS). The ST3400 records data at once per second and derives from two separate channels internal to the unit, P1 and P2. It uses GPS, radar altitude, barometric altitude, and other relevant data in combination with its internal database information to provide terrain display, charted man-made obstacles and airports with runway greater than 2,500 feet. Terrain and airport database coverage are limited by geographical region to the area between 70°N and 70°S latitude. An internal recorder automatically records a minimum of ten hours of flight data including alert data. Data may be downloaded via front mounted mini-USB port and requires decoding by the manufacturer.

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

2.1 Sandel ST3400 Data Recovery

Upon arrival at the Vehicle Recorder Division an external examination did not reveal any significant indications of damage, as shown in figure 2. However, the device was unable to power on normally and no data were recovered.



Figure 2. Front and side view of the Sandel ST3400 as received.

Submitted by:

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