

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

February 24, 2020

Electronic Devices

Specialist's Factual Report
By W. Deven Chen

1. EVENT SUMMARY

Location: Blythe, California
Date: November 25, 2019
Aircraft: Beech V35
Registration: N14UC
Operator: Private
NTSB Number: ANC20FA005

On November 25, 2019, about 1739 Pacific standard time, a Beech V35 airplane, N14UC, was destroyed after impacting terrain about 40 miles west of Blythe Airport (BLH) Blythe, California. The solo private pilot sustained fatal injuries. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a visual flight rules personal flight. Dark night visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed. The flight originated from La Cholla Airpark (57AZ) Tucson, Arizona about 1601 mountain standard time.

2. GROUP

A group was not convened.

3. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **Appareo Stratus 3i**
Recorder Serial Number: **Unknown**

Recorder Manufacturer/Model: **Printed Circuit Boards**
Recorder Serial Number: **Unknown**

3.1. Appareo Stratus 3i Description

The Appareo Stratus 3i device is a self-contained battery powered unit that contains an internal AHRS¹, GPS/WAAS receiver², and ADS-B³ receiver in one compact unit. It receives ADS-B, FIS-B (weather information), TIS-B (traffic information), and other related data and broadcasts it to compatible flight apps via a Wi-Fi network. In addition to communicating with compatible devices, the Stratus device records GPS position and AHRS information internally on a non-volatile flash memory⁴ chip. Internal memory has the space to store over 20 hours of flight data that is sampled at approximately 5 data records per second (5 Hz).

3.1.1. Appareo Stratus 3i Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the device had severe damage, as shown in Figure 1. The memory chip of the device, as shown in Figure 2, was removed and the stored data were downloaded using laboratory tools. However, the downloaded data was an empty file. The process was repeated several times, and the result confirmed that there were no data stored on the memory chip. Thus, no data were recovered from the device.

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.



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

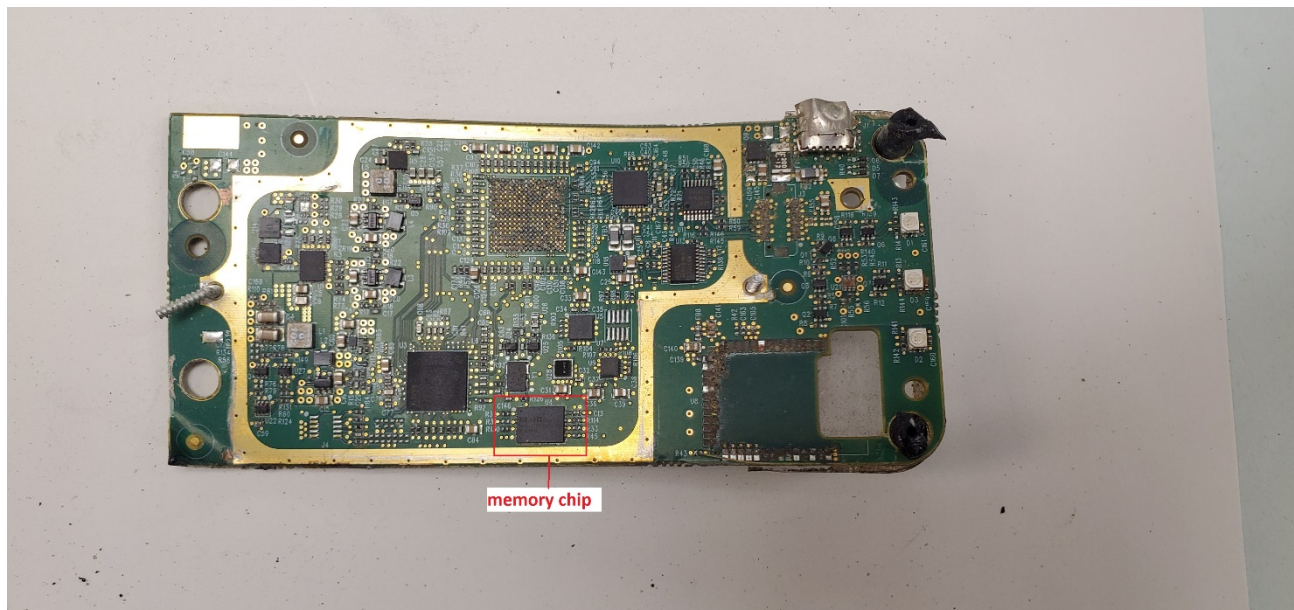


Figure 2: Circuit board with Non-volatile memory chip of the Appareo Stratus 3i.

3.2. Printed Circuit Boards Description

A Printed Circuit Board (PCB) is a thin board made of fiberglass, composite epoxy, or other laminate material. The board contains one or more sheet layers. Conductive pathways are etched onto sheet layers, connecting different components on the PCB, such as transistors, resistors, and integrated circuits.

3.2.1. Printed Circuit Boards Data Recovery

The Vehicle Recorder Division received five PCBs for this case as shown in Figure 3. After cleaning up, the largest board was identified to belong to a product of ACR/ARTEX, as shown in Figure 4. The manufacturer confirmed that the board belonged to one of their Emergency Locator Transmitter devices (ELT) – ELT345. This board itself did not record and store data. The other four PCBs, as shown in Figure 5, were not identified. The majority of the chips on the four boards were damaged. The only undamaged chip did not contain NVM. Thus, no data were recovered from the five PCBs.



Figure 3: Front and back of PCBs as received.

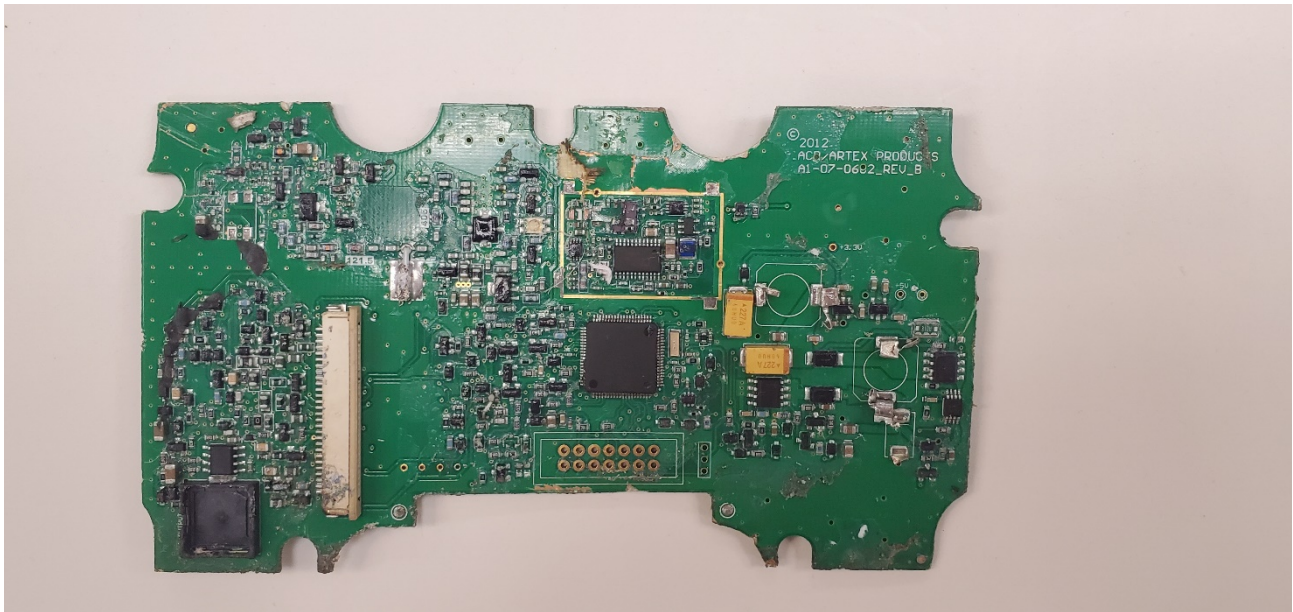


Figure 4: The largest board among the five PCBs after clean-up.

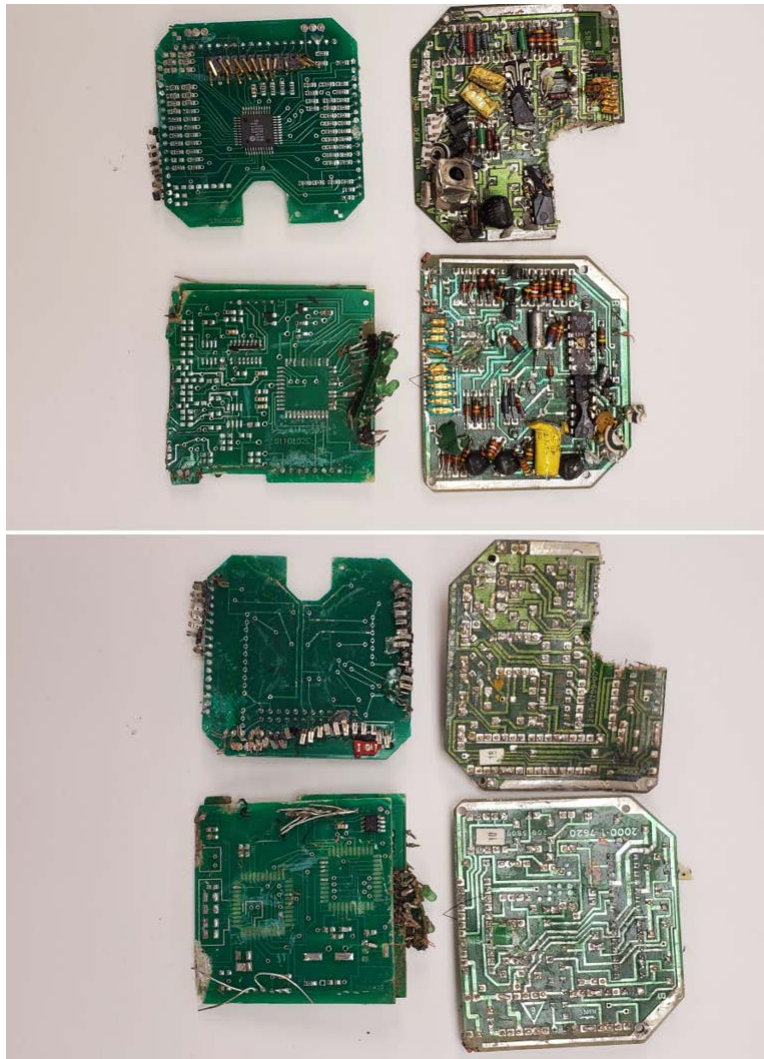


Figure 5: The four smaller boards among the five PCBs after clean-up.