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

January 25, 2021

Electronic Devices

Specialist's Factual Report
by Gerald Kawamoto

1. EVENT

Location:	Soldotna, Alaska
Date:	July 31, 2020
Aircraft:	DeHavilland DHC-2 (N4982U) / Piper PA-12 (N2587M)
Operator:	High Adventure Air Charter / Private
NTSB Number:	ANC20LA074AB

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices. Devices 1 through 7 were recovered from N4982U and devices 8 and 9 were recovered from N2587M:

Device 1:	**Apple iPhone 11 Pro**
Device 1 Serial Number:	**353245103075465**
Device 2:	**Apple iPhone 11**
Device 2 Serial Number:	**352909111164931**
Device 3:	**Apple iPhone XR**
Device 3 Serial Number:	**356423103666081**
Device 4:	**Apple iPhone X**
Device 4 Serial Number:	**354856092804183**
Device 5:	**Apple iPhone 8**
Device 5 Serial Number:	**356085098581383**
Device 6:	**Garmin Aera 795**
Device 6 Serial Number:	**2CZ000950**
Device 7:	**Samsung Galaxy S10**
Device 7 Serial Number:	**Unknown**
Device 8:	**Apple iPad Mini 2**
Device 8 Serial Number:	**DMPQK406FLMK**
Device 9:	**Garmin GDU 460**
Device 9 Serial Number:	**350001458**

2.1. Personal Electronic Device (PED) Description

PEDs are a category of devices comprised primarily of portable computing devices and mobile phones. Portable computing devices are typically capable of taking photos and videos, internet access, email, messaging services, and can run user-installed

applications to perform specific tasks. PED user and system data is typically stored on non-volatile memory[1] and can be accessed through manufacturer-provided interfaces.

2.1.1. PED Data Recovery

Upon arrival at the Vehicle Recorder Division, exterior examinations of the devices revealed:

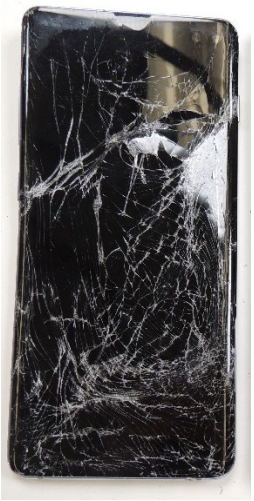
- The iPhone 11 and iPhone X were undamaged, as shown in Figures 1 and 2, and powered on normally.
- The iPhone 11 Pro, iPhone XR, iPhone 8, and iPad Mini 2 sustained impact damage, as shown in Figures 3 through 6, rendering the devices inoperable. The logic boards were removed and powered on normally in lab surrogates.
- The Samsung Galaxy S10 sustained impact damage, as shown in Figure 7, rendering the device inoperable. The logic board was removed and examined. The extent of the damage precluded normal recovery procedures and additional attempts at recovery usable data were unsuccessful, thus no data were recovered from the logic board. The device contained an undamaged micro SD card that downloaded normally using laboratory tools.

Figures 1 & 2. Undamaged iPhone 11 (left) and iPhone X (right) as received.

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

Figures 3 & 4. Damaged iPhone 11 Pro (left) and iPhone XR (right) as received.

Figures 5 & 6. Damaged iPhone 8 (left) and iPad Mini 2 (right) as received.



Figures 7. Damaged Samsung Galaxy S10 as received.

2.1.2. PED Data Description

The devices were accessed using passcodes provided to the investigation team. Data was reviewed and evaluated. It was determined that a total of four photos from the iPhone 11 and iPhone 11 Pro were relevant to the investigation. Descriptions of the relevant photos are included in the Weather Factual Report in the public docket.

2.2. Garmin Aera 795 Device Description

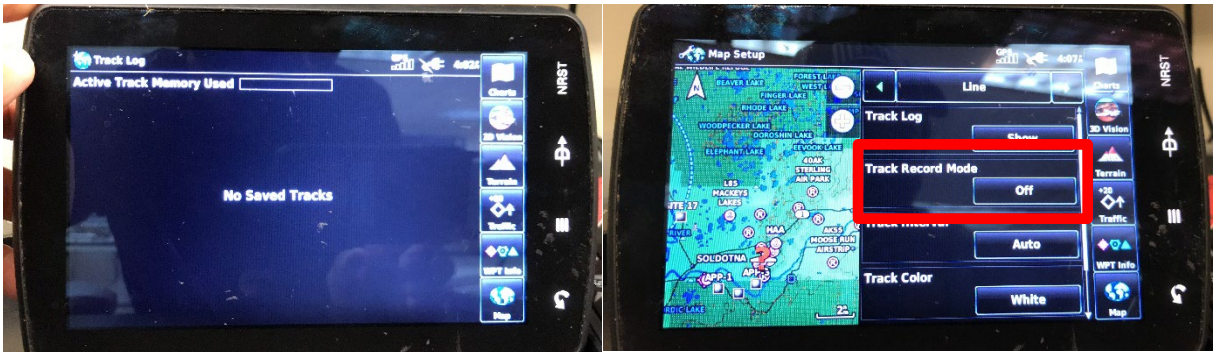
Garmin aera 795 is a battery-powered multi-function display and GPS receiver with a 7-inch diagonal high-resolution touch screen. The unit includes a built-in Jeppesen database and can receive XM satellite radio for flight information including NEXRAD Radar, lightning, METARs, and TFRs. The unit can also perform and store weight and balance calculations. A built-in AOPA Airport Directory and SafeTaxi airport diagrams are included for selected airfields. With appropriate subscriptions, the unit can store and display geo-referenced VFR and IFR navigation charts, including IFR approach charts. The unit also has a “scratch pad” feature, allowing the user to hand write electronic notes.

The unit stores date, route-of-flight, and flight-time information. A detailed track log including latitude, longitude, date, time, and GPS altitude information is stored within the unit whenever the receiver has a lock on the GPS navigation signal. Position is updated within the track log as a function of time or distance moved, depending on how the unit has been configured. The current track log can be saved to long-term memory. Track log storage may be activated or de-activated at user discretion. All recorded data is stored in non-volatile memory.

The unit contains hardware and software permitting the download of recorded waypoint, route, and track log information to a PC via a built-in USB port. An internal button-battery is used to back up power to the internal memory and real-time clock during those periods when main power is removed

2.2.1. Garmin Aera 795 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had not sustained any damage and powered on normally. There were no track logs recorded to NVM as shown in Figure 7, and the “Track Record Mode” was set to “Off”, as shown in Figure 8, thus no data were recovered.



Figures 7 & 8. Track Log screen (left) and Track Record Mode (right).

2.3. Garmin GDU 460 Description

The Garmin GDU 460 is an advanced flight display with a configurable touchscreen that can serve as a primary flight display (PFD) and multifunction display (MFD). The device integrates with other Garmin avionics for added capability such as display of traffic, weather, radios, and audio information. Flight data is internally recorded and can be exported to a mounted SD card.

2.3.1. Garmin GDU 460 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained impact damage, as shown in Figure 9, rendering it inoperable. No SD card was present in the front slot. A non-volatile memory chip was identified on one of the circuit boards and was removed, readout, and converted to engineering units using laboratory tools.

Figure 9. Garmin GDU 460 as received.

2.3.2. Garmin GDU 460 Data Description

The converted data contained one track log from the date of the accident. The track log contained the first minute of the accident flight from the Piper PA-12 (N2587M) as shown in Figure 10. The corresponding tabular data used to create Figure 10 is provided in electronic comma separated value (.CSV) format as Attachment 1 to this report.

Figure 10. Data extracted from the Garmin GDU 460 memory chip.