

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

February 25, 2020

Onboard Image Recorder and Other Devices

Specialist's Factual Report
By Christopher Babcock

1. EVENT

Location:	Fort Rice, North Dakota
Date:	July 17, 2018
Aircraft:	Cessna 152, N24515
Operator:	Private
NTSB Number:	CEN18FA277

2. GROUP

A group was not convened.

3. SUMMARY

On July 17, 2018, about 2:23 PM central daylight time (CDT), a Cessna 152 airplane, registration N24515, impacted the Missouri River while maneuvering about one mile east of Fort Rice, North Dakota. The left seat commercial pilot and sole occupant sustained fatal injuries. The airplane sustained substantial damage. The airplane was registered to Arbach Enterprises, Inc., Watertown, South Dakota and was operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* (CFR) Part 91 as a visual flight rules commercial aerial photography flight. Visual meteorological conditions prevailed at the time of the accident, and no flight plan was filed. The flight originated from the Mandan Municipal Airport (Y19), Mandan, North Dakota about 1:30 PM CDT.

4. DETAILS OF INVESTIGATION

On July 23, 2018, the National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices:

Recorder Manufacturer/Model:	Canon EOS 6D
Recorder Serial Number:	402051001503

Recorder Manufacturer/Model:	Garmin Aera 660
Recorder Serial Number:	4NN003779

Recorder Manufacturer/Model: **Apple iPhone 7**
Recorder Serial Number: **NA**

Recorder Manufacturer/Model: **Apple iPad Mini (A1432)**
Recorder Serial Number: **F7NLNT0RFP84**

4.1. Recorder Description

4.1.1. Canon EOS 6D

The Canon EOS 6D is a full frame 20.2-megapixel digital single lens reflex camera. Images are stored on an SD card. The camera does not have internal storage. The camera has the capability of capturing GPS data in the image metadata.

4.1.2. Garmin Aera 660

The Garmin Aera 660 is a portable touch-screen mapping device that can display the aircraft's position on taxi diagrams, IFR, and VFR charts on a 5 inch color display. The unit's database includes obstacle and terrain features.

4.1.3. Apple iPad Mini

The Apple iPad Mini is a tablet computer with a high-resolution color touch-screen interface. All iPad devices support WiFi and Bluetooth connectivity, and use non-volatile memory for storage. Some devices also support data connectivity via existing cell-phone networks. The iPad implements its functionality by running programs called "Apps" capable of supporting web-browsing, email, audio/video playback, contact and calendar management, and numerous other specialized functions. User-installed Apps can be used to support functionality for electronic flight bags, flight planning and filing, aviation weather depiction, and electronic flight charts. Application data is stored in non-volatile memory and may include image, video, and position location information. Specialized application data may be stored in a proprietary file structure using numerous proprietary file formats. The amount and type of data stored varies based on the software version and configuration of the specific device.

4.1.4. Apple iPhone 7

The Apple iPhone is a touch-screen smart-phone capable of voice calling, text messaging, email, photo/video recording, audio playback, and numerous other specialized functions depending on configuration. Specialized functions are supported by additional user-installed apps. Application data is stored in non-volatile memory and may include call logs, text messaging logs, image, video, and position location information. In addition, the specialized application data may be stored in a proprietary file structure using numerous file formats. The amount and type of data stored varies based on the software version and configuration of the specific device.

4.2. Recorder Damage and Data Recovery

4.2.1. Canon EOS 6D

The camera and SD were wet when they arrived in the lab (Figures 1-2). The SD card was cleaned and dried and images were recovered normally. Most of the 110 recovered pictures contained images of farms and farm equipment taken at a low angle. GPS data was not found in the metadata for any image.



Figure 1. Canon EOS 6D, as recovered.



Figure 2. SD card, as recovered.

The time on the camera is set by the user and may not be aligned with any common time reference. The images were captured between 9:09 AM and 2:27 PM camera time with a gap between 12:33 PM and 1:58 PM camera time. Figure 3 contains an exemplar image of one of the farms taken at 2:04:47 PM camera time. Comparison of the photo with the aircraft's flight path from recorded FAA surveillance data showed the aircraft was in a position to capture the image in Figure 3 (taken at 2:04:47 PM camera time) at about 1:54:34 PM CDT (Figure 4). Therefore, 10 minutes and 13 seconds was subtracted from the camera time to convert to local CDT.



Figure 3. Image of farm taken at 2:04:47 PM camera time (1:54:34 PM CDT).

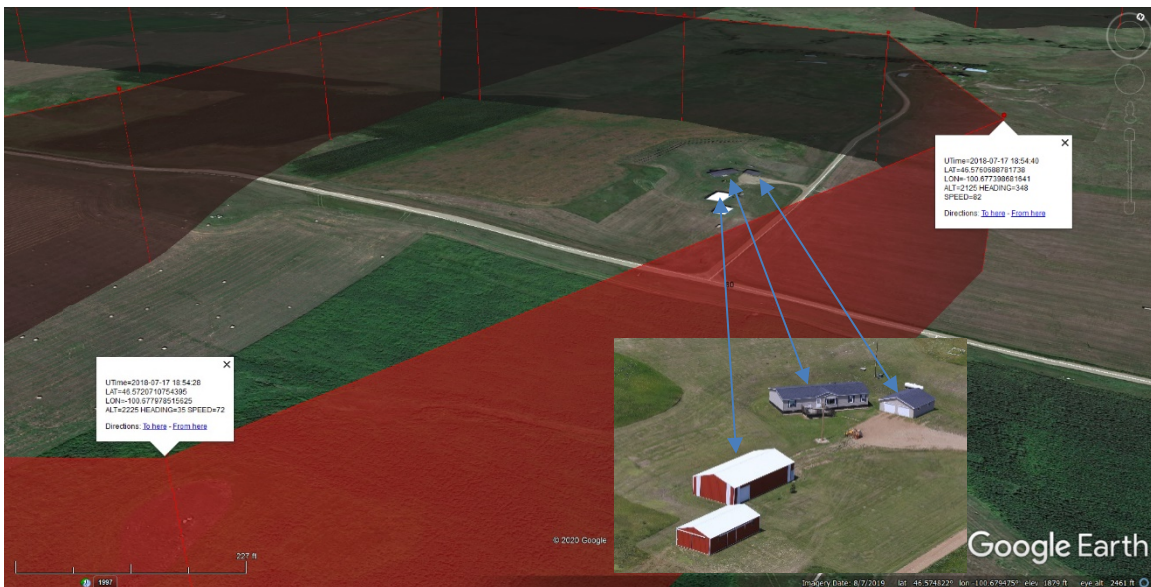


Figure 4. Flight path data showing time when the aircraft was in a position to capture inset image.

Between 2:21:57 PM CDT and 2:23:12 PM CDT (2:32:10 PM and 2:33:25 PM camera time), a series of 7 images were captured at a high angle, almost straight down. The images captured water and debris such as downed trees. Several large fish were visible in most of the images. Figure 5 contains an exemplar image. Figure 6 shows the location and time of the nearest aircraft position when the

images were captured overlaid on a plot the aircraft's flight path along with the last recorded position data at 2:23:25 PM CDT.



Figure 5. Image taken at 2:22:46 PM CDT



Figure 6. Locations and times of the last 7 images captured overlaid on the flight path.

4.2.2. Garmin Aera 660

The Garmin Aera 660 displayed evidence of water immersion (Figures 7-8). The Garmin Aera would not connect to a PC to download track data normally. The

memory device was removed from the internal printed circuit board and imaged on laboratory equipment. The image was forensically imaged and examined and no GPS track data was found.



Figure 7. Front of Garmin, as recovered.



Figure 8. Rear of Garmin, as recovered.

4.2.3. Apple iPad Mini

The iPad Mini was showed evidence of water immersion (Figure 9-10). When powered, the device's digitizer was not functional. In agreement with the investigator in charge, there were no further attempts to recover data



Figure 9. Front of iPad, as recovered.



Figure 10. Rear of iPad, as recovered.

4.2.4. Apple iPhone 7

The iPhone 7 was showed evidence of water immersion (Figure 11-12). The phone would not maintain connection with a computer for data recovery, so the internal circuit board was removed and installed on a laboratory surrogate where data was recovered. Content relevant to the investigation included images taken of the aircraft tachometer and Hobbs meter display. The tachometer gauge read zero for each image. Table 1 indicates the Hobbs meter reading for each image.

Table 1. Hobbs meter readings.

Date/Time	Hobbs Reading (hrs)
7/10/2018 4:56 PM	1226.0
7/11/2018 3:48 PM	1232.0
7/12/2018 3:48 PM	1237.6
7/13/2018 4:18 PM	1244.7
7/14/2018 2:35 PM	1249.7
7/15/2018 3:11 PM	1251.9
7/16/2018 4:12 PM	1258.6



Figure 11. Front of iPhone, as received.



Figure 12. Rear of iPhone, as received.

Additionally, the phone content was reviewed using forensic software to assist in documenting the pilot's 72-hour history. Table 2 shows the first and last phone events that could definitively be linked to the pilot's interaction with the phone each day.

Table 2. Pilot's first and last interaction with phone.

Date	First Interaction	Last Interaction
7/14/2018	5:34 AM CDT	11:15 PM CDT
7/15/2018	7:31 AM CDT	11:13 PM CDT
7/16/2018	7:00 AM CDT	10:31 PM CDT
7/17/2018	6:46 AM CDT	