

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

November 20, 2015

Non-Volatile Memory Devices

Specialist's Factual Report
By Ben Hsu

1. EVENT SUMMARY

Location: Eagle, Colorado
Date: June 5, 2015
Aircraft: MORSE FRANK L REBEL
Registration: N914FM
Operator: Private
NTSB Number: CEN15FA257

2. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following devices containing non-volatile¹ memory (NVM):

Device Manufacturer/Model:	iFly GPS 720
Serial Number:	Unknown
Device Manufacturer/Model:	AvMap Ultra
Serial Number:	4120423
Device Manufacturer/Model:	SD Memory Card
Serial Number:	BI1401222811D
Device Manufacturer/Model:	HTC One M8 Phone
Serial Number:	310003202964795
Device Manufacturer/Model:	Samsung Galaxy Tab (Black)
Serial Number:	R52G10SC1WB
Device Manufacturer/Model:	Samsung Galaxy Tab (White)
Serial Number:	R52FB0DLAZH
Device Manufacturer/Model:	Apple iPad
Serial Number:	DMPJ75EEDNQT

The iFly GPS 720 exhibited damage due to impact forces (Figure 1). No accident related data was recorded on the device's internal memory.

The AvMap Ultra exhibited major damage due to impact forces (Figure 2). No accident related data was recorded on the device's internal memory.

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

The SD memory card exhibited minimal damage due to impact forces (Figure 3). No accident related data was recorded on the device.

The HTC One M8 phone exhibited minimal damage due to impact forces (Figure 4). Photos taken on the accident flight were recovered.

The Samsung Galaxy Tab (Black) exhibited minimal damage due to impact forces (Figure 5). The internal memory was imaged using laboratory hardware and software.

The Samsung Galaxy Tab (White) exhibited major damage due to impact forces (Figure 6). Due to the damage, no data could be recovered from the device.

The Apple iPad exhibited minimal damage due to impact forces (Figure 7). No accident related data was recorded on the device.

2.1. Samsung Galaxy Tab and HTC One M8 Device Description

The Samsung Galaxy Tab and the HTC One M8 are personal electronic devices (PED). PEDs are a category of devices comprised primarily of portable computing devices and mobile phones. Portable computing devices are typically capable of internet access, email, messaging services, and can run user-installed applications to perform specific tasks. Depending on the model, mobile phones can perform many of the same tasks as portable computing devices, plus have voice call and text messaging capabilities. PED user and system data is typically stored on non-volatile memory and can be accessed through manufacturer-provided interfaces.

2.1.1. Samsung Galaxy Tab Data Description

The device was running a GPS application and recorded GPS track data from approximately 0811 to 1649 Mountain Daylight Time (MDT) on June 5, 2015. This data was considered related to the accident and is included in this report.

2.1.2. HTC One M8 Data Description

Nine photographs from the accident flight were recovered from the phone (Figures 8-16). Timing was established using the metadata embedded in the image files.²

3. OVERLAYS AND TABULAR DATA

Figure 17 shows an overlay generated in Google Earth using data from the Samsung Galaxy Tab (Black). Tabular data used to generate this overlay is included as Attachment 1 in electronic comma-separated value (CSV) format.

² Metadata is information embedded in the image file that describes various image attributes including date of exposure, time of exposure, exposure settings, etc.



Figure 1. iFly GPS 720 (S/N Unknown)



Figure 2. AvMap Ultra (S/N 4120423)



Figure 3. SD Memory Card (S/N BI1401222811D)



Figure 4. HTC One M8 Phone (S/N 310003202964795)



Figure 5. Samsung Galaxy Tab (Black) (S/N R52G10SC1WB)

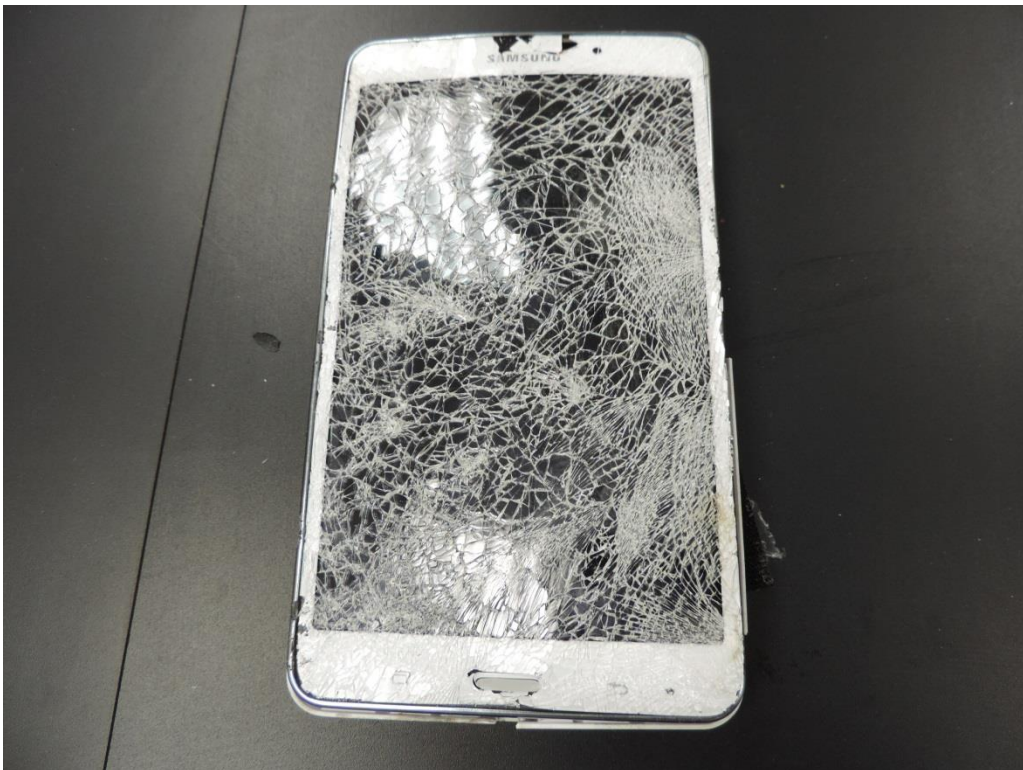


Figure 6. Samsung Galaxy Tab (White) (S/N R52FB0DLAZH)



Figure 7. Apple iPad (S/N DMPJ75EEDNQT)



Figure 8. Photo taken at 1635 MDT



Figure 9. Photo taken at 1635 MDT



Figure 10. Photo taken at 1637 MDT



Figure 11. Photo taken at 1637 MDT



Figure 12. Photo taken at 1638 MDT (pilot's hands redacted)

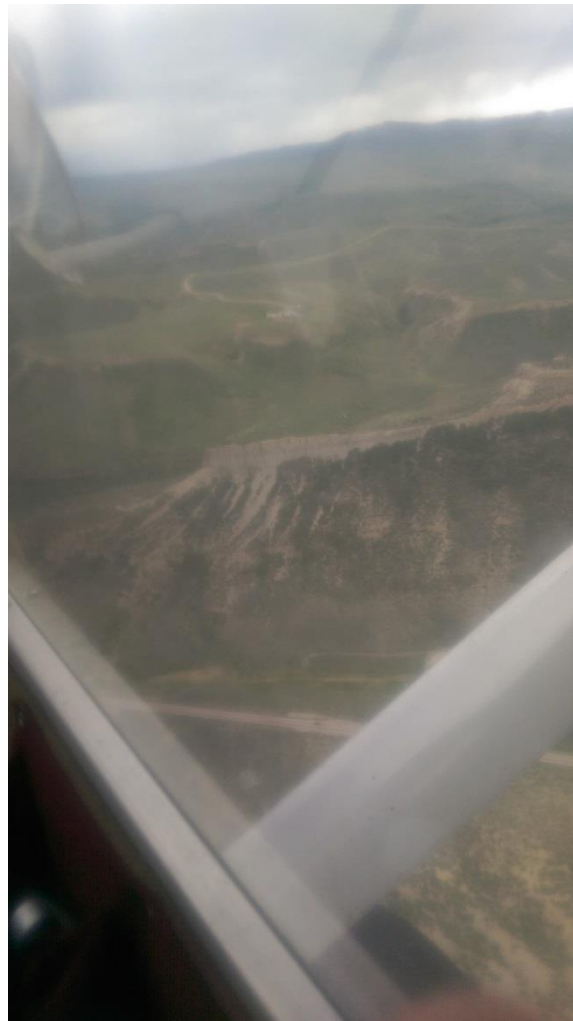


Figure 13. Photo taken at 1638 MDT



Figure 14. Photo taken at 1640 MDT



Figure 15. Photo taken at 1647 MDT



Figure 16. Photo taken at 1648 MDT

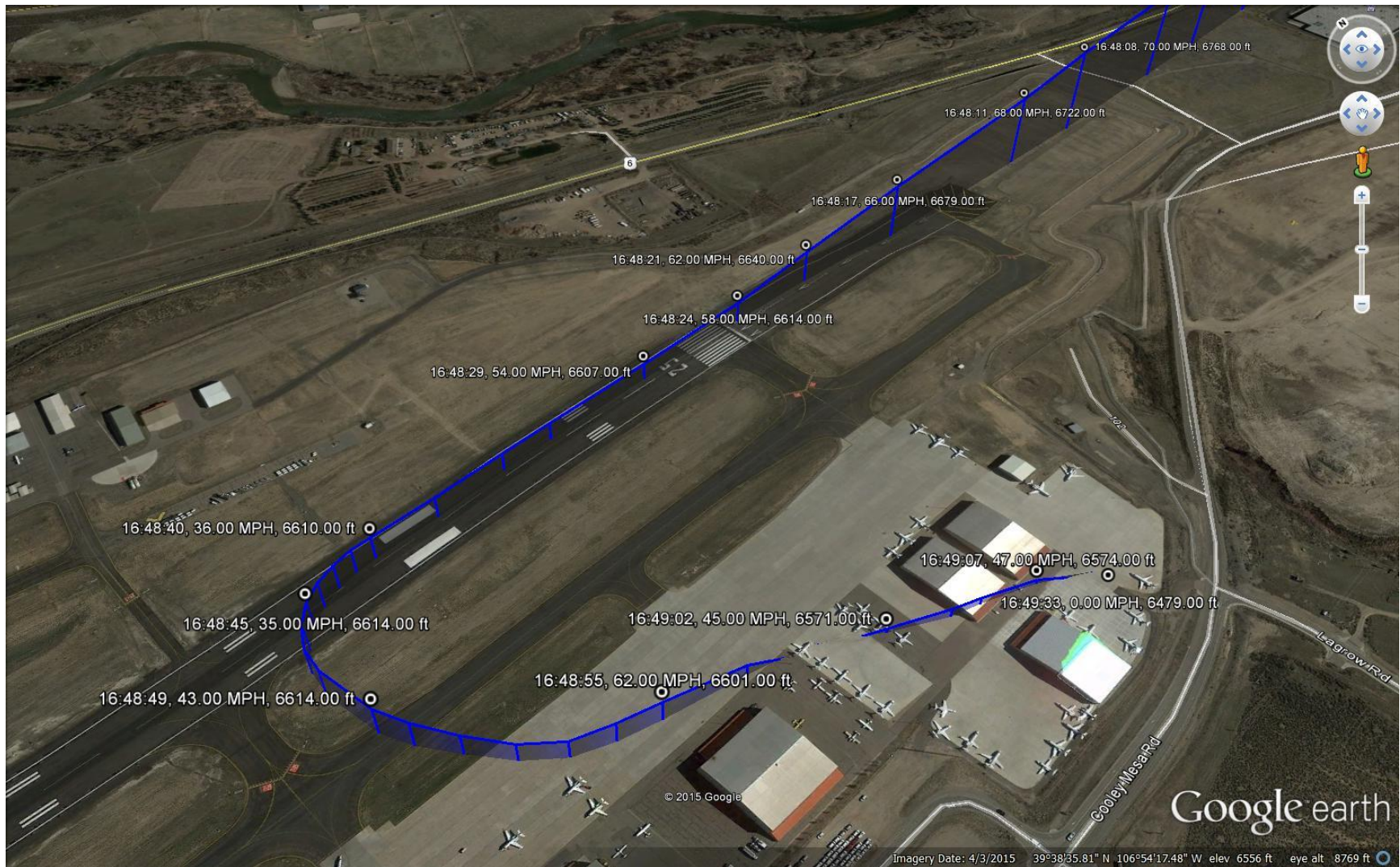


Figure 17. Google Earth overlay of data recovered from the Samsung Galaxy Tab (Black)