

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

November 9, 2021

Electronic Devices

Specialist's Factual Report by Gerald Kawamoto

1. EVENT

Location: Hilltop Lakes, Texas
Date: September 20, 2020
Aircraft: Piper PA-46-310P
Registration: N236KM
Operator: Private
NTSB Number: CEN20LA402

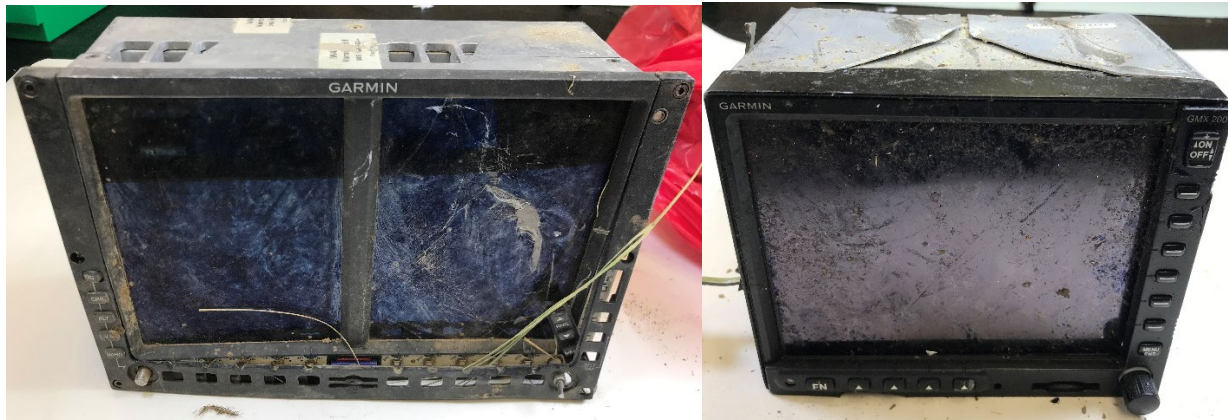
2. DETAILS OF INVESTIGATION

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

Device 1:	Garmin GDU 620
Device 1 Serial Number:	165200034
Device 2:	Garmin GMX 200
Device 2 Serial Number:	Unknown
Device 3:	Shadin ETM (Engine Trend Monitor) Remote Processor
Device 3 Serial Number:	1148
Device 4:	Shadin ETM Remote Display
Device 4 Serial Number:	433
Device 5:	Shadin ETM Recorder
Device 5 Serial Number:	0200
Device 6:	Aspen EFD1000 Pro
Device 6 Serial Number:	10052
Device 7:	Apple iPad 6th Generation
Device 7 IMEI:	GG7YGKXRJF8J
Device 8:	Apple iPhone X
Device 8 IMEI:	354858097343399
Device 9:	Apple iPhone 8
Device 9 IMEI:	353000093154188

No data were recovered from the Garmin GDU 620 and the Garmin GMX 200. Two SD cards were recovered from the GDU 620 and did not contain historical data. A Compact Flash card was recovered from the GMX 200 and did not contain historical data. Non-volatile memory chips were removed and readout, however, neither contained historical

data.¹ The Shadin ETM Remote Processor, Shadin ETM Remote Display, and the Aspen EFD1000 Pro do not contain NVM. The Personal Electronic Devices (iPad and iPhones) powered on normally and data were reviewed. It was determined that there were no accident-related data. Figures 1-8 show these devices as received.



Figures 1 and 2. Garmin GDU 620 (left) and Garmin GMX 200 (right) as received.



Figures 3 and 4. Shadin ETM Remote Processor (left) and Remote Display (right) as received.



Figure 5. Aspen EFD1000 Pro as received.

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



Figure 6. Apple iPad as received.



Figures 7 and 8. Apple iPhone X (left) and iPhone 8 (right) as received.

2.1. Shadin ETM Recorder Description

The Shadin Engine Trend Monitor consists of multiple components including the ETM Remote Processor, ETM Display, and ETM Recorder. The ETM provides the ability to maintain and track the performance of turboprop engines. Flight data is displayed and select data, such as flight time, engine hours, performance variations and exceedances, are recorded to non-volatile memory. Data can be exported to a USB flash drive for review.

2.1.1. Shadin ETM Recorder Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had sustained impact damage, as shown in Figure 9. An internal examination revealed the electronic components were mostly intact and only minor damage was sustained. The device powered on using laboratory equipment and data were exported normally to a USB flash drive. An internal 2 GB microSD card was also removed and additional archived historical data were recovered.



Figure 9. Shadin ETM Recorder as received.

2.1.2. Shadin ETM Recorder Data Description

Data exported to the USB flash drive included 15 files recorded from September 5, 2020, through September 20, 2020. An additional 111 archived files were recovered from the microSD card dated from May 19, 2020, through August 25, 2020. Three files from the date of the accident were recovered. Data included snapshots or certain parameters in time of events such as "LOGON," "Engine Start," "Exceedance Report," "Take-Off," "Power Check Report," and "Engine Off Log."

Additional references to these data files are described in the Powerplants Group Chairman's Factual Report in the public docket. The three files are included as Attachments 1 through 3 to this report in text (.txt) format, where Attachment 1 is the first recorded file on the date of the accident and Attachment 3 is the last recorded file.