

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

October 8, 2015

Non-Volatile Memory Devices

Specialist's Factual Report
By Ben Hsu

1. EVENT

Location: Mountain Pass, California
Date: January 20, 2015
Aircraft/ID: Beech 36 / N999CJ
Operator: Private
NTSB Number: WPR15FA088

2. DETAILS OF DEVICE INVESTIGATION

The Safety Board's Vehicle Recorder Division received the following devices:

Device:	Apple iPad
Device Serial Number:	DLXHC1M5DVGH
Device:	J. P. Instruments EDM-700
Device Serial Number:	10012

The Apple iPad was severely damaged by impact forces (Figure 1). Due to the damage, no data could be recovered from the device.

The J. P. Instruments (JPI) Engine Data Monitor (EDM) was severely damaged by impact forces (Figure 2). The unit's non-volatile¹ memory (NVM) was only partially recoverable using laboratory hardware and software. No accident-related data was recovered from the device.

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



Figure 1: Apple iPad (S/N DLXHC1M5DVGH)



Figure 2: JPI EDM-700 (S/N 10012)

2.1. Apple iPad Description

The Apple iPad is a touchscreen computing device capable of internet, email, photo/video recording, and many other functions depending on the specific application(s) loaded. Data is stored on NVM and may include web browser logs, emails, photos, videos, and location information. The amount and types of data stored varies based on the device's software version and configuration.

2.2. JPI EDM-700 Description

The J. P. Instruments EDM-700 is a panel-mounted gauge that allows the operator to monitor and record up to 24 parameters related to engine operations. Depending on the installation, engine parameters monitored can include:

- Exhaust Gas Temperature (EGT)
- Cylinder Head Temperature (CHT)
- Oil Pressure and Temperature
- Manifold Pressure
- Outside Air Temperature
- Turbine Inlet Temperature
- Engine Revolutions Per Minute (RPM)
- Compressor Discharge Temperature
- Fuel Flow
- Carburetor Temperature
- Battery Voltage

The unit can also calculate, in real time, percent of maximum horsepower, fuel used, shock cooling rate, and EGT differentials between highest and lowest cylinder temperatures. The calculations are also based on the aircraft installation.

The unit contains NVM for data storage of the parameters recorded and calculated. The rate at which the data is stored is selectable by the operator from 2 to 500 seconds per sample. The data can then be downloaded by the operator using the J. P. Instruments software.