

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

December 28, 2017

Engine Data Monitor (EDM)

Specialist's Factual Report
By Sean Payne

1. EVENT SUMMARY

Location: Russian Mission, Alaska
Date: October 16, 2017
Aircraft: Cessna 210
Registration: N8347Z
Operator: Private
NTSB Number: ANC18FA003

On October 16, 2017, about 1430 Alaska daylight time (AKDT), a Cessna 210 airplane, N8347Z, impacted the waters of the Yukon River, about 10 miles southwest of Russian Mission, Alaska. The private pilot sustained fatal injuries, and the airplane was destroyed. The flight was being operated by the pilot as a 14 *Code of Federal Regulations* (CFR) Part 91 visual flight rules (VFR) flight. Visual meteorological conditions were reported at the time of departure. No flight plan had been filed and there is no record of the pilot receiving a preflight weather briefing. The flight originated about 1415 from the Kako Airport, Kako, Alaska, and it was destined for Bethel, Alaska.

2. ENGINE DATA MONITOR GROUP

An Engine Data Monitor (EDM) group was not convened.

3. DETAILS OF INVESTIGATION

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

Recorder Manufacturer/Model: **JPI EDM-730**
Recorder Serial Number: **Unknown**

3.1. EDM 730/830 Description

The J. P. Instruments EDM-730/830 is a panel mounted LCD display that the operator can 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
- Compressor Discharge Temperature
- Fuel Flow
- Carburetor Temperature
- Battery Voltage

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

The unit contains non-volatile memory 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 memory can store up to 20 hours of data at a 6 second sample rate. For a non-damaged unit, the data can then be downloaded by the operator using a USB flash drive and following the instructions on the unit.

3.1.1. Data Recovery

The recorder was damaged in the event and was recovered after being submerged in a river. The device was left to dry in uncontrolled conditions between the event and transport to the NTSB laboratory. The device was encrusted with minerals and other dried substances. The device was disassembled and cleaned. The unit's internal boards were removed and dried (figure 1). The board with the data chip was identified and the data chip was removed from the board and read using the appropriate hardware device. Figure 2 shows the board with the data chip circled.

Figure 1. Cleaned and dried internal components.



Figure 2. An internal board with the memory chip circled.



3.1.2. Data Description

The EDM recording contained data for approximately 36 power cycles. The event flight was the last flight of the recording and its duration was approximately 12 minutes.

3.1.3. Engineering Units Conversions

The engineering units conversions used for the data contained in this report are based on documentation from the manufacturer of the EDM.

Appendix A lists the EDM parameters verified and provided in this report.

3.2. Time Correlation

The EDM records time with the first data sample based on the unit's internal clock. This clock is set and updated by the operator. The recorded time was in alignment with Alaska daylight time, AKDT, and no time offset was used.

3.3. Plots and Corresponding Tabular Data

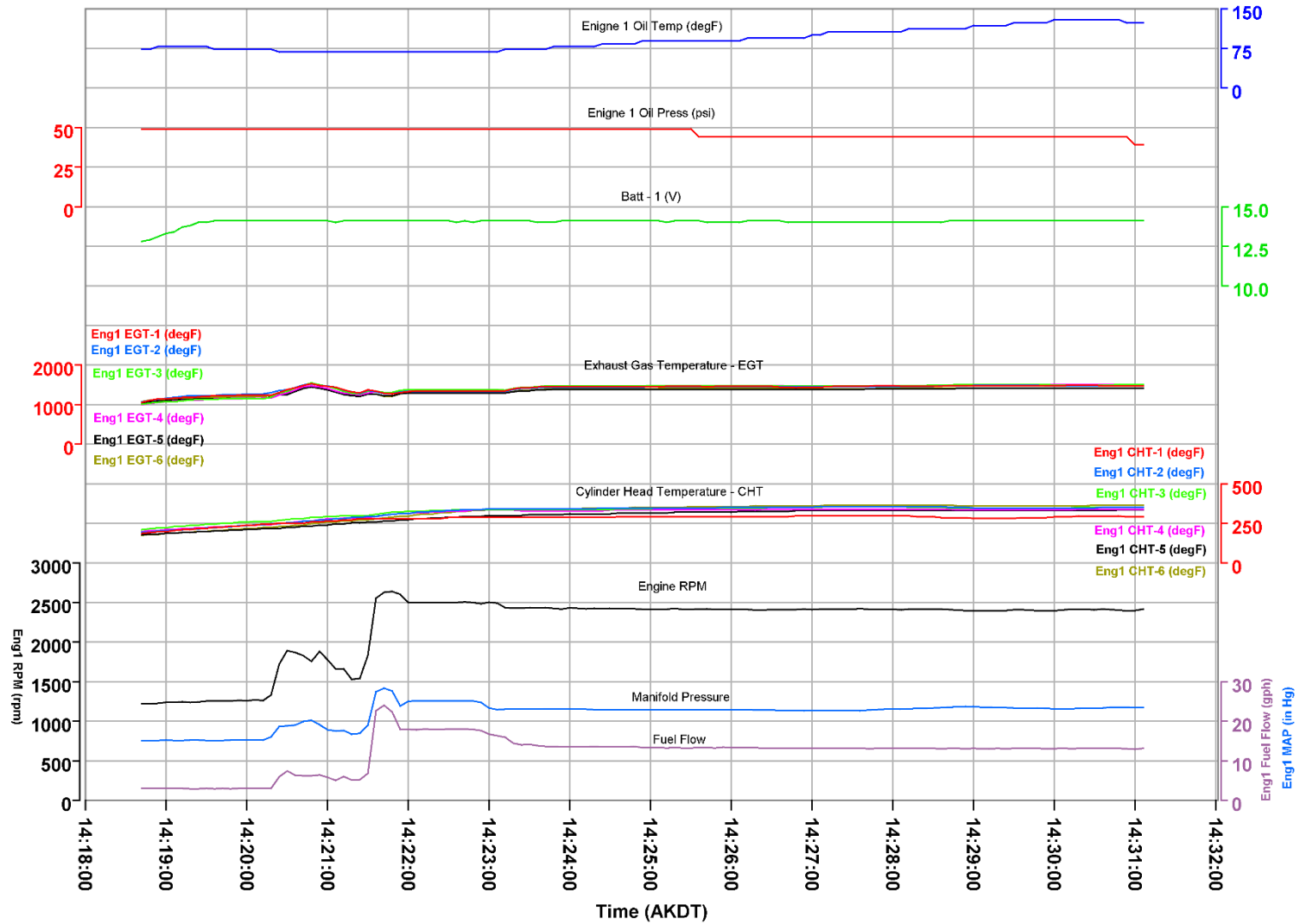
Figure 3 contains EDM data recorded during the October 16, 2017, event. All times are in AKDT.

Data began being recorded at 14:18:42. Around 14:20:30 and 14:21:30, the engine parameters appear consistent with an engine run-up. Engine manifold pressure, RPM and other parameters appear consistent with a takeoff roll around 14:21:40. For the next approximately 9 minutes all engine parameters appear nominal. Data ended at 14:31:06.

The corresponding tabular data used to create this plot are provided in electronic (*.csv¹) format as Attachment 1 to this report.

¹ Comma Separated Value format.

Figure 3. Plot of basic parameters during entire flight.



APPENDIX A

This appendix describes the parameters provided and verified in this report. Table A-1 lists the parameters and table A-2 describes the unit abbreviations used in this report.

Table A-1. Verified and provided parameters.

Parameter Name	Parameter Description
1. Eng1 CHT-# (deg F)	Cylinder Head Temperature Cylinder # ^A
2. Eng1 EGT-# (deg F)	Exhaust Gas Temperature Cylinder # ^A
3. Eng1 Fuel Flow (gph)	Engine Fuel Flow
4. Eng1 Fuel Press (psi)	Engine Fuel Pressure
5. Eng1 RPM (rpm)	Engine RPM
6. Eng1 MAP (in Hg)	Engine Manifold Pressure
7. Eng1 Oil Press (psi)	Engine Oil Pressure
8. Eng1 Oil Temp (deg F)	Engine Oil Temperature
9. Batt 1 (V)	Battery Voltage

Note A: Depending on aircraft configuration number of cylinders that are instrumented varies. In the data plots the '#' is replaced with the appropriate cylinder ID.

Table A-2. Unit abbreviations.

Units Abbreviation	Description
deg	degrees
psi	pounds per square inch
deg F	degrees Fahrenheit
gph	gallons per hour
in Hg	inches of mercury