

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

November 1, 2018

Cockpit Display – Recorded Flight Data

Specialist's Factual Report
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1. EVENT SUMMARY

Location: Pierce, Nebraska
Date: March 21, 2018
Aircraft: Rans S-16
Registration: N741WT
Operator: Private
NTSB Number: CEN18FA126

On March 21, 2018, about 1845 central daylight time, a Rans S-16 Shekari, N741WT, impacted terrain about ¼ mile from the approach end of runway 11 at a private airstrip, owned by the pilot, near Pierce, Nebraska. The airplane sustained substantial damage. The private pilot was fatally injured. The airplane was registered to and operated by the pilot under 14 *Code of Federal Regulations* Part 91 as a personal flight, which was not operating on a flight plan. Visual meteorological conditions prevailed at the time of the accident. The flight departed Norfolk Regional Airport/Karl Stefan Memorial Field, Norfolk, Nebraska, after obtaining fuel, and was returning to the private airstrip.

2. RECORDED FLIGHT DATA GROUP

A recorded flight data group was not convened.

3. DETAILS OF INVESTIGATION

The National Transportation Safety Board (NTSB) Vehicle Recorder Division received the following electronic display device capable of recording information to non-volatile memory (NVM)¹:

Recorder Manufacturer/Model: **Dynon FlightDEK-D180**
Recorder Serial Number: **001165**

3.1. Dynon FlightDEK-D180 Description

The Dynon FlightDEK D180 is a 7" wide screen display mounted in the cockpit of non type certificated aircraft. The instrument integrates multiple flight instruments including airspeed, altitude, gyro-stabilized magnetic compass, turn rate, slip/skid ball, bank angle, pitch angle and vertical speed. The unit also has other functions that include a clock/timer, g-meter, voltmeter and a density altitude/true airspeed calculator. The unit contains an Air

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

Data, Attitude and Heading Reference System (ADAHRS) to provide air data, attitude and heading information to the display. Depending on the installation in the operator's aircraft certain parameters might not be displayed, for example angle-of-attack. The instrument also integrates up to 16 engine related instruments including manifold pressure, temperatures, RPM and fuel system information. Depending on the type of engine installed in the aircraft and pilot preferences, not all display options can be available.

Depending on the firmware version on the unit, the ability to log data to internal memory exists. According to the manufacturer, firmware versions 3.0 and later contain the ability to log certain engine parameters and firmware versions 5.0 and later contain the ability to log certain Electronic Flight Information System (EFIS) and GPS parameters. The data logging must be configured by the operator to enable logging and set the data log interval. The unit can also be configured to start logging data automatically at boot-up. The data logging interval can be set to store at 1,3,5,10,30 and 60 second intervals. The internal memory can store at least 30 minutes of cumulative data at a 1 second recording interval or at least 30 hours at a 60 second data recording interval. When the recording limit in the internal memory is reached, the oldest record is dropped and a new record is added.

3.1.1. Dynon FlightDEK-D180 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had not sustained any damage and the data were downloaded using the manufacturer's procedure.

3.1.2. Dynon FlightDEK-D180 Data Description

The D180 received contained firmware version 5.4.0.233. Based on information from the manufacturer, the unit stores data. The operator had the datalog function enabled and it was set to record information at a 10 second interval and start recording at boot up. The recording contained approximately 6 hours and 34 minutes of data. The accident flight recording was the 12th event logged on the device and was approximately 41 minutes. Timing of the data is measured in seconds.

3.1.3. Dynon FlightDEK-D180 Engineering Units Conversions

Conversion of the data from the raw recorded information to engineering units is performed by the Dynon product support download program.

APPENDIX A lists the D180 parameters verified and provided in this report.

3.2. Time Correlation

The unit records clock time, either external or internal. The time is set by the operator for the internal clock or if the unit is connected to a GPS, the unit will use the GPS system time. GPS was not connected to the device and each event logged on the device corresponds to the user settings for each event. An offset of 53,340 seconds was applied to the accident event to correlate the data with the reported accident time in Universal Coordinated Time (UTC).

Dynon Multi-Function Display (MFD) Time + 53,340 seconds = UTC

3.3. Plots and Corresponding Tabular Data

The following four figures contain data recorded during the March 21, 2018 event.

Figure 1 is a plot of basic parameters during the entire flight. The time interval is 18:13:00 to 18:46:00 UTC.

Figure 2 is a plot of basic parameters during the last portion of the accident flight. The time interval is 18:33:00 to 18:46:00 UTC.

Figure 3 is a plot of engine parameters during the entire flight. The time interval is 18:13:00 to 18:46:00 UTC.

Figure 4 is a plot of engine parameters during the last portion of the accident flight. The time interval is 18:13:00 to 18:46:00 UTC.

The corresponding tabular data used to create these four plots are provided in electronic (*.csv²) format as Attachment 1 to this report.

² Comma Separated Value format.

Figure 1. Plot of basic parameters during entire flight.

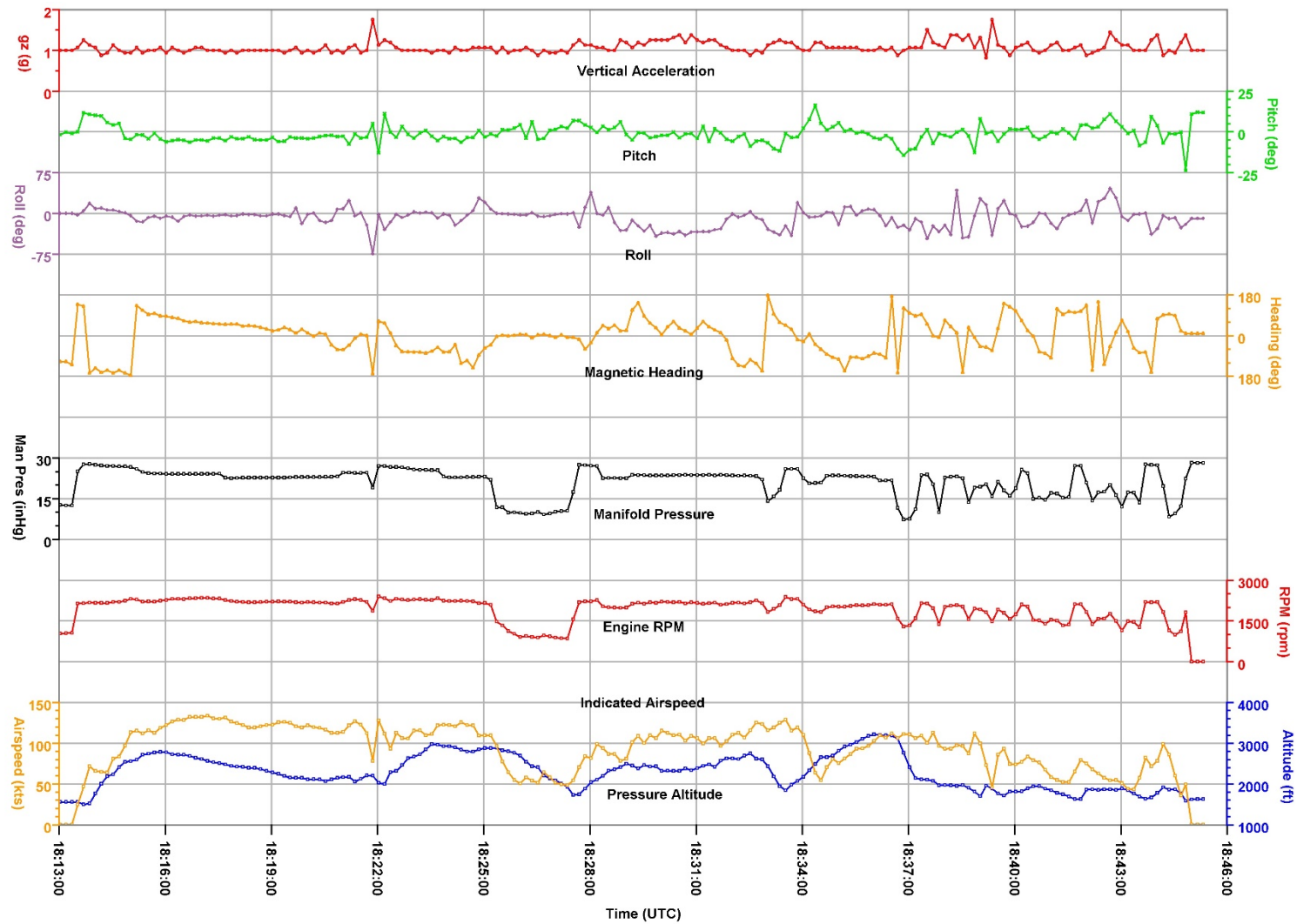


Figure 2. Plot of basic parameters at the end flight.

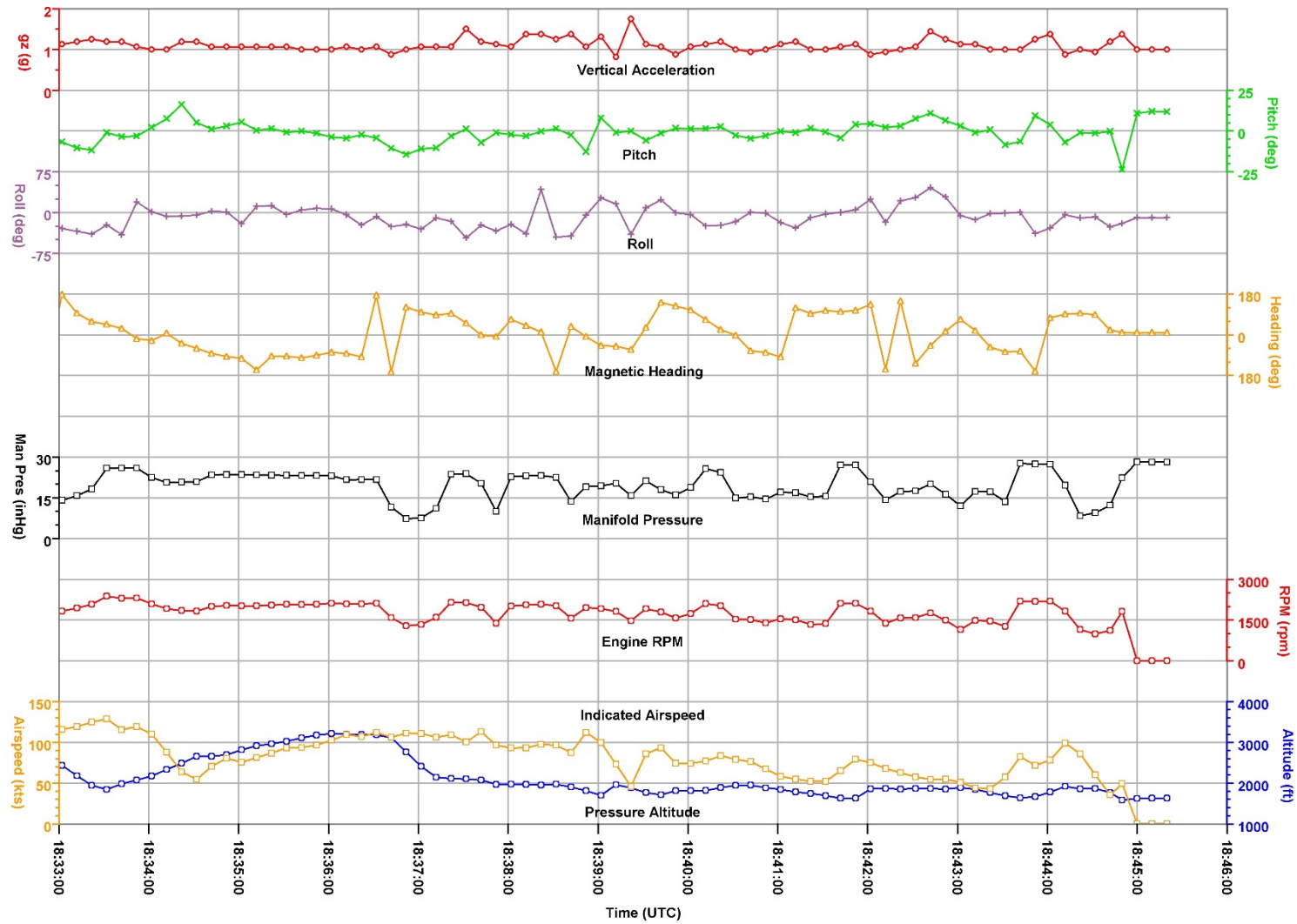


Figure 3. Plot of engine parameters during entire flight.

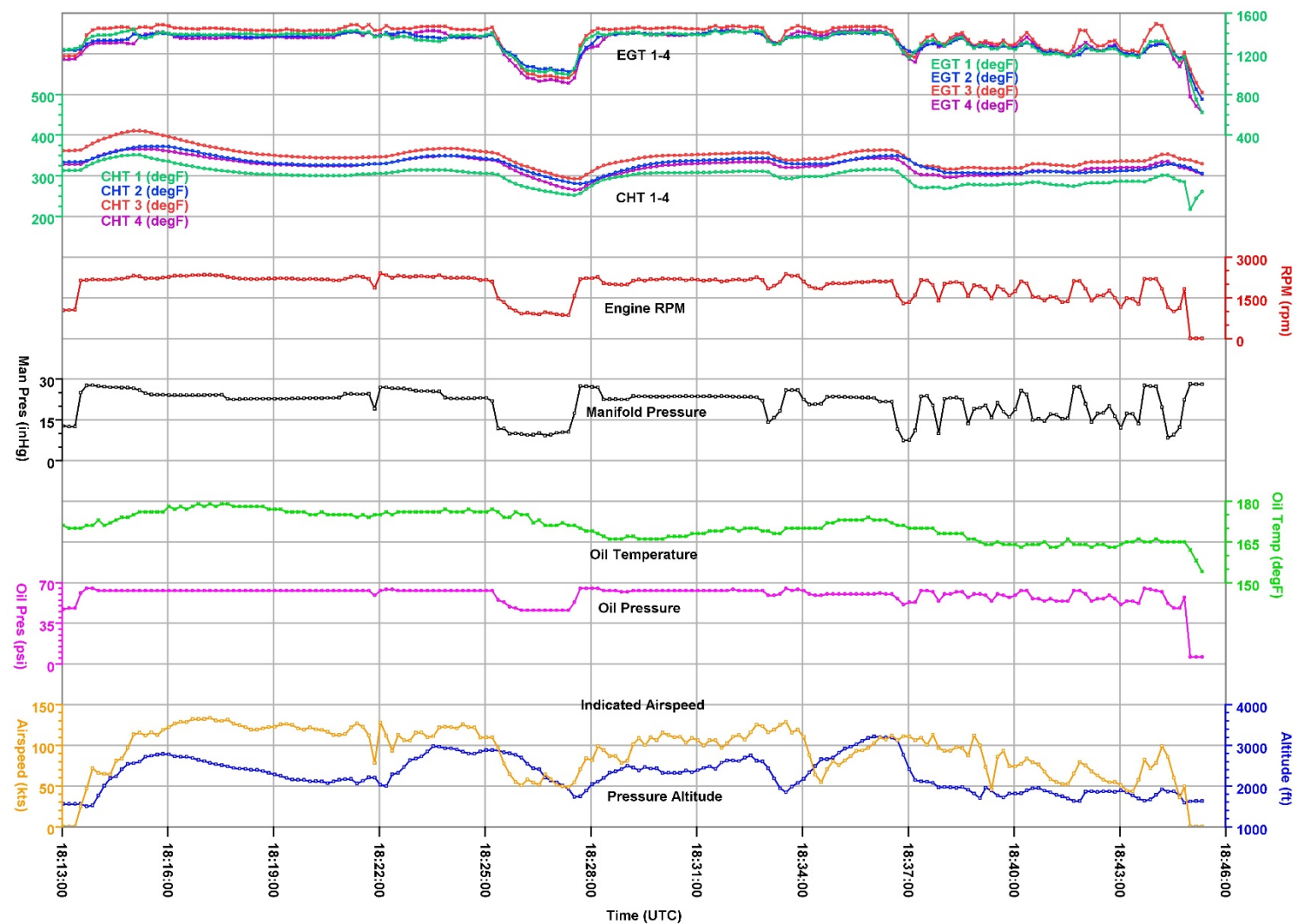
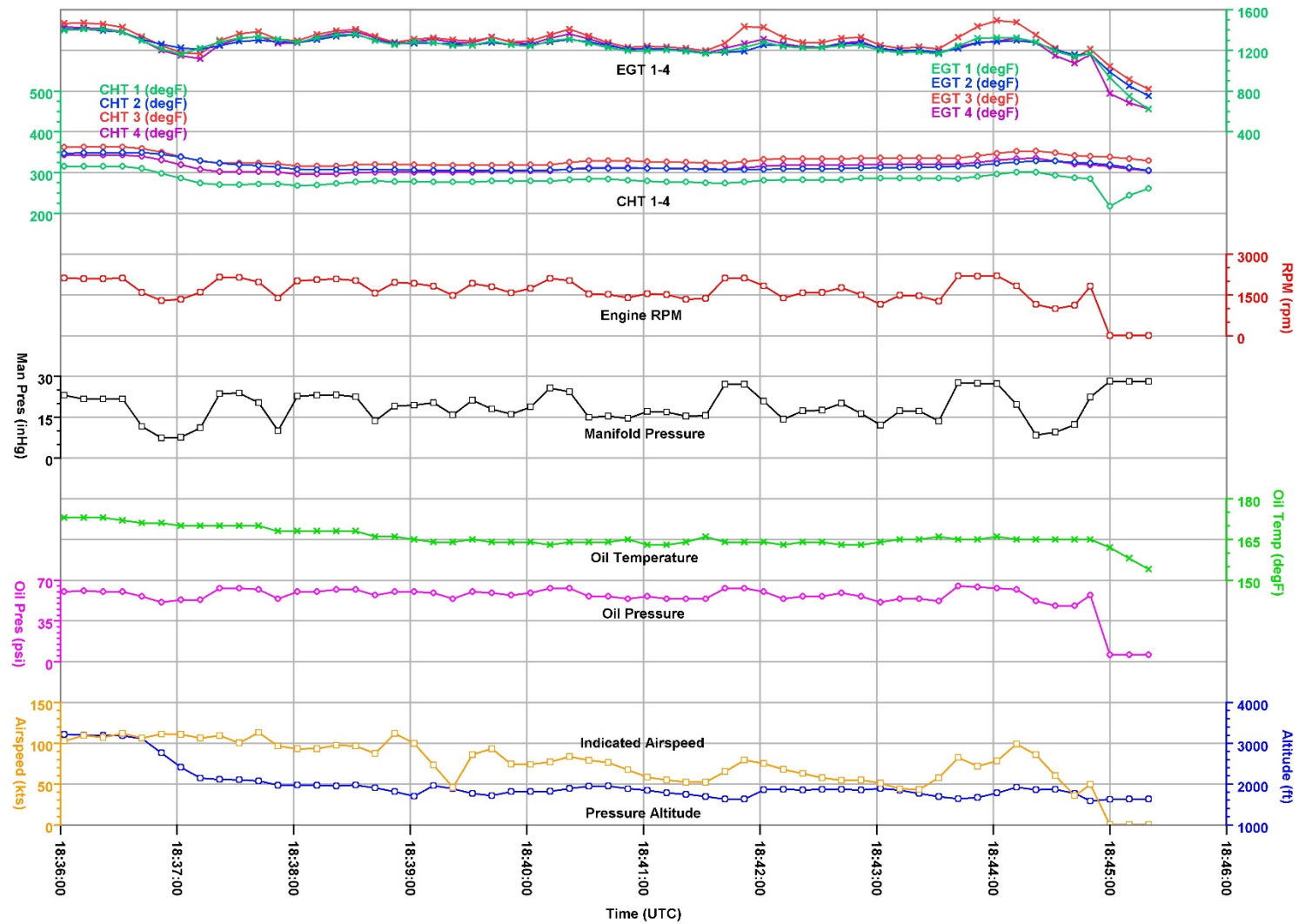


Figure 4. Plot of engine parameters at the end flight.



APPENDIX A - Dynon Parameters

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. Airspeed (kts)	Indicated Airspeed
2. Altitude (ft)	Pressure Altitude
3. CHT # (degF)	Cylinder Head Temperature #
4. EGT # (degF)	Exhaust Gas Temperature #
5. gz (g)	Vertical Acceleration
6. Heading (deg)	Heading
7. Man Pres (inHg)	Manifold Pressure
8. Oil Pres (psi)	Oil Pressure
9. Oil Temp (degF)	Oil Temperature
10. Pitch (deg)	Pitch
11. Roll (deg)	Roll
12. RPM (rpm)	Engine RPM

Table A-2 - Unit abbreviations.

Units Abbreviation	Description
deg	degrees
degF	Degrees Fahrenheit
ft	feet
g	Acceleration
inHg	inches of Mercury
kts	knots
psi	pounds per square inch
rpm	revolutions per minute