

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, DC 20594

November 30, 2018

Electronic Device

**Specialist's Factual Report
by Christopher Babcock**

1. EVENT

Location: Clearwater, Florida
Date: November 25, 2017
Aircraft: Piper PA-46-500TP
Registration: N863RB
Operator: Private
NTSB Number: ERA18LA031

On November 25, 2017, about 1315 eastern standard time, a Piper PA-46-500TP, registration N863RB, was substantially damaged when it experienced a loss of engine power during the initial climb from St. Pete/Clearwater International Airport (PIE), Clearwater, Florida. The airline transport pilot sustained serious injuries. The airplane was registered to and operated by a corporation as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed at the time of the accident, and an instrument flight rules flight plan was filed for the flight that was destined for Pensacola International Airport (PNS), Pensacola, Florida.

According to the pilot, he performed a preflight inspection of the airplane and engine runup with no anomalies noted. The takeoff roll and lift off from runway 36 were "normal;" however, when he initiated a landing gear retraction, the engine torque decreased to 300-400 ft-lbs, but the 2,000 rpm did not change. Next, the torque surged back to full power, and continued to surge. The pilot attempted to return to the runway instead of landing in the water; however, the left wing of the airplane struck the ground and it came to rest near runway 18.

A Meggitt Data Acquisition Unit was recovered for evaluation.

2. DETAILS OF INVESTIGATION

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

Device: Meggitt Data Acquisition Unit (DAU) 85-254-1
Device Serial Number: 0517-005

2.1. Meggitt DAU Device Description

The DAU¹ is part of the Meggitt Avionics, Inc. MAGIC engine instrument display system that also includes dual instrument panel mounted displays (EDU) and various engine and fuel tank sensors.

The DAU is a microprocessor-based signal-conditioning device. The unit will accept aircraft sensor data, perform signal conditioning and validation, and then present this information to the EDUs via RS-422, RS-232, and ARINC 429 compatible serial data buses. The system will also receive, via ARINC 429 compatible serial data buses, global positioning and air data information to support the exceedance and engine condition trend monitoring (ECTM) processing functions of the DAU.

The DAU supports four dual ARINC 429, two RS-422, and two RS-232 serial data buses. Information received includes altitude, airspeed, and global positioning data. Information transmitted includes engine parameters (tachometer(s), torque, inter turbine temperature, oil pressure, oil temperature, vacuum pressure, and fuel flow), fuel quantity (left and right tank groups), and global positioning data. Fuel quantity sensing and reporting functions are accomplished by independent (isolated) fuel quantity processing electronics. In addition, the DAU includes built-in test, performance, and self-test functions.

2.1.1. Meggitt DAU Data Description

The DAU records and stores up to 256 engine exceedance events in non-volatile memory. The system also provides for and automatically gathers information for Engine Condition Trend Monitoring (ECTM). Up to three ECTM records are stored per power cycle if either "Cruise 1" or "Cruise 2" states are achieved. One record for each of the following altitude ranges is stored:

- 15,000 to 20,000 feet
- 20,000 to 25,000 feet
- Above 25,000 feet

"Cruise 1" state is achieved when one of the above-mentioned altitude ranges is reached and the altitude has stabilized within ± 300 feet, airspeed of greater than 140 knots is reached and has stabilized within ± 10 knots, and engine torque is greater than 49.5%. If "Cruise 1" conditions are met for a period of two minutes, an ECTM record is stored for that particular altitude range.

"Cruise 2" state is achieved when "Cruise 1" conditions are valid, the altitude variation is within ± 100 feet, the airspeed variation is within ± 8 knots, engine torque variation has stabilized to within $\pm 3.8\%$, prop tachometer variation has stabilized to within $\pm 1.25\%$, and turbine tachometer has stabilized to within $\pm 1.0\%$. If these conditions are maintained for a period of two minutes, the "Cruise 1" data is over-written for that particular altitude range.

Each ECTM record includes the following parameters and units:

- Date/Time
- Mode ("Cruise 1" or "Cruise 2")

¹ DAU description and recorded data information were obtained from Meggitt Avionics, Inc. EIDS Installation Manual (Part Number 1031235) released on November 1, 2000, and Piper PA-46-500TP Airplane Manual Part Number 767-005 released on July 1, 2009.

- Altitude – feet (ft)
- Airspeed – knots (kt)
- Static Air Temperature - degrees Celsius (°C)
- Torque – pound-foot (lb-ft)
- Propeller Speed (Np) – percent (%)
- Turbine Speed (Ng) – percent (%)
- Inter Turbine Temperature (ITT)- degrees Celsius (°C)
- Fuel Flow – pounds per hour (pph)

In the event an engine parameter exceeds a preset value for a predetermined time an exceedance is recorded. The following is a list of parameters monitored and recorded if an exceedance occurs:

- Torque
- Inter Turbine Temperature (ITT)
- Propeller Speed (Np)
- Turbine Speed (Ng)
- Engine Oil Temperature
- Engine Oil Pressure

Each exceedance record includes the following parameters:

- Date/Time
- Exceedance Parameter
- Duration of Exceedance
- Peak Value
- Data Bus Label

2.1.2. Meggitt DAU Data Recovery

The ECTM, exceedance, and fault data from both channels of the DAU were downloaded at the NTSB's Vehicle Recorders Laboratory using the Meggitt Avionics, Inc. download software; the download software also converted the data to engineering units.

2.1.3. Data Recovered

Channel A recorded 82 ECTM data events between May 15, 2016, and September 7, 2017; however, no ECTM events were recorded on the day of the accident. Channel B recorded 85 ECTM events between April 8, 2016, and September 7, 2017. The most recent recorded ECTM events are shown in Table 1. The time zone of the date and time was not determined.

Table 1. Most recent ECTM events.

Channel	Date	Time	Mode	Altitude (ft)	Airspeed (kts)	SAT (degC)	Torque (ft-lb)	Np (%)	Ng (%)	ITT (degC)	Fuel Flow (lb/hr)
A	9/7/2017	19:54:18	2	26007	169	-20	1187	100	94.9	671	265
A	9/7/2017	21:25:06	2	24003	163	-14	1012	100	91.9	632	245
A	9/7/2017	16:34:42	2	27003	171	-20	1273	100	96.9	706	278
A	9/7/2017	18:11:00	1	21003	167	-10	954	100	90.0	600	245
B	9/7/2017	19:54:18	2	25998	169	-20	1187	100	94.9	675	266
B	9/7/2017	21:25:06	2	23993	164	-14	1011	100	91.8	635	245
B	9/7/2017	16:34:42	2	26998	171	-20	1272	100	96.9	709	278
B	9/7/2017	18:11:00	1	20995	167	-10	954	100	90.0	603	245

Channel A recorded 14 exceedances between October 15, 2015, and June 2, 2017. Channel B recorded 12 exceedances between October 15, 2015, and June 1, 2017. No exceedances were recorded on any channel on the day of the accident.

Both Channels A and B recorded 54 faults. The same 2 faults occurred on each channel on the day of the accident: "Oil Press AtoD reversion failure" and "Torque AtoD reversion failure."