

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division

April 30, 2019

Other Devices

Specialist's Factual Report
By Christopher Babcock

1. EVENT

Location: Rio Linda, California
Date: August 3, 2017
Aircraft: Lancair IV-TP
Registration: N420M
Operator: Private
NTSB Number: WPR17FA179

On August 3, 2017, at 1503 Pacific daylight time, a single-engine experimental Lancair IV-TP, registration N420M, impacted a residential area in Rio Linda, California following a loss of engine power while on approach to McClellan Airfield, Sacramento, California. The commercial pilot, the sole occupant, was fatally injured; the airplane was substantially damaged. The airplane was registered to Pilot Proficiency Inc. and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91. The personal flight departed from Auburn Municipal Airport, Auburn, California at 1455 with a planned destination of San Carlos Airport, San Carlos, California. Visual meteorological conditions prevailed and a flight plan had not been filed; the pilot was receiving flight following advisories.

2. DETAILS OF INVESTIGATION

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

Device 1:	VR Avionics TSLM-M601
Device 1 Serial Number:	N/A
Device 2:	West Coast Specialties Annunciator Panel
Device 2 Serial Number:	001
Device 3:	Sierra Flight Systems Chelton IDU ID-A1
Device 3 Serial Number:	IDA110063LSS
Device 4:	Sierra Flight Systems Chelton IDU ID-A1
Device 4 Serial Number:	IDA110060LSS
Device 5:	VR Avionics Display
Device 5 Serial Number:	NA
Device 6:	VR Avionics Display
Device 6 Serial Number:	NA

Device 7: VR Avionics Fuel Supply Manager
Device 7 Serial Number: NA
Device 8: Sierra Flight Systems Chelton Air Data Computer
Device 8 Serial Number: 237

Of all the devices received in the lab, only the VR Avionics TSLM-M601 and Sierra Flight Systems Chelton IDUs recorded data.

2.1. Sierra Flight Systems Chelton IDU Device Description

The IDU units are configured to operate as primary flight displays (PFD) or multi-function displays (MFD). Using external sensors, including solid state Air Data and Attitude Heading Reference System (ADAHRS), the PFD displays aircraft parameter data including altitude, airspeed, attitude, vertical speed, and heading.

The MFD can display navigational information by way of a moving map as well as engine related data. Figures 1 and 2 show the IDUs recovered in this accident.

While both units were identified with an identical part number, one unit contained a turn and slip indicator.



Figure 1. IDU SN IDA110063LSS, as received.



Figure 2. IDU SN IDA110060LSS, as received.

2.1.1. Sierra Flight Systems Chelton IDU Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the unit had not sustained any damage and information was extracted using from the unit's internal compact flash card.

2.1.2. Data Description

Each unit contained five flight logs. Only elapsed time was recorded within each data file. The accident flight and prior flight were identified from the geographic position of the origin, destination, and accident location. The three other logs appeared to be post-accident power cycles at the location of the accident. Data plots reflect the data stored in SN IDA110060LSS, but both datasets were similar.

2.2. VR Avionics TSLM-M601 Device Description

During flight the TSLM monitors primary parameters ITT, N1, N2, and if needed torque. If any of them breach their maximums the TSLM will turn on the exceed annunciation light to alert the operator. Each start, run and exceed event are recorded by the TSLM in a format showing turbine temperature, N1, N2, voltage, and more versus time. Figure 3 shows the TSLM-M601, as received in the laboratory.



Figure 3. TSLM-M601, as received.

2.2.1. VR Avionics TSLM-M601 Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had not sustained any damage, however, the data was unable to be extracted using the manufacturer's software. The non-volatile memory (NVM) device (Figure 4) was imaged and the data was recovered from the chip image file.¹

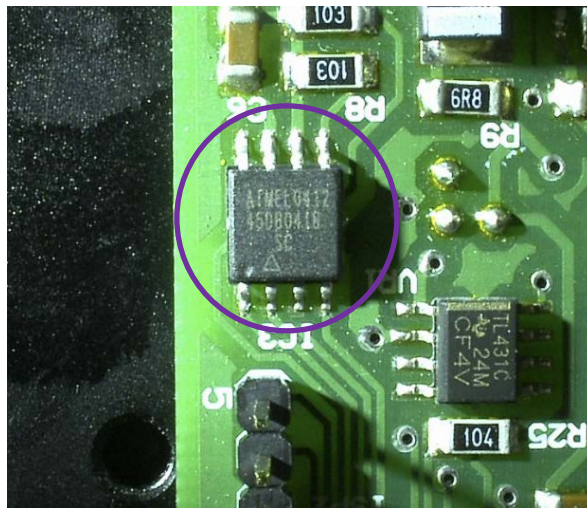


Figure 4. NVM memory device from TSLM (circled).

¹ NVM refers to semiconductor memory that does not require power to retain data.

2.2.2. VR Avionics TSLM-M601 Data Description

The TSLM recorded engine start data for engine start cycles 1044 to 1218 as well as data recorded during any exceedances. The start time associated with cycle 1218 was 984:30:00 (elapsed hours, minutes, seconds). Several exceedances were recorded in the data (Table 1).

Table 1. Recorded exceedances.

Engine Time	Exceedance Type
941:32:48	Torque
943:22:37	Torque
943:27:18	Torque
944:08:11	Torque
944:08:39	Torque
944:55:47	Torque
944:58:18	Torque
949:05:05	Torque
950:45:41	Torque
950:45:48	Torque
950:46:00	Torque
950:47:21	Torque
950:47:40	Torque
952:35:14	Torque
953:18:57	Torque
956:42:20	Torque
958:54:16	Torque
958:54:40	Torque
959:53:56	Torque
960:57:56	Compressor Speed

2.3. Data Contents

The aircraft departed Auburn at about 4:50 (mm:ss) elapsed time and climbed to about 6500 feet and turned toward the southwest. At 9:17 elapsed time, the fuel pressure began to rise from about 40 psi to 43 psi. At 9:22 elapsed time, the aircraft pitched down and banked to the left, reaching 25° nose down and 36° left wing down. At 9:24 elapsed time, the N1, N2, fuel flow, and ITT began decreasing. The aircraft returned to near level pitch at about 9:32 elapsed time, experiencing about 3.3 g vertical acceleration. The aircraft turned about 30° to the right.

The N1 stabilized at about 65% and N2 rose back to about 1800 rpm, but torque continued to drop to about 8%. At 11:44 elapsed time, N1 began falling to zero. N2 decreased to about 1000 rpm and torque decreased to zero. At 12:00 elapsed time, the aircraft banked about 40° to the left, aligning with runway 16 at McClellan Airfield. At 12:44 elapsed time, several parameters showed discontinuities consistent with the aircraft striking an object at a recorded altitude of 100 ft. The Google Earth terrain model elevation at this point is about 70 ft.

Figures 5 and 6 show the aircraft's flight path in Google Earth. Figure 7 shows flight data from the entire accident flight. Figure 8 shows flight data during the upset event of the accident flight. Figure 9 shows flight data from the upset event through the end of the flight. Figure 10 shows flight data from the previous flight from Sierra Sky Park to Auburn

for comparison. All data used to generate Figures 5-10 can be found in comma separated format in the public docket for this accident as Attachment 1 to this report.

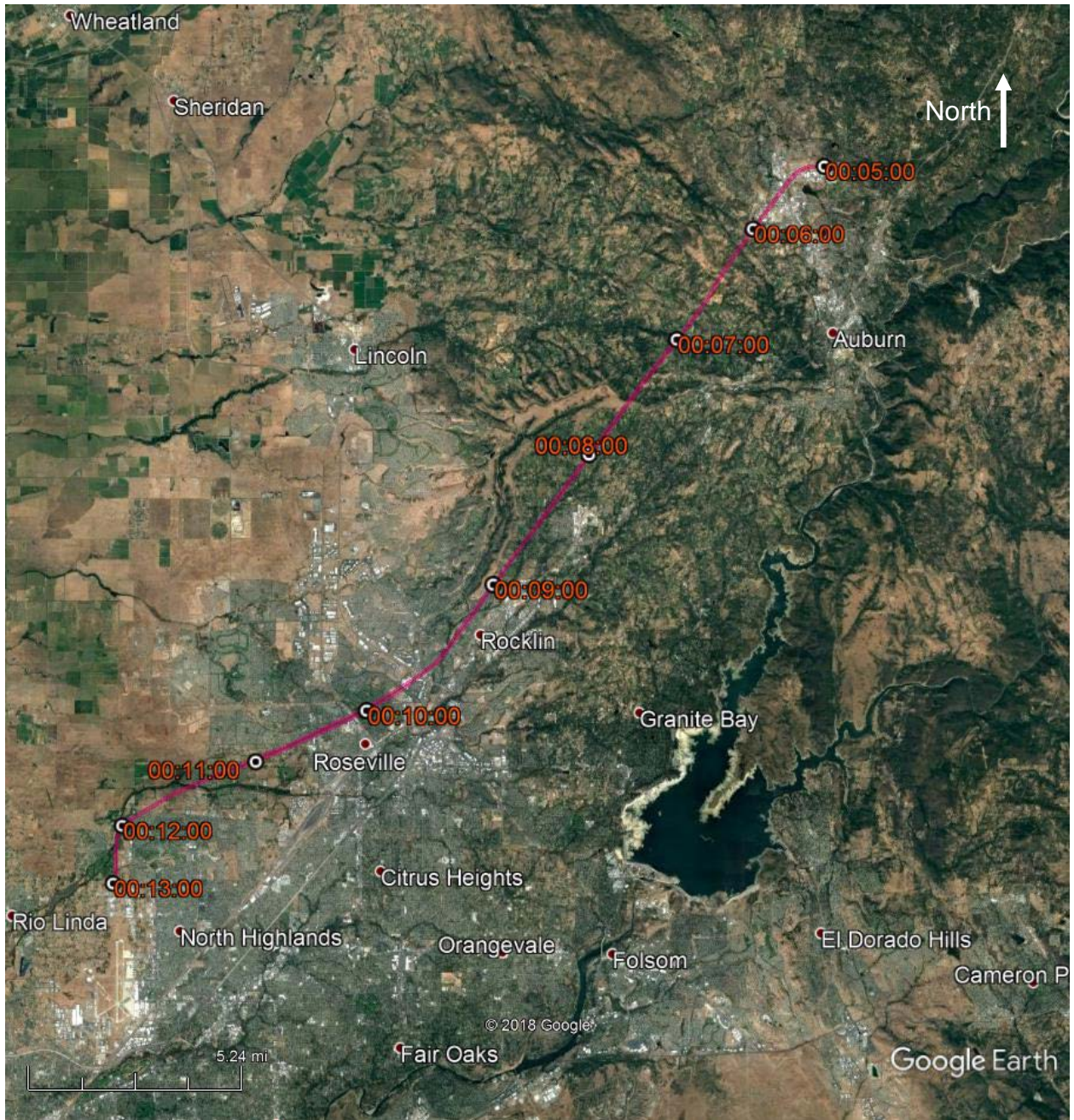


Figure 5. Bird's eye view of accident flight.

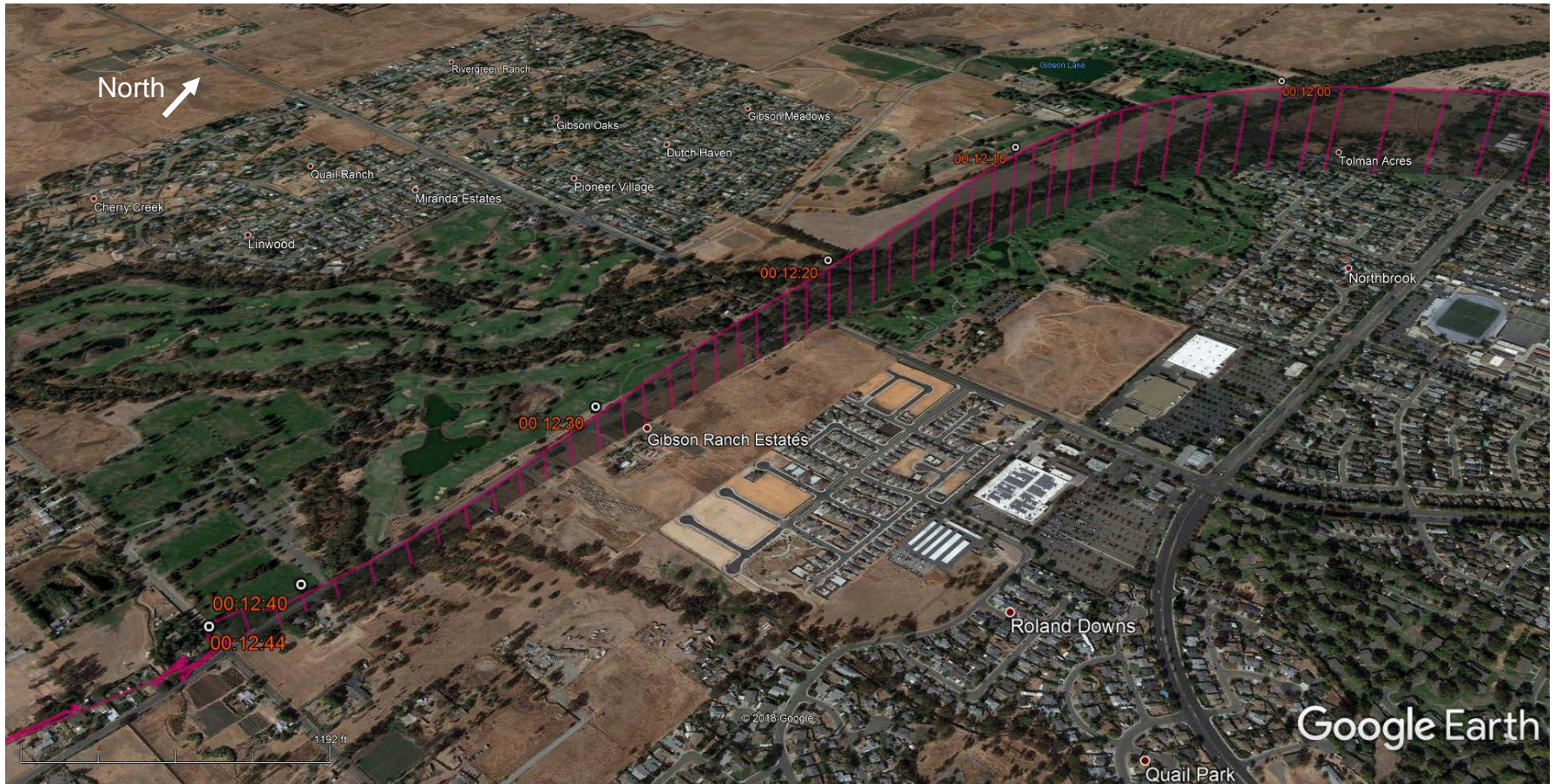


Figure 6. Last 45 seconds of accident flight.

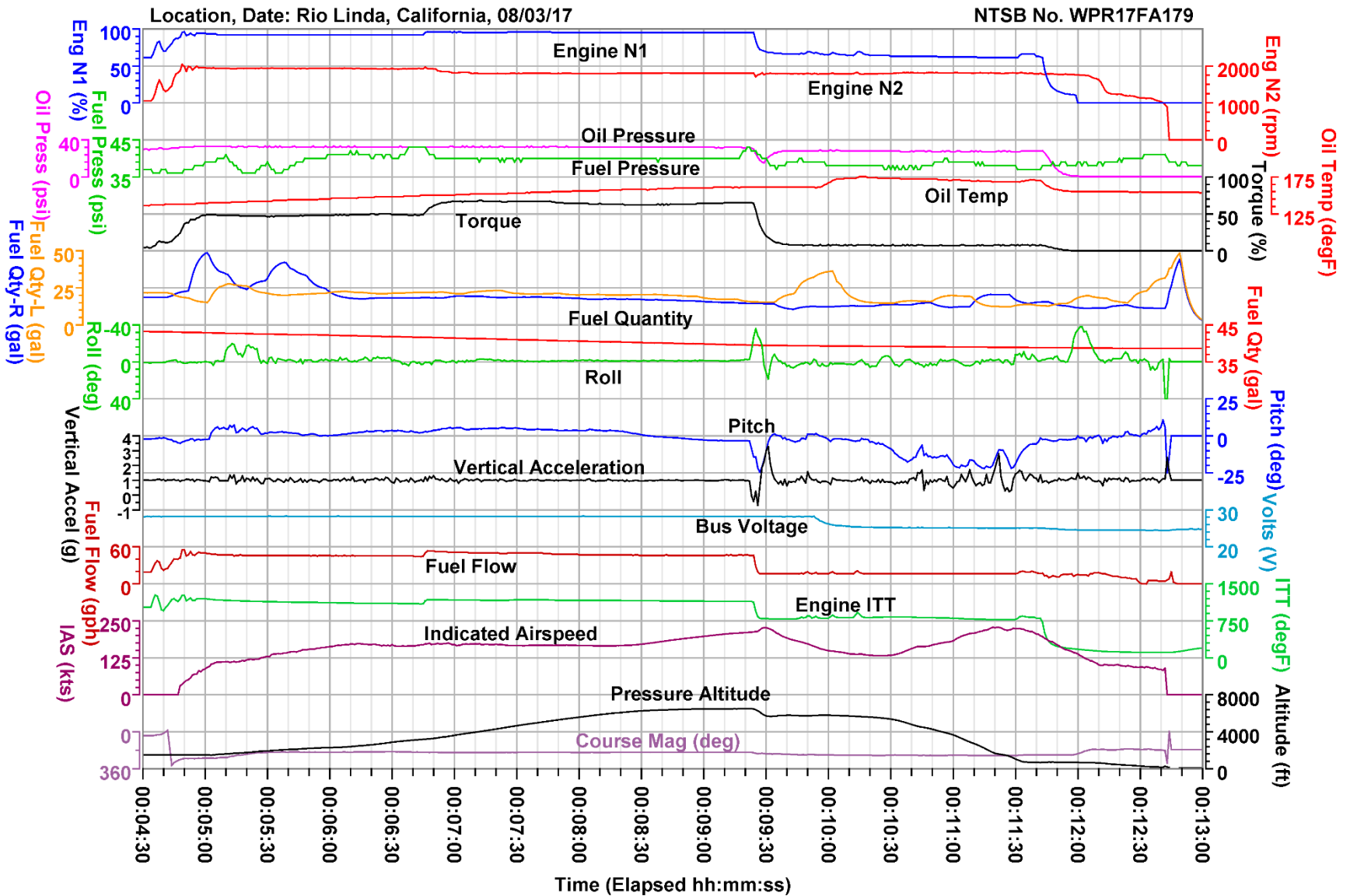


Figure 7. Flight data from entire accident flight.

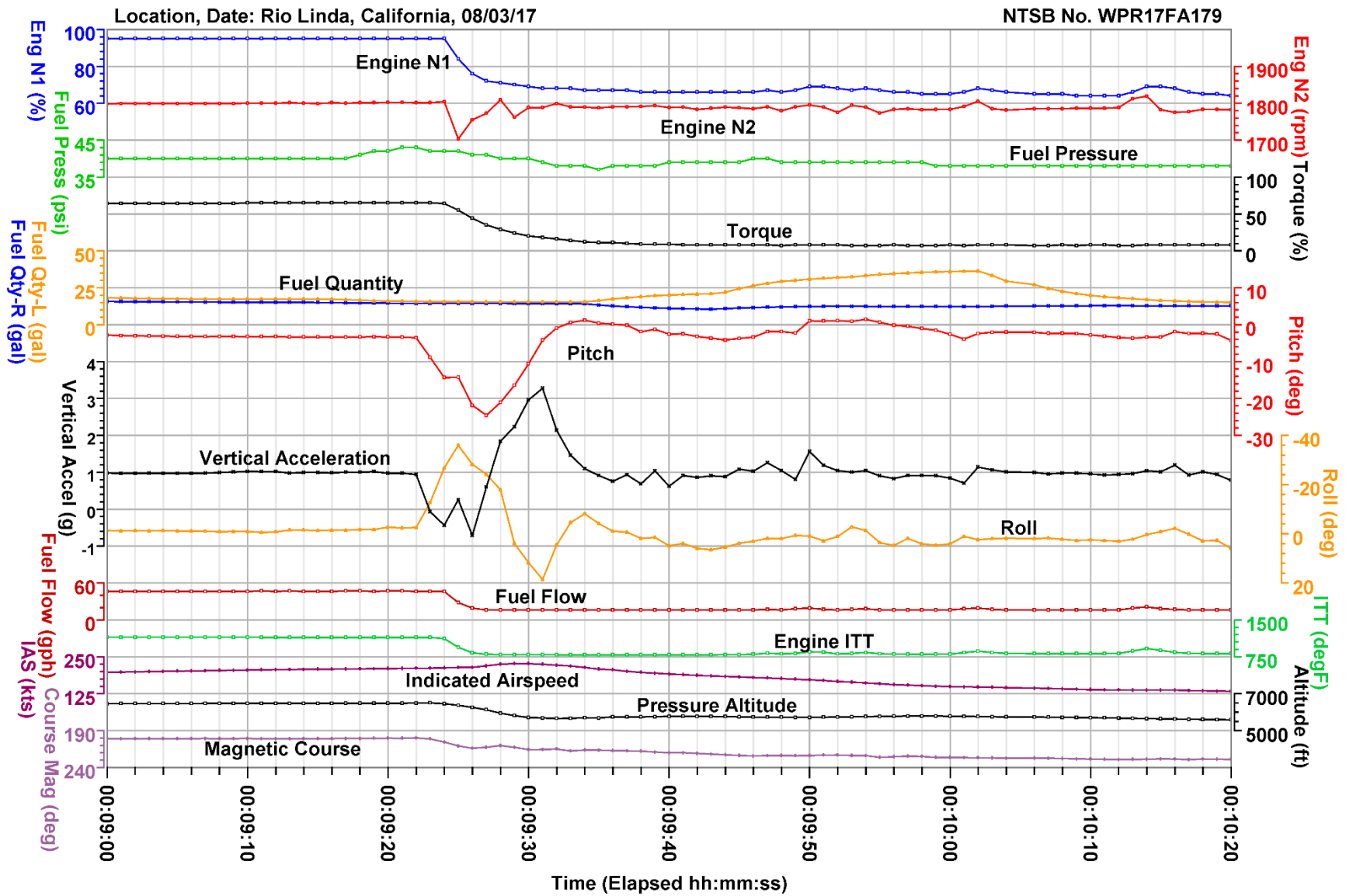


Figure 8. Flight data from upset event.

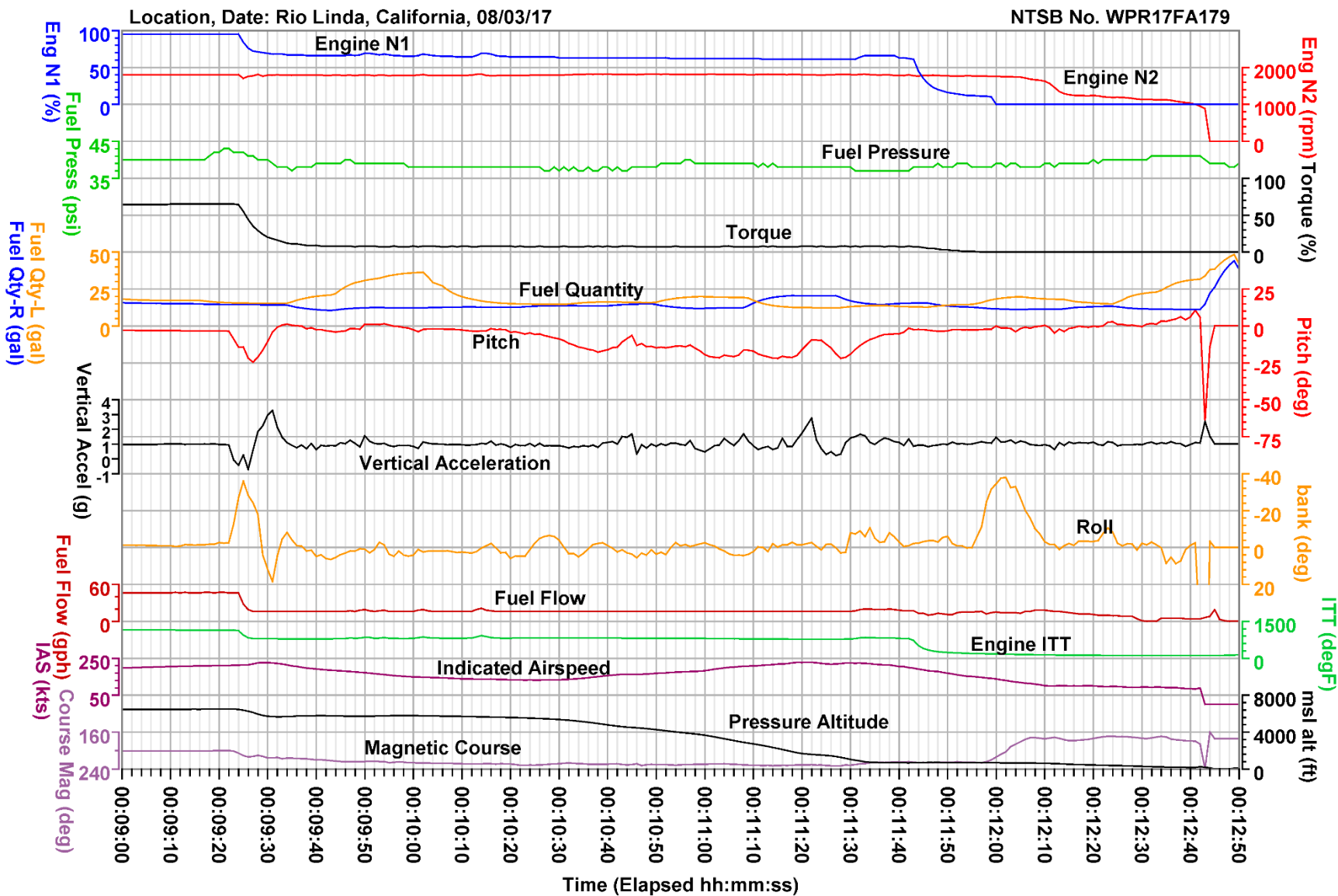


Figure 9. Flight data from upset event through the end of flight.

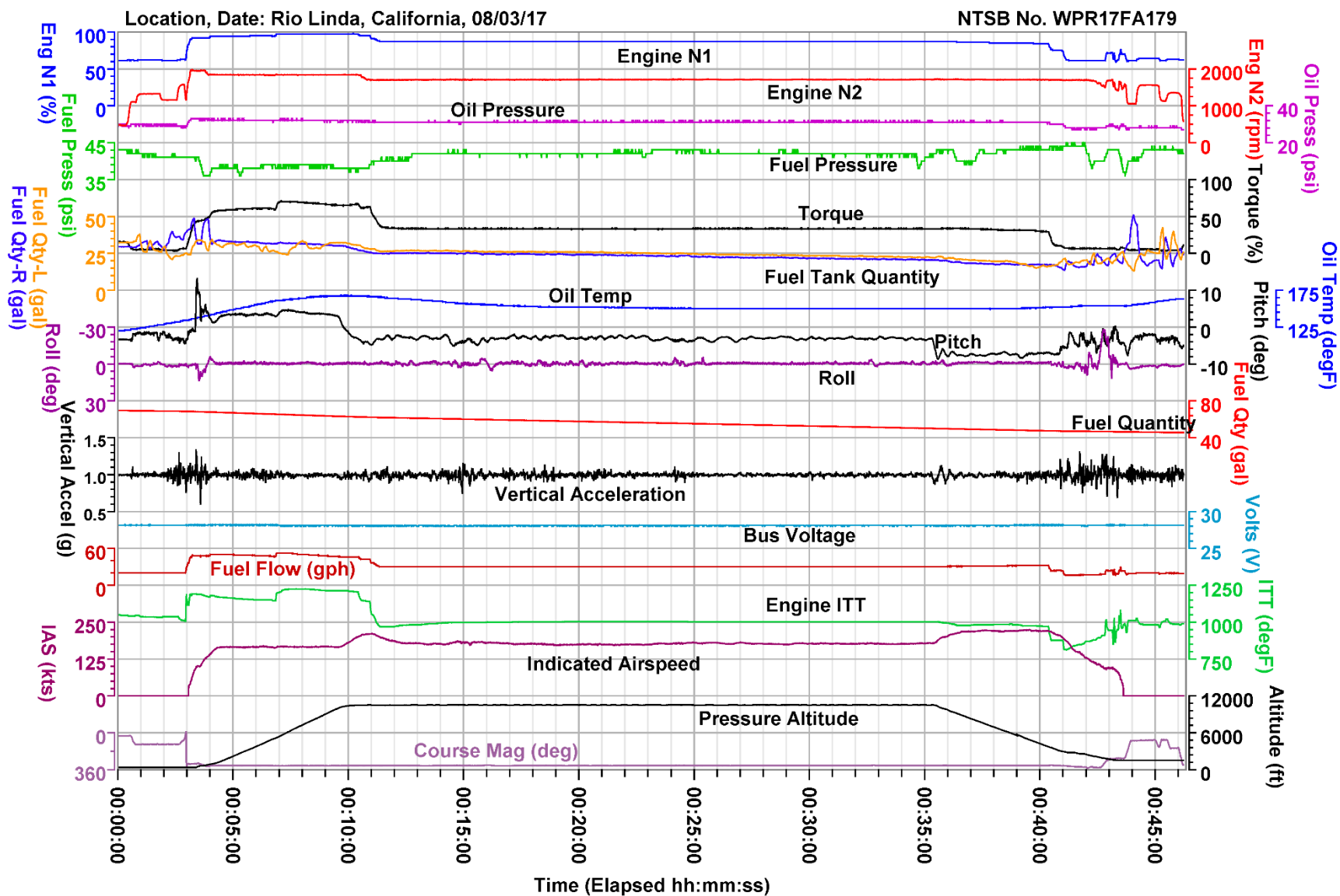


Figure 10. Flight data for previous flight.