

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR23FA185

DEEC MICROCHIP EXAMINATION REPORT

December 12, 2023

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A. Accident

WPR23FA185
San Clemente Island, California
May 10, 2023
7:49 am PDT

B. Investigative Team

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C. Summary of Investigation

On May 10, 2023, at 0749 Pacific daylight time, a Gates Lear Jet 36A, N56PA, was destroyed when it was involved in an accident near San Clemente Island, California. Both pilots and the additional crewmember are presumed fatally injured.

The airplane was operating as a Title 14 Code of Federal Regulations Part 91, other work use flight.

The airplane departed Point Magu Naval Air Station (KNTD), Oxnard, California, at 0723 as the lead airplane in formation with a second Lear Jet airplane utilizing the callsigns FENIX01 (N56PA) and FENIX02 (N544PA). The flight proceeded south towards San Clemente Island with the FENIX02 flying in close formation with FENIX01. The purpose of the flight was to participate in training exercises with the United States Navy in Warning Area 291 (W291). There were three civilian crewmembers onboard each airplane.

Shortly after entering W291, at 15,000 ft mean sea level (MSL), the aircrew of FENIX02 observed the lead airplane's flaps partially deploy. They notified the lead airplane, who acknowledged the radio call. The aircrew of FENIX02 then observed the flaps retract. Seconds later, the aircrew of FENIX01 radioed that they detected an odor in the cabin. The aircrew of FENIX02 then radioed that observed white or gray colored "smoke or gas" coming from the "left side AFT Cabin area." Unidentified fluid was also observed trailing the airplane. At this point the lead airplane was not maintaining heading or altitude.

FENIX02 then observed flames coming from around the aft equipment door and told the aircrew of FENIX01 that they were on fire and to declare an emergency. The aircrew of FENIX01 declared an emergency and their intentions to land at San Clemente Island Naval Auxiliary Landing Field (NUC). FENIX02 then took over as lead for the formation flight and maneuvered in front of FENIX01 to lead them to the airfield. FENIX02 last observed and heard radio transmissions from FENIX01 as they descended through about 9,000 feet.

Recorded Automatic Dependent Surveillance - Broadcast (ADS-B) data showed only the lead airplane's track until after the accident occurred, and FENIX02 turned their transponder on. The data showed that FENIX01 proceeded on about a 165° heading until about 30 miles south of NUC, where the airplane began a left turn. FENIX01 subsequently made a series of descending turns before the data ended. The last recorded data point showed the airplane at 1,338 ft and heading northwest about ½ mile off the southwest side of San Clemente Island (Figure 1).

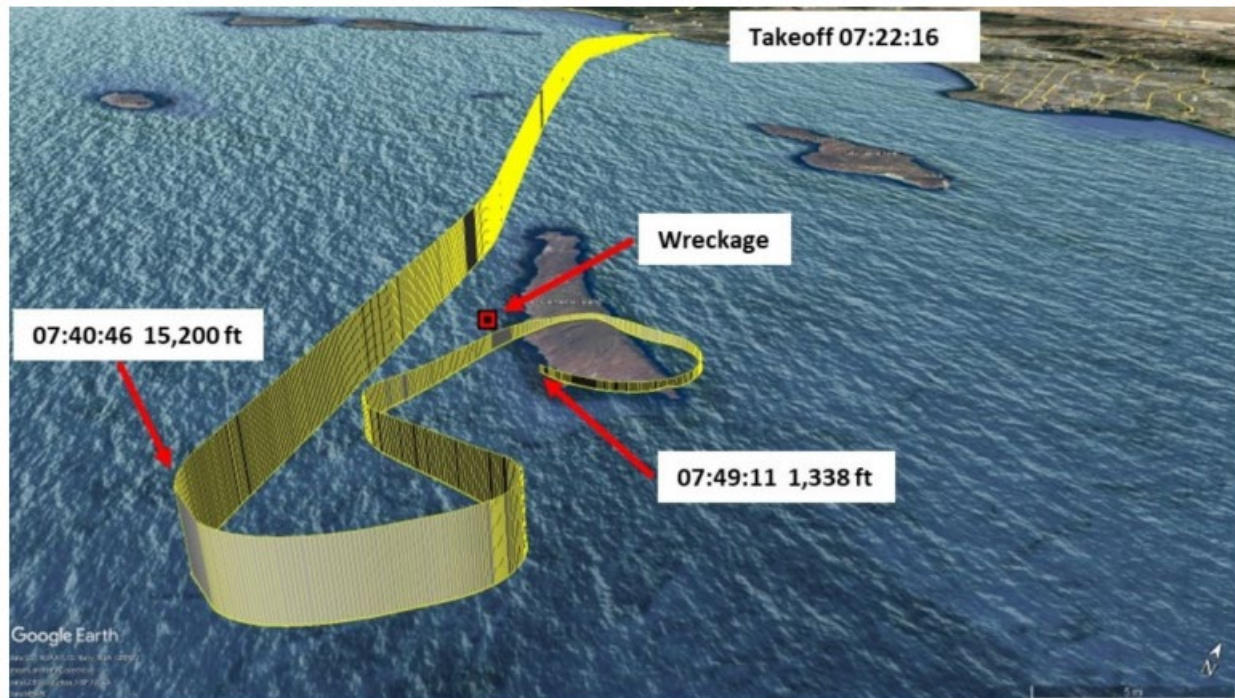


Figure 1 – ADS-B Flight Track of FENIX01 (N56PA)

The airplane wreckage was located about 4 miles northwest of the last recorded ADS-B data point and one mile offshore in about 300 ft of water. A visual inspection of the wreckage was conducted using a remotely operated vehicle. The wreckage was highly fragmented (Figure 2) and evidence of a preimpact fire was visible on portions of the wreckage.



Figure 2 – N56PA Wreckage (LASD Video Extract)

D. Component Examination

An Atmel model 50-5560-SP microchip, number 19104, for one of the airplane's two TPE-731 turbofan engine Digital Electronic Engine Controls (DEEC) was removed from the wreckage when it was recovered from the ocean floor four months after the accident. It was sent to Microchip Technologies, Incorporated, in Colorado Springs, Colorado, for examination and if needed, repair, to download any non-volatile information, it might contain regarding the accident, as engine N1 and N2 readings, inter-turbine temperature, Mach number, altitude, power lever angle thrust reverser deployment, weight on wheels, and engine operating and flight hours. The examination took place on December 12 and 13, 2023.

The accident microchip was shipped along with an exemplar microchip provided by Honeywell and placed in a secure holding facility at Microchip Technologies, Incorporated. The box was opened in one of the laboratories. Both the accident microchip and the exemplar microchip were found inside antistatic storage bags. The bags were opened, and the two microchips were removed, examined, and photographed.



Photo 1, Box Containing the Microchip, Top



Photo 2, Box Containing the Microchip, Bottom



Photo 3, Box Shown Open with Packing Material

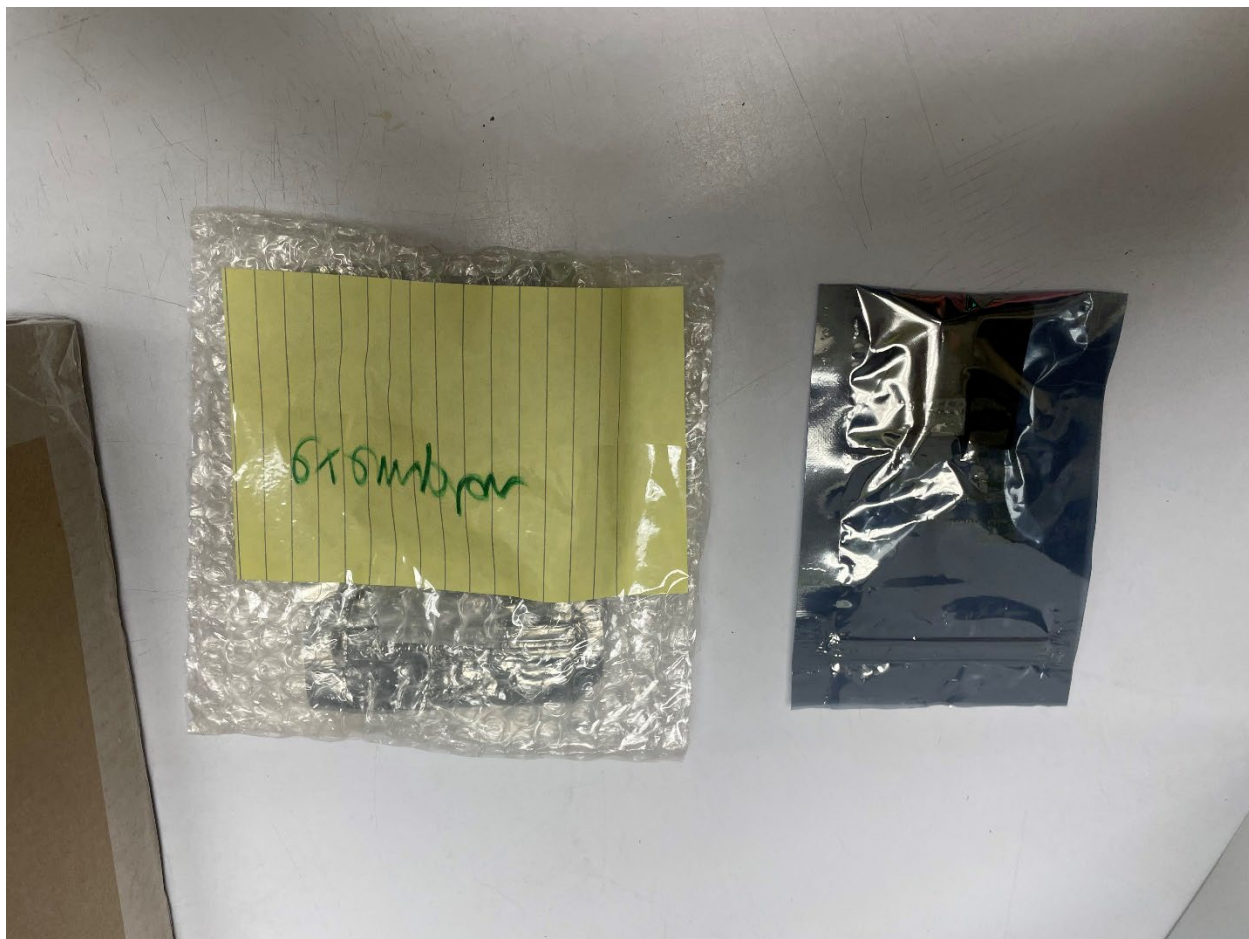


Photo 4, Bags Containing the Accident and Exemplar Microchips



Photo 5, Accident Microchip

On initial examination, the accident microchip was intact, but two of the contact pins on the chip's right side were missing. A programmable curve tracer used to determine electrical continuity was used on the exemplar chip to form a foundation from which to compare the accident chip. If continuity is good, the display will show a line from the bottom of the screen along the Y-axis to the center and then the line should bend 90 degrees to the right along the X-axis indicating good continuity. Testing of the contact pins on the exemplar microchip showed good continuity.



Photo 6, Missing Contact Pins

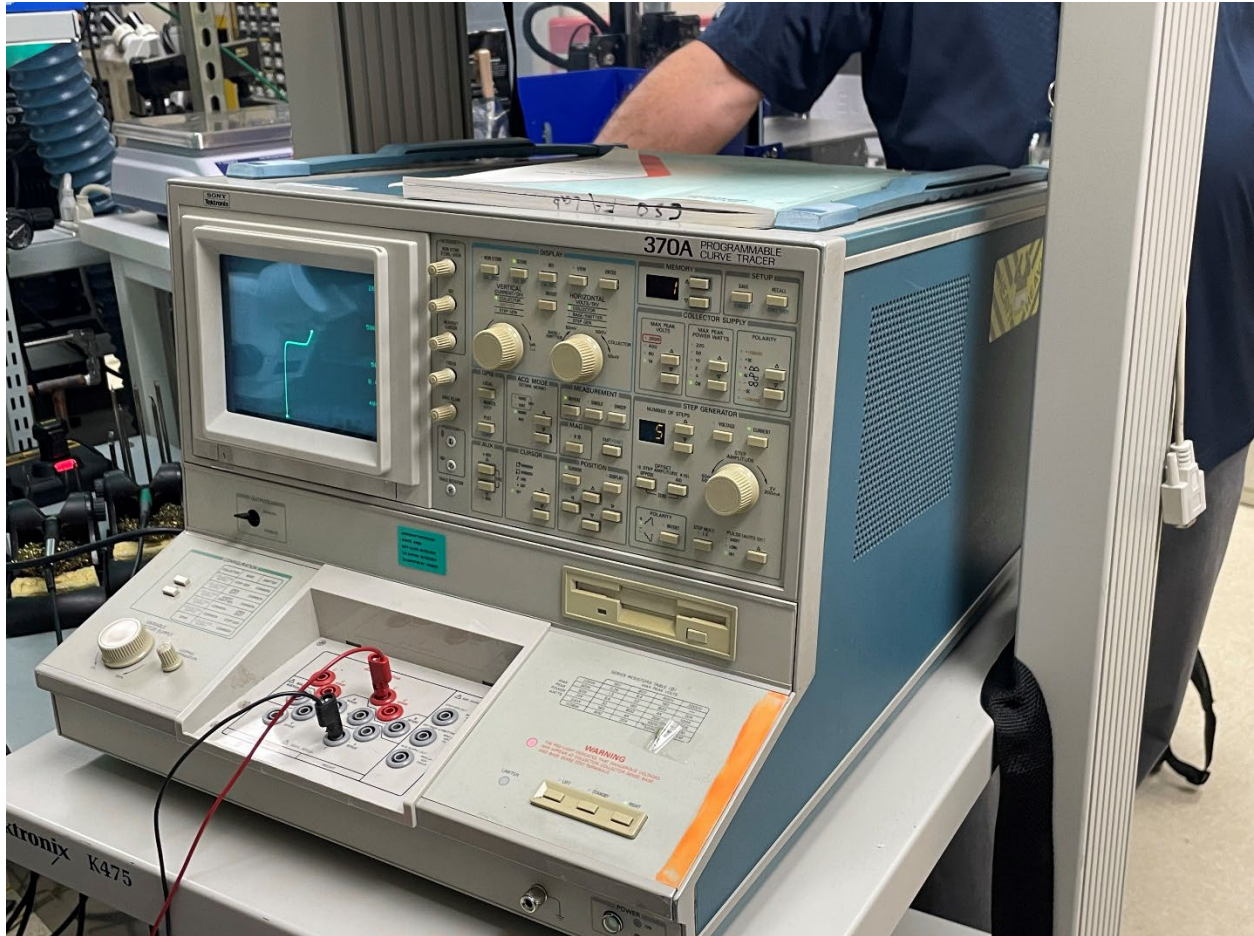


Photo 7, Curve Tracer Display of the Exemplar Chip

The accident microchip was then curve traced for continuity and failed to show normal readings. One channel showed a vertical loop on the Y-Axis.



Photo 8, Curve Tracer Display showing one channel (narrow vertical loop) on the Accident Chip (The proper continuity curve display is superimposed)

The microchip was then opened, and the microprocessor was examined under the microscope. Corrosion contamination was observed. The pad wires were removed, and the microprocessor was cleaned with acetone. The microprocessor was tested again and still showed erroneous curve tracing. The microprocessor was cleaned further and the pad metal at each of the 28 leads were either scraped or etched with a laser to assure better contact.



Photo 9, Opened Accident Microchip Showing the Microprocessor in the Center

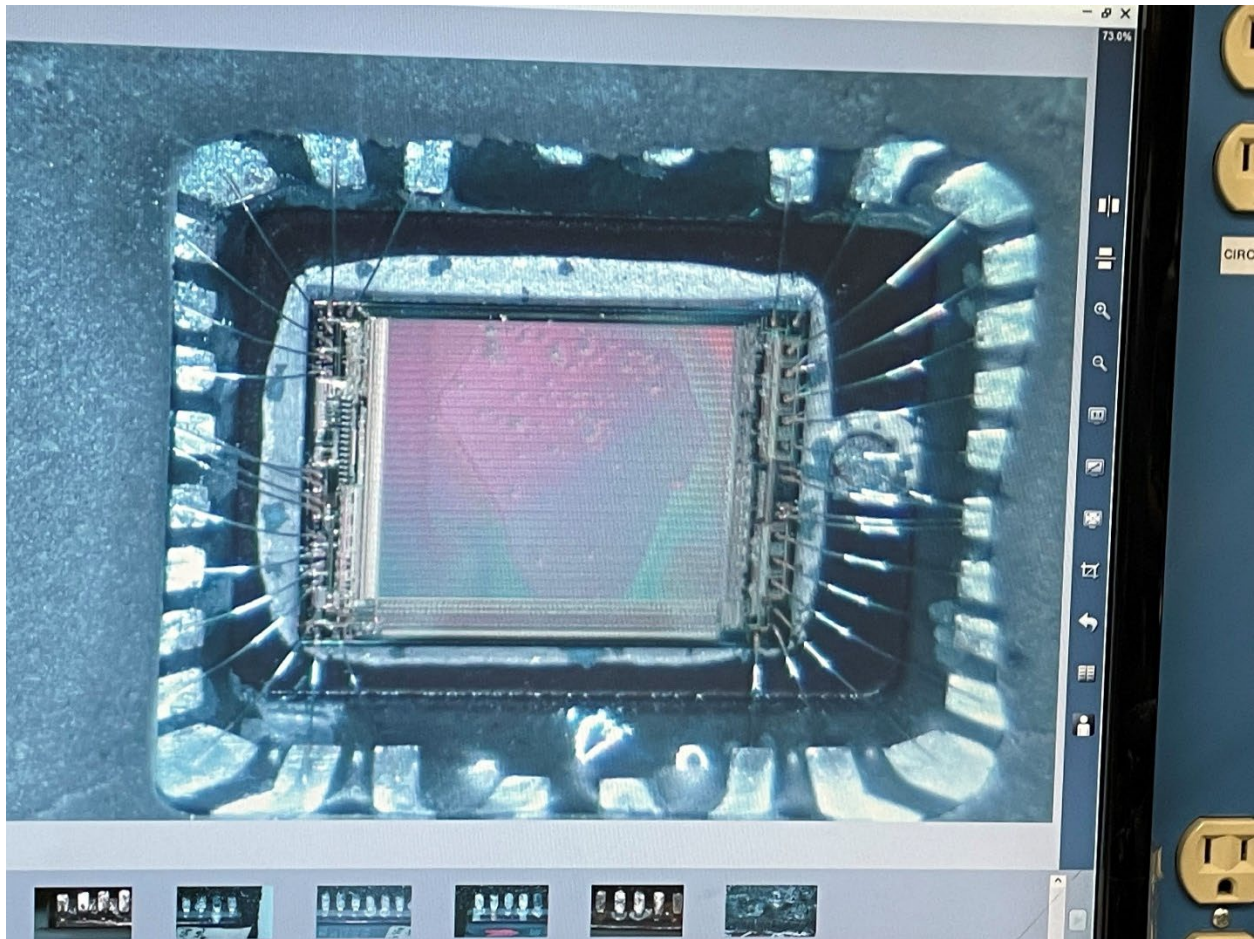


Photo 10, Accident Microprocessor, Close up View.

Curve tracing following the cleaning process produced positive results, indicating there was a chance to retrieve data from the microprocessor. The microprocessor was then placed in a chip card and contact probes were connected to each of the 28 lead pads. The cannon plug at the end of a wiring harness from the contacts to the microprocessor pads on the chip card was plugged into a chip reader and the data received was downloaded to a laptop computer in a hexadecimal file. Two additional and separate downloads from the microprocessor were done and compared to each other to ensure the data being received was consistent. Using a conversion program, the hexadecimal file was converted into an ASCII text file.

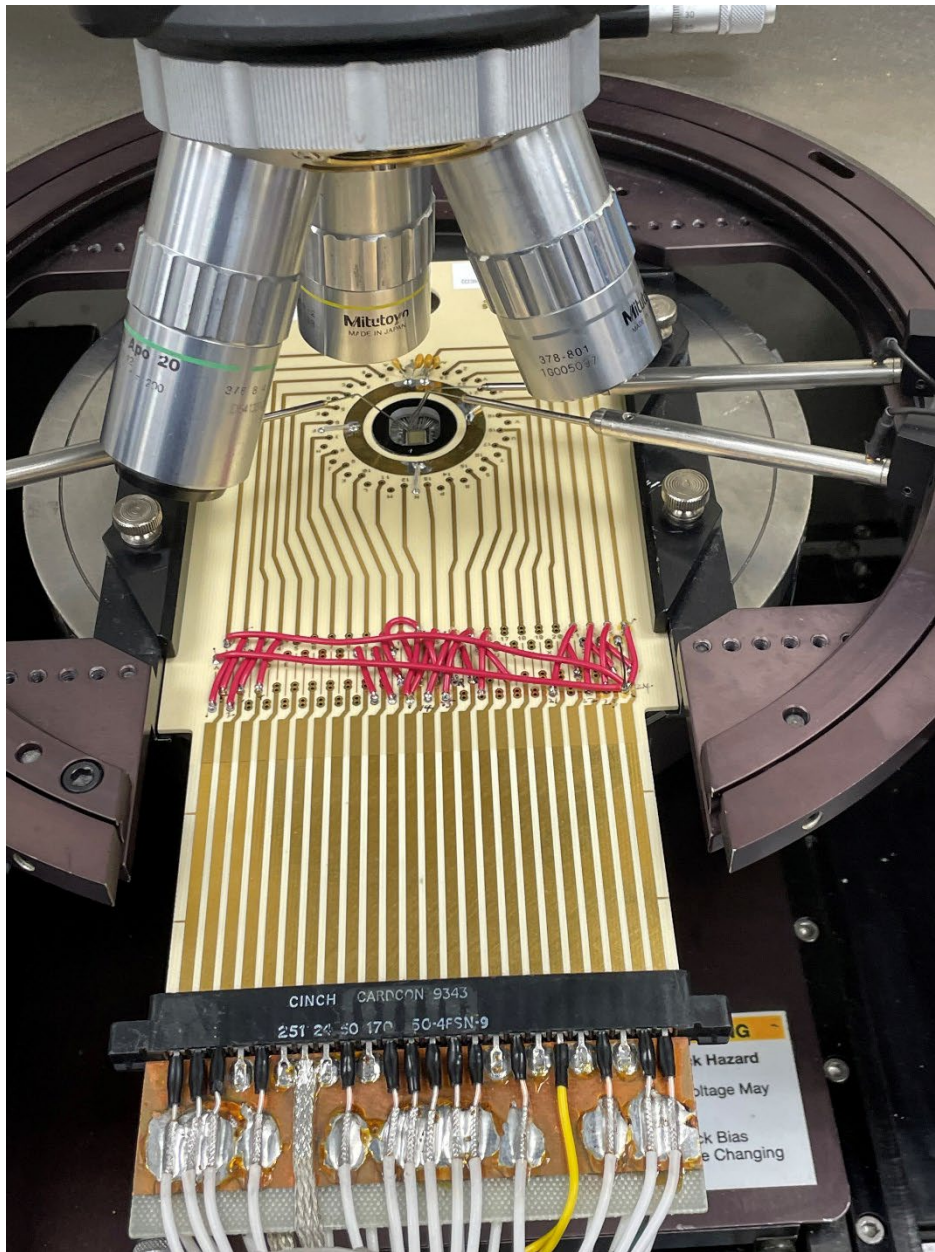


Photo 11, Accident Microprocessor in the Chip Card Reader



Photo 12, Second Curve Trace showing Microprocessor Continuity



Photo 13, Chip Card with Microprocessor, Wire Harness from Chip Card to Canon Plug, Plugged into the Chip Reader.

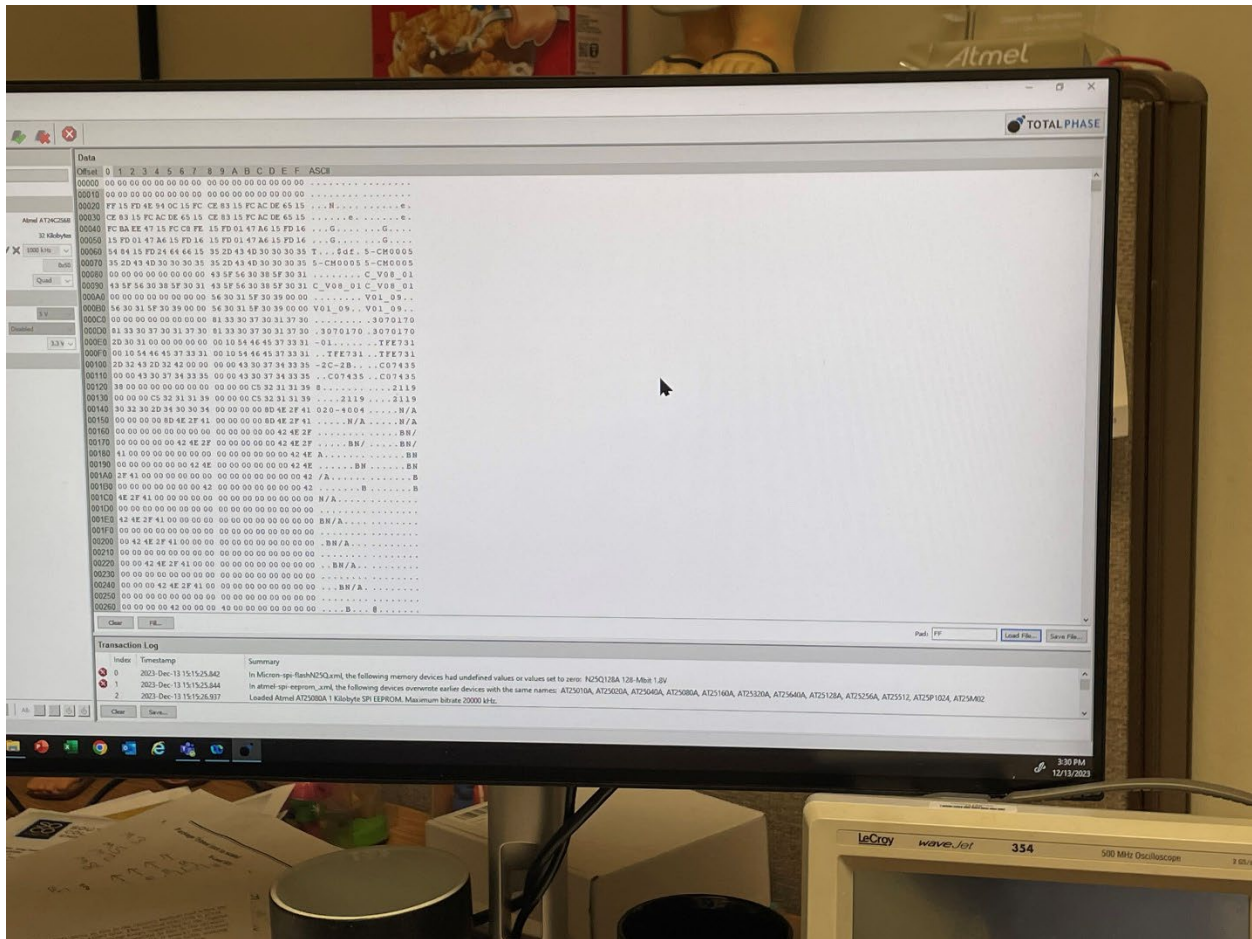


Photo 14, ASCII Text Display

Reviewing the ASCII text file, the data was found to be corrupt, repeating each of the data file lines at least three times and showing gaps in the lines. It was determined that the pathway between one of the leads from the microprocessor to the pads (narrowed to lead A3, pin 7) was not transmitting data. To move forward to clear this error would require additional probing to establish the pathway. This process would take addition setup time and equipment that was available but not yet in place. At that point, the team determined that they would reconvene at a later date to try and clear the error and re-download the data. However, what was determined from the ASCII text file was that the DEEC microchip was from the suspect left engine.

Following the examination, the accident microchip body and microprocessor and the exemplar microchip were repacked and placed back in secure storage at Microchip Technologies, Incorporated.

Submitted by:

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