



Aviation Investigation Final Report

Location:	Dallas, Texas	Accident Number:	CEN23LA014
Date & Time:	October 15, 2022, 14:48 Local	Registration:	N84LT
Aircraft:	DIAMOND AIRCRAFT IND INC DA 62	Aircraft Damage:	Substantial
Defining Event:	Electrical system malf/failure	Injuries:	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

While descending in preparation to fly a visual approach, the pilot lowered the landing gear and contacted the tower controller for landing clearance. During the controller’s response, the pilot reported hearing a “pop” and observed the avionics display screens lose power. A few seconds later, he observed that both engines had lost power. The pilot executed a forced landing on to a road, during which the airplane struck a power line in the descent, and after touchdown, two road signs, which resulted in substantial damage to the right wing.

A postaccident examination of the airplane revealed that the electronic control unit (ECU) backup batteries were wired incorrectly (parallel versus series) and the in-line fuses for the backup ECU power system for both engines were blown. The incorrect wiring would have resulted in only 12 volts instead of 24 volts being available which would have resulted in a higher current draw and subsequent blown fuses.

According to the airplane’s maintenance records, 4 new ECU battery backup batteries were installed during the annual maintenance inspection about 4 months before the accident. The 1,000 hour/12-month Concorde battery capacitance check was also completed, and the battery had 92% capacitance. It is likely that during this maintenance the batteries were incorrectly rewired in parallel.

A review of the aircraft maintenance manual showed that it did not provide a procedure to verify the ECU backup batteries were functioning correctly after replacement. The last step in the ECU back-up battery installation was to run engines and verify that the electrical system operated correctly. However, this step does not verify that the ECU backup batteries were installed correctly and were ready to provide power to the ECUs. In addition, there was no ECU backup battery operational test. If there had been such a test, the improperly connected

batteries would have been discovered immediately after replacement. Completing this check on a routine basis would determine if the in-line fuse has blown. Furthermore, the pilot did not have the ability to check for the proper functioning of the ECU batteries before every flight during the before-takeoff checklist. The airplane manufacturer does complete a test of the ECU back-up batteries as part of the production process.

Per the airplane's maintenance records, the main battery was a serviceable one that was installed while maintenance waited for a new battery that was on order. The battery had been installed 23 days before the accident. The airplane had flown about 15 hours from the time the serviceable battery was installed to the accident. The main battery capacitance was tested and found to be 11.04 Amperes-hours (Ah) or 81.2% of rated capacity. The battery capacitance requirement was 85% or better.

The loss of main battery power most likely occurred during the landing gear extension when the hydraulic pump turned on, and simultaneous with the radio transmissions. However, during the aircraft and component testing a definitive root cause of the initial power failure could not be determined. Testing could not duplicate the conditions of the flight when the electrical system anomaly occurred or the anomaly itself. With the ECU backup batteries and the alternator relays wired incorrectly, there was no back-up power to the ECU, which resulted in the complete loss of power to both engines and the inability for the engines to restart.

While multiple anomalies with the wiring and battery system were documented, a definitive root cause of the initial power failure could not be determined. An electrical system anomaly caused the aircraft electrical system to shutdown and subsequent engine shutdown due to the mis-connected ECU back-up batteries. The testing done could not duplicate the actual conditions of the flight when the electrical system anomaly occurred or the anomaly itself.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A total loss of airplane electrical power for undetermined reasons, which resulted in a complete loss of engine power to both engines. Contributing was the worn main battery and the incorrectly wired ECU backup batteries.

Findings

Aircraft	Battery/charger - Failure
Aircraft	Electrical pwr sys wiring - Incorrect service/maintenance
Organizational issues	Document/info verification - Manufacturer
Personnel issues	Installation - Maintenance personnel
Personnel issues	Scheduled/routine maintenance - Maintenance personnel

Factual Information

History of Flight

Unknown	Unknown or undetermined
Approach	Electrical system malf/failure (Defining event)
Approach	Loss of engine power (total)
Emergency descent	Off-field or emergency landing
Landing	Collision with terr/obj (non-CFIT)

On October 15, 2022, about 1448 central daylight time, a Diamond Aircraft DA62, N84LT, was substantially damaged during a forced landing near the Dallas Executive Airport (RBD), Dallas, Texas. The pilot and passenger were not injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

A review of ADS-B data revealed that the airplane departed Winston Field Airport (SNK), Snyder, Texas, about 1448, and climbed to a cruise altitude of 11,500 ft mean sea level (msl). On arrival, the pilot descended to fly a visual approach to Runway 13 at RBD, extended the landing gear, and contacted the tower controller for landing clearance.

During the controller's response, the pilot heard a "pop" and observed the avionics display screens lose power. A few seconds later, he observed that both engines had lost power. The pilot executed a forced landing on to a road, during which the airplane struck a power line in the descent, and after touchdown, two road signs, which resulted in substantial damage to the right wing.

A review of downloaded engine and flight data indicated the airplane lost electrical power to the avionics system and both engines nearly simultaneously while at 2,000 ft msl and about 5 miles west of RBD.

The airplane was equipped with two Austro Engine E4P-C liquid-cooled, in-line four-stroke four-cylinder diesel engines. All engine components are controlled by an electronic engine control unit (ECU) system. Each engine can only be operated with the engine master switch ON. Each engine has its own ECU which receives its electrical power from the alternator when at least one engine is running. When both engines are off, the ECU receives its electrical power from the main battery or the back-up ECU batteries.

The engine master switch must be set to ON to activate the engine ECU. To support the alternator electrical power supply to the ECUs in case of a malfunction of the main battery, additional sealed-lead-acid batteries are connected to the left and right engine ECU buses.

These batteries are designed to provide 30 minutes of engine operation in case of a complete airplane electrical failure. Both engines may stop if the 30 minutes have elapsed.

Postaccident examination of the airplane revealed the backup ECU batteries for both engines had been wired in parallel, rather than in series, and the in-line fuses to the ECU batteries were blown. The main battery capacitance was tested and found to be 11.04 Amperes-hours (Ah), or 81.2% of its rated capacity. The battery capacitance requirement was 85% or better. Additionally, the alternator relays were wired such that the alternator would not disconnect the alternator power from the main electrical system. The relays would cut power to the glow plugs for the respective engines.

The Garmin G1000 NXi electronic flight instrument system (EFIS) recorded data indicated that the accident flight had a duration of 1 hour 25 minutes and 49 seconds.

The Austo Engine ECUs contained non-volatile memory used to store 16 channels of data signals. The right engine data contained 23 sessions of recording to include the accident flight. The left engine data contained 11 sessions to include the accident flight. However, while the right engine event flight recording had one hour 25 minutes 3 seconds of recording, the left engine data ended earlier and had only 18 minutes and 46 seconds of recording. The ECU right engine data of the event showed the right engine circuitry bus voltage was at 27 volts until 1447:41, when it suddenly dropped to 11.7 volts, after which the recording stopped.

Airplane and component testing did not reveal a definitive root cause of the initial power failure. Testing could not duplicate the actual conditions of the flight when the electrical system anomaly occurred or the anomaly itself.

According to the airplane's maintenance records, as part of the annual maintenance inspection on June 24, 2022, the 12-month ECU battery backup replacement check was completed, and 4 new ECU battery backup batteries were installed. The 1000 hour/12-month Concorde battery capacitance check was also completed, and the battery had 92% capacitance.

On September 21, 2022, the airplane's main battery was replaced with a serviceable one as the maintenance facility waited for a new battery that was on order. The airplane had flown about 15 hours from the time the serviceable battery was installed to the accident.

A review of the aircraft maintenance manual showed it did not provide a procedure to verify the ECU back-up batteries were functioning correctly after replacement. The last step in the ECU backup battery installation was to run engines and verify that the electrical system operated correctly. However, this step does not verify that the ECU backup batteries were installed correctly and were ready to provide power to the ECUs. In addition, there was no ECU backup battery operational test.

Diamond Aircraft issued a service information letter requiring inspection of ECU backup batteries wiring installation on all DA 62 aircraft.

Pilot Information

Certificate:	Commercial	Age:	60, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	3-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	May 20, 2021
Occupational Pilot:	No	Last Flight Review or Equivalent:	June 6, 2022
Flight Time:	905 hours (Total, all aircraft), 332 hours (Total, this make and model), 818 hours (Pilot In Command, all aircraft), 46 hours (Last 90 days, all aircraft), 26 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	DIAMOND AIRCRAFT IND INC	Registration:	N84LT
Model/Series:	DA 62	Aircraft Category:	Airplane
Year of Manufacture:	2018	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	62.C003
Landing Gear Type:	Retractable - Tricycle	Seats:	7
Date/Type of Last Inspection:	June 24, 2022 Annual	Certified Max Gross Wt.:	5071 lbs
Time Since Last Inspection:	54 Hrs	Engines:	2 Reciprocating
Airframe Total Time:	577 Hrs as of last inspection	Engine Manufacturer:	Austro Engines
ELT:	C126 installed, not activated	Engine Model/Series:	E4P-C
Registered Owner:	On file	Rated Power:	180 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KRBD,657 ft msl	Distance from Accident Site:	3 Nautical Miles
Observation Time:	14:53 Local	Direction from Accident Site:	120°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	11 knots / 20 knots	Turbulence Type Forecast/Actual:	None / Unknown
Wind Direction:	180°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	29.93 inches Hg	Temperature/Dew Point:	33°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Snyder, TX (SNK)	Type of Flight Plan Filed:	None
Destination:	Dallas, TX (RBD)	Type of Clearance:	VFR flight following
Departure Time:	13:35 Local	Type of Airspace:	

Airport Information

Airport:	Dallas Executive Airport RBD	Runway Surface Type:	Concrete
Airport Elevation:	660 ft msl	Runway Surface Condition:	Dry
Runway Used:	13	IFR Approach:	None
Runway Length/Width:	7136 ft / 100 ft	VFR Approach/Landing:	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	1 None	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 None	Latitude, Longitude:	32.706286,-96.925575(est)

Administrative Information

Investigator In Charge (IIC):	Folkerts, Michael
Additional Participating Persons:	Robert Bennett; FAA Flight Standards District Office; Irving , TX Nora Vallee; Transportation Safety Board of Canada; Gatineau Bernhard Kobylak; Austrian Federal Safety Investigation Authority; Vienna Beverley Harvey; Transportation Safety Board of Canada; Ottawa, OF
Original Publish Date:	November 26, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=106135

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