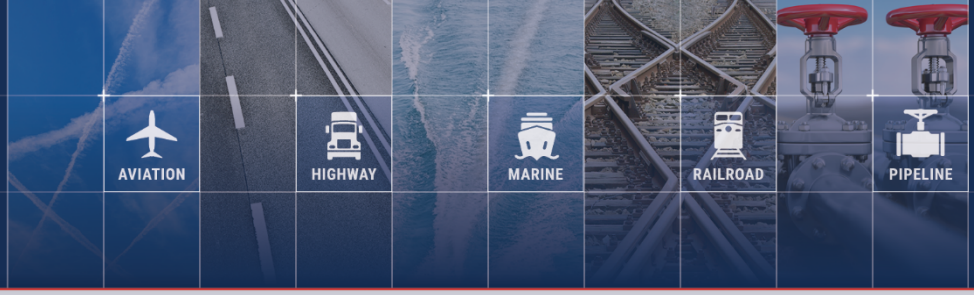

Aviation Investigation Final Report

Location:	South Deerfield, Massachusetts	**Accident Number:**	ERA11LA502
Date & Time:	September 23, 2011, 16:15 Local	**Registration:**	N210LE
Aircraft:	Cessna P210N	**Aircraft Damage:**	Substantial
Defining Event:	Electrical system malf/failure	**Injuries:**	2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

According to the pilot, during the initial climb, the airplane experienced a loss of electrical power. The pilot said that he unsuccessfully attempted to restart the alternators by cycling the on/off switches. The airplane was in instrument meteorological conditions, and when he saw a clearing in the clouds, the pilot made a “standard rate” spiral down through it. After exiting the clouds, he found a suitable place to land. On the approach, about 300 feet above ground level, the airplane started to porpoise. The pilot attempted to correct the porpoise, but the nose of the airplane struck the top of a tree before impacting the ground.

Postaccident examination of the airplane’s flight controls did not reveal any mechanical anomalies. The engine examination revealed that incorrect pistons were installed at the time the engine was overhauled about 350 hours before the accident, but this did not play a role in the accident. The airplane was equipped with a dual alternator system. A postaccident interview with the pilot revealed that he attempted to energize the alternator’s field utilizing the pilot operating handbook procedure for a single alternator system. The dual alternator system emergency procedure was a supplement for the pilot operating handbook, and the checklist that was located in the airplane did not contain the normal or emergency procedures that were required for the dual alternator system. The emergency procedure for the dual system stated to depress the ALT RESTART switch, located next to the circuit breaker panel; the pilot stated that he did not know about the ALT RESTART switch. The No. 1 alternator was tested and examined. The No. 1 alternator functioned for 5 minutes during the test before it stopped producing power. It showed signs of excessive heat consistent with overloading when examined internally. The No. 2 alternator was not tested due to accident damage. The internal examination revealed burnt windings.

The onboard engine data monitoring system indicated that the battery voltage decreased rapidly just prior to the loss of electrical power. A postaccident examination of the airplane's electrical system revealed that the alternator restart battery pack did not contain enough voltage to reenergize the alternator field in the event that an alternator failed. A functional test of the system was required every 25 hours to ensure it worked correctly. The batteries were required as per the Airplane Service Manual to be replaced annually or sooner if the alternators cannot be restarted under a heavy load electrical load. A review of the airplane's maintenance records revealed that most recent documentation for the alternator restart system batteries change was about 12 years ago.

It is likely that the No. 2 alternator failed at an unknown time, which resulted in the entire electrical system on the airplane feeding off of the No. 1 alternator. The No. 1 alternator subsequently overloaded and failed, and the airplane's battery was unable to sustain the electrical system demand. If the BEFORE TAKEOFF checklist for a dual alternator equipped airplane had been completed, the pilot could have detected that the airplane's electrical charging system was not working correctly.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the electrical system due to an alternator failure during flight in instrument meteorological conditions, and the pilot's inadequate preflight inspection and failure to use the approved checklist for the dual alternator system. Contributing to the accident was the inadequate maintenance because the alternator restart battery pack was not replaced annually, as required by the airplane service manual.

Findings

Aircraft	AC generator-alternator - Failure
Aircraft	DC power distribution system - Failure
Environmental issues	Below VFR minima - Contributed to outcome
Personnel issues	Use of checklist - Pilot
Personnel issues	Preflight inspection - Pilot
Personnel issues	Scheduled/routine maintenance - Maintenance personnel

Factual Information

History of Flight

Initial climb	Electrical system malf/failure (Defining event)
Emergency descent	Off-field or emergency landing
Emergency descent	Collision with terr/obj (non-CFIT)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY

On September 23, 2011, at 1615, eastern daylight time, a Cessna P210N, N210LE, registered to Silent H LTD and operated by an individual, incurred substantial damage when it impacted trees during a force landing in South Deerfield, Massachusetts. The pilot and passenger received serious injuries. Instrument meteorological conditions (IMC) prevailed and an instrument flight rules flight plan was filed for the 14 Code of Federal Regulations Part 91, personal flight. The flight originated from Barnes Municipal Airport (BAF), Westfield, Massachusetts, and was enroute to Hancock County-Bar Harbor Airport (BHB), Bar Harbor, Maine, about 1539.

According to the pilot, he completed a preflight inspection of the airplane with no anomalies noted. After takeoff he raised the landing gear and the gear warning horn remained on continuously. He reported to the controller at the tower that he may be returning to land. He had his passenger look for the gear warning horn circuit breaker, however about two minutes later, the warning horn stopped by itself. The pilot thought the gear horn issue was resolved and elected to continue to his destination of BHB. The air traffic controller gave the pilot further instructions to contact departure control and a frequency change was approved.

Immediately following the frequency change, the navigation systems failed, restarted, and failed again. The cabin fan, instrument lights, and cabin lights failed and the airplane suffered a total electrical system failure. At this point, the pilot believed that the airplane encountered turbulence, heavy rain, and he elected to climb above the weather. He reported the airplane seemed to receive strong gusts of wind upsetting the airplane; at one point, giving an indication of over 2,000 feet per minute descent. The pilot put the gear handle down and the flaps out in order to try to stabilize the airplane, but neither functioned. The pilot arrested the steep descent, elected to descend below cloud level, and make a precautionary landing. He saw a clearing in the clouds and made a “standard rate” spiral down through it. He broke out of the clouds about 2,700 feet mean sea level. He saw an open field and maneuvered for the downwind with the intent to land there. On the approach to the field, about 300 feet above ground level, the airplane porpoised three times; the pilot increased engine power, however, the airplane porpoised again. The nose of the airplane struck the top of a tree, the airplane impacted the ground, and came to rest about 200 feet past the tree.

PERSONNEL INFORMATION

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. He was issued a third-class medical certificate on June 24, 2010, with limitation of must wear corrective lenses. He reported 1,452 total hours, of which 985 were in make and model of the accident airplane; 87 of those total hours were in actual instrument conditions.

AIRCRAFT INFORMATION

The pressurized, six place, high wing, serial number P21000825, airplane was manufactured in 1983 and issued a standard airworthiness certificate in the normal category. The airplane incorporated an optional dual alternator electrical system. The airplane was equipped with a Continental Motors TSIO-520-AF3B, 310 horsepower engine with a McCauley controllable pitch propeller. According to airplane's maintenance records, the most recent annual inspection was performed on August 11, 2011. At the time of the accident the airplane had accumulated 2,985 hours of total time and the engine accumulated 350 since major overhaul.

The airplane was equipped with the following electrical operated equipment: Garmin GMX200 Color Multi-Functional Display (MFD) equipped with Electronic Charts, XM Weather, Traffic Information System (TIS) and XM Radio, a Garmin 530WAAS (Wide Area Application Services) , a Garmin SL30 #2 NAV/COM slim line unit, a Garmin GTX330, S-Mode Transponder, a Garmin Audio Panel GMA340, a Goodrich Avionics System WX-500 Stormscope, 6-Place Stereo Intercom with XM Interface (Weather and Stereo Music), a Garmin GDL69A, XM Weather, a factory weather radar pod Bendix King KN62A DME, an EDM800, 6-cylinder Engineering Monitoring System Shadin Fuel Flow, a HID (High Intensity Discharge) wing tip, nose taxi, and landing lights, a PS Engineering, PAV-80 Audio/Video, DVD/CD/XM Stereos System, 6-place jacks.

METEOROLOGICAL INFORMATION

The closest official weather observation was at BAF, which was 20 miles north of the accident site. At 1609, the automated weather observing system (AWOS) indicated wind from 130 degrees at 4 knots; visibility, 6 statute miles; light rain and mist; clouds broken 900, broken 1400, overcast 2200; temperature 22 degrees Celsius (C); dew point 20 degrees C; altimeter 30.04 inches of mercury.

WRECKAGE and IMPACT INFORMATION

The responding Federal Aviation Administration (FAA) inspector stated that the right wing was damaged and folded aft onto the fuselage and the left wing was bent aft. Flight control continuity was confirmed to all flight controls. The flap setting was checked with the flap actuator and they were positioned with about 20 degrees of flaps extended. The propeller was

separated from the engine and the propeller bolts were pulled out of the flange on the crankshaft. The engine remained intact and attached to the fuselage. In addition, the No. 6 cylinder rocker box cover exhibited a puncture hole in it. Further examination revealed that the No. 6 intake valve and valve stem penetrated the cover and the head of the valve was resting on top of the cylinder.

TEST AND RESEARCH

An electronic JPI Engine Data Monitor, 700/800 model, was removed from the airplane and submitted to the NTSB Recorders Laboratory in Washington, DC, for data retrieval. The data revealed that there were no anomalies with the engine. However, the data indicated that the battery voltage decreased rapidly from 21 volts to 10 volts just prior to the end of the data, which coincided with the loss of electrical power.

A postaccident engine run with FAA oversight was conducted at the engine manufacturer facility. The No. 6 cylinder was replaced and the engine was placed in a test cell and operated successfully in the low, intermediate, and high rpm ranges. The No. 6 intake valve guide, intake valve, valve springs, retainer, and valve keys were sent to Continental Motors Engineering Department for metallurgical evaluation. The testing revealed that the valve spring retainer failed in overload. For further information, reference the metallurgical evaluation report in the docket for this accident.

In addition, the engine's maintenance records revealed the engine was most recently overhauled was on July 21, 2009. During the overhaul, ECI part number 648045 pistons were installed. A review of work order documents revealed that the FAA certificated repair station that performed the work installed six complete AEC631397/TISN71.4ACA cylinder assemblies, of which incorporated AEC 648045 high compression pistons (incorrect pistons). According to ECI service bulletin 99-8-1, page 6, AEC631397/TIST71.4BCA complete cylinder assemblies, utilizing part number 648044 pistons, were to be installed on the engine. The installed pistons produced a high compression ratio, which the engine was not adjusted for.

The number 1 and 2 alternators and number 1 and 2 alternator control units were retained and examined by Cessna Aircraft Company with FAA oversight. Both alternator control units functioned in the areas of regulation, low voltage annunciation, overvoltage trip, and field current overload. The No. 1 alternator was tested and malfunctioned approximately 5 minutes into the dynamic test. The No. 1 alternator was disassembled for further examination, which revealed that the rotor body and slip ring exhibited discoloration. The stator was found with one phase of the windings that had been burned from the copper wire so that coils were shorted together. The brushes were visually examined and found to be in worn but in functional condition. The No. 2 alternator was not dynamically tested due to damage incurred in the accident that prevented rotational operation. The No. 2 alternator was disassembled and had burnt windings in the two phases of the stator. No other anomalies were noted with the No. 2 alternator.

A postaccident examination of the wreckage with FAA oversight of the airplane's electrical system revealed that the alternator restart battery pack did not contain enough voltage to reenergize the alternator field in the event that an alternator failed. A functional test of the system was required every 25 hours to ensure it worked correctly. The batteries were required to be replaced annually or sooner if the alternators cannot be restarted under a heavy load electrical load. A review of the airplane's maintenance records revealed that most recent documentation for the alternator restart system batteries change was on December 15, 2000.

A postaccident interview with the pilot revealed that he attempted to regain electrical power by cycling the alternator switches on and off. In addition, he attempted to energize the alternator's field utilizing the pilot operating handbook procedure for a single alternator system instead of the dual alternator system. The dual alternator system emergency procedure is a supplement for the pilot's operating handbook (POH). The emergency procedure for the dual system states to depress the ALT RESTART switch. In the interview, the pilot stated that he did not know about the ALT RESTART switch.

For the dual alternator system, the BEFORE TAKEOFF checklist in the POH supplement stated for the pilot to perform a functional check of the system. The checklist that was located in the cockpit did not contain this functional check, nor did it contain the emergency procedures part of the supplement. The complete supplement can be found in the docket for this accident.

Pilot Information

Certificate:	Private	**Age:**	61,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 24, 2010
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	January 19, 2011
Flight Time:	1452 hours (Total, all aircraft), 985 hours (Total, this make and model), 1284 hours (Pilot In Command, all aircraft), 56 hours (Last 90 days, all aircraft), 32 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N210LE
Model/Series:	P210N	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	P21000825
Landing Gear Type:		**Seats:**	6
Date/Type of Last Inspection:	August 11, 2011 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	2985 Hrs at time of accident	**Engine Manufacturer:**	Continental Motors Inc.
ELT:	Installed, not activated	**Engine Model/Series:**	TSIO-520-AF3B
Registered Owner:	On file	**Rated Power:**	310 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	ORE,555 ft msl	**Distance from Accident Site:**	
Observation Time:	16:10 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 2000 ft AGL	**Visibility**	3 miles
Lowest Ceiling:	Overcast / 2400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	21°C / 19°C
Precipitation and Obscuration:	Light - Showers - Rain		
Departure Point:	West Field, MA (BAF)	**Type of Flight Plan Filed:**	IFR
Destination:	Bar Habor, ME (BHB)	**Type of Clearance:**	IFR
Departure Time:	15:39 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious	**Latitude, Longitude:**	42.49472,-72.664718(est)

Administrative Information

Investigator In Charge (IIC):	Obregon, Jose
Additional Participating Persons:	Dean C Spitnale; FAA/FSDO; Windsor Locks, CT Richard I Bunker; Massachusetts DOT Aeronautics Division; Boston, MA Jason Lukasik; Continental Motors Inc; Mobile, AL Peter Basile; Cessna Aircraft Company; Witchita, KS
Original Publish Date:	April 10, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=81884