



Aviation Investigation Final Report

Location:	Rattan, Oklahoma	Accident Number:	CEN17LA121
Date & Time:	February 14, 2017, 11:45 Local	Registration:	N1551C
Aircraft:	Beech C90A	Aircraft Damage:	Substantial
Defining Event:	Electrical system malf/failure	Injuries:	3 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Unspecified)		

Analysis

The pilot stated that the engine start and airplane power-up were normal for the air medical flight with two medical crewmembers. The engine ice vanes were lowered (as required for ground operations) and then were subsequently raised before takeoff. Takeoff and climbout were routine, and the pilot leveled off the airplane at the assigned cruise altitude. The air traffic controller informed the pilot of heavy showers near the destination airport, and the pilot "put the ice vanes down." The pilot indicated that, shortly afterward, the airplane experienced two "quick" electrical power fluctuations in which "everything went away and then came back," and "[s]econds later the entire [electrical] system failed." Due to the associated loss of navigation capability while operating in instrument meteorological conditions (IMC), the pilot set a general course for better weather conditions based on information from his preflight weather briefing. While the pilot attempted to find a suitable hole in the clouds to descend through under visual conditions, the left engine lost power. The pilot ultimately located a field through the cloud cover and executed a single-engine off-airport landing, which resulted in substantial damage to the right engine mount and firewall.

A postaccident examination of the airplane and systems did not reveal any anomalies consistent with an in-flight electrical system malfunction. The three-position ignition and engine start/starter-only switches were in the ON position, and the engine anti-ice switches were in the ON position. When the airplane battery was initially checked during the examination, the voltmeter indicated 10.7 volts (normal voltage is 12 volts); the battery was charged and appeared to function normally thereafter.

The loss of electrical power was likely initiated by the pilot inadvertently selecting the engine start switches instead of the engine anti-ice (ice vane) switches. This resulted in the starter/generators changing to starter operation and taking the generator function offline. Airplane electrical power was then being supplied solely by the battery, which caused it to deplete and led to a subsequent loss of electrical power to the airplane.

A postaccident examination revealed that neither wing fuel tank contained any visible fuel. The left nacelle fuel tank did not contain any visible fuel, and the right nacelle fuel tank appeared to contain about 1 quart of fuel. The lack of fuel onboard at the time of the accident is consistent with a loss of engine power due to fuel exhaustion. This was a result of the extended flight time as the pilot attempted to exit instrument conditions after the loss of electrical power to locate a suitable airport. Further, the operator reported that 253 gallons (1,720 lbs) of fuel were on board at takeoff, and the accident flight duration was 3.65 hours. At maximum range power, the expected fuel consumption was about 406 lbs/hour, resulting in an endurance of about 4.2 hours. Thus, the pilot did not have the adequate fuel reserves required for flying in IMC.

Both the pilot and medical crewmembers described a lack of communication and coordination among crewmembers as the emergency transpired. This resulted in multiple course adjustments that hindered the pilot's ability to locate visual meteorological conditions before the left engine fuel supply was exhausted.

Probable Cause and Findings

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

The loss of electrical power due to the pilot's inadvertent selection of the engine start switches and the subsequent fuel exhaustion to the left engine as the pilot attempted to locate visual meteorological conditions. Contributing to the accident were the pilot's failure to ensure adequate fuel reserves on board for the flight in instrument meteorological conditions and the miscommunication between the pilot and medical crewmembers.

Findings

Personnel issues	Use of equip/system - Pilot
Aircraft	Starter-generator - Incorrect use/operation
Aircraft	Fuel - Fluid management
Personnel issues	(general) - Other
Personnel issues	Fuel planning - Pilot

Factual Information

History of Flight

Enroute-cruise	Electrical system malf/failure (Defining event)
Enroute-cruise	Fuel exhaustion
Emergency descent	Off-field or emergency landing

On February 14, 2017, about 1145 central standard time, a Beech C90A twin-engine airplane, N1551C, was substantially damaged during a precautionary landing following a loss of power on one engine near Rattan, Oklahoma. The pilot and two medical crew members on board were not injured. The airplane was registered to and operated by EagleMed LLC under the provisions of Title 14 *Code of Federal Regulations* Part 135 air medical flight.

The pilot stated that the engine start and airplane power-up were normal. The engine ice vanes were lowered, and the de-icing system was activated as required for ground operations. The ice vanes were subsequently raised before takeoff. Takeoff and climb out were routine, and he subsequently leveled off the airplane at 7,000 ft. mean sea level (msl). The air traffic controller informed him of "heavy rain showers" near the destination airport and he "put the ice vanes down." Shortly afterward, the airplane experienced two "quick" electrical power fluctuation; "everything went away and then came back." "Seconds later the entire [electrical] system failed." Due to the associated loss of navigation capability while operating in instrument meteorological conditions, the pilot set a general course for better weather conditions based upon the preflight weather briefing.

During the attempt to find a suitable hole in the clouds to descend through under visual conditions, the left engine lost power. The pilot ultimately located a field through the cloud cover and executed a single engine precautionary landing. The nose landing gear collapsed, and the airplane sustained substantial damage to the right engine mount and firewall.

A postaccident examination was conducted by Federal Aviation Administration inspectors and operator personnel. The left propeller blades were bent aft and did not exhibit any curling of the blades. The right propeller blades were curled in the direction of rotation. The left- and right-wing fuel tanks did not contain any visible fuel. The left nacelle fuel tank did not contain any visible fuel. The right nacelle fuel tank appeared to contain about one quart of fuel. The three-position Ignition and Engine Start/Starter Only switches on the cockpit instrument panel were in the ON position. The Engine Anti-Ice switches were in the ON position. The cabin medical bed electrical switches corresponding to the inverter and accessories were in the ON position; the remaining medical bed switches were OFF. A postrecovery examination was conducted by the NTSB investigator-in-charge and operator personnel. No anomalies consistent with an in-flight electrical system malfunction were observed. When the airplane battery was initially checked during the exam the voltmeter indicated 10.7 volts; the battery was charged and appeared to function normally thereafter.

The operator reported that 253 gallons (1,720 lbs.) of fuel were onboard at takeoff and the airplane gross weight was 7,838 lbs. The accident flight duration was 3.65 hrs. Airplane performance data indicated

that at maximum cruise power, the expected fuel flow would be about 632 lbs./hr., resulting in an endurance of approximately 2.7 hrs. At maximum range power, the expected fuel consumption was about 406 lbs./hr., resulting in an endurance of approximately 4.2 hrs.

Both the pilot and medical crew described a lack of communication and coordination among crew members. The pilot reported that the medical crew became apprehensive as the emergency transpired. On three occasions, as the pilot maneuvered the airplane attempting to locate a hole in the clouds to descend, the medical crew member in the co-pilot seat grabbed the control wheel to keep the pilot from banking the airplane. He subsequently relinquished the control wheel as directed by the pilot. The medical crew attempted to locate the airplane by using cellphones to coordinate with the operator's operations center or by using the cellphone GPS capability. However, these efforts resulted in multiple course adjustments and ultimately failed to encounter visual meteorological conditions before fuel exhaustion on the left engine.

Pilot Information

Certificate:	Airline transport	Age:	72, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	Toxicology Performed:	No
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	October 20, 2016
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	December 5, 2016
Flight Time:	22000 hours (Total, all aircraft), 400 hours (Total, this make and model), 21500 hours (Pilot In Command, all aircraft), 41 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	Registration:	N1551C
Model/Series:	C90A A	Aircraft Category:	Airplane
Year of Manufacture:	1994	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	LJ-1365
Landing Gear Type:	Retractable - Tricycle	Seats:	7
Date/Type of Last Inspection:	December 20, 2016 Continuous airworthiness	Certified Max Gross Wt.:	10485 lbs
Time Since Last Inspection:	75 Hrs	Engines:	2 Turbo prop
Airframe Total Time:	7862.1 Hrs as of last inspection	Engine Manufacturer:	Pratt & Whitney Canada
ELT:	C126 installed, not activated	Engine Model/Series:	PT6A-21
Registered Owner:	EAGLEMED LLC	Rated Power:	550 Horsepower
Operator:	EAGLEMED LLC	Operating Certificate(s) Held:	On-demand air taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	MLC,771 ft msl	Distance from Accident Site:	49 Nautical Miles
Observation Time:	11:53 Local	Direction from Accident Site:	148°
Lowest Cloud Condition:	Scattered / 700 ft AGL	Visibility	2 miles
Lowest Ceiling:	Broken / 1100 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	8 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	20°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.96 inches Hg	Temperature/Dew Point:	7°C / 4°C
Precipitation and Obscuration:	N/A - None - Fog		
Departure Point:	McAlester, OK (MLC)	Type of Flight Plan Filed:	IFR
Destination:	Idabel, OK (404)	Type of Clearance:	IFR
Departure Time:	08:06 Local	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	3 None	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 None	Latitude, Longitude:	34.238609,-95.25389

Administrative Information

Investigator In Charge (IIC):	Sorensen, Timothy
Additional Participating Persons:	Rakesh P Patel; FAA Flight Standards; Oklahoma City, OK Steven C McNeely; EagleMed LLC; Birmingham, AL Peter Basile; Texron Aviation; Wichita, KS
Original Publish Date:	August 10, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=94826

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).