



Aviation Investigation Final Report

Location:	Clay, Alabama	Accident Number:	ERA14FA120
Date & Time:	February 14, 2014, 22:21 Local	Registration:	N732EJ
Aircraft:	Cessna 210L	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	2 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The pilot departed on the first leg of a revenue flight after the end of civil twilight but diverted to another airport because of adverse weather at the intended destination. Once the weather conditions improved, the pilot departed and proceeded to the first destination where he landed uneventfully; at that time, the pilot had been on duty for about 14 hours. After landing, the pilot did not call the company's director of operations as he was reportedly instructed to do when the flight was dispatched. One witness at the airport reported that the pilot seemed anxious, which the individual attributed to his being late and not because of the weather.

The pilot obtained weather information for the second destination from a friend (who was a flight instructor) and subsequently departed on the visual flight rules (VFR) flight to his second destination. At the time of departure, the destination forecast was a ceiling of 1,500 ft and visibility of 6 miles. After establishing contact with the approach controller, the pilot was informed that the airport was operating under instrument flight rules (IFR). The controller asked the pilot his intention, and the pilot replied that he wanted an IFR clearance. The pilot confirmed with the controller that he was capable and qualified for IFR flight and was provided an IFR clearance.

The pilot was instructed to turn right to intercept the localizer at a 30-degree angle and was cleared for the instrument landing system runway 24 approach. (Postaccident examination confirmed that one navigation receiver was set to that approach.) The airplane then banked left, and, during portions of the turn, the bank rate was three times greater than a standard banked turn, and the pilot began flying in an east-northeasterly direction while descending. The bank angle reduced and was changing at the end of the radar data. About 2 seconds after the last radar return, the pilot stated, "say again for two echo Juliet." This response likely indicated that he was not prepared for the approach clearance instructions or was distracted by cockpit duties. The controller immediately instructed the pilot to level the wings and climb, but there was no reply.

A performance study indicated that the airplane made a left bank of about 60 degrees (a rate of turn of

about 11 degrees per second) during the last seconds of flight before it crashed about 0.3 mile from the last radar target. The airplane was fragmented after impacting trees and terrain on a magnetic heading of about 284 degrees. Postaccident examination of the airplane revealed that the flaps and landing gear were retracted, and there was no evidence of preimpact failure or malfunction of the airframe, flight controls, or engine. There were no reported issues with the localizer at the airport following the accident.

Although one witness reported hearing a sputtering sound coming from the engine likely about the time that the flight was being vectored by the air traffic controller on the downwind leg, the pilot did not advise the controller of any problems during that or any subsequent portion of the flight. Additionally, a witness who was located less than 1/2 nautical mile from the accident site reported that the engine sound was steady. Further, a cut portion of tree made by the propeller was consistent with the engine developing power.

Although windshear advisories were in effect and windshear was reported from a flight crew about 29 minutes after the accident, the wind encountered by the airplane at the time of the accident likely would not have caused the pilot to turn in a direction opposite that instructed by the controller. The pilot was reportedly in good health, and his communications with the controller indicated that he likely was not impaired at the time of the accident.

Although the autopilot programmer/computer was too badly damaged to functionally test, the steeply banked turn opposite that instructed by the air traffic controller was likely the result of pilot input and not the result of an autopilot malfunction. The roll servo was tested, and the lowest reported override force was slightly less than the lowest limit. Thus, if the autopilot had commanded greater than 90 percent of a standard-rate turn, the pilot would have been able to easily override the roll servo.

It could not be determined if the engine-driven vacuum pump was operating or the standby vacuum system was engaged; however, the electrically driven instruments, such as the turn coordinator, and flight instruments consisting of the airspeed indicator, altimeter, and vertical speed indicator would have provided the pilot with roll and pitch information.

Although the pilot was instrument-rated and had recently passed his instrument proficiency check, he was only qualified to fly VFR in revenue operations. He was also not current to fly at night, which was unknown to company personnel at the time of dispatch. In addition, although the flights could have been completed within the pilot's duty day if there were no delays, company personnel should have recognized that weather was causing delays and that the pilot was continuing to fly beyond his duty day. Thus, the company's dispatch procedures were lacking in that they allowed the pilot to fly in night, instrument meteorological conditions beyond his duty day, and company personnel were seemingly unaware that he initiated the flight and was not current to fly at night.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain control of the airplane while being vectored to intercept the localizer during night instrument meteorological conditions (IMC). Contributing to the accident was the

operator's inadequate dispatch procedures, which did not prevent the pilot from flying beyond his duty day, flying at night for which he was not current, or flying in IMC for which he was not qualified by the company.

Findings

Aircraft	Lateral/bank control - Not attained/maintained
Personnel issues	Lack of action - Pilot
Personnel issues	Qualification/certification - Pilot
Organizational issues	Operation records - Operator
Personnel issues	(general) - Pilot

Factual Information

History of Flight

Prior to flight	Preflight or dispatch event
Approach-IFR initial approach	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On February 14, 2014, about 2221 Central Standard Time, a Cessna 210L, N732EJ, crashed in a heavily wooded area near Clay, Alabama. The commercial pilot and one passenger were fatally injured. The airplane was destroyed. The airplane was registered to and operated by Southern Seaplane, Inc., under the provisions of 14 Code of Federal Regulations (CFR) Part 135 as a non-scheduled, domestic, cargo flight. Instrument meteorological conditions prevailed in the area at the time and an instrument flight rules (IFR) clearance had been obtained by the pilot from air traffic control. The flight originated from Jackson-Medgar Wiley Evars International Airport (JAN), Jackson, Mississippi, about 2106 CST, and was destined for Birmingham-Shuttlesworth International Airport (BHM), Birmingham, Alabama.

Earlier that day, an individual with Mississippi Organ Recovery Agency (MORA) contacted Southern Seaplane, Inc., located in Belle Chasse, LA, and spoke with the accident pilot about a request to transport specimens from Stennis International Airport (HSA), Bay St Louis, Mississippi, to BHM and then to JAN. The trip was to depart HSA at 1800 CST, and arrive at BHM before 2000 CST. The pilot in turn contacted the company Director of Operations (DO) and discussed the trip.

According to the company DO, the accident pilot expressed an interest to fly the trip, and the DO indicated he would have been within his duty day at the estimated landing time at Birmingham, and he had experience flying blood and organs for MORA in the past. The DO also indicated that the accident pilot asked him if he could take his wife along, which he agreed to because of the significance of the day. The DO reported that the accident pilot called him about 5 minutes later and said he had checked the weather and determined weather would be moving into BHM, so it was decided to fly to JAN first. He informed the pilot to ask the representative of MORA if it was acceptable to fly into JAN first instead of BHM. He also instructed the pilot to call him when he was on the ground at JAN to discuss the weather and reportedly told him if the weather was bad to have the MORA representative drive the blood samples to BHM.

According to company records, the flight departed Southern Seaplane Airport (65LA), Belle Chasse, LA, on a 14 CFR Part 91 positioning flight between 1730 and 1736 CST, and proceeded to HSA where the pilot landed uneventfully about 1804 (end of civil twilight was later determined to occur in that area at 1810). After landing he was provided with specimens and the pilot informed the individual that provided the specimens of the estimated time of arrival at both airports but that the times were depending on the weather conditions. The person on the ground at HSA who provided the specimens to the pilot reported observing him spend 5 to 7 minutes in a room with computers that provided weather information.

The flight departed HSA about 1835 (approximately 25 minutes after the end of civil twilight), but

landed at Magee Municipal Airport (17M), Magee, Mississippi. The company DO reported that the pilot texted him at 1914, and informed him that he had landed there to wait out the storm at JAN, and at 1925, the pilot communicated with an individual with MORA and advised him that he was unable to proceed to JAN because of adverse weather in the Jackson, Mississippi, area. Also while at 17M, at 1944 CST, the pilot called a friend of his who is a certified flight instructor (CFI) and whom had given him an instrument proficiency check (IPC) flight several months earlier. During that call the pilot stated that he was flying a Cessna 210 for a blood run, and was waiting at 17M for thunderstorms to clear. The CFI reported he checked the weather and saw why the pilot had landed. During the phone call the CFI checked the METARS at JAN and also at BHM, noting at that time that the METARS for BHM indicated the ceiling was between 3,500 or 4,000 feet. He also checked the terminal area forecast (TAF) for BHM which indicated the ceiling would be dropping to 1,500 feet and wind gusts to 29 or 30 knots possibly higher were expected. The CFI told the pilot to expect a rough trip based on the winds, and to expect an ILS Runway 24 Approach at BHM based on the wind. The accident pilot did not mention any health issues, and the CFI reported he (accident pilot) seemed upbeat during the phone call. There was no further conversation between the CFI and the accident pilot. The DO reported the flight was delayed longer than expected; the flight departed 17M between 2008 and 2010.

The pilot proceeded to JAN and landed uneventfully about 2050. After landing, a toxicology box of specimens was offloaded, and the individual who received them asked the pilot if he was going to BHM, to which he replied that he was if the weather cooperated. The company DO reported the pilot did not contact him as instructed. The individual who was given the specimens reported that although she had never met the pilot before, to her he appeared anxious. She also reported that the pilot repeatedly apologized for being late and attributed his anxiousness to being tardy, rather than being due to the weather.

According to a chronological summary of flight communications with JAN Air Traffic Control Tower, at 2103, the pilot contacted ground control requesting visual flight rules (VFR) flight following to BHM, to be flown at either 3,500 or 5,500 feet mean sea level (msl). The pilot was advised to maintain VFR at or below 5,000 feet msl, and was assigned a discrete transponder code of 1546. At 2106, the flight was cleared for takeoff, and after takeoff air traffic control (ATC) communications were transferred several facilities while proceeding towards BHM.

At 2145, the pilot established contact with the R14 sector of the Memphis Air Route Traffic Control Center and advised the controller that he was at 5,500 feet. The controller provided the pilot the altimeter setting for BHM, which he acknowledged, but the controller did not communicate with the pilot after that time. The controller did coordinate with the next facility, which was the Atlanta Air Route Traffic Control Center (ARTCC); however, the controller did not instruct the pilot to establish contact with that facility. The Atlanta ARTCC also did not establish contact with the pilot, but the controller did coordinate with the next facility, which was the BHM ATCT.

There was no record of any contact by the pilot with any ATC facility between about 2145, and 2208:04; between 2154 and 2206, radar data from Birmingham ATCT indicates that the flight proceeded in a northeasterly direction while flying about 5,600 feet msl (slight altitude deviations were noted). The radar data indicates that between 2206 and 2208, the flight descended from 5,800 to 4,300 feet msl while continuing in a northeasterly direction.

The transcription of communications from Birmingham ATCT indicates that at 2208:04, the pilot established contact with the facility. The controller immediately provided the altimeter setting and informed the pilot that the airport was IFR, and asked him to advise he had automated terminal information service (ATIS) Golf. The controller also asked the pilot to state his intentions. The pilot stated that he had ATIS information Golf, and requested local IFR clearance for an ILS approach to runway 24. The controller asked the pilot, "just uh for the tapes just need to make sure are you capable and qualified of IFR flight" to which he replied, "affirmative." At 2208:32, the controller cleared the flight to BHM via radar vectors on a 55-degree heading, and to maintain 4,000 feet. Radar data indicates the flight continued in an east-northeasterly flight track with altitude deviations minus 200 feet to plus 200 feet from the assigned altitude noted, although between 2213:28 and 2218:26, with the exception of 1 radar return, the airplane maintained a constant altitude of 4,000 feet msl.

At 2217:57, the controller instructed the pilot to turn right to heading 090 degrees and to descend to and maintain 3,000 feet, which he acknowledged. The radar data indicates the groundspeed at that time was approximately 160 knots. About 2218:16, the radar data indicates a turn to an easterly direction occurred and the airplane began descending. About 2219:18, while at 3,400 feet msl, the controller instructed the pilot to turn to right to heading 150 degrees, which he responded, "one five zero echo Juliet." At 2219:30, a position relief briefing occurred. During this briefing the controller being relieved informed the relieving controller in part, of the active runways, aircraft that were on approach were breaking out about 100 feet above minimums, and there was no icing.

Between 2219:18, and 2220:13, the airplane continued on a flight track of approximately 103 degrees magnetic and descended from 3,400 to approximately 3,000 feet, then about 2220:13, a change to a flight track of approximately 149 degrees was noted and the groundspeed increased to 190 knots.

At 2220:38, the controller instructed the pilot to turn right to heading 210 degrees, and advised him that the flight was 3.5 miles from HUKV and to maintain 2,800 feet until established on the localizer, cleared for the ILS runway 24 approach. The radar data indicated that at the completion of the controller's approach clearance instruction at approximately 2220:46, the airplane was at 2,700 feet msl, and then turned left flying in a northeasterly flight track. According to the NTSB Radar Study, plotting of the radar targets onto an instrument approach plate indicated the airplane turned left flying nearly over the outbound course of the procedure turn. At 2220:54, the airplane was lost from radar at 2,400 feet msl; the airplane at that time was located at 33 degrees 42.166 minutes North latitude and 086 degrees 33.533 minutes West longitude. About 2 seconds after the last radar target, the pilot stated, "say again for two echo juliet." About 2221:00, the controller informed the pilot that it appeared he was in a turn to the north, and advised him to level the wings, maintain 2,800 feet, or climb to 3,000 feet; there was no reply from the pilot. A copy of the NTSB Radar Study and radar data used for the study are contained in the NTSB public docket.

A witness who was located about .8 nautical mile north of the flight path of the airplane as it proceeded on an east-southeasterly direction, and 3.3 nautical miles northwest of the accident site reported that she and her husband were inside their house, and she heard an engine making a sputtering sound as if it were not getting fuel or there was water in the fuel. She reported that the engine "cut off totally and then restarted." By sound the airplane was heading 220 degrees, and turned left while over her house. She reported that by sound the airplane was low but she never saw it. She was not sure if it was raining at the time, and reported the wind had been blowing. She has lived in the house 6 years and airplanes do fly

frequently over her house. She reported that the sputtering sound continued while in the turn.

Another witness located less than ½ nautical mile north of the accident site and familiar with airplanes reported after 2200, he heard the sound of a low flying airplane based on the sound level. It got his attention enough to walk out onto his patio and while he did not see the airplane, he guessed by the sound that it was flying in a direction that was determined to be 250 degrees. He said the sound faded and he then heard a "thump" sound but there was nothing more; and no explosion. He did not see any lights and was not sure what occurred. He reported it was not raining at the time, and he was not sure if it was cloudy or overcast. He estimated the total time he heard the airplane was for 30 seconds. He reported that the engine sound was steady or constant and there was no sputtering. He did not recall the wind at the time, and did not call 911 to report what he heard. The following day he informed law enforcement about what he heard.

The airplane crashed during night conditions. The accident site was located about .3 nautical mile and 311 degrees from the last radar target.

FAA air traffic control tower personnel contacted law enforcement at 2234:45, alerting of the airplane being lost from radar. The following day about 0910 CST, a request was made to the Jefferson County Sheriff Department to use their helicopter to search for the wreckage. The helicopter crew became airborne at 0944 CST, and the wreckage was spotted at 1327 CST. The helicopter crew directed ground personnel to the accident site location.

Pilot Information

Certificate:	Commercial; Flight instructor	Age:	44
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Lap only
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane single-engine	Toxicology Performed:	Yes
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	May 3, 2013
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	February 14, 2014
Flight Time:	923.2 hours (Total, all aircraft), 326.7 hours (Total, this make and model), 841.5 hours (Pilot In Command, all aircraft), 29.6 hours (Last 90 days, all aircraft), 23.3 hours (Last 30 days, all aircraft), 1.3 hours (Last 24 hours, all aircraft)		

The pilot, age 44, held a commercial pilot certificate with airplane single engine land, airplane multi-engine land, and instrument airplane ratings, and also held a certified flight instructor certificate with airplane single engine rating. He held a 2nd class medical certificate with no limitations issued May 3, 2013. He also held a Statement of Demonstrated Ability (SODA) last issued February 28, 2008, due to an issue with his left hand. The flight test for the SODA was conducted in a Cessna 172 with an FAA operations inspector present.

A review of his airman file revealed he obtained his private pilot certificate with airplane single engine land rating on January 30, 2007. He failed his first instrument airplane rating checkride on April 8, 2008, for Area VI (A) titled Non-Precision Approach, but subsequently passed his instrument checkride the following day. He then obtained his commercial pilot certificate with airplane single engine land and instrument airplane ratings on June 10, 2009. Further review of his airman file revealed he twice failed the practical or oral portions for certified flight instructor (CFI), and once failed the checkride adding a multi-engine rating onto his commercial pilot certificate; however, he subsequently passed both and was issued the appropriate certificate and/or rating. On January 13, 2013, he renewed his CFI which expired on March 31, 2015.

The co-owner of the operator reported that the pilot was hired on April 28, 2012, to fly cargo in a Cessna 210. A review of the pilot's training file revealed his initial flight check in accordance with (IAW) 14 CFR Part 135.293 and 135.299 occurred on May 1, 2012. The Airman Competency/Proficiency Check form indicates the result was "Approved"; however, the instrument proficiency check IAW 14 CFR Part 135.297 was not complied with, and a note on the form indicates, "Initial VFR checkride." According to the company DO, he flew 5 days a week until the contract with the customer ended on July 31, 2012. After that, he flew when flights became available. When his recurrent training became due on May 31, 2013, he was put on inactive duty because of a lack of volume of flights.

The "Monthly Flight and Duty Time Log" for January 2014, indicates he was requalified on January 15, 2014, and since then, was scheduled 7 days on followed by 7 days off. Paperwork provided by the operator indicated that as of January 17, 2014, the pilot had 901 hours total time, 115 hours instrument. His last "Initial and Recurrent Pilot Testing Requirements" IAW 14 CFR Part 135.293, and his last "Pilot-In-Command: Line Checks, Routes and Airports" IAW 14 CFR Part 135.299 occurred on January 17, 2014. The flight duration was listed as 1.0 hour and was flown in the accident airplane. The airman competency/proficiency check form associated with the latest checks indicate the instrument proficiency check IAW 14 CFR Part 135.297 was not complied with, and a note on the form indicates, "pilot not 297 qualified VFR only." The result of the flight check was indicated to be "Approved."

The pilot was qualified to fly in visual flight rules (VFR) only and to act as pilot-in-command of Cessna 210L airplanes.

A review of copies of his first and second pilot logbooks that contained entries from January 19, 2007, to the last entry dated February 14, 2014 (documenting his adding a seaplane rating to his commercial pilot certificate earlier that day), revealed he logged a total time including the carry over time from the first pilot logbook of approximately 923 hours (corrected for minor record keeping errors). He logged a total of approximately 38 hours actual instrument flight time (corrected for an overstatement of 10.0 hours associated with a record keeping error in the first logbook). His last logged actual instrument flight time amount of 2.0 hours associated with his last instrument proficiency check (IPC) IAW 14 CFR Part 61.57(d) occurred on October 27, 2013. His last logged night flight occurred on November 8, 2013, and his last simulated instrument flight consisting of 0.3 hour occurred in the accident airplane on January 17, 2014. The last simulated instrument flight time was associated with his pilot checks IAW 14 CFR Part 135.293 and 14 CFR Part 135.299. Excerpts of his pilot logbook are contained in the NTSB public docket.

A CFI who was a friend of the pilot since 2007, and who gave him his last IPC reported the pilot

performed 3 approaches consisting of a global position system (GPS) Runway 18 Approach at BHM, a GPS Runway 17 Approach at Yazoo City Airport (87I), Yazoo City, Mississippi, and an instrument landing system (ILS) Runway 16 Approach at Hawkins Field Airport (HKS), Jackson, Mississippi. During the IPC, the pilot demonstrated navigation associated with a VOR, and also performed unusual attitude recovery, circle to land, holding, and emergency procedures. The CFI did not recall any issues with his pilot abilities, and was asked if he remembered having the pilot execute partial panel, which he did not recall. He relayed that the pilot did an, "excellent job on the IPC." He also mentioned that the airplane utilized has an autopilot installed; however, the entire flight was hand flown. The CFI relayed that he "really worked him out good that day" during the IPC flight, and when asked if he recalled if any approaches were made in actual instrument conditions he said he could not recall. He also mentioned that the landing at HKS was close to perfect.

The accident date was the pilot's 4th day on of a 7 day on, 7 day off schedule. The previous 3 days his duty day began at 0600 and ended either at 1800 for two of the days, or 1840 for one of the days. No flying was performed during the previous three days. On the accident date, according to the Monthly Flight and Duty Log, his duty day began at 0600, but according to a timeline prepared by the company Director of Operations (DO), the pilot began his duty day at 0630, and had a lunch break from 1100 to 1200. At 1230 pm, the company DO flew him to a location for his checkride, which was between 1300 and 1500 hours. At 1500 hours, the company DO flew the pilot back to their home base arriving there at 1545. At the time of the accident, the pilot had been "on duty" for approximately 16 hours. The company DO did not report any instance during that evening contacts via text messages from the pilot that he expressed any issue related to fatigue. Additionally, the pilot's friend who spoke with him that evening reported the pilot did not report any issues related to his health or physical issues.

According to the designated pilot examiner (DPE) who gave him a checkride earlier that day adding a seaplane rating to the pilot's commercial pilot certificate, no simulated instrument time was done during the flight portion that lasted about 1 hour 18 minutes. The DPE indicated the pilot did "real well."

A review of the Monthly Flight and Duty Time Log sheets for January and February 2014 revealed that since passing his flight check on January 17, 2014, he did not accrue any flight time for a revenue trip; however, he did accrue approximately 10 hours under Part 91 operations, and approximately 7 hours under a column titled "training."

The pilot's father reported his son was in good health, and was not a smoker.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N732EJ
Model/Series:	210L	Aircraft Category:	Airplane
Year of Manufacture:	1976	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	21061454
Landing Gear Type:	Retractable - Tricycle	Seats:	5
Date/Type of Last Inspection:	January 30, 2014 100 hour	Certified Max Gross Wt.:	3800 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	9336.9 Hrs as of last inspection	Engine Manufacturer:	Continental Motors, Inc.,
ELT:	C91 installed	Engine Model/Series:	IO-520-L
Registered Owner:	SOUTHERN SEAPLANE INC	Rated Power:	285 Horsepower
Operator:	SOUTHERN SEAPLANE INC	Operating Certificate(s) Held:	On-demand air taxi (135)
Operator Does Business As:		Operator Designator Code:	SSCA

The airplane was manufactured in 1976 by Cessna Aircraft as model 210L, and was designated serial number 21061454. It was powered by a 285 horsepower Continental Motors, Inc., IO-520-L engine and equipped with a Hartzell HC-J3YF-1RF constant speed propeller with F8068-2 blades installed IAW Supplemental Type Certificate (STC) SA02821CH. A Genesys-Aerosystems (formerly S-TEC) System 40 single-axis rate based Automatic Flight Guidance System was also installed IAW STC SA5302SW-D on April 12, 1994. On December 11, 2008, the System 40 programmer/computer was removed from the instrument panel, and a System 50 programmer/computer and corresponding pitch servo and pressure transducer were installed upgrading to a two-axis autopilot.

The System 50 is a rate based two-axis autopilot which uses an inclined rate gyro in the turn coordinator instrument as the primary roll and turn rate sensor. The turn coordinator includes an autopilot pick-off, a gyro RPM detector and an instrument power monitor. Low electrical power will cause the instrument "flag" to appear while low RPM will cause the autopilot to disconnect. The system includes a pilot activated automatic pre-flight test feature that allows a visual check of all the annunciator lamps and checks critical elements of the accelerometer system. The pre-flight test feature will not enable autopilot function unless the automatic test sequence is satisfactorily completed. When the test sequence is satisfactorily completed and when the rate gyro RPM is correct, the green "RDY" light will illuminate indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the "RDY" light is illuminated. When the system is equipped with an optional directional gyro (DG) or a compass system, directional information is provided to the autopilot by a heading bug in the instrument.

Pitch axis control is provided for the altitude hold function by use of the accelerometer and the pressure transducer. When the altitude hold mode is engaged, an elevator trim sensor in the pitch servo will detect the elevator trim condition. When elevator trim is necessary to reestablish a trimmed condition, trim indicator lights on programmer indicate the direction of trim to restore the trimmed condition.

With respect to flight instruments, the airplane was equipped with an electric turn coordinator, a vacuum driven attitude indicator and directional gyro, and pitot static instruments consisting of an airspeed indicator, altimeter, and vertical speed indicator. The airplane was also equipped with a compass, appropriate engine instruments, a VFR panel-mounted Garmin 150XL GPS receiver, a portable Garmin 396 GPS receiver, and also a Garmin aera 560 portable GPS receiver.

A Precise Flight Standby Vacuum System (SVS) III was installed in August 1988, IAW airframe STC SA2162NM and engine STC SA1780NM, and on August 8, 2007, a SVS model V shuttle valve, serial number 22382/9292A, was installed, which changed the system to model V.

Precise Flight, Inc., Installation Report 08072 Revision A dated 2/21/2001, for the model V SVS specified instructions for installation, testing, and continued airworthiness which included inspection procedures every year, and also a biennial requirement to remove and inspect the shuttle valve to verify the springs return the flapper valves to the closed position, and to change the shuttle valve if the flapper valves do not close.

Review of the airframe maintenance records from the date the model V shuttle valve was installed (August 8, 2007), to the last entry dated February 5, 2014, revealed there was no entry indicating the shuttle valve was removed, inspected, and replaced or reinstalled. According to the company Director of Maintenance, he verified that removal of the shuttle valve for inspection would have required a logbook entry, and he did not recall removing the shuttle valve per the Continuing Airworthiness instructions contained in Installation Report No. 08072. Entries however were noted in the airframe maintenance records dated June 15, 2012, and May 7, 2013, specifying compliance with AD 99-24-10, which was not applicable for the installed SVS V system, but did contain a requirement for removal and inspection of the shuttle valve every 2 years. Subsequently postaccident, the operator added the Continued Airworthiness inspection requirement into their maintenance program for their other Cessna 210L airplane.

Further review of the maintenance records revealed the airplane's altimeter, static system and altitude reporting equipment test and inspections required by 14 CFR Part 91.411 IAW FAR 43 Appendix E were performed on October 31, 2013. On the same date, the ATC transponder tests and inspections as required by 14 CFR Part 91.413 IAW FAR Appendix F were also signed off as being completed. The airplane was last inspected IAW a 200-Hour inspection on January 30, 2014. The airplane total time at the time was reported to be 9,336.9 hours, and the engine time since major overhaul was reported to be 1,167.2 hours. The static system test was also signed off as being performed the same day. The operator reported the airplane had accumulated about 19 hours since the last inspection was performed. Since the autopilot was installed, or the system was upgraded to a two-axis autopilot, there was no record that any component of the autopilot system was removed, replaced, or repaired. Excerpts of the airframe maintenance records are contained in the NTSB public docket.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Night/dark
Observation Facility, Elevation:	BHM,650 ft msl	Distance from Accident Site:	13 Nautical Miles
Observation Time:	21:53 Local	Direction from Accident Site:	228°
Lowest Cloud Condition:		Visibility	7 miles
Lowest Ceiling:	Overcast / 800 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	9 knots /	Turbulence Type Forecast/Actual:	/ Convective
Wind Direction:	310°	Turbulence Severity Forecast/Actual:	/ Moderate
Altimeter Setting:	29.79 inches Hg	Temperature/Dew Point:	8°C / 6°C
Precipitation and Obscuration:	Light - None - Rain		
Departure Point:	Jackson, MS (JAN)	Type of Flight Plan Filed:	None
Destination:	Birmingham, AL (BHM)	Type of Clearance:	IFR
Departure Time:	21:06 Local	Type of Airspace:	Class D

According to personnel of Lockheed Martin Automated Flight Service Station (LM AFSS), there was no record using the airplane's call sign that the pilot obtained a preflight weather briefing with LM AFSS or either CSC or DTC DUATS.

The company DO reported that after his initial conversation with the pilot about the flight, he (accident pilot) checked the weather at their facility using their computer and then relayed to the DO after doing so he was unable to fly first to BHM. The DO reported he too checked the weather using an APP on his smart phone and agreed with the pilot's assessment.

The Area Forecast issued by the National Weather Service (NWS) at 2045 CST, or approximately 24 minutes before departure and valid for the accident time for northeastern Alabama, forecasted overcast ceilings between 1,500 and 2,500 feet mean sea level (msl) with clouds tops to Flight level (FL) 250. The visibility was forecast to be between 3 and 5 miles with light rain and mist and isolated embedded thunderstorms with cumulonimbus tops to FL 280. The surface wind gusts were not forecast to pick up until after 2300, which was about 39 minutes after the accident.

The Terminal Area Forecast (TAF) for Birmingham issued on the accident date at 1729 CST, and valid for a 24 hour period starting at 1800 CST, indicated the wind was forecast to be from 310 degrees at 15 knots with gusts to 23 knots, the visibility was forecast to be greater than 6 miles, and an overcast ceiling at 1,500 feet above ground level (agl) was forecast. The TAF was not updated for the rain that was reported on the BHM surface observations from 2000 to 2200 CST, or the IFR ceiling that briefly showed up after 2130 CST.

There was no Significant Meteorological Information (SIGMET) valid at the accident flight level at the accident time; however, an Airman's Meteorological Information (AIRMET) applicable to light aircraft was issued at 2045 CST and valid at the accident time for the accident site and surrounding area. The AIRMET indicated moderate turbulence below 10,000 feet mean sea level (msl).

The closest winds aloft station was BHM, and the closest data before the accident occurred at 1800 CST, or approximately 4 hours 21 minutes before the accident. The weather computer model generated winds for 2100 CST, or approximately 1 hour 21 minutes before the accident. The following were reported for the following altitudes:

2,329 feet mean sea level (msl) – 248 degrees at 28 knots
3,064 feet msl – 252 degrees at 30 knots
3,816 feet msl – 258 degrees at 32 knots

The weather computer generated winds for 0000 CST, or approximately 1 hour 39 minutes after the accident. The following were reported for the following altitudes:

2,366 feet msl – 314 degrees at 30 knots
3,089 feet msl – 318 degrees at 35 knots
3,827 feet msl – 313 degrees at 34 knots

At 2250, or approximately 29 minutes after the accident, a flight crew member of a Boeing 737 made a pilot report (PIREP) reporting a broken ceiling at 1,100 feet msl, and remarked windshear plus or minus 15 knots from the surface to 7,000 feet msl during their descent to runway 24 at BHM.

The freezing level at BHM based on the 2100 CST computer model was slightly below 5,374 feet msl, while the freezing level based in the 0000 CST computer model was slightly below 3,089 feet msl.

A surface observation weather report taken at BHM at 2153, associated with ATIS information Golf, or approximately 28 minutes before the accident, indicates the wind was from 310 degrees at 8 knots, the visibility was 7 statute miles with light rain. Overcast clouds at 800 feet, the temperature and dew point were 08 and 06 degrees Celsius respectively, and the altimeter setting was 29.79 inches of Mercury (inHg). The ATIS indicated in part that simultaneous approaches were in use, to expect ILS Approach to runway 24, Localizer Approach to runway 18, and Notice to Airman for wind shear advisories were in effect.

A special surface observation weather report taken at BHM at 2231, or approximately 10 minutes after the accident indicates the wind was from 300 degrees 14 knots, the visibility was 10 statute miles. Scattered clouds existed at 600 feet, broken clouds existed at 1,500 feet, and overcast clouds existed at 3,300 feet. The temperature and dew point were 08 and 06 degrees Celsius respectively, and the altimeter setting was 29.81 inHg.

On the day of the accident at HSA, sunset was noted to occur at 1745, and the end of civil twilight was determined to be at 1810 hours local time. Excerpts of weather reports and documents are contained in the NTSB public docket.

Airport Information

Airport:	Birmingham-Shuttlesworth Int'l BHM	Runway Surface Type:	
Airport Elevation:	650 ft msl	Runway Surface Condition:	Unknown
Runway Used:		IFR Approach:	ILS
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Fatal	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	33.7075,-86.561668

Examination of the accident site revealed the airplane crashed into a wooded area; the main wreckage was located at 33 degrees 42.452 minutes North latitude and 086 degrees 33.706 minutes West longitude. The elevation by GPS was 1,075 feet. An energy path through the trees was oriented on a magnetic heading of 284 degrees. The crash site was located approximately 12 nautical miles and 047 degrees from the approach end of runway 24, or north of an extended centerline from runway 6/24.

Further examination of the accident site revealed the airplane impacted up sloping terrain of about a 20 degree slope; the wreckage came to rest on its left side with the wings and horizontal stabilizer and elevators separated. Components of the airplane in the surrounding area were located and reconstructed; all four corners were accounted for although heavy fragmentation of the wings, horizontal stabilizer, and elevators was noted. No pre or postcrash fire was noted on any components or of the surrounding area. Additionally, no smell of fuel was noted. A several inch diameter tree limb was found in the accident site area; 45 degree cut surface was noted consistent with being made by the propeller. A fragmented piece of instrument approach plate for BHM airport was located on the ground adjacent to the main wreckage; one side was for the Localizer Runway 18, while the other side was for an instrument approach to runway 24; the page was dated 13 September 2013. Pieces of aircraft found in a tree consist of the tip of the right horizontal leading edge and outboard section of right flap, while a section of right elevator trim tab piece and wing skin fragment with flap track were noted at the base of the tree. A section of left wing with flap actuator was found near the base of the tree. The flap actuator measured 4 7/16 inches extension, which equates to flaps retracted.

Examination of the main wreckage consisting of the fuselage and empennage revealed the vertical stabilizer and rudder remained attached; however, the cockpit and cabin areas were fragmented. A total of 5 seats were located in the wreckage. Three of the seats were articulating and were found outside the wreckage. Examination of the carry-thru spar revealed it was fractured. The aileron balance cable was fractured in tension overload. Inspection of the leading edges of both wings, the vertical stabilizer, and

of both horizontal stabilizers revealed dirt adhering to the surfaces. Components of the standby vacuum system were not identified in the wreckage.

Examination of the left wing revealed it was fragmented in several pieces; however, the wingtip was accounted for. The full span of the aileron was accounted for; the aileron was fractured at the middle hinge while it remained connected at the inboard hinge. The flap was fragmented into 3 pieces, only the inboard rib of the flap was not accounted for. The fuel cap was not attached to the wing but remained secured by the lanyard. Inspection of the aileron flight control cables revealed tension overload.

Examination of the right wing revealed it was fragmented in several pieces; however, the wingtip was accounted for. The flap was fragmented in three pieces but the full span was accounted for, as was the full span of aileron. The fuel cap was in place and the aileron autopilot servo was separated structurally. The bridle cables were around servo's capstan and the ball was in the slot; the cables remained connected to the primary control cables; however, the cables failed in tension overload. Inspection of the aileron flight control cables revealed tension overload. The landing gear was retracted.

Examination of the empennage revealed both horizontals were fragmented, and both elevators were fragmented. Pieces of the elevator were unaccounted for; however, the outboard portion of the elevator was accounted for. The tip of the right horizontal stabilizer and outboard section of right flap were found in the tree. The rudder remained attached at all hinges; the rudder cables remained connected to the bellcrank near the control surface. The elevator push/pull rod was connected at the rear and forward bellcranks near the control surface, and the elevator flight control cables remained connected to the forward bellcrank. The right elevator counterweight was located. The trim cables for pitch trim exhibited tension overload. The aft baggage door remained attached at the hinge. A cargo net was located among the wreckage. The elevator pitch autopilot servo remained secured in the airplane; the bridle cables remained secured around the capstan pulley which was noted to move freely; the servo was retained for further examination. The elevator trim tab actuator was separated and found extended approximately 15/16 inch which was less than the normal tab trailing edge down limit extension of 1.3 inches.

Examination of the cockpit revealed it was fragmented. The throttle quadrant was separated and the cables were stretched; therefore, the positions were deemed unreliable. The remains of a yoke mount for a GPS receiver and also the back of a GPS receiver S/N 125001076 was found among the wreckage. Additionally, a circuit board with a marking of "GPS16M" was found loose in the wreckage and was retained and secured for further examination. The magneto switch was found and the key was broken off; the switch position was not determined. Both rudder cables remained connected to the torque tube but exhibited tension overload. The fuel selector handle and faceplate were located and appeared to be on the left tank position; however, impact damage and structural deformation precluded accessing the valve. The elevator "Bob Weight" still had a cable attached but the end was pulled; the other elevator cable exhibited tension overload. The aileron torque tube was separated from the airplane but both cables remained connected and exhibited tension overload.

Numerous instruments were found among the wreckage and were documented. The vacuum suction gauge was separated from the instrument panel and the needle was off-scale low; no needle witness mark was noted. Only the faceplate of the vertical speed indicator (VSI) and altimeter were found. The needle was missing from VSI and no needle witness mark was noted, while no needles of the altimeter were found. The autopilot mode control panel was found separated from the instrument

panel. The directional gyro face with compass card was found separated from the housing; the internal components were not identified. Although the airplane silhouette was missing, the heading was approximately 293 degrees. Both communications transceivers were separated from the instrument panel and were retained for further examination. The Bendix/King KI-209 VOR/LOC Converter and Glide Slope indicator was separated from the instrument panel and was extensively impact damaged which precluded operational testing. Miscellaneous VFR and IFR charts and Terminal Approach Procedures were found on the ground. The autopilot programmer/computer, pitch and roll servos were retained for further inspection at the manufacturer's facility.

The engine was completely separated from the airplane and came to rest against up sloping terrain. The propeller was found embedded in the soil aft of the engine's resting area; all 3 propeller blades remained secured inside the propeller hub. Components of the engine were located in the immediate vicinity and were recovered for further examination.

Following recovery of the airplane and engine, further inspection of the engine was performed by a representative of the engine manufacturer with NTSB oversight. The inspection revealed the crankshaft was fractured aft of the crankshaft flange. Extensive impact damage was noted to the exhaust, induction, ignition, and fuel system components. Impact damage precluded rotation of the crankshaft; therefore, partial disassembly of the engine was performed to inspect the power train of the engine. The inspection of the crankshaft revealed no evidence of failure, while the inspection of the camshaft revealed the governor drive gear was separated. The engine-driven vacuum pump was separated from the engine and the drive coupling was not located; the engine-driven vacuum pump was retained for further examination. A copy of the report from the engine manufacturer representative documenting the engine and its systems is contained in the NTSB public docket.

Examination of the three bladed propeller revealed all propeller blades remained secured inside the propeller hub, and the leading edges of all blades exhibited impact damage. One propeller blade was full span, the second propeller blade was bent and fractured near the tip, while the third propeller blade was fractured into multiple pieces mid span. Examination of the blade that was full span revealed it was bent aft, the leading edge was twisted towards low pitch, spanwise scratches were noted on the blade face, and heavy gouges were noted in the trailing edge of the blade. The propeller blade that was fractured near the tip exhibited "S" bending of the trailing edge, was bent aft in a sharp radius at the fracture surface, and exhibited heavy chordwise scratches were noted on the blade face. Examination of the blade that was fractured into multiple pieces revealed it was bent aft at the root.

Communications

The pilot was in contact with Birmingham Air Traffic Control Tower at the time of the accident, there were no reported communication difficulties with that facility.

Medical and Pathological Information

Postmortem examinations of the pilot and passenger were performed by the Jefferson County Coroner Medical Examiner Office, located in Birmingham, Alabama. The cause of death for both was listed as extensive blunt force injuries. The autopsy report for the pilot indicates the heart and aorta were not identified, and only about 10 grams of possible brain tissue was identified; no natural disease was noted.

Forensic toxicology was performed on specimens of the pilot by the FAA Bioaeronautical Sciences Research Laboratory (CAMI), Oklahoma City, Oklahoma, and also the University of Alabama at Birmingham, Department of Pathology, Division of Forensic Pathology (UAB Department of Pathology). The results of analysis by FAA CAMI were negative for volatiles and tested drugs, and testing for carbon monoxide and cyanide was not performed. The results of analysis by UAB Department of Pathology were positive for ethanol in the submitted brain specimen (0.08 gm/100 gm Tissue), and also positive for ethanol in the submitted liver specimen (0.01 gm/100 gm Tissue), while the alkaline drug screen was negative in the submitted liver specimen.

The results of analysis for specimens of the passenger by UAB Department of Pathology were positive for ethanol in the submitted brain specimen (0.16 gm/100 gm Tissue), and also positive for ethanol in the submitted liver specimen (0.02 gm/100 gm Tissue), while the alkaline drug screen was negative in the submitted liver specimen.

Tests and Research

Examination of the engine-driven vacuum pump was performed by the NTSB Materials Laboratory located in Washington, DC. According to the NTSB Materials Laboratory Factual Report, impact damage was noted to the pump. Radiograph images revealed no obvious indications of internal damage. Disassembly of the pump revealed the rotor and 6 vanes were fractured in multiple places with no obvious initiation site. The rotor had fractured in a direction that was consistent with the deformation in the circumferential pump housing, and the face of the fractured rotor also exhibited a white dried substance consistent with residual compounds from a dried fluid that had pooled in the pump. Following removal of the rotor from the pump, the opposite face exhibited a circular grinding pattern on the outside of the rotor consistent with rotation of the rotor and contact of the adjacent pump housing. Additionally, circumferential wear marks were noted generally on either outside edge of the fractured rotor, also consistent with contact with the adjacent housing while rotating. Inspection of the fractured surfaces of the rotor revealed they exhibited a rough morphology with a dull luster, consistent with overstress failure of brittle materials. The 6 vanes were removed and inspection revealed all had cracked in multiple places. Each vane generally contained a primary crack that had progressed from one edge to the other, typically with branching cracks emanating from the primary crack. The fracture surfaces of the vane fragments exhibited a rough morphology with a dull luster, consistent with overstress failure of brittle materials. Horizontal and vertical sliding marks on the machined inside faces of the vanes, consistent with similar marks on the machined inside faces of the rotor pieces. The horizontal marks

were consistent with sliding of the vanes that occurred during rotational operation of the rotor. Measurement of each vane was performed. A copy of the NTSB Materials Laboratory Factual report is contained in the NTSB public docket.

Examination of both navigation and communication transceivers was performed with FAA oversight at the manufacturer's facility in an attempt to determine the frequencies selected. Both units sustained impact damage that precluded operational testing, including operational testing of the glide slope receiver. The non-volatile memory (NvRAM) device of one radio was cracked but removed and placed in an engineering exemplar unit; however, the unit displayed the default communication and navigation frequencies indicating the exemplar unit could not read the NvRAM memory device. The NvRAM device of the other radio was also removed and placed in an engineering exemplar unit. The exemplar unit was powered and the active communication and navigation frequencies were 123.80 (Birmingham Approach Control) and 109.50 MHz (Localizer/DME frequency for ILS or LOC/DME Runway 24 Approach to BHM), respectively, while the standby communication and navigation frequencies were 127.10 and 110.3 MHz, respectively. The report from the manufacturer and concurring statement from the FAA inspector who witnessed the testing and confirmed the report results are contained in the NTSB public docket.

Examination of the autopilot components consisting of the programmer/computer, pitch and roll servos were performed at the manufacturer's facility with FAA oversight. The inspection of the programmer/computer revealed extensive impact damage that precluded functional testing. Inspection of the board that contained the annunciator bulbs revealed the "REV" and "APR" bulb filaments were stretched. The "RDY" and Trim Up/DN bulbs were inaccessible due to the face plate damage. The bulbs from "ALT", "STB" and "NAV" were broken and no determination was made whether the broken filament pieces were stretched or un-stretched. Following inspection of the roll servo, electrical power was applied but there was no movement of the capstan. The servo cover was removed and the solenoid was noted to operate, although the solenoid was out of alignment. The lack of movement of the servo motor was consistent with impact damage misalignment of the motor brush. The roll clutch torque setting for servo override was checked and found to be between 26 and 30 inch pounds (specification is 32 plus or minus 5 inch pounds). Following inspection of the pitch servo, electrical power was applied and there was movement of the capstan. The servo cover was removed and internal damage and misalignment was noted. The solenoid functioned properly and there was movement of the servo motor. The clutch torque setting for servo override was checked at 26 inch pounds (specification is 33 plus or minus 5 inch pounds). Acceptance test procedure (ATP) testing of the solenoid indicated the servo RPM was 1.08 (specification is 1.35 RPM), and was consistent with gear misalignment. The clutch assembly backlash was tested and found to be 0.025 inch (specification is 0.15 inch). A copy of the report and FAA concurring statement are contained in the NTSB public docket.

The circuit board with "GPS16M" printed on it was submitted to the NTSB Vehicle Recorder Division in Washington, D.C., in an effort to determine if it contained data associated with the accident flight. According to the Vehicle Recorder Factual Report, the non-volatile memory (FLASH) was removed from the printed circuit board, and readout using a programmer. Although track log data from June 26, 2012, to July 13, 2012 was recovered from the unit, no track log data was identified correlating with the accident date. A copy of the GPS Factual Report is contained in the NTSB public docket.

The company Operations Manual indicates in Section II that a pilot will not be assigned to night flying

duties unless he has made 3 takeoffs and landing's within the proceeding 90 days. As previously reported, the pilot's last logged night flight was November 8, 2013. According to the DO, they normally verify night currency for dispatch purposes by looking at a pilot's flight and duty time sheets; however, in this instance because the pilot recently returned with the company, they should have looked at his pilot logbook to verify night currency. Postaccident the operator added a block to the Flight and Duty Time Sheet to document night currency. Excerpts from the Operations Manual are contained in the NTSB public docket.

A NTSB Performance Study was performed using radar from BHM Airport Surveillance Radar (ASR) - 9, which is sampled at a frequency of every 4 to 5 seconds. The study was performed to determine the rate of turn, bank angle, true airspeed, and turn radius associated with the turn opposite that instructed by the controller. According to NTSB Vehicle Performance Report, between the last 5 radar returns, the average rate of turn during the entire 19 seconds was approximately 4.7 degrees per second. Closer review of the report revealed that at 2220:35, while flying at approximately 170 knots true airspeed, the airplane was in a left bank of 30 degrees, which increased to a maximum bank of approximately 45 degrees two radar returns later at 2220:45 while flying at approximately 160 knots true airspeed. The bank angle decreased to approximately 35 degrees at the next radar return at 2220:49 while flying at approximately 160 knots true airspeed, and the bank angle then decreased to approximately 25 degrees at the last radar target while flying at approximately 175 knots true airspeed. The radius between the last radar target and the accident site location was approximately 0.25 nautical mile. The estimated bank angle to fly between the locations of the last radar return and the accident site location at 170 knots would have been approximately 60 degrees, or 10.8 degrees per second, but did not take into account the altitude decrease. To complete the 0.25 nautical mile radius turn at 3.0 degrees per second, or standard rate turn, the aircraft's speed would need to be 47 knots, which is below the aircraft's published lowest stall speed at the lowest weight. A copy of the NTSB Vehicle Performance Report and radar data file used for the report are contained in the NTSB public docket.

According to information from the autopilot manufacturer, the primary roll and turn rate sensor for the autopilot comes from the electrically powered turn coordinator, and an accelerometer and an absolute pressure transducer are used as the pitch rate sensors. The pilot activated test feature of the autopilot will not allow autopilot function unless the automatic test sequence is satisfactorily completed. According to personnel of the autopilot manufacturer, the roll computer limitations in the roll axis are 90 percent of standard rate turn for a piston engine equipped aircraft; there is no limit of bank angle.

The FAA Instrument Flying Handbook FAA-H-8083-15B specifies a standard rate turn of 3.0 degrees per second while flying in IMC conditions. Excerpts of the handbook are contained in the NTSB public docket.

According to the airplane flight manual supplement (AFMS) for the model V SVS, the system is designed to provide a temporary vacuum system in the event of a primary vacuum failure. The AFMS also indicates that the SVS operates on the differential between the intake manifold and ambient air pressure and is directed through a shuttle valve to drive the gyro operated flight instruments. According to the STC holder, the system includes a low vacuum warning light (incandescent bulb) activated by an adjustable vacuum switch factory set to 3.5 inches of Mercury. According to the DO, the low vacuum warning light was installed on the pilot's side of the instrument panel. The AFMS specifies a ground check to pull the Standby Vacuum Control knob out, and then push it in returning to the off position, as

well as a before takeoff check where with the engine at idle rpm, momentarily pull the Standby Vacuum Control knob out, and to verify that the setting is higher than with the system off. The AFMS indicates that while en route, to check the vacuum gauge and low vacuum warning light for proper system operation; however, there is no procedure in the AFMS to verify the low vacuum warning light functions before initiation of a flight.

Additional Information

Air Carrier Information

The operator was issued their on-demand airplane passenger and cargo certificate on February 21, 1990; the certificate was held/assigned to the FAA Baton Rouge Flight Standards District Office (Baton Rouge FSDO). At the time of the accident, airplanes on their certificate consisted of 3 Cessna 185's, 2 Cessna 206's, 2 Cessna 210L's, and 1 DeHavilland DHC-2.

FAA Flight Standards District Office (FSDO) Oversight of Air Carrier

Between June 10, 2013, and June 13, 2013, personnel of the FAA Baton Rouge FSDO performed an "office focused inspection" of the operator's facility, aircraft, aircraft records, pilot records, and fuel farm. According to the letter from the FAA principal maintenance inspector to the operator dated July 18, 2013, regarding their inspection findings, in part, a "variety of placards damaged and some missing in numerous aircraft" was noted. The inspector indicated the operator was required to inspect each airplane in correlation with each airplane Type Certificate Data Sheet and the current Pilot Operating Handbook for each airplane to assure the required placards were installed. The letter also references an issue related to the transponder of the accident airplane not meeting the requirements of 14 CFR Part 135.143(c)(2) mode S requirements.

A response letter from the DO to the FAA inspector dated July 25, 2013, indicates that 4 airplanes were inspected which included the accident airplane, and the necessary placards have been ordered, although it was not specific what placards were needed for each airplane. With respect to the accident airplane and a discrepancy related to the transponder, the DO suggested a completion date by August 31, 2013. A review of the maintenance records for this airplane revealed that on August 19, 2013, a Trig Avionics TT31 Mode S transponder was installed, and on the same date, test of the ATC transponder and automatic pressure altitude reporting equipment was performed.

NTSB Postaccident Review of Operator's Other Cessna 210L

NTSB review of the FAA Airworthiness File for the other Cessna 210 airplane operated by Southern Seaplane, Inc., (N954RW) was performed, which revealed in part it too was also equipped with a Precise Flight Supplemental Vacuum System V installed on December 12, 2003, IAW STC SE1780NM for the engine and STC SA2162NM for the airframe. A review of pictures of the instrument panel of this airplane provided by the operator revealed the control in the cockpit and the low vacuum warning light

had the appropriate placards installed in the correct positions, and the Altitude-Power Chart placard was installed near the control as specified by the installation report; however, the Flight Manual Supplement provided conflicting information specifying the Altitude-Power Chart placard is to be installed near the instrument vacuum indicator. Subsequently, the operator reported replacing the left and right sides of the instrument panel, and moved the Altitude-Power Chart placard from beneath the rudder trim control to near the gyro suction gauge, to coincide with the flight manual supplement.

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Robert L Bullock; FAA/FSDO; Vestavia Hills, AL Marvin Trease; FAA/FSDO; Kansas City, MO Steve M Miller; Cessna Aircraft Company; Wichita, KS Nicole L Charnon; Continental Motors, Inc.; Mobile, AL Bill Gill; Honeywell; Olathe, KS Steven Joseph; Genesys Aerosystems; Mineral Wells, TX
Original Publish Date:	July 7, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=88799

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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](#).