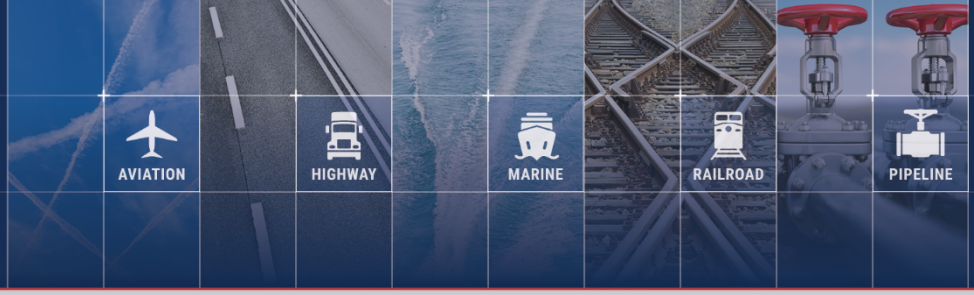

Aviation Investigation Final Report

Location:	Daggett, California	**Accident Number:**	WPR11FA173
Date & Time:	March 20, 2011, 12:34 Local	**Registration:**	N50MC
Aircraft:	Cessna P210	**Aircraft Damage:**	Substantial
Defining Event:	Unknown or undetermined	**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

About 4 hours before the pilot's planned first leg of her return flight home, AIRMETs for instrument flight rules (IFR) and mountain obscuration conditions, moderate turbulence, and moderate icing were issued for the flight track region and timeframe. About 1 hour before the flight, the Federal Aviation Administration (FAA) issued a center weather advisory (CWA) that warned of moderate-to-severe turbulence. There were no records that the pilot obtained a formal weather briefing. According to the pilot's husband, the pilot typically obtained preflight weather information from "aviationweather.gov," but the website does not retain records of user access. A friend of the pilot reported that the pilot was aware that "a storm was coming" into southern California on the day she was leaving, but the friend was unaware of the pilot's specific pre-flight activities or preparations. The investigation was unable to determine whether or how the pilot obtained weather information regarding her planned flight. About 5 minutes after departure on the IFR flight, a second CWA for moderate to severe turbulence for the flight track region and timeframe was issued.

The flight proceeded uneventfully until an air traffic controller advised the pilot of a report of light rime icing at her altitude. The controller then broadcast an all-aircraft advisory regarding the issuance (but not content) of the second CWA and instructed pilots to contact flight service for further information. It could not be determined whether the pilot obtained any specific information regarding the CWA, but she did not request to go off frequency to contact flight service. However, she requested a higher altitude in an apparent effort to avoid the reported rime icing. About 2 minutes later, the flight was cleared to 15,000 feet, and several minutes after that, the pilot reported breaking out of the clouds at 13,300 feet. Later, an air traffic controller advised the pilot of a re-route, and she reported that she had encountered moderate turbulence at 15,000 feet. About 3 minutes after that, radar data indicated that the airplane was descending at nearly 12,000 feet per minute and, very shortly thereafter, the

airplane was lost from air traffic control radio and radar contact.

Several ground eyewitnesses reported observing the airplane in a spin and in a vertical trajectory toward the ground, in an area where the local ceiling was about 12,000 feet above ground level. Although the airplane was substantially damaged by postcrash fire, the evidence indicated that the airplane impacted the ground in an aerodynamic spin. The investigation was unable to determine the specific reasons for the loss of control and resulting aerodynamic spin. Postaccident examination of the engine, propeller, and airframe did not reveal any preexisting mechanical deficiencies or failures that would have precluded normal operation or continued flight.

The airplane aerodynamic configuration and weight distribution were significantly modified via several supplemental type certificates (STCs) relative to the original FAA-certificated configuration. Neither the FAA nor any of the STC holders evaluated the individual or combined effects of the STC changes on the airplane's spin susceptibility, characteristics, or recovery capability. Evaluation of the mass properties of the modified airplane indicated that it would be more resistant to spin recovery than it would be as originally configured. However, the investigation was unable to determine if this played a role in the pilot’s inability to recover from the aerodynamic spin. On May 24, 2012, the NTSB issued Safety Recommendations A-12-21 through -23 to the FAA to address the potential adverse effects on an airplane’s performance and structure if it has multiple STCs that are not properly analyzed for compatibility.

Toxicological testing by the FAA Civil Aeronautical Medical Institute detected Nortriptyline in the pilot's liver. This is a prescription antidepressant used in the treatment of major depression and for certain chronic pain conditions; it is not normally used for intermittent pain. The pilot did not report the medication during her FAA medical certification examination or on her medical certificate application; pilots taking this medication are not eligible for FAA medical certification. A warning associated with this medication stated that it may impair mental and/or physical ability required for the performance of potentially hazardous tasks. However, the degree to which the pilot may have been impaired from the medication could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's decision to conduct the flight into a region of reported moderate to severe turbulence and icing conditions, followed by a loss of airplane control and an aerodynamic

spin from which the pilot did not recover.

Findings

Environmental issues	Convective turbulence - Effect on operation
Environmental issues	(general) - Effect on operation
Environmental issues	Conducive to structural icing - Not specified
Personnel issues	Decision making/judgment - Pilot
Aircraft	Configuration - Not specified

Factual Information

History of Flight

Enroute-cruise	Unknown or undetermined (Defining event)
Uncontrolled descent	Unknown or undetermined

HISTORY OF FLIGHT

On March 20, 2011, about 1234 Pacific daylight time, a Cessna P210N Silver Eagle, N50MC, was substantially damaged when it departed from cruise flight and impacted rocky desert terrain about 2 miles south of Barstow-Daggett Airport (DAG), Daggett, California. The certificated private pilot/co-owner and her two passengers were fatally injured. The personal flight was operated under the provisions of Title 14 Code of Federal Regulations Part 91, and was operating on an instrument flight rules (IFR) flight plan from John Wayne Airport-Orange County (SNA), Santa Ana, California, to Henderson Executive Airport (HND), Las Vegas, Nevada. Instrument meteorological conditions existed for portions of the flight route and altitudes.

According to the husband of the pilot, they co-owned the airplane, and they lived and based the airplane in Truckee, California. A few days before the accident, the pilot flew herself and their two children to SNA to visit friends. The accident flight was the first leg of the return trip to Truckee; the pilot had planned the stop at HND as another personal visit.

About 0700 on the morning of the accident, the fixed base operator (FBO) at SNA topped off the main fuel tanks of the airplane, in accordance with the pilot's request. Later that morning, the FBO shuttle van picked up the pilot and children at the main terminal of SNA, and stopped at a local fast food restaurant to obtain meals for the children, before continuing to the FBO. According to the driver of the shuttle, they arrived at the FBO about 1100. The pilot informed the FBO personnel that she had to "check the weather" and take care of other "paperwork" before she could be taken to the airplane, which was parked remotely from the FBO office. At least one FBO employee observed the pilot at the computer in the FBO pilot lounge/computer room. After that, the pilot, her children, and their luggage were driven to the airplane. The driver only observed the initial portion of the loading, and no one from the FBO observed the preflight inspection or departure of the airplane. The driver reported that the pilot was not talkative, and that she told her coworkers that the pilot seemed "kind of sad."

According to Federal Aviation Administration (FAA) air traffic control (ATC) information, the airplane departed SNA about noon. After departure from SNA, the flight was handled by five different SoCal TRACON (TRAffic CONtrol) sectors/controllers. While climbing through about 9,000 feet above mean sea level (msl) for 11,000 feet, the pilot was advised that there were reports of light rime icing at 11,000 feet, about 10 miles ahead of her. She then requested a

higher altitude, and was advised that "the next sector" was "working" on it. About 1217, the flight was handed off to Joshua Approach, and was cleared from 11,000 feet to its cruise altitude of 15,000 feet. Shortly thereafter, the flight was handed off to Los Angeles Air Route Traffic Control Center (ARTCC, referred to as "LA Center"). About 1219, while in communication with the first sector of LA Center, the pilot was advised that she was in an area of moderate precipitation that extended about 10 miles ahead of her. About 1224, the pilot advised that she "broke out" of the clouds at 13,300 feet. About 1229, after she was switched to the next LA Center sector, the pilot was advised that ATC had amended her route, and was asked whether she was ready to copy it. She acknowledged the transmission with "go ahead," and the controller issued the revised routing. After a silence of about 16 seconds, the controller asked if the pilot copied the transmission, and the pilot responded "stand by." About 45 seconds later, the pilot advised that she had encountered moderate turbulence, but was now ready to copy. The controller reissued the revised clearance, the pilot read it back, and that was followed by the controller's query to confirm that the pilot reported moderate turbulence, which she did. About 2 minutes 15 seconds after that, a partial and final transmission was received from the airplane, and ATC lost radar contact with the airplane shortly thereafter.

Several ground-based eyewitnesses in the vicinity of DAG reported that their attention was initially drawn to the airplane by the varying sound of the engine. They reported that they observed the airplane "spiraling" or "spinning" in a vertical trajectory towards the ground, and that they then observed the resulting explosion, fire, and smoke. The first 911 telephone call was received from an eyewitness at 1234. First responders were only able to access the accident site on foot or by all-terrain vehicles. Firefighting vehicles were unable to access the site due to the terrain.

PERSONNEL INFORMATION

Pilot

FAA records indicated that the pilot held a private pilot certificate with airplane single-engine and instrument-airplane ratings. On her May 2006 application for an FAA first-class medical certificate, the pilot reported that her flight experience included 290 total hours, and 0 (zero) hours in the 6 months prior to the medical examination. On that application, she reported that she was not taking any medications, and had been hospitalized for two childbirths and one minor surgery. No significant pilot medical issues were identified by the aviation medical examiner (AME) who performed that examination.

In September 2010, the pilot reported a total flight experience of about 930 hours on her airplane insurance application form. Her most recent flight review was completed in the accident airplane in February 2011.

The pilot's personal flight logbook was not recovered; it was presumed lost in the post-impact

fire. Her husband estimated that at the time of the accident, the pilot had about 1,000 hours of total flight experience, including about 400 hours in the accident airplane make and model, and about 450 hours of IFR experience. He did not estimate her IFR time in the accident airplane make and model. He stated that they were both pursuing their commercial pilot certificates, and that due to her recent training and flight activity, the pilot was "never more competent and comfortable in the airplane" than she was in the few weeks preceding the accident flight.

According to the husband, the pilot typically hand-flew the airplane for about 10 minutes on each trip; most of the time during any flight the autopilot would be engaged. He said she typically turned it on shortly after takeoff for the climb out, and typically before entering IMC. She was well versed in the programming and usage of the airplane's autoflight capabilities. Prior to departure, the pilot would program the Garmin 530 with the planned flight route, and the airplane would then fly the programmed route/profile. Any in-flight ATC-specified changes would be input into the Garmin 530 by the pilot as she became aware of them. She would hand fly the airplane in "heavy turbulence," and she took turbulence "very, very seriously." Both the pilot and her husband avoided icing conditions as much as possible, and she would not hesitate to mention icing if she was encountering it, and/or request ATC assistance/clearance to escape it.

The husband stated that 15,000 feet was a typical altitude for short trips. They typically seated the children in the aft (5 and 6) seats. They often removed one or both middle (3 and 4) seats; for this trip one of those seats was removed. The children did not use car seats in the airplane. He stated that the pilot was "very comfortable" flying with the children and no other pilot, since they complied with her need to have little or no interference when she requested or required it. The children did not like using headsets, but headsets were available for them, and the children occasionally used them.

The husband reported that neither the pilot nor the children had any known or recent medical issues that could have impacted the flight, and that they were all in "great health" for the trip. He stated that she was not on any medications prior to the flight, and that she rarely took any medications, except possibly an occasional over-the-counter pain reliever.

Prior to the weekend, and in the phone calls that they had over the weekend, the pilot was in a "great mood." However, particularly when flying or getting ready for a flight, she was "all business," which he said could be interpreted as a bad mood by some persons. Her normal radio communications bordered on terse.

Both the husband and the pilot's friend who spent the weekend with her reported that it was a relaxing time, with ample opportunity for rest. The friend, a non-pilot, reported that the pilot was aware that "a storm was coming in" to southern California on the day she was leaving, but the friend left the afternoon before, and therefore, was unaware of the pilot's specific pre-flight activities or preparations. The children's nanny, who accompanied the pilot and children on the flight to SNA, and who spent some of the weekend with the pilot, departed SNA separately from the pilot, and therefore, also was unaware of the pilot's specific pre-flight activities or

preparations.

MEDICAL AND PATHOLOGICAL INFORMATION

The pilot was in the left front seat at the time of the accident. The San Bernardino County Medical Examiner’s autopsy report listed the cause of death as "massive blunt force trauma, instantaneous." The FAA Civil Aeronautical Medical Institute (CAMI) conducted toxicological testing on tissue samples (Heart, Kidney, Liver, Lung, Muscle, Spleen) from the pilot; no blood was collected or available for testing. No ethanol was detected in the muscle or liver. The following medications or metabolites were detected in the pilot's tissue samples:
- Dextromethorphan was detected in the liver and kidney. This is an over the counter cough suppressant (contained in Robitussin, Delsym, Sucrets, Bromfed-DM, Tylenol Cold) also found in prescription cough medications.

- Nortriptyline was detected in the liver. This medication was not reported by the pilot during her FAA medical certification examination, or on her medical certificate application. Pilots taking this medication are not eligible for FAA medical certification. This is a prescription antidepressant with trade names such as Pamelor, Aventyl, and Nortrilen. It is used in the treatment of major depression. It is also a metabolite of amitriptyline, which is used as an antidepressant. One warning associated with this medication stated that it may impair mental and/or physical ability required for the performance of potentially hazardous tasks such as driving or operating heavy machinery.

Passengers

The two passengers were the pilot’s children. The male child was born in July 2004. He weighed approximately 45 pounds, and was approximately 40 inches tall. The female child was born in October 2005. She also weighed about 45 pounds, and was about 38 inches tall. Witnesses reported that the children were positioned in the rear of the airplane for the departure from SNA. It could not be determined exactly where the children were situated for the flight, or whether they were seated or restrained at the time of the accident.

AIRCRAFT INFORMATION

According to FAA information, the airplane was manufactured in 1978, and equipped with a Continental Motors TSIO-520 series piston engine. According to the maintenance records, the "original logs [were] lost" and an "Aircraft Log" beginning September 15, 1993, was the earliest available documentation, exclusive of the FAA records in Oklahoma City.

In February 2007, the airplane underwent extensive modifications to convert it to a "Silver Eagle" turboprop-powered airplane by an aftermarket company, O&N Aircraft Modification, Factoryville, Pennsylvania. That conversion included installation of a Rolls Royce M250 B17/F2 series turbine engine, a 27.7-gallon auxiliary fuel tank in the aft fuselage, a Hartzell 3 blade

propeller, and multiple avionics and systems upgrades. The basic conversion was accomplished via Supplemental Type Certificate (STC) SA1003NE. SA1003NE was approved by the FAA New York Aircraft Certification Office (ACO) in 1992. Also in February 2007, a 16.25-gallon Flint Aero auxiliary fuel tank was installed in each outboard wing via STC SA3226NM. SA3226NE was approved by the FAA Los Angeles ACO in 1986. Those tanks added 26 inches to the wing span of the original airplane. No documentation for any of these modifications was contained in the FAA records in Oklahoma City, and the FAA registry information still listed the airplane as being equipped with the original piston engine.

The airplane was first registered to the pilot in 2009. Maintenance records information indicated that as of its most recent annual inspection in October 2010, the airframe had accrued a total time in service of about 3,786 hours, and a total time since conversion of about 764 hours. Examination of the wreckage and maintenance records revealed that the airplane was equipped with deicing boots. According to Cessna information, the airplane was not delivered with deicing boots. The airframe logbook entry for the O&N Silver Eagle conversion in February 2007 was the only record regarding the boots; that entry only stated "installed new deice boots."

The on-airplane Pilot's Operating Handbook (POH) and the weight and balance information were not located, and were presumed to be consumed by the post-accident fire. A copy of the POH for the P-210N model was obtained from Cessna. The airplane was not approved for flight into know icing (FIKI), but the POH contained procedures for "Inadvertent Icing Encounter" in Section III, Emergency Procedures. The Cessna POH Limitations section stated that "aerobatic maneuvers, including spins, are not approved," and a cockpit placard stating same was required.

A copy of the Silver Eagle POH and Airplane Flight Manual (AFM) Supplement was obtained from Propjet Aviation LLC, the Silver Eagle sales and service facility, which was the pilot's primary maintenance facility for the accident airplane. The Supplement mirrored the Cessna POH regarding aerobatic maneuvers. The Supplement contained a prohibition against FIKI in the Limitations section, and the Normal Procedures section of the Supplement also contained a warning that stated "Flight into known icing conditions is prohibited." Like the Cessna POH, the Supplement contained procedures for "Inadvertent Icing Encounter" in Section III, Emergency Procedures.

A copy of the Flint Aero "FAA Flight Manual Supplement" was obtained from Flint Aero. The Flint supplement stated that its information "supersedes the basic manual only where covered in the items contained herein. For limitations, procedures, and performance not contained in this supplement, consult the manual proper." The Flint supplement did not include any information regarding FIKI or aerobatic maneuvers. Therefore, the Cessna and Silver Eagle prohibitions against FIKI and spins were still applicable.

The most recent full weight and balance documentation that was located was dated February 2007, and was published on O&N letterhead. That record documented the Silver Eagle

conversion, and the wing tip fuel tank additions. The most recent weight and balance amendment record was dated September 2009, and was prepared by Propjet Aviation of Santa Rosa, California. That record documented the removal of the weather radar system.

METEOROLOGICAL INFORMATION

Direct Users Access Terminal System (DUATS) records indicated that the pilot utilized DUATS to file her IFR flight plan with the FAA at 1003. However, there was no record that the pilot obtained a formal weather briefing from DUATS, or from the Automated Flight Service Station. According to the pilot's husband, the pilot typically obtained preflight weather information from "aviationweather.gov," but that web site does not retain records of user access. The investigation was unable to determine whether or how the pilot obtained weather information regarding her planned flight.

The 1153 automated weather observation for SNA included winds from 150 degrees at 16 knots with gusts to 22 knots; visibility 9 miles; few clouds at 3,000 feet, scattered clouds at 4,300 feet, a broken layer at 5,500 feet, an overcast layer at 15,000 feet; temperature 16 degrees C; dew point 9 degrees C; and an altimeter setting of 29.83 inches of mercury.

The area forecast valid at the time of the accident was issued at 0345, and was valid until 1600. The forecast for the departure area called for a broken cloud layer at 2,000 feet, overcast at 4,000 feet, cloud tops to 28,000 feet; visibility 3 to 5 miles in light rain; and southwesterly winds gusting to 25 knots. After 1100, the forecast included scattered rain showers and isolated thunderstorms, with tops to 30,000 feet, and westerly winds gusting to 30 knots. The forecast for the accident site area called for a broken cloud layer at 10,000 feet, with tops to 25,000 feet. After 1300, the forecast was for scattered clouds at 5,000 feet, overcast layer at 8,000 feet, and isolated light rain showers.

At 0745, the NWS issued three AIRMETs (Airmen’s Meteorological Information) for the flight track region and timeframe, including one for IFR and mountain obscuration conditions, one for moderate turbulence below 18,000 feet, and one for moderate icing conditions from the freezing level (5,000 to 8,000 feet) up to 20,000 feet. The LA Center Weather Service Unit issued two Center Weather Advisories (CWA) for the flight track region and timeframe; both warned of moderate to severe turbulence below 12,000 feet. One (CWA 101) was issued at 1116, which was before the flight, but about the same time as when the pilot was at the FBO. It could not be determined whether the pilot was aware of or obtained CWA 101. CWA 101 was superseded by CWA 201, issued at 1206, which was about 3 minutes after the airplane departed SNA.

There were 92 pilot reports, including 30 "urgent" reports, of icing, turbulence, mountain wave activity, and low-level wind shear encounters over southern California in the period from approximately 6 hours prior the accident until 4 hours after it. There were also multiple reports of strong up and downdrafts of 1,000 to 1,500 feet per minute across the region, and in the

vicinity of the accident site. Thirty-one of those pilot reports were made before 1100, the approximate time that the pilot might have obtained her latest weather-related information. Seven more reports were made between 1100 and 1130, the approximate time that the pilot went to the airplane on the ramp. Seven additional reports were made between the time that the pilot arrived at the airplane and the time of the accident.

The National Weather Service (NWS) Surface Analysis Chart for 1200 depicted an occluded front across southern Oregon and northern California, which became a cold front across southern California. A separate trough of low pressure extended across Nevada into Arizona. The accident site was located between the cold front and the trough of low pressure in an area of a weak high pressure ridge. The station models over southwest California indicated strong southerly winds with light to moderate rain, and overcast cloud layers, all of which extended over SNA, the departure airport.

The NWS regional radar mosaic chart completed at 1237 depicted a large area of echoes associated with thunderstorms and rain showers extending over western and central California immediately west of the accident site. No large area of echoes was identified in the vicinity of the accident site.

The 1238 MesoWest plot of the NWS remote observation site wind data depicted strong surface winds and gusts at multiple locations just south and southwest of the accident site. Many stations recorded wind speeds in excess of 17 knots, with gusts above 31 knots. In addition, multiple stations reported wind gusts in excess of 50 knots.

A rawinsonde atmospheric sounding profile depicted conditions favorable for mountain wave activity immediately downwind (north) of the high terrain overflown by the airplane. Based on the local terrain features, there was potential for a mountain wave at 11,395 feet, with a wavelength of 4.63 miles, an amplitude of 4,692 feet, maximum vertical velocities of 4,088 feet per minute (fpm), and likely to generate severe turbulence. Another potential wave was located at 18,400 feet with maximum vertical velocities of 5,190 fpm, and also likely to generate severe turbulence.

Visible and infrared imagery from the Geostationary Operational Environmental Satellite number 11 (GOES-11) depicted an extensive area of clouds over southern California, with several bands of clouds in the vicinity of the accident site, and with a narrow but distinct clear zone immediately south of the accident site. That clear zone was indicative of a weather phenomenon known as a "hydraulic jump," which is associated with mountain wave activity. Overlays of ground tracking radar flight path data depicted the airplane penetrating this area about the time of the accident.

Recordings of ATC communications revealed that the airplane was assigned to seven different ATC sectors in the period from 1206 to 1232, the time of the accident. Between 1206 and 1216, at least three of the sectors issued all-aircraft advisories regarding CWA201, but N50MC was not in communication with those sectors when the advisories were broadcast. About

1216, the controller from the Norton Sector of SoCal Approach advised the pilot of a PIREP about light rime icing at 11,000 feet, which was the assigned altitude for N50MC. The pilot acknowledged that report, and requested a higher altitude. Just after that, while N50MC was still on frequency, the Norton Sector controller broadcast an all-aircraft advisory regarding the issuance of CWA201, and instructed pilots to contact Flight Service for further information. It could not be determined whether the pilot obtained any specifics regarding CWA201, but she did not request to go off frequency from the Norton Sector controller to contact Flight Service. About 1218, the pilot was switched to next sector (Joshua Approach), and the airplane was cleared to 15,000 feet. About 2 minutes later, the pilot was advised by Joshua Approach of "moderate precipitation" extending another 10 miles along her route, and about 3 minutes after that, the pilot advised that she "broke out" of the clouds at 13,300 feet. About 1230, the pilot reported to ATC that she had encountered "moderate turbulence," but she did not mention any icing, and did not report whether she was in still visual meteorological conditions, or had re-entered the clouds.

The 1151 automated weather observation for DAG, which was located about 2 miles north of the impact location, included winds from 090 degrees at 5 knots; visibility 10 miles; overcast clouds at 12,000 feet; temperature 14 degrees C; dew point -2 degrees C; and an altimeter setting of 29.78 inches of mercury. The 1251 DAG observation was similar, except that the sky condition was reported as scattered clouds at 11,000 feet.

All witnesses in the vicinity of DAG reported unusual weather about the time of the accident. One common witness observation was that the conditions in the immediate vicinity of the airport and the accident site were calm, but that severe weather and cloud formations (witness' descriptions included "pretty ugly," "black clouds," and "very windy") were present just south of DAG, which was the direction that the airplane had come from.

Refer to the accident docket for detailed weather documentation information.

ATC COMMUNICATIONS and RADAR

Recordings of all communications between N50MC and ATC facilities were obtained and reviewed. In the 50 minutes between the pilot's first contact with SNA Clearance Delivery at 1142, and her final transmission to LA Center sector R17 at 1232, the pilot communicated with a total of eleven different ATC positions. With the exception of the loss of the airplane while in communication with the R17 sector, all communications were unremarkable.

The flight was continuously tracked on ATC radar from 1203:30, when the airplane was at a transponder-reported altitude of 1,300 feet, until the final radar return at 1233:44, when the transponder-reported altitude was 4,700 feet. Review of the radar data indicated that the flight was unremarkable until 1232:08, when the track began to deviate to the north, and the airplane descended about 200 feet below its assigned altitude of 15,000 feet. A total of eight subsequent radar returns were received from the airplane, but most of those did not have

transponder altitudes associated with them. The next to last radar return with a transponder altitude was at 1232:55, with a reported altitude of 14,400 feet. Calculations using that radar return and the final radar return indicated that the airplane descended 9,700 feet in 49 seconds, which yields an average descent rate of nearly 12,000 feet per minute.

WRECKAGE AND IMPACT INFORMATION

The impact site was on a rocky, low plateau about 2 miles south of the nearest paved road. There were no ground scars beyond the immediate vicinity of the wreckage. Aside from the propeller hub and two blades, the engine cowl, numerous window fragments, and flight- or airplane-related papers, all wreckage was located approximately within the bounds of the airplane planform. The wreckage was upright, and oriented on a heading of about 151 degrees magnetic. Most of the cockpit/cabin/fuselage structure and contents were consumed by fire, and about 50 percent of the wing structure was consumed by fire. The empennage was essentially intact. The wreckage components located away from the main wreckage did not contain any evidence of fire, heat distress, or smoke. All primary flight control surfaces and components were accounted for at the accident site.

Detailed examination of the engine, propeller, and airframe did not reveal any pre-existing mechanical deficiencies or failures that would have precluded normal operation. The pre-accident integrity, functionality, configuration, and operating status of the ice protection systems could not be determined. All damage patterns were consistent with ground impact while the airplane was in a left spin, with the engine running. Refer to the accident docket for detailed wreckage documentation information.

ADDITIONAL INFORMATION

Weight and Balance

The investigation was unable to determine the exact fuel or baggage weights for the flight. Available information indicated that for departure, the main tanks were full, the wingtip (auxiliary) tanks were about half full, the aft tank was empty, and that there was about 50 pounds of baggage. Based on those values, the weight at the start of the flight was about 3,418 pounds, with an estimated center of gravity (CG) location of 45.01 inches. Since fuel consumption data was not produced or provided by the engine conversion STC holder, engine performance test stand ("uninstalled engine") data from Rolls-Royce was utilized. That data indicated that about 134 pounds of fuel would have been consumed during the flight. POH procedures indicated that that fuel should have been obtained from the main tanks. Based on those values, the airplane weight at the time of the accident was estimated to be 3,285 pounds, with a CG location of 45.09 inches. All calculated values were within the allowable weight and CG envelope.

STC Compatibility

The airplane aerodynamic configuration and weight distribution were significantly modified relative to the original FAA-certificated configuration. The aerodynamic changes consisted of a 26-inch increase in wing span, and an extended and reshaped engine cowl. The weight distribution changes consisted of replacement of the piston engine with the turbine engine, a heavier propeller, and the addition of an aft fuel tank and two wingtip fuel tanks. Those changes were approved independent of one another by two separate STCs, from two different companies, under two different FAA offices (New York and Los Angeles). Although the modifications from those two independent STCs were installed on the same airplane, there was no FAA requirement to determine the compatibility or adverse interactions of the two STC modifications. There was no evidence that any such compatibility/interaction testing by either STC applicant was accomplished, despite the fact that the two STCs were frequently installed on the same airplanes.

Airplane Configuration and Performance Changes

No information regarding the Silver Eagle STC applicant's scope or depth of the flight testing, especially stall and/or spin tests, was obtained by the investigation. However, comparisons of the original Cessna P-210N stall speeds with those in the Silver Eagle POH supplement indicated that the Silver Eagle stall speeds were typically 2 to 4 knots (both indicated and calibrated) higher than the original Cessna values. The Silver Eagle POH stated that "Altitude loss during a stall recovery may be as much as 600 feet from a wings level stall and even greater from a turning stall." The Cessna POH cited a maximum altitude loss of 300 feet. The reason for these differences was not determined.

According to the holder (Flint Aero) of the wing tip fuel tank STC, some flight testing for stall speeds and stall characteristics was accomplished for STC approval, but the specifics were not available. The Flint Aero POH supplement did not change the original Cessna stall speeds, or any other operational speeds.

Spins were prohibited in the Cessna, Silver Eagle, and Flint Aero versions of the airplane, and the investigation did not obtain any information regarding the spin or spin recovery characteristics for any of the configurations. According to the text Aerodynamics for Naval Aviators (ANA), the "motion of an airplane in a spin can involve many complex aerodynamic and inertia forces and moments." The Silver Eagle and Flint Aero conversions changed the aerodynamic configuration of the airplane, but the aerodynamic effects of those modifications on the airplane's spin and spin recovery characteristics could not be determined by the investigation. The Silver Eagle and Flint Aero conversions resulted in an increase in the airplane's moment of inertia about the vertical axis (Izz). A coarse engineering evaluation indicated that, at the approximate airplane flight weight and CG, the Izz was increased by about 6.79 million pound-force-inch2 (lbf-in2), or approximately 45%, above the production airplane

value of 15.05 million lbf-in2 at its approximate flight weight of 3,284 pounds.

Typical spin recovery procedures include the sequential or simultaneous reduction of power to idle, neutralization of the ailerons, and application of full opposite rudder until rotation is stopped. According to ANA, the "rudder is the principal control for spin recovery" in most airplanes; the rudder deflection generates the yawing moment needed to counter the auto-rotation of the spin. The yawing moment produced by the rudder is a direct function of rudder deflection; increased deflection yields increased yawing moment.

The effect of the altered aerodynamic configuration on spin entry susceptibility, spin and spin recovery characteristics, or spin recovery yawing moment requirements, could not be determined. The effect of the increased Izz on spin entry susceptibility, or spin and spin recovery characteristics could not be determined, but the increased Izz would result in an increase in the yawing moment required to counter and stop spin rotation. However, neither the Silver Eagle nor the Flint Aero conversions altered the original Cessna rudder travel range, which meant that the rudder yawing moment capability of the modified airplane was the same as the production airplane.

Unidentified Aural Tone

About 1233:50, which was about 50 seconds after the truncated and final radio communication from the pilot, the audio channel for LA Center sector R17 captured a warble tone that lasted about 7 seconds, and also captured some sounds similar to intermittent heavy breathing. In an effort to identify the source of the tone, a .wav file of the warble tone was provided to representatives from Cessna, Cobham Avionics (autopilot manufacturer), and Propjet, and a pilot who had recently flown the airplane. None of the persons were familiar with the tone, or were able to identify the source of the tone. The investigation was unable to determine whether the tone was transmitted from N50MC.

Pilot Information

Certificate:	Private	**Age:**	37,Female
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:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1100 hours (Total, all aircraft), 400 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N50MC
Model/Series:	P210 Silver Eag	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	P21000044
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	4016 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo prop
Airframe Total Time:		**Engine Manufacturer:**	Rolls Royce
ELT:	Installed	**Engine Model/Series:**	250
Registered Owner:	On file	**Rated Power:**	450 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	DAG,1930 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	12:51 Local	**Direction from Accident Site:**	360°
Lowest Cloud Condition:	Scattered / 11000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.76 inches Hg	**Temperature/Dew Point:**	16°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Santa Ana, CA (SNA)	**Type of Flight Plan Filed:**	IFR
Destination:	Henderson, NV (HDN)	**Type of Clearance:**	IFR
Departure Time:	12:00 Local	**Type of Airspace:**	

Airport Information

Airport:	Barstow Daggett DAG	**Runway Surface Type:**	
Airport Elevation:	1930 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	34.828609,-116.791114

Administrative Information

Investigator In Charge (IIC):	Huhn, Michael
Additional Participating Persons:	Michael Baudoux; FAA/FSDO; Riverside, CA Andrew Hall; Cessna Aircraft Company; Wichita, KS David Riser; Rolls Royce; Indianapolis, IN
Original Publish Date:	May 30, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=78598