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# National Transportation Safety Board - Aircraft Accident/Incident Database

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Incident Rpt# OPS17IA014B	02/15/2017 2000 PST	Regis#	San Francisco, CA		
Acft Mk/Mdl AIRBUS A320 214-214		Acft SN 2851	Acft Dmg: NONE	Rpt Status: Prelim	Prob Caus: Pending
Eng Mk/Mdl CFM INTL CFM56-5B4/P			Fatal 0	Ser Inj 0	
Opr Name:		Opr dba:		Aircraft Fire: NONE	

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## Events

1. Taxi-into takeoff position - Air traffic event
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## Narrative

On February 15, 2017, about 2000 pacific standard time, a runway incursion occurred on runway 28L at San Francisco International Airport (SFO), San Francisco, California, when Virgin America, call sign Redwood, flight 920 was on line up and wait clearance issued by the local air traffic controller and Compass Airlines, call sign Compass, flight 6081 was cleared to land on the same runway. The air traffic controllers received an Airport Surface Detection System Model X (ASDE-X) alert and commanded the Compass flight to "go-around," and the crew subsequently performed a go-around maneuver. There were no injuries reported to the crew or passengers of either flight. Both flights were operating under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121. The Compass flight was arriving SFO from their departure airport of Los Angeles International Airport (LAX), Los Angeles, California. The Virgin America flight was operating the from SFO to McCarran International Airport (LAS), Las Vegas, Nevada. Night visual meteorological conditions (VMC) prevailed at the time of the incident.

# National Transportation Safety Board - Aircraft Accident/Incident Database

Accident Rpt# CEN16LA187	05/10/2016 1730 CDT	Regis# N86TR	Dexter, MO	Apt: Dexter Municipal Airport DXE
Acft Mk/Mdl BEECH B100		Acft SN BE-22	Acft Dmg: SUBSTANTIAL	Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl GARRETT TPE 331-6-251		Acft TT 17777	Fatal 0 Ser Inj 0	Flt Conducted Under: FAR 091
Opr Name: DEXTER AIR LLC		Opr dba:		Aircraft Fire: NONE

## Events

2. Landing-landing roll - Collision during takeoff/land

## Narrative

On May 10, 2016, at 1730 central daylight time, a Beech B100, N86TR, impacted runway 18 when the right main landing gear collapsed during landing at Dexter Municipal Airport (DXE), Dexter, Missouri. The airplane sustained substantial damage. The pilot, flight instructor, and two passengers were uninjured. The airplane was operated by Dexter Air LLC under 14 Code of Federal Regulations Part 91 as an instructional flight that was not operating on a flight plan. Visual meteorological conditions prevailed for the flight that last departed from Jonesboro Municipal Airport, Jonesboro, Arkansas at 1650 and was destined to DXE.

The pilot stated that the purpose of the flight was a Beechcraft B100 initial training flight with a second pilot who occupied the right pilot seat. According to the Federal Aviation Administration inspector, the flight instructor was in a non-seated position between both pilots.

The left seat pilot stated that they flew about 3 hours and had taken turns performing turns, stalls, slow flight and approaches. He stated that the accident landing was the third landing of the day that he performed. He said that during the left downwind approach for landing on runway 18, he performed the airplane checklist items that the flight instructor read to him. The left seat pilot said that the landing gear extended, and the three landing gear position indicator lights illuminated green. The left seat pilot said that during touchdown, the right side of the airplane descended lower than the left side and then the right main landing gear collapsed. The airplane veered off and into a grass area adjacent to the runway.

The aircraft came to rest approximately 2,518 feet from runway 18 touchdown end and 100 feet west of the runway edge in a field of grass. The right hand main gear was collapsed, right hand prop blades were bent and the right wing leading edge and tip was damaged. Evidence of fuel leakage was noted surrounding the right wing in the grass. The wing top skin outboard of the engine nacelle displayed evidence of wrinkling.

Post-accident examination revealed the bottom right wing skin to the integral fuel tank was torn resulting in an approximate five by three inch hole. The right main gear actuator assembly exhibited numerous bent parts and was broken out of its mounting structure. The inboard top actuator mounting structure was torn away from the airframe. The right nacelle fuel tank bulkhead was ruptured with the top of the gear actuator resting inside the tank area. The top wing skin wrinkling was not as evident post recovery but still shows signs of damage. Puncture damage to the fuselage pressure vessel was noted in 5 places below the copilot side window and a two-inch crack or tear was found on the belly skin approximately centered between the main gear legs.

The rigging for the landing gear system could not be checked nor could functional gear swing test be performed due to damage incurred to the system from the accident.

# National Transportation Safety Board - Aircraft Accident/Incident Database

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Accident Rpt# WPR18LA029	11/07/2017 930 CST	Regis# N93PH	Rolling Fork, MS	Apt: N/a
Acft Mk/Mdl BELL 206-B		Acft SN 788	Acft Dmg: SUBSTANTIAL	Rpt Status: Prelim Prob Caus: Pending
Eng Mk/Mdl ALLISON 250-C20 SERIE			Fatal 0 Ser Inj 0	Flt Conducted Under: FAR 137
Opr Name: PROVINE HELICOPTER SERVICE INC	Opr dba:			Aircraft Fire: NONE
				AW Cert: SPR

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## Events

1. Maneuvering-low-alt flying - Loss of engine power (total)
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## Narrative

On November 7, 2017, about 0930 central standard time, a Bell 206B helicopter, N93PH, landed hard after experiencing an unexpected "yaw" near Rolling Fork, Mississippi. The helicopter sustained substantial damage to the tailboom, and the pilot sustained minor injuries. The helicopter was registered to, and operated by, Provine Helicopter Service Inc., as a 14 Code of Federal Regulations Part 137 aerial application flight. Visual meteorological conditions prevailed, and no flight plan was filed. The local flight originated from a nearby staging area about 0900.

The pilot reported that he was spraying a bayou when he felt the helicopter yaw. He climbed over the surrounding trees, but the helicopter didn't have enough power to sustain flight; therefore, he landed it in a field below. The helicopter landed hard and the main rotor blades severed the tailboom before the helicopter came to rest on its right side.

The helicopter has been moved to a secure location for further examination.

# National Transportation Safety Board - Aircraft Accident/Incident Database

Accident Rpt# CEN17LA174	05/02/2017 635 CDT	Regis# N457PH	Venice, LA	Apt: Grand Bay Receiving Station NONE
Acft Mk/Mdl BELL 407		Acft SN 53121	Acft Dmg: SUBSTANTIAL	Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl ROLLS-ROYCE 250 C478		Acft TT 5839	Fatal 0 Ser Inj 0	Flt Conducted Under: FAR 135
Opr Name: PHI, INC.		Opr dba:		Aircraft Fire: NONE

## Events

1. Enroute-cruise - Part(s) separation from AC

## Narrative

On May 2, 2017, about 0635 central daylight time, a Bell 407 helicopter, N457PH, registered to and operated by PHI Helicopters, Inc., Lafayette, Louisiana, made a precautionary landing at Grand Bay Receiving Station near Venice, Louisiana, after the pilot noticed an in-flight vibration. The pilot and five passengers on board the helicopter were not injured and the helicopter sustained substantial damage. The non-scheduled domestic passenger flight was being conducted under the provisions of Title 14 Code of Federal Regulations Part 135, and a company VFR flight plan had been filed. Visual meteorological conditions prevailed at the time of the accident. The cross-country flight originated from Boothville (LS08), Louisiana, at 0629, and was en route to Main Pass 311A in the Gulf of Mexico when the accident occurred.

The pilot said he detected an in-flight vibration and made a precautionary landing on the Grand Bay oil platform. As he was shutting down the engine, the vibration increased and he initiated an emergency shutdown using the rotor brake. Post-accident inspection revealed the tip block and weights had separated from one of the tail rotor blades. Cracks were noted on the tail rotor gear box mounting hardware and the tail boom.

The tail rotor hub and blade assembly, tail rotor gear box with two fractured studs, and tail boom support casting were sent to NTSB's Materials Laboratory for examination. In addition to NTSB's staff, representatives from PHI, Inc., and Bell Helicopter were present for the laboratory examination. Visual examination of the tail rotor confirmed the tip block and blade tip weights were missing from one of the tail rotor blades. According to PHI, the blade had a total service life of 2,658.65 hours, and had a tip block replacement repair approximately 65 hours prior to the separation. The examination found that the tip block separated along the adhesive interface, leaving the majority of the adhesive attached to the blade skin. The adhesive remaining on both skins appeared as a waffle pattern, indicative of partial bonding and subsequent interfacial separation. Approximately 50% of the adhesive surface had smooth and glossy surfaces consistent with voids and lack of contact between the adhesive and the tip block.

The tail rotor gearbox was detached from the tail boom support casting, and the two outboard attach studs were fractured. The entire support casting was fractured and all but 2.7 inches of the skin and the four-inch wide cover were cracked. The fracture in the casting and crack in the skin were consistent with overstress separations. Both fractured left-hand studs displayed reversed bending fatigue fractures. Magnification of the fracture faces revealed features and topographies consistent with multiple origin reversed bending fatigue initiating in the respective root radii on opposed sides of each studs. Fretting and rub marks were observed on both the support casting and tail rotor gearbox where the attach studs were fixed. The tail rotor gearbox alignment dowel pins were missing. The tail boom support casting had cracks at the two forward stud hole locations, and stud hole elongation was noted at the two aft stud hole locations. A circumferential crack had formed from the forward left stud hole along the left side. On May 2, 2017, about 0635 central daylight time, a Bell 407 helicopter, N457PH, registered to and operated by PHI Helicopters, Inc., Lafayette, Louisiana, made a precautionary landing at Grand Bay Receiving Station near Venice, Louisiana, after the pilot noticed an in-flight vibration. Visual meteorological conditions prevailed at the time of the accident. The non-scheduled domestic passenger flight was being conducted under the provisions of Title 14 Code of Federal Regulations Part 135, and a company VFR flight plan had been filed. The pilot and five passengers on board the helicopter were not injured. The cross-country flight originated from Boothville (LS08), Louisiana, at 0629, and was en route to Main Pass 311A in the Gulf of Mexico when the accident occurred.

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According to Bell Helicopters, after repairs were made to tail rotor blades, a 1,320-lb. pull test was performed on the tip block, a tap test was performed to check for voids, a peel test was performed from skin patch material, and a water leak test was performed. Bell reported that no blade had ever failed the 1,320-lb. pull test, and the facility had made approximately 25 tail rotor tip block crack repairs per year.

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Incident Rpt# OPS17IA008B    12/14/2016 1743 PST    Regis#    San Francisco, CA    Apt: San Francisco Intl SFO  
Acft Mk/Mdl BOEING 737-924ER    Acft Dmg: NONE    Rpt Status: Prelim    Prob Caus: Pending  
Fatal 0    Ser Inj 0  
Opr Name:    Opr dba:    Aircraft Fire: NONE  
AW Cert: STT

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## Events

1. Takeoff - Runway incursion veh/AC/person

# National Transportation Safety Board - Aircraft Accident/Incident Database

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Incident Rpt# OPS17IA008A	12/14/2016 1743 PST	Regis#	San Francisco, CA	Apt: San Francisco Intl SFO
Acft Mk/Mdl BOMBARDIER INC CL 600 2B19-100		Acft SN 7967	Acft Dmg: NONE	Rpt Status: Prelim Prob Caus: Pending
Eng Mk/Mdl GE CF34 SERIES			Fatal 0 Ser Inj 0	
Opr Name:		Opr dba:		Aircraft Fire: NONE
				AW Cert: STT

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## Events

1. Taxi-to runway - Runway incursion veh/AC/person

## Narrative

On December 14, 2016, about 1743 pacific standard time, a runway incursion occurred at San Francisco International Airport (SFO), San Francisco, California, when SkyWest Airlines flight 5086, a CL-600-2B19, crossed the runway hold short line to runway 28L at the taxiway "Juliet" intersection while another air carrier flight was on takeoff roll. There were no injuries reported to the crew or passengers of either flight. The SkyWest flight was operating under the provisions of Title 14 Code of Federal Regulations Part 121 from SFO to Ontario International Airport (ONT), Ontario, California. Night visual meteorological conditions (VMC) prevailed at the time of the incident.

# National Transportation Safety Board - Aircraft Accident/Incident Database

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Accident Rpt# WPR16LA107	05/12/2016 1413 PDT	Regis# N1114A	Acampo, CA	Apt: Lodi 103
Acft Mk/Mdl CESSNA 208B-B		Acft SN 208B0309	Acft Dmg: SUBSTANTIAL	Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl P&W PT6A SER		Acft TT 12849	Fatal 0 Ser Inj 0	Flt Conducted Under: FAR 091
Opr Name: PARACHUTE CENTER		Opr dba:		Aircraft Fire: NONE
				AW Cert: STN

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## Events

1. Enroute-climb to cruise - Loss of engine power (total)
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## Narrative

On May 12, 2016, about 1413 Pacific daylight time, a Cessna 208B, N1114A, was substantially damaged during a forced landing near Acampo, California. The airplane was registered to Flanagan Enterprises (Nevada) INC., and operated by the Parachute Center under the provisions of 14 Code of Federal Regulations Part 91. The commercial pilot sustained minor injuries and his 17 passengers were not injured. Visual meteorological conditions prevailed and no flight plan was filed for the skydiving flight. The local flight originated about 1 minute prior to the accident.

The pilot reported that following takeoff from runway 26, he made a right turn and continued his climb for the skydive drop, however, as the airplane passed 1,000 ft above ground level (agl), the engine lost power. The pilot initiated a turn toward the airport, however, realized he was unable to make it, and landed in an open field. During the landing roll, the airplane exited the field, crossed a road, impacted a truck, continued into a vineyard, and nosed over.

Examination of the airplane by a Federal Aviation Administration inspector revealed that the fuselage and left wing were substantially damaged. The wreckage was recovered to a secure location for further examination.

Examination of the recovered wreckage was conducted on May 17 and 18, 2016. The engine remained partially attached to the fuselage. The fuel pressure line that connects the fuel control unit to the airframe fuel pressure transducer, Pratt & Whitney Canada (PWC) part number 3033981, was fractured below the fuel control unit fitting swaged seat. The supporting clamp, PWC part number 3006614, was fractured and was separated from its mating fuel pressure fuel line, PWC part number 3032010. In addition, the airframe P3 air line that provides air to the vacuum system exhibited a hole within the tube.

The operator reported that they had replaced the fuel line, PWC part number 3033981, the night before the accident due to the original fuel line being fractured. They stated that the new fuel line had about 4 hours of operational time since the installation. Review of the maintenance logbooks revealed that an entry regarding the replacement of the fuel line was dated April 11, 2016, with no airframe, engine, or HOBBS meter times listed. The operator was further questioned about what manual they used regarding engine maintenance and they replied they used the manufacturers manual for all engine related maintenance. When questioned about the supporting clamp, PWC part number 3006614, the operator stated that the clamp was attached at the time of the fuel line replacement.

Both the new and old fuel lines and separated clamp were sent to the National Transportation Safety Board Materials Laboratory for further examination. A Senior Materials Engineer examined the fuel lines and clamp and reported that the fuel line fracture surfaces were examined with the aid of a digital optical microscope and a scanning electron microscope and both fractured tubes were found to exhibit features consistent with crack initiation due to reverse bending fatigue.

The metal band of the clamp was fractured near the intersection of the tab and the loop portion of the clamp. The fracture surfaces were examined and exhibited features consistent with crack initiation at the inward-facing side of the tab due to bending fatigue. The fracture surface exhibited a comparatively flat appearance with curved crack progression marks on the fracture surface consistent with the crack initiating on the inward-facing side of the tab.

For further information, see the Materials Laboratory Factual Report within the public docket for this accident.



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Accident Rpt# WPR16FA054	01/18/2016 1000 MST	Regis# N711BX	Cedar Fort, UT	Apt: N/a
Acft Mk/Mdl CESSNA 525		Acft SN 525-0299	Acft Dmg: DESTROYED	Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl WILLIAMS INTERNATIONAL FJ 44		Acft TT 2304	Fatal 2 Ser Inj 0	Flt Conducted Under: FAR 091
Opr Name: DONALD L BAKER		Opr dba:		Aircraft Fire: UNK
				AW Cert: STN

## Events

1. Enroute-climb to cruise - Unknown or undetermined

## Narrative

On January 18, 2016, about 1000 mountain standard time, a Cessna 525, N711BX, was destroyed following a loss of control and in-flight breakup while maneuvering at altitude near Cedar Fork, Utah. The airline transport pilot and his sole passenger sustained fatal injuries. Instrument meteorological conditions prevailed in the area, and an instrument flight rules (IFR) flight plan was filed for the personal cross-country flight, which was operated under the provisions of 14 Code of Federal Regulations Part 91. The flight departed Salt Lake City International Airport (SLC), Salt Lake City, Utah, about 0950, with an intended destination of Tucson International Airport (TUS), Tucson, Arizona.

According to air traffic control voice communication and radar information, the pilot contacted the SLC departure controller at 0951:59 and reported that he was climbing through 7,500 ft mean sea level (msl) for 10,000 ft (all altitudes are expressed as msl unless otherwise noted). The controller then cleared the pilot to climb to and maintain Flight Level 230 (FL230), and to delete speed restrictions; the pilot confirmed the clearance. At 0952:21, the controller instructed the pilot to maintain 14,000 ft, to delete all speed restrictions, and asked him what speed he was climbing at; the pilot confirmed the clearance and stated that he was climbing at 200 knots (kts).

At 0955:01, while approaching 14,000 ft the pilot reported that he had a failure with his Flight Management System (FMS), that he was "switching to NAV for a second," and would be exceeding the assigned altitude. This was followed by an unintelligible transmission. At 0955:16, the controller instructed the pilot to descend and maintain 14,000 ft and to fly his present heading. About 10 seconds later, the pilot advised the controller that he had an autopilot failure, and requested a climb to visual meteorological conditions. The controller instructed the pilot to climb and maintain FL180. At 0955:47, the pilot responded by confirming the climb to FL180. The controller then asked the pilot if he needed assistance. The pilot did not immediately respond, and the controller asked him a second time. At 0956:16, the pilot responded "negative," saying that he was "just trying to get to clear skies," and was climbing to FL180. The pilot stated that his "number 2" was working, and that his "altitude" had failed. The pilot concluded the transmission by saying, ".so, uh, my number two is working, climbing to one eight thousand."

At 0956:32, the controller advised the pilot that traffic would be crossing above him at FL190, and that it was important that he level the airplane at FL180; the pilot replied, "We'll be watching." At 0956:45, the controller advised the pilot of two areas of light precipitation directly ahead of the airplane, and asked the pilot if he would need vectors to clear the weather. At 0956:59, the pilot responded that he would appreciate any vectors possible. Shortly thereafter, at 0957:06, the controller asked the pilot to "...paint a picture for me of where you think the clearest skies would be. I can vector you wherever you need to go." At 0957:12, the pilot replied that he was heading to TUS, his altitude would not hold, and that he was hand flying the airplane. About this time, radar showed the airplane beginning a right turn from its previously-established southerly heading to a southwesterly heading, though the airplane had neither been cleared to do so by the controller nor had the pilot informed the controller of the deviation. About 0957:20, the pilot transmitted that he would appreciate any vectors possible. About 15 seconds later, the controller advised the pilot that he was showing him at 17,500 ft, directed the pilot to fly his present heading, and stated that the airplane would be clear of the precipitation in about 4 miles. About 17 seconds later, the pilot transmitted, "...ok, MAYDAY. I do need to get up higher. I am losing different instruments. I'd really like to get clear of weather." At 0958:01, the controller issued the pilot a clearance to climb and maintain FL230, which the pilot confirmed. About 0958:26, the controller amended the previous clearance and instructed the pilot to climb to and maintain FL310, which the pilot initially confirmed, but shortly thereafter stated, "...yeah. I can't even dial that in. Still climbing, passing twenty thousand, so I'm just going to be reading it out to be sure my second is operating correctly."

At 0958:46, the controller stated that he was showing the airplane climbing through 20,200 ft, and asked the pilot if he wanted to continue to TUS; the pilot replied, "That is affirmative." At 0958:53, when the airplane was at 20,700 ft, the controller issued the pilot a no-gyro turn to the left for vectors to the southeast; this occurred about 1 minute 41 seconds after the airplane had turned southwest. Radar data showed that the pilot initiated a right turn from a southwesterly heading at an altitude of 20,700 ft. At 0959:12, the airplane reached an altitude of 21,300 ft. msl, and was still in the right turn. At 0959:13, the controller stated, "November one bravo x-ray. I show you in a right turn. Can you turn left?" At 0959:17, while climbing out of 21,300 ft, the pilot replied that he was "trying to climb."

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About 0959:47, the controller advised the pilot that he had lost the airplane's altitude readout, and asked the pilot the airplane's altitude. There were no further transmissions received from the pilot. Between 0959:49 and 0959:58, the airplane descended from an altitude of 21,300 ft to 16,000 ft, with its rate of descent during this time increasing from 9,600 ft per minute (fpm) to 36,000 fpm.

The Utah County Sheriff's Office collected four witness statements. One witness heard a loud boom and about 45 seconds later heard a motor sputtering, followed by seeing a piece of the airplane falling; the piece that he observed was on fire, but the witness could not identify what it was. The witness stated that he heard the plane crash but never saw it. A second witness said he heard a boom but did not report seeing [the airplane]. Another witness heard an explosion while in his house, then went outside and saw debris falling from the sky. The fourth witness reported hearing a loud explosion and heard the airplane descend, but did not hear the impact.

Within hours of the accident, a Federal Aviation Administration (FAA) inspector responded to the accident site. The inspector reported that he did not observe ice accumulation on any of the airplane's surfaces during his onsite examination. The inspector stated that it was snowing at the accident site throughout the day.

## PERSONNEL INFORMATION

The pilot was issued an airline transport pilot certificate with an airplane multiengine land rating on April 8, 2008, which included commercial privileges for single-engine land airplanes, and a A/CE-525S type rating for single-pilot operations.

A review of the pilot's personal logbook revealed that, at the time of the accident, he had accumulated a total flight time of 3,336 hours, of which 3,138 hours was as pilot-in-command, and 2,015 hours was multiengine time. The pilot had 1,588 total hours of turbojet time, all in the accident airplane. The pilot had flown 8.8 hours, 8.8 hours, and 7.9 hours in the last 90, 60, and 30 days respectively. The pilot was current and qualified to operate the airplane in single-pilot flight operations.

On December 1, 2014, the pilot was issued an FAA third-class airman medical certificate with the restriction, "Must wear corrective lenses." At the time of the application, the pilot reported a total flight time of 3,232 hours, of which 55 hours was accumulated in the previous 6 months.

Records provided by FlightSafety International's (FSI) San Antonio Learning Center, San Antonio, Texas, revealed that, since 2011, the pilot had attended CE-525 recurrent training on a semi-annual basis. The pilot attended his most recent CE-525 recurrent training from August 7, 2015 through August 9, 2015. At the time of his training, the pilot reported a total time of 3,113 hours, with 1,563 hours of turbo-jet time in multiengine airplanes. The FSI recurrent training course consisted of 12.5 ground training hours, and 6 hours of flight simulator time, each of which the pilot completed satisfactorily.

As annotated on the FSI Client Information Sheet, the pilot reported under Type of Flight Director: [Garmin] G750; dual Garmin GTN 750 units were installed in the accident airplane in October 2014. According to the FSI Director of Training Operations, FSI does not possess any Citation simulators configured with this avionics suite. Further, the Director of Training stated that FSI did not provide the accident pilot with training specific to the operation and use of the two Garmin GTN 750. At the time of the accident, the pilot had accumulated a total of 97.8 hours of flight time in the accident airplane since the modification had been completed. Additionally, and in a telephone conversation with the NTSB IIC, the FAA Certificate Management Office, which is located in Wichita, Kansas, and who manages the FSI certificate, reported that while recommended to do so, FSI was not required to provide the pilot with specific training for the Garmin 750 and GTX 33 equipment.

## AIRCRAFT INFORMATION

The airplane, serial number 525-0299, had a low-wing, T-tail configuration, with retractable tricycle landing gear. The cabin was pressurized, and the airplane was capable of operating at a maximum pressure altitude of 41,000 ft. The airplane was configured for up to 7 occupants, including the pilot(s). It was approved for single-pilot operations provided the pilot-in-command held a CE525 (single-pilot) type rating. The airplane was equipped with two Williams International FJ44-1A medium-bypass turbofan engines installed on the rear fuselage pylons, each of which produced 1,900 lbs. of thrust.

## Maintenance

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According to Cescom Maintenance Transaction Records provided by Textron Aviation, the airplane's most recent maintenance occurred on January 4, 2016, when the left and right horizontal stabilizer deice boots were replaced at Mesa Citation Service Center, Mesa, Arizona. At the time of the inspection, the airframe had accumulated 2,301.9 hours, the #1 (left engine) 2257.1 hours, and the #2 (right engine) 2205.4 hours. At the time of the accident, the airplane had accumulated about 3 hours since this inspection.

## Avionics

During the investigation Sierra Industries provided the following information relative to the Garmin GTN 750 flight management system as installed in the accident airplane:

In October 2014, Sierra Industries installed a Dual Garmin GTN 750 system into a Cessna Citation Jet, Model 525, Serial Number 525-0299. The Garmin GTN 750 is a fully integrated Global Positioning System (GPS), Navigation (NAV), Communication (COMM), and Multi-Functional Display (MFD) system. The installation was approved under FAA Form 337, dated 10/10/2014.

The Garmin GTN 750 is a fully integrated GPS/NAV/COM/MFD system. Each unit is 6.25-inch-wide x 6-inch-high and provides an 800 x 600-pixel display on a 6.9-inch diagonal color liquid crystal display (LCD) screen with touchscreen controls. The unit simplifies pilot workload by providing a visual display of controls and functions. The GTN 750 system has its own Global Positioning System/Satellite-based augmentation system (GPS/ SBAS) and navigator and flight planning function. In addition, the GTN 750 provides VHF Com and VHF Nav radios. The GTN 750 is a certified component with an FAA TSO C146c, and is certified for primary domestic, oceanic, and remote navigation, including en route, terminal, and non-precision approaches, and approach in vertical guidance, such as localizer performance with vertical guidance (LPV), lateral navigation (LNAV), and vertical navigation (VNAV).

The airplane was equipped with a Honeywell SPZ-5000 integrated flight guidance system (IFGS), which provided, in part, flight director guidance, an altitude alerting system, and autopilot. For engagement of the autopilot and yaw damper, the autopilot system requires a single directional gyro and two vertical gyro sources; the VG-14A vertical gyro is the primary source for the flight guidance system. This system comprised a display guidance computer (IC-500), air data system, attitude and heading reference (vertical and directional gyros), electronic attitude director indicator (EADI), electronic horizontal situation indicator (EHSI), autopilot controller, mode selector, and autopilot servos. The IC-500 display guidance computer (DGC) was the focal point for the flow of information within the IFGS. It received information from various sensors and control system inputs, and converted this information to pilot-selected formats for display on the pilot's EADI and EHSI.

The #1 VG-14A supplied data to the IC-500 for the pilot's side EADI and EHSI. The #2 VG-14A provided data to the IC-500 for comparison to the #1 VG-14A data and supplied data directly to the co-pilot's side attitude indicator. A cockpit panel-mounted switch allowed the pilot to switch between the #1 VG-14A and the #2 VG-14A to display information on the pilot's side EADI/EHSI.

The two AC inverters provided power to the two VG-14A gyros. The #1 inverter supplied power to the #1 VG-14A, and the #2 inverter supplied power to the #2 VG-14A. Should one of the inverters fail, both gyros can be powered by one inverter when the pilot switches to the inverter that remains powered. The airplane was also equipped with a standby jet gyro attitude indicator with a separate power supply, which supplied emergency power for 30 minutes.

A review of the airplane's maintenance records showed that during October 2014, several avionics components were removed. The replacement avionics consisted of several Garmin GA55 antennas, a Skylight Converter, dual Garmin GTN 750s, which incorporated a Global Positioning System, Navigation and Communication capabilities, a Multi-Functional Flight Display, a Garmin GDL69A XM Weather and Radio remote sensor, a Shadin ADC-200 Fuel Flow Indicator, and dual Garmin GTX33 transponders.

The airplane was also equipped with two AM-250 Barometric altimeters as part of the reduced vertical separation minimums (RVSM) modification. The pilot's AM-250 supplied ARINC 429 air data information to the Number 1 Garmin GTX33 transponder (XPDR 1) and to the IC-500 DGC; it also supplied ATC encoded altitude data to the IC-500 DGC. The co-pilot's AM-250 supplied air data information to the Number 2 Garmin GTX33 transponder (XPDR 2).

Additionally, the airplane was equipped with one encoding altimeter, P/N 44929-013, S/N 1783. This altimeter was found installed within the left or (pilot's side) instrument panel located below the vertical speed indicator. The altimeter indicated 5,280 feet, and a barometric setting of 30.09 inHg, which was observed at the accident site.

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# National Transportation Safety Board - Aircraft Accident/Incident Database

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## METEOROLOGICAL INFORMATION

At 0954, the weather reporting facility at the Provo Municipal Airport (PVU), Provo, Utah, which was located about 16nm southeast of the accident site, reported wind calm, visibility 10 miles, scattered clouds at 3,000 ft above ground level (agl), broken clouds at 3,500 ft agl, overcast clouds at 4,000 ft agl, temperature 0°C, dew point -3°C, and an altimeter setting of 30.11 inches of mercury.

At 0955, the weather reporting facility at the South Valley Regional Airport (U42), Salt Lake City, Utah, which was located about 18nm north-northeast of the accident site, reported wind calm, visibility 10 miles, scattered clouds at 3,800 ft agl, broken clouds at 4,300 ft agl, overcast clouds at 4,900 ft agl, temperature 2°C, dew point -1°C, and an altimeter setting of 30.09 inches of mercury.

In a review of the weather conditions that the pilot may have encountered during the 10-minute flight, an NTSB Senior Meteorologist reported that the airplane would have ascended through an icing layer during the climb to FL210, with solid instrument meteorological conditions (IMC) likely from 9,000 ft msl through FL250. The flight would have then encountered layered clouds from FL250 through FL320; however, there were no pilot reports available to provide further information regarding the locations of cloud layers between these altitudes. The accident flight was also operating in a layer with super-cooled large drop (SLD) icing and ice crystals. Additionally, AIRMETs for icing conditions and mountain obscuration were valid for the area of the accident site at the time of the accident. No reports of lightning strikes were recorded near or around the accident site at the time of the accident.

## WRECKAGE AND IMPACT INFORMATION

Investigators from the NTSB and FAA, accompanied by representative from Textron Aviation, examined the wreckage site the day following the accident.

The wreckage was located in open, flat pasture ground, about 1 nautical mile (nm) southeast of Cedar Fort, Utah, and about 28 nm south-southwest of SLC. The onsite examination revealed that the airplane had experienced an in-flight breakup, with all structural components located at the accident site. Various airframe components were found scattered throughout a rectangular area measuring about 4,000 ft long and about 1,500 ft wide on an approximate 247° magnetic heading.

The main wreckage consisted of the fuselage with attached cockpit assembly and two seats, the cabin area with all five seats, the center wing section, and the aft fuselage extending aft to, but not including the empennage. The center wing section was located near the main wreckage and was separated outboard of the main landing gear on the right wing, and inboard of the landing gear on the left wing. The inboard section of the right wing displayed evidence of extensive thermal damage. The right flap remained attached to the wing, with extensive thermal damage to the bottom of the flap. Additionally, the inboard section of the right wing displayed evidence of extensive thermal damage. The left flap had separated from the wing, and was found upright in the ground next to the main wreckage. The right main landing gear and the nose landing gear were observed in the UP position. The left main landing gear was found separated from the landing gear housing, but remained near the main wreckage. The actuator was observed in the extended position, with damage to the actuator housing near the wing attachment point noted. The wreckage came to rest inverted, slightly on its left side, and oriented on a measured magnetic heading of 42°.

All airframe components, except for both engines, were located northeast of the main wreckage site. They consisted primarily of the outboard sections of both left and right wings, the outboard sections of the left horizontal stabilator, and the airplane's empennage.

The left outboard wing section was located about 3,000 ft northeast of the main wreckage, and was bent and twisted. The left aileron remained partially attached to the wing. About 4 ft of the outboard section of the wing was separated and not recovered. The upper interspar skin was separated from the main body of the wing. The spoiler/speed brake actuator measured 2.25 inches from the center of the bolt to the face of the actuator, with .1 inches of chrome showing. The fuel cap was secure.

The right outboard wing section was located about 4,700 ft northeast of the main wreckage and exhibited top wing skin separation, with the aileron separated mid-span at the outboard attach point. The spoiler/speed brake actuator measured 2.25 inches from the center of the bolt to the face of the actuator, with .5 inches of chrome showing. The fuel cap was secure.

The empennage was located about 1,700 ft east of the main wreckage and was intact, except for its left outboard horizontal stabilator and elevator sections. The separated outboard horizontal stabilator and elevator section was located about 4,100 ft northeast of the main wreckage, and exhibited deformation where it had separated from its mating surface. The leading edge of the vertical stabilizer exhibited a downward-oriented crease about mid-span. The rudder remained

attached to the vertical stabilizer at all attach points. The rudder trim actuator measured 1 inch.

The right engine and carry-through beams were located about 300 ft north of the wreckage. Fragments of the airframe hardware were found attached to the engine. The outer cowling displayed evidence of impact damage. Fan blades did not display rotational scoring. An initial onsite inspection revealed no catastrophic anomalies with the engine.

The left engine was not located during the initial onsite examination. However, on April 9, 2016, the engine was located about 3,000 ft west-northwest of the main wreckage. The outer cowling displayed heavy impact damage. The engine was subsequently recovered to a secured storage facility in Phoenix, Arizona for further examination.

An examination of the flight control system revealed that the control cables either remained attached to their respective attach fittings or had separated in a manner consistent with tension overload. In addition, several control cables were cut by the recovery personnel.

On March 2 and 3, 2016, under the supervision of the NTSB IIC, and technical support provided by field representatives for Williams International, Honeywell, and Textron Aviation, a detailed examination of the engine and airframe was performed at the facilities of Air Transport, Phoenix, Arizona. Additionally, on April 27, 2016, under the supervision of the NTSB IIC, and with the support of a Williams International field technician, the airplane's left engine was examined in detail. The results of the examinations revealed no mechanical anomalies with the airframe or either engine that would have precluded normal operation. (For additional information, refer to the NTSB Summary of Airplane Accident report, which is appended to the docket for this accident.)

## MEDICAL AND PATHOLOGICAL INFORMATION

The Office of the Medical Examiner, Utah Department of Health, Salt Lake City, Utah, performed an autopsy on the pilot. The results of the examination revealed that the pilot was fatally injured due to total blunt force injuries.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted forensic toxicology examinations of specimens from the pilot, and reported that no ethanol was detected in muscle or brain, with no testing performed for carbon monoxide and cyanide. Valsartan (Diovan) was detected in the liver and kidney. Valsartan is a prescription medication used alone or in combination with other medications to treat high blood pressure.

## TESTS AND RESEARCH

During the investigation numerous avionics system components were tested with no evidence of any malfunctions or anomalies that would have precluded normal operation. (Refer to the NTSB System's Group Chairman's Factual Report, which is appended to the docket for this accident, which provides detailed information relative to the operation of each individual component, and its accompanying examination.)

At the request of the NTSB IIC, and under the supervision of an NTSB air safety investigator, on January 17, 2017, the airplane's standby attitude indicator (PN: 5010-1197-09, SN: 6494, Model: AI-804AH) was examined at the facilities of Air Transport, Phoenix, Arizona. The examination, which was performed by a Honeywell Aerospace engineer, revealed no evidence to indicate that the component was not operating normally prior to impact with terrain. (Refer to the Honeywell Standby Display - Disassembly and Examination Report, which is appended to the docket for this report, for a detailed explanation of the examination.)

## Airplane Performance

After departing SLC about 09:50:30, the airplane flew a track of about 180° for the first seven minutes of flight. About 09:57, it began a tightening right turn that ended in a final radar return at 09:59:58.

The airplane climbed in three distinct segments. The first was after takeoff from 4,200 ft msl (SLC elevation) to 14,800 ft, after which it descended to 14,000 ft between 09:55:30 and 09:55:49. The airplane's equivalent airspeed during this climb was increasing, but less than 190 kts. During the descent, the airspeed increased to over 240 kts. During the second climb segment, which was from 14,000 ft to 18,000 ft, the airspeed continuously decreased to 170 kts. Following the second climb, which ended at 09:57:07, the airplane held its altitude for 14 seconds before descending briefly to 17,400 ft. During the descent, the

airplane's speed increased to near 230 kts. The airplane completed its third climb to 21,000 ft, during which its airspeed dropped to about 140 kts. As the airplane leveled from 09:59:03 until 09:59:44, its airspeed increased to 200 kts. The airplane then entered a rapid descent, and the final radar return was at 16,000 ft.

During the second climb, the airplane initiated a right turn at a rate of less than 1ø per second. During the third climb, the rate of turn began about 1.75ø per second and increased throughout the turn, which necessitated an increased angle of bank. The smoothed bank angle increased rapidly to near 90ø before the loss in altitude. The straight calculated bank angle, which anticipates the airplane flying through the next radar point, was 122ø of right bank, consistent with a partially-inverted attitude. The next radar point, 4.5 seconds later, recorded an 800-ft loss of altitude.

According to the Aircraft Flight Manual (AFM), "full application of rudder and aileron controls, as well as maneuvers that involve angles-of-attack near the stall, should be confined to speeds below maximum maneuvering speed." For a pressure altitude of 21,000 ft, maneuvering speed (Va) for the airplane could be between 145 and 182 kts depending on whether the airplane was operating at a low gross weight or high gross weight, respectively. Weight and balance calculations indicated that the airplane was operating about 415 pounds below its maximum gross takeoff weight at the time of departure.

## ADDITIONAL INFORMATION

The Pilot's Abbreviated Emergency/Abnormal Procedures Checklist for the Citation 525, EFIS FAILURE (FLT GUIDANCE COMPUTER FAILURE), states that if a red X appears on either the EADI and/or the EHSI, or both displays are blank, and after having checked and reset the Flight Guidance System circuit breaker and both screens still display a red X, or both are blank, to "Continue the flight by referring to the standby gyro and the pilot's air data and NAV instruments, and cross referencing the copilot's attitude and heading. The autopilot will be inoperative."

According to FAA Advisory Circular AC 60-4A, "Pilot's Spatial Disorientation," tests conducted with qualified instrument pilots indicated that it can take as long as 35 seconds to establish full control by instruments after a loss of visual reference of the earth's surface. AC 60-4A further states that surface references and the natural horizon may become obscured even though visibility may be above VFR minimums, and that an inability to perceive the natural horizon or surface references is common during flights over water, at night, in sparsely-populated areas, and in low-visibility conditions.

The FAA Civil Aeromedical Institute's "Intro to Aviation Physiology" defines spatial disorientation as a loss of proper bearings or a state of mental confusion as to position, location, or movement relative to the position of the earth. Factors contributing to spatial disorientation include changes in acceleration, flight in instrument meteorological conditions (IMC), frequent transfer between visual meteorological conditions (VMC) and IMC, and unperceived changes in aircraft attitude. The publication states that pilots flying in IMC are more susceptible than usual to the stresses of flight, such as fatigue and anxiety, and any event that produces an emotional upset is likely to disrupt the pilot's mental processes, making them more vulnerable to illusions and false sensations.

According to the FAA's Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A), "Va" is referred to as the airplane's calibrated design maneuvering speed. This is the maximum speed at which the limit load can be imposed (either by gusts or full deflection of the control surfaces) without causing structural damage. Operating at or below maneuvering speed does not provide structural protection against multiple full control inputs in one axis or full control inputs in more than one axis at the same time.

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Incident Rpt# OPS17IA014A    02/15/2017 2000 PST    Regis#    San Francisco, CA  
Acft Mk/Mdl EMBRAER S A ERJ170-200LR-200LR    Acft SN 17000508    Acft Dmg: NONE    Rpt Status: Prelim    Prob Caus: Pending  
Fatal 0    Ser Inj 0  
Opr Name:    Opr dba:    Aircraft Fire: NONE

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## Events

1. Approach - Air traffic event

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## Narrative

On February 15, 2017, about 2000 pacific standard time, a runway incursion occurred on runway 28L at San Francisco International Airport (SFO), San Francisco, California, when Virgin America, call sign Redwood, flight 920 was on line up and wait clearance issued by the local air traffic controller and Compass Airlines, call sign Compass, flight 6081 was cleared to land on the same runway. The air traffic controllers received an Airport Surface Detection System Model X (ASDE-X) alert and commanded the Compass flight to "go-around," and the crew subsequently performed a go-around maneuver. There were no injuries reported to the crew or passengers of either flight. Both flights were operating under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121. The Compass flight was arriving SFO from their departure airport of Los Angeles International Airport (LAX), Los Angeles, California. The Virgin America flight was operating the from SFO to McCarran International Airport (LAS), Las Vegas, Nevada. Night visual meteorological conditions (VMC) prevailed at the time of the incident.

# National Transportation Safety Board - Aircraft Accident/Incident Database

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Accident Rpt# CEN18LA026	11/07/2017 934 CST	Regis# N138WH	Sulphur, LA	Apt: N/a
Acft Mk/Mdl HUGHES 369D-D		Acft SN 911027D	Acft Dmg: NONE	Rpt Status: Prelim Prob Caus: Pending
			Fatal 2 Ser Inj 0	Fit Conducted Under: FAR 133
Opr Name: WINCO, INC.		Opr dba:		Aircraft Fire: NONE
				AW Cert: STN

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## Events

1. Maneuvering-low-alt flying - Low altitude operation/event

## Narrative

On November 7, 2017, at 0934 central standard time, a Hughes 369D helicopter, N138WH, was not damaged when its external cargo long line severed after contacting a shield wire suspended between power transmission towers located near Sulphur, Louisiana. The two linemen who were being hoisted on the long line were fatally injured when they fell about 100 ft to the ground. The helicopter was registered to and operated by Winco, Inc., under the provisions of 14 Code of Federal Regulations Part 133 as an external load flight without a flight plan. Day visual meteorological conditions prevailed for the local flight that departed at 0932 from a temporary landing zone located near the accident site.

According to the power company, the purpose of the flight was to install guard ropes between the deenergized power transmission lines before the existing shield wire from the nearby transmission tower was unsecured. The east/west power transmission lines crossed perpendicular over North Claiborne Street. There were three sets of bundled conductors (northern, center, and southern). The pilot reported that following a preflight safety briefing he and one of the linemen discussed the expected work tasks. The pilot stated that following his discussion with the lineman he brought the helicopter into a hover above the linemen to allow them to hook onto the external cargo long line. He then repositioned the helicopter to allow the linemen to work on the center conductor bundle. The pilot reported that after the linemen had tied-off the guard rope to the center conductor bundle, he repositioned the helicopter to allow work on the northern conductor bundle. The pilot reported that he saw one of the linemen grab hold of the conductor, and at the same time he also observed the long line in contact with the shield wire. The pilot stated that the long line severed as he turned the helicopter into the wind and attempted to coax the linemen away from the northern conductors. The pilot reported that immediately before the long line severed he observed one of the linemen tugging at the conductor in an attempt to reposition the guard rope perpendicular to the conductors. After the long line severed, he returned to the landing zone and made an uneventful landing. The pilot did not report any malfunction or failures with the helicopter that would have prevented normal operation. According to postaccident measurements made by local law enforcement and witness video footage of the flight, the 60 ft long unsheathed long line separated about midspan while it was in contact with the braided steel shield wire suspended between power transmission towers.

The nearest aviation weather reporting station was located about 9 nautical miles south of the accident site at Southland Field Airport (UXL), Sulphur, Louisiana. At 0935, the UXL automated surface observing system reported: wind from 210 degrees at 8 knots; visibility 10 miles; broken ceilings at 1,400 ft above ground level (agl), 2,400 ft agl, and 3,000 ft agl; temperature 27°C; dew point 23°C; and an altimeter setting of 30.11 inches of mercury.