National Transportation Safety Board
Aviation Accident Final Report

Location:	Cedar Fort, UT	**Accident Number:**	WPR16FA054
Date & Time:	01/18/2016, 1000 MST	**Registration:**	N711BX
Aircraft:	CESSNA 525	**Aircraft Damage:**	Destroyed
Defining Event:	Unknown or undetermined	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The airline transport pilot and passenger departed on a cross-country flight in instrument meteorological conditions in the light business jet. About 1 minute after departure, air traffic control instructed the pilot to climb and maintain an altitude of 14,000 ft mean sea level (msl). About 3 minutes later, the pilot stated that the airplane's flight management system (FMS) had failed. Shortly thereafter, he requested a climb and stated that he was "trying to get to clear skies." Over the next several minutes, the controller provided the pilot with headings and altitudes to vector the airplane into visual meteorological conditions. During this time, and over the course of several transmissions, the pilot stated that he was "losing instruments," was hand-flying the airplane (likely indicating the autopilot was inoperative), and that he wanted to "get clear of the weather."

Radar data indicated that, during the 10-minute flight, the airplane conducted a series of climbs and descents with large variations in airspeed. About 2 minutes before the loss of radar contact, the airplane entered a climbing right turn, reaching its highest altitude of about 21,000 ft, before it began a rapidly descending and tightening turn. Performance data revealed that, during this turn, the airplane entered a partially-inverted attitude, exceeded its design maneuvering speed, and reached a peak descent rate of about 36,000 ft per minute. Radar contact was lost at an altitude of about 16,000 ft msl, and the airplane subsequently experienced an inflight breakup. The wreckage was distributed over a debris path that measured about 3/4-mile long and about 1/3-mile wide.

Postaccident examination and testing of various flight instruments did not indicate what may have precipitated the inflight anomalies that the pilot reported prior to the loss of control. Additionally, all airframe structural fractures were consistent with ductile overload, and no evidence of any preexisting condition was noted with the airframe or either engine.

The airplane was equipped with three different sources of attitude information, all three of which were powered by separate sources. It is unlikely that all three sources would fail simultaneously. In the event the pilot experienced a dual failure of attitude instrumentation on

both the pilot and copilot sides, airplane control could have been maintained by reference to the standby attitude indicator. Further, the pilot would have been afforded heading information from the airplane's standby compass.

Although the pilot did not specifically state to the controller the nature of the difficulties he was experiencing nor, could the investigation identify what, if any, anomalies the pilot may have observed of the airplane's flight instruments, the pilot clearly perceived the situation as one requiring an urgent ascent to visual conditions. As a single pilot operating without the assistance of an additional crewmember in a high-workload, high-stress environment, the pilot would have been particularly susceptible to distraction and, ultimately, a loss of airplane control due to spatial disorientation.

Probable Cause and Findings

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

The pilot's loss of control due to spatial disorientation while operating in instrument meteorological conditions, which resulted in an exceedance of the airplane's design stress limitations, and a subsequent in-flight breakup. Contributing to the accident was the pilot's reported inflight instrumentation anomaly, the origin of which could not be determined during the investigation.

Findings

Aircraft	Lateral/bank control - Not attained/maintained (Cause) Performance/control parameters - Capability exceeded (Cause) Flt management computing sys - Malfunction (Factor)
Personnel issues	Spatial disorientation - Pilot (Cause) Aircraft control - Pilot (Cause)
Environmental issues	Ceiling/visibility/precip - Effect on operation (Cause)
Not determined	Not determined - Unknown/Not determined (Factor)

Factual Information

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."

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

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.

METEROROLOGICAL 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 1° per second. During the third climb, the rate of turn began about 1.75° per second and increased throughout the turn, which necessitated an increased angle of bank. The smoothed bank angle increased rapidly to near 90° before the loss in altitude. The straight calculated bank angle, which anticipates the airplane flying through the next radar point, was 122° 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.

History of Flight

Enroute-climb to cruise	Unknown or undetermined (Defining event) Loss of control in flight
Uncontrolled descent	Aircraft structural failure Part(s) separation from AC Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Airline Transport	**Age:**	59, Male
Airplane Rating(s):	Multi-engine Land; 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 3 With Waivers/Limitations	**Last FAA Medical Exam:**	12/01/2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	08/08/2015
Flight Time:	3334 hours (Total, all aircraft), 1588 hours (Total, this make and model), 2959 hours (Pilot In Command, all aircraft), 8.5 hours (Last 90 days, all aircraft), 7.1 hours (Last 30 days, all aircraft), 0.5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	**Registration:**	N711BX
Model/Series:	525	**Aircraft Category:**	Airplane
Year of Manufacture:	1999	**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	525-0299
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	01/04/2016, Continuous Airworthiness	**Certified Max Gross Wt.:**	10600 lbs
Time Since Last Inspection:	3 Hours	**Engines:**	2 Turbo Jet
Airframe Total Time:	2304.4 Hours at time of accident	**Engine Manufacturer:**	Williams International
ELT:	C126 installed, activated	**Engine Model/Series:**	FJ 44
Registered Owner:	On file	**Rated Power:**	1900 lbs
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	SLC, 4227 ft msl	**Distance from Accident Site:**	28 Nautical Miles
Observation Time:	0953 MST	**Direction from Accident Site:**	20°
Lowest Cloud Condition:		**Visibility**	10 Miles
Lowest Ceiling:	Broken / 2700 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	Calm /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	3°C / 1°C
Precipitation and Obscuration:	Light - Showers - Rain		
Departure Point:	Salt Lake City, UT (SLC)	**Type of Flight Plan Filed:**	IFR
Destination:	Tucson, AZ (TUS)	**Type of Clearance:**	IFR
Departure Time:	0930 MST	**Type of Airspace:**	Class B

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	Unknown
Ground Injuries:	N/A	**Aircraft Explosion:**	Unknown
Total Injuries:	2 Fatal	**Latitude, Longitude:**	40.313889, -112.080833

Administrative Information

Investigator In Charge (IIC):	Thomas Little	**Report Date:**	12/12/2017
Additional Participating Persons:	Mathew Green; Federal Aviation Administration; Salt Lake City, UT Andrew Hall; Textron Aviation; Wichita, KS Virgil Mill; Textron Aviation; Wichita, KS Jay Eller; Honeywell Aerospace; Phoenix, AZ Ernest King; Sierra Industries; Uvalde, TX Mahyar Heshmat; Williams International; Walled Lake, MI Donald Furmanski; Ametek Power & Data Systems; Harleysville, PA		
Publish Date:	12/12/2017		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=92582		