Aviation Investigation Final Report

Location:	Carson City, Nevada	**Accident Number:**	WPR14FA132
Date & Time:	March 8, 2014, 17:15 Local	**Registration:**	N76856
Aircraft:	Cessna 120	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The owner/pilot regularly made roundtrip flights between his home airport and another airport located about 25 miles to the northwest. A north-south mountain range, with peaks ranging between 8,300 and 9,400 ft above mean sea level (msl), separated the two airports. Due to the limited climb capability of the airplane, on each leg, the pilot would climb parallel to the mountain range until he gained sufficient altitude and then turn to cross the range. Thus, the pilot's normal westbound (outbound) crossing segment was situated well north of his eastbound (return) crossing segment. The pilot typically crossed the mountain range at an altitude of 8,500 to 9,000 ft msl, which provided limited terrain clearance.

After successfully completing the outbound trip in the morning, the pilot departed on the 30-minute return trip in the late afternoon likely about 1 hour before sunset. The pilot did not return home, and the airplane was reported missing on the following day about the same time that another pilot who was overflying the mountain range spotted the wreckage. The accident site was located at an elevation of about 6,200 ft msl about 7 miles north of the pilot's normal return trip crossing location, likely indicating that the pilot had turned early to cross the mountain range. Examination of the accident site indicated that the airplane impacted a hillside in a steep descent with a nose-down attitude. The airplane heading at the time of impact was about opposite of that required for the intended flight.

The impact trajectory and attitude, airplane heading, and accident location are consistent with the airplane exceeding the critical angle of attack and entering an aerodynamic stall during the pilot's execution of a course reversal turn. It is unknown why the pilot attempted to cross the mountain range at a different location than the one he normally used. It is possible that he turned early in order to cross before nightfall. Because he made the attempt to cross significantly closer to the departure airport than normal, there was a reduced amount of time and distance for the airplane to climb to an altitude sufficient to clear the mountain range.

Propeller damage signatures indicated that the engine was developing power at the time of impact. Except for the engine primer handle, which was found in the unlocked and partially extended position,

no pre-impact mechanical anomalies or deficiencies were noted with the engine or airframe. If the engine primer was unlocked during the flight, the engine would likely have been running rich, possibly resulting in reduced power and climb capability. However, the investigation was unable to determine whether the engine primer was unlocked during the flight or became unlocked during the accident sequence. A pilot report from earlier in the day indicated turbulence and downdrafts in the vicinity, which, if present during the accident flight, could have reduced the airplane's ability to clear rising terrain.

The premature eastbound turn, possibly in combination with reduced climb capability due to reduced engine power, downdrafts, or both, placed the airplane in a situation that prevented a successful crossing and that the pilot failed to respond to until it was too late to escape. The pilot's decision to reverse course may have been delayed because he had made many previous successful crossings and had a habit of crossing the range with limited terrain clearance. The delayed decision resulted in the pilot attempting the course-reversal turn without sufficient airplane performance capability to successfully complete it.

Probable Cause and Findings

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

The pilot's delayed decision to initiate a course-reversal turn when the airplane was unable to attain sufficient altitude to cross a mountain range, which resulted in the airplane exceeding its critical angle of attack and entering an aerodynamic stall during the turn. Contributing to the accident was the pilot's selection, for undetermined reasons, of a route different than his normal route.

Findings

Personnel issues	Decision making/judgment - Pilot
Personnel issues	Delayed action - Pilot
Aircraft	Climb capability - Capability exceeded
Aircraft	Angle of attack - Capability exceeded
Personnel issues	Aircraft control - Pilot
Personnel issues	Flight planning/navigation - Pilot

Factual Information

History of Flight

Enroute-climb to cruise	Loss of control in flight (Defining event)
Enroute-climb to cruise	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On March 9, 2014, about 1500 Pacific daylight time, the wreckage of a Cessna 120, N76856, was noticed by a pilot overflying mountainous terrain about 6 miles southeast of Carson City airport (CXP), Carson City, Nevada. The pilot notified the Carson City Sheriffs Office, and a ground team accessed the wreckage about 1600 that same day. They determined the identity of the airplane, and that the sole person on board had received fatal injuries. That person was subsequently identified as a private pilot who was the registered owner of the airplane. The personal flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91, and no FAA flight plan was filed for the flight. Neither the day or time of the departure, nor the day or time of the accident, were able to be determined with certainty.

According to the pilot's girlfriend, the airplane was based at Farias Wheel airport (NV33) Smith Valley, Nevada, and the pilot had flown to CXP on March 8 for some shopping errands. The girlfriend's last communication from the pilot was a text message from him at 1538 on March 8. Because the pilot occasionally remained overnight at CXP, his girlfriend did not report the airplane missing until the next day, March 9, at about the same time that the overflying pilot spotted the wreckage.

On scene and subsequent examination of the wreckage revealed that airplane damage and ground scars were consistent with a steeply-descending flight path in a steep nose-down attitude, and that the engine was developing power at the time of impact.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	59
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	November 14, 2013
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 4900 hours (Total, all aircraft)		

Federal Aviation Administration (FAA) records indicated that the pilot, age 59, held a flight instructor certificate with single and multi-engine, instrument airplane, ratings. His most recent flight review was completed in April 2013, and his most recent FAA second-class medical certificate was issued in November 2013. His most recent pilot logbook entry was dated March 2, 2014. Review of his logbook entries indicated that as of that date, the pilot had accumulated a total flight experience of 4,907.2 hours, including about 3,150 hours in single-engine airplanes.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N76856
Model/Series:	120	**Aircraft Category:**	Airplane
Year of Manufacture:	1946	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	11290
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	June 2, 2013 Annual	**Certified Max Gross Wt.:**	1450 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	5492 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	C85 SERIES
Registered Owner:	On file	**Rated Power:**	85 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

According to FAA information, the high-wing, taildragger-configuration airplane was manufactured in 1946. It was equipped with a Continental Motors C-85 series engine with a rated output of 85 horsepower. The airplane was purchased by the pilot in June 2012.

The maintenance records indicated that the most recent annual inspection was completed on June 2, 2013, when the airplane had a total time (TT) in service of 5,492.27 hours and an unspecified hour meter indicated 3,599.66 hours. Review of the available records did not indicate any unusual or uncorrected items.

The airplane was not equipped with a stall warning system or any navigation radios. A partially completed FAA Form 337, filed with the FAA records division in Oklahoma City, indicated that seats from a Cessna 150 were installed in the airplane in 1987, but that installation was not properly approved by the FAA. There was no evidence consistent with those seats adversely affecting either the flight, or the survivability aspects of the accident.

At the time of the accident, the pilot had the airplane for sale, and several advertisement postings for the

airplane were located in the airplane and on the internet.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Unknown	**Condition of Light:**	Not reported
Observation Facility, Elevation:	CXP,4705 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	17:15 Local	**Direction from Accident Site:**	325°
Lowest Cloud Condition:		**Visibility**	
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	
Precipitation and Obscuration:	N/A - None - Unknown precipitation		
Departure Point:	Carson City, NV (CXP)	**Type of Flight Plan Filed:**	None
Destination:	Smith Valley, NV (NV33)	**Type of Clearance:**	None
Departure Time:	15:00 Local	**Type of Airspace:**	

The date and time of the accident were not able to be positively established. The CXP conditions from local noon to sunset on March 8 included clear skies, with winds from the east at 10 knots or below. Temperatures during that period ranged between 10 and 17 degrees C.

A Pilatus PC-7 pilot reported that about 1245 on March 8, while inbound to CXP in the vicinity of the accident site, and at an altitude of about 1,000 feet above ground, he encountered turbulence conditions that were "really bumpy," as well as a significant up- and down- draft.

According to the United States Naval Observatory, sunset at the accident site occurred at 1759 on March 8.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	39.098056,-119.665

The impact site was at an elevation of about 6,200 feet msl, 6 miles, on a magnetic bearing of 131 degrees, from CXP. The site was near the eastern (higher, narrower) end of an approximately east-west valley in the mountain range that separated the origin and destination airports; the valley widened and

descended to the west. Terrain to the north, east, and south of the accident site was all higher than the impact site. The surrounding terrain was mostly covered by vegetation, with a mix of trees and low scrub. The wreckage was situated on a partially-vegetated sandy slope, with an incline of about 30 degrees, and a downslope direction of 160 degrees magnetic.

The wreckage was tightly contained, and the airplane orientation was right side up. The fuselage was aligned on a magnetic heading of about 312 degrees, which was essentially opposite the heading required for a flight directly to the pilot's home airport, his presumed destination. All major components were accounted for at accident site.

The airplane was constructed with an all-metal fuselage, with fabric-covered wings and empennage. The fuselage was extensively crushed in the up and aft direction until just aft of cabin. The engine intruded aft into the cabin/cockpit, and the instrument panel was severely deformed. The occupiable volume of the forward cockpit had been reduced to about 40 percent of its original value. First responders reported that the pilot had to be cut out of his four-point restraint system; all buckles/ends were secured. There was no evidence of airplane rotation (spin) at impact. There was no structural damage to the tailcone/aft fuselage or the empennage.

Both wings remained partially attached to the fuselage. Although still attached to the airplane, the left wing was also entangled in a tree that remained standing, and which was only slightly damaged. The tree damage signatures were consistent with a 50- to 70-degree airplane descent trajectory. The right wing leading edge was crushed aft along its full span. All flight controls remained fully attached to their respective airfoils, except for a portion of the right aileron; that separation was consistent with impact damage. Exclusive of impact damage, flight control continuity was confirmed for each control surface. The elevator trim tab was found in the neutral/faired position

The cockpit fuel/engine primer handle was found in its unlocked and partially extended position, and the FAA inspector who conducted the initial on-scene survey indicated that he had observed it in that condition prior to the recovery of the pilot. The investigation was unable to determine whether the primer was unlocked during the flight, or had become unlocked during the impact sequence. The primer handle was free to move, and could be stowed in its locked position. The primer line was routed to a single jet in the intake manifold, immediately downstream of the carburetor.

Both fuel tanks contained fuel, and both fuel caps were found securely installed. The fuel tested negative for water. The fuel selector valve was found set to the left tank, and found to be unobstructed. Airplane damage precluded full assessment of the fuel system integrity, but no evidence of any pre-impact leaks or other mechanical abnormalities was observed.

Examination of the engine did not reveal any non-impact related evidence of catastrophic failure or other anomalies. The crankshaft was able to be rotated by hand; thumb compression was observed on all four cylinders, and continuity of the valve train was verified. Magneto impulse coupling activation was audible when the crankshaft was rotated, and sparks were observed on all eight ignition leads.

The all-metal, two-blade propeller remained attached to the engine, and the engine remained attached to the airframe. The propeller was almost completely buried in the sandy slope, and bore significant chordwise scouring of its paint. One blade exhibited aft bending and twisting, and the other blade

exhibited light "S" bending from mid-span to the tip. All propeller signatures were consistent with powered rotation when the propeller contacted the sand.

Communications

There were no known radio communications to or from the airplane during the accident flight.

Medical and Pathological Information

The Washoe County (NV) Medical Examiner's Office conducted the autopsy on the pilot, and determined that the cause of death was "multiple blunt force injuries."

The FAA Civil Aeromedical Institute (CAMI) conducted forensic toxicology examinations on specimens from the pilot, and reported that no carbon monoxide, cyanide, or ethanol was detected. The only screened drug that was detected was Doxylamine, in the liver and blood. Doxylamine is an over-the-counter antihistamine marketed as NyQuil, and is used in the treatment of the common cold and hay fever. It is also marketed as Unisom, as a sleep aid. The medication is sold with warnings that it may impair mental and/or physical ability required for the performance of potentially hazardous tasks such as driving or "operating heavy machinery."

The medication has a half life of about 6 to 12 hours, and therapeutic levels are considered to be between 0.05 and 0.15 percent. The level of drug detected in the liver was not reported; the reported level in the blood was 0.14 percent. CAMI reported that post-mortem blood levels were not necessarily indicative of ante-mortem values, which could be lower or higher.

According to the pilot's girlfriend, it was possible that he took a particular brand of 50mg sleep aid containing Doxylamine about 2100 or 2200 on the evening of March 7. She reported that he preferred that brand because it "didn't make him groggy the following morning."

Additional Information

Date and Time of Accident

Several information sources were utilized in an unsuccessful attempt to positively establish the date and time of the accident. Searches of Federal Aviation Administration (FAA) radio communications and radar data did not reveal any evidence of the accident flight. A non-NTSB examination of Fallon Naval Air Station (NFL) Fallon, Nevada, radar target data did not yield any targets that could be associated with the accident flight.

A receipt from the Carson City Home Depot store was located in the wreckage. That receipt bore a date/time stamp of March 8, 2014, at 2:12 pm.

Two different witnesses at CXP, both of whom were pilots, reported that they observed the airplane depart CXP on the afternoon of March 8.

One witness observed an airplane that matched the description of the accident airplane depart runway 9 about 1400 on Saturday, March 8. He observed the airplane from his hangar, which was situated about 4,000 feet down, and on the south side of, runway 9. He reported that the engine sounded "awful," and that when the airplane was abeam his hangar, it was about the height of his hangar, and "just was not climbing."

Another witness, who owned and operated a maintenance facility at CXP, observed an airplane that matched the description of the accident airplane land earlier in the day, and watched it depart from runway 9 about 1700 on Saturday, March 8. He noted that the airplane departed prior to sunset, but he did not note the departure direction after takeoff.

Those two CXP witness reports each appeared internally consistent and credible, but the investigation was unable to reconcile the apparent discrepancy regarding the departure time between the two reports. The reported departure time (1400) of the first report was inconsistent with the time and date stamp on the Home Depot receipt.

Review of the available March 8 text and email messages to or from the pilot indicated that the pilot's last message was sent to his girlfriend at 1538. The pilot was known to text while in flight, but the topic of the 1538 text (product selection assistance for the shopping errands in Carson City) was inconsistent with the text being sent after the pilot was airborne, when he was on his way home after the shopping was completed.

The pilot's girlfriend was not certain whether the pilot planned to return on March 8 or on the morning of March 9. On the morning of March 9, when the pilot had not returned, and the girlfriend had not heard from him despite a texted query, she initiated an unsuccessful telephone search among their friends. Subsequent to that effort, she conducted an aerial search of his normal routes, which was also unsuccessful. She then filed a missing persons report sometime in the mid afternoon of March 9.

Pilot's Flight Routes and Habits

The pilot's girlfriend, who was also a certificated pilot, reported that they owned two other airplanes, a Cessna 150 and a Piper Seneca. She stated that he made the round trip flights from NV33 to CXP approximately once every week, usually in one of the Cessna airplanes, and that when she accompanied

him, they typically flew in the Cessna 150. She reported that he was familiar enough with the route that he did not need or use navigation charts.

The pilot's girlfriend stated that the pilot normally navigated the trip legs by visual means. However, she stated that when he conducted the flight at night, he took the C-150 because of its greater engine power, and the fact that it was equipped with a VOR navigation receiver, in order to avoid the need to rely solely on visual navigation. She reported that when he crossed the mountains at night, he climbed higher than normal to ensure sufficient terrain clearance.

According to the pilot's girlfriend, the accident site was not along the pilot's normal route of flight between the two airports. She explained that due to the north-south mountain range that separated NV33 from CXP, the route that the pilot followed to CXP was different from the route that he followed on the return trip. The rationale was that the pilot would climb parallel to the mountain range until he gained sufficient altitude, and then he would turn to cross the range.

Because CXP was northwest of NV33, on the outbound (NV33 to CXP) leg, the pilot's typical westbound range-crossing segment was north of his typical eastbound, return trip crossing segment. The pilot's girlfriend reported that the pilot's normal return trip crossing segment was located east of Minden, Nevada. Minden was located about 12 miles to the south of CXP. In contrast, the impact site was located about 5 miles to the south of CXP, which was approximately 7 miles north of (prior to) the point where the pilot normally conducted his eastbound crossing of the mountain range.

An interview with the pilot's daughter, who was not a pilot, revealed that she had flown with the pilot in both the C-150 and the Piper Seneca. She had seen the C-120, but told the pilot that she would not fly in that airplane with him.

The pilot's daughter stated that she had flown in the C-150 with the pilot. It was her opinion that he flew "uncomfortably close" to the terrain when he was crossing the mountains between CXP and NV33, and estimated that the terrain clearance was "hundreds of feet." When she expressed concern to him about the terrain proximity, he informed her that "we're catching the lift."

The pilot's daughter also reported that the pilot would text from his cell phone while flying/airborne. She witnessed him texting while she was in the airplane with him, and she also received text messages from him when he was airborne and inbound to meet her.

Engine Primer Information

The engine primer was a manually-powered pump system, which provides unmetered fuel to the engine cylinders to facilitate engine start. The primer handle was designed to lock in the closed position; for engine start it was to be unlocked, pumped a specified number of times, and then stowed and re-locked for the remainder of the flight. According to the airplane manufacturer's Operation Manual (OM) recovered from the wreckage, "The primer is not required except at winter temperatures."

FAA Advisory Circular AC 20-105B (Reciprocating Engine Power-Loss Accident Prevention and Trend Monitoring) stated the following, "if the primer pump handle is not locked in the closed position, raw fuel will continue to be drawn into the cylinders by the suction created in the affected cylinders during

the intake cycle. The engine will run rough at low RPM, mimicking magneto problems, but will smooth out above 1700 RPM."

Chapter 10 of the FAA Airplane Flying Handbook (FAA-H-8081-3A) stated the following related to an engine failure, "Check to determine the cause of the engine malfunction, such as position of the fuel selectors, magneto switch, or primer. If possible, the cause of the malfunction should be corrected immediately and the engine restarted."

Engine Fuel Mixture/Control Information

The airplane was equipped with an engine fuel mixture control. Wreckage documentation indicated that the cockpit mixture control was found in its full rich position. Due to impact damage, the carburetor mixture setting was not able to be determined.

The Cessna OM did not contain any references to engine mixture during climb. The "Cruising" subsection of the "Operating Check List" section stated "above 5000 ft. lean mixture as required to obtain maximum r.p.m." The "Mixture Control" subsection of the "Operating Details" section stated that the mixture control was to always be set at full rich "for starting and take-off purposes." It also stated that "The mixture control should be used cautiously to lean mixtures to give maximum engine r.p.m. when flying above 5000 feet pressure altitude." The manual did not contain any additional information regarding which flight phases (climb, cruise, and descent) the leaning guidance was applicable to, or whether the engine should not be leaned in certain flight phases. The investigation was unable to determine the fuel mixture procedures that were used to determine the airplane climb performance values that were published in the Cessna OM.

In contrast, the Continental Motors Operator's Manual (OM) for the C-85 engine, which was not observed in the wreckage, stated that "Climb must be done at "FULL RICH" mixture setting." The Continental OM also contained a caveat which stated that the engine "must be operated in accordance with the instructions" in the manual, and that "failure to comply will be deemed as engine misuse, thus relieving the engine manufacturer of any responsibility."

Neither manual contained any statements as to which guidance takes precedence in the event of a conflict between the two. In response to an NTSB question regarding which manual guidance should take precedence, the FAA inspector stated that because the CAA Airplane Flight Manual (AFM) is specifically cited as a required item in the Cessna 120 Type Certificate Data Sheet, while the two OMs are not, the AFM takes precedence. However, the AFM did not address the subject of engine leaning/fuel mixture. According to the FAA inspector, in that case, the Cessna OM guidance takes precedence, because the engine can be installed in several different aircraft, and therefore the engine manufacturer's guidance is not installation- or aircraft-specific.

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25) stated that "Since the process of adjusting the mixture can vary from one aircraft to another, it is important to refer to the airplane flight manual (AFM) or the pilot's operating handbook (POH) to determine the specific procedures for a given aircraft."

A document entitled "Engine Operation for Pilots (P-8740-13)" located on the FAA website, and

attributed jointly to "Teledyne Continental and AVCO Lycoming" stated that pilots should "Lean the mixture during climb to the specified fuel flow or for smooth operation above a density altitude of 5000 feet."

Weight and Balance, Airplane Performance

Investigation computations indicated that the airplane was about 130 lbs below its maximum certificated gross weight of 1,450 lbs, and was within its center of gravity envelope.

The airplane manufacturer's OM contained a chart of climb performance data for the airplane at its maximum gross weight. The chart stated rates of climb, in feet per minute, of 450, 360, and 260 for altitudes of 5,000, 7,500, and 10,000 feet, respectively. The maximum altitude in that chart for which performance data was provided was 15,000 feet.

Administrative Information

Investigator In Charge (IIC):	Huhn, Michael
Additional Participating Persons:	Lee Oscar ; FAA-FSDO; Reno , NV
Original Publish Date:	November 19, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=88891