Aviation Investigation Final Report

Location:	Challis, Idaho	**Accident Number:**	WPR15FA143
Date & Time:	April 10, 2015, 12:25 Local	**Registration:**	N732YQ
Aircraft:	Cessna T210M	**Aircraft Damage:**	Substantial
Defining Event:	Collision during takeoff/land	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot and three passengers had landed at a remote airstrip earlier in the morning to visit the pilot's ranch. The published guidance for the airstrip noted that the runway was 2,500 ft long and 75 ft wide. After being on the ground about 2 hours 30 minutes, the pilot indicated to ranch personnel that he wanted to depart before the wind increased. Shortly thereafter, the airplane departed with an estimated 4- to 5-kt tailwind. During the initial climb, the nose landing gear and left tire impacted a tree (which was about 50 ft tall) located about 100 ft from the fence that made the perimeter of the runway. The left tire then likely impacted the left horizontal stabilizer and elevator, rendering the airplane uncontrollable. The airplane then descended into a creek and came to rest inverted; a postimpact fire ensued. There was no evidence of any mechanical malfunctions or failures with the airframe or engine that would have precluded normal operation.

The performance data were calculated using the estimated airplane and environmental conditions at the time of the accident. The distance required to clear a 50-ft obstacle for a takeoff with a 5-kt tailwind from a dry grass runway similar to the accident runway was about 2,675 ft. The actual distance from the area where the pilot began the takeoff roll to the first impacted tree was about 2,625 ft, which indicates that the airplane did not have the sufficient performance capability to climb over the tree.

The pilot frequently flew into the airstrip and was familiar with the terrain and departure procedures, and GPS data revealed that the pilot departed from the airstrip on nine prior occasions in the past year. Comparison of these flights to the accident flight revealed that the pilot's flightpath was normally to the right of the accident flightpath. The pilot likely would have not been able to see the tree due to the airplane's nose-high pitch configuration during the takeoff.

Probable Cause and Findings

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

The pilot's attempt to depart in conditions that resulted in the airplane having insufficient performance capability, which resulted in a collision with a tree.

Findings

Aircraft	Climb capability - Capability exceeded
Environmental issues	Tailwind - Effect on equipment
Personnel issues	Monitoring environment - Pilot
Environmental issues	Tree(s) - Contributed to outcome

Factual Information

History of Flight

Takeoff	Collision during takeoff/land (Defining event)

On April 10, 2015 about 1225 mountain daylight time, a Cessna Centurion T210M, N732YQ, collided with trees shortly after departing from Upper Loon Creek USFS Airport located in the Salmon-Challis National Forest near Challis, Idaho. The pilot, who was the registered owner, was operating the airplane under the provisions of 14 Code of Federal Regulations (CFR) Part 91. The private pilot and three passengers sustained fatal injuries; the airplane sustained substantial damage. The personal cross-country flight was originating from Upper Loon Creek with a planned destination of Driggs-Reed Memorial Airport, Driggs, Idaho. Visual meteorological conditions prevailed and no flight plan had been filed.

The pilot had a solar energy system installed on his residence in the Driggs area and wanted the same solar company, Creative Energies, to assess if it was possible to do a similar installation at his private residence at Diamond D Ranch, where he was a partial owner. The pilot had been staying in Driggs for several days and had planned to take a few of the Creative Energies employees to the ranch to perform an evaluation of the solar installation possibilities. Earlier in the week, he notified the ranch manager that he intended on flying into Upper Loon Creek, located about two miles downstream from the ranch on a northeasterly heading. During the winter, the ranch is only practically accessible by flying into the airport.

The pilot and three passengers departed from Driggs with the airplane loaded with full fuel in the wing tanks. After completing the approximate 170 nautical mile (nm) cross-country flight, the airplane landed at Upper Loon Creek. The solar employees performed their assessment and they all left the ranch at which time the pilot told the ranch personnel that he wanted to depart before the wind picked up. There were no witnesses to the accident, nor did anyone at the ranch hear the airplane depart.

Pilot Information

Certificate:	Private	**Age:**	70,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
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:**	January 8, 2015
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 9051 hours (Total, all aircraft)		

The pilot, age 70, held a private pilot certificate, with ratings for single and multiengine land, and instrument airplane. His third-class medical certificate was issued on January 08, 2015 and contained the limitation that he must wear lenses for distant vision and possess glasses for near vision. He held a type certificate for a Lear Jet.

The pilot's personal flight records were not recovered. On his last application for a medical certificate, the pilot reported a total flight time of 9,051 hours, of which 42 hours were accumulated in the last 6 months. The pilot's spouse stated that the pilot frequently flew into Upper Loon Creek. This was his first trip to the ranch since fall 2014. She recalled that the pilot would normally depart in the direction away from the ranch (northeast), and would make a straight out departure until reaching a ridge where he would begin to circle in an effort to gain altitude.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N732YQ
Model/Series:	T210M	**Aircraft Category:**	Airplane
Year of Manufacture:	1977	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	21061884
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	December 8, 2014 Annual	**Certified Max Gross Wt.:**	3803 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3669 Hrs as of last inspection	**Engine Manufacturer:**	Continental Motors Inc.
ELT:	Installed, activated, aided in locating accident	**Engine Model/Series:**	TSIO-520-R9B
Registered Owner:	On file	**Rated Power:**	310 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The Cessna T210M airplane, serial number 21061884, was manufactured in 1977. The airplane logbooks were not provided to the National Transportation Safety Board. The last annual inspection record was found at the facility that performed the maintenance. It indicated that the last inspection was completed on December 08, 2014, at a total airframe and engine tachometer time of 3,669.4 hours. The time since last major overhaul was 1,341.4 hours.

The last maintenance performed on the airplane was recorded as being performed in January 2015 and consisted of the left brake and oxygen hose being serviced.

Fuel

The airplane was last fueled at Driggs on April 04, 2015 and topped off with the addition of 50.4 gallons of fuel. According to the line manager at the fueling facility, the airplane was not flown between the fueling and the flight to Upper Loon Creek. The airplane was hangared at their facilities in Driggs, so

they likely would have known if the airplane was flown prior. The JPI unit showed that at the time of the accident, 14 gallons of fuel had been used which is presumably since that fueling, equating to 70 gallons of fuel on board at the time of takeoff on the accident flight.

Weight and Balance

Weight and balance computations were made for the accident takeoff and based on the airplane's empty weight, total moment, and center of gravity that were obtained from the maintenance records. The detailed computations are appended to this report.

The performance data was calculated using information from the Pilot's Operating Handbook for a 1977 Cessna Model T210M, Section 5 Performance and from flight test information provided by Textron Aviation. For the purpose of the calculations, investigators utilized an estimated gross weight at the time of the accident to be 3,551 pounds, which was derived by the assumption of 70 gallons of fuel on board and a total weight of pilot and passenger of 745 pounds (derived from the Custer County Records); baggage weight of 50 pounds (estimated from witnesses and the coroner); the airplane's empty weight was 2,322 pounds. Using the temperature of 10 degrees Celsius (see Meteorological Section of this report) and a gross weight of 3,500 pounds (51 pounds under the estimated weight), at the accident altitude, the performance charts indicated the following distances required to clear a 50 ft obstacle for a takeoff on a dry grass runway:
No wind: 2,231 ft
2.5 kt. tailwind: 2,454 ft
5.0 kt. tailwind: 2,677 ft
7.5 kt. tailwind: 2,900 ft
10 kt. tailwind: 3,123 ft

Assuming the airplane started its takeoff roll at the beginning of the runway, with a 5 kt tailwind as reported by the ranch manager, the calculated distance to clear a 50 ft obstacle would be 2,677 ft. The actual distance from the area where the pilot began his takeoff roll (derived from the GPS data) to the first tree that was impacted (which is approximately 50 ft in height), was about 2,625 ft.

In the takeoff configuration, with the nose-high pitch, it is possible that the pilot's windscreen view of the terrain would be limited; the airplane was not equipped with a v-brace on the windscreen.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KLLJ,5040 ft msl	**Distance from Accident Site:**	26 Nautical Miles
Observation Time:	18:55 Local	**Direction from Accident Site:**	99°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.01 inches Hg	**Temperature/Dew Point:**	11°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Challis, ID (U72)	**Type of Flight Plan Filed:**	None
Destination:	DRIGGS, ID (DIJ)	**Type of Clearance:**	None
Departure Time:	12:25 Local	**Type of Airspace:**	

Just prior to the accident, the pilot mentioned to a ranch caretaker that he wanted to depart before the wind picked up. The caretaker estimated that the wind was out of the south at about 4-5 kts at the ranch, and it picked up later in the afternoon; the temperature was about 55 degrees Fahrenheit.

Information from the Bureau of Land Management remote weather stations was provided. According to weather information for Little Creek, Custer County, Idaho, located about 11 nautical miles northwest of the accident site, about 25 minutes after the accident the temperature was 13 degrees Celsius; wind was from 352 degrees at 2 kts gusting to 5 kts.

According to weather information for Bonanza, Custer County, Idaho, located about 14 nm southeast of the accident site, about 25 minutes after to the accident the temperature was 10 degrees Celsius; wind was from 180 degrees at 7 kts gusting to 15 kts.

Local pilots familiar with the wind conditions and patterns at Upper Loon Creek stated that there can be downdrafts at the drainage confluences next to the runway. They also noted that the weather changes very fast in the springtime.

Utilizing a temperature of 10 degrees Celsius and the airport elevation of 5,500 feet msl, the density altitude at the time of the accident was computed to be approximately 6,046 feet msl.

Airport Information

Airport:	UPPER LOON CREEK USFS U72	**Runway Surface Type:**	Dirt;Grass/turf
Airport Elevation:	5500 ft msl	**Runway Surface Condition:**	Dry;Rough;Vegetation
Runway Used:	04	**IFR Approach:**	None
Runway Length/Width:	2500 ft / 75 ft	**VFR Approach/Landing:**	None

The Airport/Facility Directory (AFD), indicated that Upper Loon Creek USFS Airport runway 04 was about 2,500 ft long and 75 ft wide. The runway surface was composed of turf/dirt, and noted to be in fair condition. The airport elevation was 5,500 ft msl, and the AFD noted the obstructions for the runway to be a 70-ft tree 45 ft from the runway and 70 ft left of the centerline. In the remarks section of the AFD was a note "recommended for experienced mountain pilots only with trees and higher terrain on both ends."

Local pilots stated that almost everybody will land on runway 22 and depart runway 04 due to the terrain. While on-site, investigators noted that the runway was in fact oriented on a bearing of about 051 degrees; following the accident, the FAA reflected the runway to be designated as 05/23.

In June 1995, an accident (SEA95LA117) occurred at Upper Loon Creek where the pilot and passenger received minor injuries. According to the pilot involved in the accident, he was attempting to take off from runway 04 with an approximate 10 kt tailwind. When reaching the end of the runway, he encountered a severe downdraft, and descended into the trees near the end of the runway.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	44.593887,-114.818336

The accident site was located partially submerged in the shallow creek that approximately paralleled the runway; the fuselage along with a majority of the wing skin was consumed by fire. Situated on the relatively level terrain, the airplane came to rest inverted, and the debris path was oriented on a 080-degree magnetic heading. The main wreckage, which consisted of a majority of the airframe and engine, was located about 600 feet from the fence located at the end of runway 04 on a heading of 060 degrees. The runway and first identified impact marks were located on a raised plateau about 40 feet higher than the river.

The first identified impact point consisted of broken tree limbs located about 170 feet northeast from the center of the fence and about 430 feet south west of the main wreckage. The first tree impacted was identified by it having a junction where two separate branches forked upward, both of which had fresh cuts around the 50-foot level. The tree was located in line with the far right side of the fence, which was about 100 feet east of an extended runway centerline. There were numerous broken branches along the

debris field to the main wreckage. The nose wheel was located about 100 feet from the first tree, and remained on the plateau. The left landing gear tire was located the farthest from the debris field, and found on the southwest side of the bank (opposite of the airstrip). The outboard half of the left horizontal stabilizer was found in the river around the same length down the debris field as the nose landing gear.

Medical and Pathological Information

The Custer County Coroner's Office completed an autopsy on the pilot. The trachea showed no evidence of soot deposition. The FAA Civil Aeromedical Institute (CAMI) performed toxicological screenings on the pilot. According to CAMI's report (#201500076001), the toxicological findings were positive for Atorvastatin and Diltiazem. The results were negative for ethanol.

Tests and Research

Investigators from the Safety Board, Federal Aviation Administration, and Textron Aviation examined the wreckage on April 14, 2015, at the facilities of SP Aircraft, Boise, Idaho. The engine was later sent to Continental Motors Analytical Department, located in Mobile, Alabama.

Airframe

The main wreckage came to rest partially submerged in a creek, and had been subjected to severe thermal damage. The main wreckage consisted of the wings, empennage, engine, and the mostly ashen remains of the fuselage. The cabin was completely consumed by fire.

The left wing remained affixed to the fuselage with the aileron and wing flap control surfaces still attached at their respective hinges. The wing tip, located about 35 ft upstream of the wreckage in the bush bordering the creek, was not attached, and had burned; pieces of the red navigation lens were found near the wingtip. The right wing remained affixed to the fuselage with the aileron and wing flap control surfaces still attached at their respective hinges. The inboard 3 ft of the wing had sustained thermal damage, and the remaining outboard area was not burned, consistent with it being partially submerged in the creek. The outboard half of the leading edge displayed crush deformation with the skin folded into itself giving an accordioned appearance with three distinct divots noted. The flap control surfaces were found in the retracted (flush) position. The actuator jackscrew was examined by measuring the exposed threads, which totaled 2.625 in. A representative from Textron Aviation stated that the position of the jackscrew was consistent to the flaps being extended between 5 and 10 degrees. Flap cable continuity was established from the control surface to the cockpit area. The aileron cable continuity was established from the control surfaces to the control yoke assembly.

The rudder control surface remained affixed to the vertical fin structure. There were several areas of crush damage and punctures on the leading edge of the vertical fin. The rudder cables were attached to the rudder horn, and continuity was established to the aft baggage compartment through a series of pulleys and runs through lightning holes; the ends of the cables were thermally deteriorated. Investigators established continuity of the elevator control cables to the aft baggage compartment through a series of pulleys and runs through lightning holes; the ends of the cables were thermally deteriorated. The left inboard half of the horizontal stabilizer and elevator remained attached to the empennage. The outboard section was found about 450 ft upstream in the river. The outboard section of the horizontal stabilizer was deformed aft about 18 in from the leading edge creating an accordion appearance, with the aluminum skin folded over on itself and the boot surface flat. This u-shaped wrinkle was about 10 inches in diameter. There were several black rub markings and splatter found on the elevator control surface positioned aft of the divot.

Fuel system continuity could not be established due to the amount of impact and thermal damage that the airplane had sustained. No fuel was present in either wing tank. The fuel selector valve was found in the "LEFT" position. Trace amounts of fuel were recovered from the fuel manifold and the gascolator.

The nose landing gear (NLG) doors were located about 30 ft upstream from the main wreckage. The doors were fragmented, and sustained severe crush damage. The NLG wheel was separated at the strut, and found near the initial impact. A 2-inch portion of the rim's flange was fragmented on both sides of the wheel, each fracture being located in the same relative position on the left and right sides of the wheel rim. The right main landing gear was found in the wreckage. The gear was locked, and the tire/wheel assembly was attached and burned. The left main landing gear was found in the wreckage. The gear was unlocked, and the tire/wheel assembly was separated (the tire was found the furthest away from the debris field). According to the manufacture, Goodyear Aviation Tires, the left main landing gear, (p/n 606C86-6) had an outside diameter between 17.5 and 16.8 inches depending on the inflation. The section width was between 6.3 and 5.9 in.

Engine

The Continental Motors TSIO-520-R, serial number 294045-R, sustained impact damage. Investigators removed the upper spark plugs of all cylinders. According to the Champion Aviation Check-A-Plug AV-27 Chart, the spark plug signatures corresponded to normal engine operation although numerous plugs were coated with oil. A subsequent borescope examination revealed that the combustion chambers remained mechanically undamaged, and there was no evidence of foreign object ingestion (pre-impact) or detonation. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed.

Prior to the test run the Nos. 6 cylinder and several induction system components and exhaust risers were replaced due to impact-related damage. The engine was placed on a test bench at the manufacturer. The engine experienced a normal start on the first attempt without hesitation or stumbling in observed rpm. The engine rpm was advanced in steps for 5 minute intervals for warm-up in preparation for full power operation. The engine throttle was then advanced to full open position, and held for 5 minutes to stabilize. The engine throttle was rapidly advanced from idle to full throttle five times where it performed normally. Throughout the test phase, the engine accelerated normally without any hesitation, stumbling, or interruption in power, and demonstrated the ability to produce rated horsepower. The

turbo controller was disassembled, and no anomalies were noted. The waste gate actuator was inspected, and determined to be at or near full extension, consistent with the waste gate being closed.

The propeller remained attached to the engine crankshaft. All three blade tips remained attached. One blade was twisted to an opposite direction of rotation in the hub. The second blade was slight bowed on the outboard area. The third blade was bent forward at mid-span, and bent aft the outboard foot. The blades did not display any evidence of chordwise scratching or leading edge dents or dings.

There was no evidence of mechanical malfunction or failure with the airframe or engine that would have precluded normal operation. Detailed examination reports with accompanying pictures are contained in the public docket for this accident.

Global Positioning System (GPS) Data

Investigators found a Garmin GPSMAP 496, battery-powered portable GPS receiver within the wreckage. The unit included a built-in Jeppesen database, and was capable of receiving XM satellite radio for flight information. The unit stores date, route-of-flight, and flight-time information for up to 50 flights; all recorded data is stored in non-volatile memory. A detailed report with accompanying graphs and pictures is contained in the public docket for this accident.

Recorded data plots were recovered from the unit, and contained 50 different flights over the duration from June 2014 to the accident date. Within those flights, there were nine prior takeoffs from runway 04 at Upper Loon Creek that occurred between June and September 2014.

The morning flight originated from Driggs-Reed Memorial Airport about 0825, and landed at Upper Loon Creek about 0945. The last recorded flight, the accident flight, occurred between the span of 1223:03 and 1225:02, about 2 minutes. The groundspeed began to increase from 6 kts to 32 kts at 1224:38 on a heading of 050 degrees. Thereafter, the remaining 5 hits of the flight track occurred over 24 seconds. During this time, the speed gradually increased to 80 kts, and the airplane gained about 50 ft, reaching 5,567 on the penultimate hit, and descended 96 ft on the last hit.

A comparison was made between the accident takeoff and nine prior Upper Loon Creek takeoffs from runway 04. Lateral and perpendicular distances were measured between the nine prior flight paths, and compared to the accident antepenultimate and penultimate hits, at 1224:56 and 1225:00, respectively. Comparing all nine flight paths to the antepenultimate hit revealed that they were all to the right of this accident flight point with the farthest being 111 ft; the average distance was 56 ft to the right. Relative to the penultimate hit, five flights were to the right of this accident flight point, with the farthest being 126 ft right of this accident flight point; the average was 21 ft to the right.

Engine Data Monitoring Device

The airplane was equipped with a JP Instrument, Inc., EDM 700 engine data management system. The non-volatile memory was removed and downloaded following the accident. The data extracted contained 22 different flights between September 2014 through April 14, 2015.

The last flight recorded displayed engine operation between April 10 at 2117:10 to April 14 at 1848:56.

Based on the display time that showed during the download, the clock was about 8 hours and 54 minutes ahead of the local time. The data was recorded in 12 second intervals.

On the accident flight, at 0000:24 elapsed time, the cylinder head temperature (CHT) values began to increase. Between 0001:36 and 0001:48 elapsed time, the exhaust gas temperature (EGT) values, rpm, and fuel flow all began to increase. After 0002:12 elapsed time, all values contain no variation, consistent with invalid data. The last reliable data point shows an rpm of 2,700 and symmetry between cylinders' CHT and EGTs.

Administrative Information

Investigator In Charge (IIC):	Keliher, Zoe
Additional Participating Persons:	Keith Rittenberry; Federal Aviation Administration; Boise, ID Paul Yoos; Textron Aviation ; Witchita, KS Nicole Charnon; Continental Motors Inc.; Mobile, AL
Original Publish Date:	July 25, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91009