Aviation Investigation Final Report

Location:	South Lake Tahoe, California	**Accident Number:**	WPR13FA335
Date & Time:	July 22, 2013, 10:45 Local	**Registration:**	N6709U
Aircraft:	Mooney M20C	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane was departing from a high-altitude airport. After liftoff, about midfield on runway 36, the pilot elected to turn right for a downwind departure. After the right turn, the pilot expressed concern to the passenger that the airplane could not outclimb the rapidly rising terrain. The pilot banked left to avoid a tree near the top of a ridge. The right front seat passenger heard the stall warning horn come on, and the airplane descended into the trees, coming to rest inverted on the forest floor.

Based on atmospheric conditions and an airport elevation of 6,269 feet, the calculated density altitude was 9,044 feet. According to the airplane's pilot operating handbook, for those conditions, the pilot could expect about a 330- to 490-feet-per-minute (fpm) rate of climb. The best angle-of-climb airspeed was about 82 mph. To clear the ridge ahead (180 feet above the airport elevation, not including trees), which was within 1/4 mile, the airplane would have to maintain a 981-fpm rate of climb, which was not possible given the density altitude at the time of departure.

The Federal Aviation Administration's Airport Facility Directory for the departure airport noted that the airport was surrounded on the east, south, and west by rapidly rising terrain. It further noted that for noise abatement the preferred departure runway was 36 and advised pilots to continue straight out for 1 mile before making turns.

A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

Probable Cause and Findings

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

The pilot's decision to turn into rising terrain that would have required performance in excess of the airplane's maximum climb rate to clear after taking off at a high density altitude.

Findings

Aircraft	Climb rate - Capability exceeded
Aircraft	Airspeed - Attain/maintain not possible
Personnel issues	Incorrect action selection - Pilot
Personnel issues	Decision making/judgment - Pilot
Environmental issues	High density altitude - Effect on operation
Environmental issues	Mountainous/hilly terrain - Contributed to outcome

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On July 22, 2013, about 1045 Pacific daylight time, a Mooney M20C airplane, N6709U, sustained substantial damage when it collided with trees during takeoff initial climb, from the South Lake Tahoe Airport (TVL), South Lake Tahoe, California. The airplane was being operated by the pilot as a personal cross-country flight, under the provisions of 14 Code of Federal Regulations Part 91. The pilot received fatal injuries, and the sole passenger received serious injuries. Visual meteorological conditions prevailed at the time of the accident. The flight was departing South Lake Tahoe for Palo Alto, California.

South Lake Tahoe Airport is a non-tower controlled airport (no operating control tower). Witnesses heard the pilot of the accident airplane announce his intention to depart via runway 36, with a right downwind departure on the airport's universal communications frequency (UNICOM). The airport has rapidly rising terrain on the east side (right side) of runway 36.

Multiple witnesses saw the accident airplane lift off from runway 36 about midfield, and commence an immediate right climbing turn to the east, toward the rising terrain. The airplane maintained a nose-high attitude, and as it crested the ridgeline, it turned left, and descended below the ridge out of sight.

The airplane's wreckage was located about 1 mile east of the airport in a heavily wooded area.

During an interview with the wife of the deceased pilot on July 24, she told the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) that she was the sole passenger, and was seated in the right front seat of the airplane. She said she and her husband had made the trip to Lake Tahoe many times, and that this trip was no different than the others. They had stayed with family at the lake for a few days, and were departing for home when the accident occurred. She said after arriving at the airport, the preflight inspection of the airplane, and preparation for departure seemed normal. During the taxi for takeoff, she heard some radio traffic, and heard her husband announce his intent to depart on runway 36. She said there was no urgency or change in her husband's demeanor prior to takeoff. The airplane rolled down the runway and lifted off like always. After making the right turn after liftoff, her husband became concerned about the airplane's ability to out-climb the terrain ahead. Nearing the top of the ridge, he said he didn't think they were going to make it. He banked the airplane to the left to avoid a tree; however the airplane descended into the trees while in the left turn. She said she heard the stall warning horn, and closed her eyes.

During follow-up questions she said the engine sounded normal during the climb, and that her husband never said anything about the engine not running properly.

When asked about the right turn midfield, she concluded that that was her husband's normal departure procedure for that airport.

When asked by the IIC, she exhibited good knowledge about density altitude, and was familiar with the effect of density altitude on airplane performance. She said she did not know what the actual density altitude was at the airport during their departure, but said her husband was always aware and concerned about density altitude.

PERSONNEL INFORMATION

The pilot, age 66, held a private pilot certificate with ratings for airplane single-engine land, and instrument airplane. He was issued a third-class airman medical certificate on July 15, 2011, with the limitation that he wear corrective lenses for distance vision, and have glasses for near vision available.

According to personal flight records, he had accrued about 2,820 hours of flight experience.

The pilot completed a required biennial flight review on February 19, 2012.

DAMAGE TO AIRCRAFT

The airplane received substantial damage to its fuselage and wings.

AIRCRAFT INFORMATION

The airplane, manufactured in 1963, was a single-engine Mooney M20C with retractable landing gear, a Lycoming O-360 series engine, and controllable pitch propeller.

An examination of the airplane's engine and airframe logbooks by the NTSB IIC showed no mechanical anomalies. A required annual inspection was completed on September 1, 2012. At the time of the inspection the airplane had accrued 395 hours since a major overhaul, and had a total airframe time of 1,473 hours.

METEOROLOGICAL INFORMATION

Visual meteorological conditions prevailed in the area at the time of the accident. The automated surface observing system at TVL was reporting at 1053 PDT; wind 020 at 5 knots, visibility 10 miles, temperature 26 degrees Celsius (C), dew point 9 degrees C, and atmospheric pressure 30.24 inHg. Based on those conditions, the calculated density altitude was 9,044 feet above sea level.

Prior to the flight, the pilot received an abbreviated weather briefing from a Federal Aviation Administration (FAA) Flight Service Station. There was no significant weather reported along the route of flight.

COMMUNICATIONS

The NTSB IIC received a digital WAV file from a fixed base operator at TVL who recorded the airport's UNICOM frequency 122.95 MHz. The accident pilot (identified by tail number) was heard on the recording stating his intention to depart runway 36, with a right downwind departure. Although there

were other arriving and departing aircraft heard on the recording, there were no transmissions heard that would require an expedited right turn after takeoff by the accident airplane.

WRECKAGE AND IMPACT INFORMATION

On July 23, the wreckage was examined at the crash site by the NTSB IIC, accompanied by an FAA aviation safety inspector. The area of the accident was a heavily treed National Forest, with steep and uneven terrain, above 6,000 feet in elevation. The airplane had descended through dense, tall trees in a shallow then increasingly steeper arc, and came to rest inverted on the forest floor next to a dirt road. Smaller pieces of wreckage were scattered about, but essentially the airplane was intact. All major components and control surfaces were present at the accident site.

The wreckage path was about 150 yards long from the first signs of the airplane entering the treetops, running downhill, until the airplane impacted the ground. The path described a steepening arc through the trees on a heading of 0 to 020 degrees magnetic. The fuselage came to rest inverted with the nose pointing approximately in the direction from which it had come.

The landing gear was retracted. Both wings and the stabilator showed multiple impact damage from striking trees during the descent. Some pieces of tree were imbedded in the wings, and broken treetops and branches littered the wreckage path and impact site.

The top of the cabin was crushed inward at the windscreen, with the most intrusion on the left (pilot) side of the cockpit.

Due to its position the engine was not examined at the accident site. The two-bladed, variable pitch propeller appeared to be in high-pitch, and relatively undamaged. The two blades were straight, and the leading edges were undamaged. In the cockpit the propeller control appeared to be full forward (high-pitch), and the throttle appeared to be pulled out (power off). The right seat passenger said she could not say whether the pilot had pulled the power back once the airplane entered the trees.

An examination of the airplane did not reveal any mechanical anomalies.

MEDICAL AND PATHOLOGICAL INFORMATION

A postmortem examination of the pilot was performed under the authority of the El Dorado County Coroner's Office, South Lake Tahoe, CA, on July 22, 2013. The examination revealed that the cause of death was attributed to a cervical vertebral fracture, resulting from an airplane accident.

A toxicological examination by the FAA's Civil Aeromedical Institute (CAMI) on October 2, 2013, showed that 0.0016 (ug/ml, ug/g) Tetrahydrocannabinol (Marihuana) was detected in the lung, 0.0093 (ug/ml, ug/g) Tetrahydrocannabinol carboxylic Acid (Marihuana) was detected in the blood (heart), and 0.0029 (ug/mi, ug/g) Tetrahydrocannabinol carboxylic Acid (Marihuana) was detected in the lung, but not in the blood (heart).

A review by NTSB medical staff determined that the pilot was probably not impaired by the Marihuana use.

ADDITIONAL INFORMATION

Density Altitude

The FAA defines Density Altitude as the pressure altitude corrected for non-standard temperature variations, and affects all aircraft. A more easily understood definition is; the altitude the aircraft thinks it's at, due to its actual altitude/elevation, adjusted for atmospheric pressure, air temperature, and humidity/dew point. The aircraft will perform relative to that density altitude.

Aircraft performance figures developed by the manufacturer are predicated on the aircraft's expected performance at sea-level, and associated with a standard day temperature, humidity, and atmospheric pressure. The variation of any one or more of those parameters will affect the aircraft's performance. As altitude increases air density decreases, and aircraft performance decreases. An increase in air temperature and humidity will further decrease the performance. Therefore, takeoffs at high altitude airports on hot days will necessitate longer takeoff rolls, and decrease aircraft climb performance.

At the time of the accident, the outside air temperature was 79 degrees Fahrenheit (F), dew point was 48 degrees F, altimeter was 30.24 inches of mercury, and the elevation of the airport was 6,269 feet above sea level. The computed takeoff density altitude was 9,044 feet.

(Excerpt from the Mooney Airplane Pilots Association practical operations guide.)

Although high density altitude and high humidity do not necessarily go hand-in-hand, in the event that high humidity is present, the FAA has said to add a 10% safety margin to the computed takeoff distance, and to anticipate an additionally reduced rate of climb.

(Excerpt from the Mooney M20C Pilot's Operating Handbook (POH).

ENGINE MIXTURE

When maximum power available is less than 75% or at density altitudes above 5,000 feet, the POH recommendations for leaning normally aspirated engines should be followed.

CLIMB PERFORMANCE

Takeoff Climb Chart, at a density altitude of 9,044 feet and maximum gross weight, the pilot could expect about 330 to 490 feet per minute rate of climb during takeoff.

The best angle of climb airspeed would have been about 82 statute miles (sm) per hour.

The fuel quantity could not be determined due to the destruction of the fuel tanks during the accident. No fuel was purchased at the departure airport. Minimum fuel for the flight plus VFR reserve would be the minimum required. Baggage and equipment recovered at the accident site weighed 187 pounds.

After liftoff, about mid-field, the airplane turned right toward rising terrain. The ridge ahead of the airplane was within one-quarter mile (1,320 feet horizontally), and the crest was about 180 feet above

the elevation of the airport, not including the dense, tall trees on the top of the ridge. At 82 miles per hour (7,216 feet per minute horizontally), the airplane would have about 11 seconds to climb over the terrain ahead, requiring a calculated climb rate of about 981 feet per minute to clear the ridge and trees.

Stall Speeds

According to the POH, the flaps up, gear up stall speed for the accident airplane was 67 sm per hour indicated airspeed, with 0 degrees angle of bank. As angle of bank increases the stall speed increases.

FAA Airport Facility Directory

South Lake Tahoe Airport (TVL) contains the following comments; Airport surrounded on East, South, and West by rapidly rising terrain; Noise abatement; preferred departure runway 36, continue straight out for 1 mile before making turns.

Aeronautical Information Manual (AIM)

Section 3. Airport Operations, Key to Traffic Pattern Operations;

If departing the traffic pattern, continue straight out, or exit with a 45 degree turn (to the left when in a left-hand traffic pattern; to the right when in a right-hand traffic pattern) **beyond the departure end of the runway, after reaching pattern altitude.**

YouTube

A seven second video was posted to YouTube, showing the accident airplane at the top of the ridge, in a nose-high left turn, and it descended out of sight beyond the ridge.

Pilot Information

Certificate:	Private	**Age:**	66
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
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:**	July 15, 2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	February 19, 2012
Flight Time:	(Estimated) 2300 hours (Total, all aircraft), 50 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N6709U
Model/Series:	M20C	**Aircraft Category:**	Airplane
Year of Manufacture:	1963	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2441
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	September 1, 2012 Annual	**Certified Max Gross Wt.:**	2575 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	1473 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	O&VO-360 SER
Registered Owner:	LEFTON STEVEN A	**Rated Power:**	180 Horsepower
Operator:	LEFTON STEVEN A	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Dusk
Observation Facility, Elevation:	KTVL,6269 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	09:53 Local	**Direction from Accident Site:**	80°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.01 inches Hg	**Temperature/Dew Point:**	26°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	South Lake Tahoe, CA (KTVL)	**Type of Flight Plan Filed:**	None
Destination:	Palo Alto, CA (KPAO)	**Type of Clearance:**	None
Departure Time:	10:45 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	South Lake Tahoe KTVL	**Runway Surface Type:**	
Airport Elevation:	6269 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	38.88972,-119.990554

Administrative Information

Investigator In Charge (IIC):	Lewis, Lawrence
Additional Participating Persons:	Jack Roche; FAA FSDO; Reno, NV Troy Helgeson; Lycoming; Williamsport, PA
Original Publish Date:	April 23, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87530