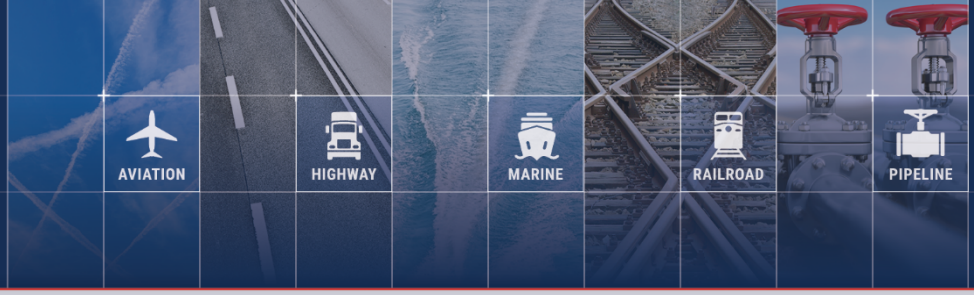

Aviation Investigation Final Report

Location:	Redding, California	**Accident Number:**	WPR18FA244
Date & Time:	August 29, 2018, 11:00 Local	**Registration:**	N7990F
Aircraft:	Cessna 150	**Aircraft Damage:**	Substantial
Defining Event:	Aerodynamic stall/spin	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot was departing on a personal flight in his single-engine airplane. Multiple witnesses described the airplane's initial climb as slow and steep, and recounted the airplane entering a left turn before descending to ground contact, consistent with an aerodynamic stall.

Although several witnesses reported that the engine sound during the initial climb was abnormal, examination of the engine and airframe revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. The wing flaps were found extended to 20°; the airplane's owner's manual suggested 10° of flap extension for takeoffs from soft or rough runways; however, the manual also indicates that flaps can reduce the climb to 50 ft. Federal Aviation Administration guidance states that flap deflection of up to 15° primarily produces lift with minimal drag, while flap extension greater than 15° produces a large increase in drag and a significant nose-up pitching moment in high-wing equipped airplanes. It is likely that, during the takeoff with 20° of flaps extended, the airplane became airborne at a lower than normal airspeed and entered a climb at a higher than normal nose-up pitch attitude, placing the airplane very close to its critical angle of attack. During the climb, the pilot exceeded the critical angle of attack, likely by allowing the airspeed to decay due to the airplane's nose-up pitch attitude, and the airplane entered an aerodynamic stall at an altitude too low for recovery.

Toxicology testing of the pilot indicated the presence of THC (tetrahydrocannabinol), the active compound in marijuana. There is no known relationship between tissue levels and impairment; therefore, whether the pilot's use of a potentially impairing substance contributed to the accident could not be determined.

Probable Cause and Findings

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

The pilot's exceedance of the airplane's critical angle of attack during the initial climb after takeoff, which resulted in an aerodynamic stall and loss of control. Contributing to the accident was the pilot's failure to properly configure the wing flaps for takeoff.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Not attained/maintained
Aircraft	Airspeed - Not attained/maintained
Personnel issues	Incorrect action selection - Pilot
Personnel issues	Use of equip/system - Pilot
Aircraft	TE flap control system - Incorrect use/operation
Personnel issues	Illicit drug - Pilot

Factual Information

History of Flight

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

On August 29, 2018, about 1100 Pacific daylight time, a Cessna 150F airplane, N7990F, impacted terrain shortly after takeoff from Benton Field Airport (O85), Redding, California. The private pilot was fatally injured, and the airplane sustained substantial damage. The airplane was privately owned and operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed in the area, and no flight plan was filed for the local flight, which was originating at the time of the accident.

Multiple witnesses saw the airplane during the initial climb shortly after its takeoff from runway 33; several stated that their attention was drawn to the airplane due to its abnormal engine sound. Many of the statements provided by witnesses were consistent in describing the airplane's nose-high attitude and slow airspeed before it turned left and descended to ground contact. One witness, a mechanic, stated that the engine was "misfiring" during the initial climb; the airplane stalled, and the left wing dropped "aggressively."

Pilot Information

Certificate:	Private	**Age:**	71,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	June 27, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 19, 2017
Flight Time:	(Estimated) 195 hours (Total, all aircraft), 161.3 hours (Total, this make and model), 136.3 hours (Pilot In Command, all aircraft), 0.8 hours (Last 90 days, all aircraft), 0 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The 71-year-old pilot held a private pilot certificate with a rating for airplane single-engine land issued on September 21, 2017. The pilot's most recent Federal Aviation Administration (FAA) third-class medical certificate was issued on June 27, 2017, with a limitation stating, "must have available glasses for near vision." At the time of his medical examination, he reported 110 total hours of flight experience. About 5.5 hours were logged in the previous 6 months; .8 hour in the previous 90 days and 0 hour in the previous 60 days. The pilot logged a total of 14.7

hours in the accident airplane. The pilot's most recent flight review took place on September 19, 2017.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N7990F
Model/Series:	150 F	**Aircraft Category:**	Airplane
Year of Manufacture:	1966	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	15064090
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	1601 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Continental
ELT:		**Engine Model/Series:**	O-200 SERIES
Registered Owner:		**Rated Power:**	100 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was manufactured in 1966 and purchased by the pilot on December 20, 2017. The airplane was equipped with a Continental O-200A engine, serial number 63876-6-A, and a two-blade, fixed-pitch propeller.

A review of the airframe and engine logbooks revealed that the most recent annual inspection was completed on October 20, 2017, at an airframe total time of 4,814.54 hours. The engine was last overhauled on August 7, 1998, at a tachometer time of 4,304.11 hours. At the time of the accident, the airplane had accumulated 27.39 hours since the most recent annual inspection, and the engine had accumulated 537.82 hours since major overhaul.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	RDD,739 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	127°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.88 inches Hg	**Temperature/Dew Point:**	26°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Redding, CA (O85)	**Type of Flight Plan Filed:**	None
Destination:	Redding, CA (O85)	**Type of Clearance:**	None
Departure Time:	10:55 Local	**Type of Airspace:**	Class G

At 1053, the automated weather observation station at Redding Municipal Airport (RDD), Redding, California, about 7.5 miles southeast of the accident site, reported wind from 150° at 4 knots, clear sky, 10 statute miles visibility, temperature 25°C, dew point 13°C, and an altimeter setting of 29.89 inches of mercury. Using the reported weather conditions and field elevation, the calculated density altitude about the time of the accident was about 2,343 ft.

Airport Information

Airport:	Benton Field Airport O85	**Runway Surface Type:**	Asphalt
Airport Elevation:	723 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	2420 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	40.578056,-122.409721(est)

The airplane came to rest upright on a magnetic heading about 125° on a generally level, wooded area of private property about 500 ft northwest of the runway 33 centerline and 680 ft from the departure end of the runway. The wreckage was contained in an approximate 30-square-ft area. All major components of the airplane were found at the site. The first point of impact was about 20 ft above the ground on a tree about 7 ft to the left and behind the wreckage.

The fuselage displayed damage from underneath the engine nacelle extending upward and aft. The fuselage was buckled and fractured open just aft of the main landing gear. The wings displayed four concave dents in which traces of tree bark were embedded, consistent with tree impact. A portion of the left wing, about 15 inches from the wing tip inboard, was separated near a large concave dent on the leading edge. The left wing and cabin ceiling separated from the fuselage and was displaced forward about 15°. The right wing separated from the fuselage, was displaced forward about 5°, and came to rest against a tree near the wing root. The main landing gear remained intact and attached to the fuselage. The nose landing gear was displaced aft.

The propeller remained attached to the crankshaft propeller flange. The spinner was crushed aft around the propeller. One blade displayed moderate aft bending along with leading edge gouging and chordwise striations along the blade face; the other displayed minor aft bending, some leading edge gouging, and few striations along the blade face.

The fuel selector was found in the ON position. About 2 gallons of fuel were drained from the left wing tank and 6 gallons were drained from the right wing tank. The fuel tested negative for water. The last fuel receipt discovered was dated August 15, 2018, for 17.0 gallons.

Flight control continuity was established from all flight control surfaces to the cabin flight controls. The flap selector was found in the down position, the flap actuator was at 3.25 inches, consistent with the flaps being between 10° to 20°. The flaps were extended about 20°. Elevator trim continuity was established and was found 1.44 inches, consistent with a neutral setting. The engine was examined at the accident site.

The engine remained attached to the firewall. The rear of the engine was pushed up towards the pilot's glare shield. The engine sustained impact damage, which had fractured the intake manifold allowing the carburetor to separate. The mixture control arm and the throttle control arm moved freely throughout their full range. The carburetor bowl was removed to examine the floats. The float bowls were brass in appearance and moved through their full travel. The floats displayed hydraulic damage. The airframe fuel strainer was damaged and there was no presence of fuel. No contaminations were found on the carburetor fuel finger strainer. The accelerator pump functioned normally. A blue fluid with the

appearance and smell of aviation gasoline was found in the carburetor bowl. This fluid tested negative for water and was free of debris. The upper spark plugs were removed at the scene and appeared undamaged. Spark plugs number 1, 2, and 3 appeared dark in color and dry. Sparkplug number 4, appeared darker in color and wet. Thumb compression was obtained on all four cylinders. All rocker arms moved freely when the engine was rotated. The carburetor had a red Precision Airmotive Corporation data tag riveted to it. The data tag displayed the following information: Model: MA-35PA, Part No.: 10-4894, Serial Number: 3E-0-231 or BE-0-231. The vacuum pump had separated but remained attached via hoses. The oil filter was examined, and the filtering medium exhibited no foreign or metal material.

On November 26, 2018, the engine was further examined at Continental Motors, Mobile, AL. During this examination the engine could be rotated freely by turning the propeller mounting flange. All cylinders appeared intact without damage. The lower spark plugs were removed. Spark plugs number 1, 2, and 3 appeared dark in color, dry and undamaged. Spark plug number 4, appeared darker in color and wet. Various shields and non-system items were removed. The starter motor appeared normal. The oil filter attachment bracket had a mounting tab broken. The other tab was cracked. Deposits were found trapped in the oil screen but estimated to be less than 10% blockage. The oil pump attachment bolts did not have safety wire but appeared to retain their torque. The oil pump gears appeared normal. The engine was verified to be timed correctly at 24°. The left magneto, Left, S/N: A58836, was test run and verified to function correctly. The right magneto, S/N: A58837, was test run and verified to function correctly. The generator appeared normal. The exhaust mufflers appeared normal. The intake manifold was broken at the carburetor mount, otherwise it appeared normal. Cylinders 1, 3, and 4 were standard nitrated steel cylinders. Cylinder 2 had been channel-chrome plated. All cylinders, valves, valve lifter bodies, connecting rods, rod end bearings, wrist pins, cam, and cam bearing surfaces exhibited normal wear patterns. All pistons exhibited normal wear patterns with light to medium combustion deposits on all four piston domes. The pistons were a standard bore size. The number 2 intake and number 3 exhaust valve lifter faces exhibited spalling where the cam lobes meet the lifter face. The number 2 intake and number 3 exhaust guides were pitting at the point where the cam lobes meet the guide. The crank case and bearing surfaces exhibited normal wear patterns.

Additional Information

The Cessna 150 Owner's Manual stated that normal and obstacle clearance takeoffs should be performed with flaps retracted. A flap extension setting of 10° would shorten the airplane's ground roll during takeoff by about 10% but reduces the climb to a 50-ft obstacle.

The FAA Airplane Flying Handbook (FAA-H-8083-3B), Chapter 8, Approaches and Landings, stated:

Flap extension has a definite effect on the airplane's pitch behavior. The increased camber from flap deflection produces lift primarily on the rear portion of the wing. This produces a nose-down pitching moment; however, the change in tail loads from the downwash deflected by the flaps over the horizontal tail has a significant influence on the pitching moment. Consequently, pitch behavior depends on the design features of the particular airplane.

Flap deflection of up to 15° primarily produces lift with minimal drag… Flap deflection beyond 15° produces a large increase in drag. Also, deflection beyond 15° produces a significant nose-up pitching

moment in high-wing airplanes because the resulting downwash increases the airflow over the horizontal tail.

Medical and Pathological Information

An autopsy of the pilot was performed by the Shasta County Sherriff-Coroner, Redding, California. The cause of death was blunt trauma.

Toxicology testing performed at the FAA Forensic Sciences Laboratory identified Tamsulosin in blood and in urine, Delta-9-THC in blood (cavity) and urine, Carboxy-Delta-9-THC in blood (cavity) and urine, and 11-Hydroxy-Delta-9-THC in urine.

Tamsulosin is an a1a-selective alpha blocker used in the symptomatic treatment of benign prostatic hyperplasia. It is not generally considered impairing.

THC (tetrahydrocannabinol) has mood-altering effects, including euphoria, relaxed inhibitions, disorientation, image distortion, and psychosis. In addition, THC is lipophilic and stored in liver and lung for long periods after smoking. The cavity blood taken from the chest was in close proximity to the liver and lung, and postmortem levels may therefore be significantly elevated compared with antemortem levels.

Administrative Information

Investigator In Charge (IIC):	Salazar, Fabian
Additional Participating Persons:	Michael D O'Kane; FAA; Sacramento, CA Mike Council; Continetal Motors; Mobile, AL Ricardo J Asensio; Textron Aviation; Wichita, KS
Original Publish Date:	April 8, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98186

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available here.