Aviation Investigation Final Report

Location:	Abilene, Texas	**Accident Number:**	CEN16FA114
Date & Time:	March 1, 2016, 08:40 Local	**Registration:**	N419B
Aircraft:	OHLGREN RV 6A	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airline transport pilot and the passenger departed in the experimental amateur-built airplane that he had recently purchased on a cross country flight. After takeoff, the airplane drifted slightly right in a wings-level climbing attitude. A turn to the left with a bank angle of more than 30° began, and the airplane pitched nose-up followed by an immediate nose-down spin to the left. An onboard display unit recorded a left roll in excess of 80° and an indicated airspeed of 79 knots. Given that the airplane's estimated stall speed in level flight was about 49 knots and its estimated stall speed in a 75° bank is about 98 knots, it is likely the airplane entered an aerodynamic stall. An examination of the wreckage did not reveal evidence of any preimpact anomalies that would have prevented normal operation of the airplane. Damage to the propeller blades was consistent with engine power being delivered to the propeller, and witness marks indicated that the canopy was latched.

The investigation was unable to determine if the pilot's psychiatric conditions impaired his ability during the accident. There was no evidence that the pilot's cardiovascular disease was impairing. However, toxicology testing detected high levels of the medications buspirone and hydroxyzine and of tetrahydrocannabinol, the active compound in the illicit drug marijuana, in the pilot's blood. All three of these drugs are potentially-impairing, central nervous system (CNS) depressants, and, in combination, each drug may enhance the CNS depressant effects of the other drugs. Therefore, it is likely that the combination of the three drugs impaired the pilot's ability to safely fly the airplane.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain airplane control during takeoff, which resulted in the airplane exceeding its critical angle of attack and an aerodynamic stall/spin. Contributing to the

accident was the pilot's impairment due to his combined use of central nervous system depressant medications and the illicit drug marijuana, which degraded his ability to maintain control of the airplane.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Not attained/maintained
Aircraft	Lateral/bank control - Not attained/maintained
Personnel issues	Prescription medication - Pilot
Personnel issues	Illicit drug - Pilot
Personnel issues	Predisposing condition - Pilot
Personnel issues	Alcohol - Passenger

Factual Information

History of Flight

Prior to flight	Miscellaneous/other
Takeoff	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On March 1, 2016, about 0840 central standard time, an experimental amateur-built Van's RV-6A airplane, N419B, impacted terrain during takeoff from runway 35 at the Elmdale Airpark (82TS), near Abilene, Texas. The airline transport pilot and his passenger were fatally injured. The airplane was destroyed. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Day visual meteorological conditions prevailed, and the flight was not operated on flight plan. The flight was destined for Henderson, Nevada, and was originating from 82TS at the time of the accident.

A witness reported that he picked the pilot and passenger up at a local hotel and brought them to 82TS. The pilot had refueled the airplane the previous day upon arrival at 82TS. The pilot checked weather and performed a preflight inspection of the airplane. According to the witness, the airplane taxied to the threshold of runway 35, and the pilot performed an engine run-up, which sounded normal. The airport windsock indicated winds from the north-northwest. After takeoff, the airplane drifted slightly right (east) in a wings-level climbing attitude. A left turn to the west with a bank angle of more than 30° began, and the airplane pitched nose-up followed by an immediate nose-down spin to the left. The witness then lost sight of the airplane due to a rise in terrain. The witness and another airport tenant drove to the accident site and observed that the airplane had impacted terrain.

Recorded data recovered from the airplane indicated that, at 0822:07, the airplane was on the ramp west of the runway. Due to non-recovered data between 0822:07 and 0839:11, the airplane's taxi path to the end of runway 35 could not be determined. By 0839:11, the airplane had begun its takeoff roll on runway 35. Around 0839:34, the airplane began a climbing roll to the right. By 0839:45, the airplane had begun to roll left and track left. The last recovered point from the recording was at 0839:49, and showed a GPS altitude of 1,930 ft, a pitch-down attitude, a left roll in excess of 80°, and an indicated airspeed of 79 knots (kts).

Pilot Information

Certificate:	Airline transport	**Age:**	63,Male
Airplane Rating(s):	Single-engine land; Multi-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 2 With waivers/limitations	**Last FAA Medical Exam:**	January 16, 2016
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 8010 hours (Total, all aircraft)		

The 63-year-old pilot held a Federal Aviation Administration (FAA) airline transport pilot certificate with a multi-engine rating. He held commercial pilot privileges for single-engine land airplanes. The pilot was issued an FAA second-class medical certificate during his most recent medical examination dated February 16, 2016. The medical certificate had a limitation that the pilot must have glasses available for near vision. On the application for this medical certificate, the pilot reported that he had accumulated 8,010 hours of total flight time and 10 hours of flight time in the 6 months before the exam.

Aircraft and Owner/Operator Information

Aircraft Make:	OHLGREN	**Registration:**	N419B
Model/Series:	RV 6A	**Aircraft Category:**	Airplane
Year of Manufacture:	2001	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	21550
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	May 4, 2015 Condition	**Certified Max Gross Wt.:**	1650 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	791.2 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	C91A installed, not activated	**Engine Model/Series:**	O-360-C1G
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane, which was constructed from a Van's Aircraft, Inc., RV-6A kit, was completed in 2001, and the airplane's special airworthiness certificate was issued on August 4, 2001. The airplane was a single-engine, low-wing monoplane, configured to seat two occupants in a side-by-side seating arrangement. It

was constructed primarily from aluminum alloy materials, and it had a fixed tricycle landing gear arrangement. The airplane was powered by a 180-horsepower Lycoming O-360-C1G engine, serial number L-31710-36A. The engine drove a two-bladed, constant-speed Hartzell propeller. The airplane was equipped with a forward-opening, tip-up canopy. Endorsements in the airplane's logbooks indicated that a condition inspection was completed on May 4, 2015, and that the airplane had accumulated 791.2 hours of total time at that date. The pilot signed an FAA Aircraft Registration Application form for the airplane dated January 10, 2016.

The airplane kit manufacturer provided the following stalls speeds for a typical RV-6 kit airplane in coordinated flight.

Bank Angle 0° 30° 45° 60°
Flaps Retracted 49 kts 53 kts 58 kts 69 kts
Flaps Extended 45 kts 49 kts 54 kts 64 kts

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KABI,1790 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	07:52 Local	**Direction from Accident Site:**	212°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	12 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.1 inches Hg	**Temperature/Dew Point:**	11°C / 2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Abilene, TX (82TS)	**Type of Flight Plan Filed:**	None
Destination:	Henderson, NV	**Type of Clearance:**	None
Departure Time:	08:40 Local	**Type of Airspace:**	

At 0752, the recorded weather at the Abilene Regional Airport, near Abilene, Texas, located about 3 miles from 82TS, included wind 340° at 12 kts, visibility 10 statute miles, sky condition clear, temperature 11°C, dew point 2°C, and altimeter 30.10 inches of mercury.

Airport Information

Airport:	ELMDALE AIRPARK 82TS	**Runway Surface Type:**	Asphalt
Airport Elevation:	1775 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	36	**IFR Approach:**	None
Runway Length/Width:	3270 ft / 50 ft	**VFR Approach/Landing:**	None

82TS was a non-towered, privately-owned, private-use airport. The airport had an estimated elevation of 1,775 ft above mean sea level. Two runways, 18/36 and 17/35, served the airport. Runway 17/35 was a 2,950-ft by 30-ft asphalt runway. The airport had 100 low lead fuel service.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	32.455276,-99.649444

The airplane came to rest upright about 189 ft and on a magnetic heading of 330° from the departure end of runway 35. The airplane's resting heading was about 360° magnetic. The airplane's propeller and propeller flange separated from the engine crankshaft. The propeller was found embedded in the ground about 1 ft below the surface. When removed, the propeller blades exhibited chordwise abrasions and leading-edge nicks. The engine mounts and engine cowling were deformed rearward and crushed consistent with the nose of the airplane impacting terrain. The leading edge of both wings exhibited aft deformation consistent with a nose-low impact with terrain. The empennage was attached to the fuselage and wrinkle deformation was observed at the juncture of the two.

The cockpit canopy was found separated from the fuselage. The canopy's latch was found in the latched position, and the latching assembly was deformed, consistent with impact damage. The canopy handle was missing from its canopy handle block. The center section of the canopy handle block, which holds the canopy handle, exhibited a vertical tear where the canopy handle was housed. The left aileron separated from its wing. The control stick was moved, and the attached right aileron and the elevators moved accordingly. The rod end to the left aileron moved when the control stick was moved. The control cables at the rudder pedals were manipulated by hand, and the rudder moved. Flight control continuity was established.

A liquid consistent with 100 low lead aviation fuel was found in the fuel line routed to the engine-driven fuel pump and in the fuel line to the carburetor. The right magneto was found separated from its accessory pad. Both magnetos were removed from the wreckage, and their ignition leads cut near their towers. Both magnetos were rotated by hand, and sparks were observed at all ignition leads. The engine-

driven fuel pump sustained impact damage, and its base was separated from its body. The engine-driven fuel pump produced suction when its slotted shaft was manipulated with a flat-bladed screwdriver. A liquid consistent with the smell of aviation gasoline subsequently exited the engine-driven fuel pump fitting. The sparkplugs were removed. One spark plug was oil fouled, and the remaining plugs exhibited a brown color consistent with normal combustion. The carburetor was removed from the intake. The carburetor's mounting base was fractured. The carburetor finger screen was removed, and no debris was observed in the screen. The mixture and throttle cables were pulled in the cockpit, and corresponding motion on the carburetor linkages was observed. The propeller control in the cockpit was pulled, and corresponding motion on the governor linkage was observed. Engine control continuity was established.

The cover over the vacuum accessory pad was removed, and a splined adapter tool was inserted in the pump drive base to turn the engine accessory gears. All cylinder rocker covers were removed. The engine produced a thumb compression at all cylinders when the adapter tool was rotated by hand. No rocker or valve movement anomalies were observed when the adapter tool was rotated. Crankshaft and camshaft continuity were established.

Flight recorders

The airplane was equipped with a Dynon SkyView SV-D700 display unit with serial number 2256. The Dynon SV-D700 is an uncertified screen display suitable for mounting in the cockpit of non-type-certificated airplanes, such as the accident airplane. The display receives input from multiple modules for flight instrumentation including modules for air data/attitude/heading, engine monitoring, GPS, transponder, radios, and intercoms. Data is recorded on a Serial-ATA based Disk on Module (DOM) mounted to the main memory board.

The Dynon unit was recovered from the wreckage and shipped to the NTSB Recorder Laboratory for readout. The non-volatile memory chip on the DOM was removed from the DOM, and a raw-data binary readout of the chip was obtained. The binary readout was directly examined, and corrupt data was discarded. For further details concerning the readout of the data, see the Cockpit Display Specialist's Factual Report included in the public docket for this accident.

In addition to the previously discussed data from the accident flight, data from a departure from the Carroll County Airport (4M1), near Berryville, Arkansas, on February 28, 2016, two days before the accident, were examined. The data for the departure from 4M1 showed that the airplane began a takeoff on runway 25 about 1010:59 at an initial GPS altitude of 1,201 ft. The airport had a surveyed elevation of 1,205.5 ft above mean sea level. The airplane climbed straight ahead until the end of the recovered data at 1011:37 at a GPS altitude of 1,829 ft. The indicated airspeed was more than groundspeed throughout the takeoff, consistent with a headwind; for example, at 1011:30, the indicated airspeed was 80 kts, and the groundspeed was 63 kts.

Medical and Pathological Information

The Tarrant County Medical Examiner determined that the pilot's cause of death was massive blunt force trauma, and the manner was consistent with an accident. The report documented cardiomegaly (an enlarged heart) with moderate to severe coronary artery atherosclerosis but did not identify ischemic heart muscle damage. Tarrant County toxicology testing detected the potentially-impairing sedating antianxiety medication hydroxyzine at 8,298 ng/ml, the antidepressant medication venlafaxine at 20,393 ng/ml, and its metabolite norvenlafaxine at 784 ng/ml in cavity blood.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, toxicology testing detected marijuana's potentially-impairing psychoactive compound tetrahydrocannabinol (THC) in lung at 1373 ng/ml, in brain at 22 ng/ml, in liver at 121 ng/ml, and in cavity blood at 56 ng/ml. Tetrahydrocannabinol carboxylic acid (THC-COOH), THC's primary inactive metabolite, was detected in the lung at 102 ng/ml, in brain at 25 ng/ml, in the liver at 1361 ng/ml, in urine at 807 ng/ml, and in cavity blood at 21ng/ml.

On his most recent FAA medical application, the pilot denied any medical concerns or the use of medications. Personal medical records from a January 2016 examination (about a month before his FAA medical review) documented a history of multiple psychiatric hospitalizations, recurrent major depression (currently mild), generalized anxiety disorder, and insomnia. His prescribed medications included bupropion (considered potentially impairing) and venlafaxine (generally not considered impairing) for depression and the potentially-impairing medications buspirone, clonazepam, and hydroxyzine for anxiety.

The 33-year-old male passenger was not a pilot. However, a flight training handbook was found in his belongings. The Tarrant County Medical Examiner determined the passenger's cause of death was massive blunt force trauma and the manner was consistent with an accident and did not identify any significant natural disease. Toxicology testing in two laboratories detected ethanol ranging from 0.126 - 0.127 g/dl in blood and 0.141 - 0.150 g/dl in vitreous. Ethanol is primarily a social drug that acts as a central nervous system depressant commonly found in beer, wine, and liquor. After ingestion and absorption, ethanol is quickly distributed throughout the body's tissues and fluids fairly uniformly. The distribution pattern parallels the water content and blood supply of each organ. It is also produced after death by microbial activity. In addition to impairing judgment, attention, and response times, ethanol, at doses between 0.06 gm/dL and 0.10 gm/dl blood alcohol concentration, significantly impairs the user's ability to maintain upright posture and balance.

Additional Information

According to the airport manager at 4M1, the airplane arrived there about 1600 on Saturday, February 27, 2016. He stated that the pilot did not sound accustomed to aircraft radio phraseology, and the airplane made its approach well below glideslope, almost at the tree tops; he did not see the landing/rollout.

The airport manager reported that the pilot was the only person onboard and that the pilot told him that

he had just arrived from Florida. The manager fueled the airplane with 12.5 gallons of 100 low lead aviation gasoline. The pilot remarked to the manager how little fuel he had burned since his takeoff from Florida, and he stated he was going to Las Vegas. The pilot purchased a quart of motor oil for the airplane. However, the manager did not see the pilot add the motor oil to the airplane, nor was there a used bottle in the trash receptacle on the aircraft parking ramp after the airplane departed about 1000 the next day (February 28, 2016). The airport manager observed the airplane depart with the pilot and a male passenger onboard. Again, the pilot sounded unfamiliar with radio usage and phraseology. The pilot asked where the airport's tower was located and requested the frequency for Razorback Approach.

The airplane departed on runway 25 into a left-quartering headwind of 11 kts gusting to 43 kts. The manager reported that it was "VERY windy" and it appeared that the pilot lifted the airplane off before developing enough ground roll/airspeed for a safe takeoff. The manager further reported that the climb out immediately after liftoff also appeared to be very uncoordinated. The airplane made a wide turn to the northwest, away from the wind, and continued the turn into a southeast heading. He indicated that the airplane's engine sounded normal.

The investigation was unable to determine which occupant was manipulating the flight controls during the accident flight.

Administrative Information

Investigator In Charge (IIC):	Malinowski, Edward
Additional Participating Persons:	Corey Wehmeyer; Federal Aviation Administration; Lubbock, TX John Butler; Lycoming; Williamsport, PA Scott Risan; Van's Aircraft; Aurora, OR
Original Publish Date:	February 22, 2018
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92789