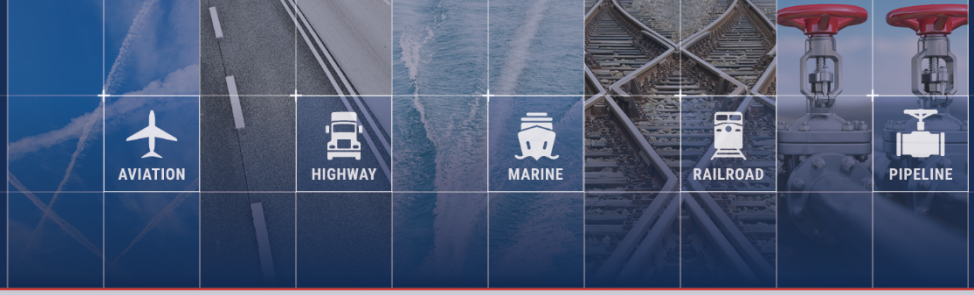

Aviation Investigation Final Report

Location:	Petaluma, California	**Accident Number:**	WPR18FA150
Date & Time:	May 27, 2018, 16:00 Local	**Registration:**	N4269Y
Aircraft:	MORRISON MARVIN E JR RV 6A	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The commercial pilot was departing in his experimental, amateur-built airplane. During the initial climb, when the airplane was between 500 to 800 ft above ground level, the engine backfired several times before losing power. The airplane entered a 180° turn back toward the airport; however, during the second half of the turn, the bank angle increased, and the airspeed slowed. The airplane entered an aerodynamic stall and spin and subsequently impacted terrain.

Postaccident examination of the engine revealed that the left magneto was loose on its mounting pad and free to rotate by hand. This would have resulted in erratic engine-to-magneto timing for that magneto and would likely account for the engine backfiring and the partial loss of engine power. There were no additional mechanical anomalies that would have precluded normal operation. No maintenance records were recovered, and whether any magneto-related maintenance was performed before the accident could not be determined.

The area beyond the departure end of the runway comprised a golf course and open fields that would have been favorable for a straight-ahead, forced landing. The pilot's decision to turn back toward the runway at low altitude and his subsequent exceedance of the airplane's critical angle of attack during the turn resulted in an aerodynamic stall/spin and a loss of control.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A partial loss of engine power during initial climb after takeoff due to a loose left magneto, and the pilot's decision to turn back to the airport and his exceedance of the airplane's critical angle of attack, which resulted in an aerodynamic stall/spin and impact with terrain.

Findings

Aircraft	Magneto/distributor - Malfunction
Aircraft	Magneto/distributor - Not serviced/maintained
Aircraft	Angle of attack - Capability exceeded
Personnel issues	Aircraft control - Pilot
Personnel issues	Decision making/judgment - Pilot

Factual Information

History of Flight

Initial climb	Loss of engine power (partial) (Defining event)
Emergency descent	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 27, 2018, about 1600 Pacific daylight time, an experimental, amateur-built RV-6A airplane, N4269Y, was substantially damaged when it impacted terrain shortly after takeoff from Petaluma Municipal Airport (O69), Petaluma, California. The commercial pilot and one passenger were fatally injured. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the flight, which was originating at the time of the accident. The reported destination was Lincoln Regional/Karl Harder Field (LHM), Lincoln, California.

A witness located about 1,100 ft southeast of the departure end of runway 29, saw the airplane take off and climb fast at a high angle of attack. When the airplane was about mid-runway and 500 ft above ground level (agl), the witness heard a loud pop or backfire from the engine. When the airplane was at the end of the runway and about 750 to 800 ft above the ground, he heard "…a series of smaller backfires…as his engine was quitting." The witness saw the airplane start a turn and stated that the first 90° of the turn looked normal. During the second half of the 180° turn, the bank angle increased and the airplane entered a spin; it completed seven full revolutions before it stopped spinning, then impacted the ground behind a golf course.

A second witness observed the accident from a golf course driving range about 1,750 ft north-northwest of the departure end of the runway. He reported that, while hitting golf balls, he heard a single-engine airplane approaching, followed by an irregular sound of the airplane's engine. He heard the engine sputter, followed by a loud pop (backfire), then silence, then another pop before the engine went silent again. He saw the airplane enter a right 180° turn during which the airplane's nose pitched up, its bank angle increased, and the airplane lost speed.

A flat golf course fairway, about 150 ft to 250 ft wide and about 1,500 ft long, was located about 1,500 ft from the departure end of the runway. Additional fairways, as well as flat terrain and agricultural fields were also located near the departure end of the runway.

Pilot Information

Certificate:	Commercial	**Age:**	67,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
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 11, 2017
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	2775 hours (Total, all aircraft), 50 hours (Total, this make and model)		

The pilot held a commercial pilot certificate with ratings for airplane single-engine land and instrument airplane. On his most recent application for a Federal Aviation Administration (FAA) airman medical certificate, dated July 11, 2017, he reported 2,775 total hours of flight experience, with 50 hours in the previous 6 months. The pilot was issued a third-class medical certificate with a limitation for corrective lenses. No personal flight records were recovered during the investigation, and the date of the pilot's most recent flight review or his total time in the accident airplane make and model could not be determined.

Aircraft and Owner/Operator Information

Aircraft Make:	MORRISON MARVIN E JR	**Registration:**	N4269Y
Model/Series:	RV 6A A	**Aircraft Category:**	Airplane
Year of Manufacture:	1996	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	21205
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:		**Engine Model/Series:**	O-360-A1A
Registered Owner:		**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was a Vans RV-6A experimental amateur-built airplane, serial number 21205. The airplane was equipped with two seats in a side-by-side configuration, each with a set of flight controls. The airplane was powered by a 180-horsepower Lycoming O-360-A1A engine equipped with a controllable pitch Hartzell propeller.

According to FAA records, the airplane was issued a special airworthiness certificate and experimental certification on June 9, 1996. FAA records further revealed that the accident pilot purchased the airplane on February 7, 2012. No maintenance records for the airplane were located.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	O69,90 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	15:55 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	N/A / Severe
Altimeter Setting:	29.81 inches Hg	**Temperature/Dew Point:**	20°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Petaluma, CA (O69)	**Type of Flight Plan Filed:**	None
Destination:	Lincoln, CA (LHM)	**Type of Clearance:**	None
Departure Time:	16:00 Local	**Type of Airspace:**	Class G

The 1555 recorded weather observation at O69 included wind from 250° at 10 knots, 9 miles visibility, clear sky, temperature 19°C, dew point 11°C, and an altimeter setting of 29.81 inches of mercury.

Airport Information

Airport:	Petaluma Municipal O69	**Runway Surface Type:**	Asphalt
Airport Elevation:	90 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	29	**IFR Approach:**	None
Runway Length/Width:	3602 ft / 75 ft	**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	38.265277,-122.611663

The airplane impacted terrain in a relatively flat attitude and came to rest mostly intact and upright on an easterly heading about 1,700 ft north-northwest of the departure end of runway 29, and just off the south side of the airport's north perimeter road. The engine, which had separated during the impact sequence, came to rest in the middle of the west bound lane of the perimeter road. The airplane sustained substantial damage to both wings and the forward fuselage. Most of the empennage sustained substantial damage. All major components of the airplane were accounted for at the accident site.

The airplane was recovered to a secured facility for further examination.

Airframe

Both left and right wings remained attached to the fuselage at their respective wing roots and sustained leading edge impact damage throughout their lateral spans. The forward fuselage area from the aft cabin/cockpit area was bent upward about 30°. The aft fuselage and empennage areas sustained substantial damage, but less severe than that of the forward fuselage area.

Flight control continuity was established from the left and right seat controls through the airframe to all primary flight control surfaces.

The left and right wing fuel tanks were breached. Both fuel tank vent lines were impact damaged near the inboard portion of the fuel tanks. A hose was attached to the vent lines and compressed air was applied. Both the left and right vent lines were free of debris and restrictions. A hose was attached to the fuel outlet port of the fuel selector valve. Compressed air was applied, and the fuel selector valve was functional throughout the left, right, and off positions. In addition, all associated fuel lines were free of debris and restrictions.

The airframe's electric fuel pump was observed intact. The outlet line of the fuel pump was separated at the "B" nut fitting; the "B" nut fitting was found slightly loose. Whether this was due to pre or postimpact forces could not be determined. The power and ground wires were attached to a 12-volt battery and the inlet line was submerged in water. The pump expelled water through the outlet port of the fuel pump.

The engine-driven fuel pump was disassembled and inspected. The internal diaphragm was intact and undamaged. The fuel inlet and outlet ports were unrestricted.

The engine compartment fuel lines "B" nuts were found secure at their respective fittings.

The airframe fuel filter (gascolator) was intact. Residual fuel was found within the gascolator bowl. The screen was free of debris and restrictions.

The fuel lines from the fuel selector valve to the carburetor displayed no evidence of debris or restriction when tested with air.

No anomalies were noted with the airframe that would have precluded normal operation.

Engine

All engine accessories remained attached to the engine except for the alternator and propeller governor. The carburetor was partially attached.

The left magneto was found loose and rotated freely by hand; its gasket was mostly extruded. The top securing nut rotated about ½ turn until it was tight, and the bottom nut rotated about ¾ turn until it was tight. When both nuts were tightened, the magneto did not rotate by hand. When the left magneto drive shaft was rotated, impulse coupling engagement was noted, and spark was produced on all four ignition terminals. No evidence of any impact damage was observed to the left magneto.

The right magneto remained secure to its mount and was found displaced to its counterclockwise rotational limit with no visible damage noted, other than displaced paint on its mounting flange. Both right magneto mounting nuts were secure and tight. When the right magneto drive shaft was rotated, spark was produced on all four ignition terminals. The ignition harness was impact damaged.

Damage to the propeller and starter ring gear prohibited verifying engine-to-magneto timing.

The oil suction screen was free of debris.

The engine-driven fuel pump was disassembled and inspected. The internal diaphragm was intact and undamaged. The fuel inlet and outlet ports were unrestricted.

The upper spark plugs were removed along with both magnetos, the engine-driven fuel pump, and propeller. All four top spark plugs exhibited normal operational signatures and gray deposits within the electrode area.

All four cylinders were examined internally using a lighted borescope and were unremarkable. The crankshaft was rotated using a hand tool attached to the accessory drive pad. Rotational continuity was established throughout the engine and valve train. Thumb compression was obtained on all four cylinders. Equal movement of all the intake and exhaust rocker arms was observed, and the fuel pump plunger shaft moved accordingly.

The carburetor was mostly intact. Damage was noted to the top and bottom flanges. A portion of the mixture arm was separated from the linkage. The remainder of the arm exhibited movement beyond its stop. The fuel inlet finger screen was free of debris. When the throttle lever was actuated by hand, no fuel expelled from the accelerator pump orifice. The carburetor was disassembled and inspected. The blue composite floats were intact. The needle valve and seat were intact. No fuel was observed within

the float bowl or the accelerator pump well. The accelerator plunger was intact and undamaged. The float bowl exhibited impact damage near one bolt hole, which would allow fuel to escape from the bowl, but not the accelerator pump well. The mixture metering sleeve was free of debris and restrictions. The throttle plate was intact and undamaged. No restrictions were noted from the fuel inlet port throughout the carburetor. The air intake airbox and filter element were impact damaged.

The exhaust stacks were free of debris.

The propeller governor remained attached to its mount; however, the mount was mostly separated from the engine. The drive shaft rotated freely by hand. The control arm shaft exhibited impact damage and was displaced. The rod end remained attached. The propeller remained partially attached to the engine crankshaft. Both propeller blades remained attached to the hub. One blade was bent aft slightly about 5° and exhibited 45° striations on the forward side of the blade. The trailing edge corner of the blade tip was separated at a 45° angle. The opposing blade was bent aft about 10° to 15° and exhibited chordwise striations on the forward side of the blade near the blade root. A large gouge was observed on the trailing edge of the propeller blade about 8 inches inboard of the blade tip.

Medical and Pathological Information

An autopsy on the pilot was performed at Regional Pathology and Autopsy Services, San Leandro, California. The results of the autopsy revealed that the pilot sustained fatal injuries as a result of multiple blunt force injuries.

Toxicology testing performed at the FAA's Forensic Sciences Laboratory revealed no carboxyhemoglobin in blood, no ethanol in vitreous, and no drugs in urine.

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	Daniel Butler; Federal Aviation Administration; Oakland, CA Mark Platt; Lycoming Engines; Williamsport, PA
Original Publish Date:	April 20, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97329

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.