Aviation Investigation Final Report

Location:	Hayward, California	**Accident Number:**	WPR16FA126
Date & Time:	June 19, 2016, 11:49 Local	**Registration:**	N1270P
Aircraft:	Piper PA 23-150	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

After multiple taxi tests of the twin-engine airplane, the airline transport pilot departed on a local personal flight. About 70 minutes later, the airplane was about 10.5 nautical miles southeast of the airport, and the pilot requested a landing clearance. Witnesses heard one of the airplane's engines "backfiring" as the airplane proceeded northwest towards the airport, and the pilot reported to an air traffic controller that he was having trouble with his left engine and could not maintain altitude. The pilot told the controller that he was going to land in a field next to a railroad track, and the airplane then turned about 45° to the left. A witness about 1/2 mile from the accident site saw the airplane in a wings-level descent for a few seconds before it suddenly rolled into a steep left bank. Security cameras showed the airplane descending with a rapidly increasing left bank angle until it impacted a building, and a postcrash fire erupted.

Postaccident examination of the airplane revealed that the left engine's propeller was feathered, and the left engine-driven fuel pump and carburetor contained trace amounts of water and displayed a white powdery residue, consistent with long term exposure to water contamination. The left wing's inboard and outboard fuel tank caps displayed rust around their circumferences, and the caps did not form a seal when inserted into the fueling portholes, which indicated that both fuel tanks were susceptible to contamination from rain water. Examination of the right engine showed that all four intake camlobes were worn nearly concentric in shape, and the corresponding tappet faces displayed spalling. Worn camlobes can lead to a degradation in engine performance.

The failure of the left wing's fuel cap seals, evidence of water contamination in the fuel system, and the feathered left engine indicate that it is likely the pilot feathered the left engine in response to a power loss resulting from water contamination. Although a witness reported heavy rainfall in the winter that preceded the accident at the airport where the airplane was based, the investigation could not determine when or how water was introduced into the fuel system. The high speed taxi tests conducted by the pilot before the accident flight suggest he may have been aware of a problem with the airplane before departure, but the reason he conducted the taxi tests is unknown.

According to the pilot's logbook, since purchasing the airplane about 10 months before the accident, he had accumulated about 19 hours of flight time in the airplane of which 1.4 hours were in the 90 days preceding the accident. Additionally, the majority of his recent flight experience involved single-engine airplanes, thus the pilot's lack of total and recent experience in the airplane make and model suggest that he may not have been prepared to manage an inflight loss of power in a twin-engine airplane.

Factoring in the reported 11-knot surface wind, radar data indicated that the airplane's airspeed dropped below the airplane's minimum control airspeed with an engine inoperative (Vmc) after it turned into the inoperative engine near the end of the flight and remained there for the remainder of the descent. Therefore, it is likely that the airspeed decayed to the point where the pilot was unable to counteract the asymmetrical thrust produced by the right engine, which led to the rapid left roll seen in the security camera images, further loss of altitude, and impact with the building.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the left engine due to water contamination and the pilot's subsequent failure to maintain single-engine minimum control airspeed, which resulted in an uncontrolled descent. Contributing to the accident was the pilot's lack of total and recent flight experience in the accident airplane make and model, which reduced his capacity to manage an inflight loss of power.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Engine out control - Not attained/maintained
Aircraft	Airspeed - Not attained/maintained
Aircraft	Fuel - Fluid condition
Personnel issues	Total experience w/ equipment - Pilot
Personnel issues	Knowledge of procedures - Pilot

Factual Information

History of Flight

Enroute-descent	Fuel contamination
Enroute-descent	Fuel related
Enroute-descent	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Enroute-descent	Loss of engine power (partial)

On June 19, 2016, about 1149 Pacific daylight time, a Piper PA-23-150, N1270P, was destroyed when it collided with a building following a loss of engine power during an approach to land at Hayward Executive Airport (HWD), Hayward, California. The airline transport pilot was fatally injured. The airplane was registered to and operated by the pilot under the provisions of 14 *Code of Federal Regulations* (*CFR*) Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the local personal flight that departed HWD about 1035.

Federal Aviation Administration (FAA) air traffic control (ATC) audio captured multiple communications between ATC and the pilot who continuously requested taxi tests on runway 28L over a time span of approximately 2 hours. He did not report any anomalies to the air traffic controller.

FAA radar data showed that the airplane departed HWD to the south, turned east, crossed over a mountain range, and turned north. The airplane maneuvered over the north end of San Francisco Bay, and then flew a reverse course back toward HWD. At 1145:06, when the airplane was about 10.5 nautical miles (nm) southeast of the airport, the pilot contacted the HWD air traffic control tower for a landing clearance. The local controller instructed the pilot to enter a straight in approach for runway 28L and to advise when he was 3 miles from the airport.

At 1147:30, when the airplane was about 6.5 nm from the airport and approaching several grass fields to the right of its flight path, the pilot notified the controller that he was experiencing "difficulty" with his left engine and could not maintain altitude. At the request of the controller, the pilot reported that he was the only person onboard and had about 60 gallons of fuel remaining. Seconds later, the pilot informed the controller that he would "not be able to make it to the airport." The controller then asked the pilot if he saw any landing sites around him. At 1148:51, the pilot informed the controller that he could see a field near a set of Bay Area Rapid Transit (BART) commuter train tracks and would attempt to land there. According to radar and map data, the airplane passed the grass fields to the right of its flight path at about 1148:33, and, seconds later, it turned about 45° left. As the airplane began its left turn near the end of the flight, the airplane's groundspeed was recorded at 59 knots (about 68 mph) at an altitude of 375 ft mean sea level (msl). The airplane never exceeded this groundspeed during its subsequent descent to impact. Additionally, about 20 seconds before the last radar return, the airplane's groundspeed reached a minimum of 52 knots (60 mph) at an altitude of about 225 ft msl (about 173 ft above ground level).

Three witnesses were interviewed: two who saw the airplane flying inbound to land (witnesses 1 and 2) and one who saw the airplane moments before it impacted the building in the rail yard (witness 3). As shown in Figure 1, Witness 1 was located near the airplane's inbound leg, about 9 nm southeast of HWD. Witness 1 reported that she heard an abnormal sound from inside her home. She went outside and saw an airplane approaching her house from a group of hills located to the east. The airplane appeared to be losing altitude, and the engine made a "sputtering sound," which she also described as "cutting out." The sound repeated when the airplane flew above her property and again seconds later after it passed her home.

Witness 2 was located about 10 miles southeast of HWD near the airplane's outbound leg and about 1 mile south of the airplane's inbound leg. Witness 2 stated that he was working in his yard all morning and initially saw a red and white airplane on a southeast heading about 1,750 ft. He never saw any smoke but heard a sound that resembled an engine "backfiring." The airplane subsequently made a left turn, proceeded eastbound, and disappeared behind a group of hills. About 30 minutes later, he saw the same airplane northeast of his house flying toward the airport. The witness reported hearing sounds like an engine "popping" and "backfiring." He added that he did not see any smoke, foreign object debris, or fluids coming from the airplane, and he further said that the engine "backfiring" sounds were much louder than those he heard during the airplane's outbound leg.

Witness 3 was located about 1/2 mile from the accident site. He saw the airplane flying abnormally low over a group of houses. He reported that the airplane was in a wings level descent for a few seconds before it suddenly entered a steep left turn, with the right wing about 70 degrees to the horizon. The airplane then disappeared behind a residential area. About 10 seconds later he heard a loud impact sound, and, shortly thereafter, plumes of smoke came from the airplane's direction.

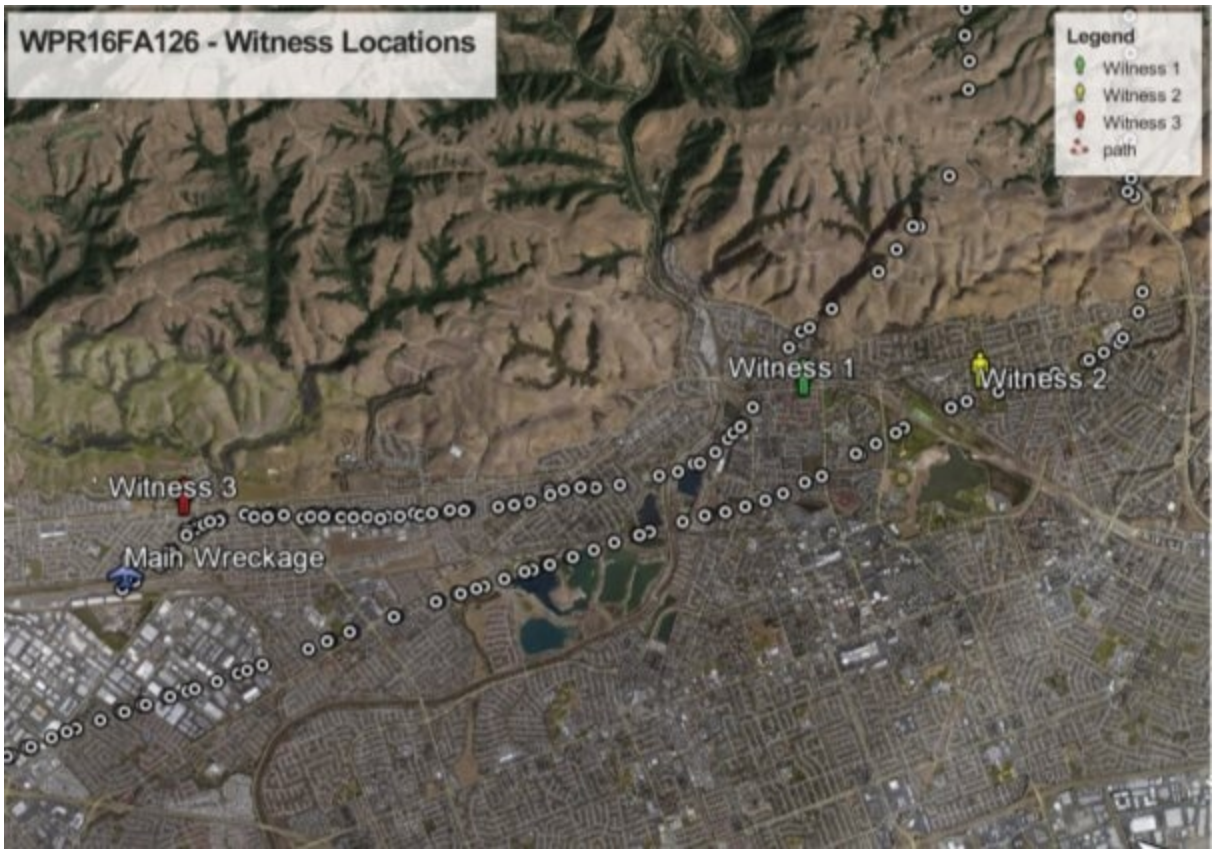

Figure 1 – Witness Locations

BART surveillance video showed the airplane in a slight left-wing-low attitude, which gradually increased as the airplane flew across a set of railroad tracks. The forward fuselage and right wing impacted the east wall of a small building. A mist covered the right wing, empennage, and tail as they fell to the ground, and a postcrash fire ensued.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	60,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):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	January 13, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 15, 2015
Flight Time:	2191 hours (Total, all aircraft), 17 hours (Total, this make and model), 1.3 hours (Last 90 days, all aircraft), 0 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The pilot held an airline transport certificate with ratings for airplane multi-engine land and a flight instructor certificate for airplane single-engine land. He held a first-class medical certificate issued on January 13, 2016, at which time he reported 2,161 total flight hours. The medical certificate included one restriction: "must have available glasses for near vision."

According to the pilot's logbook, he had accumulated about 19 hours of total flight time in the accident airplane of which 1.4 hours were in the 90 days preceding the accident. His first flight in the accident airplane took place in August 2015 when he ferried the airplane to California. After the ferry flight, the pilot accrued a total of about 27 additional flight hours in other airplanes and performing flight instruction.

The flight instructor who administered the pilot's most recent flight review reported that the flight review was conducted in March 2015 in the pilot's BE60 airplane and included two simulated left engine failures. The first simulated engine failure took place during an instrument landing system approach, and the pilot completed the engine out procedure and continued the approach successfully. The instructor noted that, during the simulated engine failure, the pilot's yaw control was "good" and that the airplane's descent was "smooth and right on." A subsequent simulated engine failure took place at 5,000 ft when the flight instructor reduced the left engine manifold pressure to 13 inches. He then asked the pilot to complete a 45° turn and hold his altitude, but the airplane was unable to maintain altitude due to the combination of a low power setting and a higher-than-standard rate turn. During both simulated engine failures, the pilot successfully kept the airspeed above the airplane's minimum controllable airspeed (Vmc).

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N1270P
Model/Series:	PA 23-150	**Aircraft Category:**	Airplane
Year of Manufacture:	1955	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	23-300
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	July 15, 2015 100 hour	**Certified Max Gross Wt.:**	3501 lbs
Time Since Last Inspection:	17 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	4076 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	O-320 SERIES
Registered Owner:	On file	**Rated Power:**	150 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

According to FAA records, the airplane was manufactured in 1955 and registered to the pilot on September 2, 2015. The airplane was powered by two Lycoming O-320-A, normally-aspirated, direct-drive, air-cooled, 150-horsepower engines. The pilot's family furnished the original aircraft logbooks, which included service information from May 1986 to July 2015. A review of the logbooks revealed that

the airplane's most recent 100-hour inspection was completed on July 15, 2015, at which time the left engine tachometer read 4,051 flight hours, and the right engine tachometer read 4,059 flight hours.

According to the logbooks, at the time of the most recent 100-hour inspection, the left and right engines had accumulated about 1,955 hours and 1,957 hours, respectively, since their most recent major overhauls. Records of the left and right engine overhauls could not be located in the available aircraft records, and the dates of the overhauls could not be determined.

The airplane total time at the time of the accident was estimated using the right engine tachometer time as the airplane's recording hour meter was not recovered. Based on the pilot's approximate 19 hours of accumulated time in the airplane make and model, the airplane's total time at the time of the accident was estimated to be about 4,077 hours.

Records furnished by a fixed base operator at HWD indicated that the pilot had purchased fuel from their self-service facility 11 times in the previous 10 months. The records showed that the pilot did not purchase fuel at HWD on the day of the accident; they showed that he last purchased fuel for the airplane at HWD in September 2015.

The pilot's logbook showed that he flew the airplane to Nut Tree Airport (VCB), Vacaville, California on May 1, 2016. VCB refueling records indicated that the pilot purchased about 15 gallons of 100LL gasoline that day. Before that, the pilot had purchased about 28 gallons of 100LL gasoline at VCB on September 27, 2015.

A procedure to feather the propeller of an inoperative engine was included in the airplane's aeronautical flight manual (AFM). According to the AFM, the procedure included the following steps:

- Throttle "CLOSED".
- Prop Control "FEATHERED". PROP CANNOT BE FEATHERED UNDER 700 RPM.
- Mixture control "IDLE CUT-OFF".
- Ignition switches "OFF".
- Electric fuel pump (if in use) "OFF".
- Main valve "OFF".

The manufacturer's published Vmc for the airplane is 85 mph.

METEOROLOGICAL INFORMATION

The 1152 recorded weather observation at HWD included wind 280° true at 11 knots, visibility 10 statute miles, clear skies, temperature 27°C, dew point 8°C, and an altimeter setting of 30.06 inches of mercury.

According to an employee of a fixed base operator at HWD, the airport received significant levels of rain during the winter of 2016 that resulted in an overflow of the airport's drainage ditch. However, the investigation was unable to determine whether the airplane was parked outside during the winter of 2016.

WRECKAGE AND IMPACT INFORMATION

Initial examination of the accident site by the National Transportation Safety Board investigator-in-charge revealed that the airplane came to rest at the base of a fiberglass railroad car wash building, about 5 nm southeast of HWD. All major structural components of the airplane were accounted for at the accident site, which was contained within an area about 35 ft long and 25 ft wide. The fuselage came to rest inverted on a heading of 095° magnetic and was destroyed by fire. With the exception of some thermal damage, the empennage was intact and remained connected to the fuselage by the airplane's rudder control cables. The right wing was destroyed by fire, and its corresponding engine was inverted and covered in soot. The left wing was co-located with the main wreckage in a near vertical position, at rest against the southeastern end of the building, and exhibited an odor of fuel near the left wingtip. Both sets of propeller blades remained attached to their respective hubs; the left engine propeller blades were in the feathered position and did not display any damage. The right engine propeller blades were in a low pitch position and displayed nicks, gouges, and tip curling.

Left aileron control continuity was confirmed from the left aileron bell crank to the wing root where the cables had been cut by recovery personnel. The rubber seal to the inboard left tank fuel cap was rusted, and the cap did not form a seal inside the fuel tank ring when installed. The fuel cap rubber seal to the left outboard tank displayed some corrosion and did not form a seal when installed in the fuel tank ring. The left fuel selector valve displayed 3/4 inches of space between the lever and the valve. According to the manufacturer, this position was consistent with an auxiliary tank setting. A trace amount of fuel was drained from the left engine gascolator into a plastic container that had been cleaned and dried. The fuel odor and appearance resembled 100LL aviation grade gasoline; however, a SAR-GEL fuel purity test indicated that the fuel was contaminated with water. The left electric fuel boost pump was not recovered.

The right wing aileron bell crank was damaged by fire but remained intact and attached to the primary aileron and balance cables. The right aileron cable was continuous from the bell crank to the chain, which had fracture signatures consistent with overload separation.

The right electric fuel boost pump was disassembled, and the gasket and internal components displayed carbon coloring consistent with exposure to fire. The pump was void of fuel, and the fuel screen was found free of debris.

One arm from the control T-bar assembly separated at the T-section, and the assembly was damaged by fire; however, the remaining three sprockets were intact. A portion of elevator control tube remained attached to the tube stem.

Continuity of the rudder assembly was traced from the rudder torque tube through a control cable located on the right side of the airplane to the rudder flight control surface. A rudder control cable on the opposing side was traced from the rudder to the cockpit; however, the cable had separated from the torque tube arm, which had separated from the torque tube.

The flap actuator measured about 20 inches, which was consistent with partial deployment of the flaps. According to the airplane manufacturer, an actuator measurement of 18.35 inches corresponds to a full flap extended position and 25.50 inches corresponds to a full flap retracted position. While the flap actuator rod displayed significant fire damage on the fore and aft ends, the intermediate section was shiny in appearance with only some blue discoloration.

Elevator continuity was traced from the elevators to a fractured control tube near the aft fuselage.

The rudder trim jackscrew displayed about 1 inch of exposed threads. According to the manufacturer, this measurement was consistent with a neutral trim position.

The elevator trim displayed about 17 threads, which correlated to a near full nose-up trim position. However, the elevator trim cables were loosely fixed to the trim drum, which indicated that the trim jackscrew may have moved during the accident sequence.

Left Engine

Mechanical continuity of the left engine was confirmed from the propeller throughout the valve train to the accessory section when the propeller was rotated by hand. Thumb compression and suction were established on each of the engine's four cylinders, and the valve train moved in the proper firing order. An examination of each cylinder's internal combustion chamber revealed no evidence of foreign object ingestion or detonation.

A magneto synchronizer confirmed the magneto breaker points opened at 25° below top dead center. Both the left and right magnetos were timed within 1° of each other. The magnetos were then removed from their respective mounting pads to facilitate a magneto examination. Hand rotation of each drive produced spark at each of the four plug leads.

The top and bottom spark plugs were secured in their respective positions and undamaged. The plugs were oil-soaked, but displayed coloration consistent with normal operation as shown on the Champion Spark Plug "Check-A-Plug" chart AV-27. The static oil soaking of the spark plugs was attributed to the engine positioning at the mishap site and post recovery.

The carburetor was attached to the engine accessory case at the mounting flange, and the throttle/mixture controls were secured to their respective controls arms at the carburetor. The carburetor fuel screen was free of debris, and the carburetor floats were intact. Trace amounts of residual fuel were discovered in the carburetor fuel bowl and in the accelerator pump. A subsequent SAR-GEL water indicating paste test confirmed the presence of water contamination in both cavities. A white powdery residue was observed on the accelerator pump plunger, consistent with corrosion.

Disassembly of the left engine-driven fuel pump revealed trace amounts of residual fuel, which exhibited an odor and appearance that resembled 100LL aviation gasoline. A subsequent SAR-GEL test indicated that the pump had been contaminated by water. The internal chambers to the fuel pump exhibited significant corrosion signatures consistent with long term exposure to water. Additionally, the pump valves and backing plate displayed a white powdery substance consistent with corrosion.

Right Engine

The right engine and accessories displayed significant fire damage. Mechanical continuity of the engine was established from the crankshaft through the valve train to the accessory section when the propeller was rotated by hand. Thumb compression and suction was achieved for each cylinder; however, a borescope inspection revealed that the intake valve rocker arm for each cylinder displayed little movement as the valve train was rotated. The exhaust rocker arms moved normally, and the pushrods did not exhibit any bending.

An internal examination was achieved by drilling holes through the top of the engine case material in-line with the rotational plane of each connecting rod. Subsequent inspection of the camshaft with a lighted borescope revealed that the intake camlobes for cylinder Nos. 3 and 4 were concentric in shape, consistent with long term wear. The intake camlobes for cylinder Nos. 1 and 2 were worn down about 90% and formed nearly concentric shapes. The corresponding tappet faces displayed significant spalling. Lycoming Engines Mandatory Service Bulletin SB301B provides guidance for maintenance and service limitations for valves. In particular Paragraph 1(b) states "Rotate the engine by hand and check to determine that all cylinders have normal lift and that rockers arms operate normally" a 400 hour inspection interval. The logbooks did not contain any record of a camshaft lobe inspection, camshaft replacement or compliance with this MSB.

Lycoming Engines Mandatory Service Bulletin SB480E provides guidance when inspecting oil system screens and filters for contamination during inspection cycles.

Both magnetos remained attached to their respective mounting pads. Due to thermal damage, magneto-to-engine timing could not be established, and the magnetos could not be functionally tested.

The top spark plugs were secured in their respective positions and had been thermally damaged. Ground electrode wear could not be determined as each plug displayed a varying amount of coloration due to the thermal effects of the postimpact fire.

MEDICAL AND PATHOLOGICAL INFORMATION

The Alameda County Sheriff's Office, Oakland, California performed an autopsy on the pilot. The autopsy report indicated the cause of death was "extensive blunt trauma."

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens recovered from the pilot. A carboxyhemoglobin saturation test revealed no evidence of carbon monoxide in the pilot's cavity blood. The pilot's toxicology results were negative for ethanol and positive for ibuprofen in his urine.

ADDITIONAL INFORMATION

According to the FAA's Airplane Flying Handbook, Vmc is defined as the "minimum control speed with the critical engine inoperative" and is marked with a red radial line on most airspeed indicators. It is the minimum speed at which directional control can be maintained under a specific set of circumstances outlined in 14 *CFR* Part 23, Airworthiness Standards.

The handbook explains that engine inoperative flight with wings level and ball centered requires large rudder input towards the operative engine. The result is a moderate sideslip towards the inoperative engine, which reduces climb performance. With wings level, Vmc will be significantly higher than

published as there is no horizontal component of lift available to help the rudder combat asymmetrical thrust. The handbook further remarks that a single engine failure in a twin-engine airplane will result in "high drag, large control surface deflections required, and rudder and fin opposition due to sideslip."

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HWD,52 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	11:52 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.05 inches Hg	**Temperature/Dew Point:**	27°C / 8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	HAYWARD, CA (HWD)	**Type of Flight Plan Filed:**	None
Destination:	HAYWARD, CA (HWD)	**Type of Clearance:**	VFR flight following
Departure Time:	10:35 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	HAYWARD EXECUTIVE HWD	**Runway Surface Type:**	
Airport Elevation:	52 ft msl	**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	37.605556,-122.035278

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen
Additional Participating Persons:	Glenn Gathright; FEDERAL AVIATION ADMINISTRATION; Oakland, CA Mark Platt; Lycoming Engines; Phoenix, AZ Charlie Little; Piper Aircraft Company; Chino, CA
Original Publish Date:	December 12, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=93401