



National Transportation Safety Board Aviation Accident Final Report

Location:	Fresno, CA	Accident Number:	WPR17FA041
Date & Time:	12/26/2016, 1318 PST	Registration:	N176PA
Aircraft:	PETRUS DAVID WAYNE S90	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The private pilot began flight training in 1996 and had accrued about 187 total hours of flight experience by 2012, mostly in low-performance Cessna and Piper airplanes. The pilot then ceased flying until mid-2016, when he purchased the previously-owned experimental amateur-built, high-performance accident airplane.

In late 2016, when he had accrued about 31 hours of flight experience in the airplane, the pilot and a non-pilot rated passenger departed for a local personal flight. Weather conditions were benign, with light winds, clear skies, and moderate temperature. According to multiple witnesses, some of whom were pilots, the airplane entered a steep climb at some point after it lifted off. The airplane then began a sharp right turn while continuing to climb rapidly. Shortly thereafter, the airplane entered a steep descent and impacted marshy terrain about 900 ft to the northeast of the departure end of the runway.

A flight path reconstructed from data recovered from an onboard GPS device indicated a trajectory that was similar to that indicated by the witness accounts. GPS-derived comparison of the profile of the accident takeoff with those of seven of the pilot's other takeoffs in the airplane from the accident airport revealed that five of the other seven takeoff profiles were similar to one another, and that the accident takeoff profile was markedly different from those five. During the accident takeoff, the airplane remained on or near the ground about 25 seconds longer than it did during those five other takeoffs, and then climbed at a rate that was about twice the rates of those five takeoffs. The other two takeoffs exhibited ground or near-ground travel durations of about 40 seconds, with climb rates similar to those of the other five takeoffs.

Postaccident examination of the engine and airframe did not reveal evidence of any pre-impact mechanical deficiencies or failures that would have precluded normal operation, and the damage was consistent with the engine developing at least moderate power at impact. The airplane was equipped with dual flight controls, but the investigation was unable to determine who was manipulating the controls for the takeoff and flight. The relative sizes of the two

occupants were not consistent with the passenger being able to overpower the pilot on the flight controls. The takeoff profile was consistent with an aggressive, more exciting technique sometimes referred to as a "high-performance" or "zoom climb" takeoff. The investigation was unable to determine the reason for this takeoff profile that was uncharacteristic from previous departures. The investigation was also unable to determine the reason(s) for the right turn/roll and departure from controlled flight.

Probable Cause and Findings

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

The pilot's abnormally steep takeoff climb followed by a loss of control and rapid descent to ground impact, for undetermined reasons.

Findings

Aircraft	Climb rate - Not attained/maintained (Cause) Lateral/bank control - Not attained/maintained (Cause)
Personnel issues	Aircraft control - Pilot (Cause) Recent experience - Pilot Recent experience w/ equipment - Pilot
Not determined	Not determined - Unknown/Not determined (Cause)

Factual Information

HISTORY OF FLIGHT

On December 26, 2016, about 1318 Pacific standard time, an experimental, amateur-built Express S-90, N176PA, was destroyed when it departed controlled flight and impacted terrain shortly after takeoff from runway 30 at Sierra Sky Park Airport (E79), Fresno, California. The private pilot/owner and his passenger received fatal injuries. The personal flight was conducted under the provisions of 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed at the time of the accident.

The pilot had a residence on E79, a residential airpark, and based his airplane there. According to the pilot's wife, the passenger was a family friend, and the flight was to be a local pleasure flight.

Several persons, some of whom were pilots, witnessed various portions of the accident flight, and the reports were generally consistent with one another. The witnesses were at multiple various locations around E79 and its surrounds. All stated that the airplane was climbing after takeoff when it made a "sudden" and/or "rapid" right turn. Two non-pilot witnesses, who were about 1,200 ft northwest of the departure end of the runway, reported that the airplane was "low" when they first observed it and that it then suddenly turned right. Several other witnesses, some of whom were pilots, reported that the airplane was in an abnormally steep climb after liftoff and then began a right turn that was followed shortly thereafter by a rapid descent and impact to the lake situated north of and below the airport elevation.

Accounts of the airplane's specific motions after the right turn varied, but all witnesses reported that the airplane descended rapidly toward the ground very shortly thereafter. Most reported a nose-down attitude during the descent, and one witness qualified the descent as "falling." Maximum bank angle accounts varied, and at least one witness reported a full 360° roll. Maximum altitude accounts also varied, but all accounts agreed that the airplane did not climb very high.

The witnesses who were able to hear the engine agreed that initially the engine sounded normal, but their accounts then diverged as the airplane began its right turn/roll. The deviations in witness accounts of the engine sound are consistent with changing airplane attitudes, and/or differences in witness locations. Some witnesses reported that the engine sounded normal, while others reported a decrease in power (based on volume of the sound) and/or "popping" sounds. Only one witness reported seeing smoke, but he was uncertain whether the airplane that he observed was the accident airplane, and he categorized the smoke as exhaust.

Immediately after the accident, several witnesses attempted to access the accident site to render assistance. One witness, a pilot who resided at E79, was the first person to arrive at the impact site. He stated that there was the "odor of gasoline but no sheen" on the surrounding water. There was no fire.

PERSONNEL INFORMATION

Pilot

The 47-year-old pilot held a private pilot certificate with an airplane single-engine land rating. His most recent Federal Aviation Administration third-class medical certificate was issued in July 2016.

According to the pilot's logbook, he began flight training in 1996 and received his pilot certificate in 1997. He accrued about 150 hours total in several airplane types, including Cessna 150, Cessna 172, Piper PA-38, and Piper PA-28R models. In 2002 and 2004, he accrued about 24 and 2 hours, respectively, in a Velocity experimental amateur-built airplane. He then stopped flying until 2011. In 2011 and 2012, he flew about 13 hours in a Piper PA-28 airplane.

In August 2016, when he had a total flight experience of about 187 hours, the pilot bought and logged his first flight in the accident airplane make and model, which was the accident airplane. Excluding the accident flight, he had logged a total of 31.1 hours in that airplane. The pilot's total flight experience at the time of the accident was about 218 hours.

A former neighbor of the accident pilot, who was also a pilot and had previously built an Express S-90 in which he had accumulated about 150 flight hours, reported that he had flown the accident airplane several times with the accident pilot, most recently about 5 days before the accident. The former neighbor stated that he knew the pilot well and firmly believed that the pilot would not try to "show off," scare passengers, or do "high performance takeoffs," which he explained were takeoffs in which the airplane climbed away from the runway at an unusually steep angle.

Another resident stated that he thought the accident pilot was a "good pilot" but added that the pilot was "behind the airplane." He did not elaborate on either his opinion or its basis.

Passenger

The passenger was a 32-year-old male. He was the son of a neighbor of the pilot. He did not hold any FAA certificates. According to family members, he had no piloting experience and no plans to learn to fly, and the accident flight was one of his very few flights in a general aviation airplane.

AIRCRAFT INFORMATION

The fixed-gear, four-place, high-performance airplane was designed and marketed by Composite Aircraft Technology. The airplane was built by a third party in 2004 and was owned by several different persons before it was purchased by the accident pilot. The airplane was equipped with a Lycoming IO-540 series engine and a Hartzell 3-blade propeller.

According to the maintenance records, the most recent condition inspection was completed in May 2016. As of that date, the airframe had accrued 501 hours total time (TT) in service. Engine maintenance records indicated that an oil and filter change was accomplished in September 2016, at which time the airframe had accumulated a TT of about 546 hours, and the

engine had accumulated a TT since major overhaul of about 945 hours. Review of the maintenance records did not reveal any discrepancies or maintenance activities that could be associated with the accident.

The former neighbor who had flown with the pilot in the airplane stated that the airplane flew straight and level "hands off" and that it flew "really well." He also stated that the flight controls were "heavy" and that manipulating them was "like driving a Mack truck." The former neighbor reported that he normally used about 5° to 10° of flap for takeoff in his S-90 and thought that the accident pilot did the same. He was not aware of the accident airplane having a cockpit flap position indicator and thought that the pilot determined the amount of flap deflection visually by looking out the cockpit window. The former neighbor stated that, in his airplane, he used a neutral (tab faired with elevator) pitch trim setting for takeoff, and that the accident pilot used a similar setting.

Weight and Balance Information

According to the most recent weight and balance documentation located by the investigation, the airplane had an empty weight of 2,163 lbs, and a maximum gross weight of 3,300 lbs. The airplane was equipped with two 15-gallon outboard fuel tanks and two 30-gallon inboard fuel tanks.

Calculations using the occupants' weight and two different fuel loads both resulted in a gross weight below the maximum allowable, but with center of gravity (CG) values about 2 inches forward of the allowable envelope. However, the validity of the airplane empty weight/CG, station information, and envelope values could not be independently verified by the investigation. In addition, the exemplar loading conditions were likely representative of the configuration for several previous flights, during which the airplane flew normally.

METEOROLOGICAL INFORMATION

The airport was not equipped with any weather sensing, reporting, or recording equipment.

The 1315 automated weather observation at Fresno Chandler Executive Airport (FCH), located 8 miles south of E79, included visibility 10 miles, clear skies, temperature 10°C, dew point 3°C, and an altimeter setting of 30.28 inches of mercury. The observation did not include any wind data. Meteorological conditions at Fresno-Yosemite Air Terminal (FAT), located 8 miles southeast of E79, were similar and included winds from 310° at 5 knots.

AIRPORT INFORMATION

E79 was equipped with a single paved runway, runway 12/30, that measured 2,473 ft by 50 ft. The airport elevation was 321 ft above mean sea level (msl). The airport was located just south of a lake and ecological preserve that adjoined the San Joaquin River; the lake surface was about 80 ft below the elevation of the airport. E79 was non-towered, and the common traffic advisory frequency communications were not monitored by ground personnel or recorded on any equipment.

Although there was a vehicular traffic monitoring camera that was located at a road intersection just south of E79 and faced the airport, the camera and system did not have any recording capability.

WRECKAGE AND IMPACT INFORMATION

The airplane impacted in marshy ground at the shoreline of the lake located north of the airport. The wreckage came to rest about 70 ft from the initial impact point, and the direction of travel between those two points was 265° true. The accident location was 2,700 ft, on a bearing of 332° true, from the threshold of E79 runway 30. The accident site elevation was about 80 ft below the elevation of E79.

The wreckage was found in three major sections, which remained partially attached to one another; the sections were the wings, the engine and cockpit, and the aft fuselage. The two wings remained attached to one another and came to rest leading edge down, with the chordline approximately perpendicular to the ground. The engine and attached propeller were fully immersed in the water and underlying mud/silt, with the significantly deformed and fractured cockpit remnants mostly above the waterline. The aft fuselage came to rest inverted on top of the cabin section. Some cowling and wing fragments were dispersed in the area of the initial impact point, and some of the marsh grass was flattened in this area as well. However, no significant gouges or other ground scars were observed in this region.

The forward and lower regions of the cabin were severely disrupted by the impact. Both front seats were fracture-separated from the structure. The available evidence indicated that both occupants were using their seat belts and shoulder harnesses and that those restraint systems remained intact and fastened during the impact.

The airplane was equipped with a total of four integral wing fuel tanks. All four tanks were breached but retained their caps in their respective filler necks. No fuel was observed the day after the accident. Wing leading edge damage was continuous along the entire span of both wings, consistent with a laterally-symmetric wing leading edge impact in the aft (chordwise) direction. The two electrically-controlled and -actuated trailing edge flaps remained fully attached to their respective wings. The left flap drive remained connected to the actuator, but the right flap drive was fracture-separated at the flap fitting. Damage precluded determination of the impact flap setting. The ailerons remained fully attached to their respective wings, and all aileron control system fractures were consistent with one-time impact-related overload fractures. All aileron balance weights were present. The left aileron weights were found partially displaced from their normal orientation due to a fractured rod that normally secured the weights. The aileron weights were retained for further laboratory examination. The laboratory findings are discussed later in this report.

The horizontal and vertical stabilizers remained attached to the aft fuselage and were essentially undamaged. The elevators, pitch trim tab, and rudder remained securely attached to their respective aero surfaces and were also essentially undamaged. All pitch and yaw flight control system fractures were consistent with one-time impact-related overload fractures, with no evidence of pre-existing failures.

The cockpit instrumentation was primarily electronic, with a few electro-mechanical or pneumatic flight instruments. All the electronic instrumentation was found immersed in the water at the site, and most were significantly impact-damaged. None had provisions for recording flight or system information. A Garmin GPSMap 496 was recovered and sent to the NTSB Recorders Laboratory for data download. Those results are discussed later.

The fuel selector valve was found in a position that corresponded to the left tank setting, and the valve was observed to be clear of internal debris and blockages. Most engine control postimpact settings were deemed to be unreliable, but no pre-impact failures were identified in those components. The ignition switch was found set to the "BOTH" position. Electrical switch and circuit breaker positions were deemed to be unreliable due to impact and recovery disruption.

The engine data plate indicated that the engine was a 300-horsepower Lycoming IO-540-K1E5. The engine sustained crush damage in the aft and up directions on the bottom and sides and propeller strike damage to the No.1 cylinder. The propeller was a Harzell all-metal, three-blade, controllable-pitch design. The propeller hub was intact, and all three blades were retained in the hub. All three propeller blades exhibited significant bending and twisting deformation and scoring/gouging. One blade exhibited damage congruent with the strike damage to the engine.

No evidence of any pre-impact mechanical deficiencies or failures of the engine or propeller that would have precluded normal operation was observed, and all damage was consistent with ground impact with the engine operating at medium to high power.

MEDICAL AND PATHOLOGICAL INFORMATION

Pilot

The Fresno County Coroner's autopsy report indicated that the cause of death of the pilot was "Multiple Skeletal and Visceral Injuries" as a result of "Blunt Impact" and that alcohol and drug test results were all negative. The pilot's height was reported as 69 inches, with a weight of 213 pounds. The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted forensic toxicology examinations on specimens from the pilot and reported that no carbon monoxide, ethanol, or any screened drugs were detected.

Passenger

The Fresno County Coroner's autopsy report indicated that the cause of death of the passenger was "Multiple Skeletal and Visceral Injuries" as a result of "Blunt Impact." The passenger's height was reported as 68 inches, with a weight of 177 pounds. The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted forensic toxicology examinations on specimens from the passenger and reported that no carbon monoxide or ethanol was detected.

TESTS AND RESEARCH

Airspeed Information Discrepancies

Comparison of the airspeed reference values depicted on the airspeed indicator (ASI), the Pilots Operating Handbook (POH), and a copy of the checklist provided by the previous owner of the airplane revealed multiple discrepancies between the three sources. For example, the POH specified a landing configuration stall speed of 50 kts, while the ASI specified 55 kts, and the checklist specified 70 kts, with no configuration reference. The previous owner of the airplane was of the opinion that 70 kts was a much more realistic and representative stall speed, and that the factory-specified 55 kt stall speed was unrealistic and/or impossible. The investigation was unable to determine which data sources and values the pilot utilized for operation of the airplane. All discrepancies are detailed in a separate report that is available in the NTSB public docket for this accident.

Left Aileron Balance Weights

Each aileron was equipped with two balance weights mounted on a common arm that attached to the aileron and extended forward into the wing. Each aileron weight assembly was fully enclosed within its respective wing. During the post recovery examination, the left aileron weights were found partially displaced from their normal orientation, due to a fractured rod that normally secured the weights. This fracture allowed the weights to pivot to an orientation that would prevent aileron motion. Detailed laboratory examination of the fractured and intact rods revealed that the fracture was a one-time overload, with no indications of pre-existing deficiencies, and that the other rods were fully intact. These observations were all consistent with impact forces being the reason for the damage.

GPS 496 Data

The NTSB Recorders Laboratory was able to successfully download data from the recovered GPS device. The extracted data included 59 track logs (referred to as sessions), that were dated between August 2, 2016 and December 26, 2016. The sessions included 35 flights (some with interim landings) including the accident flight. Because the GPS device was a handheld/portable unit, the possibility existed that, excluding the accident flight, the flights could have represented activity in other aircraft, and/or with other than the accident pilot. Correlation of the GPS flights with the pilot's logbook indicated that all but two of the GPS-recorded flights appeared to have been conducted by the pilot in the accident airplane.

The data for the accident flight indicated that the takeoff roll began about 1317:10, and that the airplane was airborne by about 1317:33. The GPS recorded a total of 5 in-flight data points. Rate of climb (ROC) calculations indicated that the airplane initially achieved a maximum ROC of 3,075 feet per minute (fpm). The airplane then entered a descent, reaching a maximum calculated descent rate of 1,924 fpm. The maximum recorded GPS altitude was 631 feet, which was about 310 feet above the runway elevation. The last recorded point was at 1317:48, at an altitude of 434 ft, which was about 200 ft above the impact elevation.

The GPS-derived ground track indicated that the airplane began translating right of the runway centerline when it was about 2/3 of the way down the runway. The flight path became perpendicular to the runway centerline before the airplane reached the end of the runway and continued to arc to the right. The final recorded GPS data point indicated that the airplane was positioned about 250 ft, on a true bearing of about 240°, from the impact location.

The accident takeoff was compared to seven other takeoffs from E79 by plotting them as altitude vs. time from the beginning of their respective takeoff rolls. Although variables affecting takeoff performance (such as flap setting, weight, ambient temperature, and wind) are not known for each takeoff, the accident takeoff profile was markedly different from the other seven takeoff profiles. On the accident takeoff, the airplane remained on or near the ground for about 52 seconds and then began a very steep climb. In contrast, on five of the previous takeoffs the airplane was airborne and climbing in less than 30 seconds, with consistent, yet much lower, climb rates. On the other two takeoffs, the airplane began its climb about 40 seconds after the takeoff began and climbed at a rate between those of the five "flutter" takeoff flights and the accident flight.

Chronologically, three of the five "flutter" takeoffs took place in August, about 4 months before the accident flight. The other two of the five "flutter" takeoffs took place in early November and December. The two remaining takeoffs took place in December.

History of Flight

Initial climb	Loss of control in flight (Defining event)
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Pilot Information

Certificate:	Private	Age:	47, Male
Airplane Rating(s):	Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 Without Waivers/Limitations	Last FAA Medical Exam:	07/15/2016
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	218 hours (Total, all aircraft), 31 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	PETRUS DAVID WAYNE	Registration:	N176PA
Model/Series:	S90	Aircraft Category:	Airplane
Year of Manufacture:	2004	Amateur Built:	Yes
Airworthiness Certificate:	Experimental	Serial Number:	80842
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	05/27/2016, Condition	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	Reciprocating
Airframe Total Time:	501 Hours as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	IO-540
Registered Owner:	On file	Rated Power:	
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	FCH, 300 ft msl	Distance from Accident Site:	8 Nautical Miles
Observation Time:	1315 PST	Direction from Accident Site:	180°
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.28 inches Hg	Temperature/Dew Point:	10° C / 3° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fresno, CA (E79)	Type of Flight Plan Filed:	None
Destination:	Fresno, CA (E79)	Type of Clearance:	None
Departure Time:	1318 PST	Type of Airspace:	

Airport Information

Airport:	Sierra Sky Park (E79)	Runway Surface Type:	Asphalt
Airport Elevation:	321 ft	Runway Surface Condition:	Dry
Runway Used:	30	IFR Approach:	None
Runway Length/Width:	2473 ft / 50 ft	VFR Approach/Landing:	Unknown

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:	36.844444, -119.870833

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	Report Date:	05/09/2018
Additional Participating Persons:	Michael Coberly; FAA; Fresno, CA Mark Platt; Lycoming Engines; Williamsport, PA		
Publish Date:	05/09/2018		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=94530		

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](#).