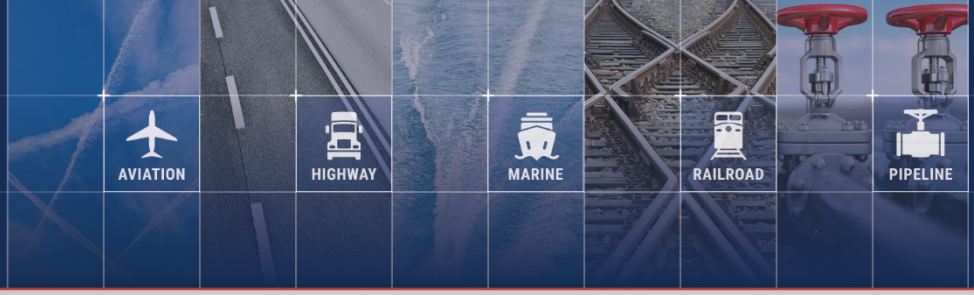

Aviation Investigation Final Report

Location:	Vancouver, Washington	**Accident Number:**	WPR22FA235
Date & Time:	June 28, 2022, 07:40 Local	**Registration:**	N444PM
Aircraft:	Beech V35B	**Aircraft Damage:**	Destroyed
Defining Event:	Aerodynamic stall/spin	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot departed and about 3 minutes into the flight he elected to return to his departure airport due to weather. The airplane entered the downwind leg of the airport traffic pattern and made his final radio transmission over the airport common traffic advisory frequency (CTAF). When abeam the runway threshold the pilot then made an early turn onto base leg of the traffic pattern for reasons that could not be determined, and the airplane descended towards the runway. As the airplane turned onto final approach, just over the runway threshold, it made a right turn about 90° and impacted the ground. The airplane was destroyed by postcrash fire.

Postaccident examination of the airplane and engine revealed no preimpact mechanical anomalies that could have precluded normal operation. The weather was not likely a factor in the accident as reports indicated few clouds and visibility was variable but appeared clear in surveillance video. The pilot's flight experience in the accident airplane make/model are unknown, but he was familiar with the traffic pattern at the airport where the accident occurred.

The pilot's autopsy report showed that he had an increased risk of a sudden incapacitating event due to coronary artery disease. However, a family member noted that the pilot was in good health and showed no indications of distress the morning of the accident flight. In addition, the pilot exhibited no medical concerns during his communications with air traffic control, which ceased about 18 seconds before the accident. Video and radar evidence also indicated the pilot flew a stabilized descent while on the base leg of the traffic pattern, which also suggests he was likely not in distress. In this context, no evidence suggests that a medical anomaly contributed to the accident.

As the pilot turned onto final approach, he commanded a steep turn to align the airplane with the runway, which likely resulted in an exceedance of the airplane's critical angle of attack, an accelerated stall, and impact with terrain. The pilot had an opportunity to go-around after the improper base leg entry, thus his decision to continue the approach following the base leg turn contributed to the accident.

Probable Cause and Findings

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

The pilot's decision to execute a steep turn to final approach, which resulted in an exceedance of the airplane's critical angle of attack and an accelerated stall. Contributing to the accident was the improper positioning on base leg and the pilot's subsequent decision to continue the approach.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Not attained/maintained
Personnel issues	Decision making/judgment - Pilot

Factual Information

History of Flight

Approach-VFR pattern final	Aerodynamic stall/spin (Defining event)

On June 28, 2022, about 0740 Pacific daylight time, a Beechcraft V35B, N444PM, was destroyed when it was involved in an accident near Vancouver, Washington. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to automatic dependent surveillance-broadcast (ADS-B) data from the Federal Aviation Administration (FAA), the airplane departed Pearson Municipal Airport (VUO), Vancouver, Washington, at 0723 on an easterly heading to an unknown destination and was in contact with air traffic control. At 0726, the pilot informed air traffic control that he was going to "circle back" due to clouds. When the controller asked for the pilot's intentions, the pilot stated that he was going to fly to Vancouver Lake, lose some altitude, and "see if this clears." For the next 2-3 minutes the pilot and air traffic controller attempted to troubleshoot a transponder issue with the accident airplane. During this time, the pilot continued to fly northwest. At 0730 the controller asked the pilot to update him on his intentions and the pilot responded that he was "wondering about the weather…thought it was 4,000 ft, but it's a lot lower than that." The controller then asked the pilot to update him with his intentions when he was able to. The pilot requested weather information from the controller, who offered to send him to approach control. After the pilot accepted his offer, the controller provided the radio frequency for approach control and then gave him a report of traffic in his area. The pilot replied to the controller that he was looking for the traffic.

At 0734, the controller discovered the pilot was not in contact with approach control. He contacted the pilot and informed him that he was still with Portland tower. During this time, the pilot was tracking southbound over Vancouver Lake, about 4 nautical miles (nm) from VUO. The pilot then informed the controller that he was going to return to VUO. The controller asked if he had the airport in sight and the pilot acknowledged that he did. The controller informed the pilot that radar services were terminated and instructed him to squawk VFR and change to the airport's CTAF.

At 0735, the pilot announced that he was entering the downwind leg of the airport traffic pattern for VUO over the airport's CTAF radio frequency. About 1 minute later the pilot announced that he was on the downwind leg, which was his final radio transmission. The airplane turned onto the base leg of the airport traffic pattern about 0736 and maintained a southerly heading.

Surveillance video captured the airplane's final seconds of flight before its impact with the ground. The airplane came into view in a slight right-wing-low attitude. In the 2 seconds that followed, the airplane's right bank angle increased as it descended rapidly towards the ground. The airplane's right wing impacted the ground first in a near-90° attitude immediately followed by the nose as it burst into flames. The airplane slid inverted for several seconds along the displaced threshold for runway 26.

Pilot Information

Certificate:	Private	**Age:**	64,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	January 31, 2022
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 600 hours (Total, all aircraft)		

A family member reported that the pilot was in good health. He worked out twice a day, ate healthy, and was not on any medications to her knowledge. In addition, she communicated via text message with the pilot on the morning of the accident and did not observe any abnormalities with his behavior.

The pilot's flight logbooks could not be located. A friend who had flown at least 30 hours with the pilot in the accident airplane reported that he had helped the pilot purchase the airplane and had given him his most recent flight review. He stated that they normally turned onto the final approach leg of the traffic pattern over a large white building (about a 0.5 nm distance from the runway). He further remarked that he had previously taught the pilot normal and accelerated stalls in the accident airplane.

Figure 1: Accident flight path versus pilot's usual flight path to runway 26

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N444PM
Model/Series:	V35B	**Aircraft Category:**	Airplane
Year of Manufacture:	1976	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	D-9905
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	June 17, 2021 Annual	**Certified Max Gross Wt.:**	3412 lbs
Time Since Last Inspection:	39 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2484 Hrs	**Engine Manufacturer:**	Continental Motors
ELT:	Installed	**Engine Model/Series:**	IO-520-BA
Registered Owner:	On file	**Rated Power:**	285 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KVUO,22 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	07:43 Local	**Direction from Accident Site:**	72°
Lowest Cloud Condition:	Few / 200 ft AGL	**Visibility**	1.75 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.13 inches Hg	**Temperature/Dew Point:**	16°C / 10°C
Precipitation and Obscuration:	Moderate - None - Haze		
Departure Point:	Vancouver, WA	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	VFR flight following
Departure Time:		**Type of Airspace:**	Class E

Airport surveillance video of the airplane's base leg and turn to final approach showed some clouds that appeared high above the airplane's flight path and did not show any meteorological obscurations in the airplane's flight path.

Recorded winds aloft data for approximately 1,000 ft msl included a temperature of 22° C, a wind direction of about 172°, and a wind speed of about 11 kts.

Airport Information

Airport:	PEARSON FLD VUO	**Runway Surface Type:**	Asphalt
Airport Elevation:	28 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	08/26	**IFR Approach:**	None
Runway Length/Width:	3275 ft / 60 ft	**VFR Approach/Landing:**	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	45.620452,-122.65648

The airplane came to rest inverted on a heading of about 038° magnetic about 120 ft east of the runway 26 numbers. All major components of the airplane were accounted for at the accident site.

The aileron flight controls were continuous from the ailerons to the cockpit and the rudder/elevator control was traced from the flight controls to the cockpit through a separation at the left differential tail control rod, which exhibited fractured characteristics consistent with overload separation.

No preimpact mechanical anomalies or malfunctions were observed during the postaccident examination of the engine.

Medical and Pathological Information

According to the autopsy report from the Clark County Medical Examiner, Vancouver, Washington, the pilot's cause of death was blunt and thermal injuries, and the manner of death was accident. The medical examiner reported the pilot had a 50-60% focal area of stenosis in his left main coronary artery and an 80% focal area of stenosis in his right coronary artery. There was no definitive evidence of smoke inhalation.

Toxicology testing performed by the FAA Forensic Sciences Laboratory did not detect ethanol in the pilot's aortic blood and did not detect tested-for drugs in his urine.

Tests and Research

An analysis of the ADS-B data from 0736 to the time of the accident combined with winds aloft data showed that the airplane had an average descent rate of about 1,000 fpm, an average airspeed of about 80 knots calibrated airspeed, bank angles of about 7°, and an average angle of attack of about 5° on the base leg of the traffic pattern.

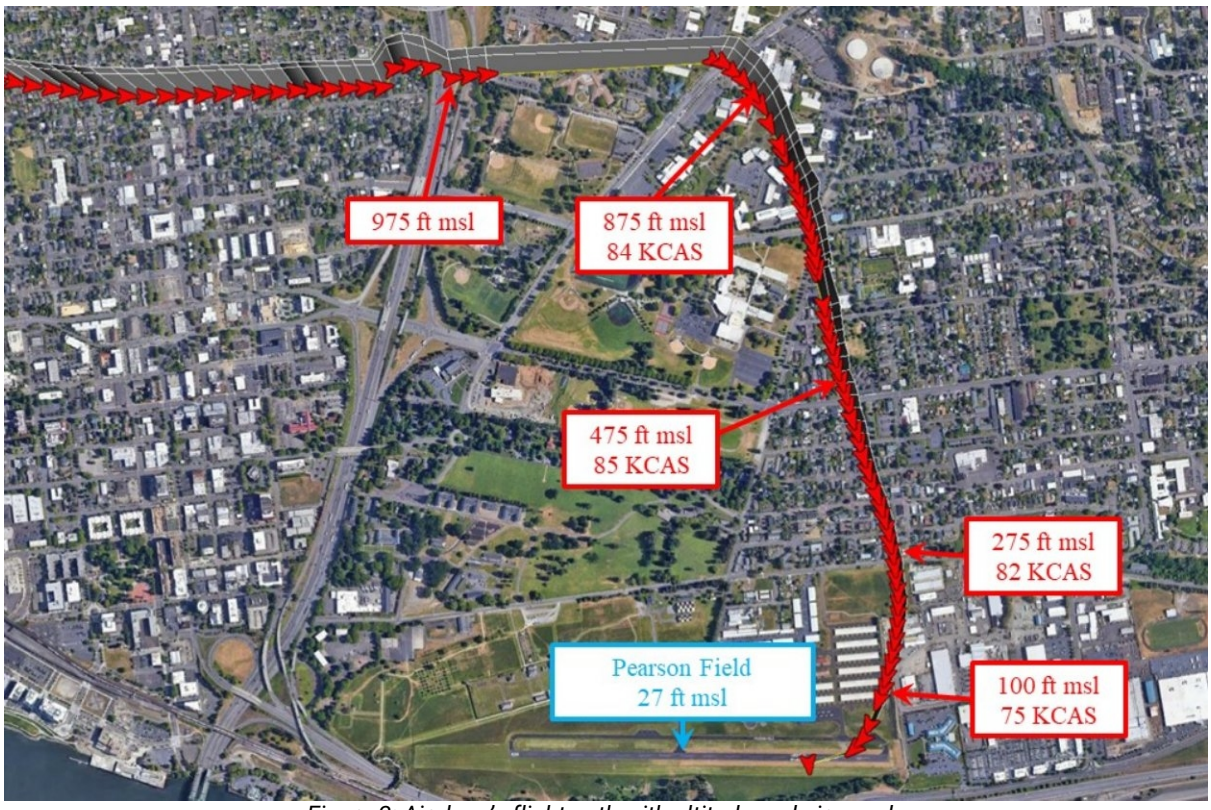

Figure 2: Airplane's flight path with altitude and airspeeds

The airplane's weight at the time of the accident was computed using a basic empty weight of 2,100 lbs as the airplane's most recent weight and balance could not be located within the maintenance records. Using the pilot's weight from his most recent medical examination in 2022 of 188 lbs, and a fuel weight of 264 lbs, the total weight at the time of the accident was about 2,562 lbs.

The airplane's stall speed was computed using the stall chart from the airplane POH. The stall chart incorporates a maximum bank angle of 60°, which the airplane exceeded during its turn to final approach. According to the stall chart, the airplane's stall speed as it turned to final approach would have been exceeded 80 kts. An analysis of the ADS-B data showed that the airplane's airspeed at this time would have been about 73 KCAS.

Additional Information

Accelerated Stalls

The FAA Airplane Flying Handbook (FAA-H-8083-3C) states,

"At the same gross weight, airplane configuration, CG location, power setting, and environmental conditions, a given airplane consistently stalls at the same indicated airspeed provided the airplane is at +1G (i.e., steady-state unaccelerated flight). However, the airplane can also stall at a higher indicated airspeed when the airplane is subject to an acceleration greater than +1G, such as when turning, pulling up, or other abrupt changes in flightpath. Stalls encountered any time the G-load exceeds +1G are called "accelerated maneuver stalls." The accelerated stall would most frequently occur inadvertently during improperly executed turns, stall and spin recoveries, pullouts from steep dives, or when overshooting a base to final turn. An accelerated stall is typically demonstrated during steep turns."

According to the Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25C),

"A study of this effect [on load factors and stalling speeds] has revealed that an aircraft's stalling speed increases in proportion to the square root of the load factor. This means that an aircraft with a normal unaccelerated stalling speed of 50 knots can be stalled at 100 knots by inducing a load factor of 4 Gs…

A pilot should be aware of the following:

• The danger of inadvertently stalling the aircraft by increasing the load factor, as in a steep turn or spiral;

• When intentionally stalling an aircraft above its design maneuvering speed, a tremendous load factor is imposed

…an aircraft greater than 72° in a steep turn produces a load factor of 3, and the stalling speed is increased significantly. If this turn is made in an aircraft with a normal unaccelerated stalling speed of 45 knots, the airspeed must be kept greater than 75 knots to prevent inducing a stall. A similar effect is experienced in a quick pull up or any maneuver producing load factors above 1 G. This sudden, unexpected loss of control, particularly in a steep turn or abrupt application of the back elevator control near the ground, has caused many accidents."

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen
Additional Participating Persons:	Dee Rice; Federal Aviation Administration; Potland, OR Ernie Hall; Textron Aviation; Wichita , KS
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Investigation Class:	Class 3
Note:	
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