



Aviation Investigation Final Report

Location:	Island Pond, Vermont	Accident Number:	ERA18FA232
Date & Time:	August 25, 2018, 15:20 Local	Registration:	N6936B
Aircraft:	Piper PA22	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot was landing his airplane at his home airport at the conclusion of a local flight. The airplane was last seen flying normally on the left downwind leg of the airport traffic pattern, and the wreckage was subsequently discovered in a location consistent with a turn from the downwind to base leg of the traffic pattern. The airplane and engine sustained extensive impact damage and postimpact fire damage; however, examination revealed no discrepancies that would have precluded normal operation. A friend of the pilot, who flew with him often, said that the pilot tended to turn from the downwind leg onto the base leg of the traffic pattern "quite steep" (about 40° bank) and slow (62-63 knots). The friend said that he shared his concerns about stalling with the pilot, but the pilot did not share the same concern. The airplane was not equipped with a stall warning horn or angle of attack indicator.

Postmortem toxicology testing revealed the presence of several medications, including diphenhydramine, a sedating antihistamine; however, given the low levels identified, there was no evidence that the pilot was impaired by his use of diphenhydramine or that it contributed to the accident.

Given the amount of fuel onboard and the duration of the flight, it is unlikely that the airplane ran out of fuel. Although there were no witnesses to the accident, given the location of the accident site, lack of preimpact mechanical anomalies, and the pilot's reported habit of conducting traffic pattern turns at a slow speed in a steep bank, it is likely that the pilot exceeded the airplane's critical angle of attack while maneuvering for landing, which resulted in an aerodynamic stall and subsequent impact with terrain.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's exceedance of the airplane's critical angle of attack while maneuvering for landing, which resulted in an aerodynamic stall.

Findings

Personnel issues

Aircraft control - Pilot

Aircraft

Angle of attack - Not attained/maintained

Factual Information

History of Flight

Approach-VFR pattern base	Loss of control in flight (Defining event)
Approach-VFR pattern base	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On August 25, 2018, between 1505 and 1520 eastern daylight time, a Piper PA-22-150 airplane, N6936B, was destroyed when it collided with terrain while attempting to land at John H. Boylan State Airport (5B1), Island Pond, Vermont. The private pilot was fatally injured. The airplane was registered to the pilot who was operating it as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight, which originated from 5B1 between 1445 and 1500.

According to a friend of the pilot, the purpose of the flight was to prepare for an upcoming flight review that was scheduled for later in the week. The pilot normally flew on Sunday afternoons and would typically remain in the local area.

A witness, who was also a pilot, was at his home when he heard the airplane depart between 1445 and 1500 and then return about 20 minutes later to land at 5B1. When he heard the airplane returning to the airport, he used his binoculars and confirmed the airplane belonged to his friend, who occupied the hangar next to him at the airport. The witness said that the airplane was on the left downwind leg for runway 32 at an altitude about 1,000 ft above ground level (agl). Everything seemed normal and the engine sounded fine. The witness recalled hearing the pilot "throttle back" as he entered the downwind and stated that the engine sounded "smooth." The witness lost sight of the airplane while it was still on the downwind leg of the traffic pattern and it was not until later in the afternoon that he learned the airplane had crashed on airport property.

A review of air traffic control (ATC) communications and radar data revealed that the pilot was not in contact with ATC and there were no radar returns for any aircraft flying in the vicinity of Island Pond around the time of the accident.

There were no witnesses to the accident and the actual time of the accident could not be determined. The pilot's wife obtained photos from a hunter who arrived on-scene after the accident. The photos were taken at 1532.

Pilot Information

Certificate:	Private	Age:	60, Male
Airplane Rating(s):	Single-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):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	June 21, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	August 13, 2016
Flight Time:	(Estimated) 1289.5 hours (Total, all aircraft), 362 hours (Total, this make and model), 1228 hours (Pilot In Command, all aircraft)		

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent Federal Aviation Administration (FAA) third-class medical certificate was issued on June 21, 2018. A review of the pilot's logbook revealed that he had accrued about 1,289 total hours of flight experience, of which about 362 hours were in the accident airplane.

The pilot also held an airframe and powerplant mechanic certificate.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N6936B
Model/Series:	PA22 150	Aircraft Category:	Airplane
Year of Manufacture:	1956	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	22-4215
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	April 9, 2018 Annual	Certified Max Gross Wt.:	2000 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	2661 Hrs as of last inspection	Engine Manufacturer:	Lycoming
ELT:	C126 installed, not activated	Engine Model/Series:	O-320 SERIES
Registered Owner:		Rated Power:	150 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

The accident airplane, manufactured in 1956, was a single-engine, 4-seat, strut braced, high-wing, fabric-covered airplane. It was powered by a Lycoming O-320 series, 150-horsepower engine equipped with a two-bladed Sensenich propeller.

A review of the airplane's maintenance logbook revealed that the most recent annual inspection was conducted on April 9, 2018, at an airframe total time of 2,661.0 hours. The engine had accrued 168.65 since major overhaul as of the last annual. The inspection was conducted and signed off by the pilot.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KCDA, 1188 ft msl	Distance from Accident Site:	16 Nautical Miles
Observation Time:	15:35 Local	Direction from Accident Site:	211°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	8 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	120°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.22 inches Hg	Temperature/Dew Point:	26°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Island Pond, VT (5B1)	Type of Flight Plan Filed:	None
Destination:	Island Pond, VT (5B1)	Type of Clearance:	None
Departure Time:	15:00 Local	Type of Airspace:	Unknown

Weather reported at 1535 at Caledonia Airport (CDA), Caledonia, Vermont, about 16 miles southwest of the accident site, included wind from 120° at 8 knots, 10 miles visibility, and clear skies. The temperature was 79°F and the dew point was 57°F, with an altimeter setting of 30.23 inches of mercury.

The witness described the wind conditions as a southerly crosswind that was shifting about 10° left and right. He said that the wind conditions were such that the pilot could have landed on either runway.

Airport Information

Airport:	John H Boylan State 5B1	Runway Surface Type:	Grass/turf
Airport Elevation:	1194 ft msl	Runway Surface Condition:	Dry;Vegetation
Runway Used:	32	IFR Approach:	None
Runway Length/Width:	2650 ft / 120 ft	VFR Approach/Landing:	Full stop;Traffic pattern

John H. Boylan State Airport was a publicly-owned, non-tower controlled airport in northern Vermont, about 16 miles south of the Canadian border. It was equipped with one turf runway, oriented 14/32, that measured 2,650 ft long and 120 ft wide.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	44.79,-71.826385(est)

The airplane came to rest upright on airport property on a heading of 070° and sustained extensive postimpact fire damage. The location of the accident site was consistent with the airplane turning from the downwind leg to a left base leg of the airport traffic pattern. The initial impact point was a ground scar located about 10 ft forward of where the airplane came to rest. Several pieces of broken Plexiglas were found in the ground scar. Another ground scar extended about 13 ft to the right of the initial impact scar. Imbedded in the ground at the end of the scar was an unburned section of the airplane's right wing tip.

The leading edges of both wings exhibited extensive leading edge crushing and were pushed aft. The wing struts were buckled on both sides and the left and right flaps were consumed by fire. The manual flap handle was broken but the actuator was in the fully-extended position. The left and right wing fuel tanks were breached and partially consumed by fire. The auxiliary fuel tank was completely consumed by fire. The main landing gear was splayed and resting underneath the main wreckage. The tailwheel was undamaged and remained attached to the airframe.

All major flight controls were accounted for at the site and flight control continuity was established to the cockpit area; however, a fractured section of left aileron cable was submitted to the NTSB Materials Laboratory. The cable fracture was located about 15 inches from a looped end. The looped end was inserted through an eye at one end of a turnbuckle assembly. This assembly originally included a brass barrel adjuster. The barrel was missing, but the safety wire was still present. Examination of the turnbuckle threads indicated that pieces of brass material were still attached to the threads on a few locations. The threaded rod ends were examined for any indication of damage, but none was found. Examination of the cable fracture revealed the individual wire strands exhibited 45° shear planes, consistent with an overload fracture of the cable under a combination of shear and torsion loads. The rudder pedals were consumed by fire, but the T-posts on the left side were displaced to the left and the posts on the right were straight.

The cockpit area sustained extensive fire damage. Though several instruments and radios were located in the wreckage, damage precluded obtaining any useful information from them. The carburetor and mixture controls were not located; however, the throttle was in place and appeared to be toward the idle position. The fuel selector was found in the "ON" position.

The airplane was equipped with two front seats, which remained in place in the main wreckage. Only the frames remained. The airplane was equipped with shoulder harnesses. All seatbelt and shoulder harness mounting brackets were found secured to their respective attach points on the airframe structure. Both front seatbelt/shoulder harness buckles were found in the wreckage. Both male ends were securely seated in the female end of the buckles.

The airplane's windshield was made of Plexiglas, which shattered from impact. Examination of the recovered sections of Plexiglas revealed no evidence of a bird strike.

The engine sustained impact and fire damage and remained partially attached to the airplane; the two-bladed propeller remained attached to the engine. The propeller spinner was crushed up and inward, and the engine was pushed into the firewall and cockpit area. One blade exhibited slight s-bending and the other blade was bent slightly forward and displayed trailing-edge nicks and leading-edge polishing.

The top and bottom spark plugs were removed. All the electrodes were black and the Nos. 2 and 4 bottom spark plugs were oil-soaked.

Both magnetos remained partially attached to the engine but exhibited extensive fire damage and could not be tested. The left magneto sustained more fire damage than the right magneto. The ignition leads had burned away except for a few short sections that were still attached to the right magneto.

The vacuum pump was partially attached and exhibited impact and fire damage and could not be tested. The drum was broken but all vanes were intact.

The firewall fuel strainer bowl sustained impact and fire damage. The bowl exhibited some heat damage and the bowl was empty. The screen was not located.

The carburetor was removed and exhibited impact and fire damage. The finger screen was removed, and dirt was found inside the screen area. The carburetor was opened and the composite floats had melted. No fuel was in the bowl.

The engine was manually rotated via the propeller, and compression and valve train continuity were established for each cylinder. No pre-accident mechanical deficiencies were noted that would have precluded normal operation of the engine.

Additional Information

A friend of the pilot, who had been a pilot for 58 years but no longer flew due to health reasons, said he flew with the pilot almost every Sunday. He described the pilot as being very thorough and always completing a preflight inspection. During the inspection, he would check the fuel for water "every time." Based on the previous weekend's flight, the airplane most likely contained a total of 18 gallons (9 gallons per wing fuel tank) when the pilot departed on the accident flight. Though the friend described the pilot as being conscientious, he said that the pilot tended to turn from the downwind leg onto the base leg of the traffic pattern "quite steep" (about 40° bank) and slow (62-63 knots). The friend shared his concern with the pilot, but the pilot did not seem to be concerned with stalling the airplane. The airplane was not equipped with a stall warning horn or angle-of-attack indicator. The friend also stated that it was normal for the pilot to turn to the base leg early and land about 800 ft from the approach end of the runway, which would allow him to bring the airplane to a stop in front of his hangar.

According to the Piper PA-22-150 Information Manual, the airplane's stall speed at gross weight in level flight with the flaps fully extended was 49 mph, or 42 knots.

Medical and Pathological Information

An autopsy was performed by the Office of the Chief Medical Examiner, State of Vermont, Burlington, Vermont. The cause of death was determined to be blunt trauma and thermal injuries.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified ibuprofen and diphenhydramine in urine as well as ranitidine, diphenhydramine (too low to quantify), and atorvastatin in heart blood. Ibuprofen is an over-the-counter analgesic often marketed with the names Motrin or Advil. Ranitidine is an over-the-counter heartburn medication often marketed as Zantac. Atorvastatin is a prescription medication for high cholesterol. None of these are considered impairing.

Diphenhydramine is a sedating antihistamine available over-the-counter in many products used to treat colds, allergies, and insomnia. Its most common other names are Benadryl and Unisom.

Diphenhydramine undergoes postmortem distribution and central levels may be 3 times higher than peripheral levels.

Preventing Similar Accidents

Prevent Aerodynamic Stalls at Low Altitude

While maneuvering an airplane at low altitude in visual meteorological conditions, many pilots fail to avoid conditions that lead to an aerodynamic stall, recognize the warning signs of a stall onset, and apply appropriate recovery techniques. Many stall accidents result when a pilot is momentarily distracted from the primary task of flying, such as while maneuvering in the airport traffic pattern, during an emergency, or when fixating on ground objects.

An aerodynamic stall can happen at any airspeed, at any altitude, and with any engine power setting. Pilots need to be honest with themselves about their knowledge of stalls and preparedness to recognize and handle a stall situation. Training can help pilots fully understand the stall phenomenon, including angle-of-attack concepts and how weight, center of gravity, turbulence, maneuvering loads and other factors can affect an airplane's stall characteristics. The stall characteristics may be different in each type of plane, so learn them before you fly.

The stall airspeeds marked on the airspeed indicator (for example, the bottom of the green arc and the bottom of the white arc) typically represent steady flight speeds at 1G at the airplane's maximum gross weight in the specified configuration. Maneuvering loads and other factors can increase the airspeed at which the airplane will stall. For example, increasing bank angle can increase stall speed exponentially.

Reducing angle of attack by lowering the airplane's nose at the first indication of a stall is the most important immediate response for stall avoidance and stall recovery. This may seem counterintuitive at low altitudes, but is a necessary first step.

See http://www.nts.gov/safety/safety-alerts/documents/SA_019.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Read, Leah
Additional Participating Persons:	JC Mills; FAA/FSDO; Portland, ME David Harsanyi; Textron Lycoming; Williamsport, PA
Original Publish Date:	November 6, 2019
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98154

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](#).