Aviation Investigation Final Report

Location:	Hanover Township, Pennsylvania	**Accident Number:**	ERA23FA045
Date & Time:	October 29, 2022, 14:52 Local	**Registration:**	N964RS
Aircraft:	Bearhawk Patrol	**Aircraft Damage:**	Substantial
Defining Event:	Collision with terr/obj (non-CFIT)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Before the flight, the pilot told a friend that the airplane had a rigging issue that seemed to cause the airplane to “kick” laterally during turns. His friend performed a 10-minute flight and reported that he noticed the odd yawing moment while performing turns. The pilot responded that he would address the issue at a later time. After fueling the airplane, the pilot and pilot-rated passenger fastened their seatbelts and departed the airport. Flight track information indicated that, several minutes after departure, the airplane leveled off. Soon thereafter, witnesses reported that the airplane “rolled” then “bucked” as its nose “dipped down initially,” then pitched up “quickly.” Several witnesses reported seeing the pilot out of the airplane at this time, and one reported seeing the pilot impact then “spiral” off the airplane’s tail. Witnesses then observed the pilot and airplane descend to the ground.

Ground scars and wreckage patterns indicated that the airplane impacted terrain in a near-vertical, nose-down attitude. All major airplane components were located at the accident site; however, paint chips, the airworthiness certificate, and portions of the cockpit ceiling or side window Plexiglas were the first items along the 1,900-ft-long debris path leading to the main wreckage (along the airplane’s flightpath), followed by a portion of a tail rib at 900 ft, and the pilot at 530 ft from the main wreckage. Postaccident examination of the engine revealed no evidence of any preimpact mechanical malfunctions or failures that would have precluded normal operation. Postaccident examination of the airframe revealed evidence consistent with the witness statements that the pilot impacted the empennage during flight.

Toxicology testing for the pilot detected the high cholesterol medication atorvastatin and the high blood pressure medication terazosin. There was no evidence of any acute issue on autopsy, and the pilot had been actively flying the airplane and was then observed outside of the airplane. Thus, the pilot’s cardiovascular conditions were not a factor in this accident.

Toxicology testing detected the antidepressant citalopram in the pilot's heart blood and urine. While it is unknown how long the pilot was on this medication or the severity of his depression, witnesses reported that the pilot was functioning well, and looking forward to participating in a holiday airport event. Thus, effects from the pilot's use of citalopram or the psychiatric condition for which he was taking the medication were not factors in this accident.

That the pilot was observed to have buckled his seatbelt and shoulder harness before flight, and that his seatbelt and shoulder harnesses were found intact, unlatched, and undamaged, suggests that he intentionally unbuckled his seatbelt during the short flight. Given his concern about the yaw during turns, he may have been attempting to observe the problem with the tail. It is possible that either the pilot fell out of the airplane while attempting to observe the tail section, or that the pilot displaced a flight control while attempting to observe the tail, which then caused an abrupt pitching moment that ejected him from the airplane.

Although the reason for the pilot's exit from the airplane during flight could not be determined, his impact with the tail section of the airplane during flight resulted in substantial damage to the tail section and a subsequent loss of control during flight from which the pilot-rated passenger would not have been able to recover.

Probable Cause and Findings

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

The pilot's decision to unlatch his seatbelt during flight, which allowed him to exit the airplane and impact the tail, resulting in a loss of control and impact with terrain.

Findings

Not determined	(general) - Unknown/Not determined
Personnel issues	Incorrect action selection - Pilot
Aircraft	(general) - Damaged/degraded
Aircraft	Pitch control - Attain/maintain not possible
Aircraft	Flight compartment equipment - Not used/operated

Factual Information

History of Flight

Enroute	Miscellaneous/other
Enroute	Collision with terr/obj (non-CFIT) (Defining event)
Enroute	Loss of control in flight

On October 29, 2022, about 1452 eastern daylight time, an experimental amateur-built Bearhawk Patrol airplane, N964RS, was substantially damaged when it was involved in an accident near Hanover Township, Pennsylvania. The pilot and pilot-rated passenger were fatally injured. The airplane was operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Witnesses reported that the pilot and pilot-rated passenger departed Farmers Pride Airport (9N7), Lebanon County, Pennsylvania, earlier in the day. They reported that the pilot was functioning well, happy, and looking forward to participating in a holiday airport event. The pilot and his pilot-rated passenger flew to the Hazleton Regional Airport (HZL), Hazleton, Pennsylvania, then on to the Wilkes-Barre Wyoming Valley Airport (WBW), Wilkes-Barre, Pennsylvania. At WBW, the pilot told a friend that the airplane had a rigging issue that seemed to cause the airplane to “kick” laterally during turns. He suggested that his friend fly the airplane to see what he thought. The friend performed a 10-minute flight and reported that he noticed the odd yawing moment in the turns. The pilot responded that he would address the issue “this winter.” After lunch and fueling the airplane, the pilot and pilot-rated passenger intended to return to 9N7. Witnesses reported that the pilot sat in the front seat and fastened his seatbelt and shoulder harness while in their presence.

Automatic dependent surveillance - broadcast (ADS-B) data revealed that the airplane departed runway 25 at WBW about 1448. After departure, the airplane turned slightly left, flew in a southwesterly direction, and climbed to an altitude of 1,700 ft mean sea level (msl). The recorded data indicated a 35-second level-off, followed by a descent to about 1,500 ft msl where the airplane’s altitude varied slightly over about two minutes. In the final seconds of the flight, data indicated a 400-ft descent in fewer than 2 seconds. At this same time, witnesses reported that the airplane “rolled” then “bucked” as its nose “dipped down initially,” then pitched up “quickly.” Several witnesses reported seeing the pilot out of the airplane at this time. One heard the pilot impact the airplane’s tail, and another observed the pilot impact, then “spiral” off, the airplane’s tail. The witnesses then observed the pilot and airplane descend to the ground.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	76,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	None
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	BasicMed None	**Last FAA Medical Exam:**	February 13, 2022
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 21000 hours (Total, all aircraft)		

Pilot-rated passenger Information

Certificate:	Sport Pilot; Student	**Age:**	59,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Rear
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Sport pilot	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Bearhawk	**Registration:**	N964RS
Model/Series:	Patrol	**Aircraft Category:**	Airplane
Year of Manufacture:	2020	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	P318
Landing Gear Type:	Tailwheel	**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:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	O-360
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was composed of a fabric-covered steel tubular fuselage and tail, and an aluminum strut-braced wing.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	AVP,951 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	14:54 Local	**Direction from Accident Site:**	50°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.41 inches Hg	**Temperature/Dew Point:**	16°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Wilkes-Barre, PA (WBW)	**Type of Flight Plan Filed:**	None
Destination:	Lebanon County, PA (9N7)	**Type of Clearance:**	None
Departure Time:	14:48 Local	**Type of Airspace:**	Class G

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:**	41.219512,-75.911701

The airplane impacted a grass field about 5.2 nautical miles southwest of WBW. A linear ground scar, consistent with the length of the left wing, extended from the center of the wreckage with the scar oriented toward a magnetic heading of 338°, and the wings came to rest oriented on a magnetic heading of 319°. All major airplane components were located on site; however, paint chips, the airworthiness certificate, and portions of the cockpit ceiling or side window Plexiglas were the first items along the 1,900-ft-long debris path leading to the main wreckage, followed by a portion of a tail rib at 900 ft and the pilot at 530 ft from the main wreckage (see figure 1.)

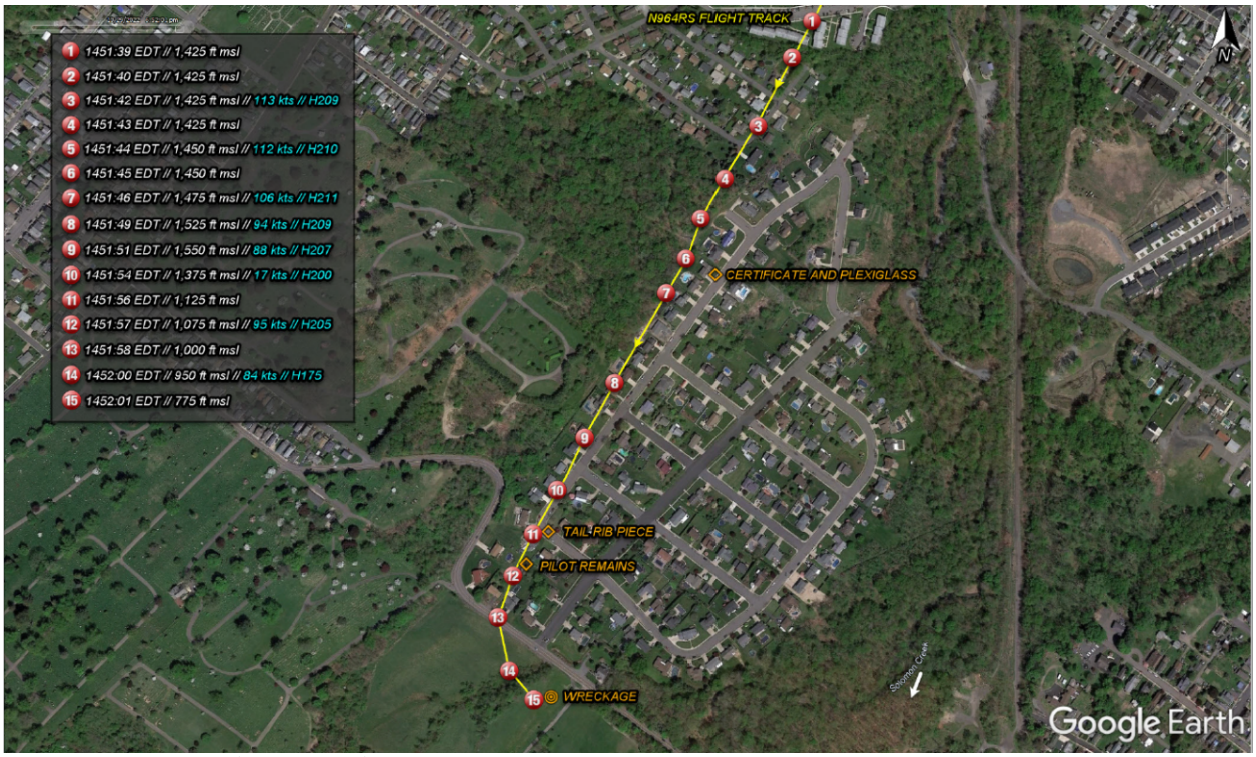

Figure 1 - Flight path (yellow line) with annotated position, time, altitude, ground speed, and path heading. The locations of recovered debris are also plotted.

Both wings were accordion-crushed aft and remained attached to the fuselage, which came to rest adjacent to the right wing. The airframe structure aft of the cockpit was intact to the tail area, where the forward attachments of both the vertical and horizontal stabilizers were fractured. The tail section was largely destroyed, except for the left horizontal stabilizer, to which its elevator and elevator trim tab remained attached. The engine was partially attached to the engine mounts and embedded in an impact crater.

The propeller hub remained attached to the crankshaft flange, and both propeller blades were impact separated from the propeller. A ground scar consistent with a propeller blade strike was found near the impact crater, where one blade was located. The other propeller blade was recovered about 100 ft from the main wreckage. Both blades
showed light rotational chordwise scratches from dirt, and minimal damage to the blade leading edges. There was no evidence of fire on any portion of the airplane. There was evidence of fuel blight in the field and a witness reported smelling fuel.

The engine was hoisted from the remaining engine mount, and the rocker box covers removed to facilitate examination. The crankshaft rotated when the propeller was rotated by hand, and continuity of the crankshaft to the camshaft was confirmed. Thumb compression was established on cylinder Nos. 1, 2, and 4, and on cylinder No. 3 after the impact-damaged exhaust valve pushrod was removed. Borescope inspection of all cylinders revealed no anomalies. The carburetor, with throttle and mixture control cables attached, was impact separated from the bottom of the sump housing and located next to the engine at the accident site. Liquid consistent with fuel was noted inside the carburetor bowl and in the fuel pump.

Both magnetos displayed impact damage to the mounting flanges. The left magneto was not capable of producing spark due to the capacitor being impact separated from the unit. The unit was opened for further examination and the points opened and closed as expected when the shaft was rotated. The right magneto produced spark at all four leads when rotated with a drill. The oil filter element appeared clean. Examination of the engine revealed no pre-impact anomalies that would have prevented normal operation.

Examination of the airframe revealed that the wing spars remained attached to the fuselage structure and both wing fuel tanks were breached. All flight control cables and tubes were connected at their associated cockpit controls. Aileron continuity was established from the cockpit control stick to the aileron control surfaces. Left rudder continuity was established from the cockpit rudder pedals to the rudder control horn; however, right rudder continuity could only be established from the cockpit rudder pedals to the cable end loop, which was not attached to the clevis at the rudder control horn. The clevis was opened and hanging from the control horn, and the clevis pin was located nearby. Examination of the elevator trim cables revealed that both cables were continuous from their attachment points at the cockpit trim control lever, through broom-strawed fractures consistent with tensile overload above the rear pilot seat, to each control surface; however, the right elevator trim tab had separated from the elevator at the two hinged attachment points.

A detailed examination of the tail tube structure by the NTSB Materials Laboratory revealed that all fractures to the tail section displayed features that were consistent with overstress. A tube that formed the trailing edge of the vertical stabilizer fractured with aft bending overstress, and the carry-through tube for mounting the aft edge of the horizontal stabilizer to the fuselage fractured in downward bending overstress, both consistent with impact with the pilot during flight.

The pilot seats remained attached to their rails, and the seatbelts remained attached to their mounts. The rear pilot's seat was equipped with the lap belt, which was cut to assist in the recovery of the pilot-rated passenger. The forward pilot's seat was equipped with a lap belt and shoulder harnesses, which were intact, unlatched, and undamaged.

Medical and Pathological Information

According to the autopsy report prepared for the Luzerne County Coroner's Office, Hanover Township, Pennsylvania, the pilot's cause of death was multiple traumatic injuries, and the manner of death was accident.

Toxicology testing performed by the Federal Aviation Administration (FAA) Forensic Sciences Laboratory detected the antidepressant citalopram in the pilot's heart blood and in his urine. Citalopram's metabolite, n-desmethylcitalopram, was detected in his heart blood and in his urine. The high cholesterol medication atorvastatin and the high blood pressure medication terazosin were detected in the pilot's heart blood and urine; these two medications are generally considered non-impairing. *Citalopram* was a prescription antidepressant medication marketed under the trade name Celexa. *N-desmethylcitalopram* is the active metabolite of citalopram. Both carry the warning that their use may impair mental of physical ability for performing hazardous tasks. The FAA will consider a special issuance of a medical certificate for depression after 6 months of treatment if the applicant is clinically stable and using only one approved treatment medication; however, the pilot had not applied for a special issuance. Citalopram is one of the FAA-approved antidepressant medications.

According to the autopsy report, the cause of death of the pilot-rated passenger was multiple traumatic injuries, and the manner of death was accident. Toxicology testing was negative for ethanol in the pilot-rated passenger's vitreous fluid and tested-for-drugs in his liver tissue.

Administrative Information

Investigator In Charge (IIC):	Spencer, Lynn
Additional Participating Persons:	Robert Ference; FAA/FSDO; Allentown, PA Ryan Enders; Lycoming Engines; Williamsport, PA Warren Daugherty; Mechanic/Kit Builder; Jonestown, PA Robert Barrows; Bearhawk
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Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=106223

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.