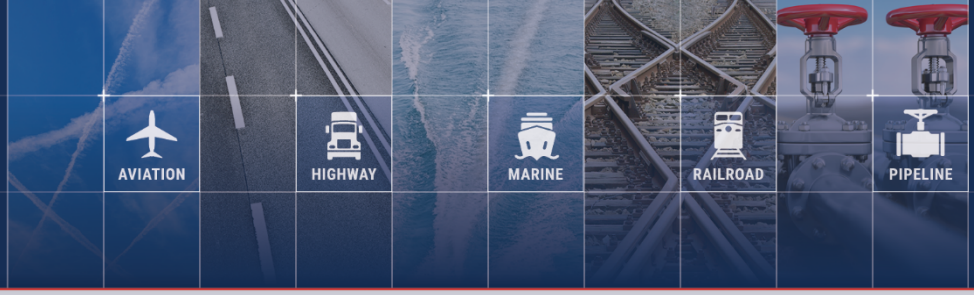

Aviation Investigation Final Report

Location:	Winston-Salem, North Carolina	**Accident Number:**	ERA23FA067
Date & Time:	November 19, 2022, 11:10 Local	**Registration:**	N7295Y
Aircraft:	Piper PA-30	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Near the conclusion of the cross-country flight, when the airplane was flying about 2,175 ft pressure altitude and about 4 nautical miles due west of the approach end of runway 4 at the destination airport, the pilot broadcast on the frequency that one engine was not making as much power as the other, but that, “we’re ok.” The controller cleared the pilot to land on runway 4; however, for reasons that were not reported by the pilot, the airplane continued past the extended runway centerline for that runway. The pilot subsequently asked to land on runway 33, which was approved. The airplane continued on an easterly heading past the extended runway 33 centerline, then turned left on northwesterly heading flying parallel to runway 33. While flying east of the airport one witness noted the airplane banking left to about 45° before the wings rolled level and then banked about 10° to the left. The same witness reported that, while flying in a nose-up attitude just above the trees with the landing gear extended, the airplane rolled to an inverted position and descended straight down. The airplane impacted terrain behind a house.

Postaccident examination of the flight controls, propellers, right propeller governor, left engine and its systems, and right engine powertrain, lubrication, exhaust, ignition, and air induction systems revealed no evidence of preimpact failure or malfunction. Neither propeller was feathered at impact. The damage to the left propeller was consistent with the engine developing some power at impact while the lack of damage to the right propeller was consistent with windmilling/rotating and not developing power at impact. Additionally, although it was not determined if there were any missing vortex generators (VG’s) on either wing at the time of the accident, the airplane’s performance was not changed by the installation of the VG’s. Thus, if any were missing at the time of the accident, it likely did not contribute to the accident.

Postaccident operational testing of the right engine's fuel servo revealed that it passed all four test points and the regulator hysteresis check, but it failed testing of the idle circuit, which should result in decreased fuel flow with movement of the throttle control from wide open to idle. The fuel flow when reducing the throttle to idle was about 2.6 times higher than what it should have been. Disassembly of the right fuel servo revealed internal contamination in the fuel section of the regulator that was determined to be acrylonitrile-butadiene-styrene (ABS), a thermoplastic, though the exact source of the contamination could not be determined. Following reassembly of the regulator with the internal contamination removed, the idle circuit test was repeated multiple times, and the fuel flow was within limits. Although it could not be determined if the excessive fuel flow during the idle circuit test was caused by the internal contamination or a combination of that and misalignment of the regulator section, the additional 0.011-inch clearance of the throttle valve at idle was likely the result of maintenance personnel attempting to remedy the excessive fuel flow when moving the throttle valve to idle. Thus, it is likely that during the descent approaching the airport with both engines operating at a reduced power setting, the excessive fuel flow to the right engine likely resulted in a total loss of engine power.

Although the right engine likely sustained a total loss of engine power due to a malfunction of the fuel servo, it is likely that the pilot either did not, or delayed, feathering the right propeller until the propeller rpm slowed to where the propeller blades engaged on the start locks. In that position, an attempt to feather the propeller would not be possible until the propeller rpm increased above the speed that disengaged the start locks. The increased parasitic drag from the windmilling and unfeathered right propeller likely precluded the possibility of straight and level flight. Towards the end of flight, the airspeed likely reduced below the published Velocity Minimum Control (Vmc) speed, and the airplane rolled to an inverted position. Had the pilot either turned towards runway 4 which was the nearest runway after advising the controller of an engine malfunction, or feathered the right propeller following total loss of right engine power and maintained an airspeed above the published Vmc speed while continuing towards the airport, it is likely that he could have reached the airport and landed uneventfully.

Probable Cause and Findings

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

Contamination and/or misalignment of the regulator section of the right engine's fuel servo, which resulted in excessive idle fuel flow and a total loss of engine power. Also causal was the pilot's failure to land immediately on the nearest runway at the destination airport, his failure to feather the right propeller following the loss of engine power while approaching the airport, and his failure to maintain airspeed while maneuvering with one engine, which resulted in a loss of control at a low altitude.

Findings

Aircraft	Fuel control/carburetor - Malfunction
Personnel issues	Use of equip/system - Pilot
Personnel issues	Aircraft control - Pilot
Aircraft	Engine out control - Not attained/maintained
Personnel issues	Lack of action - Pilot
Personnel issues	Decision making/judgment - Pilot

Factual Information

History of Flight

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

On November 19, 2022, about 1110 eastern standard time, a Piper PA-30, N7295Y, was substantially damaged when it was involved in an accident near Smith Reynolds Airport (INT), Winston-Salem, North Carolina. The commercial pilot and passenger were 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, earlier that day the pilot and passenger flew from St. Louis Downtown Airport (CPS), Cahokia, Illinois, to London (Corbin) Magee Airport (LOZ), London, Kentucky, where a go-around was performed followed by an uneventful landing. After landing, the pilot reported an electrical system issue, but no maintenance was requested or performed.

According to ADS-B data and air traffic control radio communication information, the airplane departed LOZ about 1004, and headed east-southeast towards INT, while air traffic control communications were transferred to several facilities appropriate for the route of flight. At 1103:39, while west-northwest of INT, air traffic control communications were transferred to INT air traffic control tower (ATCT).

The pilot established contact with the INT ATCT at 1104:07, and at that time the airplane was flying at 3,450 ft pressure altitude about 8.3 nautical miles west-northwest from INT. The airplane continued on an east-southeast ground track while descending, and then at 1104:40, the local controller instructed the pilot to enter left base for runway 4. The pilot incorrectly read back the instruction, which the controller corrected, and then the pilot correctly read back the runway. At 1105:05, the pilot reported on the frequency, “that engines not ah” with the rest of the comment unfinished. The airplane turned slightly to the right flying on a southeast ground track consistent with the base leg of the airport traffic pattern for runway 4. Then, at 1106:02, when the airplane was at about 2,175 ft pressure altitude and about 4 nautical miles nearly due west from the approach end of runway 4, the pilot informed the controller, “…I got one engine that’s not making as much power as the other one we’re ok….” The controller responded by telling the pilot that he was on left base for runway 4. The airplane continued on the southeast ground track until 1106:26, and then turned left flying in an easterly direction. At 1108:05, when the airplane was east of the extended runway 4 centerline at 1,050 ft pressure altitude, the pilot

asked the controller if he could land on runway 33, which was approved. The airplane continued on an east or east-southeast heading while descending. At 1109:08, when the airplane was about 4,300 ft west of the extended runway 33 centerline, the pilot asked if he could perform a right 360° turn, which was his last communication. The controller approved the pilot's request and cleared the pilot to land runway 33.

The airplane continued in an easterly direction flying east of the extended runway 33 centerline, and then turned left on northwesterly heading flying parallel to the runway. Between 1110:23 and 1110:27, which was the last ADS-B target, the flight path turned right about 20°. The accident site was located about 210 ft north-northeast from the last ADS-B target location, consistent with the turn to the right.

A witness reported that the airplane, while flying in an easterly direction, banked left at about a 45° bank angle. He noted the airplane then rolled to nearly wings level but then maintained a slight left bank of about 10°. He reported hearing the engines "roaring as hard as they can go" or at full power, while flying in a nose-up attitude just above the trees. The airplane then rolled left to an inverted position and descended straight down. He did not see any smoke trailing the airplane and reported that the landing gear was extended.

Pilot Information

Certificate:	Commercial; Flight instructor; Remote	**Age:**	64,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	March 14, 2022
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 19, 2021
Flight Time:	1462 hours (Total, all aircraft), 155 hours (Total, this make and model), 31 hours (Last 90 days, all aircraft), 22 hours (Last 30 days, all aircraft)		

Passenger Information

Certificate:		**Age:**	66,Female
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	Unknown
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N7295Y
Model/Series:	PA-30 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1964	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	30-335
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	May 3, 2022 Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	5453.3 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	IO-320-B1A
Registered Owner:	On file	**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

In accordance with Airworthiness Directive (AD) 69-24-04, the airplane's single-engine minimum control speed (Vmc) was changed from about 80 MPH calibrated airspeed (CAS) to 90 MPH CAS. The AD referenced Piper Service Bulletin 301A dated November 25, 1969.

The airplane was equipped with two Garmin G5 electronic flight instruments. At the time of the accident neither unit had a memory card installed; thus, no data was available.

Each engine was equipped with a single acting, constant speed, manual feathering, two-bladed Hartzell propeller. Each propeller was controlled by oil pressure from the engine-driven propeller governor that was commanded via cable by the propeller control lever on the throttle

quadrant. Movement of the propeller control to the low pitch/high rpm position allowed oil pressure from the propeller governor to move the blades to low pitch/high rpm. Movement of the propeller control to the feather position diverted engine oil from the governor to the engine allowing the feathering springs and air charge to move the blades to the feather position.

To prevent feathering during normal engine shutdown on the ground, the propeller incorporated spring-energized latches, or start locks. If propeller rotation was approximately 800 RPM or above, the latches were disengaged by centrifugal force, which compressed the springs. When engine RPM dropped below 800 RPM (and blade angle was typically within 7° of the low pitch stop), the springs would overcome the latch weight centrifugal force and move the latches to engage the high pitch stops, preventing blade angle movement to feather during normal engine shutdown. Following a partial loss of engine power that does not cause loss of oil pressure, if the propeller was not feathered and the engine rpm were allowed to fall below about 800 rpm, the start locks would engage and prevent the propeller from feathering if the propeller control was moved to the feather position.

According to the emergency procedures contained within the airplane Owner's Handbook, if an engine failure occurs during cruise flight, it specified to maintain airspeed and directional control. The section indicated that if the specified troubleshooting did not restore power, the propeller on the inoperative engine should be feathered. The section also indicated that best single-engine performance would be obtained by banking 3° to 5° into the operational engine and that rudder trim may be used as necessary for single-engine flight.

In March 2004, the accident airplane was modified by installation of vortex generators on each wing leading edge and both sides of the vertical stabilizer in accordance with Supplemental Type Certificate (STC) SA00763SE. According to the president of the STC holder, there was no change to the published velocity air minimum control speed, thus no change in performance.

Review of the maintenance records revealed the right engine fuel servo was overhauled and then installed on the right engine in April 2000. The right engine was subsequently removed from the airframe for overhaul, which was signed off in November 2001. According to the invoice/work order associated with the engine overhaul, there was no record that the right fuel servo was overhauled or repaired at that time. No record of FAA Form 8130-3 or serviceable tag for the right fuel servo was located. At the time of the last annual inspection about 6 months before the accident, the right fuel servo, which is considered an on-condition component, had accumulated about 1,035 hours and 23 years since last overhaul.

The airplane was last fueled at LOZ with 29.4 gallons of 100 low lead (100LL) fuel; the fuel supplier "Incident/Accident Form" specified that since the last truck top off, there were 25 aircraft fueled from the same vehicle. Sixteen were fueled before the accident airplane and eight were fueled after. Although no fuel testing was performed, there were no reported fuel-related issues.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KINT,970 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	10:54 Local	**Direction from Accident Site:**	289°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / Unknown
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / Unknown
Altimeter Setting:	30.29 inches Hg	**Temperature/Dew Point:**	8°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	London, KY (LOZ)	**Type of Flight Plan Filed:**	VFR
Destination:	Winston-Salem, NC (INT)	**Type of Clearance:**	VFR
Departure Time:	10:04 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	SMITH REYNOLDS INT	**Runway Surface Type:**	
Airport Elevation:	969 ft msl	**Runway Surface Condition:**	
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	6655 ft / 150 ft	**VFR Approach/Landing:**	Traffic pattern

The INT airport was a public use, publicly owned airport equipped with runways 15/33, and 4/22.

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:**	36.129921,-80.201142

The airplane impacted the backyard of a house at the edge of trees. The accident site was located about 4,200 ft east-northeast from the approach end of runway 33.

Hazmat personnel drained an estimated 15 to 20 gallons of fuel from the right wing's inboard and outboard fuel tanks, with the inboard tank having more fuel than the outboard or auxiliary fuel tank. During recovery of the airplane, an additional 6 gallons of fuel (blue in color consistent with 100LL) were drained from the right main fuel tank through the fuel selector after leveling the wings. No more than 1 gallon of fuel was drained from the left wing inboard and outboard fuel tanks, but fire rescue personnel reported a smell of fuel near the displaced left engine.

Examination of the wreckage revealed it was upright with the empennage nearly completely separated and inverted with the upper portion resting on the top of the fuselage and the tip of the vertical stabilizer and rudder above the wing walk compound of the right wing. The left engine was displaced down, while the right engine was nearly separated from the structure and resting beneath the right wing. There was no fire present on any observed components. Flight control continuity was established from all primary flight control surfaces to the main cabin area. The stabilator trim jackscrew displayed 3 threads, which is consistent with a neutral to nose down position, and the rudder trim was neutral. Both left and right flaps were in the up or retracted position, and the landing gear jack screw transmission displayed 0 threads, consistent with the landing gear being extended.

Both wings exhibited evidence of impact damage on the leading edge, with the left-wing damage nearly full span. The outboard third of the left wing was displaced aft consistent with ground contact. One vortex generator remained installed on the left wing, while four vortex generators out of a total of 20 remained installed on the right wing. The on-site investigation did not identify or document any separated vortex generators in the vicinity of the wreckage. Examination of the vertical stabilizer revealed both sides had 15 vortex generators installed with none missing on either side.

Examination of the cockpit revealed the right cowl flap was full in (closed), the right engine alternate air control was in (closed), and the right throttle, mixture, and propeller controls were about midrange. The right fuel selector handle and valve were just past the auxiliary fuel tank detent position, and the valve was free of obstructions in all positions. Blue colored fuel consistent with 100LL was in the right airframe fuel strainer.

Examination of both engines was performed by a representative of the engine manufacturer with NTSB oversight. No preimpact failure or malfunction was noted to the left engine or its systems, or of the right engine powertrain, lubrication, exhaust, ignition, or air induction systems.

The right fuel servo was retained for operational testing, which included a test of the idle circuit, though that test was not required by the fuel servo manufacturer. The fuel servo passed all 4 test points and the regulator hysteresis check, but it failed the idle circuit test. The idle

circuit test was performed with the throttle gap at the as-found setting of 0.017 inch instead of 0.006 inch as specified at overhaul, the mixture control full rich, no air flow, and the throttle moved from wide open to idle. During the testing, the highest recorded fuel flow was about 12.0 pounds-per-hour (pph), and the metering head pressure in terms of inches-of-fuel was about 45. The lowest fuel flow when performing the test and tapping the regulator was about 4.5 pph at 0.017-inch throttle valve gap, and the metering head was 3.0 inches of fuel. The test of the idle circuit was repeated numerous times; each time the metered head pressure remained much higher than specified and was inconsistent and did not result in the same repeated value.

The regulator section (fuel and air) was removed as a unit from the right fuel servo. Following removal, foreign debris (several small pieces) were noted in the fuel side of the regulator section. Examination of the debris by the NTSB Materials Laboratory revealed the pieces to be similar to one another and were matched to acrylonitrile-butadiene-styrene (ABS), a thermoplastic. Following removal of the foreign material the regulator section was reassembled onto the fuel servo, which was placed back onto the test bench. Following removal of air from the fuel servo, a check of the idle circuit was performed multiple times. During each check, the fuel flow consistently decreased to 4.5 pph while the metering head pressure consistently decreased to the same value and was within limits.

Disassembly examination of both propellers revealed neither was feathered at impact and there was no evidence of preimpact failure or malfunction of either propeller. There was no evidence of preimpact failure or malfunction of the right propeller governor that would have precluded normal operation, or the pilot's ability to feather the right propeller had he commanded that within the airplane's flight envelope. Measurements of impact marks on the preload plates of both propeller blades revealed that both propeller blade angles of the left propeller were between about 28° and 31° at impact, while both propeller blades of the right propeller were at about 18° at impact, which was about the nominal start lock blade angle. Examination of the left propeller revealed the L1 blade was rotationally loose in the propeller hub, was bent aft, and exhibited some bending at the tip opposite the direction of rotation. A wave bend was noted on the leading edge of the blade about 2 inches from the tip, and some resin was noted in that area. Chordwise and spanwise scratches were noted on the cambered side of the blade. The L2 blade was bent aft, while about 4 inches of the tip was bent forward in the thrust direction.

Scoring was noted at the tip corner, and 45° angular scoring near the tip and midspan on the cambered side of the blade was noted. The blade face was unremarkable. Operational nicks were noted on the leading edge of the blade. Visual examination of the right propeller revealed one propeller blade was bent aft approximately 45° and the other blade was relatively straight with no major damage.

Medical and Pathological Information

Toxicology testing performed by the FAA's Forensic Services Laboratory on the pilot identified no evidence of impairing drugs.

Additional Information

FAA Special Airworthiness Information Bulletin (SAIB) CE-05-51, dated April 29, 2005, was developed to alert owners and operators of piston multi-engine airplanes of a condition in which it becomes impossible to continue level flight with one engine inoperative (OEI) with a windmilling propeller. The SAIB also indicated that a windmilling propeller was a large producer of parasitic drag and that the inability to maintain level flight would be exacerbated by a windmilling propeller. In the case of a piston multi-engine airplane, the effect of a windmilling propeller would be to increase the total drag of the airplane and induce an asymmetric drag about the yaw axis. The net result of a windmilling propeller would be that the aircraft total drag exceeded the power available, thus the aircraft would be no longer able to sustain level flight. The SAIB also indicated that the inability to feather the propeller could be due to the propeller windmilling speed falling below the start lock disengagement speed.

Similar Accidents

The NTSB has investigated at least 5 accidents since 2008, in addition to this accident, involving multi-engine airplanes having sustained a loss of engine power from one engine as well as a delay or failure to feather the propeller of the affected engine: ERA10LA284, ERA11FA458, ERA12FA423, CEN16FA172, and ERA19FA060.

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Robert Martellotti; Piper Aircraft; Vero Beach, FL Ryan Enders; Lycoming; WIlliamsport, PA Mike Allen; FAA/FSDO; Greensboro, NC James Creider; FAA/FSDO; Greensboro, NC Les Doud; Hartzell Propeller; Piqua, OH
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