Aviation Investigation Final Report

Location:	Knoxville, Tennessee	**Accident Number:**	ANC18LA016
Date & Time:	December 19, 2017, 15:00 Local	**Registration:**	N40285
Aircraft:	Piper PA 23-250	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Serious, 2 Minor
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

During a simulated single-engine instrument approach in a multi-engine airplane, the flight instructor, who was seated in the right seat, told the multi-engine rated pilot receiving instruction, who was seated in the left seat, to go around. The pilot applied full power to the right engine and attempted to fly the pattern with a simulated left engine failure. Shortly after, while the airplane was in a left crosswind turn, the left engine lost total power. The instructor observed that the left propeller was stationary and took control of the airplane.

The instructor chose to fly at minimum controllable speed (Vmc) rather than the recommended best single-engine rate of climb speed (Vyse) and attempted to restart the failed engine rather than perform the airplane manufacturer's approved engine-out procedures. Unable to restart the left engine, he attempted to maneuver the airplane for a landing but was unable and flew toward rising terrain. Approaching a residential area, the instructor maneuvered the airplane to avoid a house, and the airplane subsequently impacted trees, fell to the ground, and came to rest on top of an automobile. The instructor stated that after the accident, he returned to the airplane to shut off the fuel and electrics when he noticed the left fuel selector was between the on and off position.

A postaccident examination revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. However, a lack of fuel was observed in the left engine's fuel system forward of the fuel injection servo.

Based on the observed intermediate position of the left fuel selector after the accident, the lack of fuel in the fuel system forward of the fuel injection servo, and the lack of mechanical malfunctions or failures noted during the wreckage examination, it is likely that the left engine lost total power due to fuel starvation. The manufacturer's approved procedures for an engine failure during takeoff included, among other things, maintaining a best rate of climb airspeed. A review of the manufacturer's pilot's operating manual indicated that even with a total loss of engine power on the left engine, the airplane would have been able to climb about 520 ft per minute had the required pilot inputs been made. The instructor failed

to comply with the published engine-out procedures and recommended airspeeds, which led to the lack of directional control, collision with trees, and impact with the ground.

Probable Cause and Findings

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

The flight instructor's failure to comply with published engine-out procedures and recommended airspeeds, which resulted in a lack of directional control, collision with trees, and impact with the ground; the left engine lost total power due to fuel starvation.

Findings

Personnel issues	Decision making/judgment - Instructor/check pilot
Personnel issues	Use of checklist - Instructor/check pilot
Personnel issues	Aircraft control - Instructor/check pilot
Environmental issues	Tree(s) - Contributed to outcome

Factual Information

History of Flight

Approach	Loss of engine power (total)
Approach-VFR go-around	Loss of control in flight (Defining event)
Approach-VFR go-around	Collision with terr/obj (non-CFIT)

On December 19, 2017, about 1500 eastern standard time, a Piper PA-23-250, a multi-engine, retractable landing gear airplane, N40285, sustained substantial damage during a forced landing following a loss of engine power on the left engine. The accident occurred as the airplane was attempting to return to the Knoxville Downtown Island Airport (KDKX), Knoxville, Tennessee. The airplane was registered to Lakelizard Aviation Training Company, LLC and operated as an instructional flight under the provisions of 14 *Code of Federal Regulations* Part 91 and visual flight rules when the accident occurred. Of the three occupants on board, the multi-engine rated pilot receiving instruction, seated in the left seat, sustained serious injuries. The certified multi-engine flight instructor (MEI) seated in the right seat, and an additional certified flight instructor (CFI) observing from the back seat, sustained minor injuries. Visual meteorological conditions prevailed, and no flight plan had been filed.

According to the MEI providing instruction, the purpose of the flight was to practice maneuvers for the multi-engine rated pilot's upcoming commercial multi-engine check ride. After completing a series of maneuvers, they returned to fly the Localizer approach to Runway 26 at KDKX. The MEI reported that during the approach, outside the final approach fix, he retarded the left engine's manifold pressure to 12 inches to simulate a left engine failure.

The MEI said that, after completing the approach to the missed approach point, they circled for landing on Runway 26, but they were too high on the approach. In an effort to correct for the high approach, the student retarded the right engine to idle, selected full flaps, and began a rapid descent. The runway threshold was crossed about 500 ft above ground level (AGL) and the MEI called for a go-around. The student applied full power to the right engine, and attempted to fly the traffic pattern with a simulated engine failure. Shortly after initiating the go-around while making the left crosswind turn, the student reported that all engine power was lost on the left engine. The MEI stated that he observed that the left prop was stationary and said, "I have the controls." He said he checked to ensure the throttles, propellers and mixture controls were full forward, and then he attempted to retract the flaps but was unable since the only hydraulic pump is powered by the left engine. He also noted that he elected not to use the emergency hand pump to retract the flaps. He stated, that in his judgement, the best option was to attempt to restart the left engine. Unable to reach the controls to restart the engine from the left seat, he asked the student to restart the engine while he concentrated on flying the airplane. He stated that lowering the nose to increase airspeed to Vyse with gear and flaps deployed and the left propeller unfeathered would have resulted in a rapid loss of altitude, so he elected to hold the airspeed at Vmc (80 mph) while banking slightly into the right engine and avoiding terrain. Unable to restart the left engine, he attempted to maneuver the airplane for a landing on runway 8 at KDKX but was unable to complete the required 180° turn and flew through the extended centerline and toward rising terrain. Approaching a

residential area, the MEI maneuvered the airplane to avoid a house, and the airplane subsequently impacted trees. The trees stopped the forward movement of the airplane and it fell to the ground, coming to rest on top of an automobile. After the accident, the MEI returned to the airplane to shut off the fuel and electrics when he noticed the left fuel selector was in between the on and off position.

According to the student, after the engine failure the MEI stated, "I got the controls" and attempted to restart the engine while flying away from KDKX. He stated that he became very concerned as the airspeed degraded to Vmc and called the MEI's attention to the airspeed multiple times, and each time he reacted by lowering the nose of the airplane. He said that at some point he told the MEI the flaps were down, and the MEI moved the flap selector to the up position. In addition, he remembered the back-seat observer stating that the landing gear was down at which point the MEI selected the landing gear to the up position.

According to the CFI observing from the back seat, they were on a downwind leg to runway 26 at KDKX with a simulated engine failure. While turning base to final they realized the airplane was too high to land and attempted a two-engine go-around. Shortly thereafter, prior to the crosswind leg, the left engine lost all power. He stated that the airplane was maneuvered in an effort to avoid terrain and return for right traffic runway 8 at KDKX, but while attempting to turn right base to final the airplane continued to the left. He said the airspeed was too slow, right on the edge of 80 mph, and they lowered the nose in an effort to avoid a stall and a Vmc roll. Unable to complete the right turn, they attempted to reacquire runway 8 on a left base, but they were too low and on the edge of a stall when he heard them hollering "were going to stall lower the nose" and he braced for impact.

The left engine was examined on January 10, 2018. The engine remained partially attached to the airframe and sustained impact damage to the front and underside. An examination of the engine did not reveal any anomalies, or evidence of malfunction in any of the engine accessories. Examination of the cylinders, pistons, valve train, crankshaft, and other internal components revealed no evidence of an anomaly or malfunction that would have precluded normal operation. Both magnetos were removed from the engine and the coupling was rotated with an electric drill. When the coupling was rotated, blue spark was observed at all six leads.

The fuel line was removed from the engine driven fuel pump to the fuel servo, and about 2 tablespoons of liquid yellowish/brown in color containing fine particle debris was recovered. The fuel pump was disassembled, and about a tablespoon of fluid light blue in color consistent with 100LL AvGas was recovered. The diaphragm in the fuel pump appeared flexible and intact. No debris was observed in the fuel pump. The fuel line between the fuel injection servo and the fuel flow divider was removed and about 3 drops of fluid light blue in color consistent with 100LL AvGas was recovered. The fuel inlet injection servo screen was removed, and no debris was observed on the screen. The fuel flow divider was disassembled, and no liquid was observed in the divider.

The left propeller remained attached to the propeller flange but separated from the engine crankshaft and was in the feathered position. The right propeller and hub remained attached to the engine crankshaft. Both of the propeller blades remained attached to the propeller hub assembly. One of the propeller blades was bent aft about 12 inches from the tip and exhibited leading edge gouging. The other blade was rotated about 180° in the hub and was bent forward near the hub.

The examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The U.S. Department of Transportation, FAA Flight Training Handbook AC 61-21A, Chapter 16 Transition to Other Airplanes, Engine Failure on Takeoff, states in part: "When the decision is made to continue flight, the single-engine best-rate of climb speed should be attained and maintained. Even if altitude cannot be maintained, it is best to continue to hold that speed because it would result in the slowest rate of descent and provide for the most time for executing the emergency landing."

The Aztec E Pilot's Operating Manual, Emergency Procedures, Engine Failure During Takeoff, states in part:

"If no landing can be made directly after the failure, the following steps should be followed:

a. Apply full power to good engine.

b. Feather dead engine.

c. Retract landing gear and flaps, if extended (using hand pump if left engine is out). If enough

altitude has been reached for reaching the airport with the gear extended, leave the landing gear in the

down position.

d. Maintain a best rate of climb airspeed."

On the NTSB Pilot/Operator Accident Report form (NTSB Form 6120.1) the MEI indicated that the gross weight of the airplane at the time of the accident was 4,071 pounds.

According to the Aztec E Pilot's Operating Manual, Performance Charts, "Single Engine Rate of Climb and Airspeed VS Density Altitude " with an aircraft weight of 4,071 pounds, and a density altitude of about 1,533 ft (airport elevation + 500 ft corrected for nonstandard temperature), the single engine climb performance with the left engine inoperative, gear and flaps retracted, and the left cowl flap closed is about 520 feet per minute rate of climb.

The closest weather reporting facility was Knoxville Downtown Island Airport (KDKX), Knoxville, Tennessee. At 1553, an METAR from KDKX was reporting, in part: wind from 260°at 7 knots, gusting 12 knots; visibility, 10 statute miles; clouds and sky condition, broken clouds at 7,000 ft; temperature, 61°F; dew point 46° F; altimeter, 30.11 inches of mercury.

Flight instructor Information

Certificate:		**Age:**	61,Male
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):		**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	November 28, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	January 30, 2017
Flight Time:	2328 hours (Total, all aircraft), 23 hours (Total, this make and model), 2219 hours (Pilot In Command, all aircraft), 55 hours (Last 90 days, all aircraft), 18 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Pilot Information

Certificate:	Private	**Age:**	58,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	December 11, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 1311 hours (Total, all aircraft), 29.6 hours (Last 90 days, all aircraft), 9.1 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N40285
Model/Series:	PA 23-250	**Aircraft Category:**	Airplane
Year of Manufacture:	1973	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	27-7305100
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	September 9, 2017 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	C91 installed	**Engine Model/Series:**	TI0-540 SER
Registered Owner:	On file	**Rated Power:**	310 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:	KDKX	**Distance from Accident Site:**	
Observation Time:	20:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 7000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots / 12 knots	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.11 inches Hg	**Temperature/Dew Point:**	16°C / 8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Knoxville, TN (DKX)	**Type of Flight Plan Filed:**	None
Destination:	Knoxville, TN (DKX)	**Type of Clearance:**	None
Departure Time:	14:00 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	KNOXVILLE DOWNTOWN ISLAND DKX	**Runway Surface Type:**	
Airport Elevation:	833 ft msl	**Runway Surface Condition:**	Dry
Runway Used:		**IFR Approach:**	Localizer only
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious, 1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 Minor	**Latitude, Longitude:**	35.968334,-83.900001(est)

Administrative Information

Investigator In Charge (IIC):	Banning, David
Additional Participating Persons:	David Alderman; FAA; Knoxville, TN Jon Hirsch; Piper Aircraft Inc.
Original Publish Date:	May 28, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96519