Aviation Investigation Final Report

Location:	Bayonne, New Jersey	**Accident Number:**	ERA17LA110
Date & Time:	February 19, 2017, 10:00 Local	**Registration:**	N15745
Aircraft:	Piper PA28R	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot reported that the personal local flight was uneventful until the engine made an odd noise, which was followed by a partial loss of engine power. The pilot attempted to troubleshoot the problem, but the engine power was not fully restored, and the airplane was unable to maintain altitude, so the pilot made a forced landing to a road. The airplane struck power lines and vehicles before coming to rest on a sidewalk.

Postaccident examination of the engine revealed that the No. 3 cylinder's intake valve had separated. The valve stem was found in the oil pan, and the remainder of the valve was found in its intake manifold. Metallurgical examination of the No. 3 cylinder assembly, including the fractured intake valve, revealed that the valve was fractured in the stem in two places and through the head in one place. The interior of the cylinder exhibited damage consistent with impacts from the fractured valve. The connecting rod was intact, but the bearings were worn through both the babbit and copper layers. Examination of the fracture surfaces revealed fatigue cracks initiating from the fillet radius between the valve stem tip and the key area of the stem shaft. The other fractures were consistent with overstress.

Further examination of the engine case revealed that all eight hydraulic valve tappet plungers were installed 180° opposite of the proper installation contained in the manufacturer's overhaul manual. The reversed installation of the plunger would have adversely affected the operation of the No. 3 cylinder's intake valve and placed an abnormal load on the valve's tip. A review of the engine's maintenance logbook revealed that the engine had been repaired about 35.7 hours before the accident. At that time, all four cylinders were removed and replaced, including the hydraulic valve tappet plunger assemblies. Given that the cylinders had been recently removed and reinstalled on the engine, including the hydraulic valve tappet plungers, it is likely that the engine experienced a partial loss of engine power due to maintenance personnel's improper installation of the No. 3 cylinder's hydraulic valve tappet plunger.

Probable Cause and Findings

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

Maintenance personnel's incorrect installation of the No. 3 cylinder's hydraulic valve tappet plunger, which resulted in a failure of the No. 3 cylinder's intake valve and the subsequent partial loss of engine power.

Findings

Aircraft	(general) - Failure
Aircraft	Recip eng cyl section - Failure
Personnel issues	Installation - Maintenance personnel
Aircraft	Recip eng cyl section - Incorrect service/maintenance
Environmental issues	Wire - Contributed to outcome

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Maneuvering	Loss of engine power (partial) (Defining event)
Maneuvering	Attempted remediation/recovery
Landing	Off-field or emergency landing
Landing	Collision with terr/obj (non-CFIT)

On February 19, 2017, about 1000 eastern standard time, a Piper PA-28R-200, N15745, sustained substantial damage during a forced landing to a road in Bayonne, New Jersey. The private pilot was seriously injured. The airplane was registered to and operated by a private company. Visual meteorological conditions prevailed and no flight plan was field for the local flight that departed Republic Airport (FRG), Farmingdale, New York, about 0900. The personal flight was conducted under the provisions of 14 *Code of Federal Regulations* Part 91.

The pilot stated that he had not flown since August 2016 and was taking the club-rented airplane, that he had previously trained in and flown, out for a pleasure flight. He conducted a pre-flight inspection and confirmed that both fuel tanks were "topped off" and added 1 quart of oil for a total of 7 quarts. The pilot then taxied to the active runway, performed an engine run-up, and departed. The pilot said the flight was uneventful until he approached the Statue of Liberty and Verrazano Bridge. That is when, and without any warning, he heard a "foomph" noise come from the engine along with a "white mist" that appeared for less than 1 second and never returned. At this point, the pilot realized that the engine had lost power (he could not estimate how much) and he was having trouble maintaining altitude. He said he attempted to trouble shoot the problem. Although he did not recall the exact sequence of things, the pilot said he switched fuel tanks from left to right, checked the ignition, and looked quickly at the engine gauges. The pilot recalled that the manifold pressure was "all the way up", but he did not remember what the other gauges indicated. He had also moved the propeller lever full forward and declared a "May Day" over the radio. He said the engine never lost full power. The pilot declared an emergency, flew toward land, and made a forced landing to a road. The airplane struck power lines and vehicles before coming to rest on a sidewalk in a congested city neighborhood. There was no post-impact fire or injuries to anyone on the ground. The airplane sustained substantial damage to the wings, tail section and fuselage.

The engine was separated from the airframe for examination. The valve covers were removed and oil was noted throughout the engine. About .5-ounce of fuel was recovered from the fuel servo and .25-ounce was recovered from the engine driven fuel pump. The fuel was blue, clear, and consistent with 100-low-lead aviation gasoline. When the engine driven fuel pump was actuated by hand, suction and compression were confirmed at the inlet and outlet port. The oil suction screen was removed and some metallic contamination was observed in the screen. The oil filter was opened and also contained metallic contamination. A timing check of the magnetos revealed that they were near their specification of 20°

prior to top dead center. Both magnetos produced spark at all leads when rotated by hand. The top spark plugs were removed and their electrodes were intact. When the propeller was rotated by hand, camshaft, crankshaft, and valve train continuity were confirmed to the rear accessory section. Thumb compression was attained on the No. 1 and No. 4 cylinders. The No. 2 cylinder was impact damaged and the No. 3 cylinder exhibited a small hole near the intake manifold of the cylinder. Removal of the No. 3 cylinder revealed that the intake valve had separated and the valve stem was recovered in the oil pan. The remainder of the No. 3 valve was recovered from its intake manifold. Further examination of the engine case revealed that all eight hydraulic valve tappet plungers were installed 180°opposite from proper installation per the manufacturer's overhaul manual.

The No. 3 cylinder assembly, including the fractured intake valve, was examined at the National Transportation Safety Board Materials Laboratory, Washington, DC. The examination revealed the intake valve was fractured in the stem in two places and through the head in one place. The interior of the cylinder exhibited damage consistent with the impacts from the fractured valve. The connecting rod was intact, but the bearings were worn through both the babbit and copper layers. Examination of the fracture surfaces revealed fatigue cracks initiating from the fillet radius between the valve stem tip and the key area of the stem shaft. The other fractures were consistent with overstress.

A review of the aircraft maintenance logbooks revealed the engine was repaired about 35.7 hours prior to the accident on January 9, 2017. At that time, all four cylinders were removed and reinstalled, including the hydraulic valve tappet assemblies for each cylinder. According to the entry, the mechanic wrote, "All work performed I/A/W Lycoming overhaul and service manuals as well as Piper service manual. Aircraft approved for return to service."

The Lycoming Direct Drive Engine Overhaul Manual, pages 6-7 and 6-8, discusses the hydraulic valve tappet assemblies along with an illustration (figure 6-9) that depicts how the tappet plungers are to be oriented once installed in the engine.

Weather at Newark International Airport (EWR), Newark, New Jersey, about 6 nautical miles northwest of the accident site, at 0951, was reported as wind from 250° at 8 knots, visibility 10 statute miles, scattered clouds at 12,000 ft, broken clouds at 27,000 ft, temperature 61° F, dew point 37° F, and an altimeter setting of 29.82 inHg.

Pilot Information

Certificate:	Private	**Age:**	56,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:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	July 13, 2015
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 7, 2016
Flight Time:	97.5 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N15745
Model/Series:	PA28R 200	**Aircraft Category:**	Airplane
Year of Manufacture:	1972	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	28R-7335087
Landing Gear Type:	Retractable - Tricycle	**Seats:**	5
Date/Type of Last Inspection:	October 17, 2016 100 hour	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	69 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	7059.07 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-360
Registered Owner:		**Rated Power:**	210 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:	EWR,16 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	09:51 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:	Scattered / 12000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 27000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	250°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.81 inches Hg	**Temperature/Dew Point:**	16°C / 3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	FARMINGDALE, NY (FRG)	**Type of Flight Plan Filed:**	None
Destination:	FARMINGDALE, NY (FRG)	**Type of Clearance:**	VFR flight following
Departure Time:	09:00 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	40.668609,-74.114166(est)

Administrative Information

Investigator In Charge (IIC):	Read, Leah
Additional Participating Persons:	Joe Martuge; FAA/FSDO; Teterboro, NJ Michael McLure; The New Piper Aircraft Company; Prosper, TX David Harsanyi; Lycoming; Williamsport, PA
Original Publish Date:	April 9, 2018
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=94725