Aviation Investigation Final Report

Location:	Moscow, Pennsylvania	**Accident Number:**	ERA19LA063
Date & Time:	December 4, 2018, 10:45 Local	**Registration:**	N618G
Aircraft:	Lancair LC41	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that, about 20 minutes after departure, the airplane began to shudder. He adjusted the engine power, but the airplane continued to shake before the engine lost total power. The pilot performed a forced landing to a road, during which the airplane sustained substantial damage.

Visual examination revealed multiple holes in the top of the engine crankcase. Disassembly of the engine revealed that the Nos. 2, 3, 4, and 5 connecting rods were fractured and separated from the connecting rod journals. The connecting rods, connecting rod bearings, and the crankshaft's connecting rod journals displayed thermal discoloration consistent with oil starvation. Examination of the engine components and engine-related systems revealed no evidence of a pre-impact oil leak; however, the left turbocharger was missing its turbine wheel, and the shaft was fractured outboard of the turbine piston ring. A test run of an exemplar engine without the left turbine wheel revealed significant oil loss during operation.

The left turbocharger was overhauled 158 flight hours before the accident, and its wheel assemblies were reused rather than replaced, as specified by the manufacturer. It is likely the separation of the left turbine wheel resulted in oil escaping the engine, which resulted in oil starvation and catastrophic engine failure.

Probable Cause and Findings

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

A total loss of engine power and catastrophic engine failure due to the failure of the left turbocharger, which resulted in oil loss and oil starvation. Contributing to the accident was the failure of maintenance personnel to overhaul the turbocharger in accordance with manufacturer guidance.

Findings

Aircraft	Turbocharger - Failure
Personnel issues	Repair - Maintenance personnel

Factual Information

History of Flight

Enroute	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing

On December 4, 2018, about 1045 eastern standard time, a Lancair LC41, N618G, was substantially damaged during a forced landing following a loss of engine power near Moscow, Pennsylvania. The private pilot was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot stated that, about 20 minutes after departure, the airplane shuddered. He adjusted the engine power, and the airplane shook again. He advised air traffic control that he was having engine trouble and was given a heading to a nearby airport; however, the engine continued to shake, and the pilot reported that there was smoke in the cockpit. About one minute later, the engine lost total power and the pilot performed a forced landing to a road.

A Federal Aviation Administration inspector examined the airplane and noted substantial damage to the left wing and multiple holes in the top of the engine crankcase.

Further examination revealed thermal damage on the induction tubes and the magnetos in areas that coincided with some of the holes. Portions of separated connecting rods were observed through the holes in the case. The Nos. 2, 3, 4, and 5 connecting rods were fractured and separated from the connecting rod journals. The connecting rods, connecting rod bearings, and the crankshaft's connecting rod journals displayed thermal discoloration consistent with oil starvation. Examination of the engine components and engine-related systems revealed no evidence of a pre-impact oil leak; however, the left turbocharger was missing its turbine wheel and the shaft was fractured outboard of the turbine piston ring.

The exhaust system was unremarkable with the exception of the missing left turbocharger turbine. The exhaust shroud showed some signs of turbine contact when it exited the exhaust system. The oil sump remained secured to the bottom of the engine, and there were no signs of an oil leak from the sump area. Removal of the sump revealed that it was filled with fractured engine core components.

The left turbocharger's turbine wheel was missing and there was little to no rub or contact damage noted on the turbine wheel housing. Examination of the left turbocharger shaft revealed scoring and corrosion pitting. The turbine wheel of the right turbocharger remained attached.

A test engine run was used to demonstrate the result of a turbine wheel failure. An exemplar engine without the left turbine wheel was placed in a test cell and lost about 5 quarts of oil in about 2 minutes; oil was observed streaming out of the exhaust pipe.

Overhaul Maintenance History

In May 2016, the engine was overhauled at an engine total time of 1,115.2 hours. When the engine was reinstalled after the overhaul, it was equipped with turbochargers that were manufactured in 2004 and overhauled by Approved Turbo Components, Inc. in April 2016. During the turbocharger overhaul, the right turbocharger shaft was reused. The left turbocharger shaft was replaced with a reused shaft from a 2008 turbocharger. The turbine wheel assemblies from the left turbocharger did not meet the criteria to be reused and were not replaced with a new assembly as specified in the Turbocharger Overhaul Manual, 400600-0000 Rev B.

Pilot Information

Certificate:	Private	**Age:**	56,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:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	March 7, 2018
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 9, 2018
Flight Time:	1499 hours (Total, all aircraft), 1351 hours (Total, this make and model), 1476 hours (Pilot In Command, all aircraft), 22 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Lancair	**Registration:**	N618G
Model/Series:	LC41 550FG	**Aircraft Category:**	Airplane
Year of Manufacture:	2004	**Amateur Built:**	
Airworthiness Certificate:	Utility	**Serial Number:**	41032
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	September 1, 2018 Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	26 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1285 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	C91 installed, not activated	**Engine Model/Series:**	TSIO-550
Registered Owner:		**Rated Power:**	350 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:	AVP,962 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	10:54 Local	**Direction from Accident Site:**	274°
Lowest Cloud Condition:	Few / 3000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 3900 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	13 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	320°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	1°C / -7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Philadelphia, PA (LOM)	**Type of Flight Plan Filed:**	IFR
Destination:	Binghamton, NY (BGM)	**Type of Clearance:**	IFR
Departure Time:	10:10 Local	**Type of Airspace:**	Class G;TRSA

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	41.326946,-75.59111

Preventing Similar Accidents

Mechanics Manage Risk and Follow Procedures

Mistakes made while performing aircraft maintenance and inspection procedures have led to in-flight emergencies and fatal accidents. System or component failures are among the most common defining events for fatal general aviation accidents. Mechanics should learn about and adhere to sound risk management practices to prevent common errors; even well-meaning, motivated, experience technicians can make mistakes. Fatigue can be a hazard even for mechanics, and it can be linked to forgetfulness, poor decision-making, reduced vigilance, and ultimately interfere with the mechanic's ability to do the job safely.

Mechanics should carefully follow manufacturers' instructions to ensure that the work is completed as specified. Also, up-to-date instructions and manuals should be used; other qualified mechanics are also a great resource. Mechanics need to pay close attention to the safety and security of the items that undergo

maintenance, as well as the surrounding components that may have been disconnected or loosened during the maintenance.

Inspecting maintenance work is a great way to ensure that it is done correctly. Routine inspections should be thorough and items needing immediate attention should be addressed rather than deferred.

See http://www.ntsb.gov/safety/safety-alerts/documents/SA_022.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):	Hill, Millicent		
Additional Participating Persons:	Thomas Gilbert; FAA/FSDO; Allentown, PA Nicole Charnon; CMI; Mobile, AL Les Doud; Hartzell; Piqua, OH		
Original Publish Date:	March 4, 2022	**Investigation Class:**	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98759		