Aviation Investigation Final Report

Location:	Enumclaw, Washington	**Accident Number:**	WPR18LA098
Date & Time:	March 4, 2018, 15:58 Local	**Registration:**	N207PC
Aircraft:	RAYTHEON AIRCRAFT COMPANY A36	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was at cruise altitude en route on a cross-country flight from Arizona to Washington when he noted that the engine oil pressure indicated zero and the manifold pressure was near zero. He then heard "…a loud bang, as though the engine had thrown a rod." The cabin filled with smoke and oil covered the windscreen, and the pilot conducted a forced landing into a stand of trees, during which the airplane sustained substantial damage.

Examination of the airframe revealed no anomalies that would have precluded normal operation. An examination of the engine revealed three holes in the crankcase, each consistent with an internal engine failure. All six cylinders remained attached to their respective cylinder bays; there was no indication of impact damage. The Nos. 2, 4 and 5 connecting rods had separated from the crankshaft. All rod bearings displayed lubrication distress consistent with oil starvation. The oil line B-nut attached to the turbocharger scavenge check valve was loose.

Based on the available information, it is likely that the loose oil line B-nut resulted in a gradual loss of oil during the long cross-country flight, which subsequently resulted in the separation of the connecting rods due to oil starvation and a total loss of engine power.

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 due to oil starvation as a result of a loose oil line B-nut.

Findings

Aircraft	Recip eng cyl section - Failure
Aircraft	Oil - Fluid level
Aircraft	Fasteners - Not serviced/maintained

Factual Information

History of Flight

Enroute	Loss of engine power (total) (Defining event)
Emergency descent	Loss of engine power (total)
Landing-flare/touchdown	Collision with terr/obj (non-CFIT)

On March 4, 2018, about 1558 Pacific standard time, a Raytheon Aircraft Company A36 airplane, N207PC, was substantially damaged when it was involved in an accident near Enumclaw, Washington. The private pilot was seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that he was en route on a 975-nautical mile nm cross-country flight when he chose to file an instrument flight rules flight plan due to weather ahead on his route. Shortly after being cleared to descend from 16,000 ft to 11,000 ft mean sea level, the pilot noted zero engine oil pressure and near-zero manifold pressure indications and immediately declared an emergency with air traffic control. The pilot stated that, about this time, he heard "…a loud bang, as though the engine had thrown a rod," the cabin filled with smoke, and oil covered the windscreen. The pilot stated that, "…the engine continued to break apart, emitting loud noises, as if more rods or cylinders were breaking."

The pilot reported that as he descended over the Cascade mountain range, the area was mostly enveloped in instrument meteorological conditions, although he did have visual contact with the ground through small openings in the clouds. The controller provided vectors to nearby airports but realizing that the airplane was not within glide distance, the pilot chose to make a controlled landing into trees. As the airplane impacted the trees, the tail section and the left wing separated, and the airplane came to rest in a thick grove of trees. All major components of the airplane were accounted for at the accident site and the wreckage was recovered for further examination.

Pilot Information

Certificate:	Private	**Age:**	52,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	June 1, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	930 hours (Total, all aircraft), 200 hours (Total, this make and model), 820 hours (Pilot In Command, all aircraft), 30 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 10 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	RAYTHEON AIRCRAFT COMPANY	**Registration:**	N207PC
Model/Series:	A36 A36	**Aircraft Category:**	Airplane
Year of Manufacture:	2003	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	E-3503
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	October 17, 2017 Annual	**Certified Max Gross Wt.:**	3651 lbs
Time Since Last Inspection:	28 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1069.1 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:		**Engine Model/Series:**	IO-550B39
Registered Owner:		**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

A review of maintenance records revealed that the engine was disassembled, repaired, and all cylinders overhauled in 2011 due to low compression on the #4 and the #6 cylinders, "bad exhaust valves on each," and a "bad lifter" and camshaft lobe on #4 exhaust. On November 25, 2011, the engine was converted from normally aspirated to turbo-normalized in accordance with supplemental type certificates SA5223NM and SE5222NM.

The most recent annual inspection was completed on October 17, 2017 at a Hobbs time of 1,009.2 hours. The most recent engine maintenance was performed on January 9, 2018, at a Hobbs time of 1,041.2 hours, during which the No. 2 cylinder was removed and replaced.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SEA,433 ft msl	**Distance from Accident Site:**	25 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	310°
Lowest Cloud Condition:	Thin Overcast / 800 ft AGL	**Visibility**	5 miles
Lowest Ceiling:	Overcast / 800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	None / Clear air
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	Light / Light
Altimeter Setting:	30.21 inches Hg	**Temperature/Dew Point:**	6°C / 3°C
Precipitation and Obscuration:	Light - Showers - Rain		
Departure Point:	Yuma, AZ (NYL)	**Type of Flight Plan Filed:**	IFR
Destination:	Everett, WA (PAE)	**Type of Clearance:**	IFR
Departure Time:	11:00 Local	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	47.202499,-121.994163(est)

During the initial examination of the engine, three holes were noted in the crankcase. The Nos. 2 and 4 connecting rods were separated from the crankshaft and the turbocharger housing and impeller were impact damaged; the impeller was free to rotate by hand. The oil scavenge pump line B-nut connection was loose. Due to the extensive damage, the engine was subsequently shipped to the manufacturer for a detailed examination and disassembly.

The largest hole was toward the rear of the crankcase and spanned both crankcase halves. One hole was located in the right crankcase half near the No. 3 cylinder, and the third hole was located in the left crankcase half near the No. 4 cylinder. All six cylinders remained attached to their respective cylinder bays, with no indication of impact damage. All four main bearings remained within the bearing supports, and there were no signs of bearing shift. The bearings displayed smearing and damage consistent with lubrication distress.

The crankshaft remained intact and there were no signs of impact damage signatures. The main bearing journals displayed normal operating signatures. The Nos. 1 and 6 connecting rod journals displayed normal operating signatures. The Nos. 2, 3, 4, and 5 connecting rod journals displayed thermal damage signatures consistent with lack of lubrication; the Nos. 4 and 5 connecting rod journals displayed mechanical damage. The No. 4 connecting rod oil galley was blocked with redeposited metal. The rest of the oil galleys were clear of blockages. The crankshaft gear remained intact and was undamaged.

Further examination revealed that all valves and guides remained intact and were undamaged. All valve heads displayed normal operating and combustion signatures. There were no anomalies noted with the valves. All rocker arms remained intact and undamaged and displayed normal operating signatures.

The Nos. 1, 2, 5 & 6 pistons remained attached to their respective connecting rods and displayed a significant amount of mechanical damage to the rear of each piston. The piston faces displayed normal operating and combustion signatures. The rear piston ring for each displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged.

Piston No. 3 remained attached to its connecting rod and displayed scoring along the piston skirt. The piston face displayed normal operating and combustion signatures. The piston rings remained within their grooves and displayed normal operating signatures.

Piston No. 4 remained attached to its connecting rod and displayed a significant amount of mechanical damage to the rear of the piston. The piston face displayed semicircular indentations consistent with valve strikes; there were no signs of detonation or preignition. The rear piston ring displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged. There were no anomalies noted with the piston.

The Nos. 2, 4, and 5 connecting rods released from their journals. The connecting rods displayed varying amounts of thermal damage consistent with lubrication distress.

The camshaft displayed significant mechanical damage and was broken into two pieces at the No. 3 camshaft journal; the forward portion of the camshaft displayed bending and impact marks and the damage corresponded with the same area as the released No. 5 connecting rod.

The lifters remained installed and displayed varying amounts of mechanical damage.

All accessory gears remained installed in their installation points and displayed normal operating and lubrication signatures.

Examination of the turbocharger revealed no evidence of preaccident mechanical anomalies.

Data from the airplane's onboard engine monitor revealed that, about 10 minutes before the end of the accident flight, exhaust gas temperature (EGT) and cylinder head temperature (CHT) values for cylinders Nos. 1, 2, and 4 begin to diverge. EGT and CHT values for cylinder No. 1 continued to diverge until stabilizing before the end of the recording. For additional information, refer to the NTSB Vehicle Recorder Division Engine Data Monitor (EDM) Specialist’s Factual Report, which is appended to the docket for this accident.

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	Kevin McGee; Federal Aviation Administration; Des Monies, WA Henry Soderlund; Textron Aviation; Wichita, KS Phillip Grice; Continental Motors; Mobile , AL Les Doud; Hartzell Engine Technologies; Montgomery, AL
Original Publish Date:	May 20, 2021 **Investigation Class:** 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96818