



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

# Aviation Investigation Final Report

<b>Location:</b>	Shullsburg, Wisconsin	<b>Accident Number:</b>	CEN18LA159
<b>Date &amp; Time:</b>	May 4, 2018, 19:30 Local	<b>Registration:</b>	N36LP
<b>Aircraft:</b>	Beech A36	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The commercial pilot reported that he heard an unusual noise from the engine during cruise flight and shortly afterward, the engine experienced a total loss of power. The pilot performed a forced landing to an open field.

Visual examination of the engine revealed a hole in the crankcase. A teardown examination revealed fretting on the crankcase mating surfaces, shifting of the No. 2 main bearing within the journal support, thermal damage consistent with a loss of oil lubrication, and separation of the crankshaft. The observed fretting damage was consistent with relative movement of the crankcase halves during operation due to a lack of through-bolt torque. The main journal bearing damage, the separation of the crankshaft, and the crankcase damage were secondary and a result of the loss of lubrication.

An engine overhaul was completed in about 11 years 5 months before the accident; about 849 flight hours had accumulated since the overhaul. Two cylinders were replaced 6 years before the accident, and one cylinder was replaced during the most recent annual inspection about 9 months before the accident. It is likely that improper torque of the through-bolt nuts was applied during one of the cylinder replacement events, though it could not be determined which event.

## Probable Cause and Findings

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

A catastrophic engine failure due to improper torque on the engine through-bolt nuts, which resulted in relative movement between the crankcase halves, damage to a main journal bearing, and a loss of oil lubrication.

## Findings

<b>Aircraft</b>	Recip engine power section - Failure
<b>Aircraft</b>	Recip engine power section - Incorrect service/maintenance
<b>Personnel issues</b>	Scheduled/routine maintenance - Maintenance personnel

## Factual Information

### History of Flight

<b>Enroute-cruise</b>	Loss of engine power (total) (Defining event)
<b>Emergency descent</b>	Off-field or emergency landing

On May 4, 2018, about 1930 central daylight time, a Beech A36 airplane, N36LP, was substantially damaged during a forced landing following a loss of engine power near Shullsburg, Wisconsin. The pilot was not injured. The airplane was registered to and operated by a private individual as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and the flight was operating on an instrument flight rules flight plan. The flight originated from the Okmulgee Regional Airport (OKM), Okmulgee, Oklahoma, about 1537. The intended destination was Bucky's Airport (WN09), Plainfield, Wisconsin.

The pilot reported that the airplane was in cruise flight at 7,000 ft mean sea level when he heard an unusual noise from the engine. Shortly afterward, the engine lost power and he executed a forced landing to an open field. He recalled thinking that oil may have escaped from the engine because he observed smoke. The airplane sustained substantial damage to the lower fuselage/nose landing gear wheel well structure.

A postaccident engine examination revealed a hole in the crankcase above the no. 1 cylinder. A teardown examination revealed wear on the mating crankcase surfaces consistent with fretting of the case halves. The no. 2 main journal bearing was shifted within the bearing support, the lock tab was elongated, and the bearing was extruded. Bearing fragments were recovered from the oil sump. The crankshaft was separated between the no. 2 main bearing journal and the no. 2 connecting rod journal. The crankshaft was discolored adjacent to the separation consistent with thermal damage due to a lack of oil lubrication. The remaining portions of the crankshaft displayed normal operating and lubrication signatures. The no. 2 connecting rod bearing exhibited damage consistent with lubrication distress. The oil pump housing and impellers exhibited scoring consistent with hard particle passage.

Airplane maintenance records indicated that an engine overhaul was completed in November 2006. The no. 2 and no. 4 cylinders were replaced in June 2012. The most recent annual inspection was completed in August 2017. The no. 5 cylinder was replaced during the annual inspection. At the accident site, the airplane recording hour (Hobbs) meter and tachometer indicated 4,698.4 hours and 7,951.79 hours, respectively. At the time of the accident, the engine had accumulated 848.9 hours since overhaul and 9.8 hours since the annual inspection. The time between overhaul (TBO) interval recommended by the engine manufacturer was 1,700 hours or 12 years, whichever came first.

In October 2016, the NTSB issued a safety alert regarding improper torque of engine fasteners during maintenance activities.

## Pilot Information

<b>Certificate:</b>	Commercial; Flight instructor	<b>Age:</b>	49, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	February 21, 2018
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	February 2, 2018
<b>Flight Time:</b>	994 hours (Total, all aircraft), 281 hours (Total, this make and model), 942 hours (Pilot In Command, all aircraft), 299 hours (Last 90 days, all aircraft), 111 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Beech	<b>Registration:</b>	N36LP
<b>Model/Series:</b>	A36 UNDESIGNAT	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1976	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Utility	<b>Serial Number:</b>	E-894
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	August 19, 2017 Annual	<b>Certified Max Gross Wt.:</b>	3651 lbs
<b>Time Since Last Inspection:</b>	10 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	7951.8 Hrs at time of accident	<b>Engine Manufacturer:</b>	Continental
<b>ELT:</b>	C91 installed, activated, aided in locating accident	<b>Engine Model/Series:</b>	IO-520-BB
<b>Registered Owner:</b>		<b>Rated Power:</b>	285 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	PVB	<b>Distance from Accident Site:</b>	12 Nautical Miles
<b>Observation Time:</b>	18:55 Local	<b>Direction from Accident Site:</b>	307°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	9 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	290°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.97 inches Hg	<b>Temperature/Dew Point:</b>	22°C / 8°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Okmulgee, OK (OKM )	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Plainfield, WI (WN09)	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	15:30 Local	<b>Type of Airspace:</b>	Class E;Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 None	<b>Latitude, Longitude:</b>	42.573055,-90.232223(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Sorensen, Timothy
<b>Additional Participating Persons:</b>	Timothy K Spreen; FAA Flight Standards; Milwaukee, WI Kurt Gibson; Continental Motors Inc.; Mobile, AL
<b>Original Publish Date:</b>	May 29, 2019
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=97174">https://data.nts.gov/Docket?ProjectID=97174</a>

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).