AIRCRAFT ACCIDENT SHORT REPORT

CA18/2/3/9796: Engine failure followed by an unsuccessful forced landing.

Date and time	:	9 January 2019 at 0558Z
Aircraft registration	:	ZS-SNU
Aircraft manufacturer and model	:	Piper Aircraft Corporation, PA-32R-301
Last point of departure	:	Mahohomal (farm), Northern Cape
Next point of intended landing	:	Wonderboom Aerodrome (FAWB), Gauteng
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	:	S26°18'31.67" E023°52'07.82"
Meteorological information	:	Surface wind: 30°/5 kt; temperature: 25°C; visibility: good
Type of operation	:	Private (Part 91)
Persons on board	:	1 + 0
Injuries	:	None
Damage to aircraft	:	Damage to the propeller, landing gear, wings, fuselage and tail section

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011), this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to establish blame or liability.***

Disclaimer:

1. SYNOPSIS

1.1. On 9 January 2019 at approximately 0500Z, the pilot and his dog took off from his farm, Mahohomal, in the Northern Cape Province with the intention to land at Wonderboom Airport (FAWB) in Gauteng.

1.2. The pilot was flying to Pretoria after a visit to his farm, located near Van Zylsrus town, in the Northern Cape Province. The pilot stated that after almost one hour into the flight, while routing to FAWB, he heard a strange noise coming from the engine, followed by high vibrations. The engine lost power and, subsequently, stopped. The pilot stated that he executed a forced landing on an open field in Phephane farm, close to the town of Morokweng, in the North West Province. The undercarriage was selected down, and the pilot landed the aircraft in a bushy terrain. All the landing gears ultimately dug into soft sand before breaking off. The aircraft continued to skid on its underbelly until it came to rest.

1.3. The pilot and his dog sustained no injuries. The aircraft had substantial damage as a result of the accident sequence.

1.4. The investigation revealed that the engine failed during cruise because of failure of the connecting rod bearings as a result of oil starvation, hence, the subsequent unsuccessful forced landing.

2. FACTUAL INFORMATION

2.1. On 9 January 2019 at approximately 0500Z, the pilot, accompanied by his dog on-board a Piper 32R-301 with registration ZS-SNU, took off from the private farm, Mahohomal in the Northern Cape, with the intention to land at FAWB in Gauteng. This was a private flight and was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) of 2011 as amended.

2.2. The pilot stated that almost one hour into the flight, while routing to FAWB, he heard a strange noise coming from the engine, followed by high vibrations. The engine lost power and, subsequently, stopped. White smoke was seen emanating from the engine compartment.

2.3. The pilot stated that he had chosen to execute a forced landing on an open field in Phephane farm, close to the town of Morokweng, in the North West Province. The pilot further stated that he had selected the undercarriage down for the forced landing. During the forced landing, the aircraft made contact with several small bushes, which caused dents to the wings, fuselage and tail section. The aircraft continued with the landing roll for approximately 85 metres (m) before all the landing gears broke off in soft sand. The aircraft continued to skid on its underbelly for a further 15m. Two of the three propeller blades were damaged during the forced landing.

Figure 1: The aircraft after it came to rest

2.4. The pilot reported that the temperature at the time of the incident was 25°C, the prevailing north-easterly wind was 5 knots (kt) and visibility was good.

2.5. The aircraft was fitted with an Artex 1000 ELT (S/N: 251-01411) and its automatic signal was transmitted at 0558Z when the aircraft came to rest in an isolated area of Phephane farm. After the Aeronautical Rescue Coordination Centre (ARCC) confirmed with the pilot that he was not injured and did not require medical attention, they requested him to confirm his Global Positioning Systems (GPS) location. The pilot provided the ARCC with S2618508 E02352129 as his location in a Short Message Service (SMS). The coordinates received by the ARCC were sent to the local police to pick up the pilot and to assist him further. During the investigators' on-site visit, the police informed the team that they had searched for the pilot about 80 kilometres (km) north-west from the site where the aircraft came to rest. The GPS coordinates where the police searched for the pilot were S26.18508 E023.52129. One of the local helicopter operators found the pilot at approximately 1200Z. The coordinates S26°18'50.8" E023°52'12.9" where the pilot was picked up are close to the accident site.

Figure 2: The police search area compared to the actual accident site on a Google Earth Map (Courtesy of Google Earth Pro)

3. ADDITIONAL INFORMATION

3.1. The pilot stated that the aircraft engine did not have a history of high oil consumption. He reported that he uplifted the engine oil to just above the 9 US QT mark on the dipstick prior to the previous flight from Wonderboom Aerodrome on 5 January 2019 to his farm in the Northern Cape. He reported that he did a thorough pre-flight inspection of the aircraft and checked the engine oil prior to his flight to FAWB on the day of the incident. He stated that the oil level was on the 9 US QT mark and did not require any oil uplift. He mentioned that he monitored the oil temperature and oil pressure on a regular basis during the flight and did not observe any abnormalities. The pilot did not record engine oil uplifts in the flight folio.

3.2. The aircraft maintenance organisation (AMO) which conducted the engine strip-down reported that the #4 and #5 connecting rod bearings had ceased in the crankshaft. They further reported that the main bearings had wear marks indicating that they were beginning to fail. The AMO also reported that the hydraulic plungers were deflated and that, during inspection, no oil was found in the oil coolers or the oil hoses. The AMO further stated that they found some oil in the Constant Speed Unit (CSU). The AMO which removed the engine from the aircraft reported that they did not find any loose, damaged or missing oil system components that could have caused a loss of engine oil, except for the damage on the engine crank case caused during the engine failure.

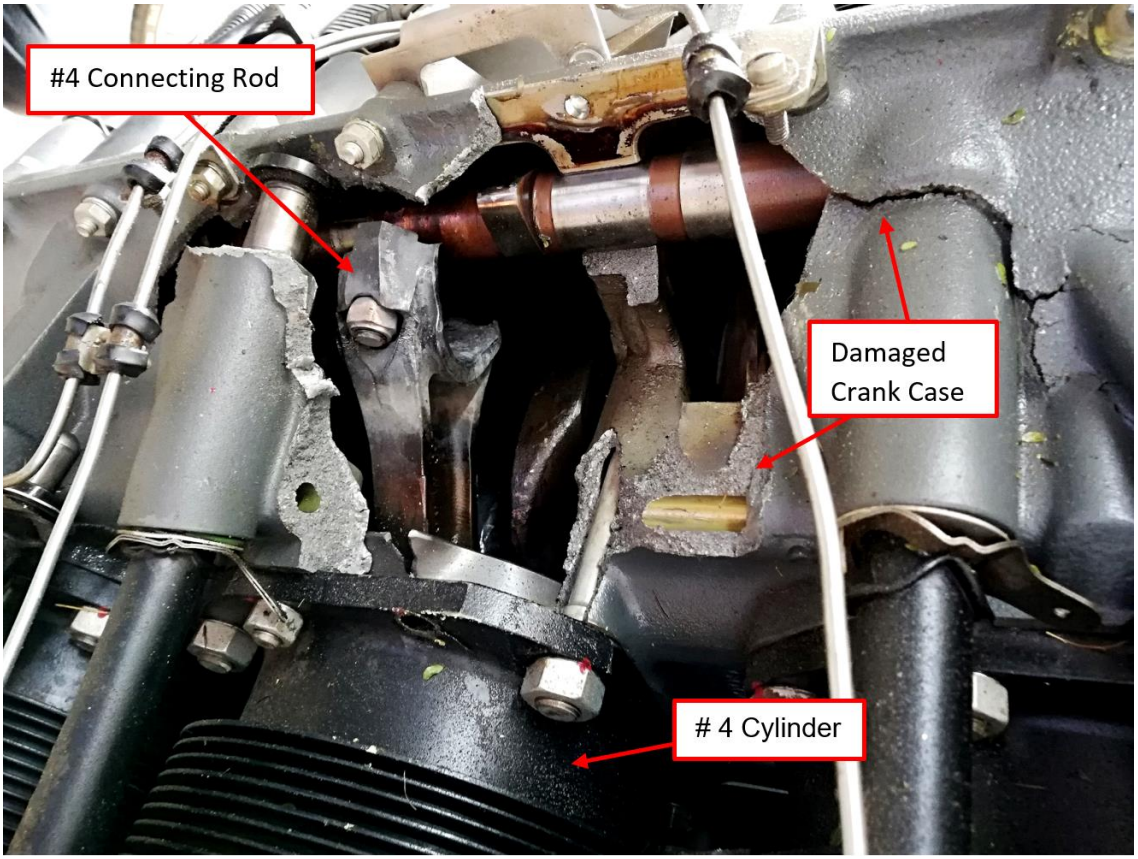

Figure 3: Some of the engine damage

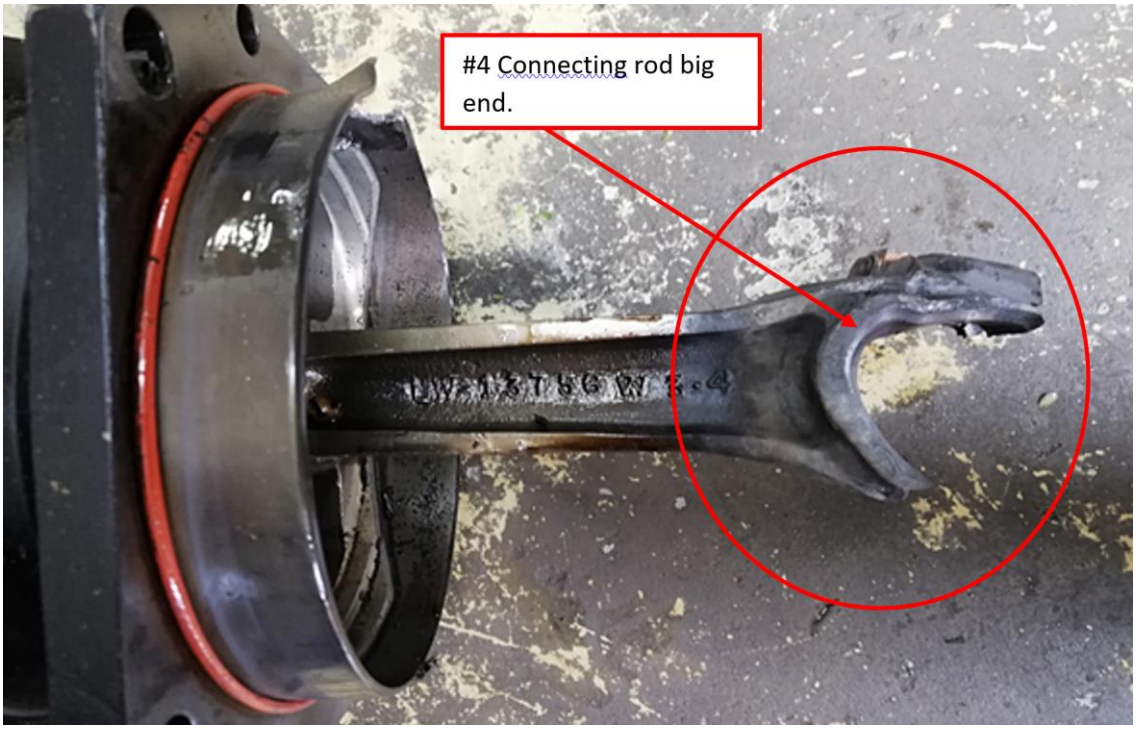

Figure 4: The failed #4 connecting rod

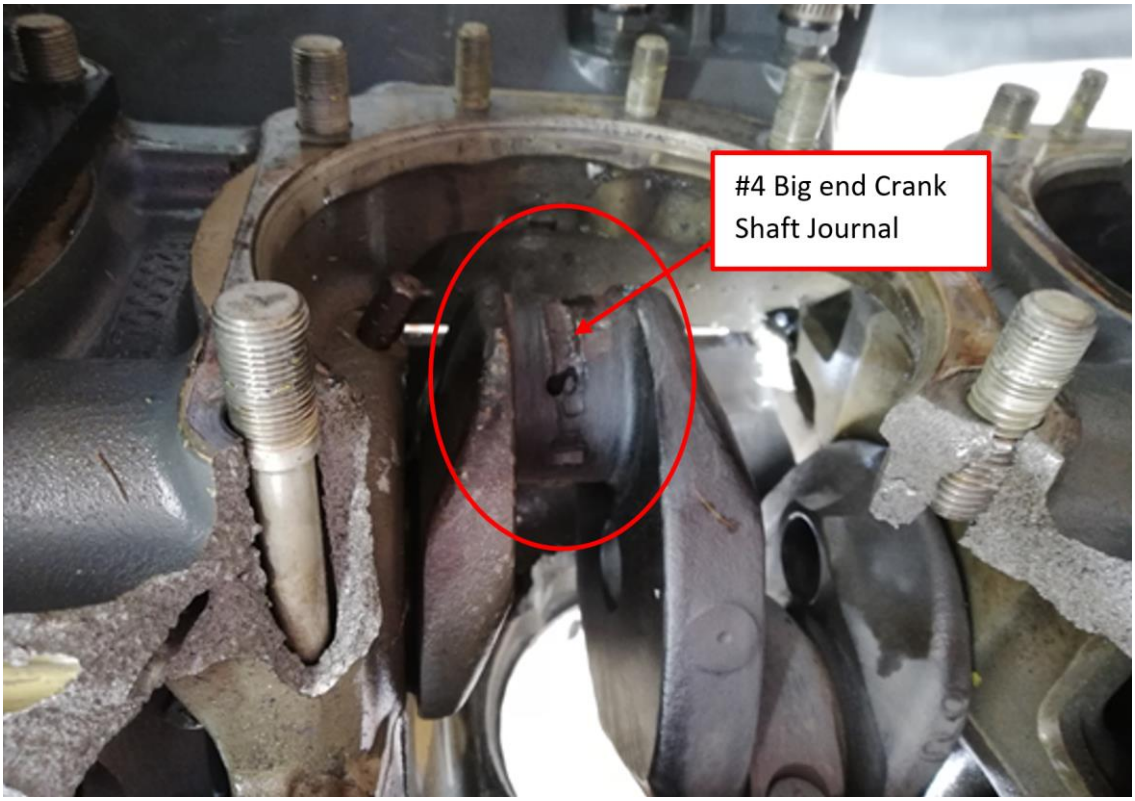

Figure 5: The damaged #4 big end crank shaft journal

3.3. Lycoming was approached through the National Transportation Safety Board (NTSB) to confirm whether the main bearings and connecting rod bearings used during the engine overhaul were acceptable replacement parts for the specific Lycoming IO-540-K1G5D engine. Lycoming confirmed that the bearings used during the overhaul had the correct part numbers.

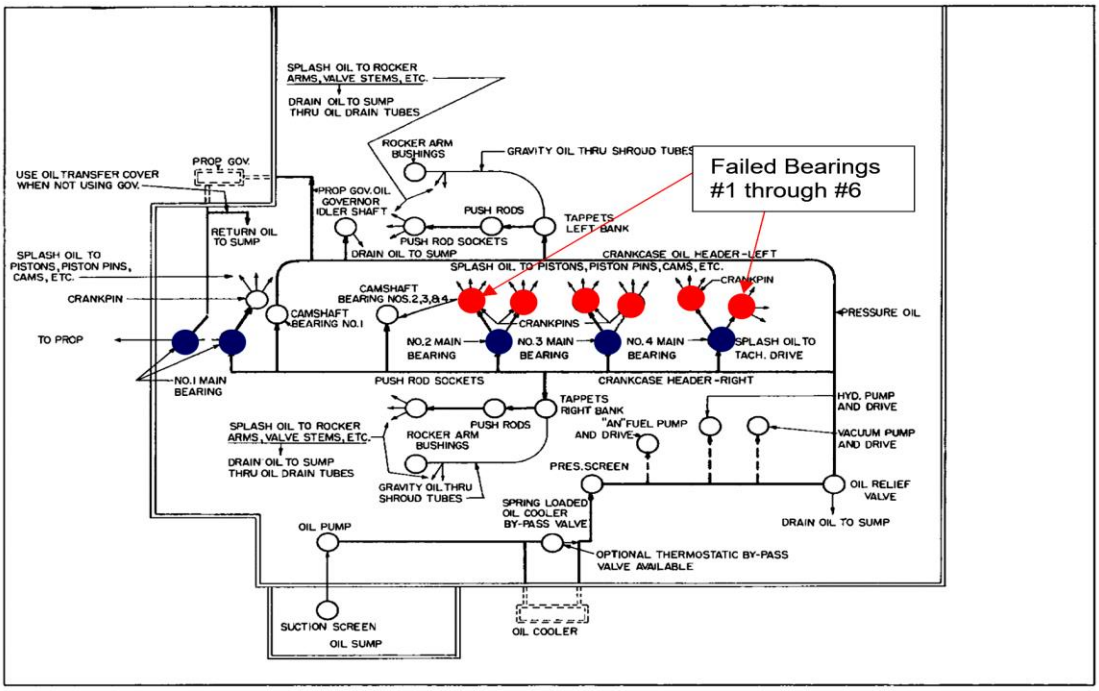

Figure 6: Lycoming 6-cylinder engine lubrication diagram (Courtesy of Textron Lycoming direct drive aircraft engines 60294-7 overhaul manual)

3.4. The job card to accomplish the last engine overhaul was opened on 28 October 2015 and was closed on 15 January 2016. The connecting rod bushes with part number LW-13923 were changed during the engine overhaul. On 4 August 2017, Lycoming issued mandatory Service Bulletin (SB) 632B which is also mandated by the Federal Aviation Administration (FAA) Airworthiness Directive (AD) 2017-16-11 dated 15 August 2017. The AD was prompted by several reports of connecting rod failures resulting in uncontained engine failure and in-flight shutdowns (IFSD). The AD and SB instructed that if an engine was overhauled or repaired on or after 18 November 2015, the shipment dates as well as maintenance and engine logbooks should be reviewed to identify any engine that could contain connecting rod assemblies or connecting rod bushings shipped from Lycoming during 18 November 2015 and 15 November 2016. No evidence was found in the aircraft logbooks to confirm that the SB 632B and AD 2017-16-11 were carried out on the aircraft. However, the records provided to this investigation by the AMO which overhauled the engine showed that the affected bushes were not shipped from the Lycoming factory during the dates mentioned. A general visual inspection of the bushes also did not reveal any visual defects that could have contributed to the failure of the connecting rods.

3.5. Mandatory Lycoming service bulletin no. 480 mandates the schedule and instructions for oil and oil filter changes, as well as oil pressure screen and oil suction screen cleaning on all Lycoming direct drive and TIGO-541 piston engines. For correct operation, an engine must have clean filtered oil of the correct grade and viscosity for in-flight ambient temperatures to lubricate all of its moving parts. The SB mandates that oil must be changed at regular intervals. The initial oil change of any new, rebuilt or overhauled engine, or engine returned to service after storage, must be done after the first 25 hours of operation after the initial start-up or within four months, whichever occurs first.

The routine oil change and oil filter replacement (after the initial 25-hour oil change and oil filter replacement) on engines with an oil filter must be done after every 50 hours of engine operation or every four months, whichever occurs first. Oil change intervals must not exceed four months if the aircraft has not been flown for at least 25 hours in a 4-month period. According to the records in the aircraft logbooks and flight folio, the first oil change after the engine overhaul was done on 8 June 2017 at 85.5 hours, that is, one year and four months since the overhaul. The next documented oil change was done on 3 August 2018 at 82.2 hours, that is, one year and two months since the last oil change. The engine failed on 9 January 2019 at 28.9 hours or five months and six days since the last oil change.

4. FINDINGS

4.1. The pilot was issued with a private pilot licence (PPL) on 2 February 2018 with an expiry date of 31 January 2019. The pilot accumulated a total of 1862.2 hours flying experience and 434 on the type.

4.2. The pilot was issued an aviation medical certificate on 7 May 2018 with an expiry date of 31 May 2019, subject to the following restrictions:

4.2.1. Hypertension protocol

4.2.2. Hypothyroidism

4.2.3. Contact lenses

4.3. The last annual inspection on the aircraft was carried out on 3 August 2018 at 2080.90 airframe hours. The aircraft had flown a total of 28.90 hours since the last major periodic inspection (MPI).

4.4. The Lycoming IO-540-K1G5D engine had catastrophic failure during cruise. The engine accumulated a total of 2218.20 engine hours and was overhauled at 2021.6 engine hours. The engine operated for 196.60 hours since the last overhaul and 28.90 hours since the last MPI.

4.5. Lycoming confirmed that the correct bearings were used to overhaul the engine.

4.6. The pilot did not record engine oil uplifts in the flight folio.

4.7. No evidence was found in the aircraft logbooks to confirm that the SB 632B and AD 2017-16-11 were accomplished on the aircraft. However, the records provided to the investigation team by the AMO that overhauled the engine showed that the affected bushes were not shipped from the Lycoming factory during the dates mentioned.

4.8. No evidence was found in the aircraft logbooks or flight folio to confirm that the oil change schedule mandated by mandatory Lycoming service bulletin no. 480 was adhered to.

4.9. The aircraft was fitted with an Artex 1000 ELT which transmitted an automatic signal when the aircraft came to rest. The police deployed in an area about 80km away from the site. In an SMS, the pilot provided “S2618508 E02352129” as his location where the accident occurred. The coordinates S26°18’50.8” E023°52’12.9” were close to the accident site. The coordinates where the police searched for the pilot were S26.18508 E023.52129. One of the local helicopter operators picked up the pilot and his dog at about 1200Z.

5 PROBABLE CAUSE

5.1. The engine failed during cruise because of failure of the connecting rod bearings as a result of oil starvation, hence, the subsequent unsuccessful forced landing.

6 CONTRIBUTING FACTOR

6.1 No recording or monitoring of oil uplifts to mitigate a high oil consumption.

7 REFERENCES

7.1. Lycoming Service Instruction No. 1432A, dated October 31, 1986.

7.2. Overhaul manual - Textron Lycoming direct drive aircraft engines 60294-7, Sixth Printing December 1974.

7.3 Mandatory Lycoming service bulletin 632B, dated August 4, 2017.

7.4 Mandatory Lycoming service bulletin 480F, dated May 25, 2017.

8 SAFETY RECOMMENDATION

8.1. None

9 ORGANISATION

9.1. None.

10 TYPE OF SAFETY ACTION

10.1. None.