

REPORT

SL 2017/05



REPORT ON SERIOUS INCIDENT AT BERGEN AIRPORT FLESLAND, NORWAY ON 31 AUGUST 2015 WITH PIPER PA-28-161, LN-BGQ

The Accident Investigation Board has compiled this report for the sole purpose of improving flight safety. The object of any investigation is to identify faults or discrepancies which may endanger flight safety, whether or not these are causal factors in the accident, and to make safety recommendations. It is not the Board's task to apportion blame or liability. Use of this report for any other purpose than for flight safety shall be avoided.

*This report has been translated into English and published by the AIBN to facilitate access by international readers.
As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.*

Photos: AIBN and Trond Isaksen/OSL

REPORT

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Date of submission: 18.04.2017
SL Report: 2017/05

This investigation has had a limited scope, and the AIBN has therefore chosen to use a simplified report format. This report format, in accordance with the guidelines given in ICAO Annex 13, is only used when necessitated by the scope of the investigation.

All times given in this report are local time (UTC + 2 hours) unless otherwise stated.

Type of aircraft:

- Type and reg.: Piper Aircraft, Inc. PA-28-161, LN-BGQ
- Year of manufacture: 1981
- Engine: Lycoming O-320-D3G

Operator:

Bergen Aero Klubb

Date and time:

Monday, 31 August 2015 at 1725 hours

Incident location:

Bergen Airport Flesland, Norway (ENBR)

ATS airspace:

Controlled airspace Class D

Type of occurrence:

Serious incident, loss of engine power during departure

Flight type:

Private (club)

Weather conditions:

Not stated

Light conditions:

Daylight

Flight conditions:

VMC

Flight plan:

VFR

Persons on board:

1

Injuries:

None

Damage to aircraft:

Fractured cylinder head

Other damage:

None

Commander:

- Age: 69
- Licence: Student licence
- Pilot experience: Total: 47 hours (all in this type). Last 90 days: 17 hours. Last 24 hours: 0 hours

Sources of information:

"NF-2007 Reporting accidents and incidents in civil aviation" from the student's instructor and Avinor, as well as AIBN's own investigations

FACTUAL INFORMATION

The student was conducting his second solo flight¹. He took off from runway 35 at intersection A7 and had reached an altitude of 100 – 200 ft when the engine stopped supplying power. White smoke was also coming off the aircraft. The student notified the tower that he was having engine trouble and landed on the remaining runway. There was now some oil on the aircraft's windshield, as well as on the runway. The aircraft came to a standstill on the runway shoulder at intersection A2.

SAS2872, which was about to land after LN-BGQ had taken off, had to abort its landing and enter holding. The runway was closed for 25 minutes while LN-BGQ was removed from the runway.

It soon became clear that the engine trouble was due to the cylinder head on cylinder no. 3 fracturing and coming loose. Cylinder no. 3 was consequently dismantled and sent to the Accident Investigation Board (AIBN) for closer examination.

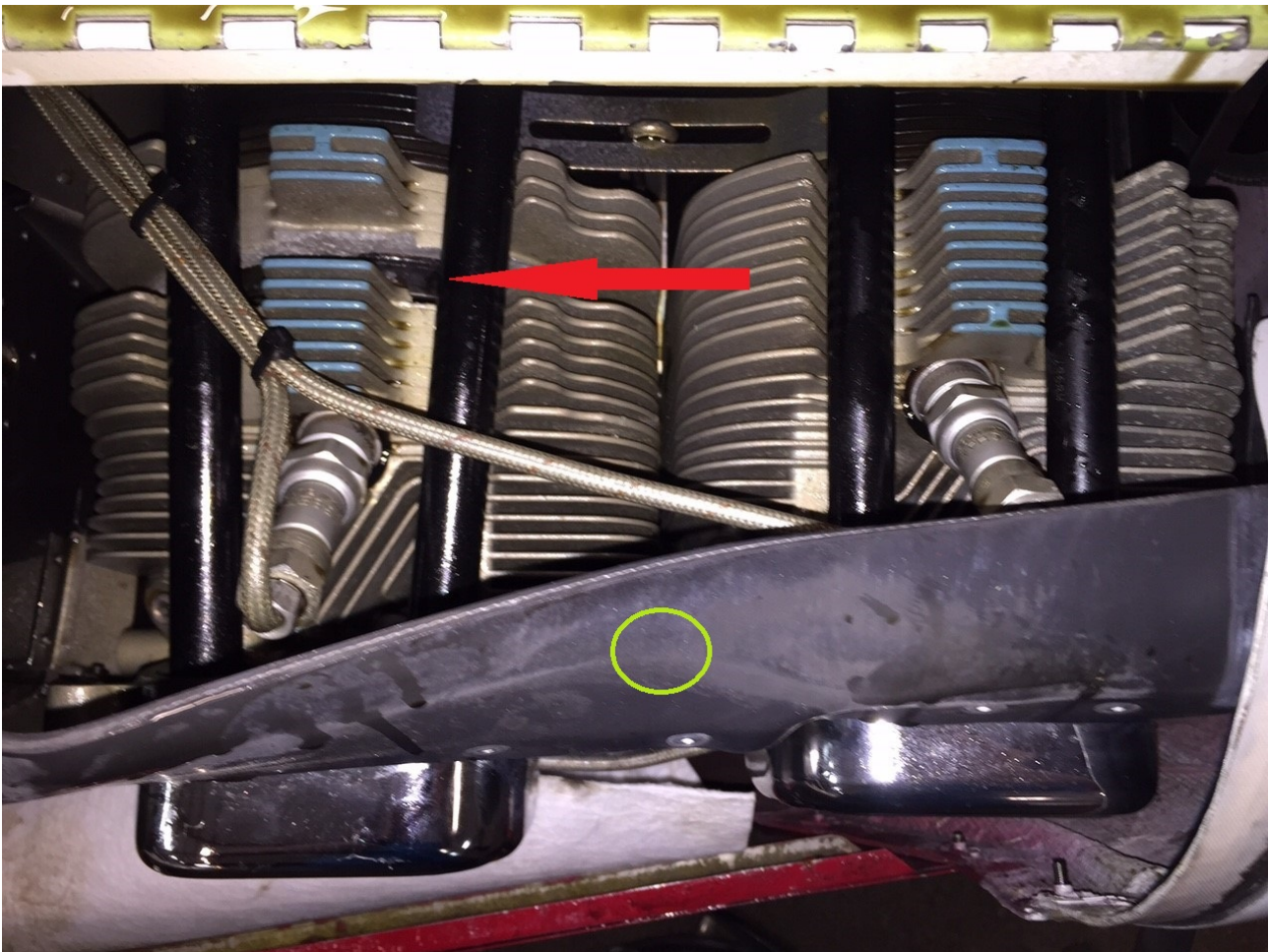


Figure 1: Fracture in cylinder no. 3 before the cylinder was dismantled. A screw was wedged between the cylinder heads in the area underneath the black rubber seal, indicated with a green circle. Photo: Private

¹ This was his first solo flight from Flesland.



Figure 2: Fracture after the cylinder head was removed. The fracture started on the right side of the photo. Soot colour in the right side of the fracture surface shows that the fracture has been open in this area for a while. Photo: AIBN

When the incident occurred, the aircraft had accumulated a total flight time of 8,078:20 hours. The engine had accumulated a total of 5,503:10 hours, 644:25 hours of which since it was overhauled by Norvic Aero Engines LTD in the UK in August 2013. In connection with the overhaul, they installed four new, complete cylinders from Superior Air Parts in the US. The cylinders had part number SL32006W-A20P. The serial number on the relevant cylinder was 326WH1214502.

According to the engine logbook, the engine was installed in LN-BGQ on 27 April 2006. After this, it has been subject to six 100-hour inspections. The last of these was carried out on 12 August 2015, 598:50 hours since overhaul (45:30 hours prior to the incident).

The cylinder head was sent to the Norwegian Armed Forces Laboratories at Kjeller (FLO/VEDL/FOLAT) for closer examination, where it was discovered that the fracture was due to fatigue. They were unable to find obvious flaws in the material or identify what initiated the fatigue crack.

The cylinder head was then sent to the manufacturer Superior Air Parts in Texas, USA, and inspected in the presence of the AIBN and the US National Transportation Safety Board. Here it was ascertained that the cylinder had been manufactured in accordance with manufacturer specifications. In this context, it was also discussed whether or not the cylinder fracture could be connected to previous cylinder fractures and the US Federal Aviation Authority's publishing of Airworthiness Directive AD 2007-04-19R. The conclusion was that no connection could be documented.

In connection with the investigation in the US, it was noted that the cylinder head had indentations from a screw-like object in the area facing cylinder no. 1 (see Figure 3). A 1/4" screw with 28 threads per inch fit right into the indentation. The area where the indentation was identified was on the same side where the fatigue fracture started.

Upon closer inspection of cylinder no. 1, an equivalent indentation was discovered directly opposite the indentations found on cylinder no. 3 (see Figure 4).

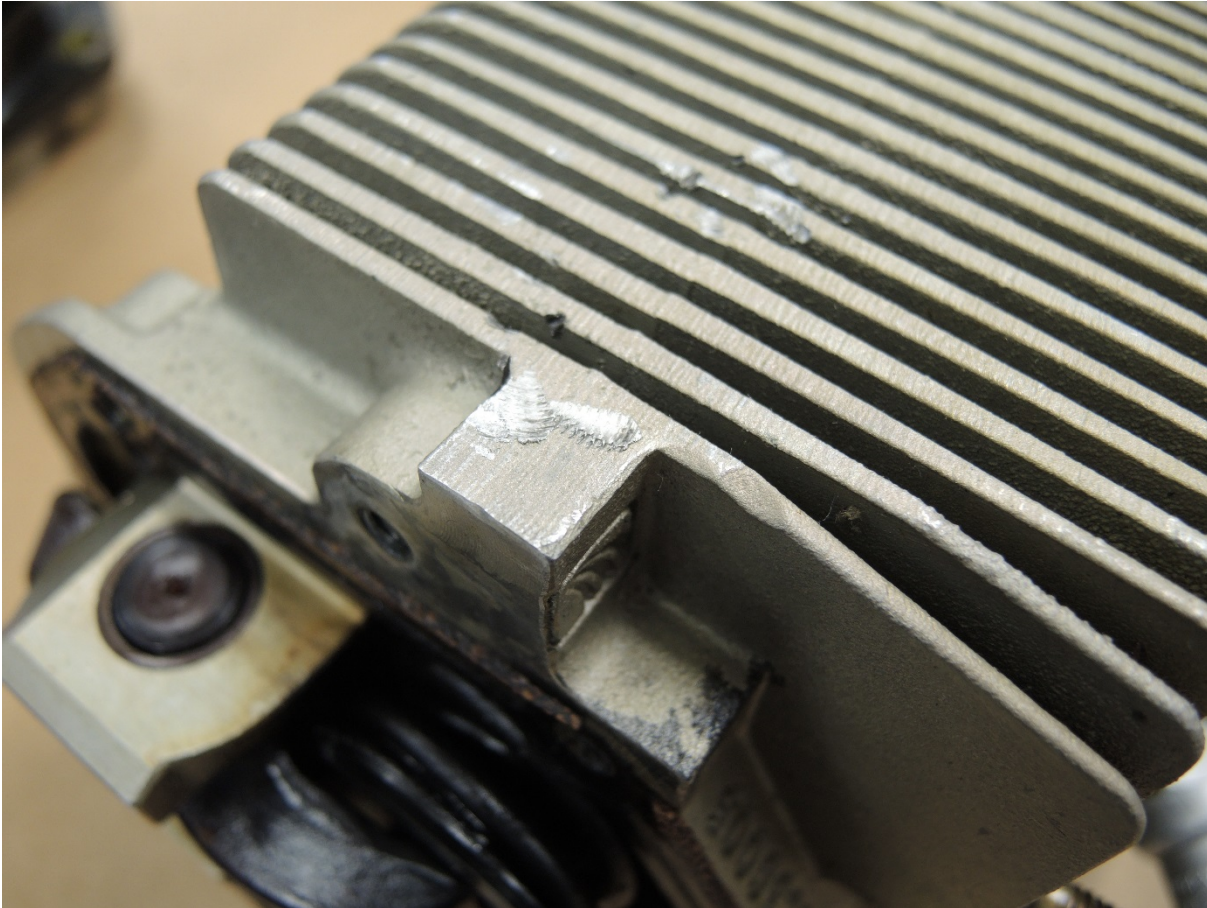


Figure 3: Marks from a screw-like object on the surface of the cylinder head (cylinder no. 3) facing cylinder no. 1. Photo: AIBN

A review of the aircraft's logbook showed two instances of missing cowling screws.

On 31 Mai 2015, at aircraft total flight time 7,937 hrs (141:20 hrs before the cylinder failure), the following was remarked: "two screws missing in cowling right side, near the generator belt." This was corrected at the same date and flight time. One screw was found and reinstalled, the other replaced.

On 31 Jun 2015, at aircraft total flight time 8,027:25 hrs (50:55 hrs before the cylinder failure), a screw was again remarked missing from the "cowling near prop". It is not known whether the missing screw was found, but the remark was signed off with "New screw installed".

The actual screw dimensions were 1/4" with 28 threads per inch.

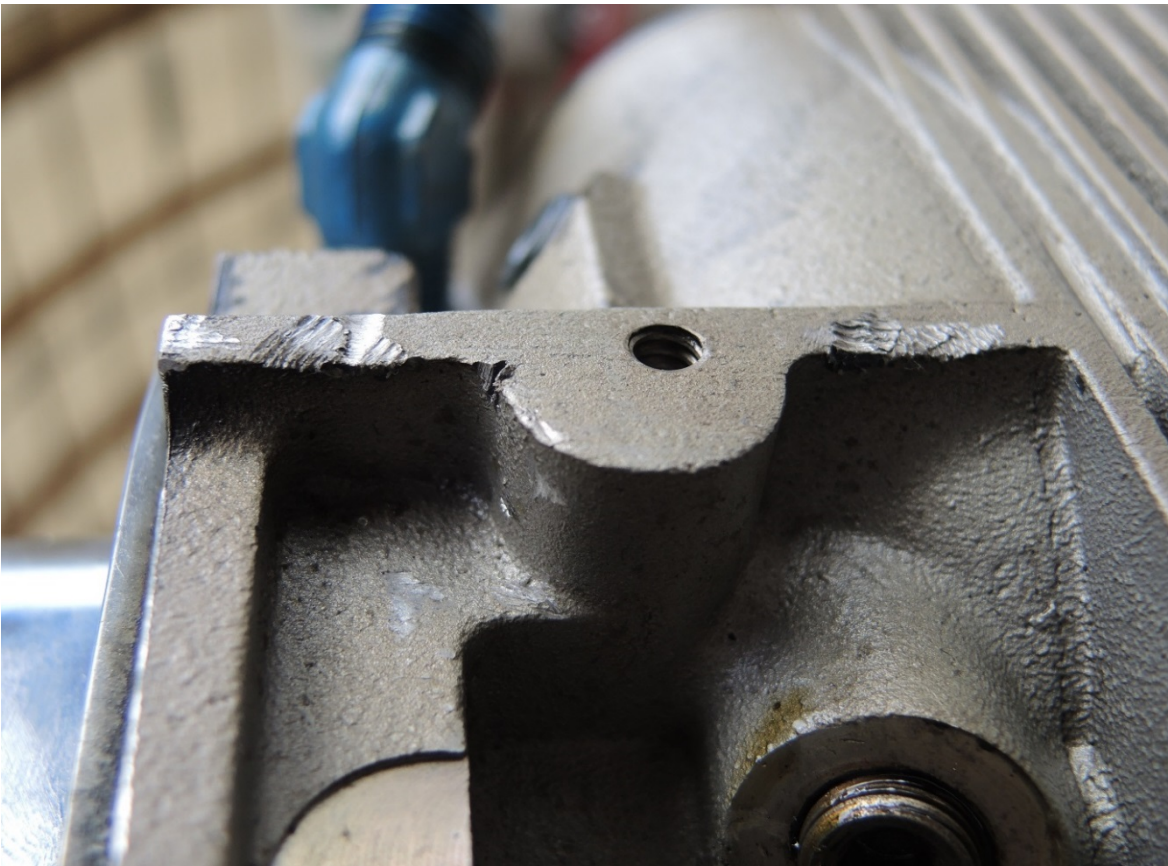


Figure 4: Equivalent indentations on cylinder no. 1. Photo: AIBN

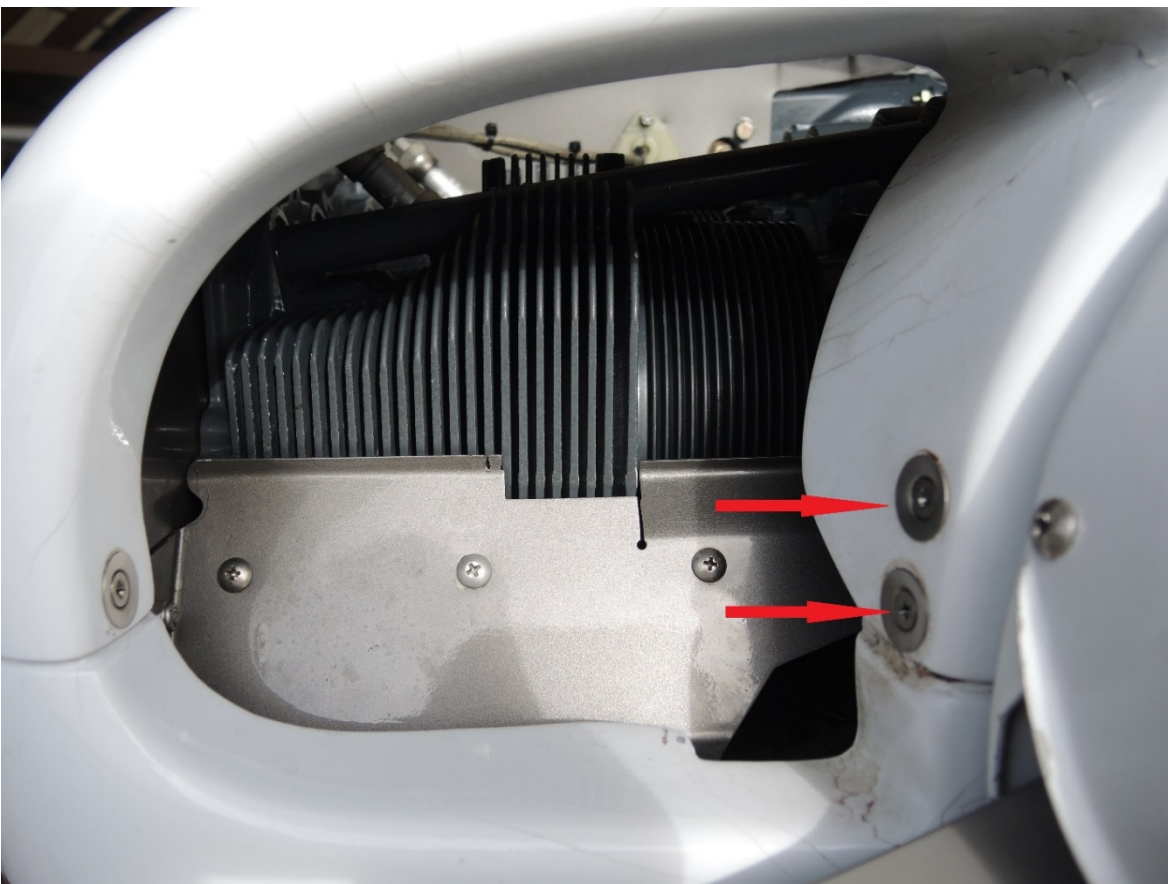


Figure 5: Arrows point at the screws in question. Photo: AIBN

THE ASSESSMENTS OF THE ACCIDENT INVESTIGATION BOARD

The Accident Investigation Board believes that the commander, despite his limited experience, completed the emergency landing in an exemplary manner. However, had the engine power loss occurred a few seconds later, the outcome could have been much more serious. The terrain north of runway 35 is very poorly suited for emergency landings.

The Accident Investigation Board cannot establish with certainty what caused the fatigue fracture and the splitting of the cylinder head. Nevertheless, it has been ascertained that the cylinder was produced in accordance with manufacturer specifications and that faulty material did not cause the start of the fatigue fracture.

The distance between the cylinders in the relevant location may allow a screw of the type in question to wedge itself in. The indentations indicate that at least one screw had been wedged in the opening between cylinders 1 and 3. Temperature changes and the cylinders' work cycle have led to small relative movements between the two cylinders. These movements have likely allowed the screw to wedge itself between the cylinders, and it has then been forced into the cylinder head. This has most likely caused abnormal strain on the cylinder as well as a lateral force which the cylinder head could not withstand, over time.

Soot on the fracture surfaces supports the theory that an open fracture has existed over a certain number of flight hours. However, the fracture was so small that only a thorough inspection immediately prior to the incident could have discovered the fault.

This incident has shown that a missing screw, which may appear to be trivial, has the potential to result in serious consequences. Everyone who inspects engines should be aware of this risk, which can be caused by even small objects between the cylinders.

Accident Investigation Board Norway

Lillestrøm, 18 April 2017