Accident

Aircraft Type and Registration:	Replica Percival Mew Gull, G-HEKL
No & Type of Engines:	1 De Havilland Gipsy Queen I piston engine
Year of Manufacture:	2013 (Serial no: PFA 013-14759)
Date & Time (UTC):	18 April 2025 at 1400 hrs
Location:	1 mile north-west of Great Massingham Airfield, Norfolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to engine, cowling and landing gear, propeller strike
Commander's Licence:	Private Pilot's Licence
Commander's Age:	71 years
Commander's Flying Experience:	2,681 hours (of which 397 were on type) Last 90 days - 27 hours Last 28 days - 15 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot plus further enquiries by AAIB

Synopsis

After approximately 30 minutes of flying as part of running-in the engine following a recent rebuild, the engine began to run roughly, and the No 3 cylinder head temperature began to decrease. A short time later the engine suffered an uncontained failure of the No 3 cylinder connecting rod and piston. The pilot was able to conduct a forced landing. The cause of the engine failure was determined to be oil starvation which led to the failure of two main bearings and the No 3 cylinder connecting rod end cap. Debris from the uncontained failure also damaged the magneto and caused the distributor gear drive shaft to shear. The exact cause of the starvation could not be fully determined.

History of the flight

The pilot departed Crowland, with the intention of an hour's flight to continue bedding in of the engine which had a recent top end rebuild. He had been flying for approximately 30 minutes, when the engine "missed a few beats", and the pilot decided to return. The engine then started to run roughly and the No 3 cylinder stopped producing power with an associated decrease in cylinder head temperature.

The aircraft was able to maintain cruise rpm and the pilot selected a direct track back to Crowland, whilst considering alternative airfields. When overhead between Sculthorpe and

Great Massingham there was a bang, some smoke, oil covered the screen, and the top of the engine cowl detached on one side and folded back.

The pilot decided to land at Great Massingham Airfield, but the open cowl affected handling to an extent that an off-field landing was required. As the aircraft came to a stop, it tipped onto its nose. The pilot was assisted, unharmed, from the aircraft.

Accident site

The aircraft came to rest in a field approximately 1 mile north-west of Great Massingham Airfield, sustaining significant structural damage following landing (Figure 1).

Figure 1
G-HEKL post-landing

Aircraft information

G-HEKL is a replica Percival Mew Gull which had flown 428 hours since completion in 2013 and had a valid Permit to Fly. The aircraft is a single-seat low-wing monoplane of wooden construction with tailwheel undercarriage layout, equipped with a tail skid.

Engine information

G-HEKL was fitted with a six-cylinder inverted de Havilland Gipsy Queen I engine manufactured in 1936 and had 436 hours running time.

The engine had been stored from new prior to installation in G-HEKL, bar an inspection and partial strip in 1979. At the time of the accident, the engine was being run-in following a top end rebuild and approximately 10 hours of ground running and flying had been completed. New cylinders, overhauled heads, new Gipsy Queen II guides, and new piston rings had been fitted. The front main bearing had been inspected, but none of the remaining main bearings or big end bearings were disturbed. Mineral lubrication oil was being used during the running-in process.

Engine examination

Following recovery of the aircraft, a full engine strip was performed by the owner.

Crankcase

The engine had a large hole in the right side of the crankcase (Figure 2), and No 3 piston and connecting rod were missing.

Figure 2
Crankcase damage

A piece of big end bearing shell was lodged in the magneto and distributor gears, and the attached quill drive shaft had failed in torsion (Figure 3).

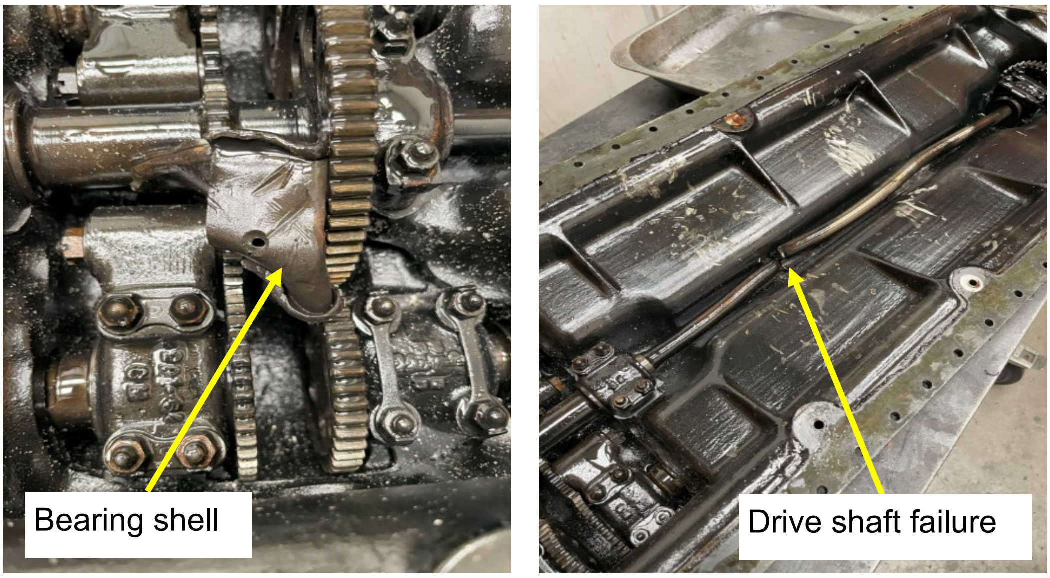

Figure 3
Magneto and distributor gears, and drive shaft

Main bearings and caps

The main bearings are numbered 1-8, from the front to rear of the engine. Nos 1, 3, 4, 6 and 7 showed various stages of surface wear and heat damage, while Nos 2 and 8 were undamaged. No 5 was severely overheated and had suffered a complete loss of its inner surface layer of white metal. The bearing cap was cracked in several places. The bearing cap bolts for Nos 3, 4 and 5 were found to be only finger-tight despite having their split pins and locking tabs in place.

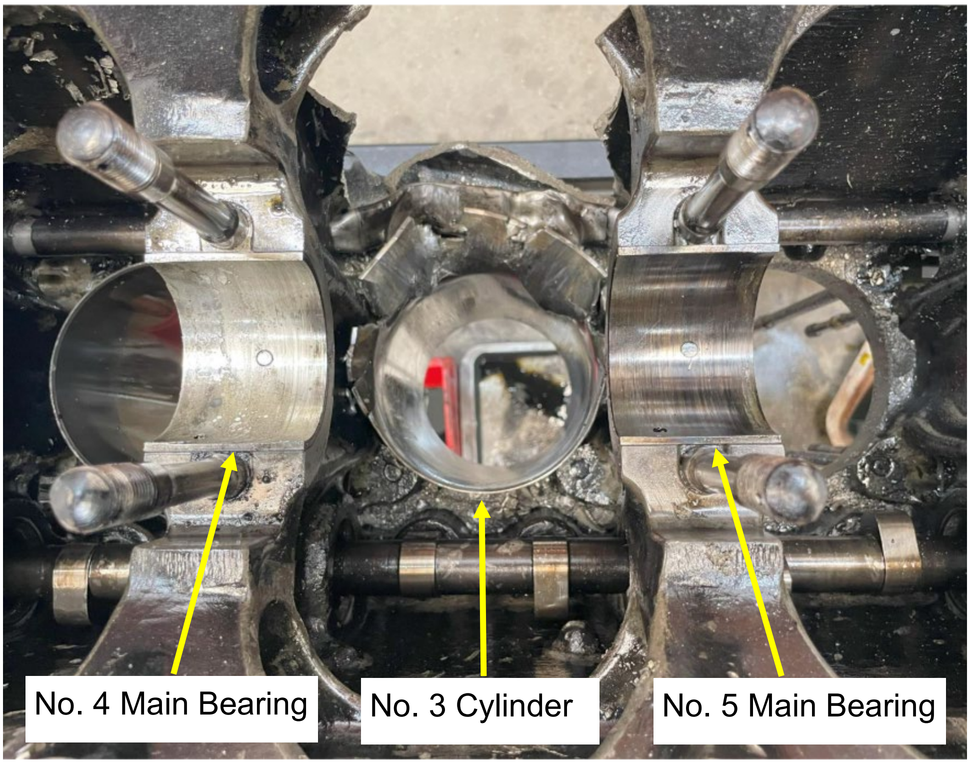

Figure 4

Main bearing, cylinder and crankcase damage

Big end bearings and caps

The big end bearings are numbered 1-6 from the front to the rear of the engine. Big end bearing No 3 is located between main bearings Nos 4 and 5.

The No 3 big end bearing shells were distorted and crushed from heat. One was located inside the empty No 3 cylinder, the other in the distributor drive gears. Two big end bolts from No 3 connecting rod were found bent, each with their nut and split pin still in place. The crankshaft journal was severely overheated and blackened.

No 4 big end cap and bearing was intact but overheated and the bearing shells had slipped by approximately 60°. Nos 5 and 6 big end bearings showed signs of starting to wear, while Nos 1 and 2 showed no damage.

Cylinders

All cylinders except for No 6 had white metal deposits on the cylinder walls of varying extents, with cylinder Nos 3 and 4 showing the most in the form of a thick band below the upper ring positions. Cylinder Nos 4, 5 and 6 had surface glazing[1].

No 3 cylinder was significantly damaged from being struck by the piston (Figure 4). None of the cylinder heads showed visible internal damage, but No 3 exhaust tappet was stuck in the open position by particles of white metal.

Oil filters

Very few metallic particles were found across the main oil inlet feed filter, main pressure filter and rear scavenge filter. The front scavenge filter contained no debris.

Other information

Cylinder honing

Surface honing introduces a grooved texture to the cylinder's internal face, which retains lubricating oil. During running-in of the engine, the piston rings mechanically wear against the grooves until a seal is formed. The angle and coarseness of the honing contributes to how the rings move and wear during this process.

Modern cylinders are often honed to a smoother final finish known as 'plateau honing' to reduce the running-in period. To achieve a firm seal between the piston rings and cylinder walls to promote initial wear and reduce the risk of glazing, running-in procedures advise periods of running the engine at high load.

Oil feed & redesign

The main bearings in the Gipsy Queen I are fed from the main oil gallery in the crankcase, with the oil flow direction from rear to front of the engine. From each main bearing, the oil feed enters the crankshaft and divides to lubricate both adjacent big end bearings. Each big end bearing receives its oil from two main bearing oil feeds.

The Gipsy Queen I had a short production run before the Gipsy Queen II was introduced. The Queen II had redesigned crankcase oil feed galleries, and central oil feeds with distribution grooves added to the main bearings. The oil feeds to the big end bearings were also modified. In addition, the crankcase was strengthened and included extra cross-bolts at main bearing No 5.

Footnote

[1] Glazing occurs when the oil lubrication film on the cylinder walls is heated to form a hard layer, filling the honing grooves. This can occur if the piston rings and cylinder surface become overheated from friction, or if they do not physically wear against each other to form a tight seal during the engine running-in process; allowing combustion gases to further heat the surfaces.

Survivability

The pilot elected to return to his home airfield whilst considering a precautionary landing. The aircraft's characteristics of minimal forward visibility and a high approach speed required additional consideration; the preferred option of a grass runway for the tailskid, and an airfield with minimal approach hazards were limited.

When faced with a forced landing, the open engine cowl created control difficulties and a high rate of descent. Oil obscured the canopy, further preventing adequate forward visibility. The pilot estimates from the time of engine cessation to landing was approximately 90 seconds. He wore a parachute, although he did not consider it was necessary to abandon the aircraft.

Analysis

Engine failure

The engine damage suggests disruption to the oil feed began at No 5 main bearing. This led to more substantial oil starvation to Nos 3 and 4 big end bearings due to them each receiving half of their oil downstream from No 5 main bearing. White metal debris, likely from No 3 big end bearing, jammed the exhaust tappet of No 3 cylinder, causing the initial power loss. Subsequent failure of No 3 connecting rod big end cap occurred, with the piston and connecting rod exiting the crankcase. The piece of No 3 big end bearing shell lodged in the distributor drive gears, shearing the distributor gear and magneto drive shaft, stopped the engine.

An exact cause of the oil starvation could not be determined, but lesser damage to main bearings downstream of the oil path to No 5 main bearing suggests its initiation was localised. It is possible that due to higher oil temperatures during the running-in process, low viscosity hot oil was able to pass through the looser Nos 3, 4 and 5 main bearing caps, locally increasing oil consumption. All piston rings and cylinders were replaced, and it is possible that the smoother cylinder honing finish prevented the compression rings to bed in correctly. This could then contribute towards higher cylinder temperatures, oil temperatures, and cylinder glazing.

After a small production run, the Queen I engine design was updated with the Queen II. The timing and nature of the design changes indicates there had been known existing in-service lubrication issues with the Queen I, suggesting it would have had little resilience to any disruption or reduction of oil feed.

The pilot decided to return to his home airfield with a partial power loss due to limited suitable landing locations nearby for the aircraft. However, the subsequent engine failure and unexpected handling characteristics from the open engine cowl resulted in little time for the pilot to execute a forced landing at high speed with limited visibility. As a result of safety recommendations following previous partial power loss accidents[2], the

Footnote

2 Safety Recommendations G-BBSA https://www.caa.co.uk/safety-initiatives/safer/safer-recommendation-management/accident-g-bbsa/.

UK Civil Aviation Authority have introduced changes to the PPL (A) training and class and type rating revalidation[3] to cover scenarios of partial power loss and decision-making, effective 1 October 2025.

Conclusion

The engine stopped due to the magneto and distributor drive shaft breaking, following failure of the No 3 connecting rod big end cap due to oil starvation. The exact cause of oil starvation could not be determined. Subsequent designs of the engine type amended the oil feed paths and strength of No 5 main bearing.

Partial power loss scenarios have been recently added to UK PPL (A) initial training and revalidation syllabi to assist pilots with decision-making ahead of a potential complete power loss.

Footnote

[3] Civil Aviation Authority (CAA) UK Aircrew Regulation, UK Regulation (EU) no. 1178/2011, Third edition, Amendment 1, August 2025. *"GM2 FCL.740.A Revalidation of class and type ratings – aeroplanes"* https://regulatorylibrary.caa.co.uk/1178-2011-pdf/PDF.pdf [accessed January 2026]