

ACCIDENT

Aircraft Type and Registration:	Aeronca C3, G-AEFT	
No & Type of Engines:	1 J.A.Prestwich J99 piston engine	
Year of Manufacture:	1936 (Serial no: A-610)	
Date & Time (UTC):	14 October 2015 at 1510 hrs	
Location:	Near Polzeath, Cornwall	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Propeller detached	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	46 years	
Commander's Flying Experience:	10,030 hours (of which 275 were on type) Last 90 days - 58 hours Last 28 days - 16 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional enquiries by the AAIB	

Synopsis

The aircraft was flying at 2,500 ft when the propeller suddenly detached. The pilot was able to execute a forced landing with no further damage to the aircraft. The detachment had been caused by a fatigue crack which had developed in the tapered end of the crankshaft. This problem had been recognised in 1939 but had not resulted in any mandatory requirements. The Light Aircraft Association (LAA) have now mandated a repetitive visual and dye-penetrant inspection of the crankshaft for corrosion and cracking.

History of the flight

The aircraft was en-route from Bodmin to Roche at 2,500 ft. It was rolling out of a gentle left orbit when there was a loud bang and the pilot saw the propeller falling away to the left side. He completed the vital actions and turned towards a suitable pasture to the east for a forced landing. Having transmitted a distress call to Newquay Airport, he spotted the golf club at Roserrow and remembered that there was a landing strip nearby. He arrived there with plenty of height to spare, so was able to fly overhead to check for obstructions before performing a successful forced landing with no further damage. A nearby Cessna 152 was able to relay a message to Newquay that the aircraft had landed safely.

Engineering examination

The propeller was recovered from a building site near Polzeath, where it had landed without causing damage or injury. The pilot examined the assembly and could see that

it had detached because the tapered end of the crankshaft on which it was mounted, had fractured (Figure 1). He also recognised that the fracture was almost identical to one he had seen in an AAIB Bulletin concerning another JAP J99-engined aircraft in 2012 (G-EBJI, Bulletin 10/2012).

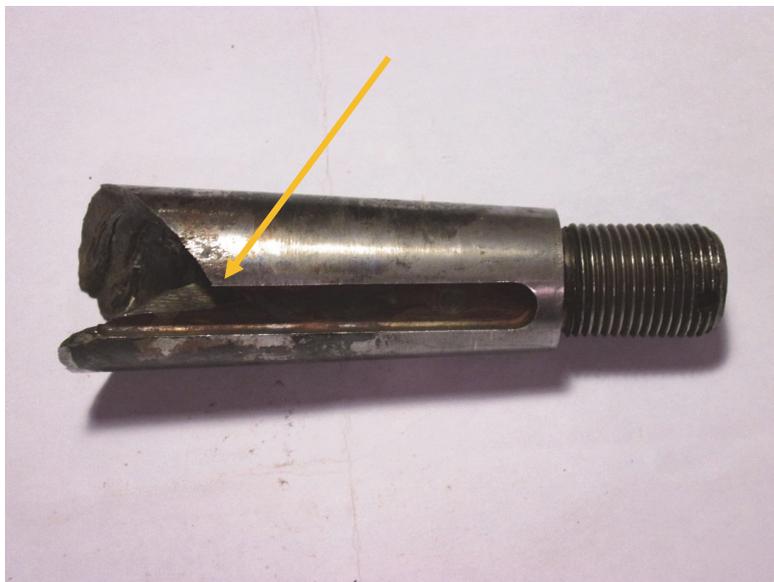


Figure 1

Failed crankshaft showing corrosion pitting in the area of the fatigue crack origin (arrowed).

The above report noted that the JAP J99 engine was essentially a licence-built version of the Aeronca E-113c engine with the addition of dual ignition, and that propeller attachment was the same. As long ago as 1939, Aeronca had experienced a number of instances of cracking from the aft end of the keyway slot and had issued Service Memorandum M-36 to advise operators to remove the propeller and visually inspect for cracks at 25 flying hour intervals. The Memorandum had not been given Airworthiness Directive status in the United States or subject to a Mandatory Permit Directive in the UK and was not, therefore, mandatory. The AAIB Bulletin noted that the LAA would

'alert owners of aircraft fitted with JAP J99 and Aeronca E113 series engines to the potential for crankshaft fatigue cracking and additionally will include a reference to Service memorandum M-36 for affected engines in the Type Acceptance Data Sheet (TADS) on the LAA website.'

In addition, the LAA were also in the process of defining a suitable inspection interval and non-destructive test method for crack detection.

Comparison of the photographs from G-EBJI and G-AEFT showed remarkable similarity and both were clearly high-cycle fatigue failures. Both fatigue origins were towards the aft end of the keyway slot, although it could be seen that the origin on 'FT' also appeared to coincide with a degree of corrosion pitting.

The owner of G-AEFT has commented that he had removed the propeller in 2012 and given it a visual inspection upon learning of the incident involving G-EBJI. Although he did not see any cracks, he now suspects that a dye-penetrant inspection would have revealed cracks.

Subsequent safety actions

After the occurrence to G-AEFT, the LAA advised that details of the first occurrence and of the Aeronca bulletin had been widely promulgated through the LAA in-house magazine 'Safety Spot'. Due to the publicity already given to this incident through Safety Spot, the very small numbers of engines involved (nine known to the LAA), and the specialist nature of the engine it had not thought it necessary to issue written directives at this time.

However, as a result of this second occurrence, in which corrosion pitting may have contributed to the problem and a visual inspection had apparently been insufficient to detect the onset of cracking, the LAA have issued Airworthiness Information Leaflets (AIL) No. MOD/ENG/JAP/001 for the JAP engine, and MOD/ENG/AER/001 for the Aeronca version, effectively mandating the following for all engines before further flight:

- Removal of the propeller.
- Removal of the Woodruff key.
- Inspection, using a 10x magnifying glass, of the tapered end for corrosion or obvious cracking, particularly around the edges and corners of the keyway. If cracks or corrosion pits are found, the crankshaft must be scrapped.
- If the findings from the step above are negative, then the area around the keyway should be subjected to a Dye Penetrant inspection technique. If no cracks are found, then the propeller can be refitted and remain in service
- The above work and subsequent refitting of the propeller should be completed to the satisfaction of a suitably qualified LAA Inspector, who should then raise worksheets and sign the log book to confirm compliance with the AIL.

The inspection is to be repeated every 25 flying hours or 3 calendar years, whichever occurs first. A copy of Aeronca memorandum M-36 was attached to the AILs for information.