

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594



February 18, 2021

MATERIALS LABORATORY FACTUAL REPORT

Report No. 21-011

A. ACCIDENT INFORMATION

Place : Welsh, Louisiana
Date : July 2, 2020
Vehicle : Robinson R-44
NTSB No. : CEN20LA286
Investigator : Courtney Liedler, AS-CEN

B. COMPONENTS EXAMINED

Camshaft and 12 tappet bodies.

C. DETAILS OF THE EXAMINATION

An overall view of the submitted camshaft and tappet bodies is shown in figure 1. The camshaft was intact, but the lobe associated with the number 1 cylinder exhaust valve was substantially worn (figure 2). The contact face on the head of the tappet body from the number 1 cylinder exhaust valve train (1E) was spalled and worn as shown in figure 3. The remaining camshaft lobes and tappet bodies were intact, free of corrosion pits, and appeared undamaged with normal wear patterns on most of the heads. The 6E tappet body had relatively deeper circumferential wear and scuff marks and the 6I tappet body had relatively heavy contact marks on their camshaft lobe contact faces.

The tappet bodies were examined for markings including part numbers. All tappet bodies had "DL 26" vibropeened into the side of the head. No additional markings were observed on the 1E, 1I, 3E, 3I, 4I, 5E, and 6I tappet bodies. The remaining 5 tappet bodies had markings in the groove of the shaft as listed in table 1 consistent with part numbers associated with the original equipment manufacturer (OEM) and with two Federal Aviation Administration (FAA) Parts Manufacturer Approval (PMA) manufacturers.

Table 1. Tappet Body Markings in the Grooves

Tappet Body	Marking
2E	SL72877 FAA-PMA ML-H
2I	72877 MC-O
4E	SL-72877 ML-RM
5I	72877 M C-O
6E	AEL-72877/L FAA-PMA N010

On November 23, 2012, the Australian Civil Aviation Safety Authority issued Airworthiness Bulletin (AWB) 85-014, applicable to all Lycoming and Continental piston engines, to alert operators and maintainers to the potential flight hazard resulting from undetected valve tappet body / lifter and camshaft lobe wear. In AWB 85-014, instances of severe spalling damage was noted in tappet bodies of now-superseded Lycoming part number 15B26064 tappet bodies. Additional images in AWB 85-014 show a spalled tappet body part number SL72877 from a Lycoming engine and spalled Continental part number 653877 hydraulic valve lifters. AWB 85-014 further states, "Aside from possible manufacturing problems identified in various manufacturers' service information, tappet body and hydraulic lifter contact surface failures are commonly attributed to corrosion pitting. ...Such corrosion commonly results from infrequent flight activity, particularly in moisture laden environments, without adequate engine preservation." AWB 85-014 further notes the importance of diligently inspecting the oil filter paper at each oil change for fine metallic particles that can be generated from excessive camshaft lobe wear and tappet face spalling.

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Senior Materials Engineer



Figure 1. Overall view of the submitted components.

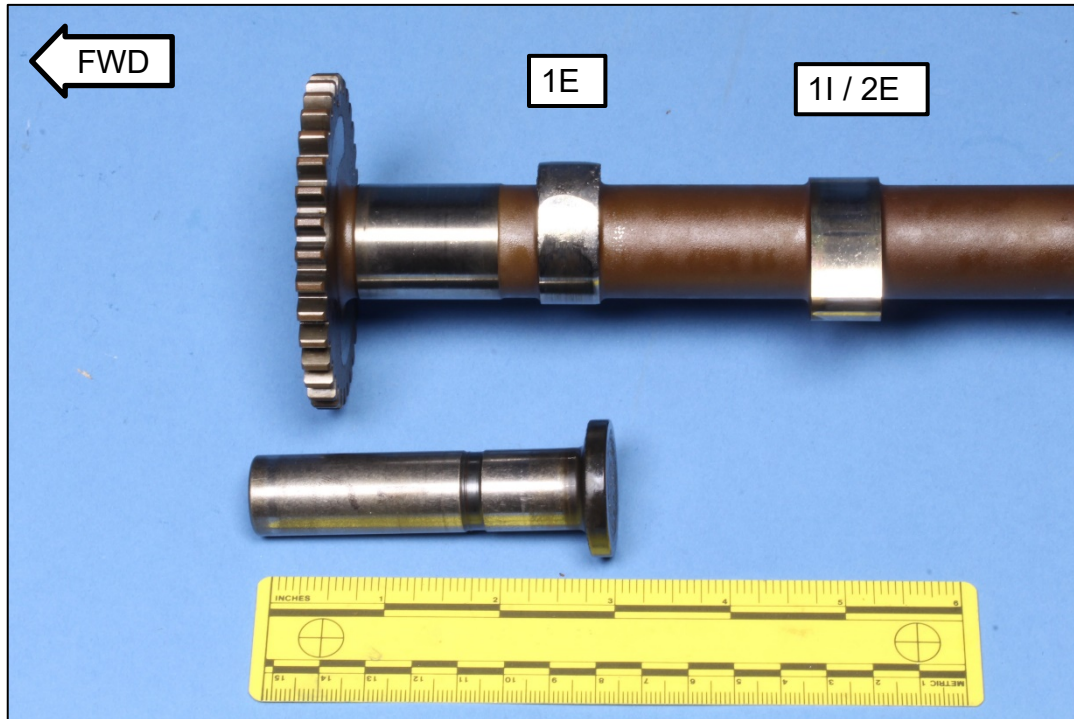


Figure 2. Closer view of the tappet body for the number 1 cylinder exhaust valve train and the corresponding lobe on the crankshaft.



Figure 3. Head face on the number 1 exhaust tappet body.