



ENGINE EXAMINATION REPORT

N1609V

ENGINE MODEL	IO-360-KB (1B)
ENGINE SERIAL NUMBER	235909-R
AIRCRAFT MAKE & MODEL	Cessna 172K
AIRCRAFT SERIAL NUMBER	R1722205
AIRCRAFT REGISTRATION	N1609V
FILE NUMBER	19-049

NAME	SIGNATURE	DATE
Mike Council		3-31-2020

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	9-25-2019	NTSB ACCIDENT #	CEN19LA258
FACILITY	AMF Aircraft Recovery	NTSB INVESTIGATOR	Daniel Baker-IIC Non-Attending Craig Hatch-Attending
ADDRESS	[REDACTED], Springfield, TN 37172,	FAA INVESTIGATOR	Joseph Lewis, FAA-Richmond, VA FSDO Non-Attending
		ACCIDENT DATE	8-8-2019
		ACCIDENT LOCATION	North Garden, VA

ENGINE INFORMATION

ENGINE POSITION	Single - Front
TOTAL TIME	2105.3 calculated
TIME SOH	Undetermined-no evidence of engine overhaul since factory rebuilt.
TYPE & TIME SLI	Annual inspection dated 8-23-2018 at Tach 1472.4 hours. See excerpt below. Tach at recovery examination 1586.1 hours or 129.7 hours since last documented inspection.
BUILD DATE	12-5-1988
IN SERVICE DATE	12-28-1988

Significant logbook information: Logbook excerpts for the last two annual (100-hour) inspections were furnished. The logbook entry for the 2018 annual inspection indicated that the engine was found to be in airworthy condition with 1975.6 hours since major overhaul.

Date August 23, 2018 Reg: N1609V Serial: R1722205 TACH: 1472.4 TTAF: 3870.1
Continental IO-360-KB1B S/N 235909-R TSOH: 1975.6

Compressions: #1)78 /80 #2) 68/80 #3)76 /80 #4)70 /80 #5)74 /80 #6)76 /80
Changed oil and replaced with 8 qts. of XC 20W50. Removed and cut filter with satisfactory results. Installed new filter PN: AA48108-2. Replaced spark plug gaskets with P1003.

I certify that this engine has been inspected in accordance with an Annual Inspection using FAR Part 43 Appendix D and Cessna Service Manual and was determined to be in airworthy condition.

[REDACTED]
Ronald L. Gatewood

A&P [REDACTED] LA

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Search Code(s):

An examination of the engine was performed by the CMI Investigator under supervision of the NTSB Investigator. The inspection of this engine revealed that the engine suffered an oil starvation event causing damage to the engine's crankcase, crankshaft, bearings, pistons and alternator. The oil pump drive gear separated causing the oil pump to cease rotating resulting in an oil starvation event. Teledyne Continental Aircraft Engine Service Bulletin SB96-4 was issued 4-12-1996 to inform customers of the availability of improved oil pump gears and oil suction screens. The inspection of the accident engine determined that this Service Bulletin had not been complied with. The accessory case, oil pump cover, gears and broken drive gear were retained by the assisting NTSB Investigator to be metallurgically examined at the NTSB laboratory.

NOTE: As of the date of this report, the published Time Between Overhaul (TBO) recommended by Continental Aerospace Technologies for the serial number range of the accident engine is 2000 hours or 12 years. Reference *Continental Aerospace Technologies Standard Practices Maintenance Manual Publication M-0*, Rev. 1, Chapter 6.3

Disposition of engine following exam: The engine will remain in the care, custody and control of AMF Aircraft Recovery until released by the NTSB IIC.

INSPECTION WITNESSES

NAME	Mike Council	NAME	Craig Hatch
ADDRESS	Mobile, Alabama	ADDRESS	Central Region
ORGANIZATION	Continental Aerospace Technologies	ORGANIZATION	NTSB
PHONE		PHONE	

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EXTERNAL INSPECTION OF ENGINE

The engine was presented to the examination already removed from the wrecked airframe.

The two-blade McCauley constant speed propeller separated from the engine inboard of the crankshaft propeller flange. The separated propeller flange remained attached to the propeller. The broken crankshaft exhibited jagged shear lips and ladder cracking. The propeller spinner was impact damaged but did not display rotational signatures. Blade A and B were slightly impact damaged but did not exhibit any rotational signatures. The only other visible impact related damage to the engine and accessories was a bent exhaust muffler tailpipe. Otherwise, no other visible impact damage was noted on the engine/engine accessories.

An engine data plate was attached to the top right side of the crankcase. The data plate identified the engine as a Teledyne Continental Motors model IO-360-KB, serial number 235909-R. Serial data obtained from the Continental Aerospace Technologies engine serial database indicated that this engine was assembled at Teledyne Continental Motors factory 12-05-1988. This engine model/spec is designed to produce 195 horsepower at 2600 RPM. Unknown persons vibro-etched additional information on the data plate indicating that the engine had been modified to produce 210 horsepower at 2800 RPM for takeoff. Additional vibro-etching included "SE1436CE". An internet search for SE1426CE produced information for a Supplemental Type Certificate (STC) which allows the Continental Motors model IO-360-KB engine to be modified to produce 210 horsepower at 2800 RPM. A copy of the STC was not available online.



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PAGE 7 of 17**INTERNAL INSPECTION OF ENGINE**

The instrument air pump was removed. The pump operated smoothly, and air was ejected when the intact splined shear drive was manually rotated. An adapter was used at the accessory drive in an attempt to manually rotate the engine at the accessory gears. The engine would not rotate.

The engine driven fuel pump was removed. The drive coupling was intact. The fuel pump would not rotate. The fuel pump was disassembled, and rust was discovered inside the pump body and between the shaft and bushing which prevented the impeller blades from rotating. No fuel was present. Once corrosion was removed and the impeller blades were reinstalled, the pump rotated freely.

The magnetos and ignition harness were intact and produced spark at each terminal when manually rotated. The ignition harness leads on the right magneto exhibited minor impact damage. The sparkplugs were removed and examined. When compared to a Champion Sparkplug "Check-A-Plug" chart, the condition of the sparkplugs was normal except for the bottom # 6 sparkplug which was oil contaminated.

The spin-on oil filter was removed and opened. Only a very small amount of metal contamination was noted. The oil rod was removed and only about 3/16" of oil was registered on the oil rod indicating that the oil quantity was low in the oil sump. The oil sump was removed, and debris was noted in the remaining oil. The oil pressure relief valve was removed and examined. Both springs were intact, and the oil pressure relief valve plunger exhibited minor corrosion and pitting on the face mating surface.

The engine driven alternator was removed, and damage was noted to the drive gear and drive coupling. The separated oil pump drive gear was found lying loose inside the accessory case. The drive gear exhibited shear lips where the shaft had separated from the gear. The accessory case was removed to gain access to the oil pump. The oil pump was disassembled and examined. No hard particle passage was noted. The oil pump gears would only rotate partially. Damage was noted to the pump body blocking the driven oil gear from rotating. See red arrows in the oil pump photos on pages 12 and 13.

Rocker covers were removed. All valve rocker arms, push rods, valve springs and keepers were intact. All six cylinders were removed. The cylinder walls exhibited rust and pitting consistent with intervals of non-use. All six pistons were scuffed and exhibited metal to metal contact and oil starvation damage to piston skirts. All intake and exhaust valves were intact and exhibited normal combustion deposits.

The crankcase was disassembled, and the main bearings exhibited thermal distress. Crankshaft main bearing journals #1,2 and 3 exhibited bluing due to thermal distress. The connecting rods moved normally and smoothly on each respective crankshaft journal. The camshaft exhibited oil starvation damage to bearing surfaces. Intake and exhaust lifters exhibited rust around the perimeter of each lifter body. Main bearings and crankshaft journals exhibited abnormal heat signatures. Main bearings were thermally damaged.

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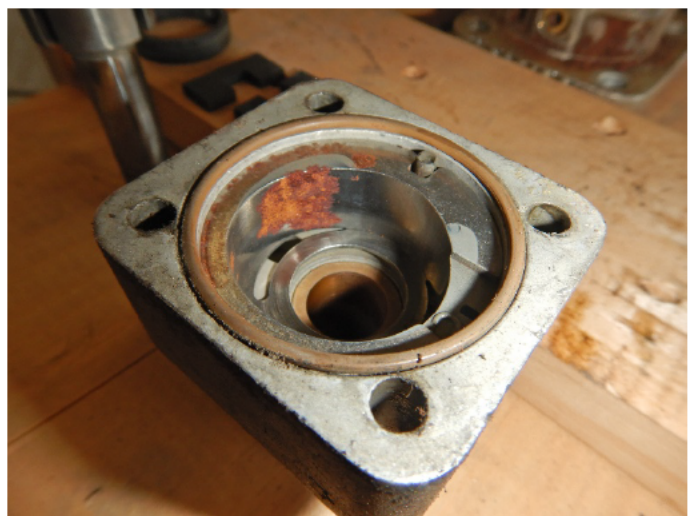
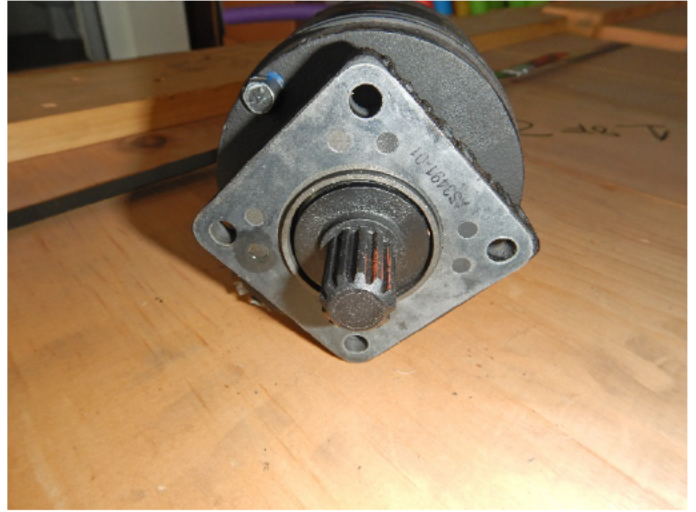
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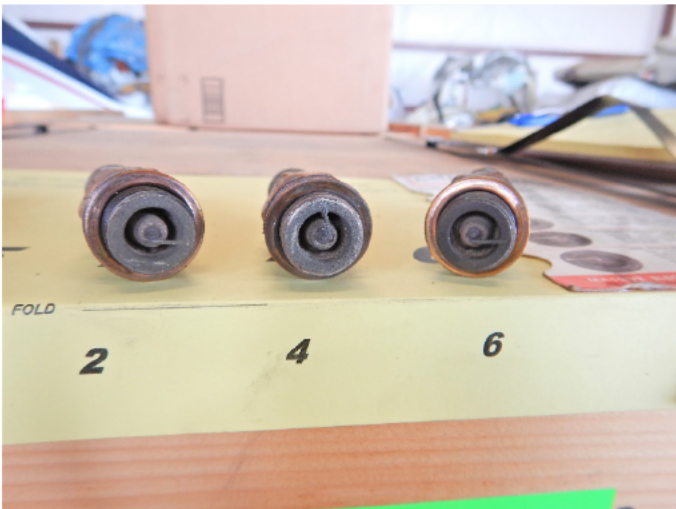
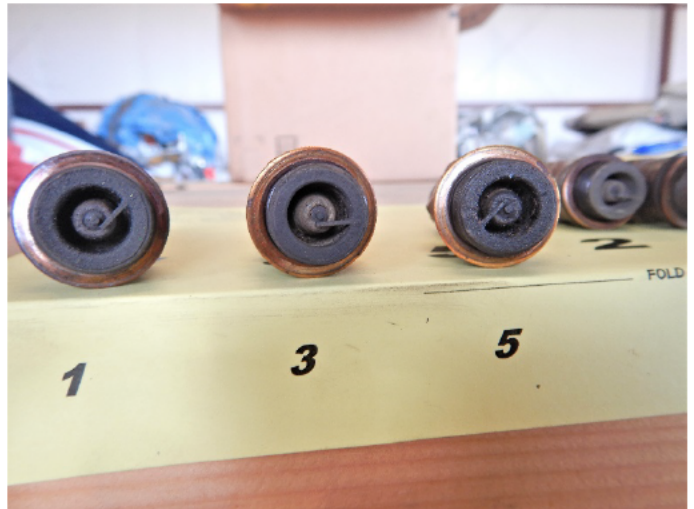
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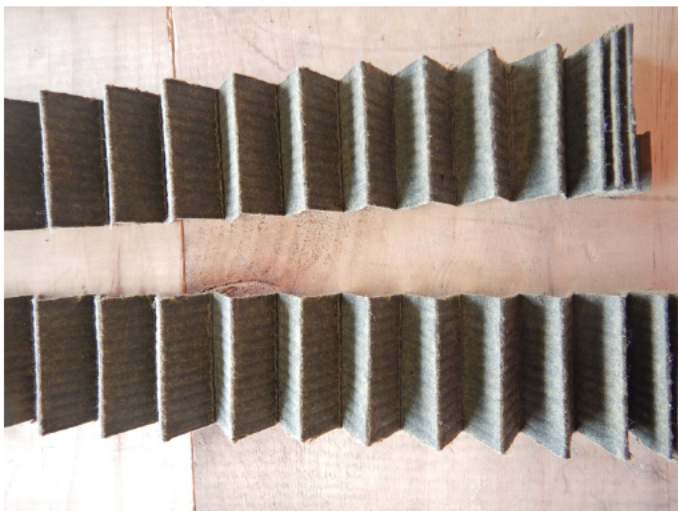
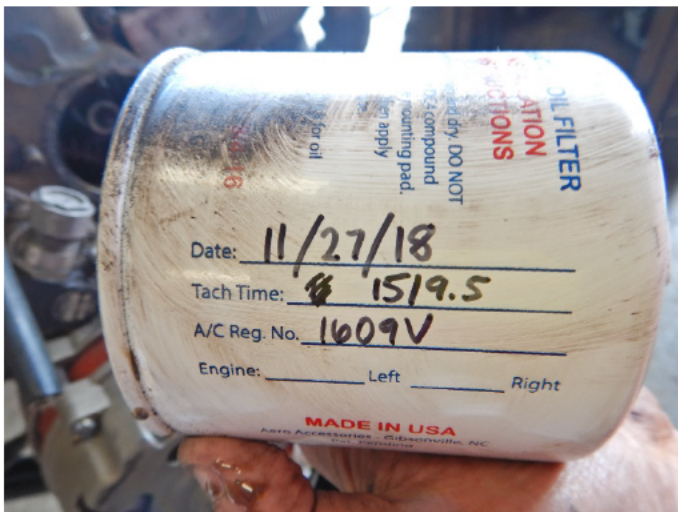
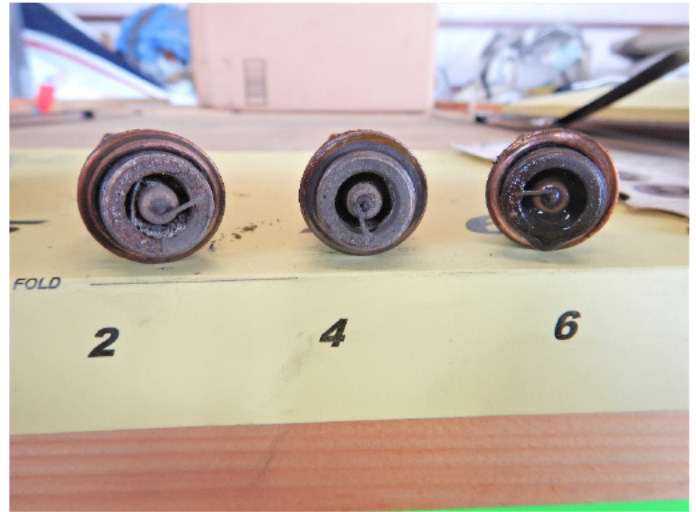
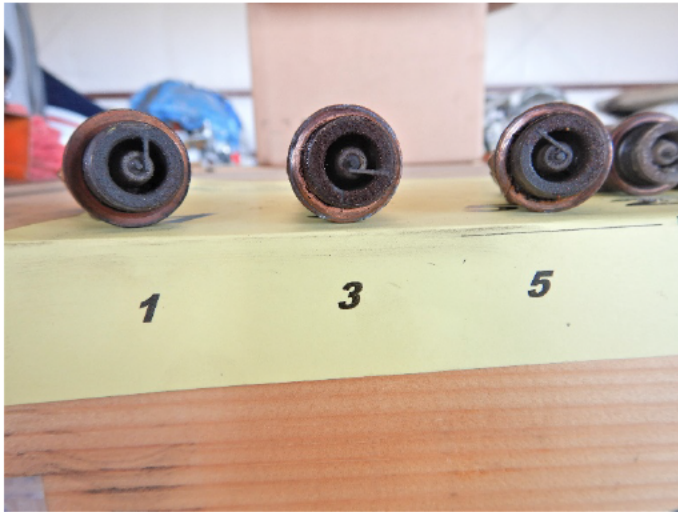
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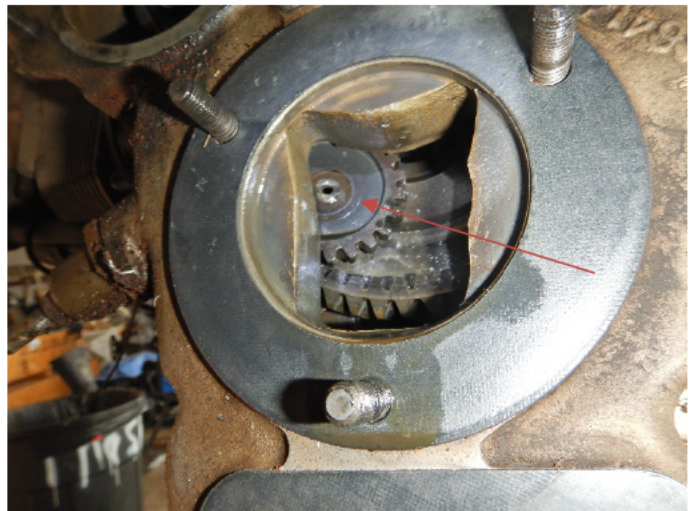
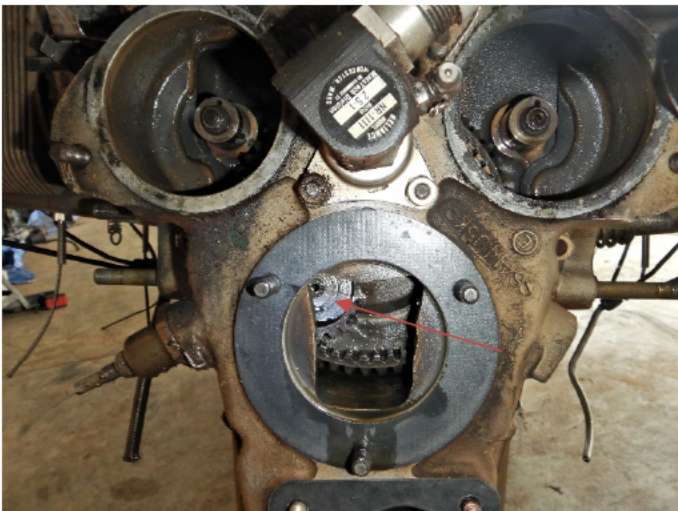
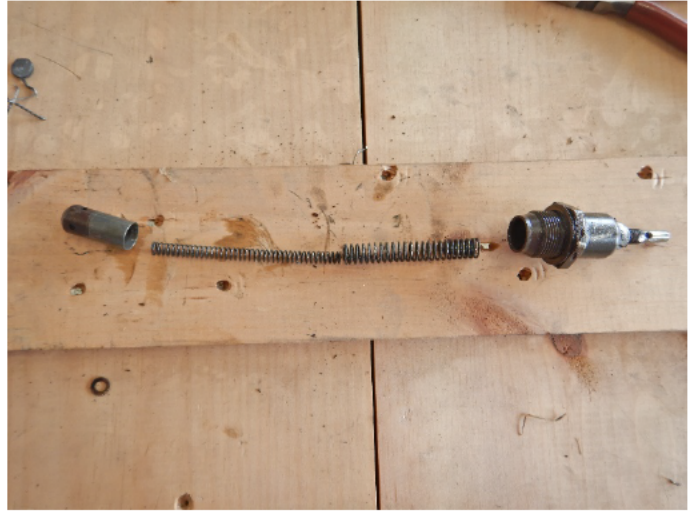
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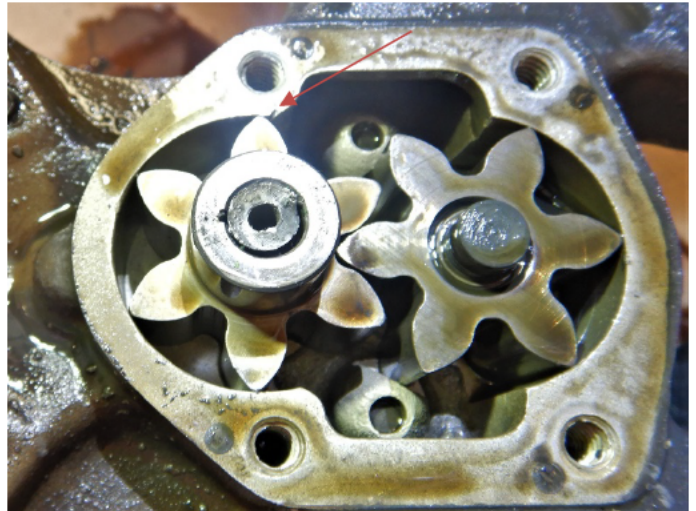
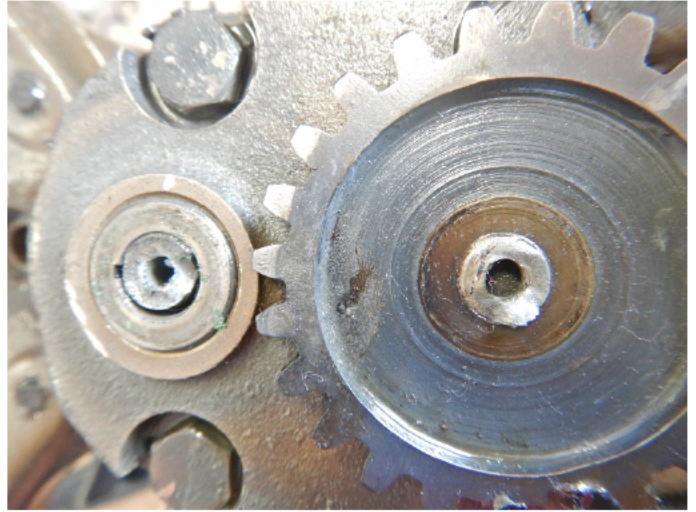
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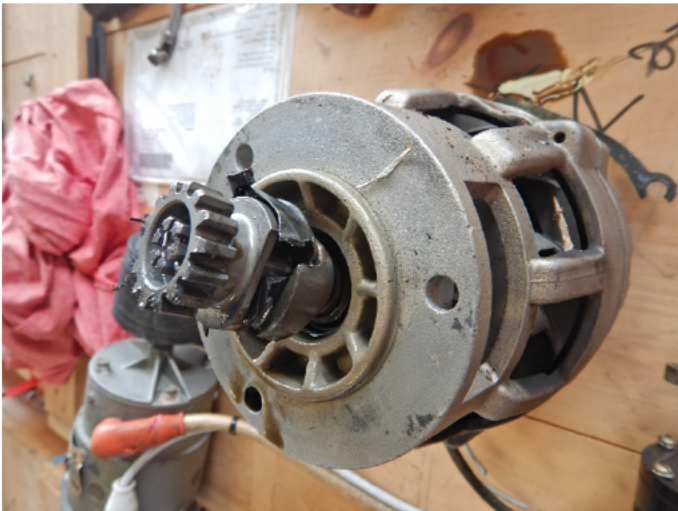
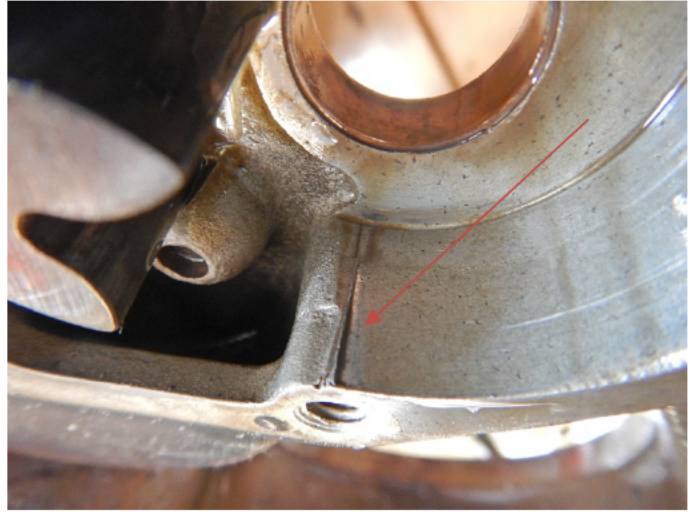
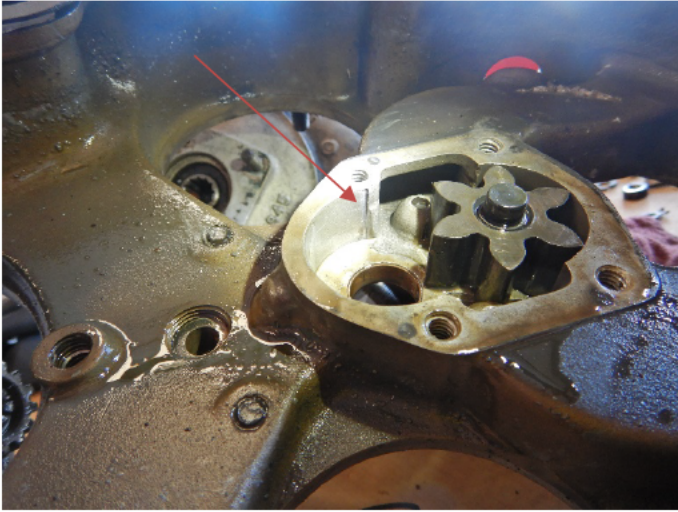
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