Continental Motors, Inc.

ENGINE EXAMINATION REPORT

ENGINE MODEL: IO520L

ENGINE SERIAL: 554710

AIRCRAFT MODEL: Cessna 210L

SERIAL NUMBER: 21061386

REGISTRATION: N723BL

Examiner	Signature	Date
Phillip Grice	[redacted]	February 26, 2013

GENERAL INFORMATION

EXAMINATION		ENGINE RECEIVED	
Date	February 26, 2013	Date	December 7, 2012
Facility	Continental Motors Inc.	RGA #	231091
Address	[redacted]	FROM	
City	Mobile	NTSB/FAA Tagged	Yes
State and Zip	Alabama 36615	Box Sealed	Yes

ENGINE INFORMATION

Make	Continental Motors Inc.
Model	IO520L
Serial No.	554710
Engine Position	Single
Total Time	Not reported
Time SOH	Not reported
Build Date	03/02/1987
In Service Date	Not reported
Removal Date	Not reported

AIRCRAFT / ACCIDENT INFORMATION

Aircraft Make	Cessna
Aircraft Model	210L
Aircraft Serial No.	21061386
Registration No.	N732BL
Accident Date	November 09, 2012
Accident Location	La Grange, Texas

Significant logbook information: The engine log book was not returned with the exhibit.

Report Summary: **Search Code:** 15-08-13

The engine was return with a hole above the number four cylinder in the top of the crank case. Disassembly of the engine revealed the engine suffered an oil starvation event. The number four connecting rod released from the crankshaft the remaining rods exhibited oil starvation signatures. The engine was equipped with an F&M oil filter adapter this adapter was returned in a condition which allow rotation on the engine the lower fiber washer seal was torn upon inspection. This is a possible leak source for the oil starvation to occur.

Disposition of engine following exam: Awaiting disposition.

Inspection Witnesses			
Inspector	Phillip Grice	Mechanic	Johnny Little
Organization	Continental Motors Inc.	Organization	Continental Motors Inc.
Witness	Tom Latson	Mechanic	Gregory Eastburn
Organization	NTSB	Organization	Continental Motors
Witness	Peter Basile		
Organization	Cessna Aircraft Company		

ENGINE COMPONENT EXAMINATION

Magneto to Engine Timing TCM Spec. - 22 ° BTDC	Left Magneto: 24 Degrees BTDC	Right Magneto: 24 Degrees BTDC

Exhaust System	Condition: The exhaust system components were returned with the engine. The flame cones were missing in both mufflers.

Starter Manufacturer: OEM Prestolite Part Number: MHJ4003S-R Serial #: 7010798
Rebuilt by Electrosystems

Condition: The starter rotated by hand and was intact and undamaged.

Starter Adapter Part Number: Illegible. Date Code: Illegible.

Condition: The starter rotated by hand and was intact and undamaged.

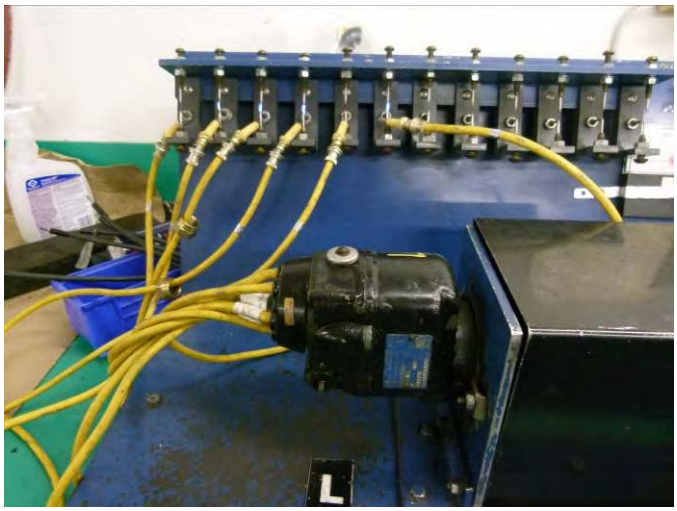
Crankshaft to Camshaft Timing The crankshaft to camshaft timing was verified by the alignment of the gear's timing marks.

Ignition Harness Manufacturer: Slick Model/Part Number: M-2380 LH M-2379 RH Serial #: N/A

Condition: All leads were free of frayed or damaged shielding and exhibited normal operating signatures.

L/H Magneto Manufacturer: Slick Model: 6210R Serial #: 6100301

Condition: The left-hand magneto turned freely with impulse coupling engagement. The magneto was installed and tested on the test bench and produced a blue spark across a 7 mm gap through the full range of test bench RPM.



R/H Magneto Manufacturer: Slick Model: 6210R Serial #: 6099033

Condition: The right-hand magneto turned freely with impulse coupling engagement. The magneto was installed and tested on the test bench and produced a blue spark across a 7 mm gap through the full range of test bench RPM.

Oil Cooler Manufacturer: No Data Plate Model/Part Number: Serial #:

Condition: The oil cooler was undamaged and exhibited normal operating signatures.

Oil Pump	Condition:	The oil pump drive was intact. The oil pump cavity contained heavy scratches and exhibited signatures. The oil pump gear teeth exhibited normal operating signatures. The oil pressure relief valve and seat contained no obstructions and exhibited signatures of proper seating.

Oil Filter adapter Manufacturer: F&M Enterprises Inc. Model number: C6LCL// S/N 11455L

Condition: The oil filter was opened to allow examination. The oil filter element was examined and contained an abundance of flakes and slivers from the damaged internal engine components. The oil filter adapter fiber seal washer was torn where the adaptor attaches to the oil pump housing. The seal had signatures of miss-alignment with the oil filter adaptor. The condition is a possible oil leak source.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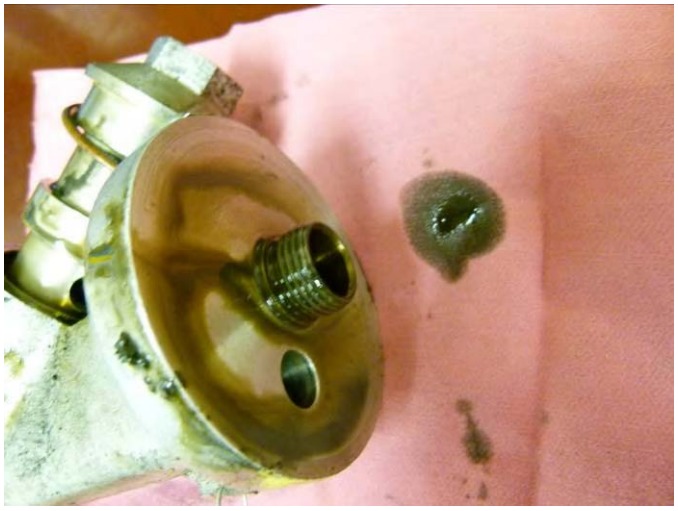
PeM ENTERPRISES INC.

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Throttle and Fuel Control / Metering Assembly | Manufacturer: TCM | Part Number: 629703-2 | Serial #: L128646RA

Condition: The throttle control had normal operating signatures. Finger screen removed and no material was present.

Fuel Pump | Manufacturer: TCM | Part Number: 646212-1 | Serial #: 438603RB

Condition: The fuel pump turned freely and there were no abnormalities present. The fuel pump drive was intact and undamaged.

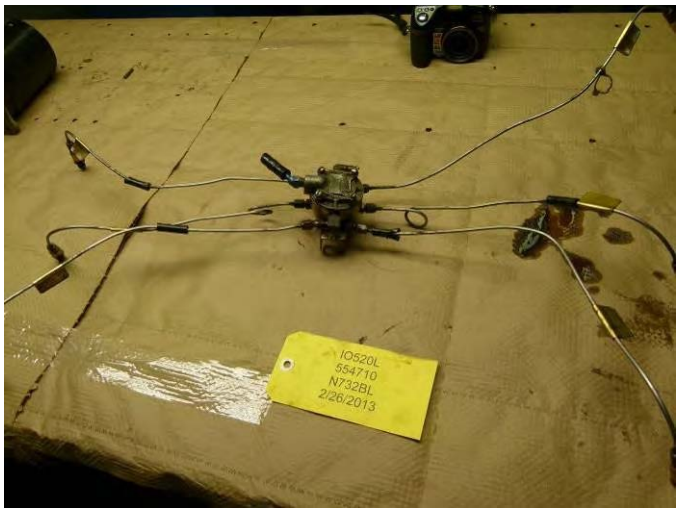
Fuel Manifold Valve Manufacturer: TCM Part Number: 632351-15A24 Serial #: L128603R1

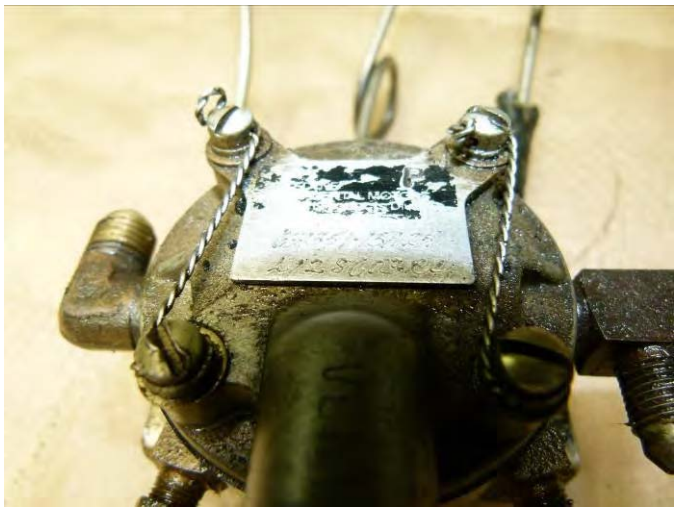
Condition: The fuel manifold valve exhibited normal operating signatures. There was no fuel stains observed from the cover vent port.

Fuel Nozzles and Lines Manufacturer: GAMI

Position	#1	#3	#5	#2	#4	#6
Size	GA184	GM166	GF257	GA184	GM166	GF157

Condition: The fuel nozzles were unrestricted and exhibited normal operating signatures. The fuel lines were intact and undamaged.





Spark Plugs Manufacturer: Champion Part number: RHB32E

Condition: The top and bottom sparkplugs had normal wear signatures in accordance with the Champion aviation check-a-plug comparison chart.

Alternator/Generator Manufacturer: Electrosystems Inc. Part Number: DOFF10300BR Serial #: A102501

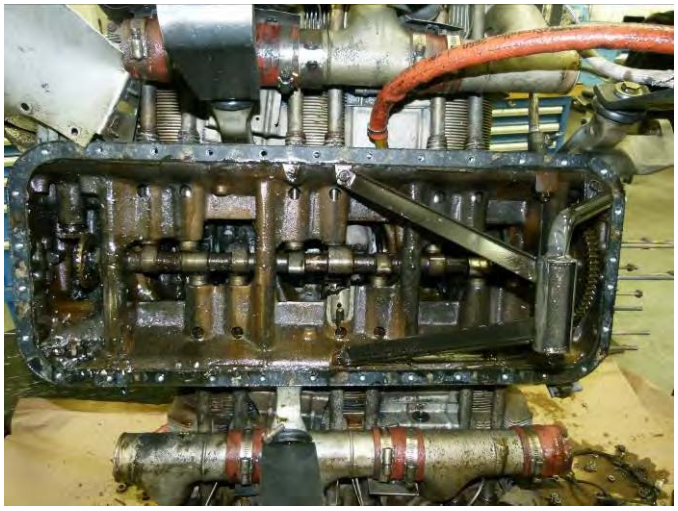
Condition: The alternator turned through freely and exhibited normal operating signatures.

Oil Sump

Condition: The oil sump drain plug was not safetied. The oil sump was undamaged and exhibited normal operating signatures. . The oil was dark in color and contained the number three intake lifter, the number four rod cap (fractured), piston ring fragments, bearing fragments, and crankcase fragments.

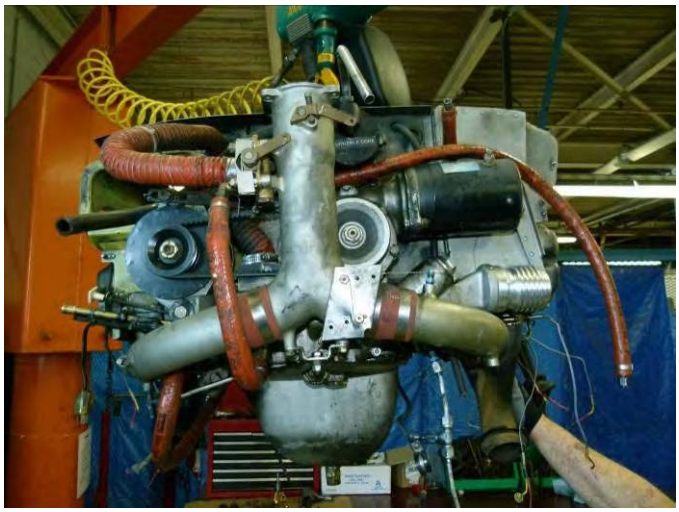
Oil Pick-up Tube & Screen

Condition: The oil pick-up tube was undamaged. The oil suction screen was unrestricted.



Induction System

Condition: The induction risers and balance tube were undamaged and exhibited normal operating signatures.



Cylinder #1 Part Number: 639272CP Head Date: N/A Barrel Surface: Chrome

Serial #: 156755 Work Order Numbers: None

Condition: The spot putty was not evident on the cylinder hold-down nuts. The cylinder combustion chamber had a normal amount of combustion deposits and the bore condition was free of scoring and undamaged. The cylinder skirt was intact and undamaged and there were no hone marks visible in the cylinder bore ring travel area. The intake and exhaust valve heads exhibited normal deposits and operating signatures. The rocker box area had an oil residue indicating lubrication to the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #2 Part Number: : 639272CP Head Date: N/A Barrel Surface: Chrome

Serial #: 156859 Work Order Numbers: None

Condition: The spot putty was not evident on the cylinder hold-down nuts. The cylinder combustion chamber had a normal amount of combustion deposits and the bore condition was free of scoring and undamaged. The cylinder skirt was intact and undamaged and there were no hone marks visible in the cylinder bore ring travel area. The intake and exhaust valve heads exhibited normal deposits and operating signatures. The rocker box area had an oil residue indicating lubrication to the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #3 Part Number: : 639272CP Head Date: N/A Barrel Surface: Steel Chrome

Serial #: 156678 Work Order Numbers: None

Condition: The spot putty was not evident on the cylinder hold-down nuts. The cylinder combustion chamber had a normal amount of combustion deposits and the bore condition was free of scoring and undamaged. The cylinder skirt was damaged and there were no hone marks visible in the cylinder bore ring travel area. The intake and exhaust valve heads exhibited normal deposits and operating signatures. The rocker box area had an oil residue indicating lubrication to the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #4 Part Number: : 639272CP Head Date: N/A Barrel Surface: Steel Chrome

Serial #: 156783 Work Order Numbers: None

Condition: The spot putty was not evident on the cylinder hold-down nuts. The cylinder combustion chamber had a normal amount of combustion deposits and the bore condition was free of scoring and undamaged. The cylinder skirt was damaged and there were no hone marks visible in the cylinder bore ring travel area. The intake and exhaust valve heads exhibited normal deposits and operating signatures. The rocker box area had an oil residue indicating lubrication to the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #5 Part Number: : 639272CP Head Date: N/A Barrel Surface: Chrome

Serial #: 156952 Work Order Numbers: None

Condition: The spot putty was not evident on the cylinder hold-down nuts. The cylinder combustion chamber had a normal amount of combustion deposits and the bore condition was free of scoring and undamaged. The cylinder skirt was intact and undamaged and there were no hone marks visible in the cylinder bore ring travel area. The intake and exhaust valve heads exhibited normal deposits and operating signatures. The rocker box area had an oil residue indicating lubrication to the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #6 Part Number: : 639272CP Head Date: N/A Barrel Surface: Chrome

Serial #: 156638 Work Order Numbers: None

Condition: The spot putty was not evident on the cylinder hold-down nuts. The cylinder combustion chamber had a normal amount of combustion deposits and the bore condition was free of scoring and undamaged. The cylinder skirt was intact and undamaged and there were no hone marks visible in the cylinder bore ring travel area. The intake and exhaust valve heads exhibited normal deposits and operating signatures. The rocker box area had an oil residue indicating lubrication to the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Rocker Arm and Shaft Condition: The intake and exhaust rocker arms and shafts exhibited normal operating signatures.

#1 Piston, Rings and Pin Piston Part Number: 648045

Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt was free of scoring and damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

#2 Piston, Rings and Pin Piston Part Number: 648045

Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt was free of scoring and damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

#3 Piston, Rings and Pin Piston Part Number: 648045

Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt exhibited mechanical damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

#4 Piston, Rings and Pin Piston Part Number: 648045

Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt exhibited mechanical damage. The piston head exhibited mechanical damage and it was required to be driven from the cylinder bore. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

#5 Piston, Rings and Pin Piston Part Number: 648045

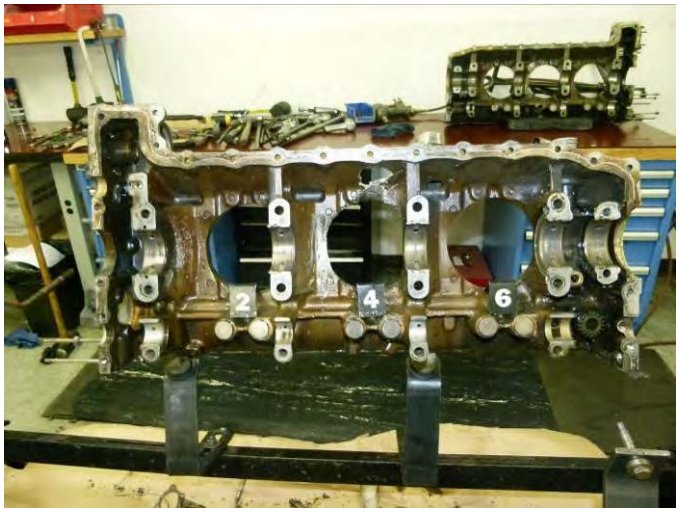
Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt was free of scoring and damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

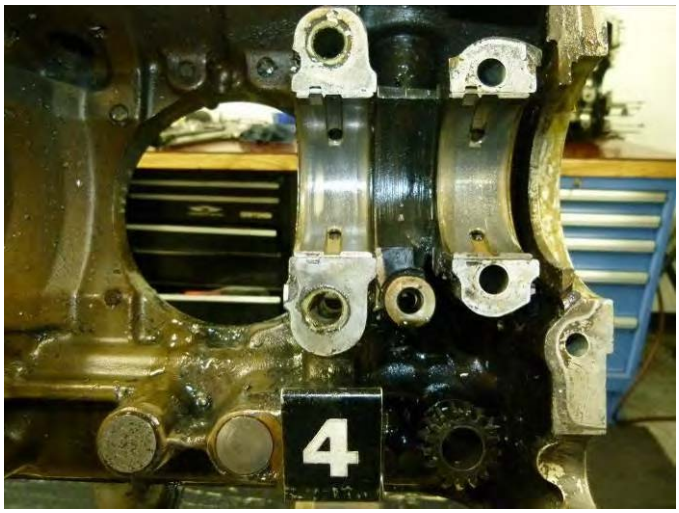
#6 Piston, Rings and Pin Piston Part Number: 648045

Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt was free of scoring and damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

Lifter	#1	#3	#5	#2	#4	#6
Intake	628488	628488	628488	628488	628488	628488
Exhaust	646477	646477	646477	646477	646477	646477

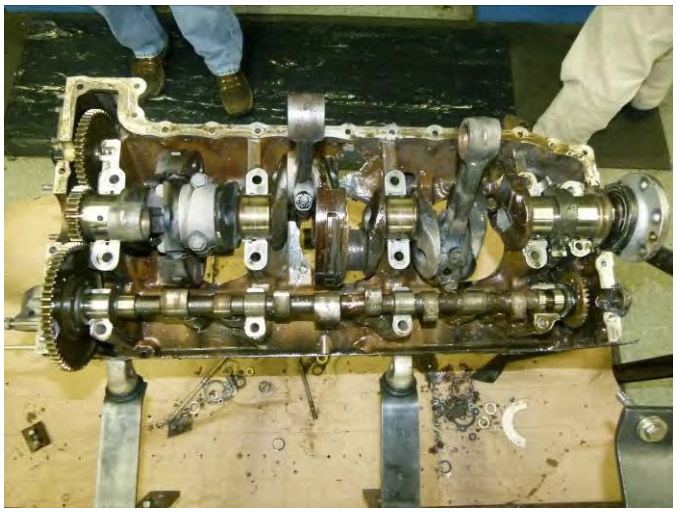
Condition: Except for the number five and six cylinder intake lifters, the lifter faces were undamaged and exhibited normal operating signatures. The lifter bodies were undamaged and exhibited normal operating signatures. The number five and six intake lifters exhibited heavy spalling. The number three cylinder intake lifter was found in the sump due to mechanical damage to the crank case

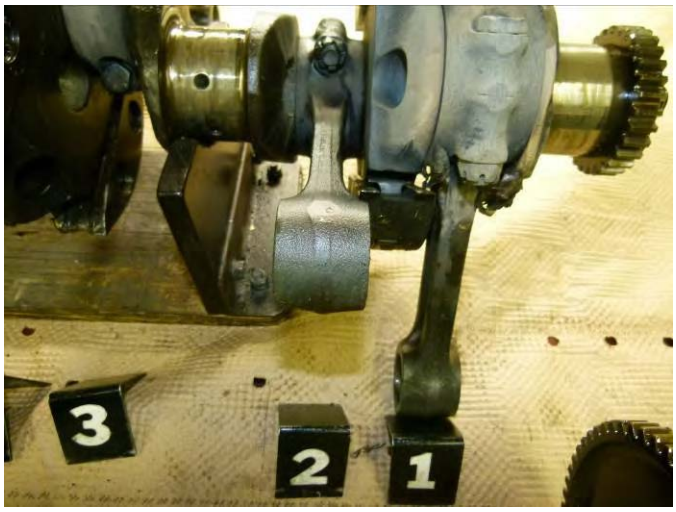




Crankshaft Forging number: 6467?? Serial number: 870494?? Heat code: ?70

Condition: The crankshaft and counterweight assembly exhibited lubrication distress, thermal damage, and mechanical damage on all connecting rod journals. The number four connecting rod had released from the crankshaft. The crankshaft gear was intact and exhibited normal operating signatures. The gear bolts were tight and safety wired and the gear teeth were undamaged. The crankshaft main bearing journals were intact and exhibited lubrication distress signatures. The rear set of counterweight assemblies were intact and had free and unrestricted movement on the hanger blades. The forward set of counterweight assemblies were intact and had free and unrestricted movement on the hanger blades and exhibited mechanical damage.

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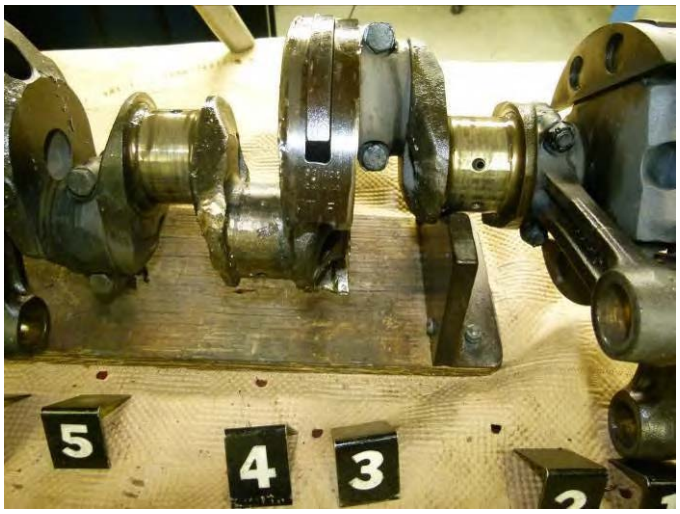
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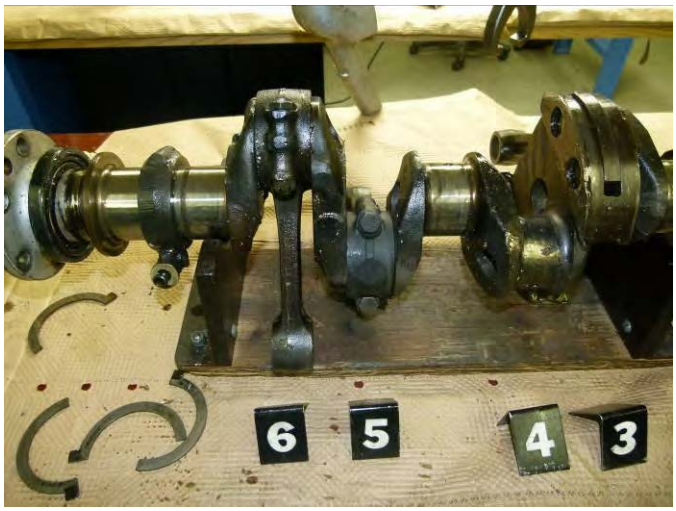
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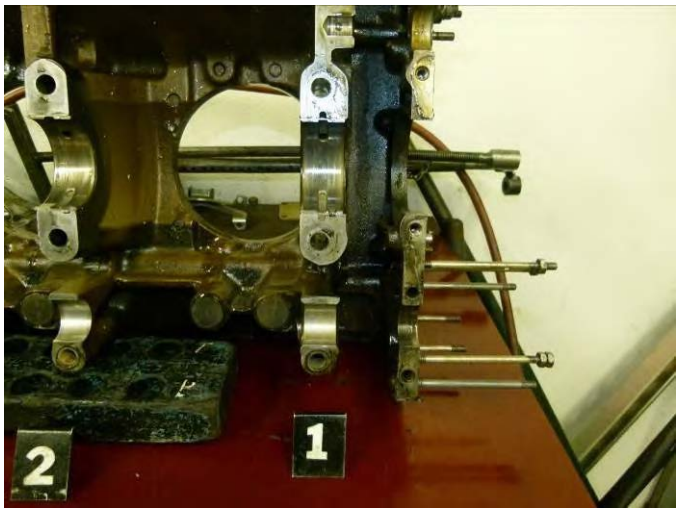
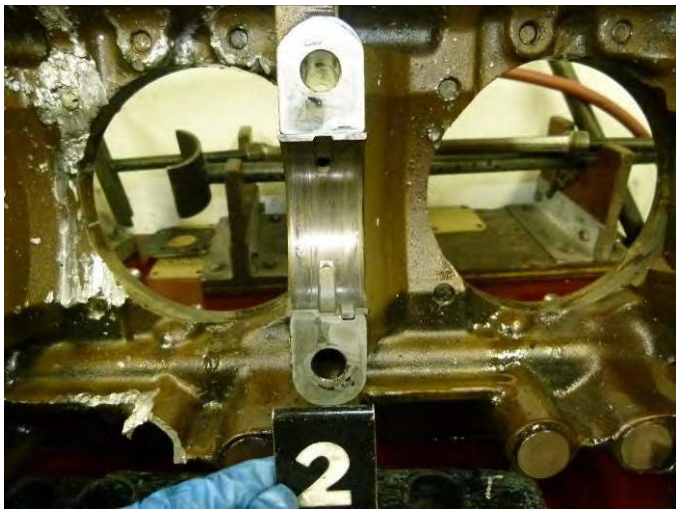
#1 Main Bearings Part #: 642720 Date Code: 10-7

Condition The #1 (rear) The bearings exhibited contamination imbedded in the surface layer. The bearings exhibited lubrication distress and thermal smearing of the surface babbit.



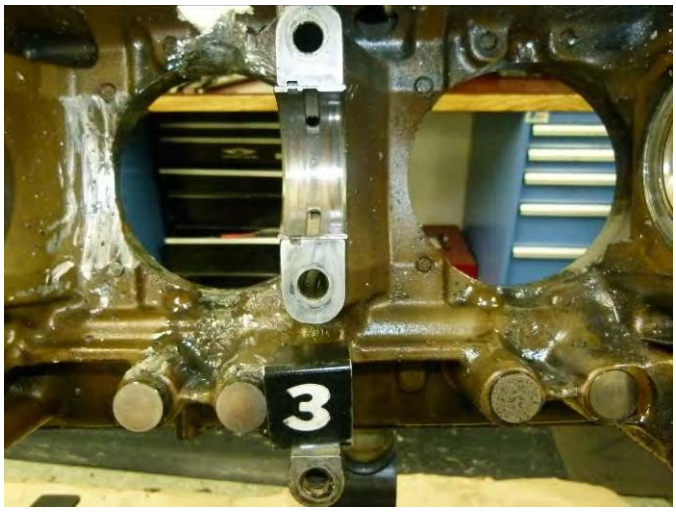
#2 Main Bearings Part #: 642720 Date Code: 10-7

Condition The #2 (intermediate) The bearings exhibited contamination imbedded in the surface layer. The bearings exhibited lubrication distress and thermal smearing of the surface babbit.



#3 Main Bearings Part #: 642720 Date Code: 1-8

Condition The #3 (intermediate) The bearings exhibited contamination imbedded in the surface layer. The bearings exhibited lubrication distress and thermal smearing of the surface babbit.



#4 Main Bearings Part #: 642720 Date Code: 10-7

Condition The #4 (intermediate or front) The bearings exhibited contamination imbedded in the surface layer. The bearings exhibited lubrication distress and thermal smearing of the surface babbit.

#5 Main Bearings Part #: 642720 Date Code: 10-7

Condition The #5 (front) The bearings exhibited contamination imbedded in the surface layer. The bearings exhibited lubrication distress and thermal smearing of the surface babbit.

Connecting Rods Part #: Not Legible Forging #: 646126 Serial #: Not applicable

Condition: The connecting rod assembly was intact and exhibited thermal discoloration. The Number four connecting rod was released from the crankshaft and exhibited extreme mechanical damage from the lack of lubrication.

Connecting Rod Bearings Part #: Not Legible Date Code: Not Legible

Condition: The connecting rod bearing exhibited lubrication distress and thermal smearing of the surface babbit, exposing the copper layer. A number of the bearing shells were extruded from the connecting rods.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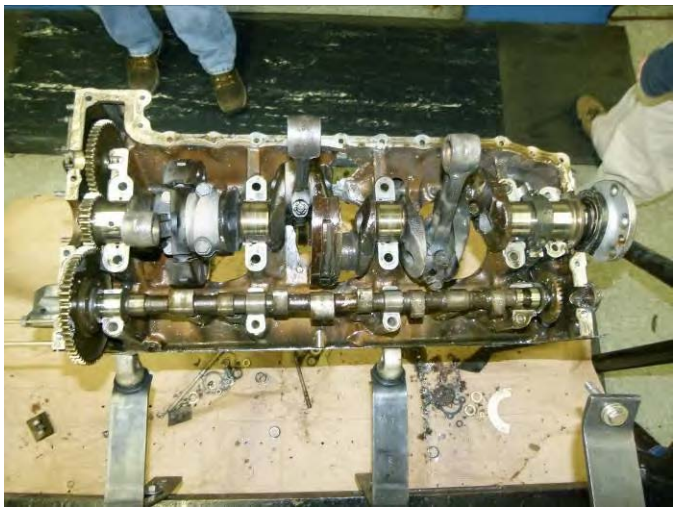
Camshaft Part number: 535661 Serial Number: N/A

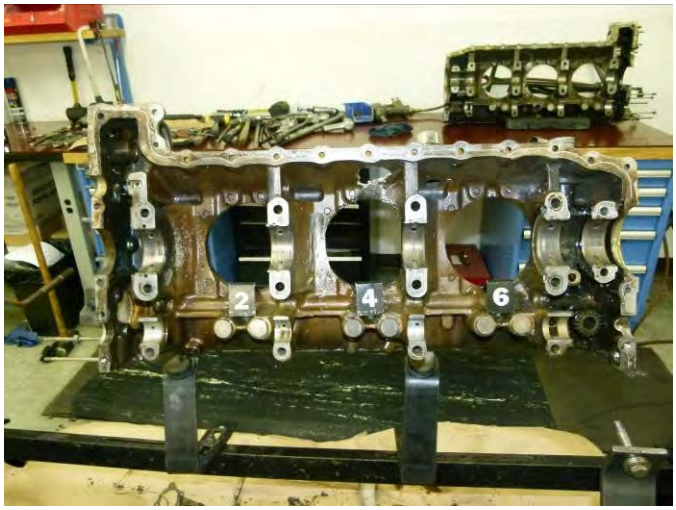
Condition: The camshaft cluster gear was intact and exhibited normal operating signatures. The gear bolts were tight and safety wired and the gear teeth were undamaged. The number five and six intake lobe exhibited mechanical damage.

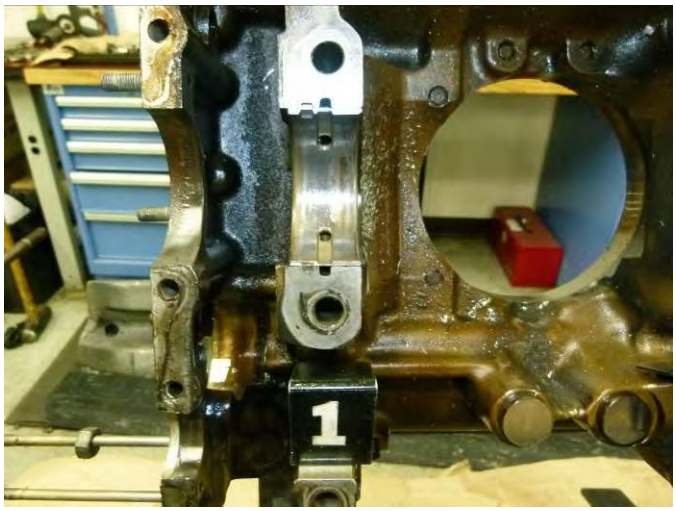


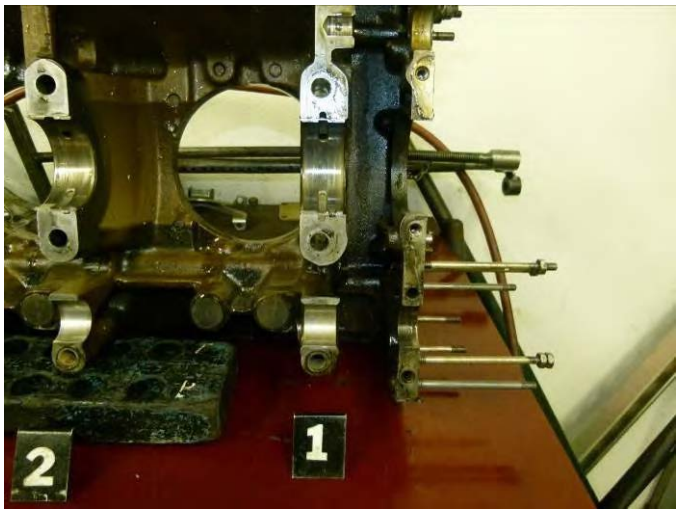
Crankcase Casting Number 1-3-5 Side: 649043 2-4-6 Side: 649042 Serial number: 862059S

Work Order Numbers: None

Condition: The crankcase exhibited exterior damage concentrated above the number four cylinder. The main bearing support mating surfaces were intact and exhibited signs of fretting or bearing tang lock-slot elongation. The main bearing support diameters were intact and exhibited signs of bearing movement. The oil galleys and passages in the left and right crankcase halves were intact, clear and unrestricted.





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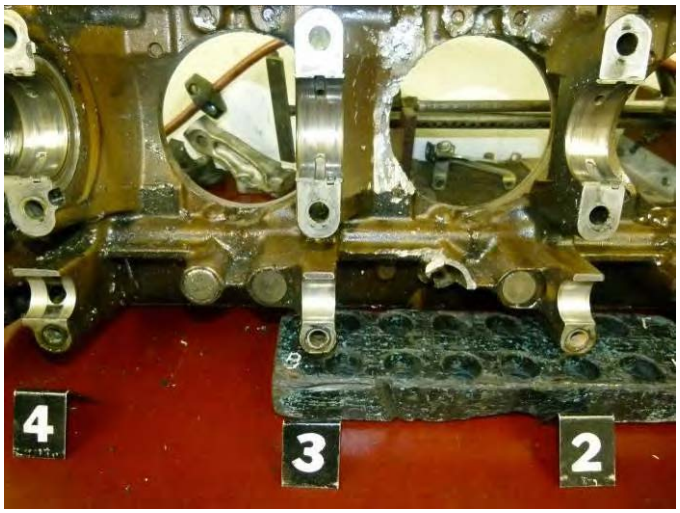
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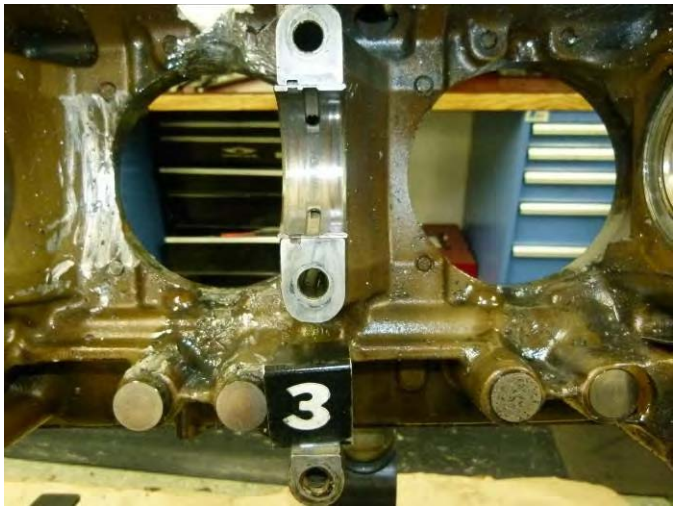
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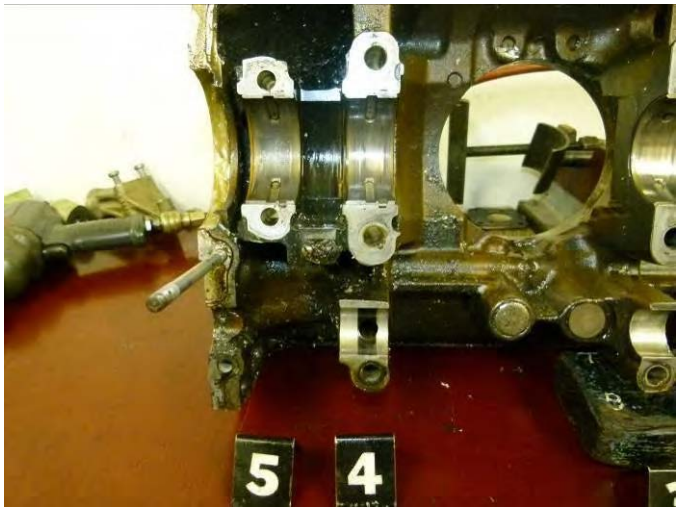
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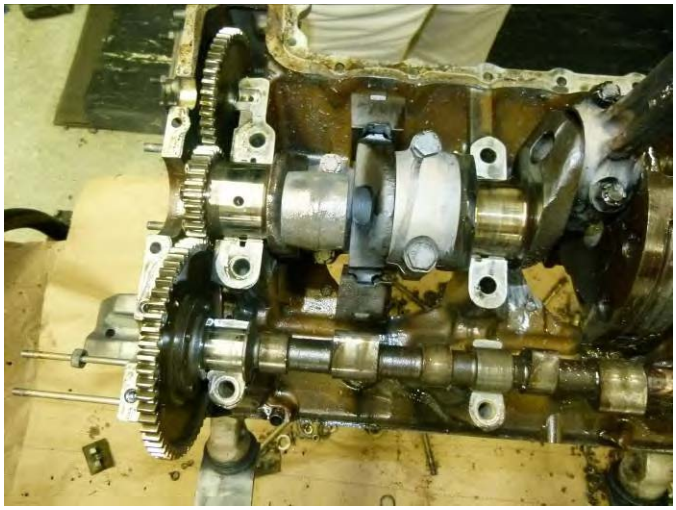
Accessory Gears	Condition: The accessory gears had continuity. The teeth were undamaged and exhibited normal operating signatures.



Propeller Governor Model number: McCauley 290D4A/T4 Serial Number: 760877

Condition: The propeller governor could be rotated by hand, was intact and undamaged.

Vacuum Pump Rapco Part Number:212CW Serial Number: 105434

Condition: The vacuum pump could be rotated by hand, was intact and undamaged.