Teledyne Continental Motors, Inc.
A Teledyne Technologies Company

Engine Analysis Report

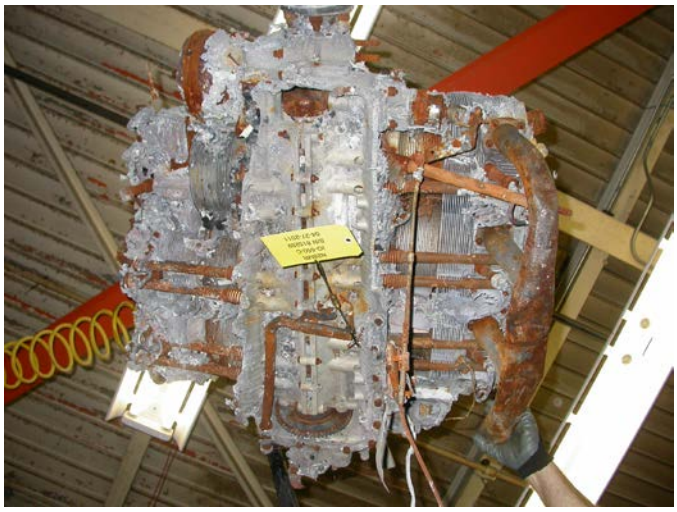
N/R = Not Reported / N/A = Not Applicable

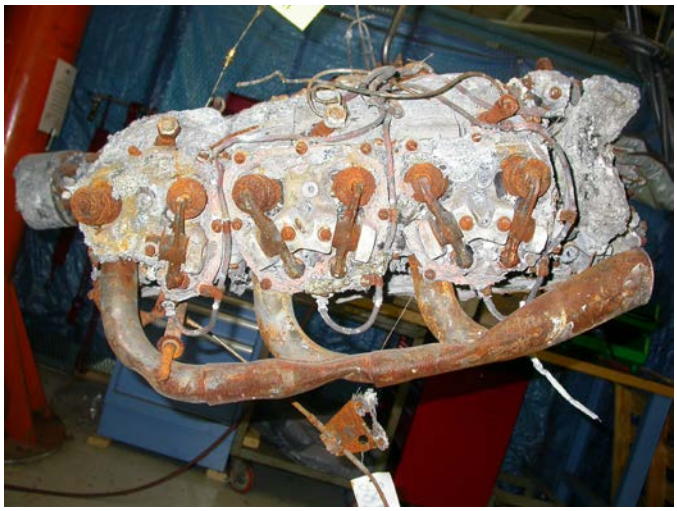
Accident #:	ERA10FA404				Analytical Date:	April 27, 2011					
Accident Location:	Saltsburg, PA				RGA:	AS00.127.702					
Engine Model:	IO-550-C				Engine Serial #:	815289					
Engine:	X	Component:		New:		Rebuilt:	X	Overhaul:		Date:	09/15/1998
Aircraft Make/Model:	Beech 58				Aircraft S/N:	TH-1328				Reg. #:	N28MR
Engine Position:	Single:		Left:	X	Right:		Front:		Rear:		
Engine Build Date:	09/15/98		Date in Service:	N/R		Date Removed:	N/R				
Date of Accident:	August 7, 2010				Engine/Component Hours:	N/R					
Inspection Performed By:	Terry L Horton				Search Code:	15-12-68					

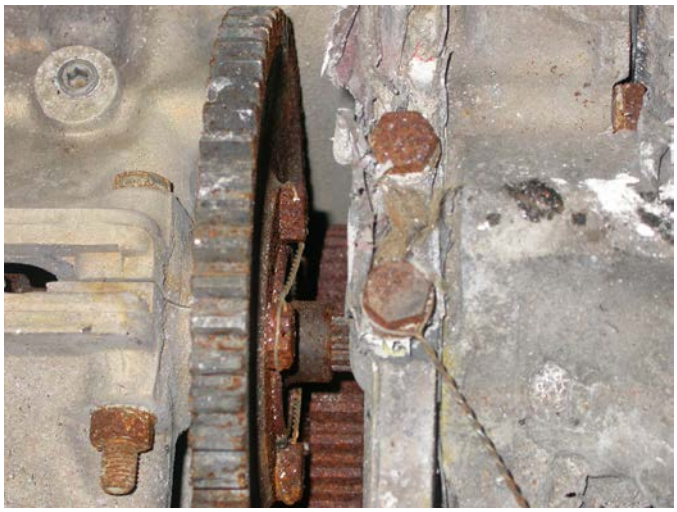
Returned By: Anglin Aircraft Recovery Services.

Parties to the Investigation: Corky Smith – NTSB
Johnny Little and Greg Eastburn - TCM

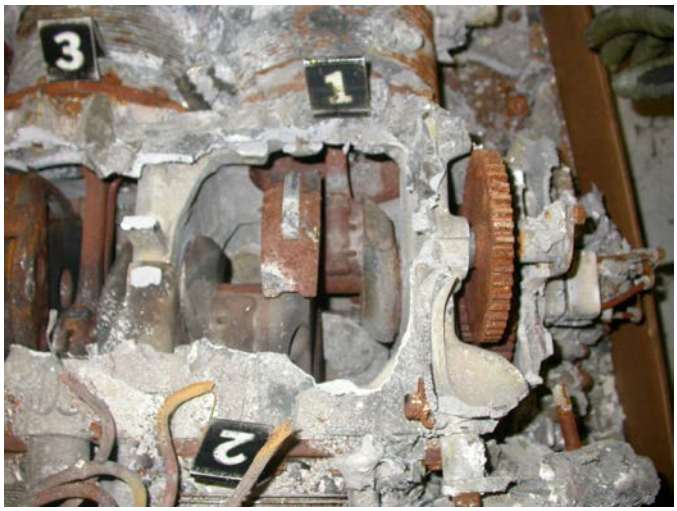
Analytical Report: The engine exhibited thermal deterioration and extensive corrosion, prohibiting separation of the assembly utilizing normal methods. Therefore, access to the internal components had to be gained by mechanical means to verify the continuity of the camshaft, pistons, crankshaft and their components. The camshaft, pistons, crankshaft and their components were intact and had exhibited no separation or fractures. The throttle and control assembly S/N 815290 (believed to be a component of the right-hand engine) was received with the engine.


N28MR
IO-550-C
S/N 815289
04-27-2011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6

Engine / Component Disposition					
Return to customer:	X	Date/Sign:	May 2, 2011		
Customer Name/Company:	Anglin Aircraft Recovery Services, LLC – Stacie Robinson				
Address:	4901 Holletts Corner Road				
City:	Clayton			State:	DE
Zip Code:	19938	Country:	USA – (302) 653-3500		

Teledyne Continental Motors, Inc.
A Teledyne Technologies Company

ENGINE EXAMINATION REPORT

ENGINE MODEL: IO-550-C

ENGINE SERIAL: 815290

AIRCRAFT MODEL: Beech 58 Baron

SERIAL NUMBER: TH-1328

REGISTRATION: N28MR

Examiner	Signature	Date
Terry L Horton		April 28, 2011

GENERAL INFORMATION

EXAMINATION		ENGINE RECEIVED	
Date	April 28, 2011	Date	April 26, 2011
Facility	Teledyne Continental Motors	RGA #	AS00.127.702
Address	2039 Broad Street	FROM	Anglin Aircraft Recovery Services
City	Mobile	NTSB/FAA Tagged	NTSB
State and Zip	Alabama 36615	Box Sealed	Yes

ENGINE INFORMATION

Make	Teledyne Continental Motors
Model	IO-550-C
Serial No.	815290
Engine Position	Right
Total Time	Not reported
Time SOH	Not reported
Build Date	September 10, 1998
In Service Date	Not reported
Removal Date	Not reported

AIRCRAFT / ACCIDENT INFORMATION

Aircraft Make	Beechcraft
Aircraft Model	58 Baron
Aircraft Serial No.	TH-1328
Registration No.	N28MR
Accident Date	August 7, 2010
Accident Location	Saltsburg, PA

Significant logbook information:

Report Summary: **Search Code:** 15-12-68

The engine components exhibited thermal discoloration, damage and corrosion. The inspection of this engine did not reveal any pre-impact abnormalities that would have prevented the production of rated horsepower.

Disposition of engine following exam: The engine was shipped on May 2, 2011 to:

Anglin Aircraft Recovery Services, LLC
4901 Holletts Corner Road
Clayton, DE 19938
(302) 653-3500

Inspection Witnesses			
Inspector	Terry L Horton	Mechanic	Johnny Little
Organization	Teledyne Continental Motors	Organization	Teledyne Continental Motors
Witness	Corky Smith	Mechanic	Gregory Eastburn
Organization	NTSB	Organization	Teledyne Continental Motors

EXTERNAL INSPECTION OF ENGINE: The engine exhibited impact damage and extensive thermal discoloration and damage. Impact damage was concentrated at the bottom area of the engine assembly.

AIRFRAME PARTS RETURNED WITH ENGINE: Portions of cooling baffles, propeller de-ice brush block assembly and slip-ring assembly, propeller governor, vacuum pump, vacuum system filter and associated hardware, tachometer generator, fuel flow transducer and portions of wiring harnesses, hoses, tubing and control cables.

ENGINE COMPONENT EXAMINATION

Exhaust System Condition: The exhaust system components exhibited impact damage and had been cut to allow engine and system removal.

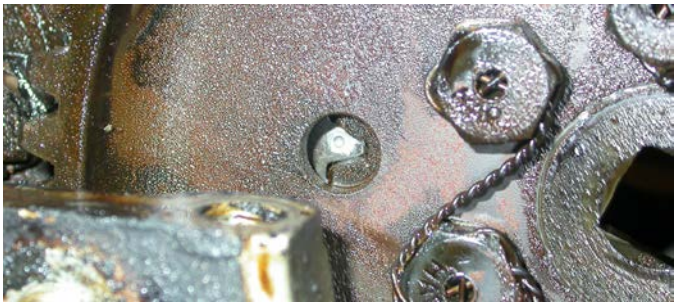
Starter Manufacturer: Energizer Part Number: 646275-1 Serial #: U-099834

Condition: The starter could not be rotated by hand and exhibited thermal damage.

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.

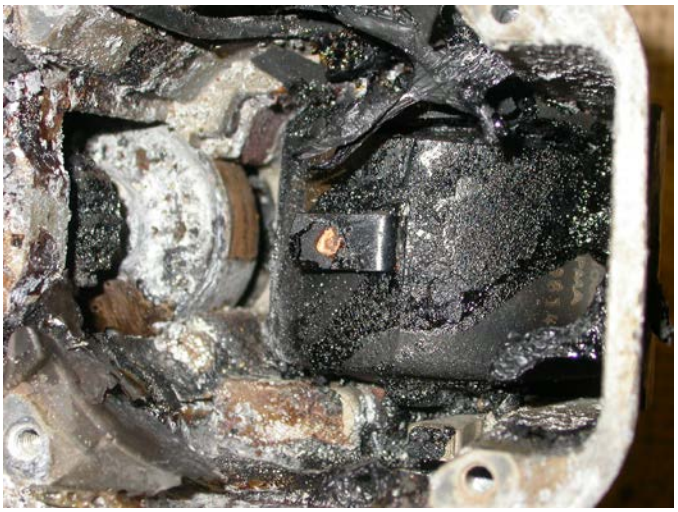


Ignition Harness Manufacturer: TCM Model/Part Number: Not Marked Serial #: Not Marked

Condition: All leads exhibited thermal damage.

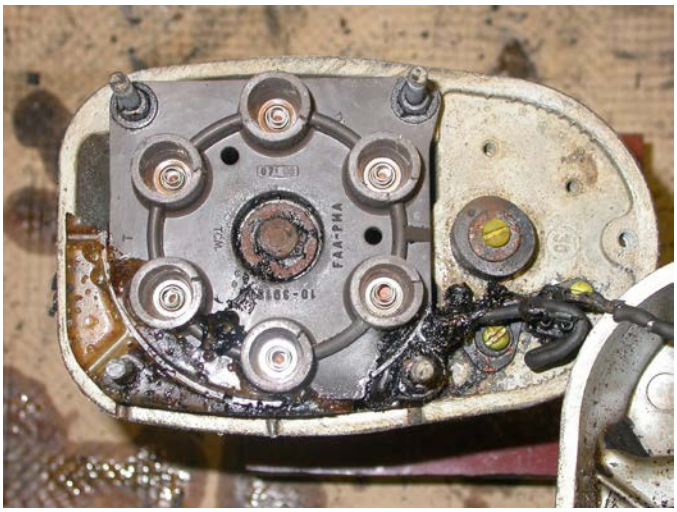
L/H Magneto Manufacturer: TCM Model/Part Number: Illegible Serial #: Illegible

Condition: The left-hand magneto could not be turned freely by hand. The impulse coupling was intact. The magneto was disassembled and found to exhibit significant thermal damage.



R/H Magneto Manufacturer: TCM Model/Part Number: Illegible Serial #: Illegible

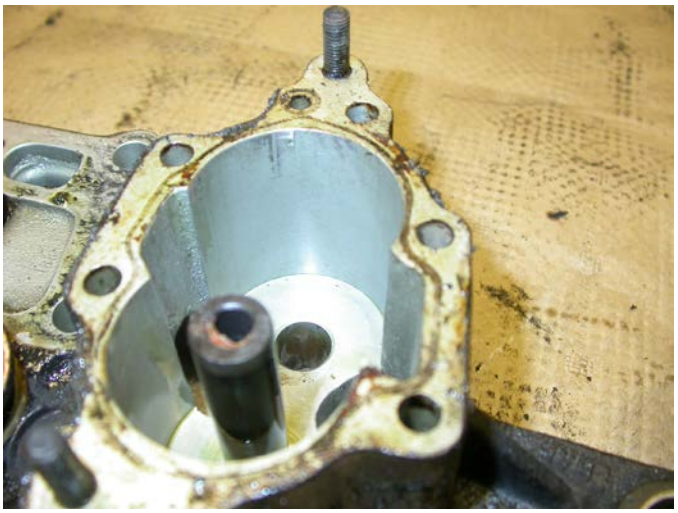
Condition: The right-hand magneto turned freely with impulse coupling engagement. The impulse coupling was intact. The magneto was disassembled and found to exhibit significant thermal damage.



Oil Cooler Manufacturer: Illegible Model/Part Number: Illegible Serial #: Illegible

Condition: The oil cooler thermal discoloration and impact damage.

Oil Pump Condition: The oil pump drive was intact and the exterior exhibited thermal discoloration. The oil pump cavity contained light scratches and exhibited normal operating 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.

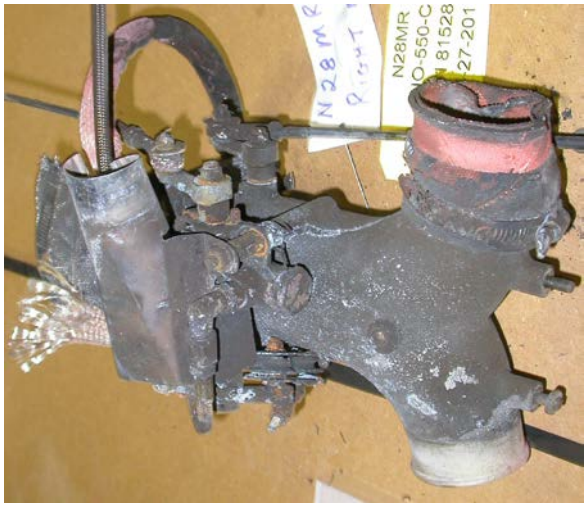


Oil Filter Manufacturer: Illegible Part number: Illegible

Condition: The oil filter housing was thermally damaged and discolored.

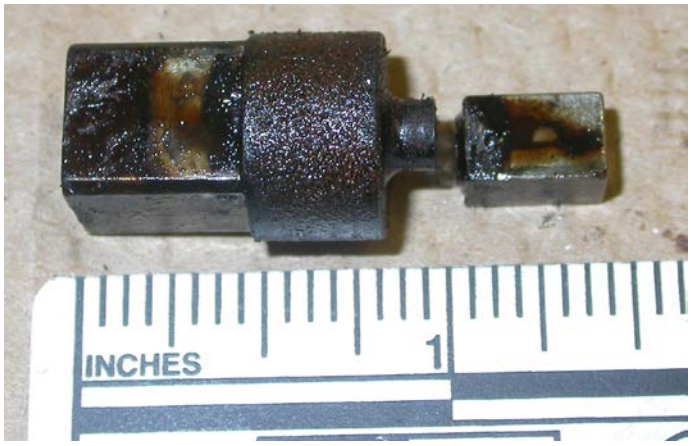
Throttle and Fuel Control Assembly Manufacturer: N/A Part Number: N/A Serial #: N/A

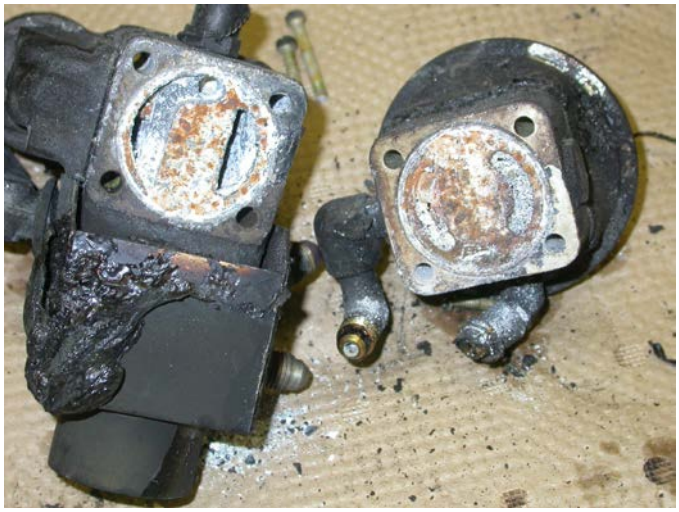
Condition: The throttle and control assembly was not returned with the engine. TCM engine build records indicate that the throttle and metering assembly (S/N H319809AR) received with the left-hand engine shipment (S/N 815289) was originally supplied with this engine. The following photographs were taken from the file created during the examination of the left-hand engine. The throttle and metering assembly (S/N H319809AR) exhibited thermal discoloration and damage. The linkage was intact and secure. The finger screen was intact and unrestricted.

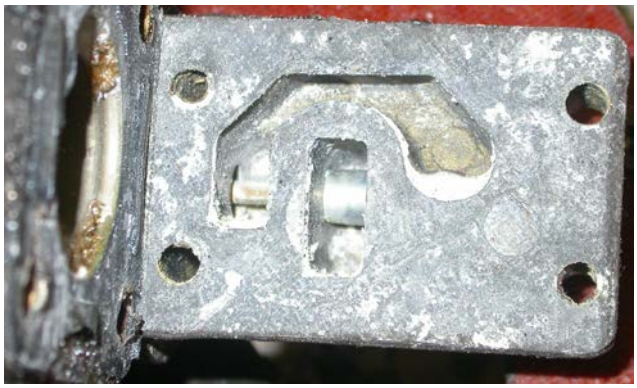


Fuel Pump Manufacturer: TCM Part Number: 646767-1 Serial #: H319819BR

Condition: The fuel pump could not be turned freely and exhibited thermal damage. The fuel pump drive was fracture in two pieces. The fuel pump was disassembled and exhibited extensive thermal damage and corrosion. The fuel pump and drive coupling were shipped to the NTSB Laboratory for further examination.







Fuel Manifold Valve Manufacturer: TCM Part Number: 64508-14A4P Serial #: H31909CR

Condition: The fuel manifold valve exhibited thermal discoloration and damage. The manifold valve was disassembled to examine the internal components. The diaphragm was thermally destroyed. The manifold valve plunger assembly was intact and secure. There were no signatures of fuel stains or leakage in the vent chamber side of the diaphragm.

Fuel Nozzles and Lines Manufacturer: TCM

Position	#1	#3	#5	#2	#4	#6
Size	D13A	D13A	D13A	D13A	D13A	D13A

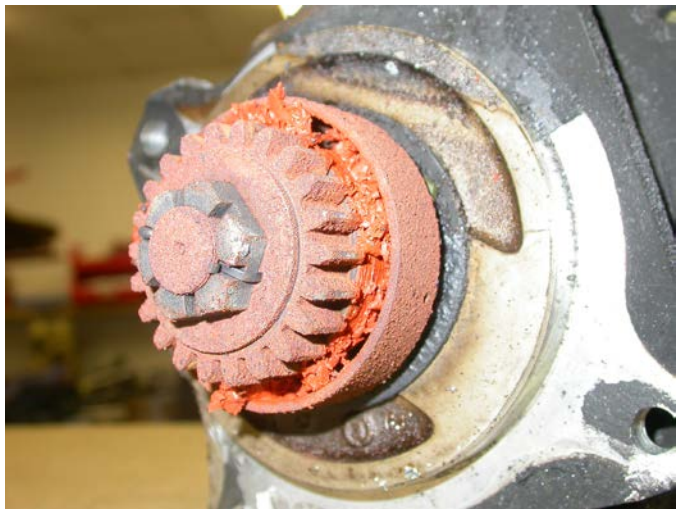
Condition: The fuel nozzles were unrestricted and exhibited thermal discoloration. The fuel lines were intact and exhibited thermal discoloration.

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.

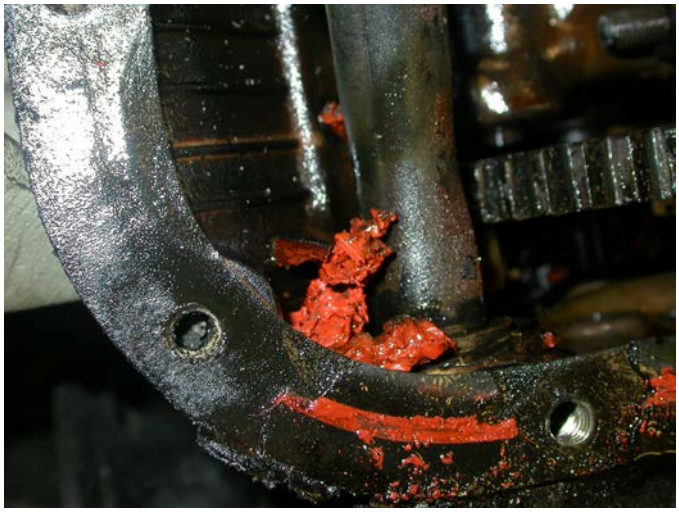
Alternator Manufacturer: TCM Part Number: 649304 Serial #: J309815.0

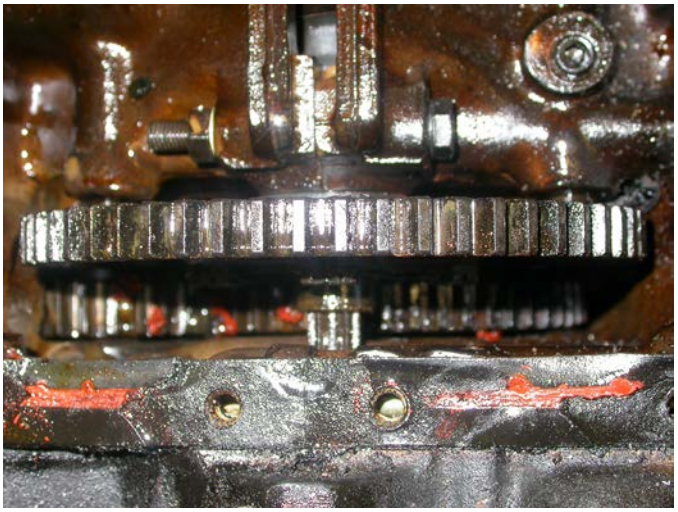
Condition: The alternator would not turn through freely and exhibited thermal damage. The drive coupling was intact and corroded. The elastomer was displaced and deteriorated.



Oil Sump

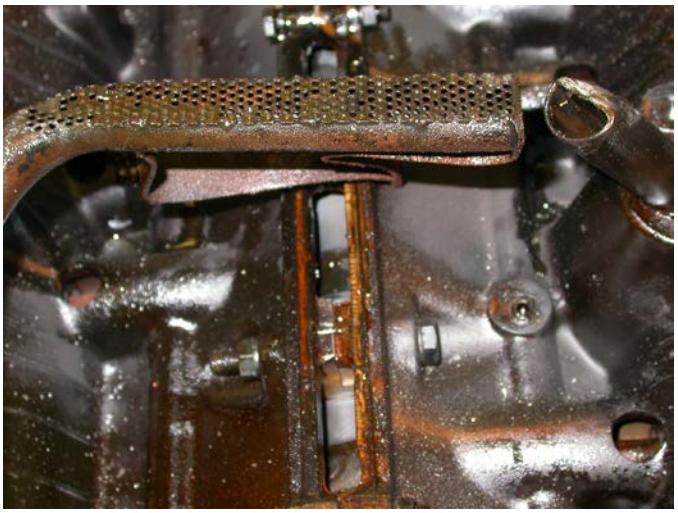
Condition: The oil sump drain plugs were safetied. The oil sump was crushed and had to be mechanically deformed to allow access to the attaching hardware for removal. The oil sump contained only residual oil. Fragments of the alternator drive coupling elastomer were located in the sump and internal areas of the engine.





Oil Pick-up Tube & Screen

Condition: The oil pick-up tube was deformed from impact damage to the oil sump. The oil suction screen was unrestricted.



Induction System	Condition: The induction risers and balance tube were intact and exhibited thermal and impact damage.

Cylinder #1 Part Number: 654961 Head Date: 9-98 Barrel Surface: Steel

Serial #: Not applicable 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 corroded. 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 oil residue in the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #2 Part Number: 654961 Head Date: 9-98 Barrel Surface: Steel

Serial #: Not applicable 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 corroded. 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 oil residue in the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #3 Part Number: 654961 Head Date: 9-98 Barrel Surface: Steel

Serial #: Not applicable 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 corroded. 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 oil residue in the overhead. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were lubricated and undamaged.

Cylinder #4 Part Number: 654961 Head Date: 9-98 Barrel Surface: Steel

Serial #: Not applicable 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 corroded. 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 minimal oil residue. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were intact.

Cylinder #5 Part Number: 654961 Head Date: 9-98 Barrel Surface: Steel

Serial #: Not applicable 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 minimal oil residue. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were intact.

Cylinder #6 Part Number: 654961 Head Date: 9-98 Barrel Surface: Steel

Serial #: Not applicable 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 no oil residue. The cylinder overhead components (valves, rocker arms, guides, springs, retainers and shafts) were intact. The intake valve was not removed due to the thermal damage and corrosion.


S/N 815290
4/28/2011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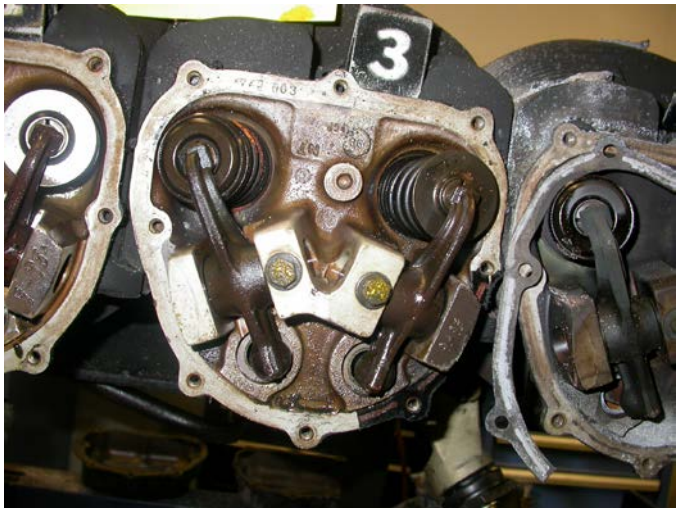
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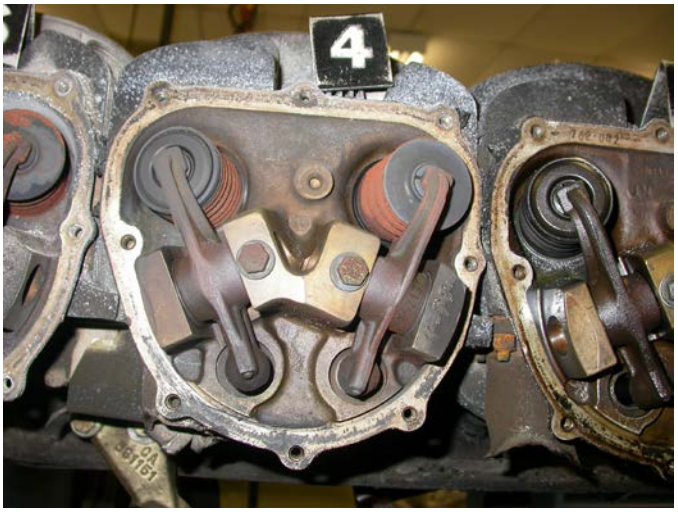
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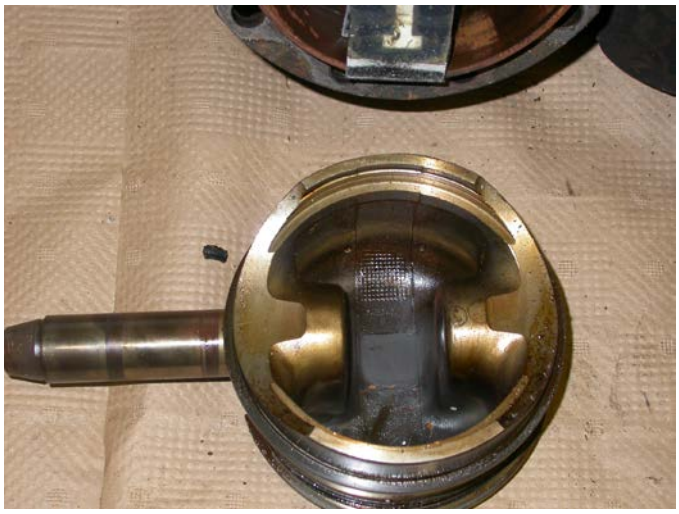
#1 Piston, Rings and Pin Piston Part Number: 648046

Condition: The piston head exhibited a minimal 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: 648046

Condition: The piston head exhibited a minimal 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: 648046

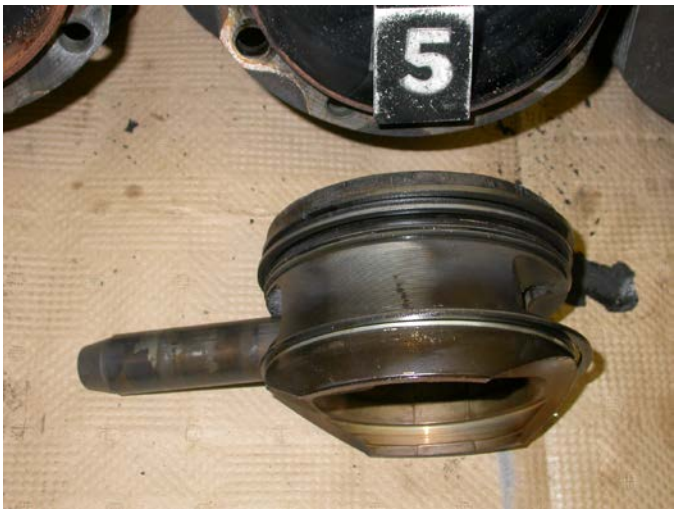
Condition: The piston head exhibited a minimal amount of combustion deposits and the piston skirt was free of scoring and damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

#4 Piston, Rings and Pin Piston Part Number: 648046

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.

#5 Piston, Rings and Pin Piston Part Number: 648046

Condition: The piston head exhibited a minimal 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: 648046

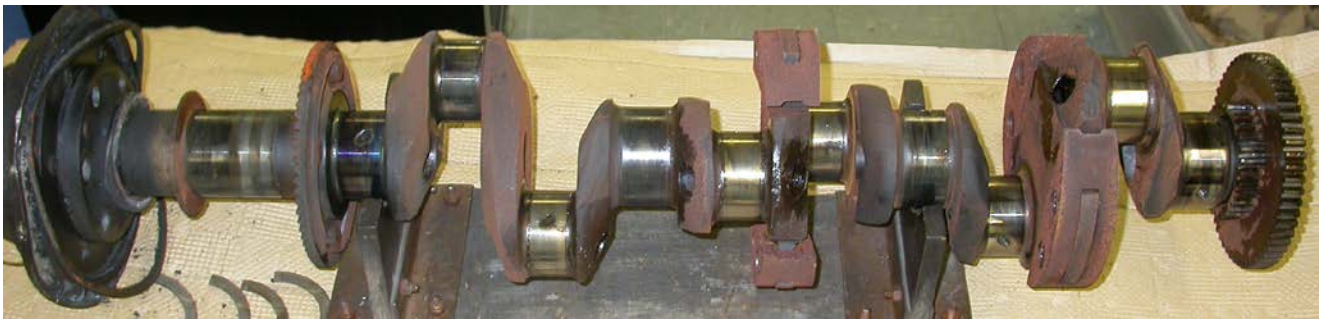
Condition: The piston head exhibited a normal amount of combustion deposits and the piston skirt was free of scoring and damage. The piston rings were intact, free in their grooves, exhibited normal wear and operating signatures. The piston pin and plug assembly was intact and undamaged.

Lifter	#1	#3	#5	#2	#4	#6
Intake	653888	653888	653888	653888	653888	653888
Exhaust	653877	653877	653877	653877	653877	653877

Condition: The number 2 and number 6 exhaust lifters exhibited fragments missing from the face circumference. The remaining lifter faces exhibited normal operating signatures. The lifter bodies were intact and exhibited normal operating signatures.

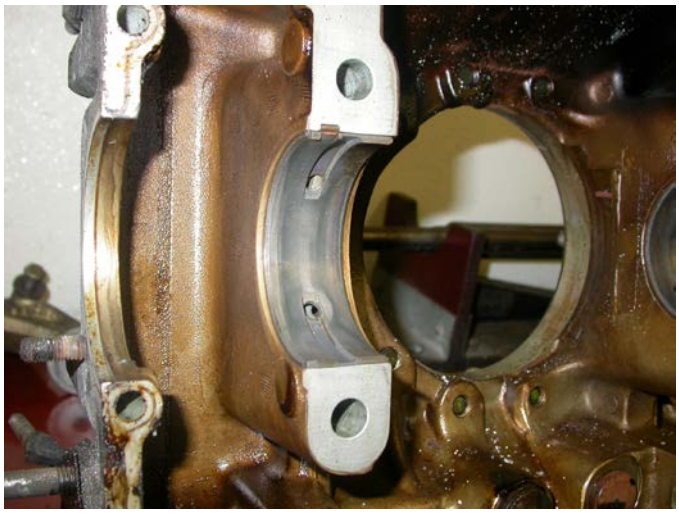
Crankshaft Forging number: 649878 Serial number: G139806N Heat code: Illegible - ?KO

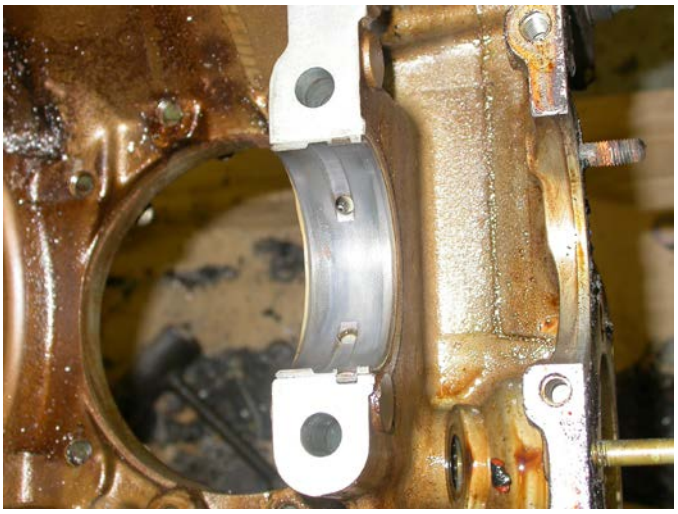
Condition: The crankshaft and counterweight assembly exhibited thermal discoloration and corrosion, but was otherwise undamaged and exhibited normal operating signatures. The connecting rod journals, main journals and thrust surfaces were undamaged and showed no signs of abnormal wear or lubrication distress. The crankshaft counterweight pins, plates and snap-rings were intact. The counterweights were undamaged and had free and unrestricted movement on the hanger blades. The gear bolts were tight and safetied and the gear teeth were undamaged. The oil transfer passages were open and unrestricted. Alternator drive face gear teeth were intact and undamaged. The oil transfer collar was intact and undamaged. The oil transfer plug was tight and in position.



#1 Main Bearings Part #: 654503 Date Code: 4-98

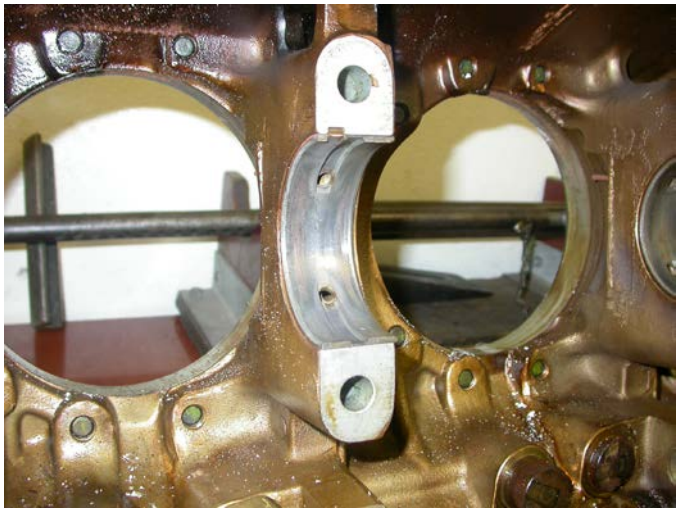
Condition The #1 (rear) crankshaft main bearings exhibited normal operating and lubrication signatures. The bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

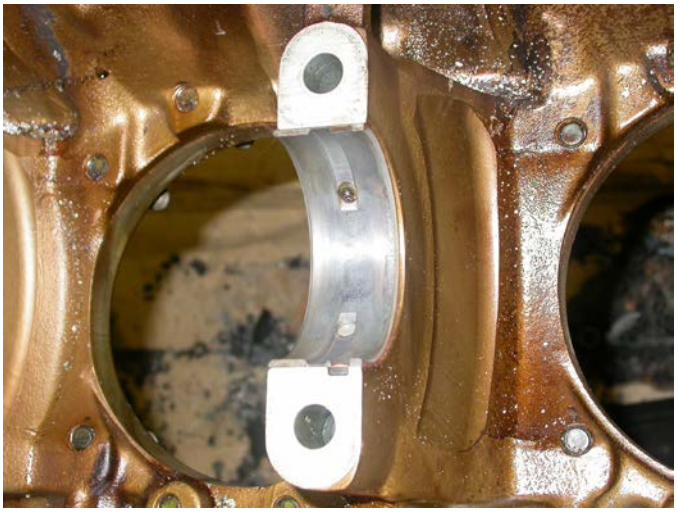




#2 Main Bearings Part #: 654503 Date Code: 4-98

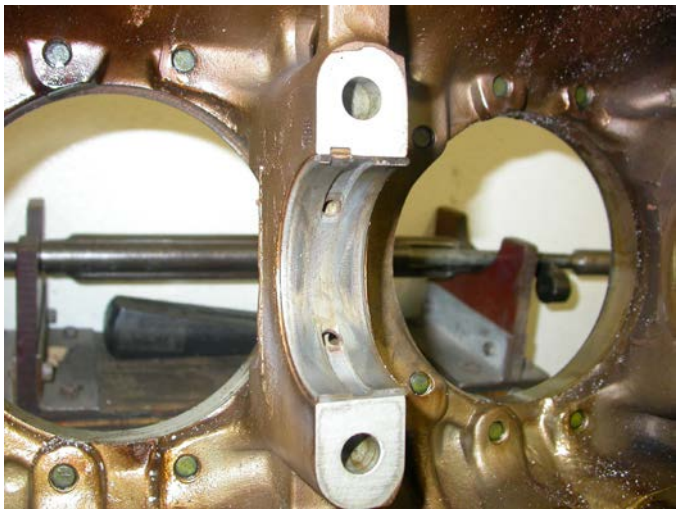
Condition The #2 (intermediate) crankshaft main bearings exhibited normal operating and lubrication signatures. The bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

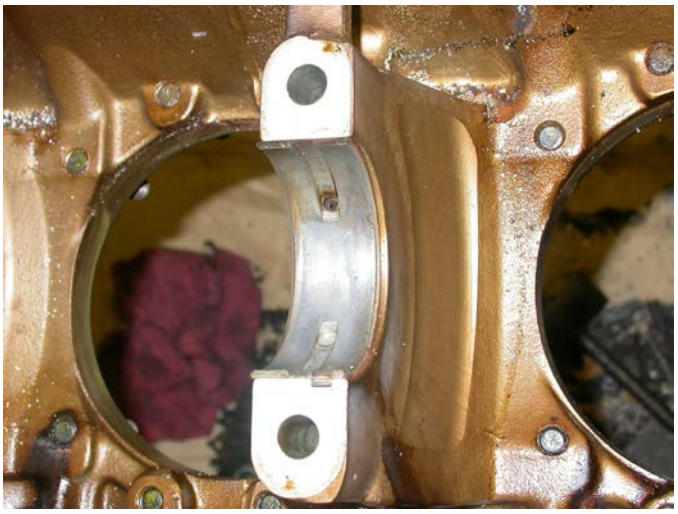




#3 Main Bearings Part #: 654503 Date Code: 4-98

Condition The #3 (intermediate) crankshaft main bearings exhibited normal operating and lubrication signatures. The bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.



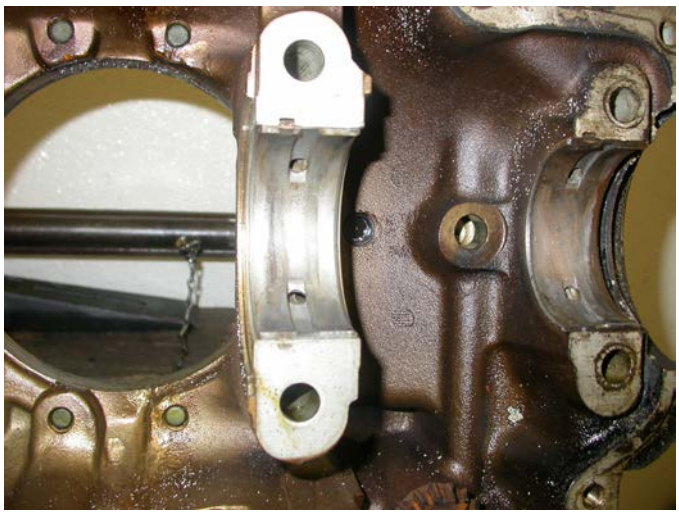


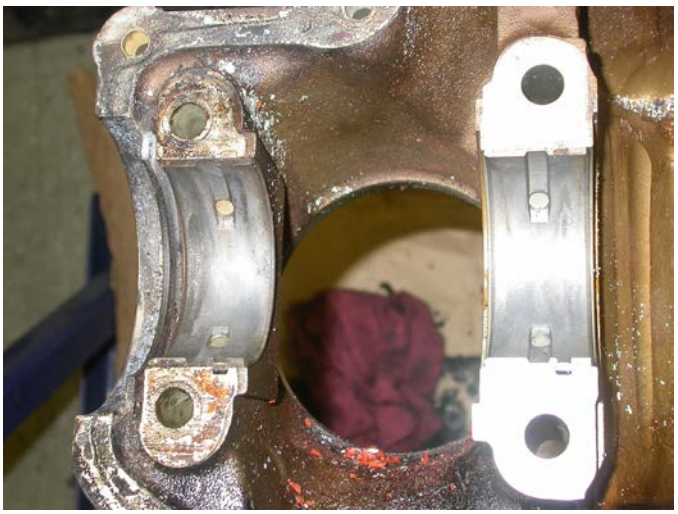
#4 Main Bearings Part #: 653547 Date Code: 3-98

Condition The #4 (intermediate) crankshaft main bearings exhibited normal operating and lubrication signatures. The bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

#5 Main Bearings Part #: 653547 Date Code: 3-98

Condition The #5 (front) crankshaft main bearings exhibited normal operating and lubrication signatures. The bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.





#1 Connecting Rod Part #: Illegible Forging #: 646126 Serial #: Not applicable

Condition: The connecting rod exhibited corrosion, but was otherwise intact and undamaged. The connecting rod nuts and bolts were intact and secure. The connecting rod bushing exhibited normal operating and lubrication signatures.

#1 Connecting Rod Bearings Part #: 642398 Date Code: 6-98

Condition: The connecting rod bearing exhibited normal operating and lubrication signatures. The connecting rod bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

#2 Connecting Rod Part #: Illegible Forging #: 646126 Serial #: Not applicable

Condition: The connecting rod exhibited corrosion, but was otherwise intact and undamaged. The connecting rod nuts and bolts were intact and secure. The connecting rod bushing exhibited normal operating and lubrication signatures.

#2 Connecting Rod Bearings Part #: 642398 Date Code: 6-98

Condition: The connecting rod bearing exhibited normal operating and lubrication signatures. The connecting rod bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

#3 Connecting Rod Part #: Illegible Forging #: 646126 Serial #: Not applicable

Condition: The connecting rod exhibited corrosion, but was otherwise intact and undamaged. The connecting rod nuts and bolts were intact and secure. The connecting rod bushing exhibited normal operating and lubrication signatures.

#3 Connecting Rod Bearings Part #: 642398 Date Code: 6-98

Condition: The connecting rod bearing exhibited normal operating and lubrication signatures. The connecting rod bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

#4 Connecting Rod Part #: Illegible Forging #: 646126 Serial #: Not applicable

Condition: The connecting rod exhibited corrosion, but was otherwise intact and undamaged. The connecting rod nuts and bolts were intact and secure. The connecting rod bushing exhibited normal operating and lubrication signatures.

#4 Connecting Rod Bearings Part #: 642398 Date Code: 6-98

Condition: The connecting rod bearing exhibited normal operating and lubrication signatures. The connecting rod bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

#5 Connecting Rod Part #: Illegible Forging #: 646126 Serial #: Not applicable

Condition: The connecting rod exhibited corrosion, but was otherwise intact and undamaged. The connecting rod nuts and bolts were intact and secure. The connecting rod bushing exhibited normal operating and lubrication signatures.

#5 Connecting Rod Bearings Part #: 642398 Date Code: 6-98

Condition: The connecting rod bearing exhibited normal operating and lubrication signatures. The connecting rod bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

#6 Connecting Rod Part #: Illegible Forging #: 646126 Serial #: Not applicable

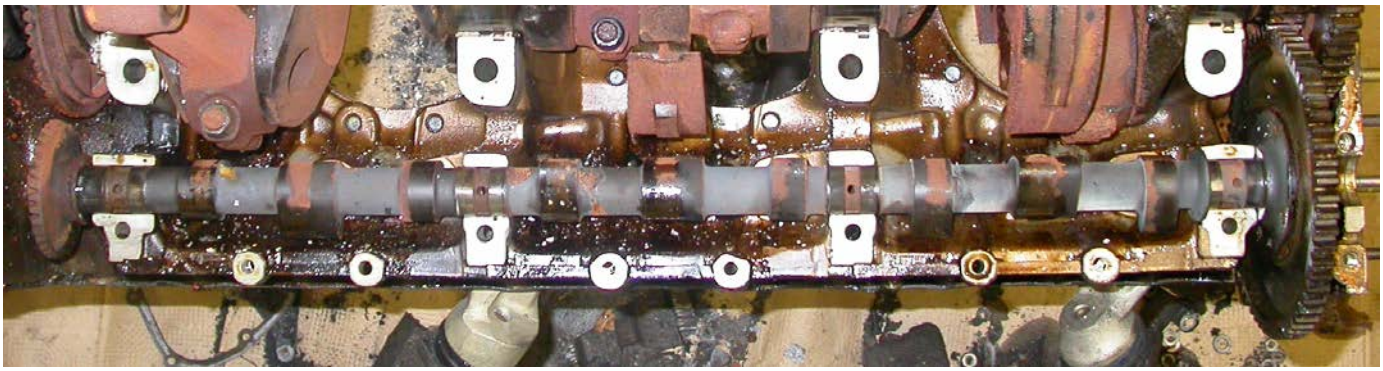
Condition: The connecting rod exhibited corrosion, but was otherwise intact and undamaged. The connecting rod nuts and bolts were intact and secure. The connecting rod bushing exhibited normal operating and lubrication signatures.

#6 Connecting Rod Bearings Part #: 642398 Date Code: 6-98

Condition: The connecting rod bearing exhibited normal operating and lubrication signatures. The connecting rod bearings were intact and exhibited an insignificant amount of contamination and hard particle passage. There were no signs of lubrication distress.

Camshaft Part number: 654837 Serial Number: N/A

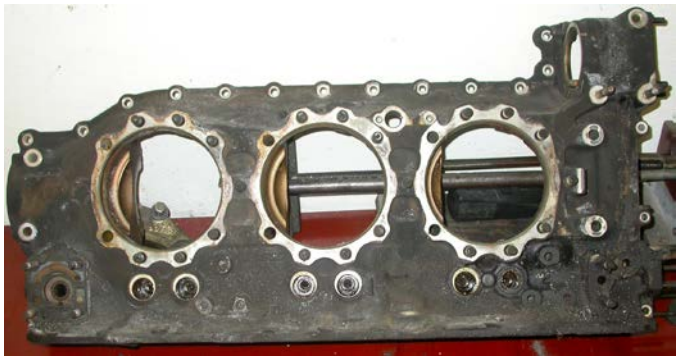
Condition: The camshaft and gear assembly exhibited corrosion. The camshaft lobes exhibited normal operating signatures. The camshaft cluster gear was intact and exhibited normal operating signatures. The gear bolts were tight and saftied and the gear teeth were undamaged.

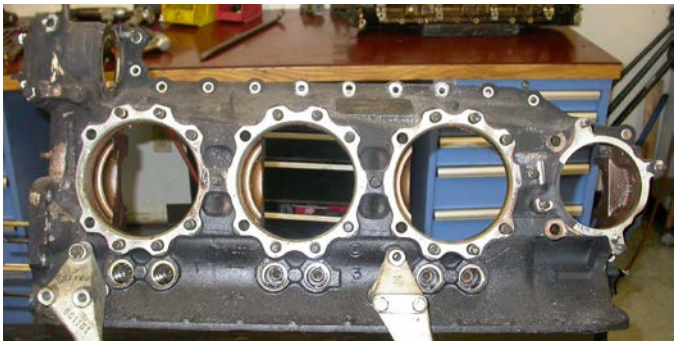


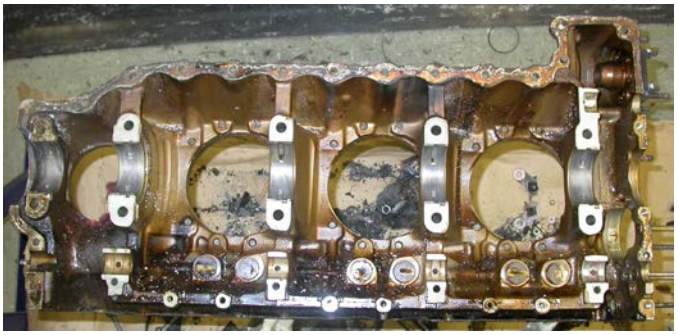
Crankcase Casting Number 1-3-5 Side: 646201 2-4-6 Side: 646200 Serial number: H069201RPL

Work Order Numbers: None

Condition: The crankcase assembly exhibited thermal discoloration. The cylinder bays were intact and undamaged. The main bearing support mating surfaces were intact and exhibited no signs of fretting or bearing tang lock-slot elongation. The main bearing support diameters were intact and exhibited no signs of bearing movement or rotation. The oil galleys and passages in the left and right crankcase halves were intact, clear and unrestricted.

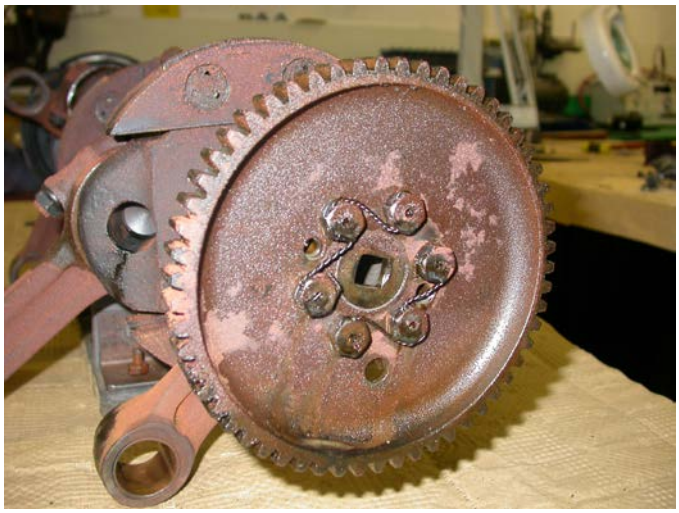






Accessory Gears

Condition: The accessory gears had continuity. The teeth were undamaged and exhibited corrosion.



Propeller Governor

Part number: A210800

Serial Number: 2700391

Condition: The propeller governor could not be rotated by hand and exhibited thermal discoloration.

Vacuum Pump Part number: Illegible Serial Number: Illegible

Condition: The vacuum pump could not be rotated by hand. The vacuum pump exhibited thermal damage.