



ENGINE EXAMINATION REPORT

ENGINE MODEL	IO-520-A5B
ENGINE SERIAL NUMBER	111479-H
AIRCRAFT MAKE & MODEL	Cessna 206
AIRCRAFT SERIAL NUMBER	206-0152
AIRCRAFT REGISTRATION	N5152U
FILE NUMBER	19-053

NAME	SIGNATURE	DATE
Nicole L. Charnon		02/28/2020
Phillip Grice		03/13/2020

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EXAMINATION		ACCIDENT DATA	
DATE	February 26 and 27, 2020	NTSB ACCIDENT #	WPR19LA217
FACILITY	Continental Aerospace Technologies	NTSB INVESTIGATOR	Tealeye Cornejo
ADDRESS	2039 South Broad Street Mobile, Alabama 36615	FAA INVESTIGATOR	Tony Moore
		ACCIDENT DATE	August 9, 2019
		ACCIDENT LOCATION	Prospect, Oregon

ENGINE INFORMATION

ENGINE POSITION	Single-Engine
TOTAL TIME	Unknown
TIME SOH	1,380.7 at time of last maintenance entry, August 6, 2019
TYPE & TIME SLI	Oil change and compression check August 6, 2019
BUILD DATE	12/14/1988
IN SERVICE DATE	11/21/1989

Significant logbook information:

The engine was assembled in December 1988 and factory overhauled in October 1989 due to inactivity. It was installed on another aircraft in November 1989. The engine was overhauled in April 1999. During that overhaul, the crankshaft was removed and replaced with the one observed during this examination. An entry dated March 5, 2010 indicated that the engine was disassembled, and the components were sent to ECI for inspection. According to the entry, the crankshaft assembly was magnafluxed and dimensionally inspected before being returned with a "yellow tag" (serviceable). The crankshaft assembly accumulated 1,380.7 hours since that overhaul at the time of the last maintenance entry, which took place three days prior to the event. The work order associated with the March 5, 2010 maintenance entry indicated that the crankshaft was overhauled by ECI in June 2009. Continental conducted a search of records that were acquired when ECI assets were purchased; however, the records only went back to 2010. According to the reviewed records, in 2010, ECI was utilizing FAA-PMA counterweight plates (SA643629 produced by Superior Air Parts).

Report Summary:**Search Code(s):**

13-06-07, 13-06-03, 13-08-28, 13-08-03

The #2 bottom counterweight hanger blade was fractured, and the counterweight was fractured in numerous pieces. Pieces of the fractured counterweight, two counterweight pins, 4 counterweight plates, and 4 counterweight snap rings were located in the oil sump. The hanger blade fracture surfaces were flat with visible beach marks consistent with fatigue cracking. However, it is presumed that the fatigue cracking was resultant damage caused by a separate initiating event. One of the 4 counterweight plates displayed a lack of mechanical deformation damage, though it was fractured into 5 pieces. All five pieces were located in the sump and loosely reassembled for documentation. A deep groove, the approximate diameter of a counterweight pin, was observed on one side of all the pieces. In comparison to the other plates, this one plate displayed a significantly deeper wear groove from the counterweight pin.

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The #2 bottom counterweight components and a portion of the crankshaft were isolated for further examination as dictated by the NTSB investigator-in-charge (IIC). The remaining items were boxed awaiting final disposition instructions.

INSPECTION WITNESSES

NAME	Phillip Grice	NAME	Lisa Jersild
ADDRESS	Mobile, Alabama	ADDRESS	Mobile, Alabama
ORGANIZATION	Continental Aerospace Technologies	ORGANIZATION	Continental Aerospace Technologies
PHONE	██████████	PHONE	██████████
NAME	Randy Bryant	NAME	Robert Skinner
ADDRESS	Mobile, Alabama	ADDRESS	Ashland, Oregon
ORGANIZATION	Continental Aerospace Technologies	ORGANIZATION	Skinner Aviation
PHONE	██████████	PHONE	██████████
NAME	Kyle Cook	NAME	
ADDRESS	Birmingham, Alabama	ADDRESS	
ORGANIZATION	FAA – Birmingham FSDO	ORGANIZATION	
PHONE	██████████	PHONE	

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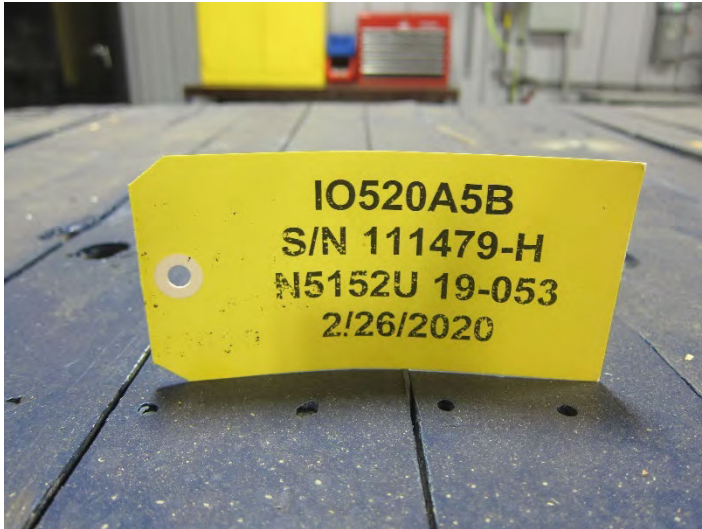
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EXTERNAL INSPECTION OF ENGINE

The engine was secured to the crate with no obvious external anomalies noted. The engine was removed and placed on a stand for disassembly.



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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM	
Condition:	The exhaust system was removed and exhibited normal operating signatures.



INDUCTION SYSTEM	
Condition:	The induction system exhibited normal operating signatures.



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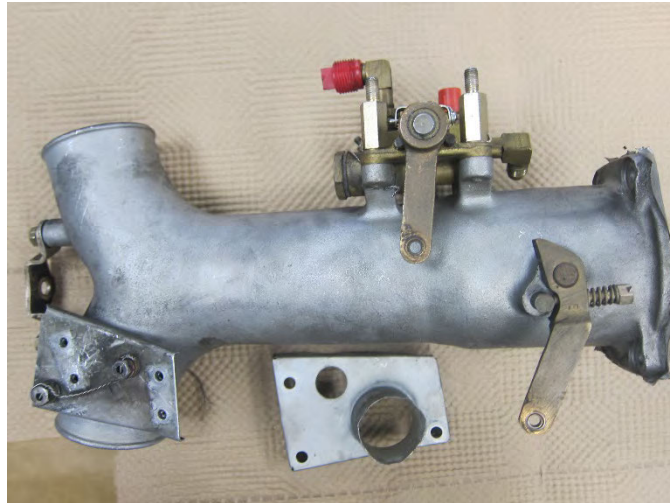
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IGNITION SYSTEM

LEFT MAGNETO	Manufacturer: Champion Slick	P/N: 6310	S/N: 98110708
Condition:	The left magneto remained in place with torque putty applied to the attaching hardware. A slip stripe was applied to the base of the magneto and the mounting area, with no evidence of magneto rotation observed. Removal of the magneto revealed no pre-event anomalies.		



RIGHT MAGNETO	Manufacturer: Champion Slick	P/N: 6310	S/N: 14060274
Condition:	The left magneto remained in place with torque putty applied to the attaching hardware. A slip stripe was applied to the base of the magneto and the mounting area, with no evidence of magneto rotation observed. Removal of the magneto revealed no pre-event anomalies.		



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IGNITION HARNESS	Manufacturer: Slick	Left: M2380	Right: M2379
Condition:	The harness remained attached to the magnetos and each terminal was secured to it respective sparkplug. No pre-event anomalies were noted.		



SPARK PLUGS	Manufacturer: Autolite	P/N: URHB32S
Condition:	The sparkplugs displayed a normal worn condition with darker soot and dirt observed on the bottom sparkplugs.	



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FUEL SYSTEM

FUEL PUMP

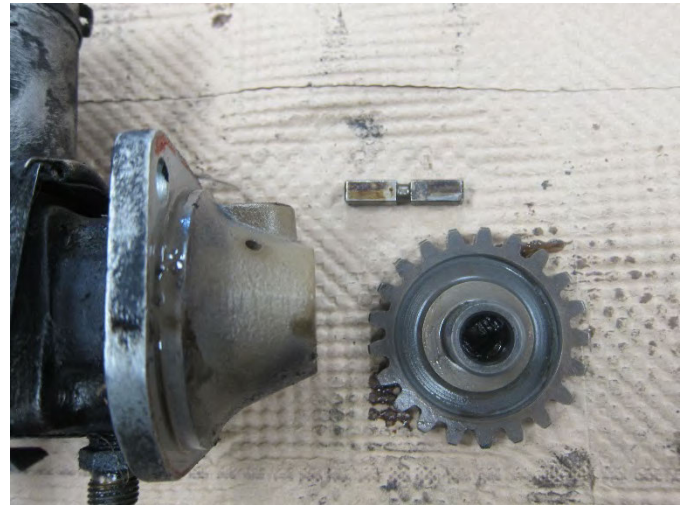
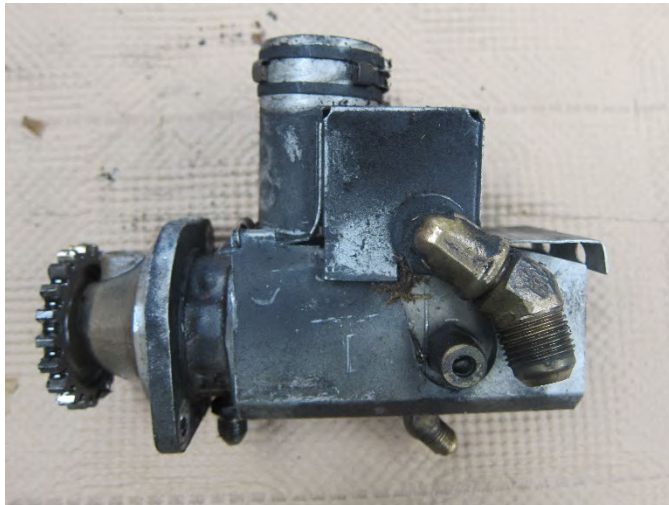
Manufacturer: Continental

P/N: 646212-1

S/N: F148630RB

Condition:

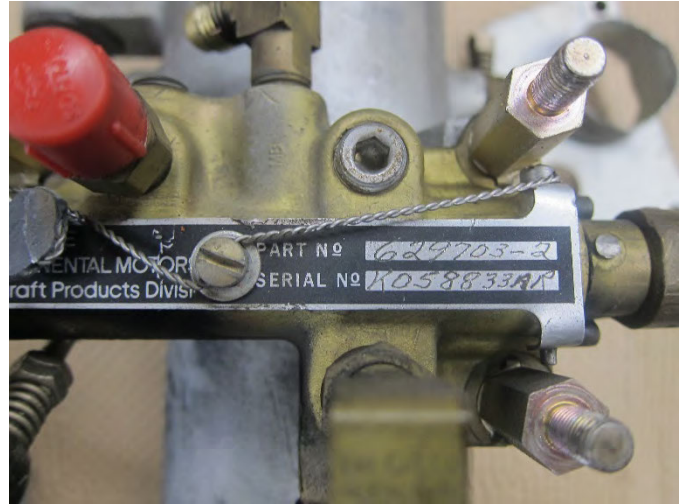
The engine-driven fuel pump remained secured to the backside of the engine. The pump shroud was coated in black dirt (likely from the alternator drive belt). Removal of the pump revealed no pre-event anomalies with the coupling or drive gear.



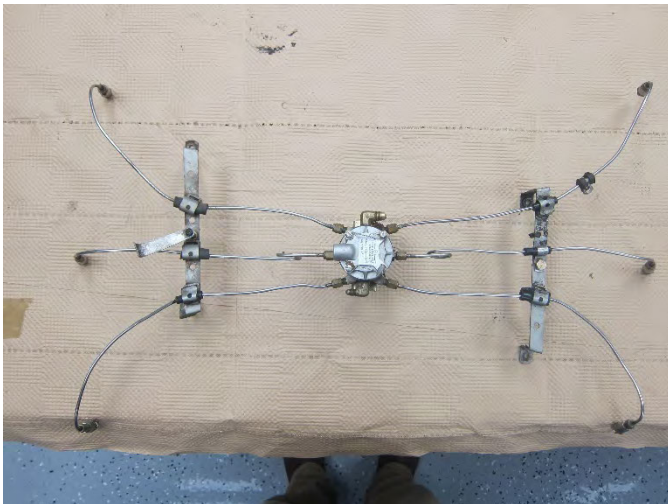
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THROTTLE BODY METERING UNIT	Manufacturer: Continental	P/N: 629703-2	S/N: K058833AR
Condition:	The throttle body remained secured to the backside of the engine and the bronze control levers remained pinned to the throttle and mixture controls shafts. No pre-vent anomalies were observed externally.		



FUEL MANIFOLD VALVE	Manufacturer: Aircraft Accessories of Oklahoma	P/N: 631351-15A3	S/N: M9014
Condition:	The fuel manifold valve remained secured to the topline of the engine with the fuel lines to and from the housing secured in place.		



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FUEL NOZZLES AND LINES

Manufacturer: Unknown

Condition:

The fuel lines and nozzles remained secured to their respective cylinders. No external pre-event anomalies were noted.



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LUBRICATION SYSTEM

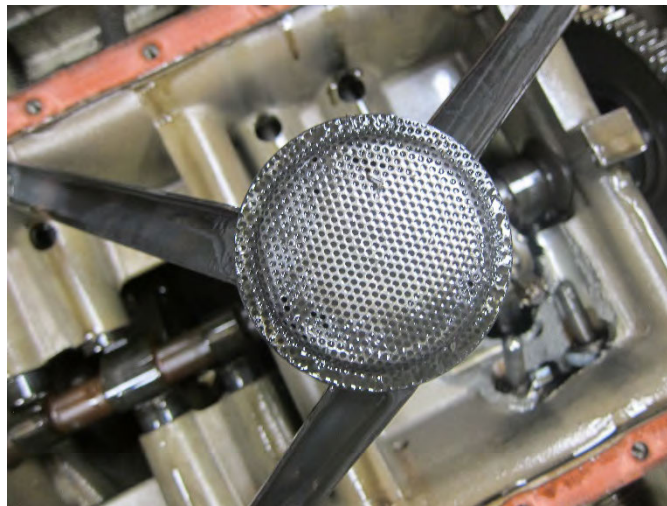
OIL SUMP

Condition: The oil sump remained secured to the bottom side of the engine. Removal of the sump revealed numerous pieces and parts had been released from the engine's internal components.



OIL PICKUP TUBE & SCREEN

Condition: The oil pickup tube and screen were unobstructed, though some metallic debris was noted on the screen.



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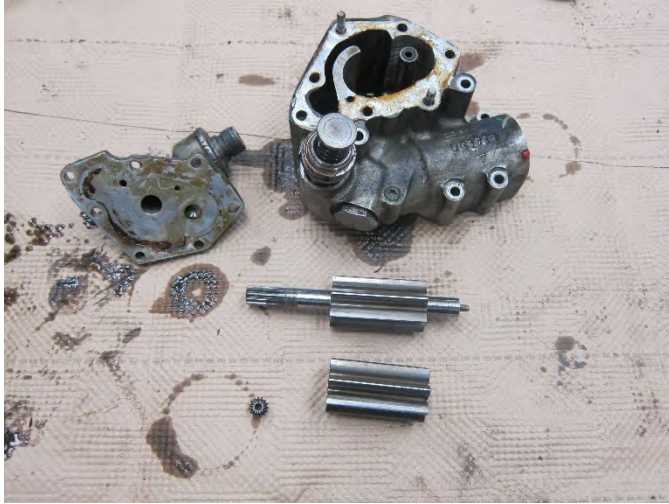
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OIL PUMP

Condition:

The oil pump displayed circumferential scoring on the pump cavity walls, indicative of hard particle passage. Additionally, the oil pressure relief valve face showed evidence of hard particle impingement.



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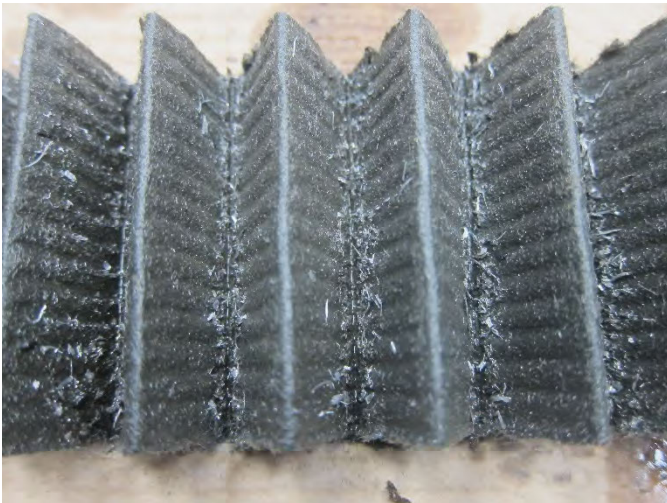
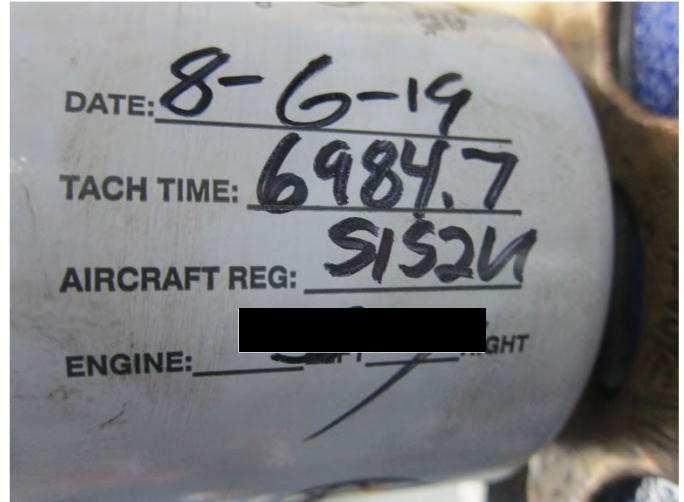
OIL FILTER

Manufacturer: Champion

P/N: CH40108-1

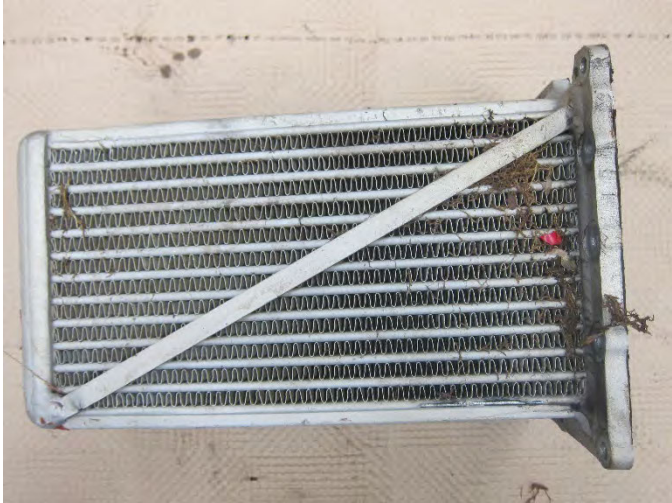
Condition:

The oil filter remained secured to the adapter and had a tachometer time of 6,984.7 and a date of 8-6-19 hand-written on the side. The filter was cut open to reveal metallic debris within the filter pleats.



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OIL COOLER	Manufacturer: Pacific Oil Cooler Harrison Service	P/N: 8520732	S/N: 117 (W.O. 114714)
Condition:	The oil cooler remained attached to the engine and no pre-event anomalies were noted with the unit.		



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CYLINDERS

CYLINDER #1

P/N: AEC631397

Condition: The cylinder remained attached to the crankcase and no torque putty was observed on the attaching hardware. One of the cylinder mounting studs was displaced outward from base of the cylinder. Removal of the cylinder revealed that the #1 piston displayed a semicircular impact impression consistent with a valve strike and it also sustained mechanical damage to the skirt. There were no pre-event anomalies noted with the rockers, valves, valve springs, and valve seats.



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CYLINDER #3

P/N: AEC631397

Condition:

The cylinder remained attached to the crankcase and no torque putty was observed on the attaching hardware. Removal of the cylinder revealed no pre-event anomalies with the cylinder, piston, rockers and springs, or valves and valve seats.



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CYLINDER #5

P/N: AEC631397

Condition:

The cylinder remained attached to the crankcase and no torque putty was observed on the attaching hardware. Removal of the cylinder revealed no pre-event anomalies with the cylinder, piston, rockers and springs, or valves and valve seats.



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CYLINDER #2

P/N: AEC631397

Condition: The cylinder remained attached to the crankcase and no torque putty was observed on the attaching hardware. Removal of the cylinder revealed that the #2 piston displayed a semicircular impact impression consistent with a valve strike and it also sustained mechanical damage to the skirt. There were no pre-event anomalies noted with the rockers, valves, valve springs, and valve seats.



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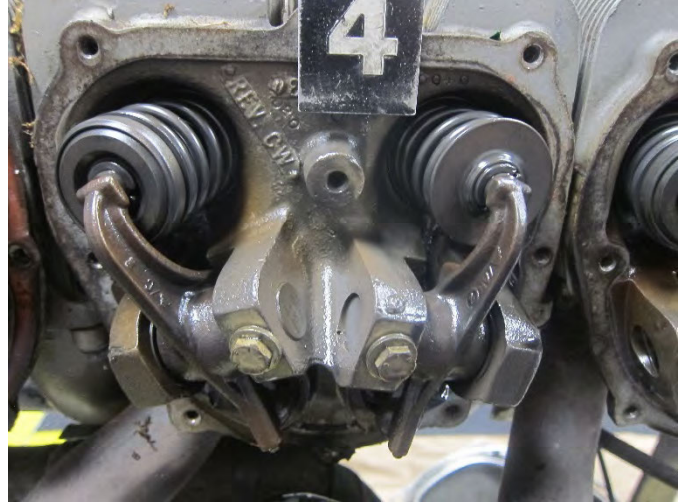
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CYLINDER #4

P/N: AEC631397

Condition:

The cylinder remained attached to the crankcase and no torque putty was observed on the attaching hardware. Removal of the cylinder revealed no pre-event anomalies with the cylinder, piston, rockers and springs, or valves and valve seats.



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CYLINDER #6

P/N: AEC631397

Condition:

The cylinder remained attached to the crankcase and no torque putty was observed on the attaching hardware. Removal of the cylinder revealed no pre-event anomalies with the cylinder, piston, rockers and springs, or valves and valve seats.

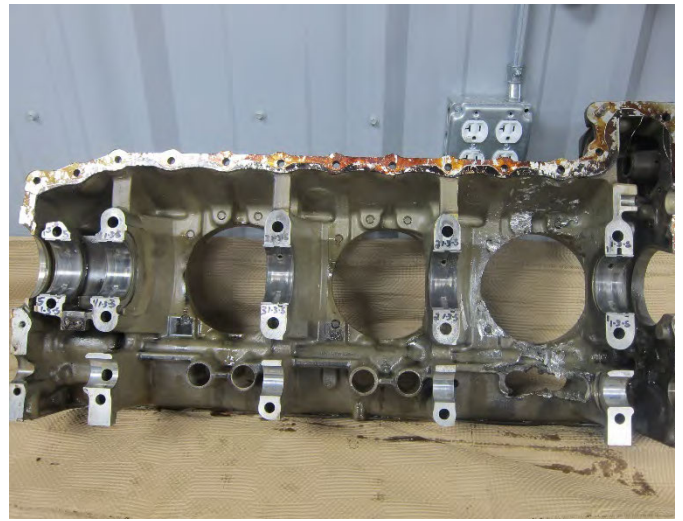
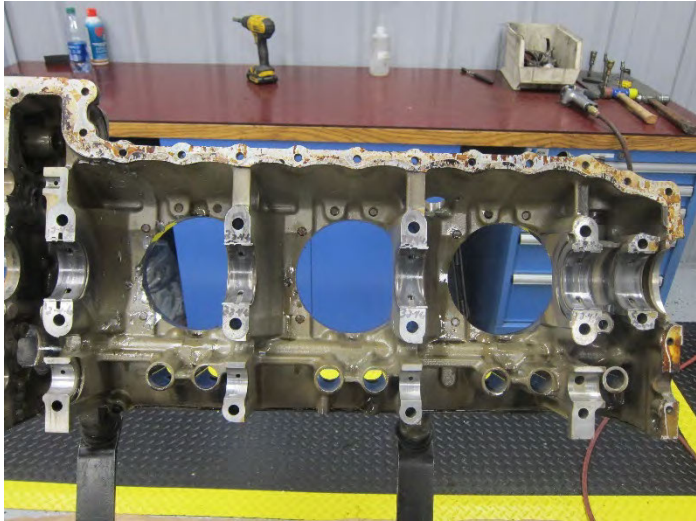


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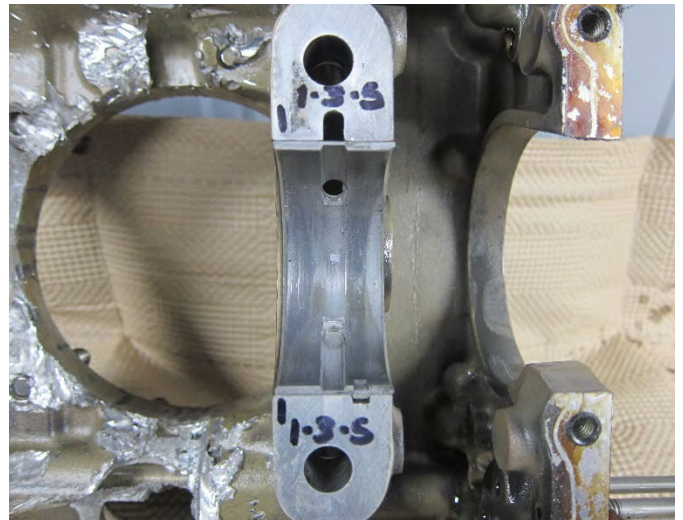
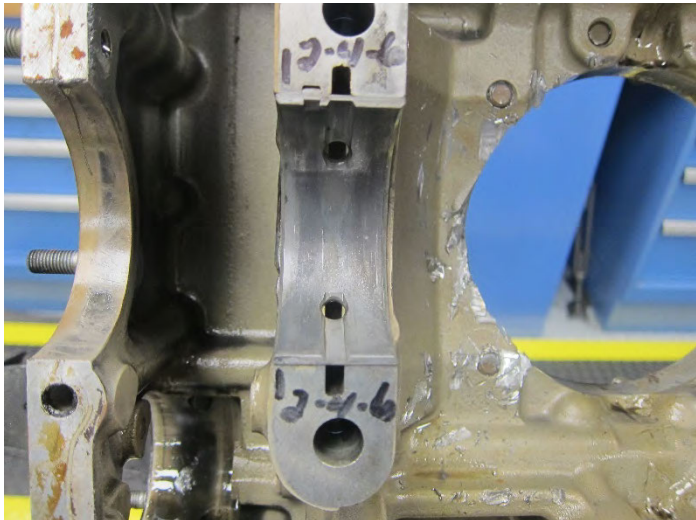
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CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: 653961	2-4-6: 653960	S/N: 210003R
Condition:	The crankcase halves remained intact with some internal mechanical damage observed in the areas of the #1- and #2-cylinder bays. It should be noted that lock slot elongation, which is consistent with inadequate through-bolt torque and bearing migration, was observed on the #2 and #3 main bearing support saddles. The break-away through-bolt torque associated with these main bearing saddles was significantly lower than the 790-810 inch-pounds as specified for this engine model.			



#1 MAIN BEARINGS	P/N: AEC642720M010	Date Code: Rev B AJ
Condition:	The bearings remained in place with indications of normal wear.	



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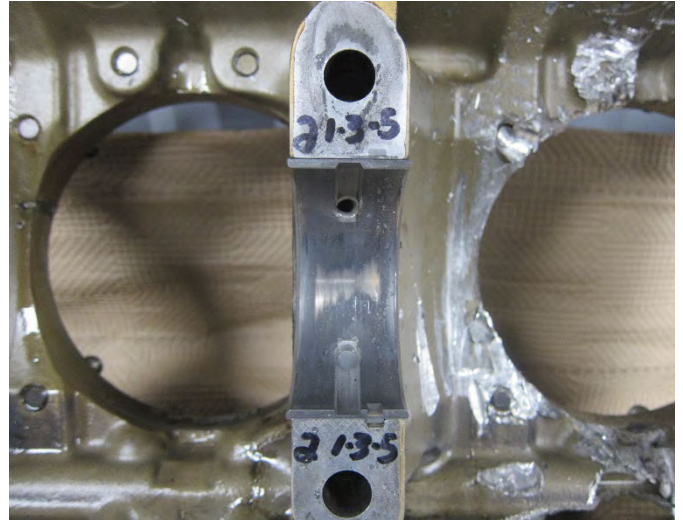
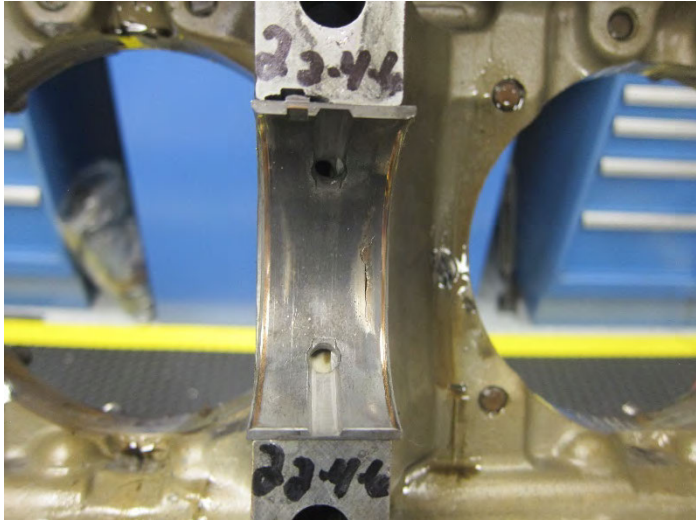
#2 MAIN BEARINGS

P/N: AEC642720M010

Date Code: Rev B AJ

Condition:

The bearing showed evidence of migration that elongated the lock slot. One half of the bearing show evidence of cracking and edge wear below the babbitt layer.



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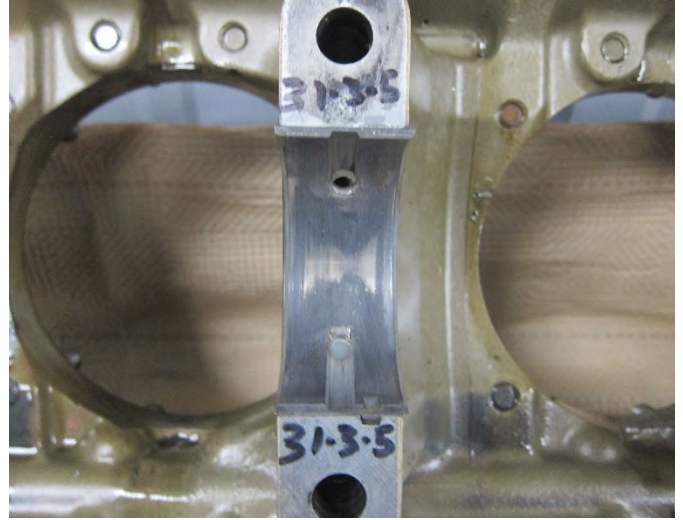
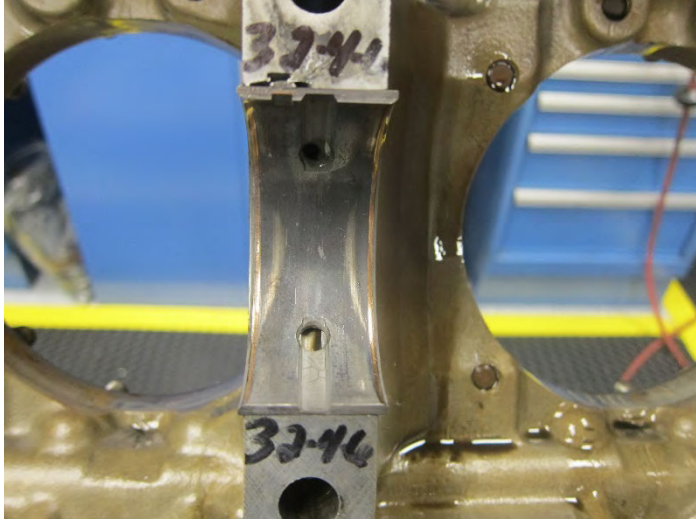
#3 MAIN BEARINGS

P/N: AEC642720M010

Date Code: Rev B AJ

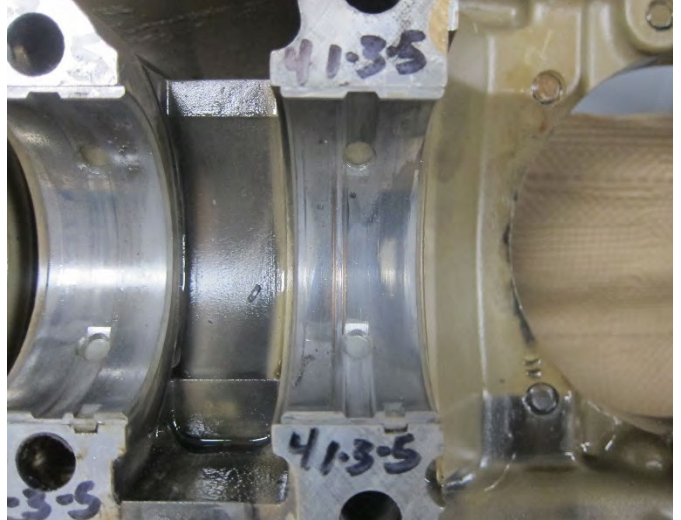
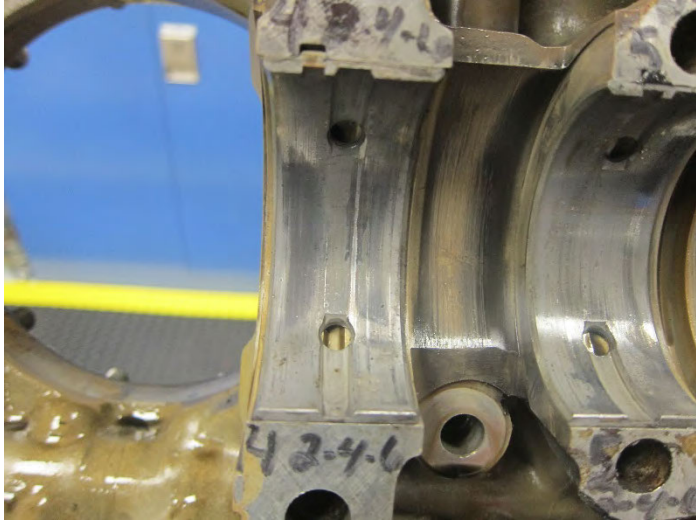
Condition:

The bearing showed evidence of migration that elongated the lock slot. One half of the bearing show evidence of edge wear below the babbitt layer.

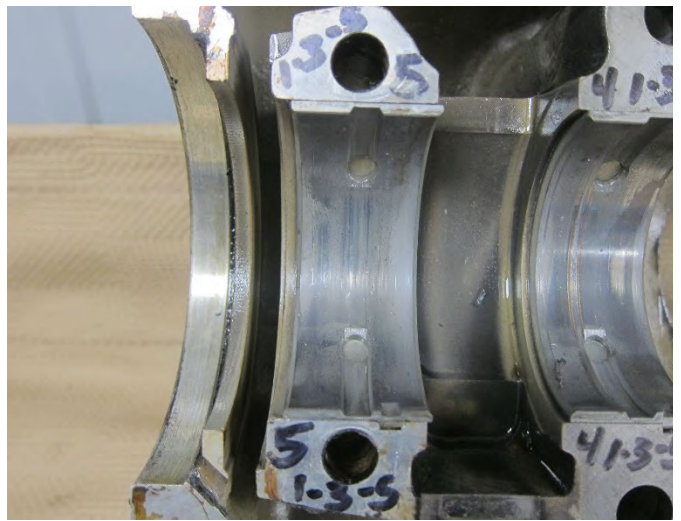
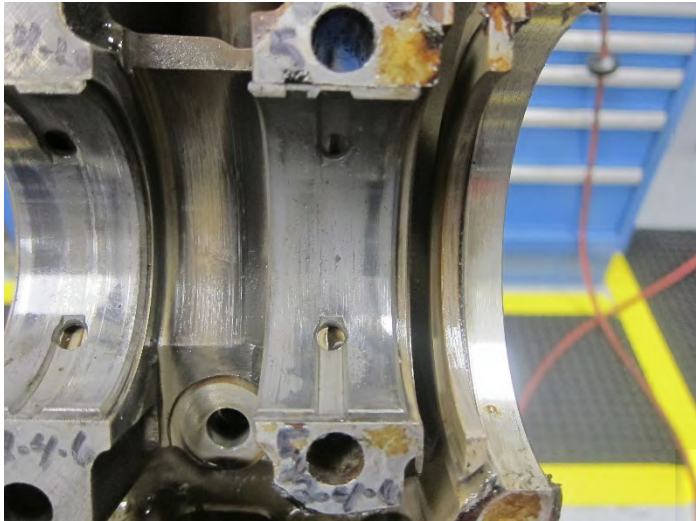


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#4 MAIN BEARINGS	P/N: AEC642720M010	Date Code: Rev B AJ
Condition:	The bearings remained in place with indications of normal wear.	



#5 MAIN BEARINGS	P/N: AEC642720M010	Date Code: Rev B AJ
Condition:	The bearings remained in place with indications of normal wear.	



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

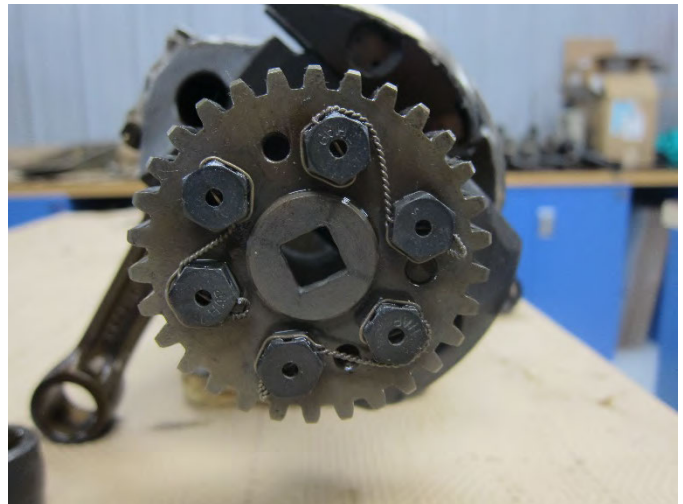
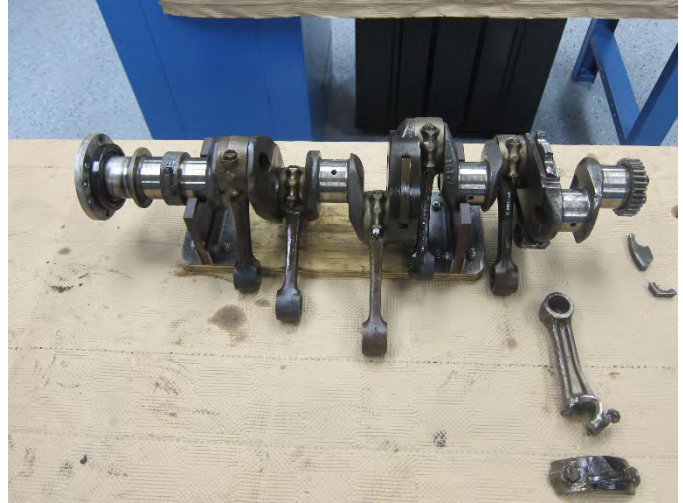
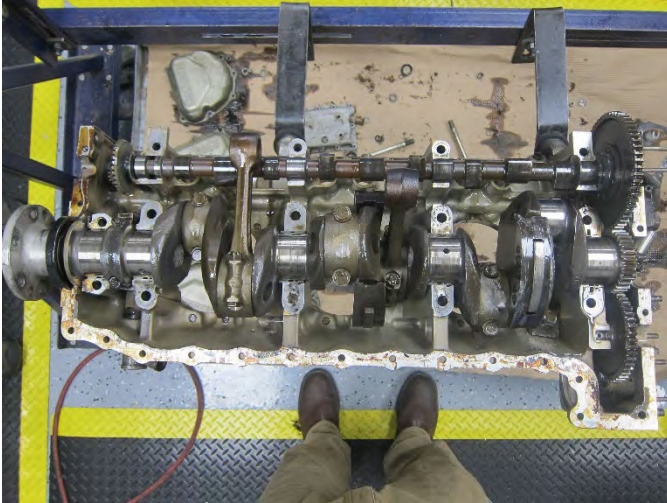
Forging Number: 649130

S/N: D149803N

Heat code: VAR

Condition:

The crankshaft remained intact with the exception of the #2 bottom hanger blade, which was fractured. The #2 bottom counterweight was separated and fractured in numerous pieces. The #2 top counterweight sustained mechanical damage.



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TRANSFER COLLAR

Condition:

The oil transfer collar remained in place with no pre-event anomalies noted.



COUNTER WEIGHTS

Condition:

The #2 bottom hanger blade was fractured, and the #2 bottom counterweight was separated and fractured in numerous pieces. The hanger blade fracture displayed a flat surface with visible beach marks consistent with fatigue cracking. However, it is presumed that the fatigue cracking was a result of a missing counterweight pin. All four of the #2 bottom counterweight's plates and snap rings, along with both pins were found in the oil sump. One of the four plates was fractured into 5 pieces and displayed a relative lack of deformation damage. It also displayed a deep circular groove consistent in circumference as the counterweight pin circumference. Metallurgical examination of the hanger blade and the counterweight pieces is pending.



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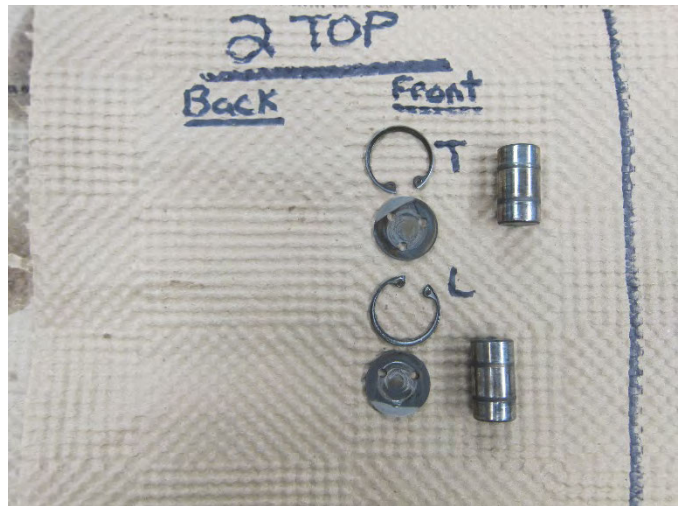
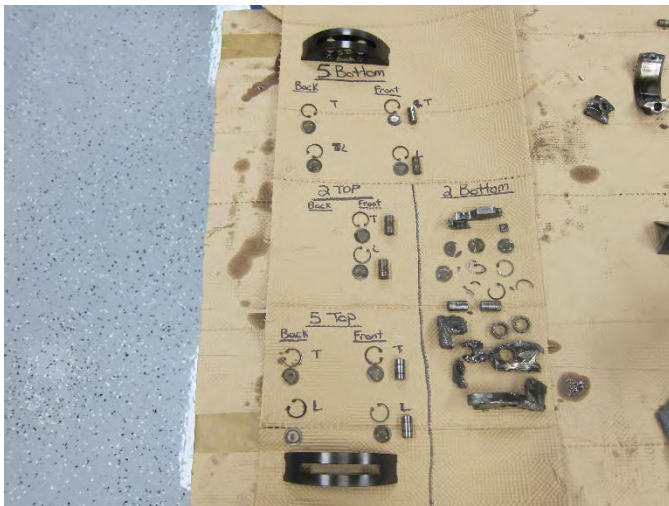
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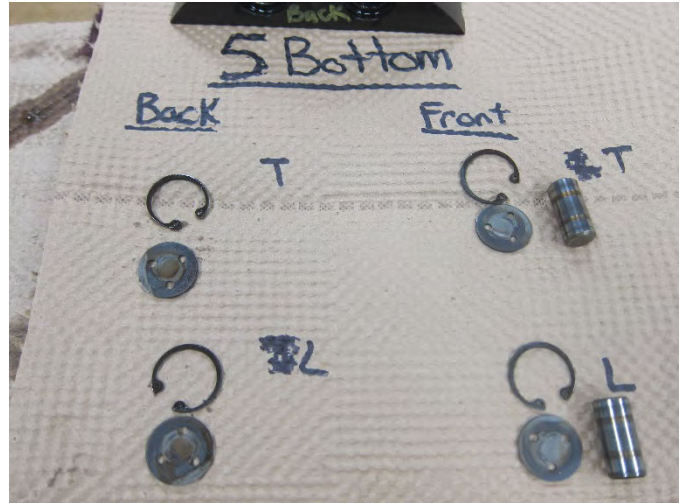
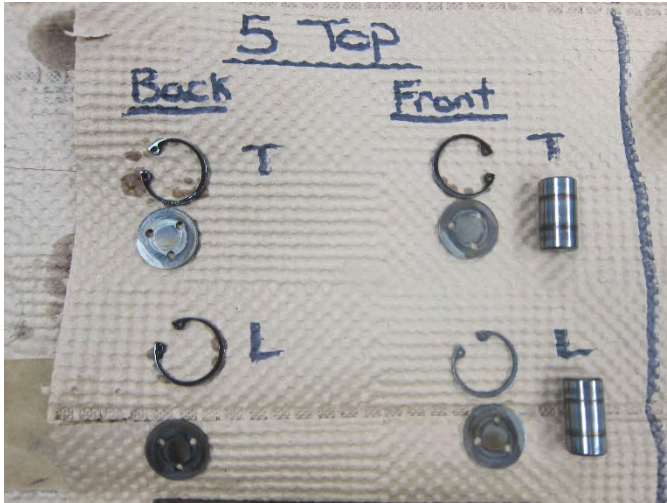
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INTERNAL TIMING

Condition: No pre-event anomalies were noted with the internal timing.



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#1 CONNECTING ROD

P/N: 632041F

Condition: One of the shoulders was fractured as were the connecting rod bolts, and the rod was separated from the crankshaft. The connecting rod displayed mechanical deformation damage that likely resulted from the separated counterweight components. The fractured bolts showed deformation damage near the fracture areas. There was no sign of thermal discoloration associated with oil starvation.

#1 CONNECTING ROD BEARING

P/N: AEC630826M010 Rev C

Condition: The bearing halves were located in the oil sump. They sustained mechanical deformation damage.



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ROD**

P/N: 632041F

Condition:

The connecting rod remained attached to the crankshaft and its piston pin. No pre-event anomalies were noted with the connecting rod.

**#3 CONNECTING
ROD BEARING**

P/N: AEC630826M010 Rev C

Condition:

The bearing remained in place and displayed normal wear.

**#5 CONNECTING
ROD**

P/N: 632041F

Condition:

The connecting rod remained attached to the crankshaft and its piston pin. No pre-event anomalies were noted with the connecting rod.

**#5 CONNECTING
ROD BEARING**

P/N: AEC630826M010 Rev C

Condition:

The bearing remained in place and displayed normal wear.



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#2 CONNECTING ROD

P/N: 632041F

Condition: The connecting rod remained attached to the crankshaft and its piston pin. No pre-event anomalies were noted with the connecting rod.

#2 CONNECTING ROD BEARING

P/N: AEC630826M010 Rev C

Condition: The bearing remained in place and displayed normal wear.



#4 CONNECTING ROD

P/N: 632041F

Condition: The connecting rod remained attached to the crankshaft and its piston pin. No pre-event anomalies were noted with the connecting rod.

#4 CONNECTING ROD BEARING

P/N: AEC630826M010 Rev C

Condition: The bearing remained in place and displayed normal wear.



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#6 CONNECTING ROD

P/N: 632041F

Condition:

The connecting rod remained attached to the crankshaft and its piston pin. No pre-event anomalies were noted with the connecting rod.

#6 CONNECTING ROD BEARING

P/N: AEC630826M010 Rev C

Condition:

The bearing remained in place and displayed normal wear.



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CAMSHAFT

CAMSHAFT	S/N: 535661-V
Condition:	The camshaft remained intact and the gear was secured in place



LIFTERS	
INTAKE	P/N: SA628488
EXHAUST	P/N: 653877
Condition:	The #1 cylinder's lifters were dislodged from the crankcase and found in the oil sump. Examination of the lifters revealed light pitting on some of the surfaces.



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ACCESSORIES

STARTER	Manufacturer: Sky-Tec	P/N: C12ST5	S/N: 2C5-141514
Condition:	The starter motor remained attached to the adapter and exhibited normal operating signatures.		



STARTER ADAPTER	
Condition:	The starter adapter remained secured to the aft end of the engine and exhibited normal operating signatures.

ENGINE EXAMINATION REPORT

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ALT/GEN #1	Manufacturer: Plane-Power	P/N: 10-1050C	S/N: H-Q010246
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Condition:	The alternator remained secured to the back side of the engine and the drive belt was in place. It exhibited normal operating signatures and was not examined as part of this investigation.
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VACUUM PUMP	Manufacturer: Airborne	P/N: 216CW	S/N: Not Recorded
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Condition:	The vacuum pump exhibited normal operating signatures and was not examined as part of this investigation.
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PROPELLER

PROPELLER GOVERNOR	Manufacturer: McCauley	P/N: C290 D3 P/T5	S/N: 050414
Condition:	The propeller governor exhibited normal operating signatures.		

