



ENGINE EXAMINATION REPORT

LEFT

ENGINE MODEL	IO-550-C (49)
ENGINE SERIAL NUMBER	1003696
AIRCRAFT MAKE & MODEL	Beechcraft 58 Baron
AIRCRAFT SERIAL NUMBER	TH-1888
AIRCRAFT REGISTRATION	N501CE
FILE NUMBER	18-383

NAME	SIGNATURE	DATE
Phillip Grice		02/21/2020
Mike Council		1-13-2020

ENGINE EXAMINATION REPORT

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	10-8-2019	NTSB ACCIDENT #	CEN19FA124
FACILITY	Continental Aerospace Technologies-Analytical	NTSB INVESTIGATOR	Mike Folkerts
ADDRESS	[REDACTED] [REDACTED]	FAA INVESTIGATOR	Did not attend
		ACCIDENT DATE	4-22-2019
		ACCIDENT LOCATION	Kerrville, TX

ENGINE INFORMATION

ENGINE POSITION	Left (#1)
TOTAL TIME	1654.5 calculated
TIME SOH	NA
TYPE & TIME SLI	105 since last 100-hour inspection dated 8-27-2018 @ Hobbs 3729.0. Hobbs at accident site 3834.5
BUILD DATE	12-11-2010
IN SERVICE DATE	1-1-2011

Significant logbook information: According to the engine maintenance logbook entry dated 8-27-2018 at Hobbs 3729 hours, the engine had accumulated 1549 hours since new and received its final 100-hour inspection. One of the logbook entries indicated "Inspected cylinders IAW SID 97-2, satisfactory, borescope & compression tests 1-51, 2-42, 3-unreadable, 4-52, 5-42, 6-58, master orifice = 40.

Report Summary:

Search Code(s):	15-12-68
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Examination of this engine was performed under the supervision of the NTSB Investigator. The inspection of this engine did not reveal any pre-impact anomalies that would have prevented its ability to produce rated horsepower.

Disposition of engine following exam: The engine was returned to Air Salvage of Dallas upon release by the NTSB IIC. See shipper number AD01188

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PAGE 3 of 38**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	Mike Council
ADDRESS	Mobile, Alabama	ADDRESS	Mobile, Alabama
ORGANIZATION	Continental Aerospace Technologies	ORGANIZATION	Continental Aerospace Technologies
PHONE	██████████	PHONE	██████████
NAME	Mike Folkerts	NAME	Jennifer Barclay
ADDRESS	Central Region	ADDRESS	Wichita, KS
ORGANIZATION	NTSB	ORGANIZATION	Textron Aviation
PHONE	██████████	PHONE	██████████

EXTERNAL INSPECTION OF ENGINE

The engine was received at Continental Aerospace Technologies in an engine shipping crate furnished by Continental. The engine shipping crate was opened in the presence of the NTSB IIC. The engine had been placed in the shipping crate by Air Salvage of Dallas still attached to the airframe engine mount. The left and right magnetos were lying loose on the top of the engine crankcase but remained attached to its respective ignition harness. The attached engine data plate confirmed that the engine was a Continental Motors engine model IO-550-C (49B), serial number 1003696. The propeller flange and the forward portion of the exposed crankshaft separated at the forward crankshaft seal area. The engine driven fuel pump, throttle body/mixture control and fuel manifold had been removed previously but were shipped in a box along with other accessories and included inside the engine shipping container. The engine driven instrument air pump had also been previously removed. The upper rear portion of the left and right crankcase halves were impact damaged near the magneto mount area and separated during the engine examination.

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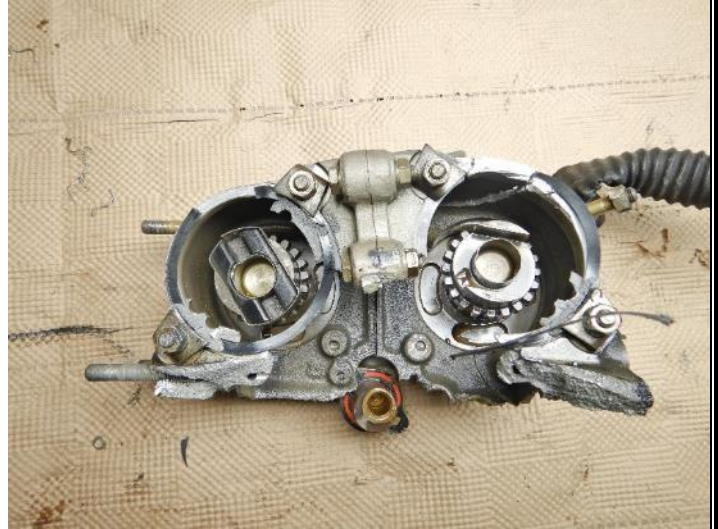
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AIRFRAME COMPONENTS RETURNED WITH ENGINE

- Air conditioning compressor and mount
- Cooling baffles
- Tachometer generator
- Propeller governor
- Instrument air pump
- Engine mount
- Exhaust components
- Propeller anti-ice brush holder

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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: The left and right exhaust collector and risers exhibited crushing impact damage



INDUCTION SYSTEM

Condition: Induction elbows and connectors exhibited impact damage



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IGNITION SYSTEM

MAGNETO-TO-ENGINE TIMING

Specification: 22 ° BTDC

L/H Magneto: *

R/H Magneto: *

*Magneto timing could not be confirmed. Magnets had been removed prior to shipping.

LEFT MAGNETO

Manufacturer: Continental

P/N: S6RN-1225

S/N: F17GA241R

Condition:

The magneto mounting ring was impact damaged, but the magneto operational test was normal producing spark at each ignition lead.



RIGHT MAGNETO

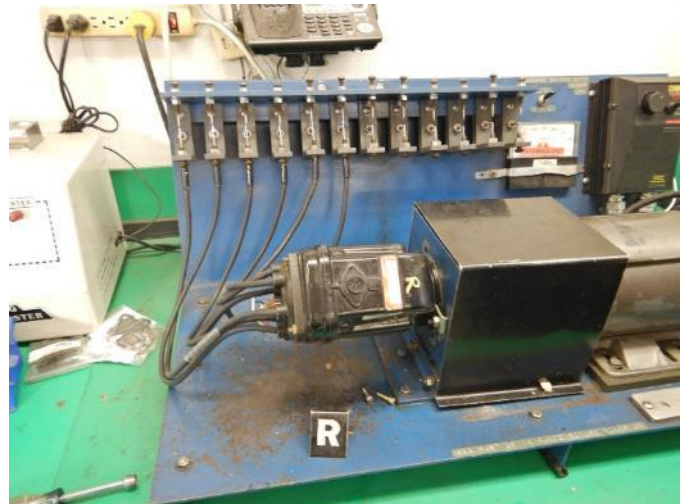
Manufacturer: Continental-ALFA

P/N: S6RN-1225

S/N: F10KA188

Condition:

The magneto mounting ring was impact damaged, but the magneto operational test was normal producing spark at each ignition lead.



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IGNITION HARNESS

Manufacturer: Continental

P/N: Data tag missing

S/N: Undetermined

Condition: Several individual ignition leads exhibited impact damage with leads cut and pinched.



SPARK PLUGS

Manufacturer: Tempest

P/N: URHB-32E

Condition: Minimal combustion deposits were present consistent with a lean fuel/air mixture. The sparkplug condition was normal to worn-out normal when compared to a Champion Check-A-Plug chart. Sparkplugs from # 4 (top) and # 3 & 5 (bottom) were impact damaged.



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FUEL SYSTEM

FUEL PUMP	Manufacturer: Continental	P/N: R646212-55A1	S/N: B16CA080R
Condition:	According to <i>Field Notes</i> from the accident site, "The coupling was intact, and the pump operated smoothly when manually rotated." At the Analytical Exam, the pump shaft would not slide from the fuel pump case due to light corrosion. Otherwise, the pump was normal in appearance. Pump impellers were intact.		



THROTTLE BODY METERING UNIT	Manufacturer: Continental	P/N: 657026A1	S/N: A10KA144
Condition:	Fuel screen was clean. Control arms remained properly secured.		



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FUEL MANIFOLD VALVE

Manufacturer: Continental

P/N: 646508-14A4

S/N: C10KA173

Condition: The diaphragm, spring and fuel screen were intact. No contamination was noted.



FUEL NOZZLES AND LINES

Manufacturer: Continental

Position	#1	#3	#5	#2	#4	#6
Size	1255	3253	5250	2255	4245	6245

Condition: #4 exhibited impact damage. All other were undamaged and open.



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LUBRICATION SYSTEM

OIL SUMP

Condition: The oil sump was impact crushed.



OIL PICK-UP TUBE & SCREEN

Condition: The pickup tube was clean, and the suction tube was impact damaged.



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OIL PUMP

Condition:

The oil pump rotated smoothly when turned manually. No evidence of hard particle passage on pump chamber or gears.



OIL COOLER

Manufacturer: Niagara

P/N: 654572

S/N: A16-13010-72

Condition:

Unremarkable



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OIL FILTER

Manufacturer: Champion

P/N: CH48108-1

Condition:

No metal contamination was noted on the filter media.



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CYLINDERS

CYLINDER #1	P/N: 658552A1	S/N: AC16CB011	Head Date: 3/16
Work Orders:	NA		
Condition:	No damage to the cylinder was noted.		



CYLINDER #3	P/N: 658552A1	S/N: AC16BB883	Head Date: 3/16
Work Orders:	NA		
Condition:	No damage to the cylinder was noted.		



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CYLINDER #5	P/N: 658552A1	S/N: AC16CA082	Head Date: 3/16
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Work Orders:	NA
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Condition:	No damage to the cylinder was noted.
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CYLINDER #2	P/N: 658552A1	S/N: AC16CA096	Head Date: 3/16
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Work Orders:	NA
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Condition:	No damage to the cylinder was noted.
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CYLINDER #4	P/N: 658552A1	S/N: AC16BB864	Head Date: 3/16
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Work Orders:	NA
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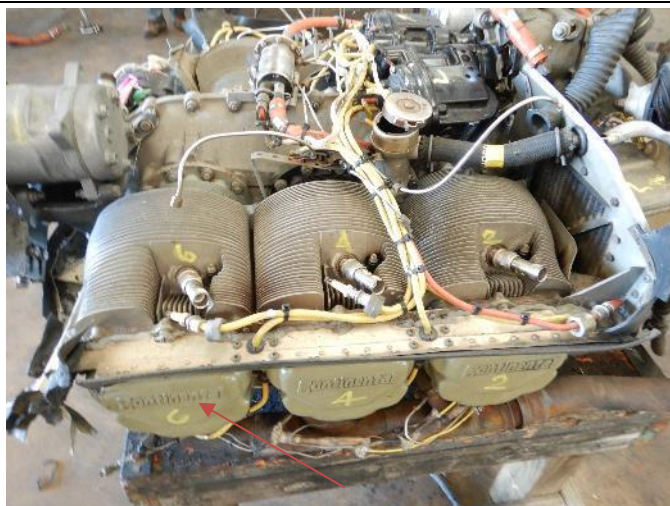
Condition:	No damage to the cylinder was noted.
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CYLINDER #6	P/N: 658552A1	S/N: AC16BA109	Head Date: 3/16
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Work Orders:	NA
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Condition:	No damage to the cylinder was noted.
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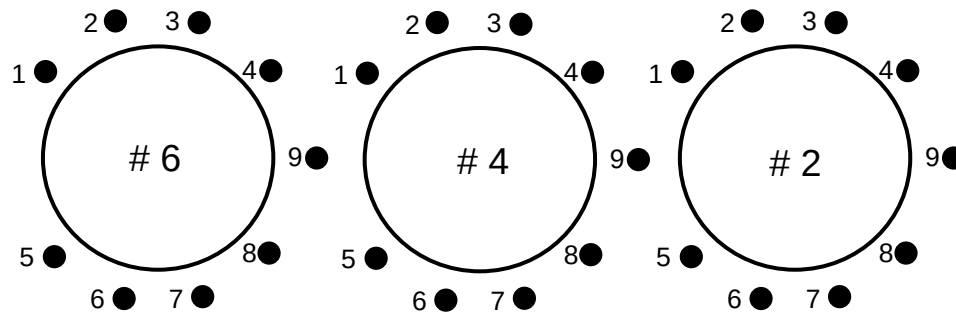
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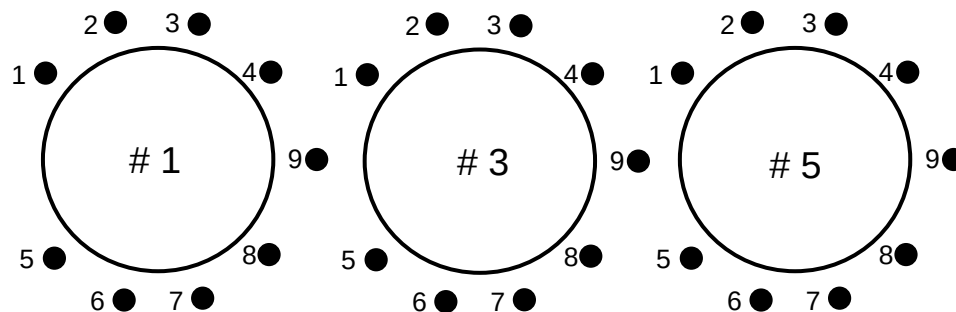
Cylinder Through-Bolt and Deck Stud Break-Away (Tightening/Loosening) Torque Measurements (in-lbs)

(NOTE: Position numbers 1 and 5 are through-bolts)

	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder #2	1249 / 968	959 / 831	973 / 836	994 / 869	1082 / 883	981 / 803	992 / 791	952 / 716	1090 / 717
Cylinder #4	952 / 834	1036 / 878	1007 / 869	865 / 800	944 / 789	939 / 728	948 / 758	979 / 815	732 / 552
Cylinder #6	1022 / 839	778 / 690	868 / 765	802 / 723	1026 / 903	913 / 712	931 / 728	973 / 790	761 / 491



	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder #1	908 / 968	935 / 797	916 / 789	957 / 831	1135 / 853	811 / 676	882 / 638	849 / 691	645 / 801
Cylinder #3	973 / 811	857 / 735	808 / 684	766 / 707	1206 / 803	768 / 460	921 / 709	973 / 795	755 / 514
Cylinder #5	748 / 625	834 / 704	890 / 803	710 / 607	1286 / 926	832 / 699	752 / 626	447 / 659	702 / 510



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VALVES AND GUIDES

Condition:

All valves were intact and exhibited normal combustion signatures and deposits.



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ROCKER ARMS AND SHAFTS

Condition:

All rocker arms and shafts were intact and in proper position



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#1 PISTON & RINGS

Piston P/N: 654857

Condition:

Piston exhibited normal combustion deposits. Rings were intact and free in their grooves.



#3 PISTON & RINGS

Piston P/N: 654857

Condition:

Piston exhibited normal combustion deposits. Rings were intact and free in their grooves.



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#5 PISTON & RINGS

Piston P/N: 654857

Condition:

Piston exhibited normal combustion deposits. Rings were intact and free in their grooves.



#2 PISTON & RINGS

Piston P/N: 654857

Condition:

Piston exhibited normal combustion deposits. Rings were intact and free in their grooves.



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#4 PISTON & RINGS

Piston P/N: 654857

Condition:

Piston exhibited normal combustion deposits. Rings were intact and free in their grooves.



#6 PISTON & RINGS

Piston P/N: 654857

Condition:

Piston exhibited normal combustion deposits. Rings were intact and free in their grooves.



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CRANKCASE ASSEMBLY

CRANKCASE

Casting
Number:

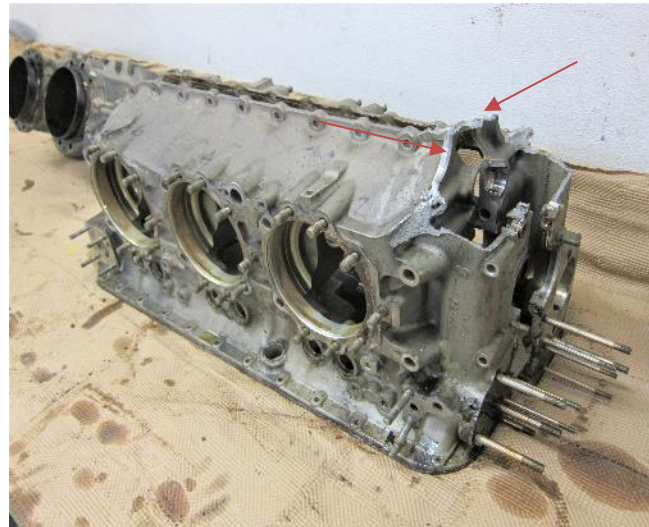
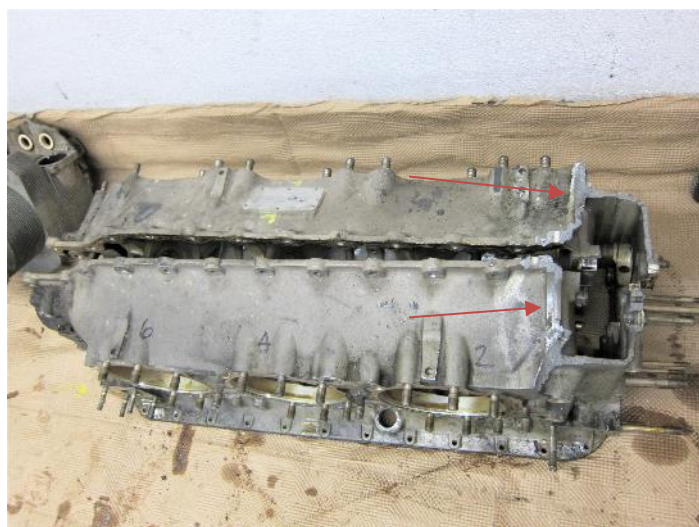
1-3-5: 655434

2-4-6: 655435

S/N: R10KA271

Condition:

The top rear portion of the crankcase halves separated during disassembly of the engine due to impact damage near the magneto mounts. Otherwise, the crankcase was unremarkable. See red arrows.



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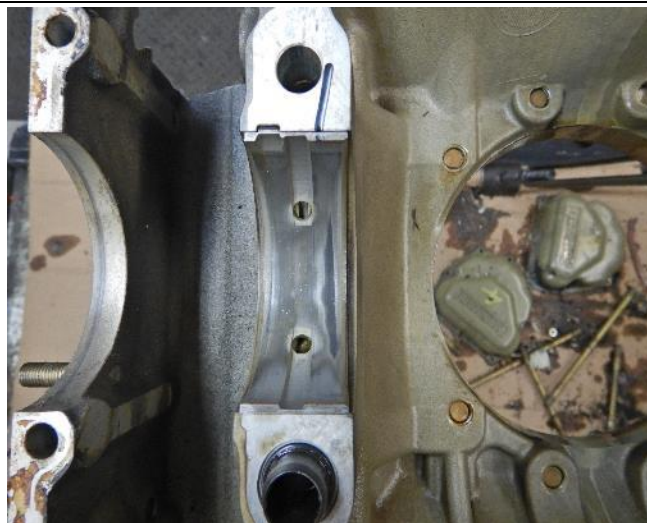
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#1 MAIN BEARINGS

P/N: 634503

Date Code: 3/16

Condition: Bearing exhibited normal signatures.

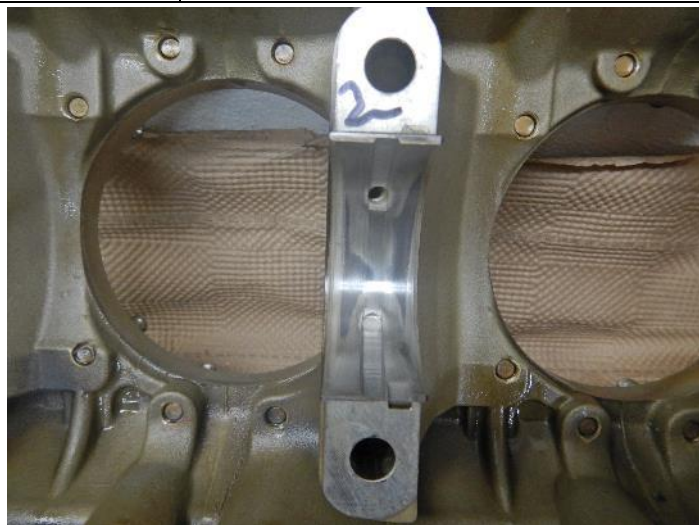


#2 MAIN BEARINGS

P/N: 634503

Date Code: 3/16

Condition: Bearing exhibited normal signatures.



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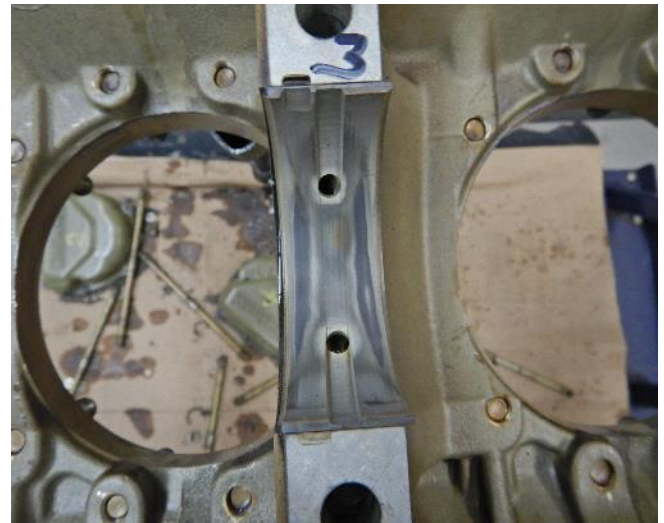
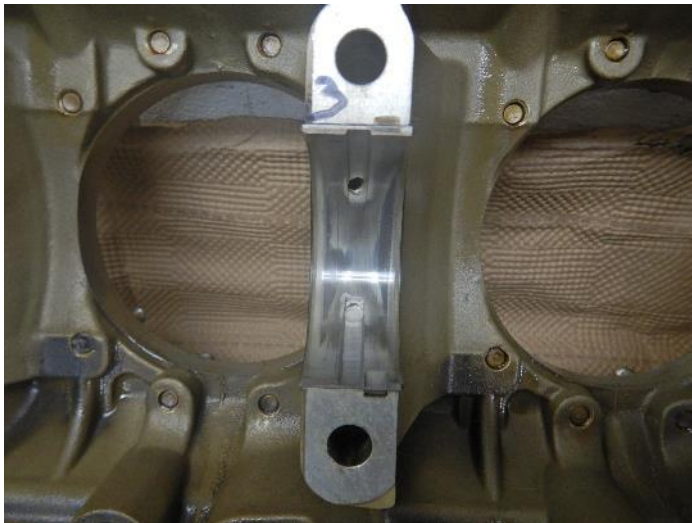
#3 MAIN BEARINGS

P/N: 634503

Date Code: 3/16

Condition:

Bearing exhibited normal signatures.



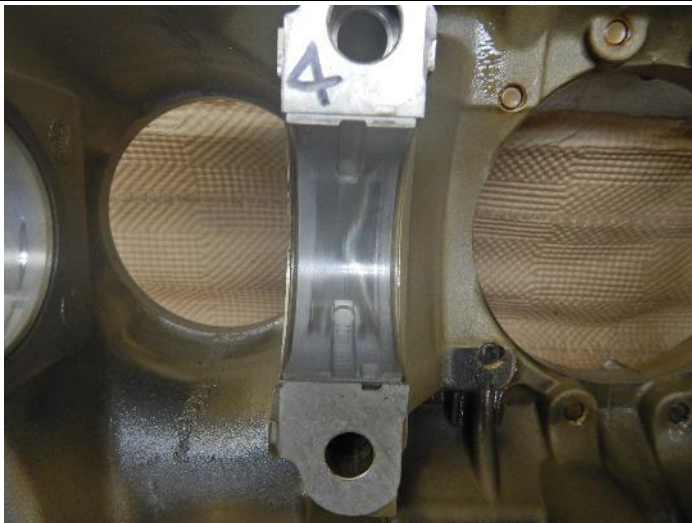
#4 MAIN BEARINGS

P/N: 653547

Date Code: 3/16

Condition:

Bearing exhibited normal signatures.



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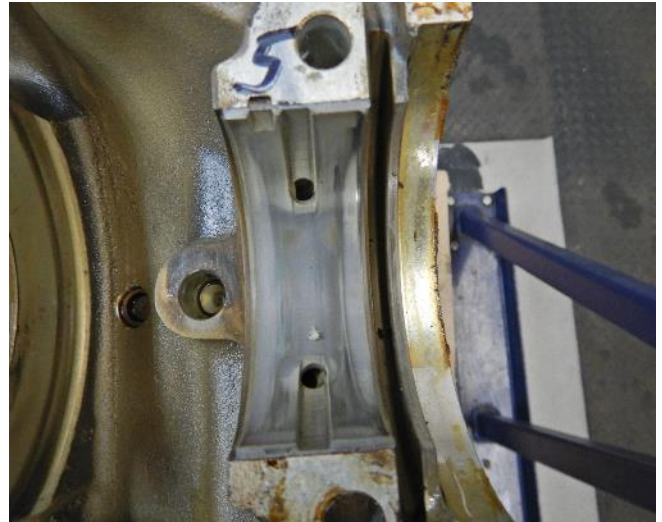
#5 MAIN BEARINGS

P/N: 653547

Date Code: 3/16

Condition:

Bearing exhibited normal signatures.



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

Forging Number: 649878

S/N: N16AA197

Heat code: AF-KXT

Condition:

The propeller flange was fractured from impact at the crankcase seal. The main and rod journals exhibited normal operating signatures.



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COUNTER-WEIGHTS

Condition:

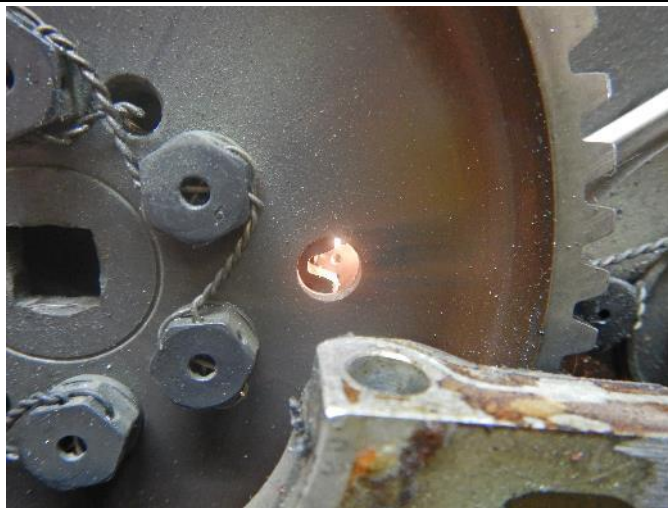
Torsion dampers/counterweights were free to move on pins. Plate and snap rings intact and correctly oriented.



INTERNAL TIMING

Condition:

The internal timing was correct. Note- dimple on gear tooth through window.



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PAGE 31 of 38**#1 CONNECTING
ROD**

P/N: 655911

Forging or Serial Number: AD16DA142

Condition:

The connecting rod exhibited normal operating signatures.

**#1 CONNECTING
ROD BEARING**

P/N: 642398

Condition:

The bearing exhibited normal wear patterns

**#3 CONNECTING
ROD**

P/N: P/N: 655911

Forging or Serial Number: AE16DA169

Condition:

The connecting rod exhibited normal operating signatures.

**#3 CONNECTING
ROD BEARING**

P/N: 642398

Condition:

The bearing exhibited normal wear patterns



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PAGE 32 of 38**#5 CONNECTING
ROD**

P/N: P/N: 655911

Forging or Serial Number: AE16DA184

Condition:

The connecting rod exhibited normal operating signatures.

**#5 CONNECTING
ROD BEARING**

P/N: 642398

Condition:

The bearing exhibited normal wear patterns

**#2 CONNECTING
ROD**

P/N: P/N: 655911

Forging or Serial Number: AD16DA143

Condition:

The connecting rod exhibited normal operating signatures.

**#2 CONNECTING
ROD BEARING**

P/N: 642398

Condition:

The bearing exhibited normal wear patterns



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ROD**

P/N: P/N: 655911

Forging or Serial Number: AE16DA183

Condition:

The connecting rod exhibited normal operating signatures.

**#4 CONNECTING
ROD BEARING**

P/N: 642398

Condition:

The bearing exhibited normal wear patterns

**#6 CONNECTING
ROD**

P/N: P/N: 655911

Forging or Serial Number: AE16DA171

Condition:

The connecting rod exhibited normal operating signatures.

**#6 CONNECTING
ROD BEARING**

P/N: 642398

Condition:

The bearing exhibited normal wear patterns



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PAGE 34 of 38**CAMSHAFT****CAMSHAFT**

P/N: 654084

S/N: 76158

Condition:

The Camshaft exhibited normal operating signatures.

**LIFTERS**

#1

#3

#5

#2

#4

#6

INTAKE

658088

658088

658088

658088

658088

658088

EXHAUST

658077

658077

658077

658077

658077

658077

Condition:

All lifters exhibited normal operating signatures.

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ACCESSORY GEARS

Condition:

All accessory gears were intact and exhibited normal operating signatures.



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ACCESSORIES

STARTER

Manufacturer: Continental

P/N: 646275-24

S/N: H-X-301073

Condition:

The starter exhibited normal operating signatures.



STARTER ADAPTER

P/N: 642083 - R629668

Condition:

The starter adapter shaft rotated normally. Spring and gear were intact.



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ALTERNATOR

Manufacturer: Continental

P/N: 649305

S/N: 012CA025

Condition:

The alternator case including mounting ears were impact damaged. The alternator rotated normally, and the coupling was intact.



VACUUM PUMP

Manufacturer: Airborne

P/N: 442CW-12

S/N: OAGF06

Condition:

The outside pump housing was impact damaged. The carbon rotor and vanes were intact. The drive couplings were intact. The pressure plate and housing exhibited normal wear signatures.



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PROPELLER GOVERNOR

Manufacturer: Woodward

M/N: 8210600

S/N: 12116997

Condition:

Shaft rotates freely and oil is discharged when rotated. Gasket screen was clean. control arm was secured.





ENGINE EXAMINATION REPORT

RIGHT

ENGINE MODEL	IO-550-C (49)
ENGINE SERIAL NUMBER	1032347
AIRCRAFT MAKE & MODEL	Beechcraft 58 Baron
AIRCRAFT SERIAL NUMBER	TH-1888
AIRCRAFT REGISTRATION	N501CE
FILE NUMBER	18-383

NAME	SIGNATURE	DATE
Phillip Grice		02/21/2020
Mike Council		1-15-2020

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	10-8-2019	NTSB ACCIDENT #	CEN19FA124
FACILITY	Continental Aerospace Technologies-Analytical	NTSB INVESTIGATOR	Mike Folkerts
ADDRESS	[REDACTED] [REDACTED]	FAA INVESTIGATOR	
		ACCIDENT DATE	4-22-2019
		ACCIDENT LOCATION	Kerrville, TX

ENGINE INFORMATION

ENGINE POSITION	Right (#2)
TOTAL TIME	610 calculated
TIME SOH	NA
TYPE & TIME SLI	105 since the last 100-hour inspection dated 8-27-2018 @ hobbs 3729.0. Hobbs at accident site 3834.5
BUILD DATE	5-25-2016
IN SERVICE DATE	6-17-2016

Significant logbook information:

According to the engine maintenance logbook entry dated 8-27-2018 at Hobbs 3729 hours, the engine had accumulated 505 hours since new and received its final 100-hour inspection. One of the logbook entries indicated "Inspected cylinders IAW SID 97-2, satisfactory, borescope & compression tests 1-65, 2-67, 3-72, 4-50, 5-64, 6-70, master orifice = 40.

Report Summary:

Search Code(s):	15-12-68
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Examination of this engine was performed under the supervision of the NTSB Investigator. The inspection of this engine did not reveal any pre-impact anomalies that would have prevented its ability to produce rated horsepower

Disposition of engine following exam: The engine was returned to Air Salvage of Dallas after release by the NTSB IIC. See shipper number AD01188

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1032347

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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	Mike Council
ADDRESS	Mobile, Alabama	ADDRESS	Mobile, Alabama
ORGANIZATION	Continental Aerospace Technologies	ORGANIZATION	Continental Aerospace Technologies
PHONE	██████████	PHONE	██████████
NAME	Mike Folkerts	NAME	Jennifer Barclay
ADDRESS	Central Region	ADDRESS	Wichita, KS
ORGANIZATION	NTSB	ORGANIZATION	Textron Aviation
PHONE	██████████	PHONE	██████████

EXTERNAL INSPECTION OF ENGINE

The engine was received at Continental Aerospace Technologies in an engine shipping crate furnished by Continental. The engine shipping crate was opened in the presence of the NTSB IIC. The engine had been placed in the shipping crate by Air Salvage of Dallas still attached to the airframe engine mount. The attached engine data plate confirmed that the engine was a Continental Motors engine model IO-550-C (49B), serial number 1032347. Cylinder # 5 pushrod tubes were impact damaged. Cylinder # 5 rocker cover was impact damaged and had been removed. Left and right magnetos, fuel manifold valve and fuel lines and instrument air pump had been previously removed at a prior recovery examination and were shipped loose in a box inside the engine shipping container.

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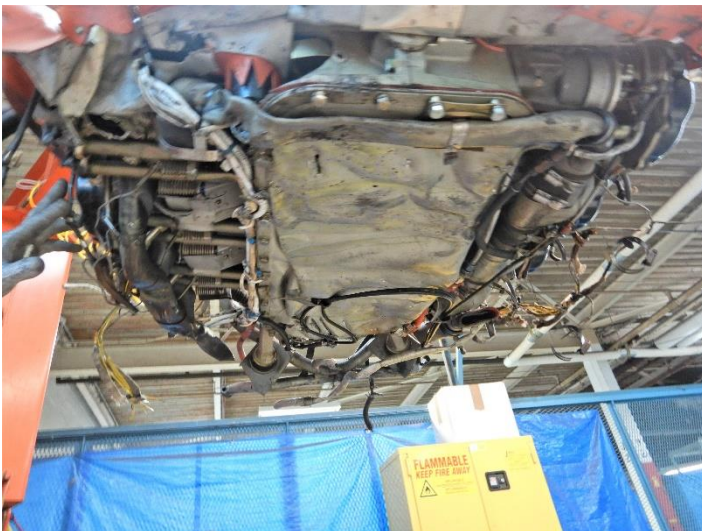
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AIRFRAME COMPONENTS RETURNED WITH ENGINE

Airframe cooling baffles
Tachometer generator
Propeller governor
Instrument air pump
Engine mount
Exhaust components
Misc. hoses and control cables

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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: Exhaust components were impact damaged.



INDUCTION SYSTEM

Condition: Several induction components exhibited impact damage.



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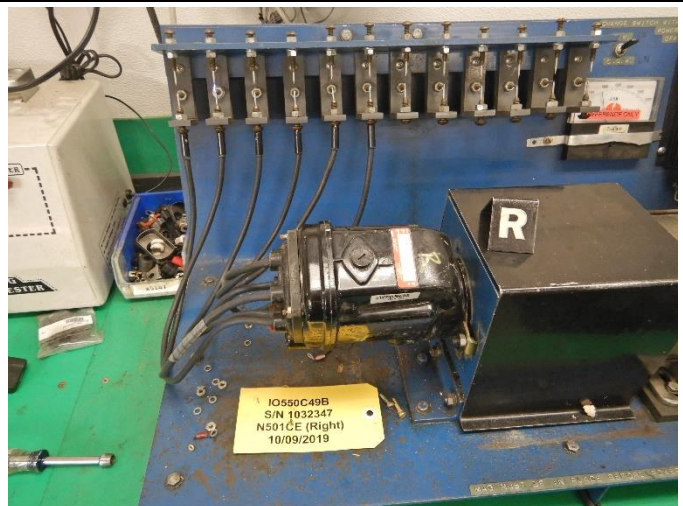
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IGNITION SYSTEM

MAGNETO-TO-ENGINE TIMING	Specification: 22° BTDC	L/H Magneto: *	R/H Magneto: *
*Both magnetos had been removed during the recovery examination. Magneto mount flanges were fractured.			
LEFT MAGNETO	Manufacturer: Continental Factory Rebuilt	M/N: S6RN-1225	S/N: F17CA251R
Condition:	The mount flange was impact damaged. The impulse coupling released normally, and the magneto functional test was normal.		



RIGHT MAGNETO	Manufacturer: Continental Alpha Systems	M/N: S6RN-1225	S/N: F10KA188
Condition:	The mount flange was impact damaged. The impulse coupling released normally, and the magneto functional test was normal.		



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IGNITION HARNESS	Manufacturer: Undetermined	P/N: Undetermined	S/N: Undetermined
Condition:	Individual leads were cut and impact damaged.		



SPARK PLUGS	Manufacturer: Tempest	P/N: URHB32E
Condition:	Top sparkplug # 4 and bottom sparkplug # 5 were impact damaged. When compared to a Champion Sparkplug "Check-A-Plug" chart, the condition was <i>worn out normal</i> with only minimal combustion deposits consistent with a lean fuel mixture.	



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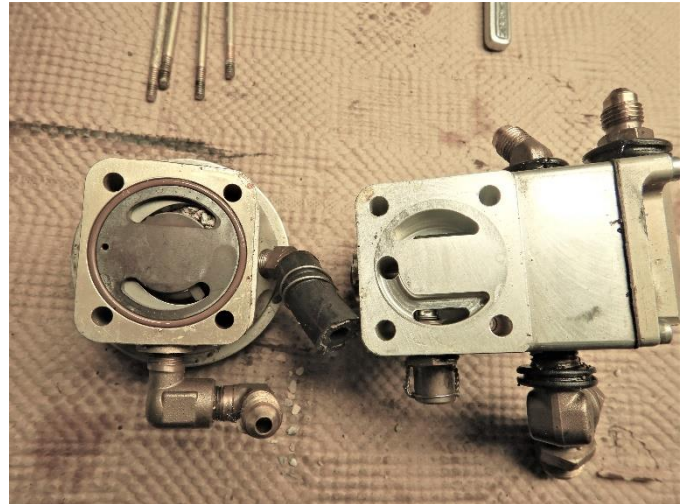


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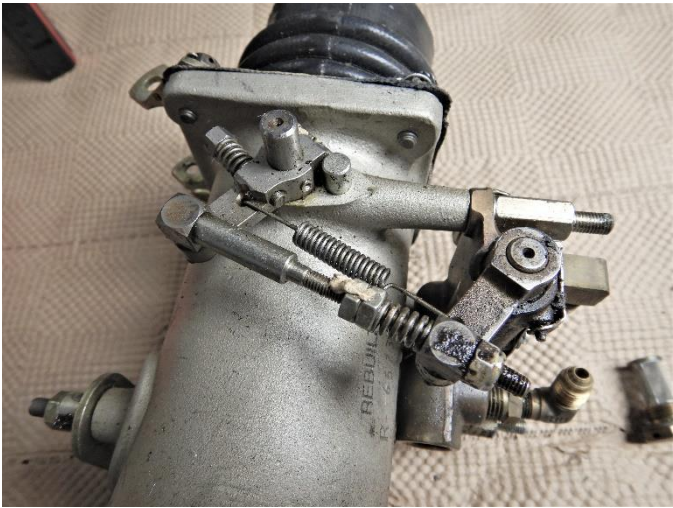
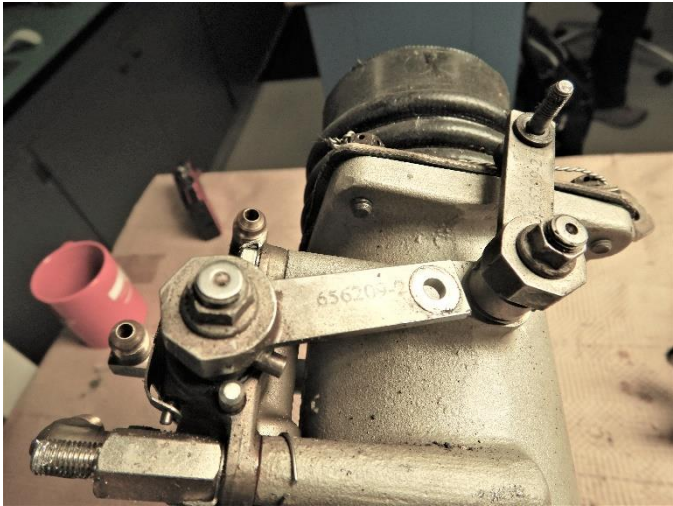
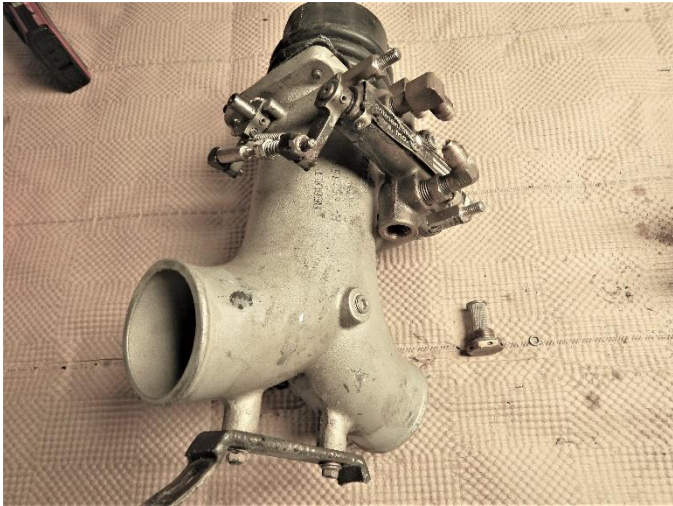
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FUEL SYSTEM

FUEL PUMP	Manufacturer: Continental	P/N: R646212-55A1	S/N: B16CA080R
Condition:	The fuel pump drive coupling was intact, and the fuel pump operated smoothly when manually rotated. A lead seal was present on the assembly bolts. The pump shaft would not slide from case bushing due to light corrosion on steel shaft.		



THROTTLE BODY METERING UNIT	Manufacturer: Continental	P/N: R657026A1	S/N: A160DA089R
Condition:	The control arms were secured properly. The fuel screen was clean. Adjustment hardware was secure.		



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FUEL MANIFOLD VALVE

Manufacturer: Continental

P/N: 646508-14A4

S/N: C16DA078R

Condition:

The fuel manifold data plate was removed by unknown persons at the accident site. The two assembly screws were missing. The data plate was located on the crankcase near the fuel manifold mount. The photo below on the top left is from the accident site. Assembly hardware was secured properly.



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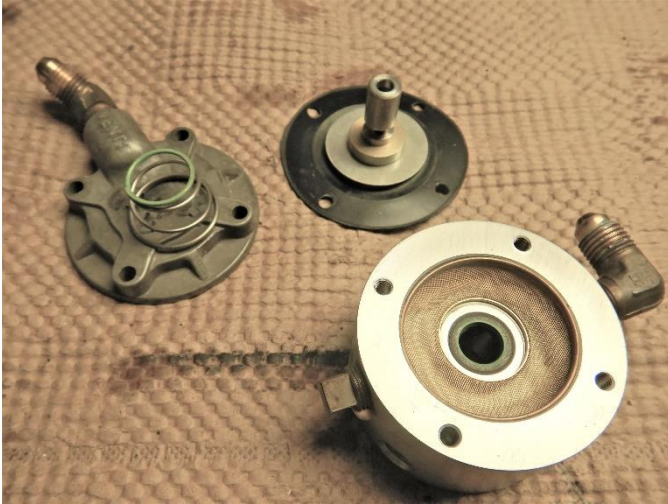
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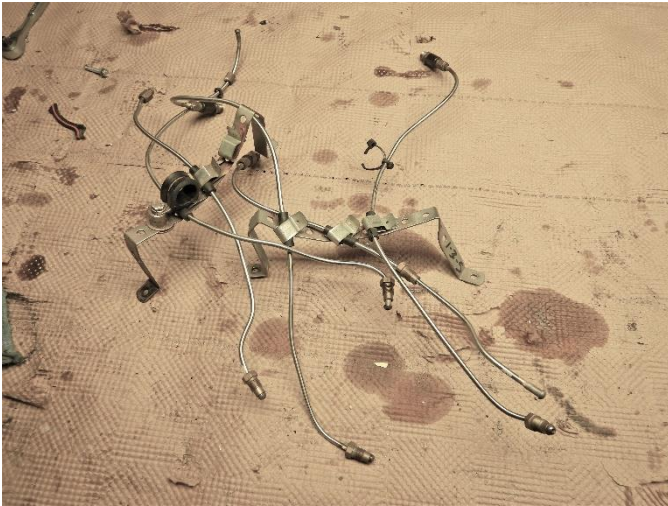
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FUEL NOZZLES AND LINES

Manufacturer: Continental

Position	#1	#3	#5	#2	#4	#6
Size	1255	325?	5250	2253	4245	6245
Condition:	All injection orifices were open. Injector # 4 was impact damaged.					



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LUBRICATION SYSTEM

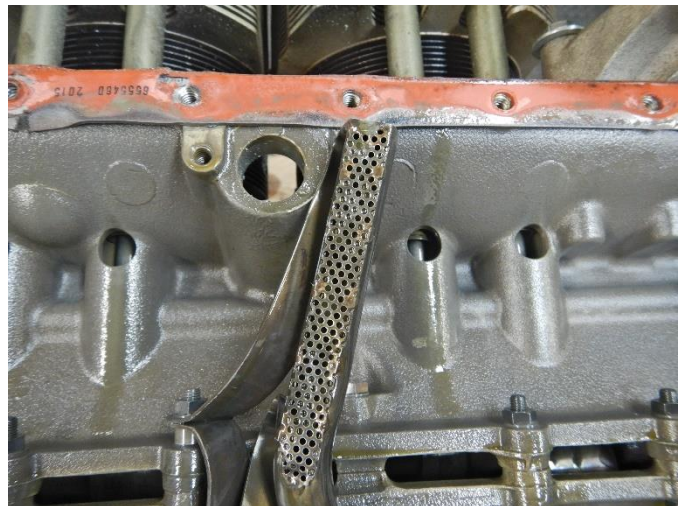
OIL SUMP

Condition: The oil sump was impact damaged.



OIL PICK-UP TUBE & SCREEN

Condition: The pick-up tube was displaced upward due to impact forces. The screen was clean.



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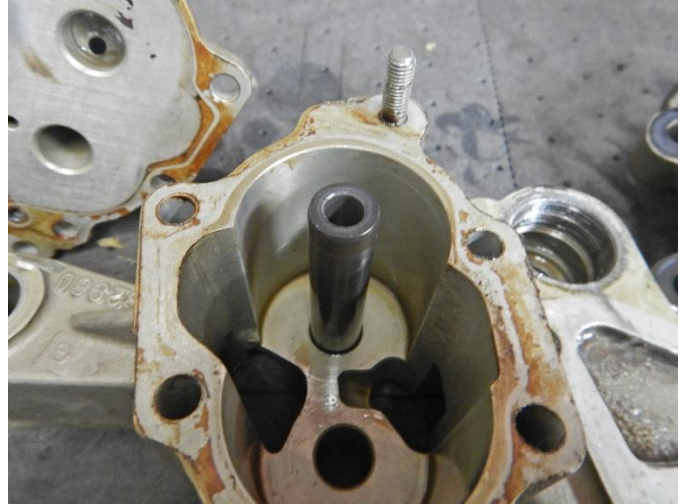
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OIL PUMP

Condition:

There was no evidence of hard particle passage on gears, pump cavity, or end plate.



OIL FILTER

Manufacturer: Champion

P/N: CH48108-1

Condition:

No metal contamination found in filter media.



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OIL COOLER		Manufacturer: Niagara Thermal Products	P/N: 10276A	S/N: A16-13010-72
Condition:	The oil cooler was intact with minor damage to the attachment flange.			



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CYLINDERS

CYLINDER #1	P/N: 658552A1	S/N:AC16CB011	Head Date: 3/16
Work Orders:	NA		
Condition:	Cylinder exhibited normal operating signatures.		



CYLINDER #3	P/N: 658552A1	S/N: AC16BB883	Head Date: 3/16
Work Orders:	NA		
Condition:	Cylinder exhibited normal operating signatures.		



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CYLINDER #5	P/N: 658552A1	S/N: AC16CA082	Head Date: 3/16
Work Orders:	NA		
Condition:	Cylinder # 5 exhibited impact damage to the lower cylinder head and push rods.		



CYLINDER #2	P/N: 658552A1	S/N: AC16CA096	Head Date: 3/16
Work Orders:	NA		
Condition:	Cylinder exhibited normal operating signatures.		



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CYLINDER #4	P/N: 658552A1	S/N: AC16BB864	Head Date: 3/16
Work Orders:	NA		
Condition:	Cylinder exhibited normal operating signatures.		



CYLINDER #6	P/N: 658552A1	S/N: AC16BA109	Head Date: 3/16
Work Orders:	NA		
Condition:	Cylinder exhibited normal operating signatures.		



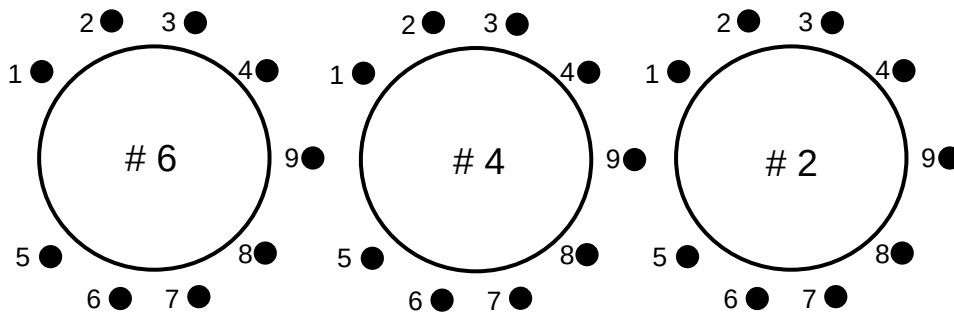
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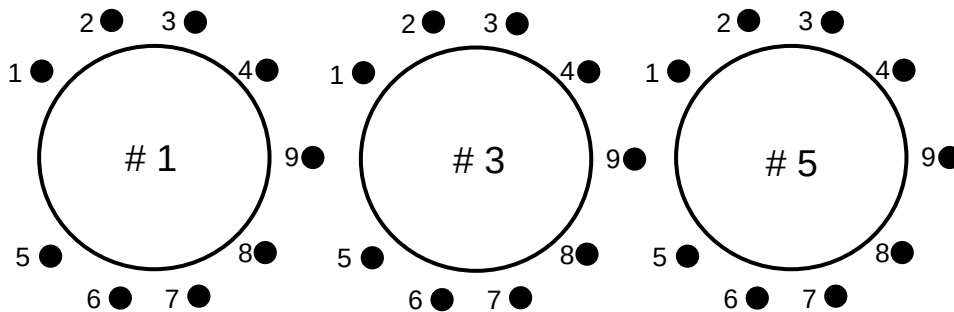
Cylinder Through-Bolt and Deck Stud Break-Away (Tightening/Loosening) Torque Measurements (in-lbs)

(NOTE: Position numbers 1 and 5 are through-bolts)

	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder #2	1249 / 998	959 / 831	973 / 836	994 / 869	1082 / 883	981 / 803	992 / 791	952 / 716	1090 / 717
Cylinder #4	952 / 834	1036 / 878	1007 / 869	865 / 800	944 / 789	939 / 728	948 / 758	979 / 815	732 / 552
Cylinder #6	1022 / 839	778 / 690	868 / 765	802 / 723	1026 / 903	913 / 712	931 / 728	973 / 790	761 / 491



	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder # 1	908 / 968	935 / 797	916 / 789	957 / 831	1135 / 853	811 / 676	882 / 638	849 / 691	645 / 801
Cylinder # 3	893 / 811	857 / 735	808 / 684	766 / 707	1206 / 803	768 / 460	921 / 709	973 / 795	755 / 514
Cylinder # 5	748 / 625	834 / 707	890 / 803	710 / 607	1286 / 926	832 / 699	752 / 626	447 / 659	702 / 510



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VALVES AND GUIDES

Condition:

All valves were intact. Valve heads and combustion chambers were nearly devoid of combustion deposits.



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ROCKER ARMS AND SHAFTS

Condition: All rocker arms and shafts were intact and in place. Pushrods for cylinder # 5 were impact damaged.



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#1 PISTON, RINGS AND PIN

Piston P/N: 654857

Condition:

The piston was intact with light combustion deposits. The rings were intact and free in their grooves.



#3 PISTON, RINGS AND PIN

Piston P/N: 654857

Condition:

The piston was intact with light combustion deposits. The rings were intact and free in their grooves.



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#5 PISTON, RINGS AND PIN

Piston P/N: 654857

Condition:

The piston was intact with light combustion deposits. The rings were intact and free in their grooves.



#2 PISTON, RINGS AND PIN

Piston P/N: 654857

Condition:

The piston was intact with light combustion deposits. The rings were intact and free in their grooves.



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#4 PISTON, RINGS AND PIN

Piston P/N: 654857

Condition:

The piston was intact with light combustion deposits. The rings were intact and free in their grooves.



#6 PISTON, RINGS AND PIN

Piston P/N: 654857

Condition:

The piston was intact with light combustion deposits. The rings were intact and free in their grooves.



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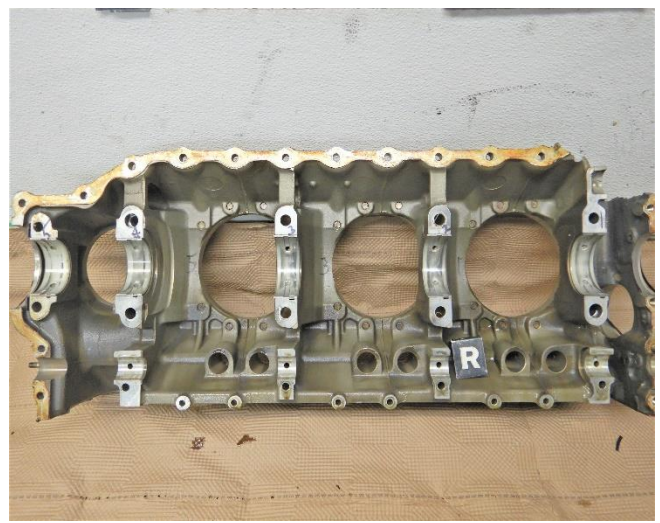
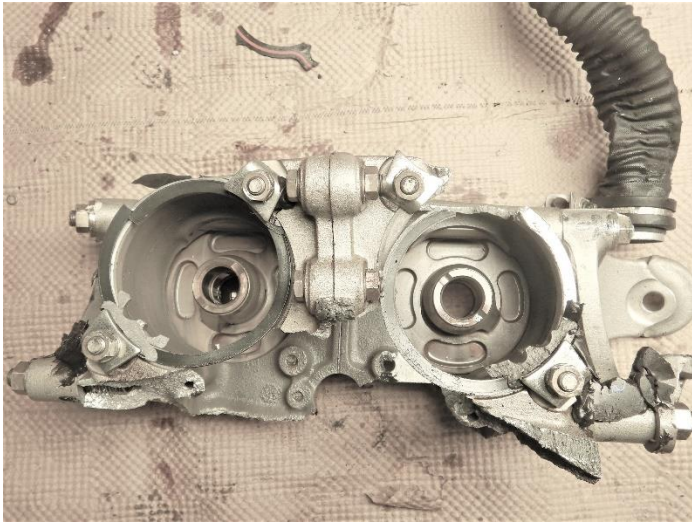
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CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: 655434	2-4-6: 655435	S/N: R16BA121
Condition:	The rear-top portion of the crankcase at the magneto mount/top engine mount separated due to impact damage. The top section released during the engine examination.			



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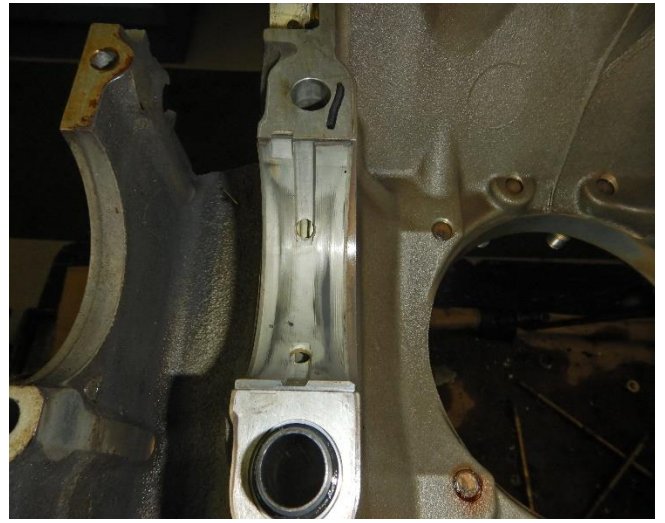
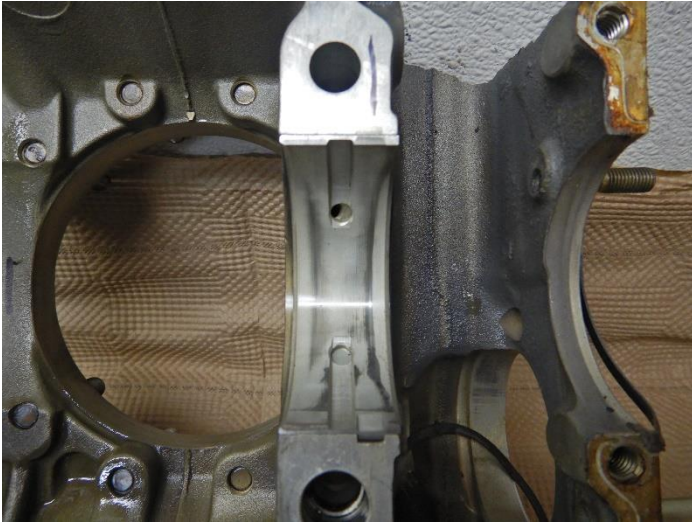
#1 MAIN BEARINGS

P/N: 634503

Date Code: 3/16

Condition:

The bearing exhibited normal operating signatures.



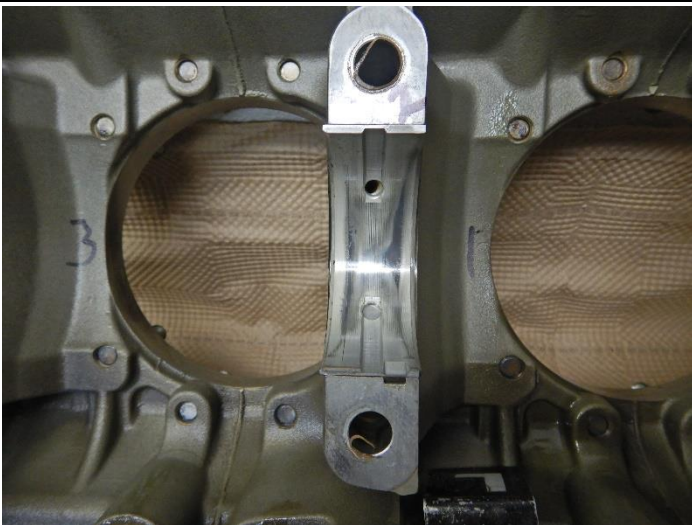
#2 MAIN BEARINGS

P/N: 634503

Date Code: 3/16

Condition:

The bearing exhibited normal operating signatures.



ENGINE EXAMINATION REPORT

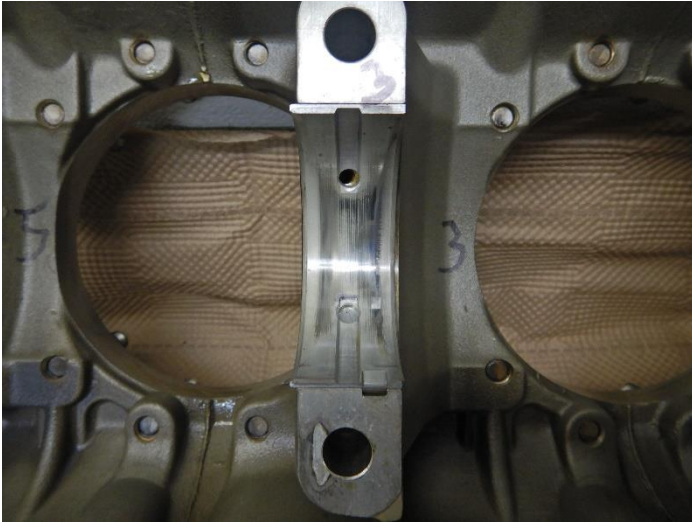
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#3 MAIN BEARINGS

P/N: 634503

Date Code: 3/16

Condition: The bearing exhibited normal operating signatures.

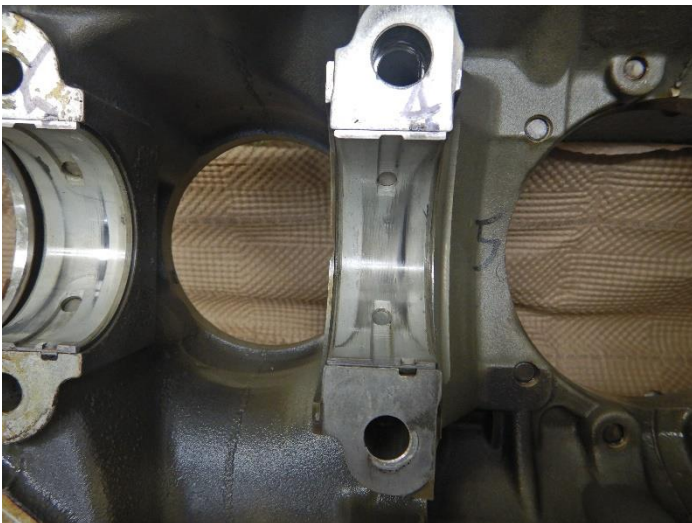


#4 MAIN BEARINGS

P/N: 653547

Date Code: 1/16

Condition: The bearing exhibited normal operating signatures.



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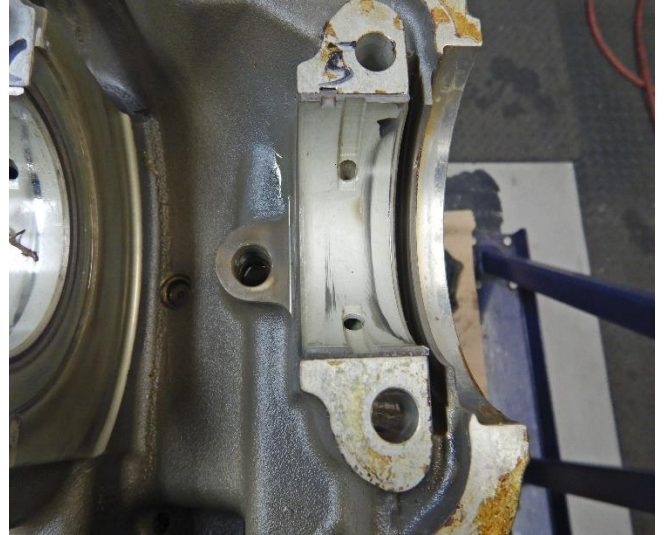
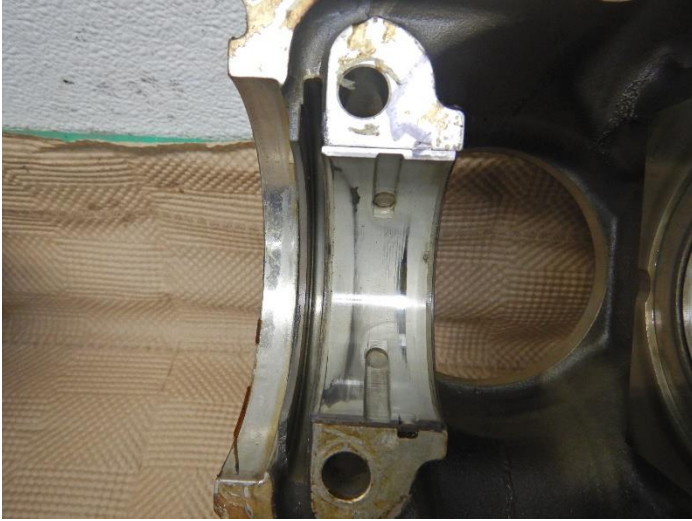
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#5 MAIN BEARINGS

P/N: 653547

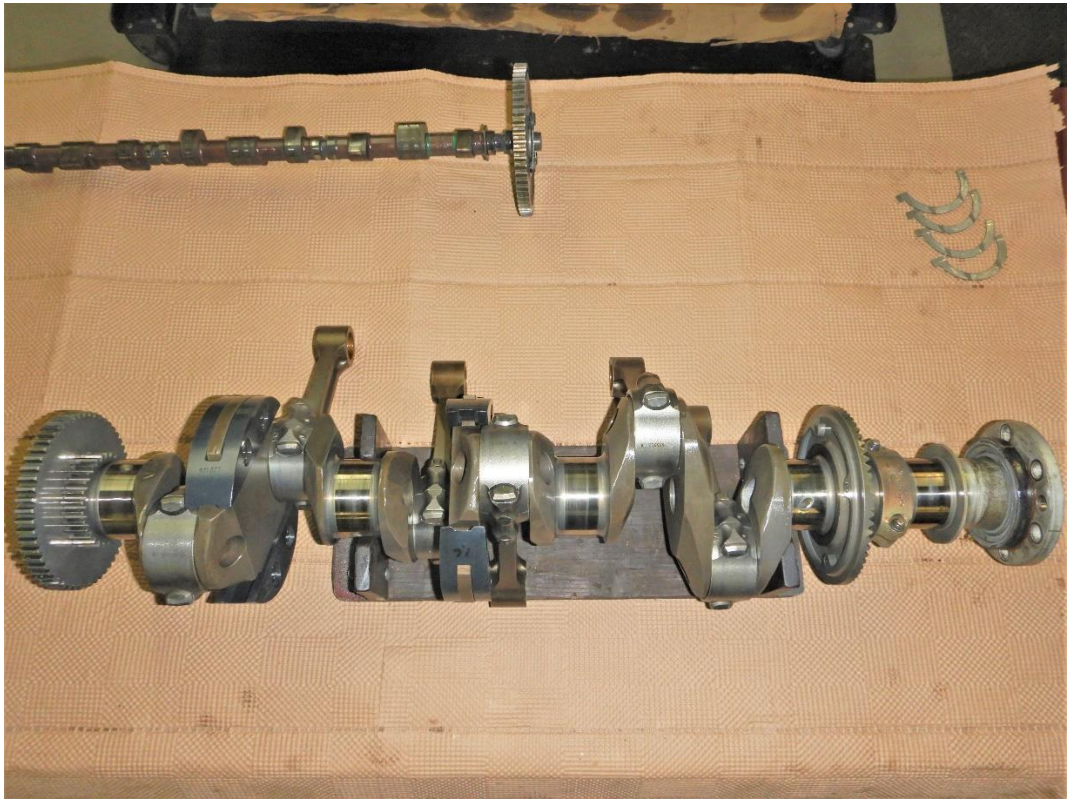
Date Code: 1/16

Condition:	The bearing exhibited normal operating signatures.
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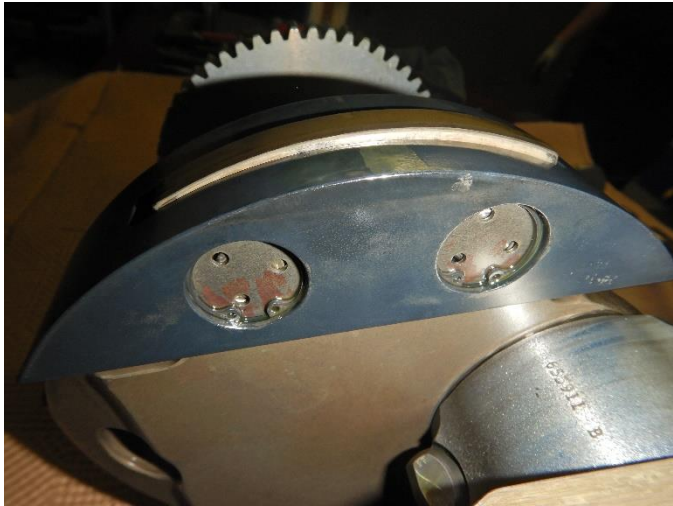


CRANKSHAFT ASSEMBLY

CRANKSHAFT	Forging Number: 649878	S/N: N16AA197	Heat code: KXT
Condition:	The crankshaft exhibited normal operating signatures.		



COUNTER WEIGHTS	
Condition:	Dampers floated freely on pins. All plates and snap rings were intact and oriented correctly.

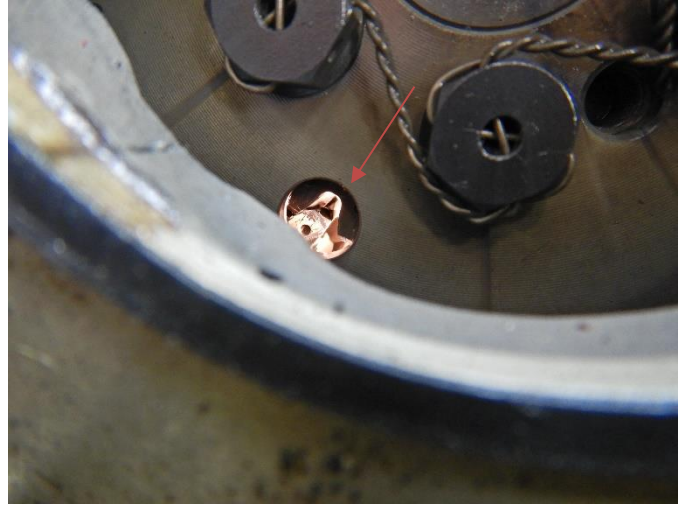


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INTERNAL TIMING

Condition: Correct internal timing was verified.



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#1 CONNECTING ROD

P/N: 655911

Forging or Serial Number: AE16DA142

Condition: The connecting rod exhibited normal operating signatures.

#1 CONNECTING ROD BEARING

P/N: 642398

Condition: Bearing exhibited normal operating signatures.



#3 CONNECTING ROD

P/N: 655911

Forging or Serial Number: AE16DA143

Condition: The connecting rod exhibited normal operating signatures.

#3 CONNECTING ROD BEARING

P/N: 642398

Condition: Bearing exhibited normal operating signatures.



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#5 CONNECTING ROD

P/N: 655911

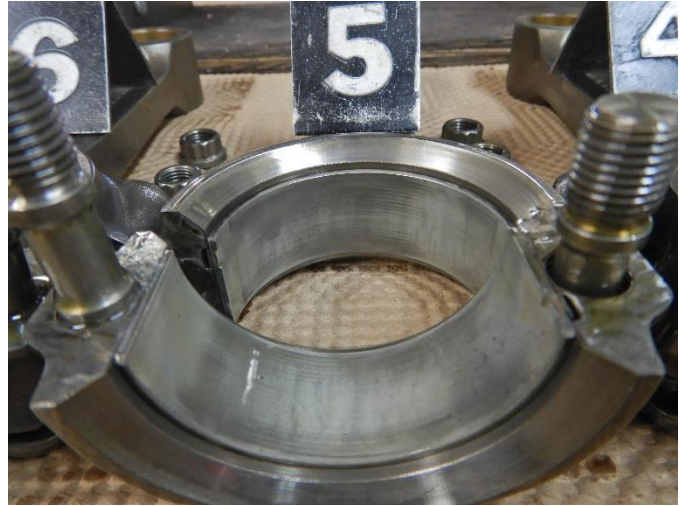
Forging or Serial Number: AE16DA169

Condition: The connecting rod exhibited normal operating signatures.

#5 CONNECTING ROD BEARING

P/N: 642398

Condition: Bearing exhibited normal operating signatures.



#2 CONNECTING ROD

P/N: 655911

Forging or Serial Number: AE16DA183

Condition: The connecting rod exhibited normal operating signatures.

#2 CONNECTING ROD BEARING

P/N: 642398

Condition: Bearing exhibited normal operating signatures.



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#4 CONNECTING ROD	P/N: 655911	Forging or Serial Number: AE16DA184
Condition:	The connecting rod exhibited normal operating signatures.	
#4 CONNECTING ROD BEARING	P/N: 642398	
Condition:	Bearing exhibited normal operating signatures.	



#6 CONNECTING ROD	P/N: 655911	Forging or Serial Number: AE16DA171
Condition:	The connecting rod exhibited normal operating signatures.	
#6 CONNECTING ROD BEARING	P/N: 642398	
Condition:	Bearing exhibited normal operating signatures.	



CAMSHAFT

CAMSHAFT	P/N: 654084	S/N: 76158
Condition:	Exhibited normal operating signatures.	



LIFTERS	#1	#3	#5	#2	#4	#6
INTAKE	658088	658088	658088	658088	658088	658088
EXHAUST	658077	658077	658077	658077	658077	658077
Condition:	All lifters exhibited normal operating signatures.					



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ACCESSORY GEARS

Condition:

All gears exhibited normal operating signatures. Assembly bolts were correctly secured.

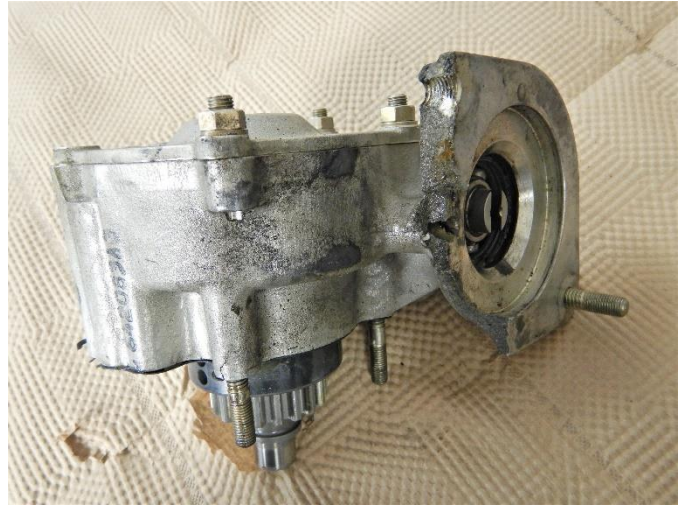
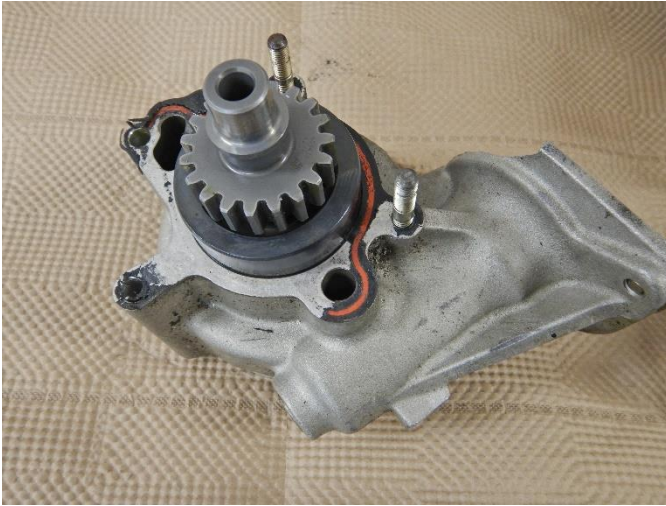


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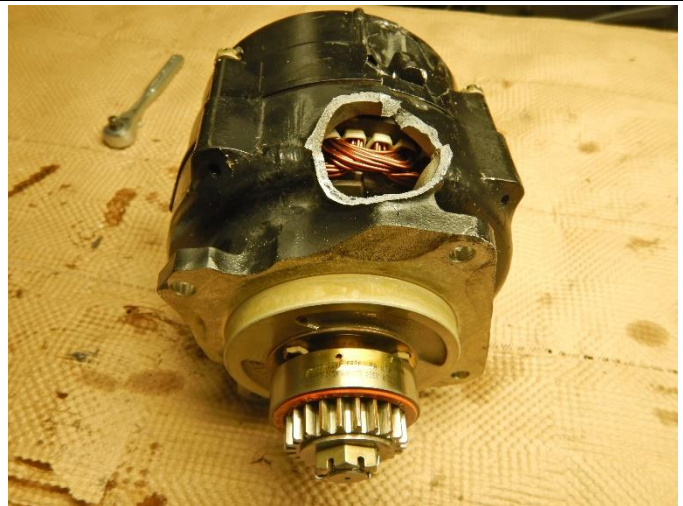
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ACCESSORIES

STARTER	Manufacturer: Undetermined	P/N: Undetermined	S/N: Undetermined
Condition:	Starter motor was not shipped with engine. Recovery photos do not include a starter motor.		
STARTER ADAPTER	P/N: R629668		
Condition:	The starter motor mounting ring was broken. The starter adapter turned smoothly when manually rotated.		

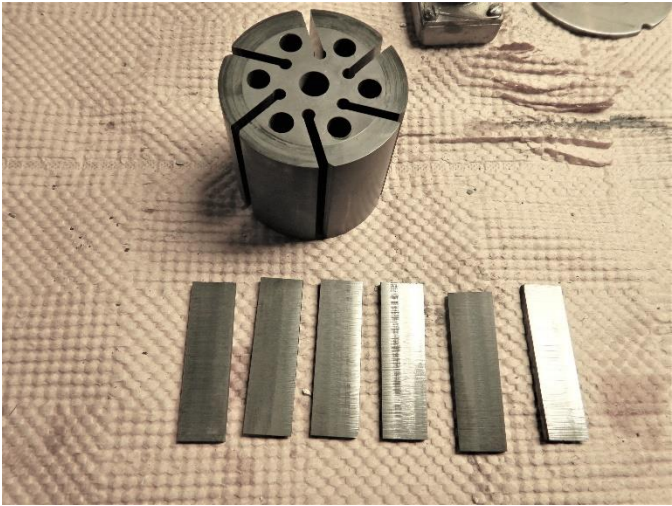
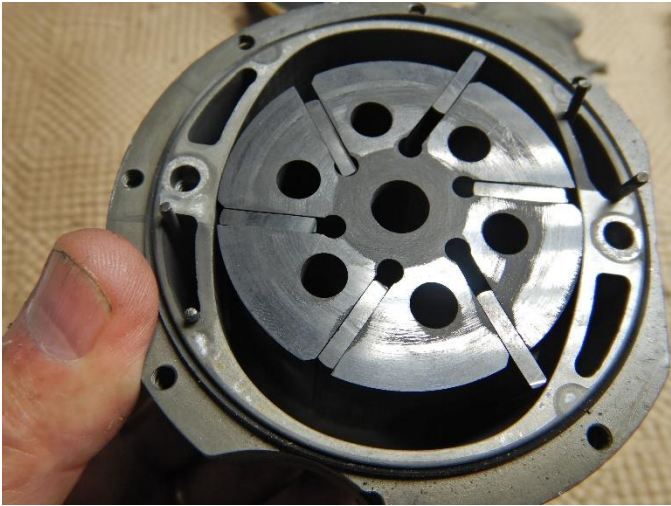
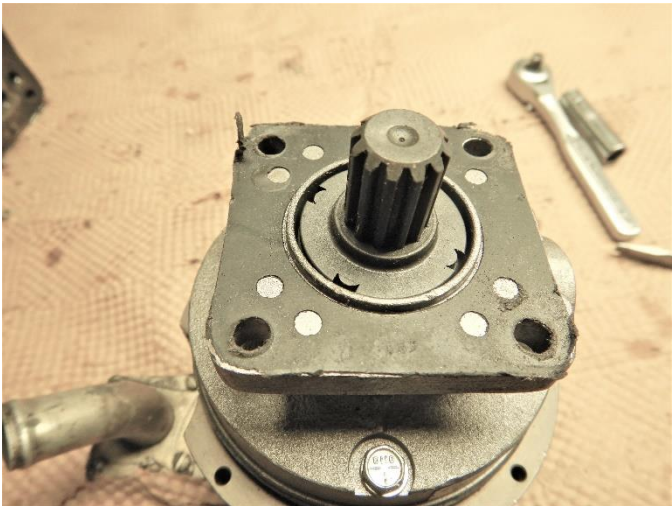


ALTERNATOR	Manufacturer: Continental	P/N: R649805	S/N: 017CA068R
Condition:	The alternator rotated smoothly. The lower case exhibited impact damage. The drive coupling was intact and secured properly.		



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VACUUM PUMP	Manufacturer: Airborne	P/N: 442CW-12	S/N: 0AGF06
Condition:	The external case exhibited impact damage. The drive couplings were intact. The pump turned smoothly when manually rotated. The carbon rotor and vanes were intact.		



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PROPELLER GOVERNOR

Manufacturer: Woodward

M/N: B210800 J

S/N: 12044328

Condition: The propeller pump rotated freely expelling oil form the port. The gasket/screen was uncontaminated, and the control arm was correctly secured with the control cable rod-end still attached.

