CONTINENTAL™
AEROSPACE TECHNOLOGIES

ENGINE EXAMINATION REPORT

ENGINE MODEL	O-300-D (6B)
ENGINE SERIAL NUMBER	27160-D-2-D
AIRCRAFT MAKE & MODEL	1958 Cessna 172
AIRCRAFT SERIAL NUMBER	36320
AIRCRAFT REGISTRATION	N8620B
FILE NUMBER	18-370

NAME	SIGNATURE	DATE
Phillip Grice	[redacted]	03-02-2020
Mike Council	[redacted]	2-18-2020

GENERAL INFORMATION

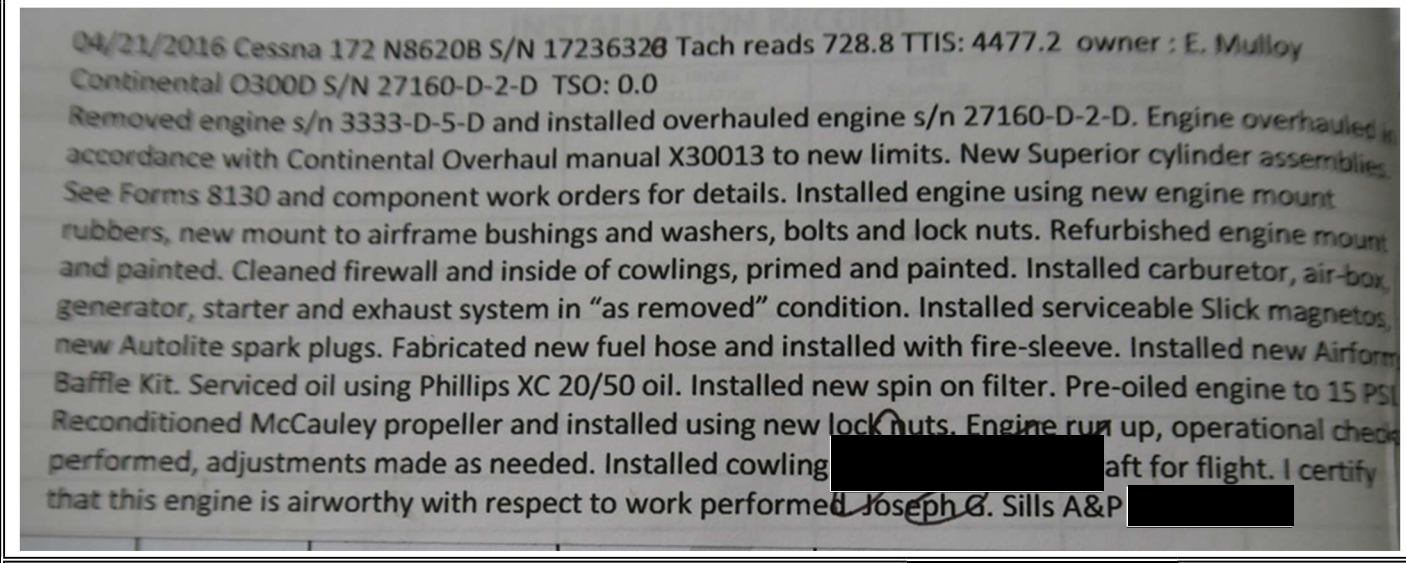
EXAMINATION		ACCIDENT DATA	
DATE	6-17-2019	**NTSB ACCIDENT #**	CEN19FA099
FACILITY	Continental Aerospace Technologies-Analytical	**NTSB INVESTIGATOR**	Michael Hodges, IIC Central Region
ADDRESS	2039 South Broad Street Mobile, Alabama	**FAA INVESTIGATOR**	NA
		ACCIDENT DATE	3-14-2019
		ACCIDENT LOCATION	Lakeway, TX

ENGINE INFORMATION

ENGINE POSITION	Single
TOTAL TIME	4630.5 calculated
TIME SOH	153.3 hours calculated
TYPE & TIME SLI	99.3 hours calculated since last 100-hour inspection dated 11-7-2018
BUILD DATE	3-26-1962 (shipped to Cessna Aircraft) according to CMI Serial Data
IN SERVICE DATE	Original undetermined

Significant logbook information:

According to the engine logbooks, the accident engine was overhauled to factory new limits in the field 4-21-2016 using new Superior Air Parts cylinders. See copy of logbook excerpt below:



04/21/2016 Cessna 172 N8620B S/N 17236328 Tach reads 728.8 TTIS: 4477.2 owner : E. Mulloy
Continental O300D S/N 27160-D-2-D TSO: 0.0
Removed engine s/n 3333-D-5-D and installed overhauled engine s/n 27160-D-2-D. Engine overhauled in accordance with Continental Overhaul manual X30013 to new limits. New Superior cylinder assemblies. See Forms 8130 and component work orders for details. Installed engine using new engine mount rubbers, new mount to airframe bushings and washers, bolts and lock nuts. Refurbished engine mount and painted. Cleaned firewall and inside of cowlings, primed and painted. Installed carburetor, air-box, generator, starter and exhaust system in "as removed" condition. Installed serviceable Slick magnetos, new Autolite spark plugs. Fabricated new fuel hose and installed with fire-sleeve. Installed new Airform Baffle Kit. Serviced oil using Phillips XC 20/50 oil. Installed new spin on filter. Pre-oiled engine to 15 PSI Reconditioned McCauley propeller and installed using new lock nuts. Engine run up, operational checks performed, adjustments made as needed. Installed cowling [redacted] aft for flight. I certify that this engine is airworthy with respect to work performed. Joseph G. Sills A&P [redacted]

Report Summary: | Search Code(s): 15-12-68

The engine was disassembled and inspected under the supervision of the NTSB IIC. This inspection 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 released by the NTSB IIC and returned to Air Salvage of Dallas. See shipper # AD01162 dated 6-19-2019.

INSPECTION WITNESSES			
NAME	Phillip Grice	**NAME**	Lisa Jersild
ADDRESS	Mobile, Alabama	**ADDRESS**	Mobile, Alabama
ORGANIZATION	Continental Aerospace Technologies	**ORGANIZATION**	Continental Aerospace Technologies
PHONE	[redacted]	**PHONE**	[redacted]
NAME	Randy Bryant	**NAME**	Michael Hodges, IIC
ADDRESS	Mobile, Alabama	**ADDRESS**	Central Region
ORGANIZATION	Continental Aerospace Technologies	**ORGANIZATION**	NTSB
PHONE	[redacted]	**PHONE**	[redacted]
NAME	Peter Basile	**NAME**	NA
ADDRESS	Wichita, KS	**ADDRESS**	
ORGANIZATION	Textron Aviation	**ORGANIZATION**	
PHONE	[redacted]	**PHONE**	

ASI-Mike Council did not attend the engine tear down examination.

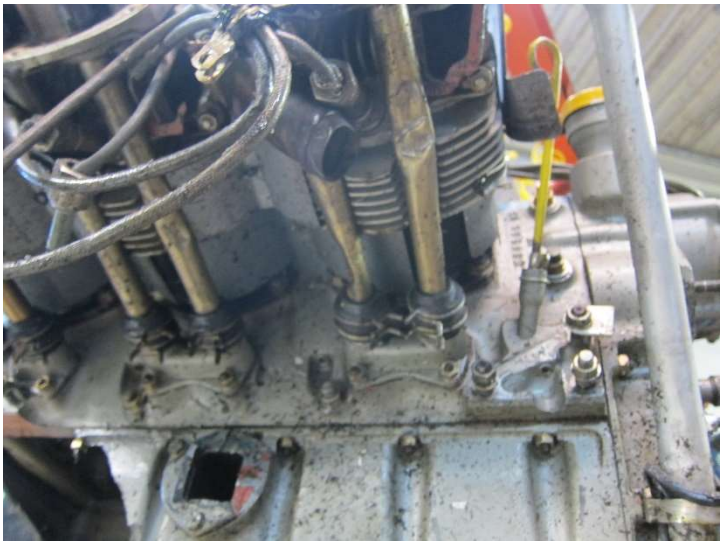
EXTERNAL INSPECTION OF ENGINE

The accident engine was received in a Continental Aerospace Technologies engine crate. The engine crate was opened in the presence of the NTSB IIC and the engine was removed and placed on an examination stand. A data plate attached to the crankcase identified the engine as a Continental Motors model O-300-D (6B) engine, serial number 27160-D-2-D.

Engine mounts were broken. The oil sump was impact damaged and the left forward/side separated.
Cylinder # 2 intake and exhaust push rods and push rod tubes were impact damaged.
Exhaust mufflers, tailpipes and risers were impact damaged.
Left induction manifold was impact damaged.
Ignition harness leads were cut and pinched.
Carburetor was impact damaged and shipped loose.

This engine has been visually inspected previously at the accident site. The following parts had been removed at the previous examination and not reinstalled:
Cylinder rocker arm covers
Left and right magnetos
Spin-on engine oil filter
Engine driven generator


HANDLE WITH CARE
THIS SIDE UP
N.T.S.B.
DO NOT OPEN




1-5/8

AIRFRAME COMPONENTS RETURNED WITH ENGINE

Cooling baffles
Engine driven generator
Right muffler assembly (Left muffler not received)
Instrument air pump
Aftermarket oil filter adapters and hoses
Oil Cooler – NOTE:
The current Continental Aerospace Technologies Illustrated Parts Catalog for this engine does not indicate that an oil cooler was included during the manufacturing of engine model O-300-D (6B) engines.

ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM	
Condition:	The exhaust system components were impact damaged. The muffler/heat exchanger was impact damaged. Left muffler assembly not shipped with engine.

INDUCTION SYSTEM	
Condition:	The left induction manifold was impact separated and not returned with the engine. The right induction manifold was intact except damage to the mounting flange.

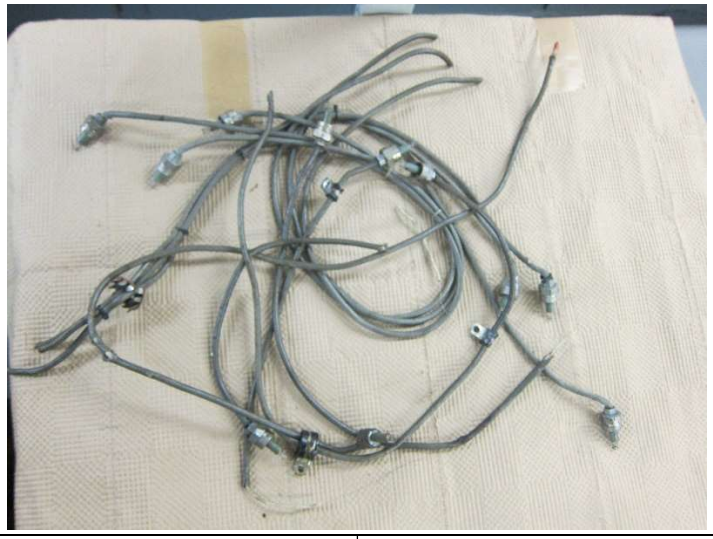
IGNITION SYSTEM

MAGNETO-TO-ENGINE TIMING	Specification: Rt. 26° BTDC Lt. 28°	L/H Magneto: NA	R/H Magneto: NA

Ignition timing could not be determined. The magnetos had been removed during the recovery examination.

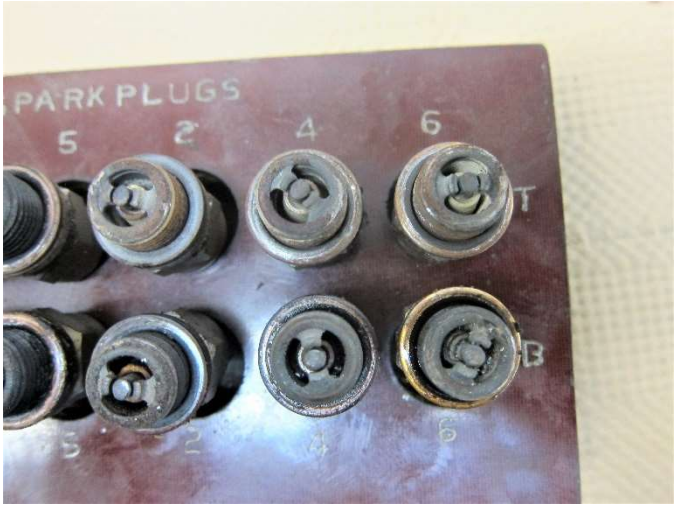
IGNITION HARNESS	Manufacturer: Slick-Unison	P/N: M-2930 (L) M-2931 (R)	S/N: Undetermined

Condition:	The ignition harness was impact damaged



SPARK PLUGS	Manufacturer: Tempest	P/N: UREM40E

Condition:	When compared to a Champion Spark Plug “Check-A-Plug” chart, the sparkplugs appear to be in *worn out normal* condition.



LEFT MAGNETO	Manufacturer: Slick-Unison Industries	M/N: 6364	S/N: 07090201
Condition:	The magneto had been removed during the initial recovery examination. The magneto and tested by manually rotating the drive and noting spark at all six ignition leads. The magneto was shipped loose in the shipping container. The magneto was bench tested and functioned normally.		

RIGHT MAGNETO	Manufacturer: Slick-Unison Industries	M/N: 6364	S/N: 07090204
Condition:	The magneto had been removed during the initial recovery examination. The magneto and tested by manually rotating the drive and noting spark at four of the six ignition leads. The magneto was shipped loose in the shipping container. The magneto was bench tested and functioned normally.		

FUEL SYSTEM

FUEL PUMP	Manufacturer: NA	P/N: NA	S/N:NA
Condition:	The engine was not equipped with an engine driven fuel pump in this application.		

CARBURETOR	Manufacturer: Precision	P/N: 10-4439-1	S/N: FV2192
Condition:	The airframe airbox and carburetor were impact separated at impact. The carburetor was destroyed by impact forces. Metal floats exhibited “hydraulic” damage consistent with fuel in the carburetor bowl at impact.		


MODEL
MA
36PA
MFR.
PART NO.
10-4439-1
KA E 04 44
S
2
31
ORIG
MFR

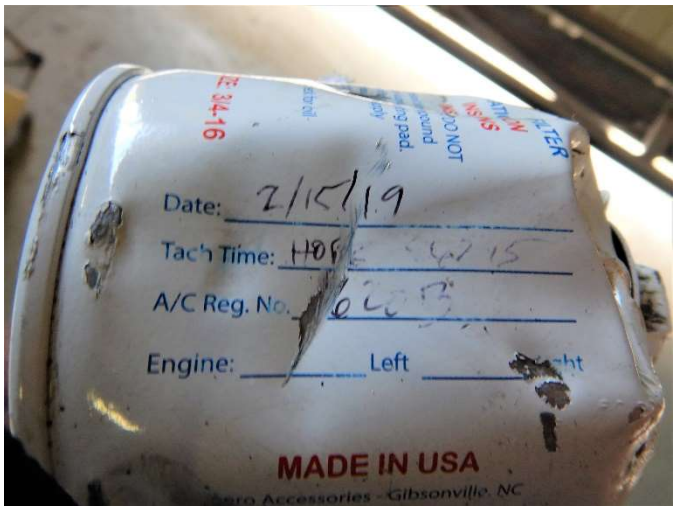
LUBRICATION SYSTEM

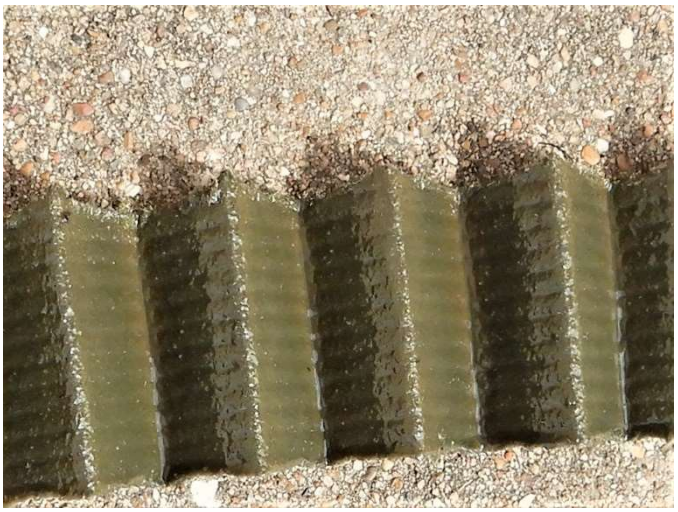
OIL SUMP	
Condition:	The oil sump was impact damaged. The left-forward section impact separated.

OIL PICK-UP SCREEN	
Condition:	The oil pick-up screen was uncontaminated.

OIL PUMP	
Condition:	The oil pump rotated normally with no binding or internal damage due to hard particle passage.

OIL FILTER	Manufacturer: Tempest	P/N: AA48108-2
Condition:	The spin-on oil filter had been previously removed at the recovery inspection and cut open for inspection. There was no metal contamination noted. Four photos below were taken at the recovery examination.	





OIL COOLER	Manufacturer: Niagara Thermal Products, Inc	P/N: 20002A	S/N: E15-12882-19
Condition:	The oil cooler exhibited impact damage		

The current Continental Aerospace Technologies Illustrated Parts Catalog for this engine does not indicate that an oil cooler was included during the manufacturing of model O-300-D (6B) engines.

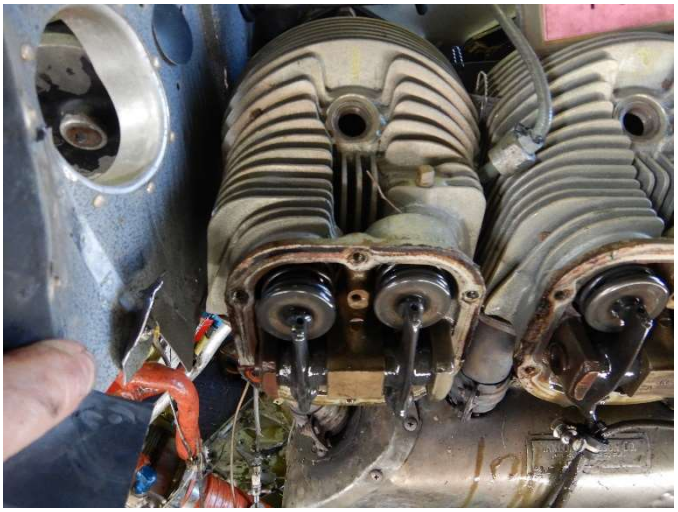
AFTERMARKET OIL FILTER ADAPTER		
FILTER ADAPTER	M/N: F&M 3?0-1	S/N:10190
OIL COOLER ADAPTER	STEVE'S AIRCRAFT	S/N: 252

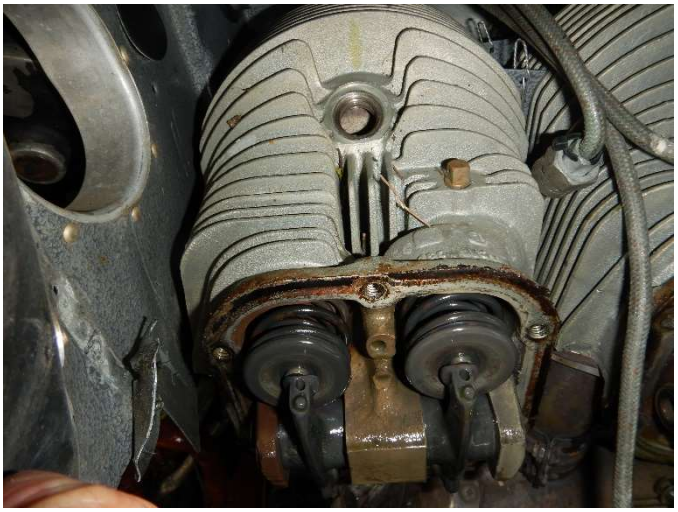
NOTE: The accident engine was equipped with an F&M aftermarket spin-on oil filter adapter model CO-300-1, serial number 10190. In addition, another aftermarket device was attached where the spin-on oil filter normally would be attached to the F&M adapter. This device had a placard indicating that it was manufactured by “Steve’s Aircraft”, serial number 252. This adapter included two flexible oil hoses attached which bypassed to the oil cooler. It was not determined if the two unrelated STC’d appliances were joined within the scope of either STC or with permission of either STC holder.

CYLINDERS

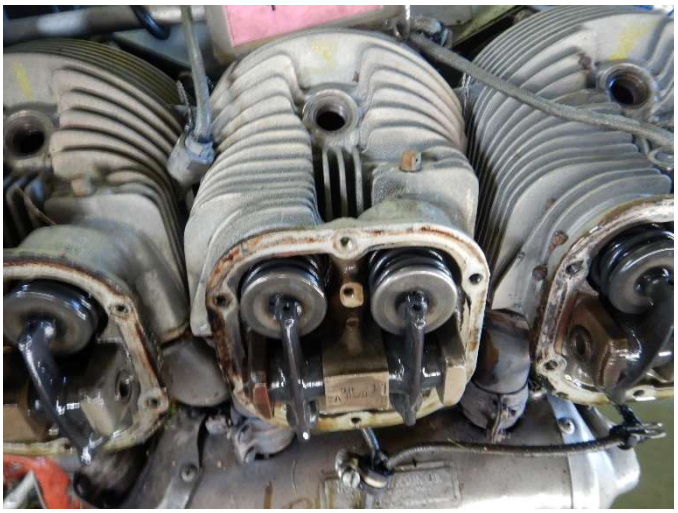
ALL CYLINDERS WERE MANUFACTURED BY *SUPERIOR AIR PARTS* AS FAA-PMA APPROVED CYLINDERS

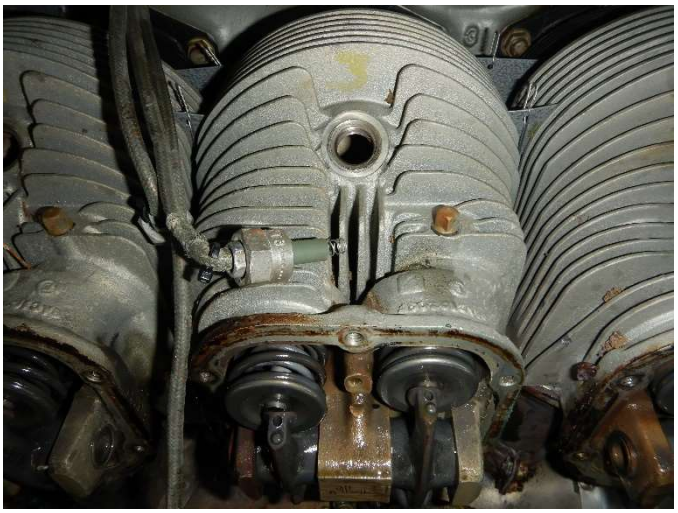
CYLINDER #1	P/N: SA 10200-A1	S/N:20-C15-41895	Head Date: Undetermined
Work Orders:	B-03309		
Condition:	No damage was noted.		





CYLINDER #3	P/N: SA 10200-A1	S/N:20-C15-41893	Head Date: Undetermined
Work Orders:	B-03291		
Condition:	Intake and exhaust push rods and push rod tubes were impact damaged.		



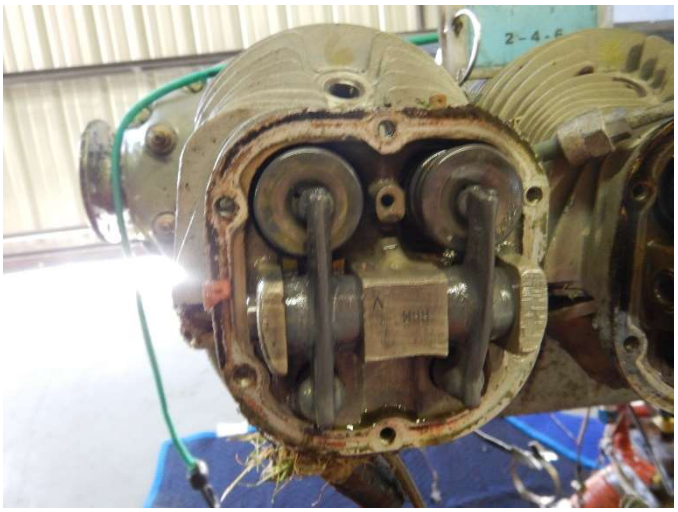


CYLINDER #5	P/N: SA 10200-A1	S/N: Undetermined	Head Date: Undetermined
Work Orders:	B03929		
Condition:	No damage was noted		

CYLINDER #2	P/N: SA 10200-A1	S/N:20-C15-41889	Head Date: Undetermined
Work Orders:	B-03365		
Condition:	No damage was noted except impact damage to pushrod tubes and pushrods		

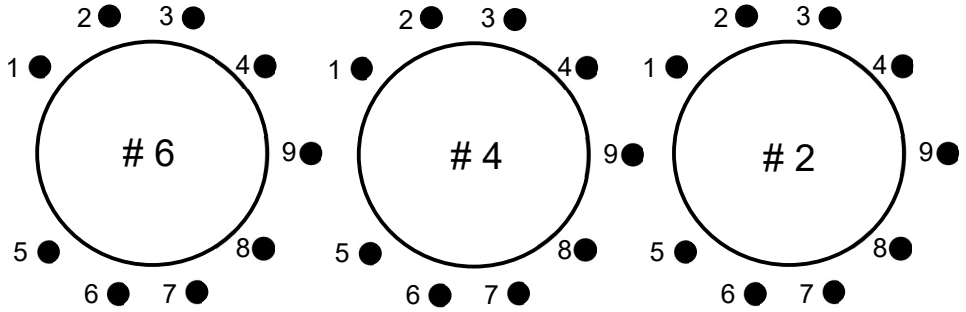
CYLINDER #4	P/N: SA 10200-A1	S/N:20-G15-42231	Head Date: Undetermined
Work Orders:	B-03970		
Condition:	No damage was noted		

CYLINDER #6	P/N: SA 10200-A1	S/N:20-C15-41886	Head Date: Undetermined
Work Orders:	B-03478		
Condition:	No damage was noted		

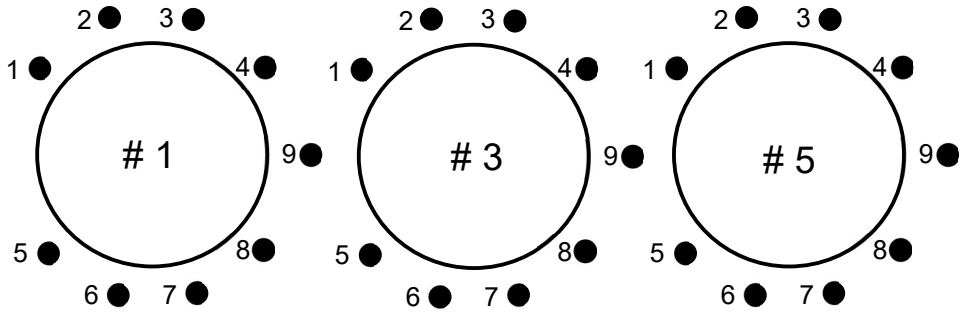


Cylinder Through-Bolt and Deck Stud Break-Away (Tightening/Loosening) Torque Measurements (in-lbs.)
(NOTE: Position numbers 1 and 5 are through bolts)

	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	563 / 430	570 / 390	626 / 473	N/A	598 / 450	565 / 450	746 / 589	N/A	N/A
Cylinder #4	550 /449	586 / 428	673 / 483	N/A	487 / 467	593 / 466	694 / 516	N/A	N/A
Cylinder #6	668 / 523	660 / 606	748 / 617	N/A	670 / 576	654 / 572	851 / 730	N/A	N/A

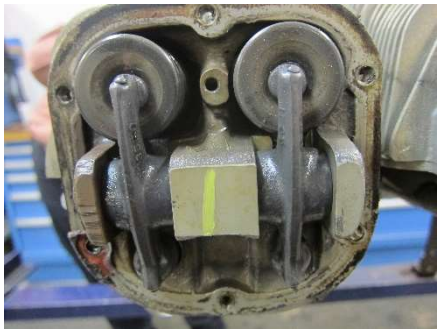


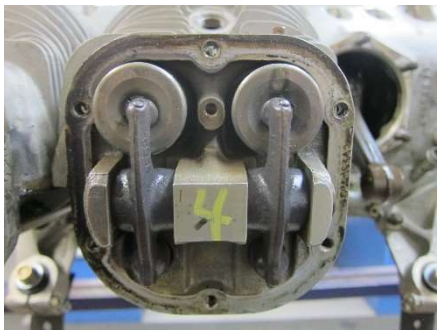
	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder # 1	517 / 584	631 / 557	748 / 647	N/A	653/ 598	530 / 454	752 / 659	N/A	N/A
Cylinder # 3	Loose	527/ 430	682 / 540	N/A	Loose	465 / 434	706 /605	N/A	N/A
Cylinder # 5	405 / 373	615 / 608	761/ 664	N/A	626 / 542	565 / 517	653 / 565	N/A	N/A

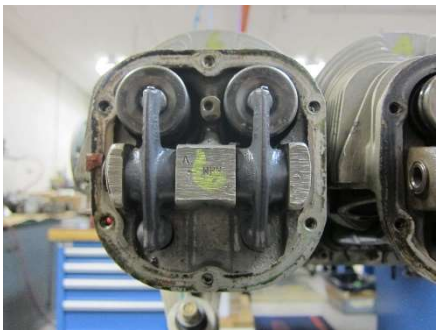


VALVES AND GUIDES	
Condition:	All intake and exhaust valves were intact and exhibited normal combustion signatures.

ROCKER ARMS AND SHAFTS	
Condition:	All rocker arms and shafts were intact and moved normally when the engine was rotated manually except cylinder 2 which sustained impact damage to the intake and exhaust pushrods.






#1 PISTON, RINGS AND PIN	Piston P/N: 654853B
Condition:	Normal combustion signatures and wear patterns

#3 PISTON, RINGS AND PIN	Piston P/N: 654853B
Condition:	Normal combustion signatures and wear patterns

#5 PISTON, RINGS AND PIN	Piston P/N: 654853B
Condition:	Normal combustion signatures and wear patterns

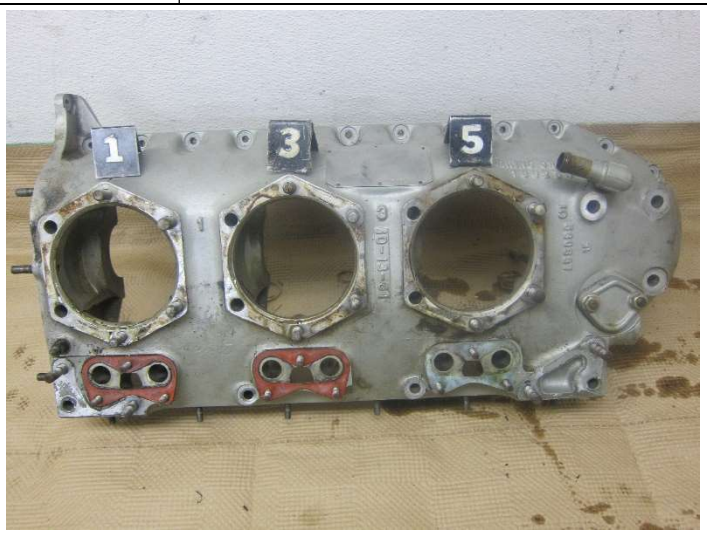
#2 PISTON, RINGS AND PIN	Piston P/N: 654853B
Condition:	Normal combustion signatures and wear patterns

#4 PISTON, RINGS AND PIN	Piston P/N: 654853B
Condition:	Normal combustion signatures and wear patterns

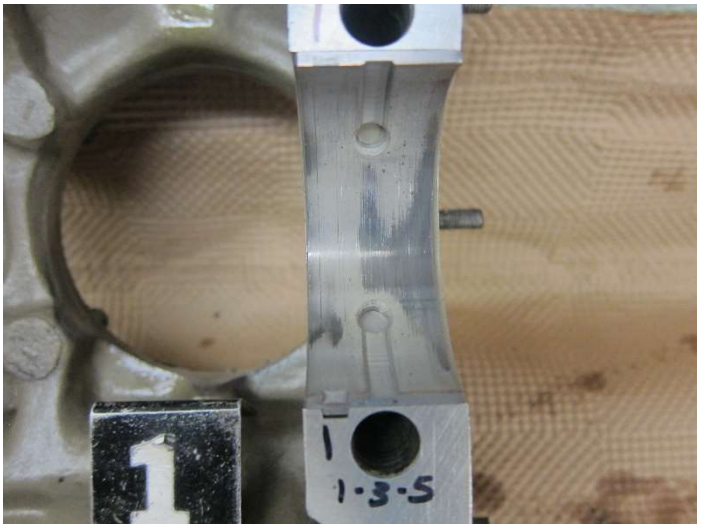
#6 PISTON, RINGS AND PIN	Piston P/N: 654853B
Condition:	Normal combustion signatures and wear patterns

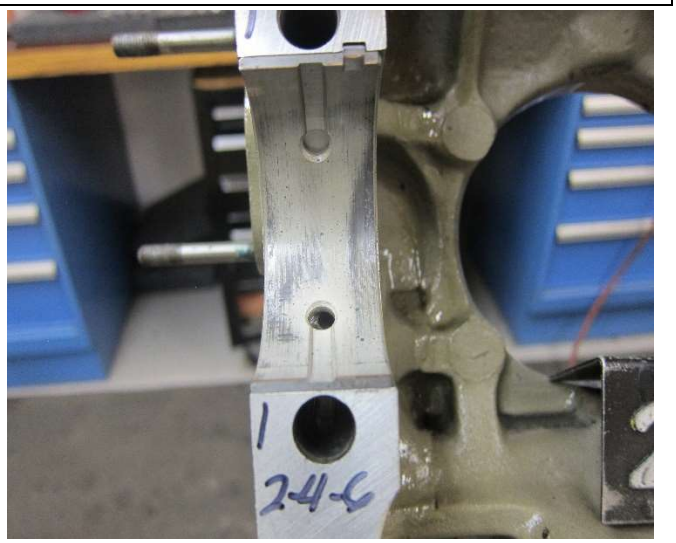
CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: 530836	2-4-6: 530837	S/N: 51157-103
Condition:	Exhibited normal operating signatures			

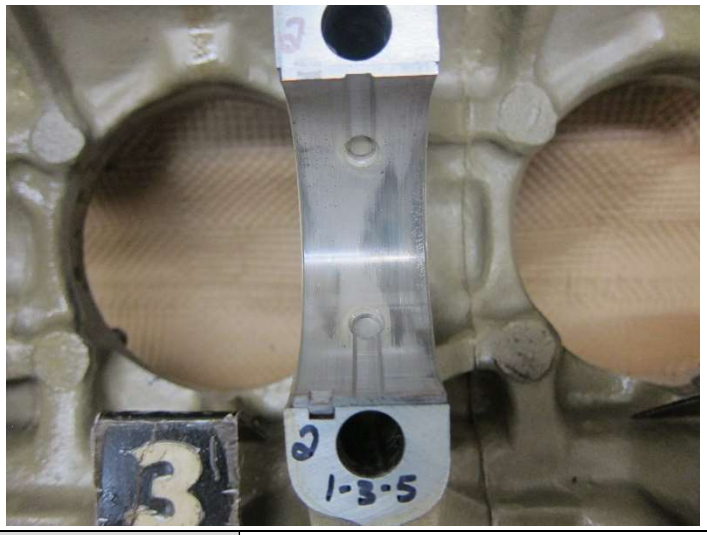


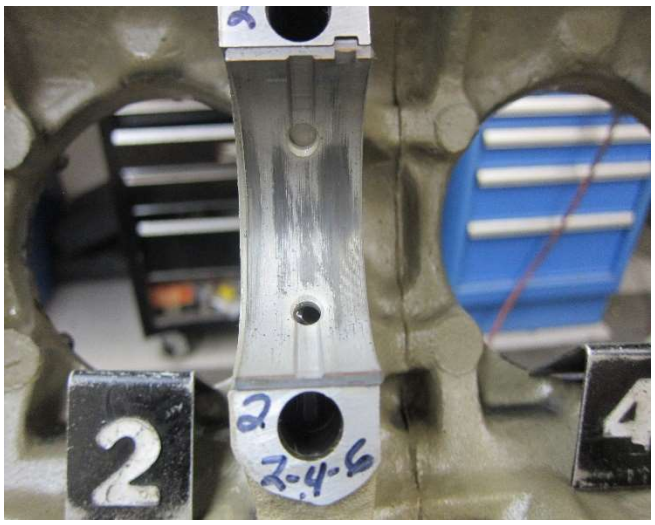
#1 MAIN BEARINGS	P/N: 626230-M010	Date Code: 06/13
Condition:	Exhibited normal operating signatures	



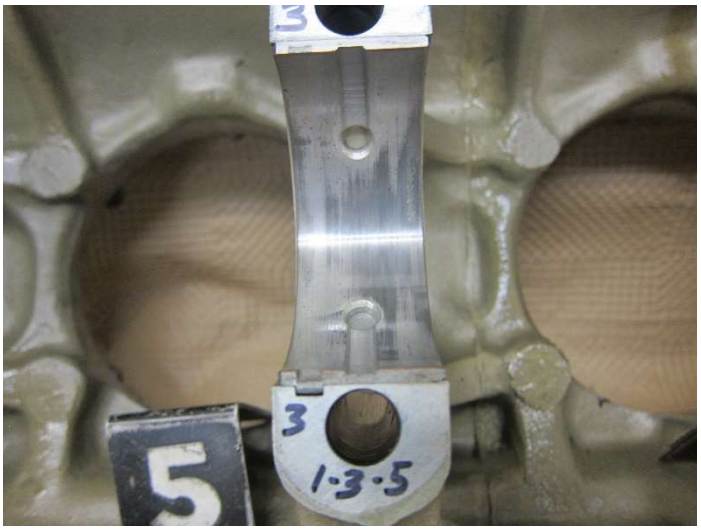


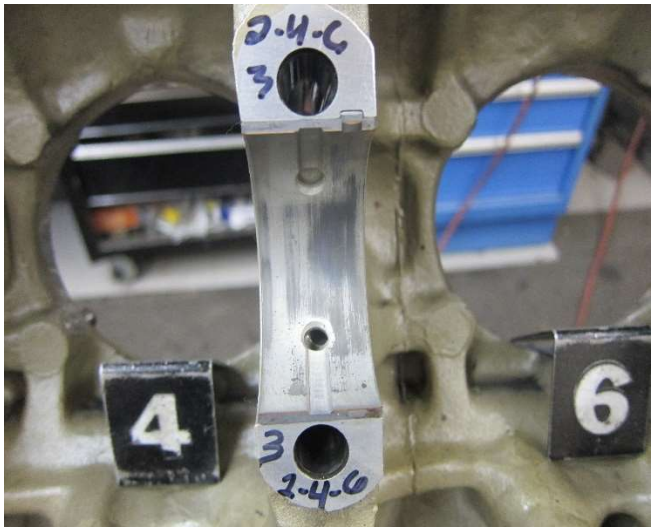
#2 MAIN BEARINGS	P/N: 626230-M010	Date Code: 06/13
Condition:	Exhibited normal operating signatures	



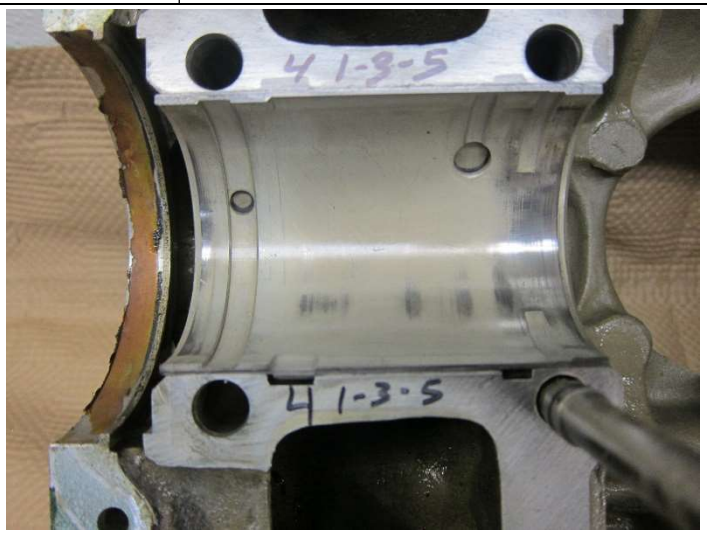


#3 MAIN BEARINGS	P/N: 626230-M010	Date Code: 06/13
Condition:	Exhibited normal operating signatures	



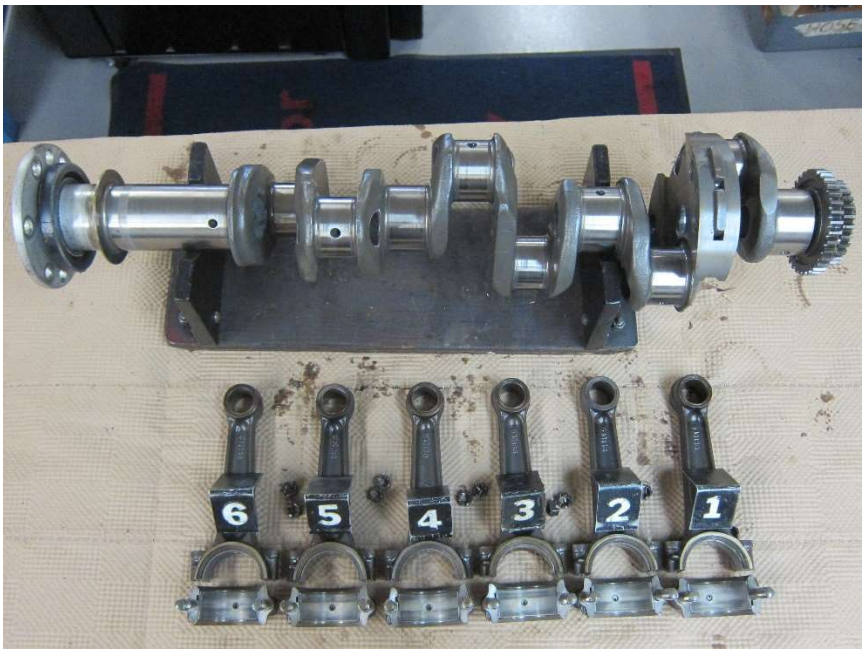


#4 MAIN BEARINGS	P/N: 652152-M010	Date Code: 03-14
Condition:	Exhibited normal operating signatures	

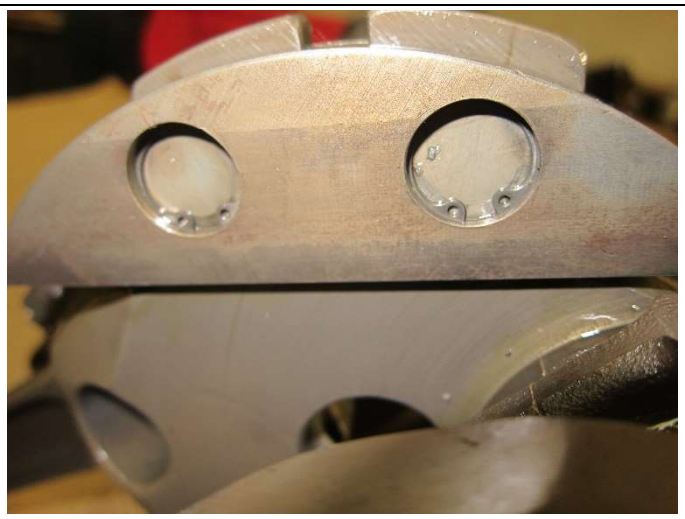


CRANKSHAFT ASSEMBLY

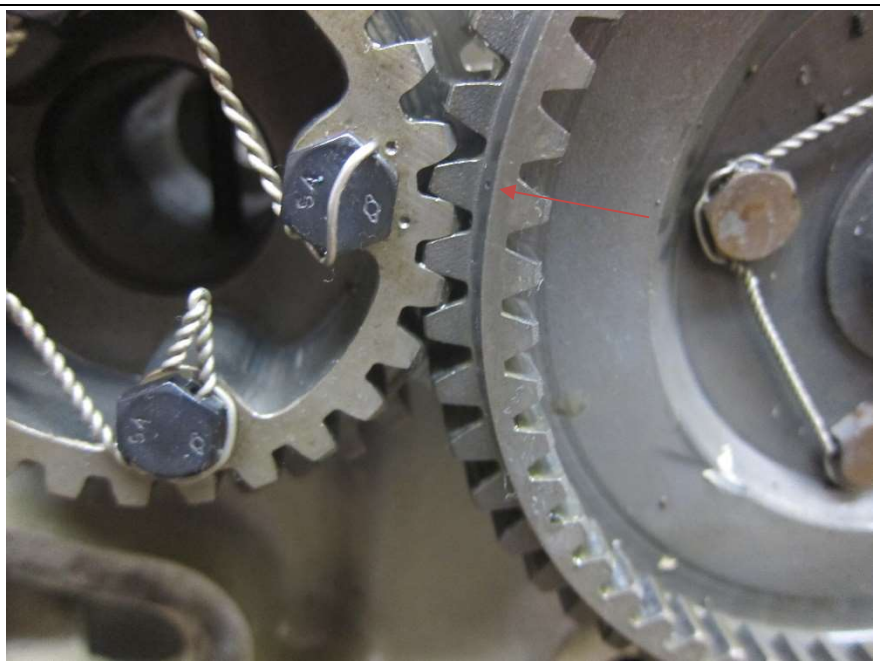
CRANKSHAFT	Forging Number: 27883	S/N: 385	Heat code: F6
Condition:	Exhibited normal operating signatures		



COUNTERWEIGHTS	
Condition:	Dampers were free to move on pins. All plates and snap-rings were intact.



INTERNAL TIMING	
Condition:	Correct internal timing was confirmed. Red arrow points to timing mark on camshaft gear.



#1 CONNECTING ROD	P/N: 654795A1	Forging Number: 530186
Condition:	Exhibited normal operating signatures	
#1 CONNECTING ROD BEARING	P/N: SA639640-M010	
Condition:	Exhibited normal operating signatures	

#3 CONNECTING ROD	P/N: 654795A1	Forging Number: 530186
Condition:	Exhibited normal operating signatures	
#3 CONNECTING ROD BEARING	P/N: SA639640-M010	
Condition:	Exhibited normal operating signatures	

#5 CONNECTING ROD	P/N: 654795A1	Forging Number: 530186
Condition:	Exhibited normal operating signatures	
#5 CONNECTING ROD BEARING	P/N: SA639640-M010	
Condition:	Exhibited normal operating signatures	

#2 CONNECTING ROD	P/N: 654795A1	Forging Number: 530186
Condition:	Exhibited normal operating signatures	
#2 CONNECTING ROD BEARING	P/N: SA639640-M010	
Condition:	Exhibited normal operating signatures	

#4 CONNECTING ROD	P/N: 654795A1	Forging Number: 530186
Condition:	Exhibited normal operating signatures	
#4 CONNECTING ROD BEARING	P/N: SA639640-M010	
Condition:	Exhibited normal operating signatures	

#6 CONNECTING ROD	P/N: 654795A1	Forging Number: 530186
Condition:	Exhibited normal operating signatures	
#6 CONNECTING ROD BEARING	P/N: SA639640-M010	
Condition:	Exhibited normal operating signatures	


1


2


3

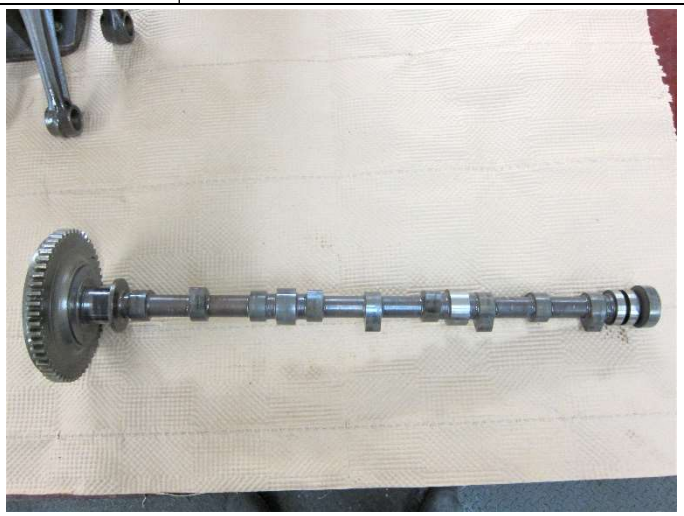

4


5


6

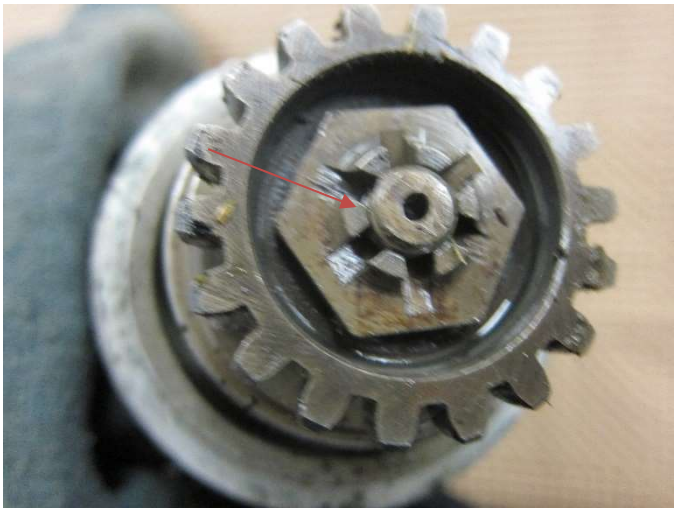
CAMSHAFT

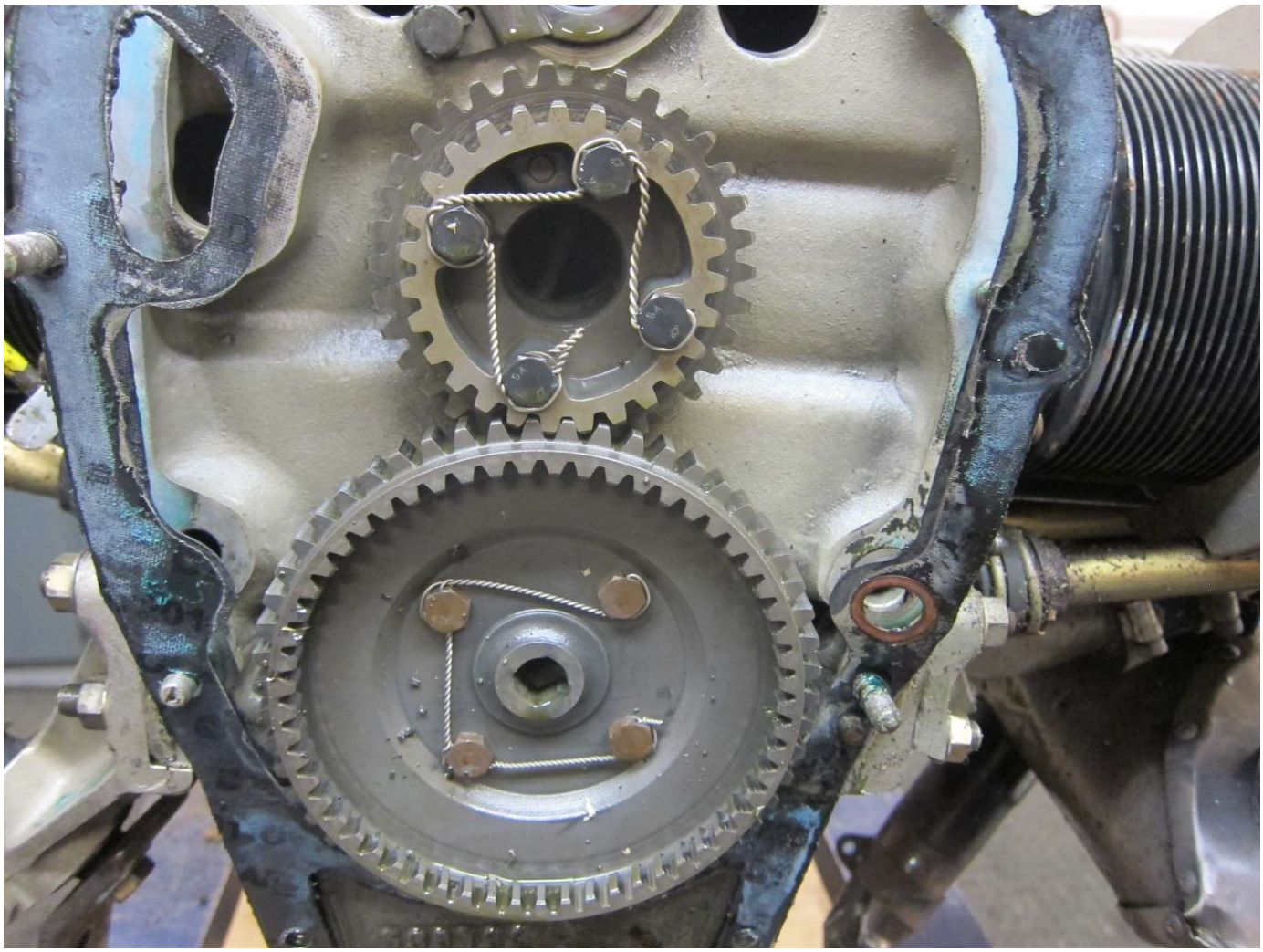
CAMSHAFT	P/N: 643068	S/N: 211706
Condition:	Exhibited normal operating signatures	



LIFTERS	#1	#3	#5	#2	#4	#6
INTAKE	530851	530851	530851	530851	530851	530851
EXHAUST	530851	530851	530851	530851	530851	530851
Condition:	All lifter surfaces exhibited normal operating signatures					

ACCESSORY GEARS	
Condition:	The accessory gears were intact with no damage noted. Red arrow indicates cotter pin missing but it had been removed at the recovery examination.





ACCESSORIES

STARTER	Manufacturer: Delco Remy overhauled by Cline's Electric Service	P/N: 1109514	S/N: 3755
Condition:	The starter motor mounting collar was impact damaged.		

STARTER ADAPTER	Manufacturer: Continental	P/N: Undetermined	S/N: Undetermined
Condition:	The starter adapter was undamaged and rotated normally.		

GENERATOR	Manufacturer: Delco-Overhauled by Aerotech	P/N: 1101898	S/N: A798030
Condition:	The generator had been previously removed during the recovery examination. Impact damage was noted on the mounting ring and the electrical posts were damaged.		

VACUUM PUMP	Manufacturer: Airborne	P/N: 215CC	S/N: 161426
Condition:	The instrument air pump was rotated by hand. The pump rotated smoothly thumb suction was achieved. The plastic drive coupling was intact.