



ENGINE EXAMINATION REPORT

ENGINE MODEL	O-470-R
ENGINE SERIAL NUMBER	84384-3-R
AIRCRAFT MAKE & MODEL	Cessna 182F
AIRCRAFT SERIAL NUMBER	18254771
AIRCRAFT REGISTRATION	N3371U
FILE NUMBER	19-146

NAME	SIGNATURE	DATE
Kurt Gibson		01/09/2020

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	12/23/2019	NTSB ACCIDENT #	WPR20FA049
FACILITY	Air Transport	NTSB INVESTIGATOR	Tealeye Cornejo
ADDRESS	[REDACTED] Phoenix, AZ 85009	FAA INVESTIGATOR	Yasmin Duran
		ACCIDENT DATE	12/21/2019
		ACCIDENT LOCATION	Goodyear, Arizona

ENGINE INFORMATION

ENGINE POSITION	Front (single engine)
TOTAL TIME	Unknown
TIME SOH	646.81
TYPE & TIME SLI	38.3 since the last annual/100-hour inspection
BUILD DATE	03/15/1963 (shipped date)
IN SERVICE DATE	Unknown

Significant logbook information:

The last annual inspection was performed on 05/10/2019 at a tachometer time of 785.36. The engine was overhauled on 01/02/1992 at a tachometer time of 176.85.

Report Summary:

Search Code(s):

15-12-68

There were no anomalies noted that would have prevented normal operation or production of rated horsepower.

Disposition of engine following exam:

The engine remained at Air Transport in Phoenix, Arizona.

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INSPECTION WITNESSES

NAME	Kurt Gibson	NAME	Tealeye Cornejo
ADDRESS	Mobile, Alabama	ADDRESS	Western Pacific Region
ORGANIZATION	Continental Aerospace	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Jennifer Barclay	NAME	
ADDRESS	Wichita, Kansas	ADDRESS	
ORGANIZATION	Textron Aviation	ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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The engine remained partially attached to the airframe through cables, wires, and hoses; all four engine mounts were broken. The engine displayed impact damage signatures as well as some minor thermal damage signatures. The crankcase remained intact and there were no holes in the crankcase that would indicate a catastrophic internal engine failure. It was observed that there was significant staining on the rear of the crankcase consistent with oil staining as well as some fresh oil. The two-blade, constant speed propeller remained attached to the crankshaft and displayed impact damage signatures. The external portion of the crankshaft was noted to be intact and there were no cracks observed in the external portion of the crankshaft. All six cylinders remained attached to their cylinder bays and displayed varying amounts of impact damage signatures.

Both magnetos remained attached to their installation points and were undamaged. The ignition harness remained attached to both magnetos as well as each spark plug; the #2 top spark plug ignition lead displayed impact damage signatures to the lead end. The spark plugs remained installed in their cylinders and were undamaged.

The carburetor remained attached to its installation point and displayed minor impact damage signatures as well as minor thermal damage signatures. There were no signs of fuel leaks observed around the carburetor.

The exhaust system remained attached to the engine and displayed impact damage signatures with most of the damage occurring to the tailpipe. There were no signs of exhaust leaks observed. The induction system displayed impact damage signatures; several of the induction tubes were broken. There were no signs of intake leaks observed.

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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition:

The exhaust system remained attached to the engine and displayed impact damage signatures with the most damage occurring to the tailpipe. The exhaust was removed and the heat exchanger shroud was removed. There were no signs of exhaust leaks observed. It was noted that one of the flame cones had almost completely broken away and no portion of the flame cone was observed; the other flame cone remained installed and a small portion had broken away. There were no blockages observed in the exhaust system.



INDUCTION SYSTEM

Condition:

The induction system remained attached to the engine and displayed impact damage signatures; several of the intake tubes were broken. There were no signs of intake leaks or obstructions observed.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: TCM

P/N: 10-79020-10

S/N: 826417

Condition:

The magneto remained attached to its installation point and was undamaged. During crankshaft rotation, it was observed that the impulse coupling operated normally. The magneto was capable of producing a spark to each ignition lead in the correct firing order and was in sync with the right magneto. The magneto timing was observed to be 24° before top center (BTC). NOTE: Timing specification for an O-470-R is 22° BTC

RIGHT
MAGNETO

Manufacturer: TCM

P/N: 10-79020-10

S/N: 826416

Condition:

The magneto remained attached to its installation point and was undamaged. During crankshaft rotation, it was observed that the impulse coupling operated normally. The magneto was capable of producing a spark to each ignition lead in the correct firing order and was in sync with the left magneto. The magneto timing was observed to be 22° before top center. NOTE: Timing specification for an O-470-R is 22° BTC



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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness remained attached to both magnetos and to each spark plug. The #2 top spark plug ignition lead end displayed impact damage signatures and was partially severed. During magneto operation, it was observed that each ignition lead was capable of conducting a spark from the magneto to each ignition lead end or to the severed portion of the #2 top spark plug.



SPARK PLUGS

Manufacturer: Tempest

P/N: URHM38S

Condition:

The spark plugs remained installed in their cylinders and were undamaged. The top spark plugs were removed for examination and the bottom spark plugs were examined using a lighted borescope. The spark plug electrodes displayed normal operating and wear signatures.



#1 Top Spark Plug



#1 Bottom Spark Plug

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#3 Top Spark Plug



#3 Bottom Spark Plug



#5 Top Spark Plug



#5 Bottom Spark Plug



#2 Top Spark Plug



#2 Bottom Spark Plug

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#4 Top Spark Plug



#4 Bottom Spark Plug



#6 Top Spark Plug



#6 Bottom Spark Plug

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FUEL SYSTEM

CARBURETOR

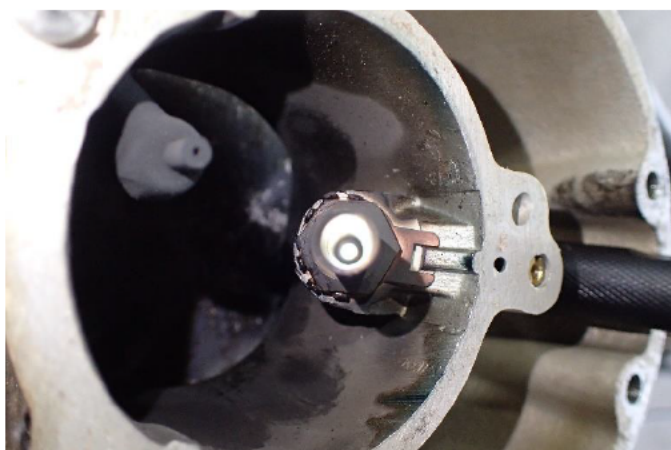
Manufacturer: Marvel Schebler

P/N: 10-4893-1

S/N: MSD56112

Condition:

The carburetor remained attached to its installation point and displayed impact damage signature as well as some thermal damage signatures. The throttle cable rod end remained attached to the throttle control rod and was properly secured. The mixture control cable had pulled out of the mixture control attach bolt; however, the mixture cable displayed impact damage signatures. The throttle was found near idle and the mixture control arm was found near the full rich position. The carburetor was removed and disassembled; there was no fuel found in the carburetor bowl. The internal components displayed normal operating signatures; the main metering jet was checked for obstructions and was found to be clear. The fuel inlet screen was clear of any debris. Air was blown into the carburetor inlet and it was noted that the carburetor float valve was capable of operating normally.



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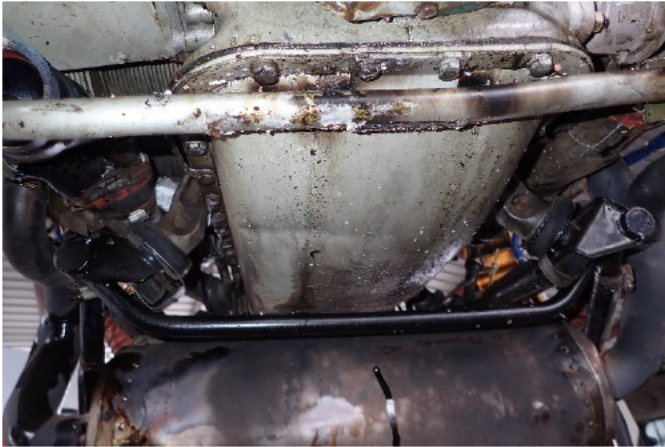
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LUBRICATION SYSTEM

OIL SUMP

Condition:

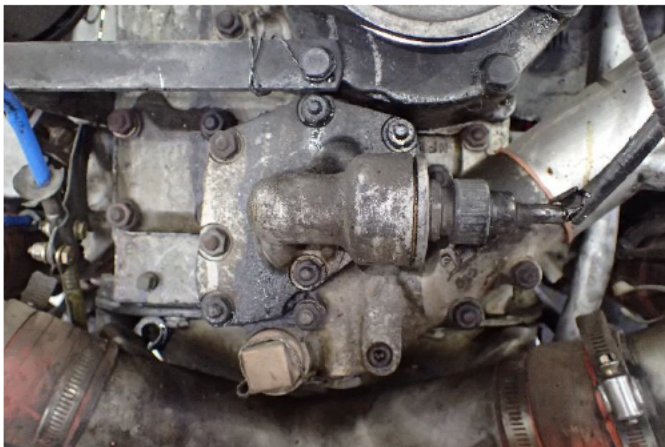
The oil sump remained attached to the engine and displayed minor impact damage signatures.



OIL PUMP

Condition:

The oil pump remained attached to its installation point and was undamaged.



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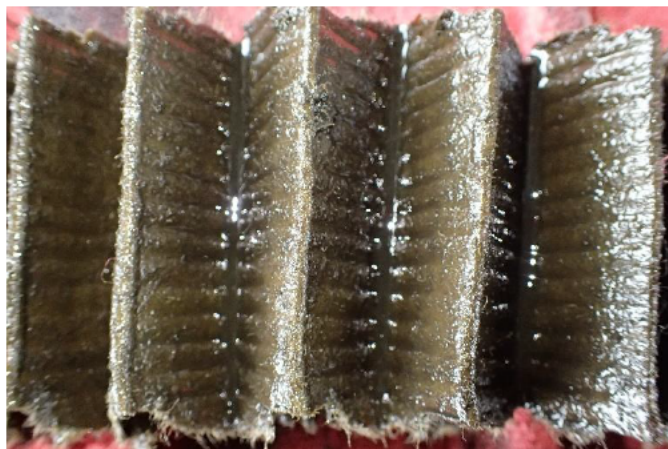
OIL FILTER

Manufacturer: Champion

P/N: CH48108-1

Condition:

The oil filter remained attached to its oil filter adapter; it was noted that the oil filter adapter was an aftermarket STC installation. The oil filter adapter was noted to be tight. The oil filter was removed, and the oil filter housing was cut open. The filter pleats were visually inspected; there was no metallic material noted within the oil filter pleats.



OIL COOLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The oil cooler remained attached to its installation point and displayed impact damage signatures. The oil temperature probe was installed and displayed fresh oil residue around the probe.



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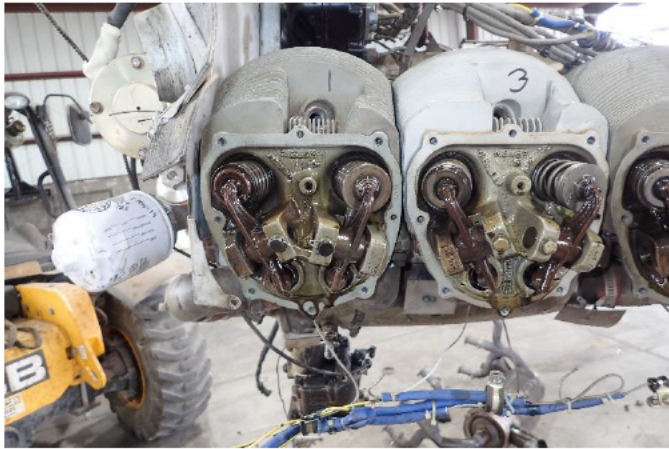
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CYLINDERS

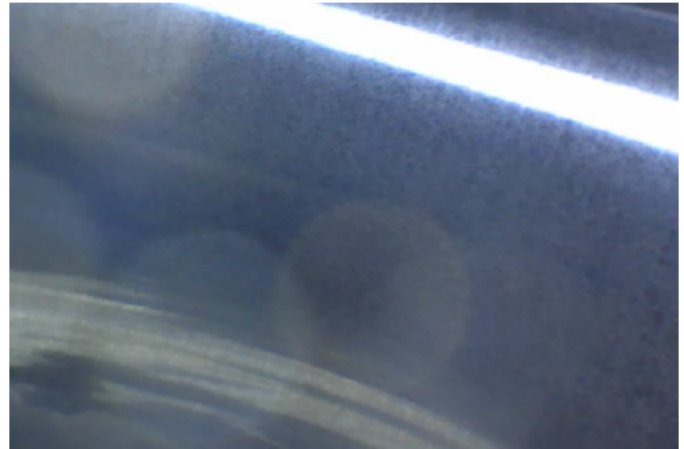
CYLINDERS

Condition:

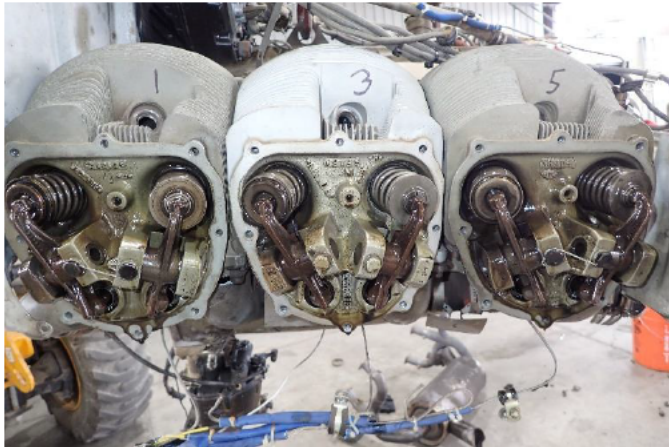
All six cylinders remained attached to their cylinder bays and displayed varying amounts of impact damage. The cylinders were inspected using a lighted borescope; the cylinder bores, piston faces, and valve heads displayed normal operating and combustion signatures. During crankshaft rotation the cylinders displayed good thumb compression and suction. The overhead components (valves, springs, and rocker arms) displayed normal operating and lubrication signatures.



#1 Cylinder Overhead



#1 Cylinder Bore



#3 Cylinder Overhead



#3 Cylinder Bore

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#5 Cylinder Overhead



#5 Cylinder Bore



#2 Cylinder Overhead



#2 Cylinder Bore



#4 Cylinder Overhead



#4 Cylinder Bore

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#6 Cylinder Overhead

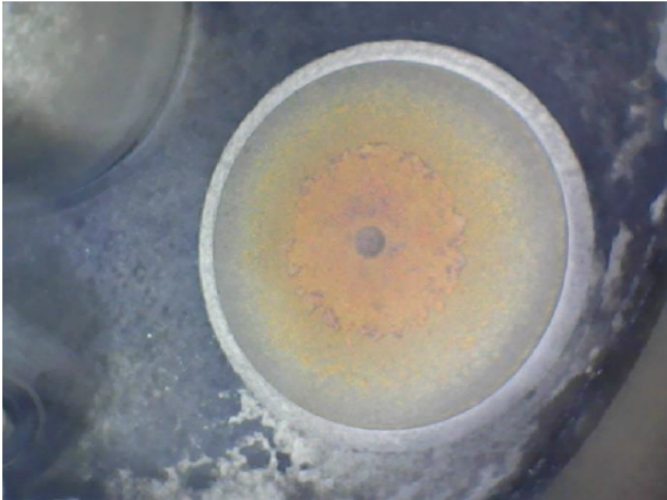


#6 Cylinder Bore

VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope. The #1 and #3 exhaust valves had a green, even discoloration to the valves; however, the valves remained intact and did not display any signs of being stuck. The rest of the valve heads displayed normal operating and combustion signatures. During crankshaft rotation all of the valves operated normally.



#1 Exhaust Valve



#1 Intake Valve

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#3 Exhaust Valve



#3 Intake Valve



#5 Exhaust Valve



#5 Intake Valve



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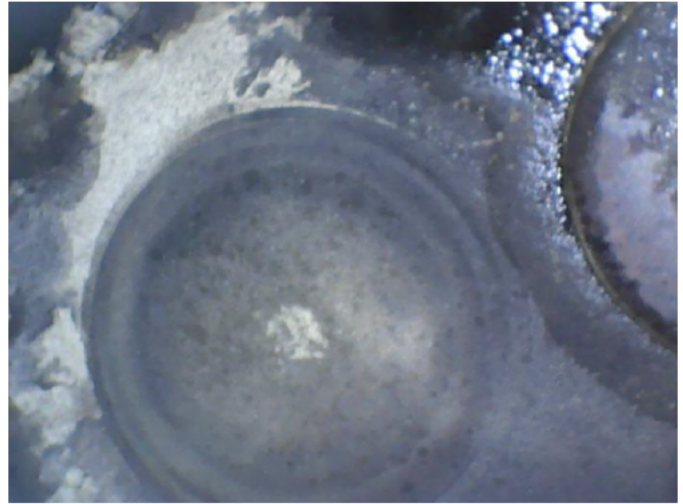
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#2 Exhaust Valve



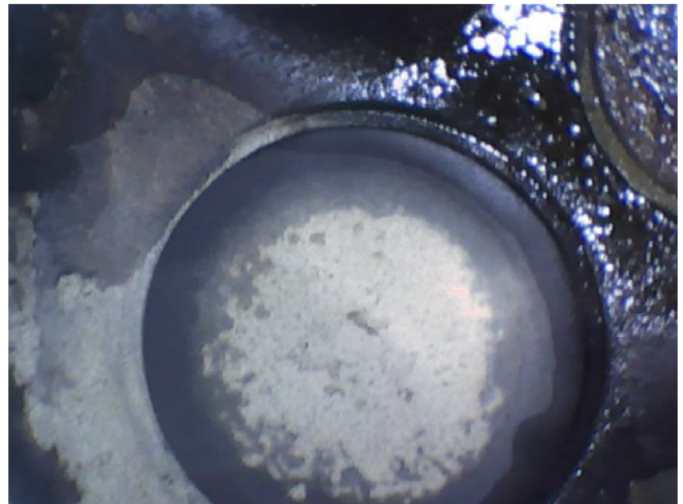
#2 Intake Valve



#4 Exhaust Valve



#4 Intake Valve



#6 Exhaust Valve



#6 Intake Valve



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ROCKER ARMS AND SHAFTS

Condition:

The rocker arms displayed normal operating and lubrication signatures. During crankshaft rotation all of the rocker arms operated normally.



PISTONS

Piston P/N: Inaccessible

Condition:

The piston faces were inspected using a lighted borescope. The piston faces displayed normal operating and combustion signatures. During crankshaft rotation all of the pistons operated normally.



#1 Piston



#3 Piston

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#5 Piston



#2 Piston



#4 Piston



#6 Piston

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CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: 539489	2-4-6: 539488	S/N: 988
Condition:	The crankcase remained intact and was undamaged. There were no holes in the crankcase that would indicate a catastrophic internal engine failure. There were no anomalies observed.			



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

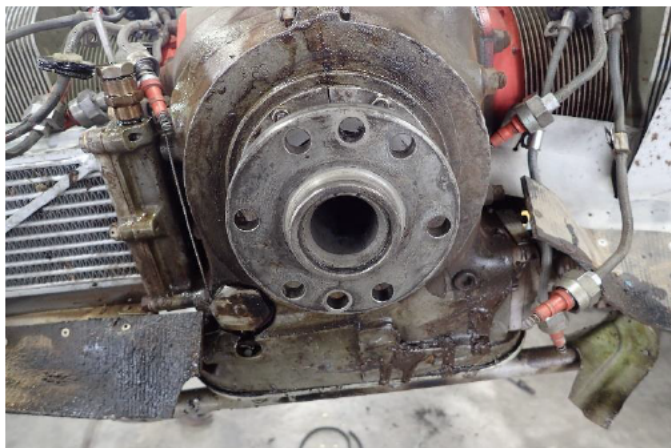
Forging Number: Not
observed

S/N: Not observed

Heat code: Not
observed

Condition:

The propeller flange remained attached to the rest of the crankshaft and there were no cracks noted in the external portion of the crankshaft. The crankshaft was rotated by hand and continuity was established between the crankshaft, camshaft, connecting rods, and associated components.



CONNECTING RODS

P/N: Inaccessible

Forging or Serial Number: Inaccessible

Condition:

The operation of the connecting rods was verified by rotating the crankshaft and observing piston movement. All of the connecting rods operated normally.

CAMSHAFT

CAMSHAFT

P/N: Inaccessible

S/N: Inaccessible

Condition:

The operation of the camshaft was verified by rotating the crankshaft and observing rocker arm movement. The camshaft operated normally.

ACCESSORY
GEARS

Condition:

The operation of the magneto drive gears was verified by rotating the crankshaft and observing the magneto impulse coupling operation. The magneto drive gears operated normally.

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ACCESSORIES

STARTER

Manufacturer: Tempest

P/N: PL13459

S/N: 1101622

Condition:

The starter remained attached to the starter adapter and displayed minor impact damage.

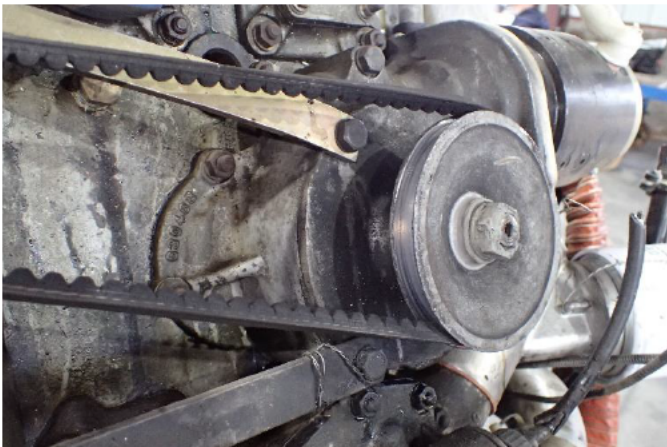


STARTER ADAPTER

P/N: Not observed

Condition:

The starter adapter remained attached to its installation point and was undamaged. During crankshaft rotation, it was observed that the starter adapter pulley operated normally.



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ALT/GEN #1

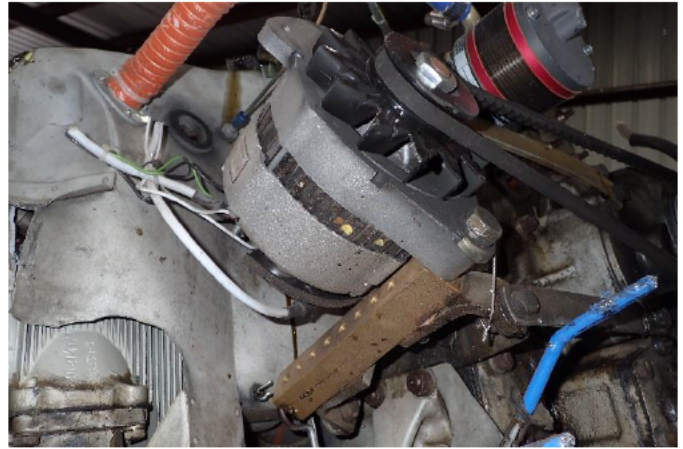
Manufacturer: InterAv Inc.

P/N: 015-01237

S/N: 13057

Condition:

The alternator remained attached to its installation point and displayed impact damage signatures. The alternator belt remained attached to the alternator and to the starter adapter pulley. The alternator drive was capable of partially rotating with resistance which was consistent with the impact damage observed.



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VACUUM
PUMP

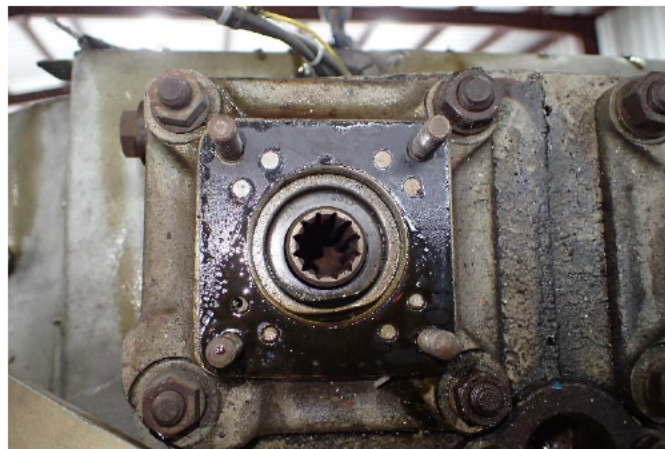
Manufacturer: Rapco

P/N: RAP216CW

S/N: B31067

Condition:

The vacuum pump remained attached to its installation point and displayed minor impact damage signatures. The vacuum pump was removed, and the drive coupling was observed to be intact. The driveshaft was rotated by hand and the vacuum pump was noted to be capable of suction. The vacuum pump was disassembled, and the internal components displayed normal operating signatures. It was noted while removing the vacuum pump that the attaching nuts were not tight. After removal it was observed that oil coated the entire bottom portion of the gasket as well as the vacuum drive and coupling. The entire back side of the crankcase was oil stained and fresh oil was noted on the back of the crankcase and several of the components on the rear of the crankcase.



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PROPELLER

PROPELLER
GOVERNORManufacturer: Aero
Technologies

P/N: PCU 5000

S/N: 06200684

Condition:

The governor remained attached to its installation point and displayed impact damage signatures. The propeller governor control cable rod end remained secured to the control arm.



PROPELLER

Manufacturer: McCauley

P/N: 2A34C66-N

S/N: 725600

Condition:

The two-blade, constant speed propeller remained attached to the crankshaft and displayed impact damage signatures. Propeller blade #1 displayed minor forward bending of the blade and the blade tip was bent aft. Propeller blade #2 displayed aft bending deformation.



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Propeller Blade #1



Propeller Blade #2