



Continental Motors

ENGINE FIELD INSPECTION REPORT

ENGINE MODEL	IO-360-ES
ENGINE SERIAL NUMBER	1000059
AIRCRAFT MAKE & MODEL	Cirrus SR20
AIRCRAFT SERIAL NUMBER	1055
AIRCRAFT REGISTRATION	N314BF
FILE NUMBER	13-101

NAME	SIGNATURE	DATE
Kurt Gibson		08/30/2016

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	08/15/2016	NTSB ACCIDENT #	CEN16LA320
FACILITY	Hanifen Co Inc.	NTSB INVESTIGATOR	Todd Fox
ADDRESS	[REDACTED] Des Moines, IA 50313	FAA INVESTIGATOR	Josh Rohrer
		ACCIDENT DATE	08/13/2016
		ACCIDENT LOCATION	Des Moines, Iowa

ENGINE INFORMATION

ENGINE POSITION	Single Engine
TOTAL TIME	604.7 (time at last maintenance entry on 08/05/2016)
TIME SOH	N/A
TYPE & TIME SLI	Unknown
BUILD DATE	03/16/2009
IN SERVICE DATE	04/27/2009

Significant logbook information:

The last annual inspection was performed on 05/19/2016 at a hobbs time of 1565.5

Report Summary:

Search Code(s):

29-09-03

29-06-14

The #3 induction tube was found fractured at the mounting flange and the #1 induction tube coupling was found partially detached from the induction tube going into the #1 cylinder. The #3 induction tube and flange were shipped to the NTSB Materials Laboratory for further testing and examination.

Disposition of engine following exam:

The engine remained at Hanifen Co Inc. in Des Moines, Iowa.

INSPECTION WITNESSES			
NAME	Kurt Gibson	NAME	Josh Rohrer
ADDRESS	Mobile, Alabama	ADDRESS	Des Moines, Iowa
ORGANIZATION	Continental Motors	ORGANIZATION	FAA
PHONE		PHONE	
NAME	Brannon Mayer	NAME	
ADDRESS	Duluth, Minnesota	ADDRESS	
ORGANIZATION	Cirrus Aircraft	ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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The engine remained attached to the airframe by its engine mounts, wires, cables, and hoses. There were no signs of thermal damage noted to the engine; the engine sustained some impact damage to the bottom of the engine. The two blade, constant speed propeller remained attached to the propeller flange and displayed impact damage signatures. Both of the propeller blades displayed chord wise scratches and gouges, and both of the propeller blades displayed twisting deformation. All six cylinders remained attached to their cylinder bays; the cylinders were undamaged. The crankcase remained intact and was undamaged.

The fuel pump remained attached to its installation point and was undamaged; all of the fuel lines were attached and secure. The throttle and fuel metering assembly remained attached to its installation point and was undamaged. It was noted that the air box attachment to the throttle body was loose. The fuel manifold valve remained attached to its installation point and was undamaged.

Both of the magnetos remained attached to their installation points and were undamaged. The ignition harness remained attached to both of the magnetos and to each of the spark plugs. All of the spark plugs remained installed in their cylinders.

The induction system did not show any signs of impact or thermal damage. It was noted that the #1 cylinder induction tube coupling was only partially attached to the induction tube going into the #1 cylinder. It was also noted that the #3 induction tube going into the #3 cylinder was fractured at the mounting flange. There was a significant amount of soot around the #3 induction tube fracture area as well as the mounting clamp.

The exhaust system remained attached to the engine and displayed impact damage to the tail pipes. There were no anomalies noted with the exhaust system.

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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 to the tail pipes. There were no signs of exhaust leaks or other anomalies noted with the exhaust system.



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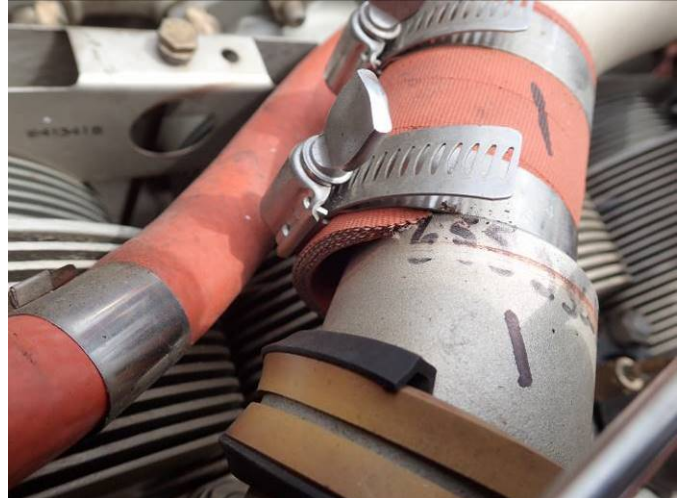
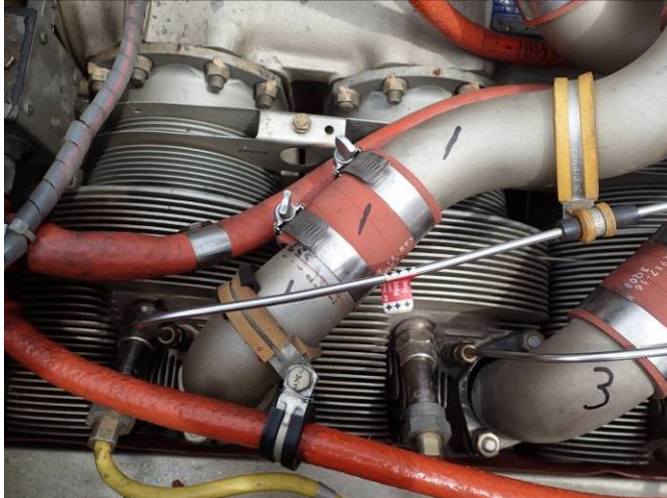
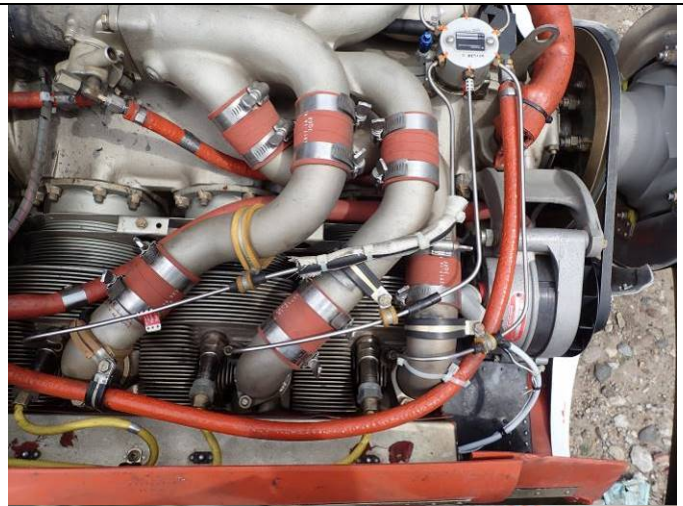
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INDUCTION SYSTEM

Condition:

The induction system did not display any signs of impact damage. It was noted that the #1 induction tube coupling was only partially attached to the induction tube going into the cylinder. The worm gear clamp remained secured to the rubber coupling. It was noted there was a wear area on the induction tube going into the cylinder consistent with where the rubber coupling was installed; it was noted that the width of the wear area was shorter than the width of the worm gear clamp. The #3 induction tube was found to be completely fractured at the mounting flange. It was noted that the induction tube and mounting area had a coating of soot. The induction tube and flange were removed from the engine; it was noted that a portion of the induction tube flange had broken free from the rest of the flange and was not located. The #3 induction tube and flange were sent to the NTSB Materials Laboratory for additional examination and testing. The remaining induction tubes displayed normal operating signatures.



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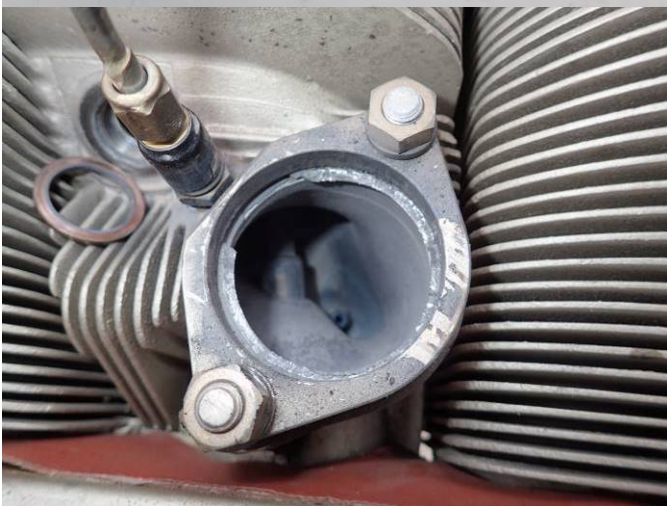
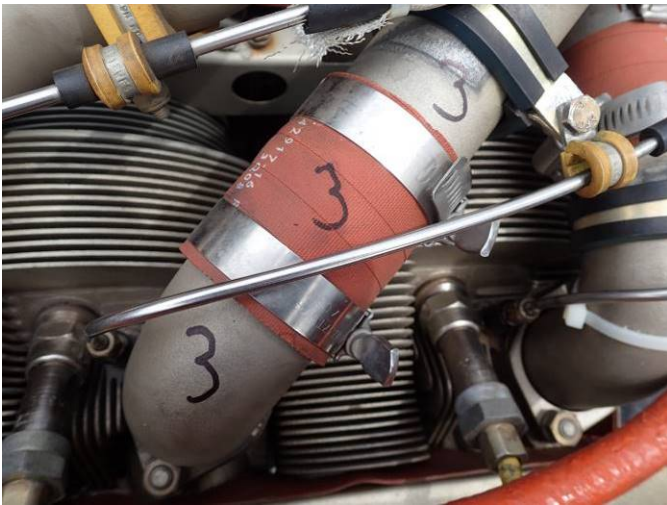
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Manufacturer: CMI

P/N: BL-500556-3

S/N: D09CA027R

Condition:

The magneto remained attached to its installation point and was undamaged. The crankshaft was rotated by hand and it was noted that the impulse coupling operated normally. It was noted that during impulse coupling operation the magneto was capable of producing a spark on each of the ignition leads. It was also noted that each ignition lead produced a spark with the approximate same timing as the corresponding ignition lead coming from the right magneto.

**RIGHT
MAGNETO**

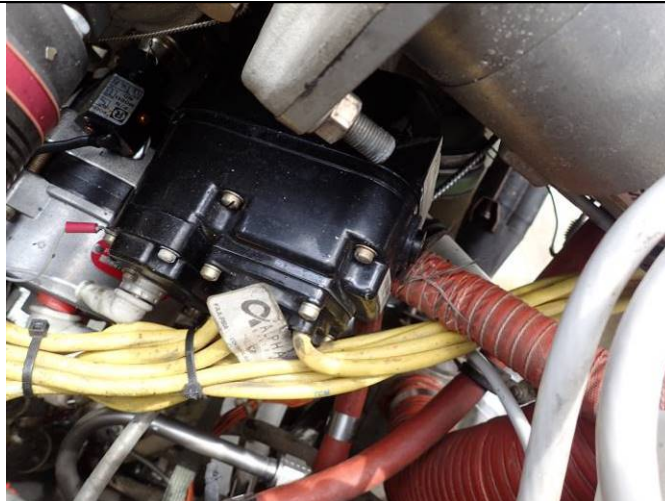
Manufacturer: CMI

P/N: Inaccessible

S/N: D09CA032R

Condition:

The magneto remained attached to its installation point and was undamaged. The crankshaft was rotated by hand and it was noted that the impulse coupling operated normally. It was noted that during impulse coupling operation the magneto was capable of producing a spark on each of the ignition leads. It was also noted that each ignition lead produced a spark with the approximate same timing as the corresponding ignition lead coming from the left magneto.



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IGNITION HARNESS

Manufacturer: CMI

P/N: Inaccessible

S/N: Inaccessible

Condition:

The ignition harness remained attached to each magneto and to each of the spark plugs. There was no damage noted to the ignition harness. It was noted that the ignition harness was capable of conducting a spark from the magneto to each of the ignition lead ends. There were no anomalies noted with the ignition harness.

SPARK PLUGS

Manufacturer: Tempest

P/N: URHM38E

Condition:

All of the spark plugs remained installed in their cylinders and were undamaged. All of the spark plugs were removed and it was noted that all of the spark plugs displayed normal wear signatures. It was noted that the #5 and the #4 cylinder spark plugs displayed a significant amount of soot consistent with an overly rich mixture. The remaining spark plugs displayed normal operating signatures.



#1, #3, #5 Top Spark Plugs



#1, #3, #5 Bottom Spark Plugs



#2, #4, #6 Top Spark Plugs



#2, #4, #6 Bottom Spark Plugs

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FUEL SYSTEM

FUEL PUMP

Manufacturer: CMI

P/N: 649368-55A4

S/N: B08FA223R

Condition:

The fuel pump remained attached to its installation point and was undamaged. All of the fuel lines that attach to the fuel pump were secure and there were no signs of fuel leaks. The fuel pump was removed and it was noted that the fuel pump coupling remained intact. The fuel pump was rotated by hand and it was noted that a residual amount of fuel was pumped out of the fuel pump. There were no anomalies noted with the fuel pump.



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THROTTLE BODY METERING UNIT

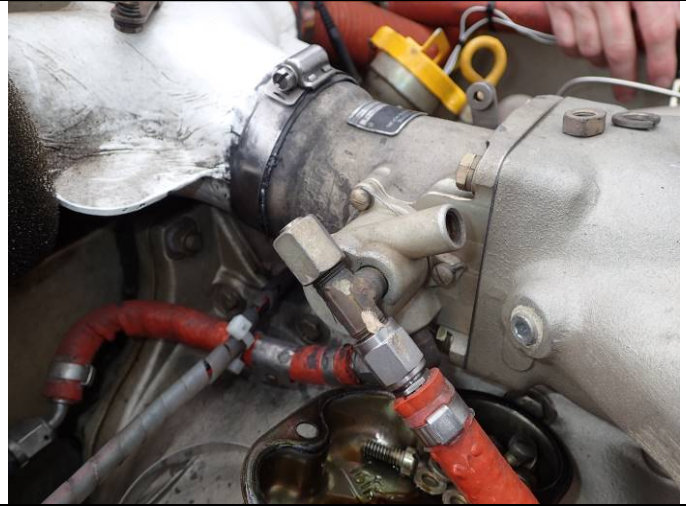
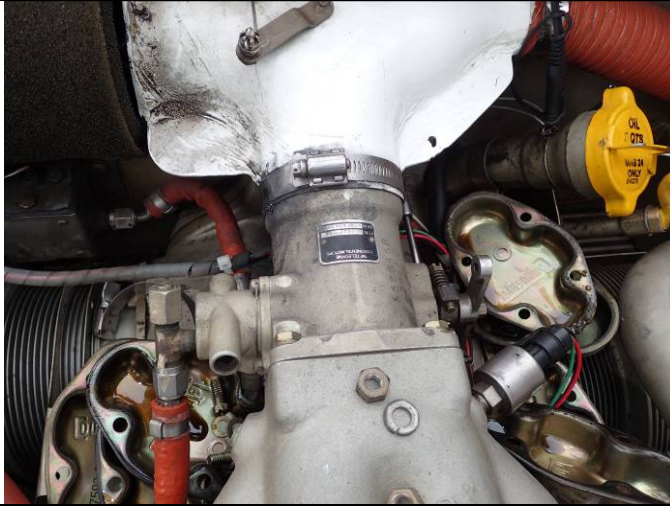
Manufacturer: CMI

P/N: 652844-1A4

S/N: A08FA263R

Condition:

The throttle and fuel metering assembly remained attached to its installation point and was undamaged. The throttle arm was secure on the throttle shaft. It was noted that the air box was slightly loose at the attachment to the throttle body. There were no further anomalies noted.



FUEL MANIFOLD VALVE

Manufacturer: CMI

P/N: 646508-10A7

S/N: C08FA236R

Condition:

The fuel manifold valve remained attached to its installation point and was undamaged. There were no signs of fuel leaks or other anomalies noted with the fuel manifold valve.



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FUEL NOZZLES AND LINES

Manufacturer: CMI

Position	#1	#3	#5	#2	#4	#6
Size	1173 (O47)	3183 (O47)	5178 (O47)	2180 (O47)	4178 (O47)	6175 (O47)
Condition:	All of the fuel nozzles remained installed in their cylinders and there were no signs of fuel leaks around the nozzles. It was noted that the #4 fuel nozzle was cross threaded in the cylinder and was not installed in the cylinder as far as the other nozzles. All of the nozzles were removed and it was noted that all of the nozzles were clear of obstructions.					



#4 Fuel Nozzle



#1 Nozzle



#3 Nozzle

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#5 Nozzle



#2 Nozzle



#4 Nozzle



#6 Nozzle

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LUBRICATION SYSTEM

OIL SUMP

Condition: The oil sump remained intact and displayed minor impact damage. There were no anomalies noted with the oil sump

OIL PICK-UP TUBE & SCREEN

Condition: Due to the type of inspection performed the oil pick-up tube and screen was not observed.

OIL PUMP

Condition: Due to the type of inspection performed the oil pump was not observed.

OIL FILTER

Manufacturer: Champion

P/N: CH48108-1

Condition: The oil filter remained secured to the oil filter adapter and was undamaged. The oil filter was removed and the oil housing was cut open. The oil filter pleats were visually inspected; there were no anomalies noted.



OIL COOLER

Manufacturer: Not marked

P/N: 646880

S/N: J03-6608-437

Condition: The oil cooler remained attached to its installation point and was undamaged. There were no anomalies noted with the oil cooler.



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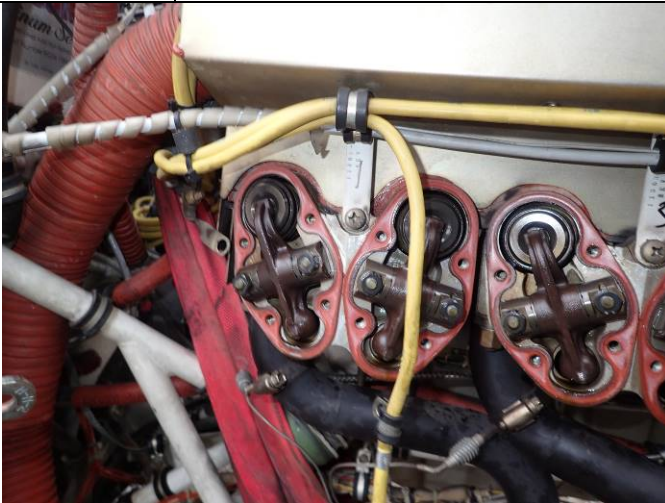
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CYLINDERS

CYLINDERS

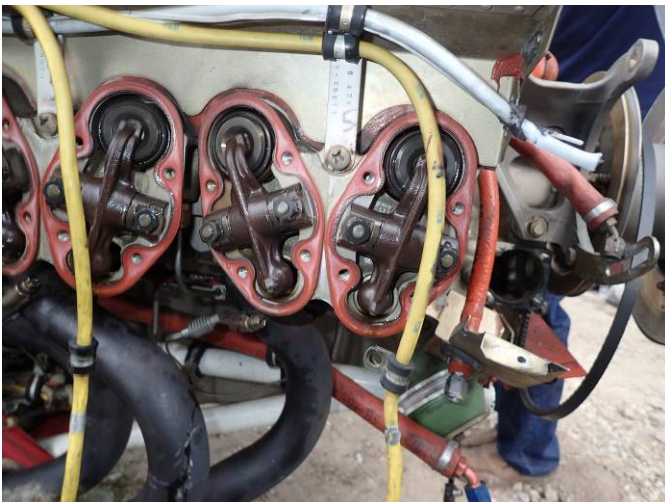
Condition: All of the cylinders remained attached to their cylinder bays and were undamaged. It was noted that there was a significant fuel leak coming from the even numbered cylinder drains; there were no further external anomalies noted. All of the cylinders were inspected using a lighted borescope; the cylinder bores, piston faces, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated by hand and it was noted that all of the cylinders displayed good thumb compression and suction; it was also noted that all of the cylinder overhead components (valves, springs, rocker arms) operated normally during crankshaft rotation.



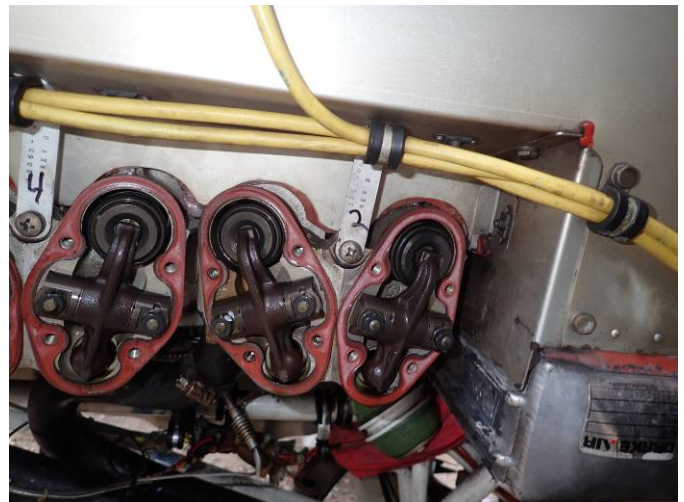
#1 Cylinder



#3 Cylinder



#5 Cylinder



#2 Cylinder

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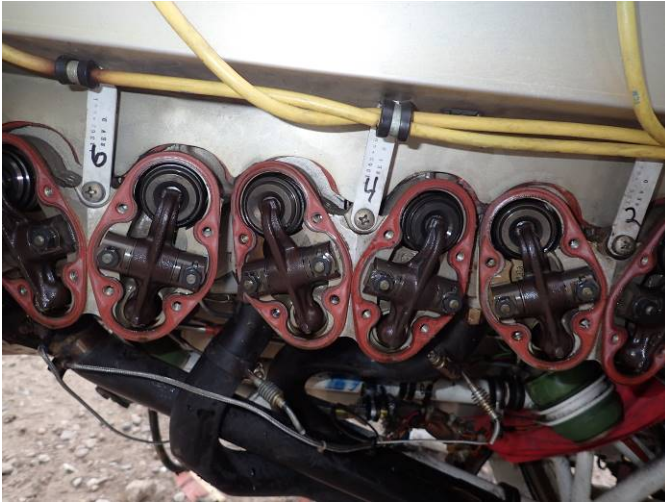
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#4 Cylinder



#6 Cylinder

VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope. All of the valve heads displayed normal operating and combustion signatures. During crankshaft movement the valves operated normally.

ROCKER ARMS AND SHAFTS

Condition:

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



PISTONS

Piston P/N: Inaccessible

Condition:

All of the piston faces were inspected using a lighted borescope; the piston faces displayed normal operating and combustion signatures. It was noted that during crankshaft rotation all of the pistons operated normally.

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CRANKCASE ASSEMBLY

CRANKCASE

Casting
Number:

1-3-5: Not Observed

2-4-6: Not Observed

S/N: S01BA200

Condition:

The crankcase was intact and undamaged. There were no anomalies noted with the crankcase.



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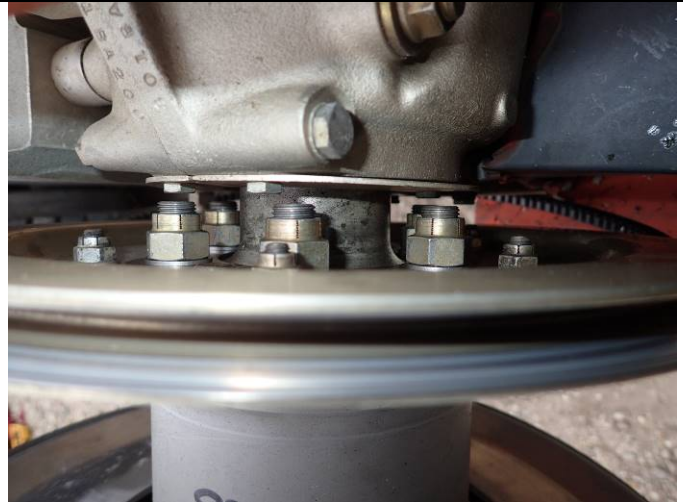
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CRANKSHAFT	Forging Number: Inaccessible	S/N: Not observed	Heat code: Inaccessible
Condition:	The crankshaft remained intact and there was no damage noted to the visible portion of the crankshaft. The crankshaft was rotated by hand and continuity was established between the crankshaft, camshaft, connecting rods, and associated components. There were no anomalies noted with the crankshaft.		



CONNECTING RODS	P/N: Inaccessible	Forging or Serial Number: Inaccessible
Condition:	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:	Operation of the camshaft was verified by rotating the crankshaft and observing rocker arm movement. The camshaft operated normally.	
ACCESSORY GEARS		
Condition:	Operation of the magneto accessory gears was verified by rotating the crankshaft and noting impulse coupling operation. The fuel pump drive gear was visually inspected after the fuel pump was removed. There were no anomalies noted with the accessory gears.	

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ACCESSORIES

STARTER

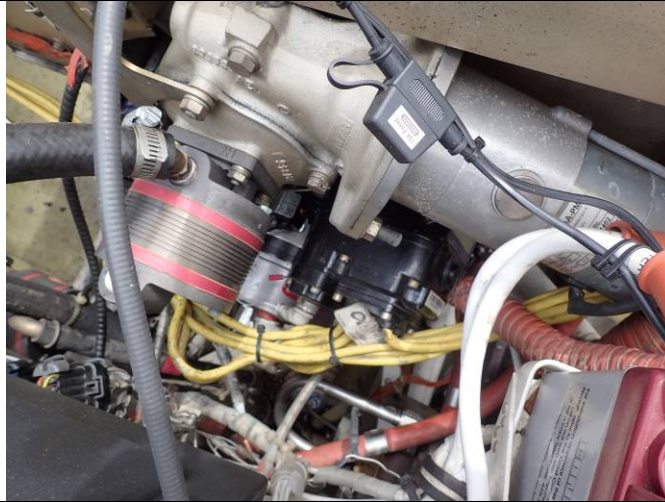
Manufacturer: Sky-Tec

P/N: C24ST3

S/N: 4C3-011402

Condition:

The starter remained intact and undamaged. There were no anomalies noted with the starter.



STARTER ADAPTER

P/N: Illegible

Condition:

The starter adapter remained intact and was undamaged. There were no anomalies noted with the starter adapter.



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ALTERNATOR #1

Manufacturer: Not Observed

P/N: Not Observed

S/N: Not Observed

Condition:

The alternator remained attached to its installation point and was undamaged. There were no anomalies noted with the alternator.



ALTERNATOR #2

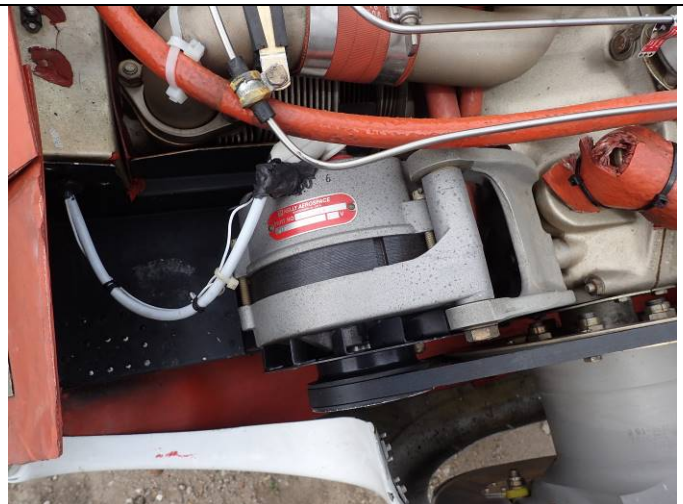
Manufacturer: Kelly Aerospace

P/N: ES-4024LP

S/N: J020320

Condition:

The alternator remained attached to its installation point and was undamaged. There were no anomalies noted. The alternator was removed and it was noted that the alternator drive was capable of normal rotation.



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VACUUM PUMP

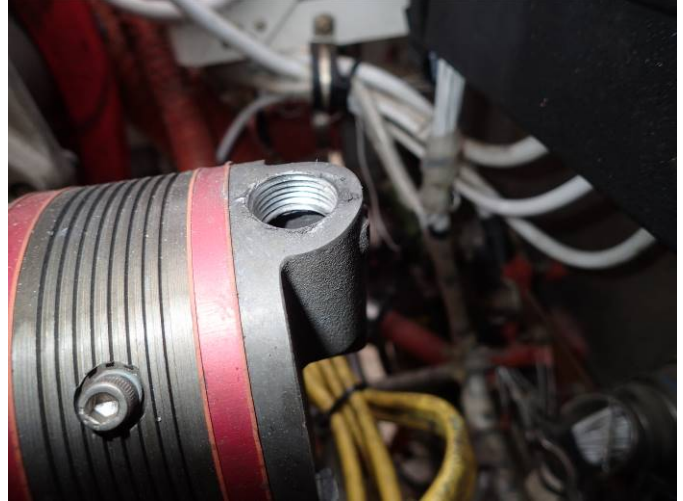
Manufacturer: Rapco

P/N: RA215CC

S/N: A33393

Condition:

The vacuum pump remained attached to its installation point and was undamaged. It was noted that the vacuum pump outlet pipe was not installed on the vacuum pump; the outlet pipe was located at the bottom of the cowling. All of the threads in the vacuum pump and the outlet pipe remained intact.



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PROPELLER

PROPELLER GOVERNOR

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The propeller governor remained attached to its installation point and was undamaged. There were no anomalies noted with the governor.

PROPELLER

Manufacturer: Hartzell

P/N: Inaccessible

S/N: Inaccessible

Condition:

The two blade, constant speed propeller remained attached to the propeller flange and displayed impact damage signatures. Both of the propeller blades displayed chord wise scratches and gouges, and both of the propeller blades displayed twisting deformation.



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