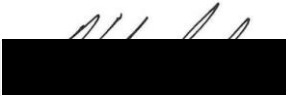




ENGINE EXAMINATION REPORT

ENGINE MODEL	IO-550-N
ENGINE SERIAL NUMBER	917998
AIRCRAFT MAKE & MODEL	Velocity XL-RG-5
AIRCRAFT SERIAL NUMBER	3RX180
AIRCRAFT REGISTRATION	N735D
FILE NUMBER	19-065

NAME	SIGNATURE	DATE
Kurt Gibson		11/13/2019

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	10/08/2019	NTSB ACCIDENT #	ERA19LA253
FACILITY	Florida Air Recovery	NTSB INVESTIGATOR	Leah Read
ADDRESS	[REDACTED] Jacksonville, FL 32256	FAA INVESTIGATOR	Peter Kandravi
		ACCIDENT DATE	08/21/2019
		ACCIDENT LOCATION	Kissimmee, Florida

ENGINE INFORMATION

ENGINE POSITION	Rear (single engine)
TOTAL TIME	2041.3 (time was taken from the last maintenance entry)
TIME SOH	266.3 (time was taken from the last maintenance entry)
TYPE & TIME SLI	Unknown
BUILD DATE	09/23/2005
IN SERVICE DATE	Unknown

Significant logbook information:

The engine underwent an overhaul by Poplar Grove Airmotive, Inc. on 06/17/2016 at an unknown tachometer time. After the engine was installed on the accident aircraft the magnetos were removed to install the EI mag timing housings. The last condition inspection was performed on 12/30/2018 at a tachometer time of 202.3.

While viewing the aircraft's electrical diagram it was noted that the electronic ignition system requires a complete circuit connected to the main battery.

Report Summary:

Search Code(s):

98-01-01

15-12-68

Both battery terminals were found to be improperly crimped and the wires were pulled out of the terminals. The engine used electronic ignition that requires electrical power to operate; there was no magneto backup for ignition.

Disposition of engine following exam:

The engine remained at Florida Air Recovery in Jacksonville, Florida.

INSPECTION WITNESSES			
NAME	Kurt Gibson	NAME	Dan Boggs
ADDRESS	Mobile, Alabama	ADDRESS	Eastern Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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PAGE 4 of 25**EXTERNAL INSPECTION OF ENGINE**

The engine remained attached to the airframe and displayed minor impact damage signatures. The crankcase remained intact and there were no holes in the crankcase that would indicate a catastrophic internal engine failure. All six cylinders remained attached to their cylinder bays and the #3 and the #4 cylinders displayed impact damage to the rocker box covers. The three-blade, constant speed propeller remained attached to the crankshaft and displayed impact damage; portions of all three propeller blades had broken free from the propeller hub. The crankshaft remained intact and there were no visible cracks noted in the crankshaft.

The engine was equipped with an electronic ignition system that required electrical power in order to operate. There was no magneto backup or a separate battery backup installed on the aircraft. The ignition harness remained intact and was undamaged. All of the spark plugs remained installed in their cylinders and were undamaged.

The fuel pump remained attached to its installation point and was undamaged. The mixture control cable rod end remained attached to the control arm and was capable of movement. It was observed that one of the large gauge wires was not properly secured and would interfere with the mixture control arm movement. The throttle and metering assembly remained attached to its installation point and was undamaged. The throttle control cable rod end remained attached to the throttle control arm and the control arm was secured to its shaft. The throttle control was capable of normal movement. The fuel manifold valve, fuel lines, and nozzles remained attached to their installation points and were undamaged. There were no signs of fuel leaks observed around the engine fuel components; however, there was blue staining noted around the airframe boost pump fuel lines as well as the left-wing fuel tank.

The exhaust system remained attached to the engine and was undamaged. There were no signs of exhaust leaks observed. The induction system remained attached to the engine and was undamaged. There were no signs of intake leaks noted around the induction system.

ENGINE FIELD INSPECTION REPORT

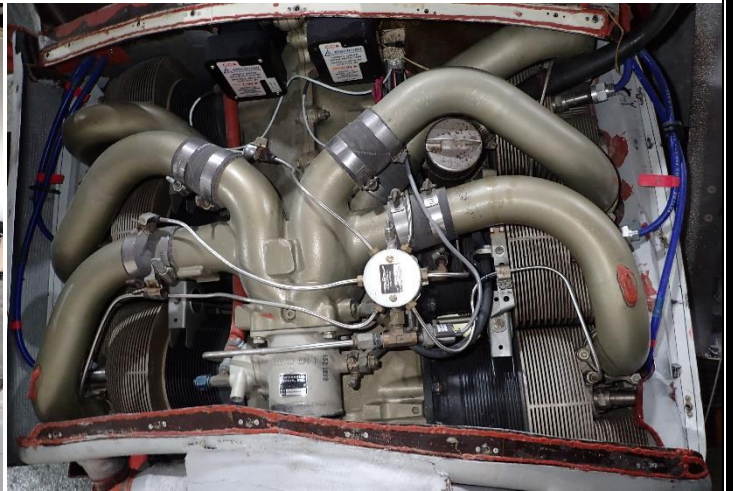
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ENGINE TEARDOWN AND COMPONENT EXAMINATION

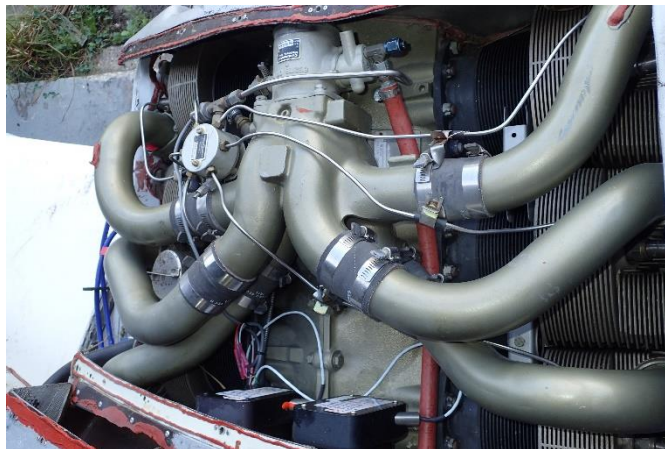
EXHAUST SYSTEM

Condition: The exhaust system remained attached to the engine and was undamaged. There were no signs of exhaust leaks observed



INDUCTION SYSTEM

Condition: The induction system remained attached to the engine and displayed impact damage signatures to the inlet airbox. There were no signs of intake leaks or blockages observed.



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IGNITION SYSTEM

ELECTRONIC IGNITION

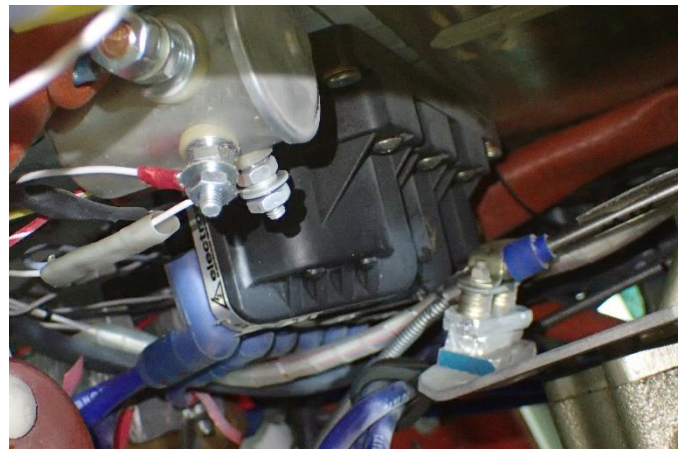
Manufacturer: Electroair

P/N: Not observed

S/N: Not observed

Condition:

The aircraft was equipped with an electronic ignition system and there was no magneto backup. The electronic ignition system appeared to be undamaged. Examination of the main battery terminals revealed that neither the positive or negative terminals were properly crimped, and the terminals had fallen off the wires.



IGNITION HARNESS

Manufacturer: Taylor

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness was undamaged and was connected to the electronic ignition system and to each spark plug. There were no anomalies observed.



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SPARK PLUGS

Manufacturer: Tempest

P/N: EARHB32S

Condition:

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



#1 Top Spark Plug



#1 Bottom Spark Plug



#3 Top Spark Plug



#3 Bottom Spark Plug

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#5 Top Spark Plug



#5 Bottom Spark Plug



#2 Top Spark Plug



#2 Bottom Spark Plug



#4 Top Spark Plug



#4 Bottom Spark Plug

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#6 Top Spark Plug



#6 Bottom Spark Plug

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FUEL SYSTEM

FUEL PUMP

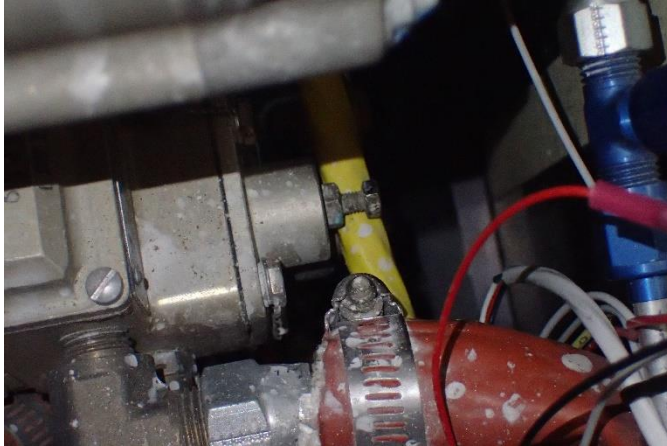
Manufacturer: CMI

P/N: Not observed

S/N: Not observed

Condition:

The fuel pump remained attached to its installation point and was undamaged. It was noted that the routing of one of the large gauge electrical wires would interfere with the mixture control movement. It was observed that the mixture control rod end was secured to the control arm and the control arm remained secured to the shaft.



THROTTLE BODY METERING UNIT

Manufacturer: CMI

P/N: R-653353-5

S/N: A16CA177R

Condition:

The throttle and metering assembly remained attached to its installation point and was undamaged. The throttle control rod end remained attached to the control arm and was capable of normal movement. There were no anomalies observed



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FUEL MANIFOLD VALVE

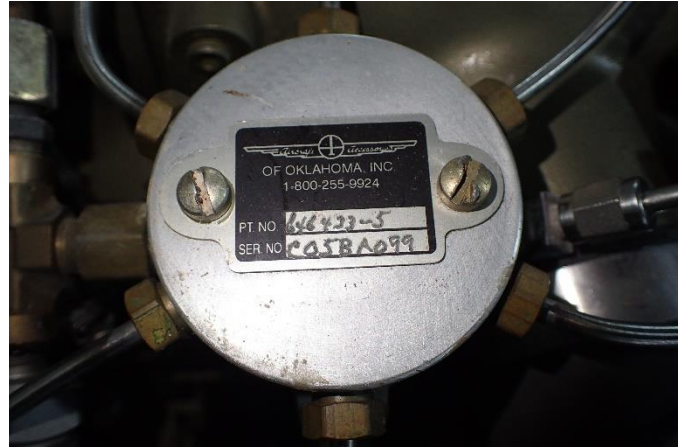
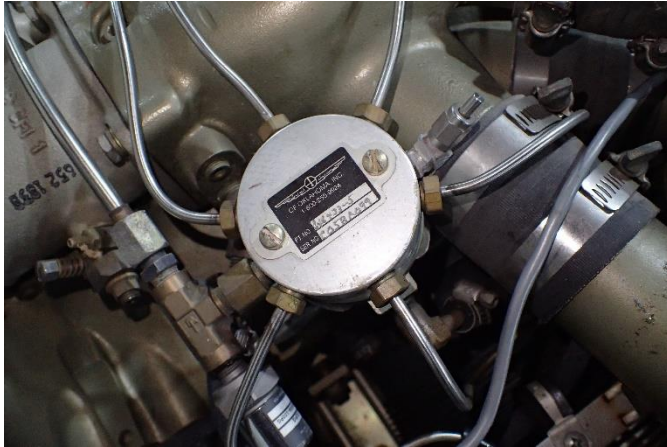
Manufacturer: CMI
(overhauled by Aircraft
Accessories)

P/N: 646433-5

S/N: C05BA099

Condition:

The fuel manifold valve remained attached to its installation point and was undamaged. There were no fuel leaks noted around the manifold valve.



FUEL NOZZLES AND LINES

Manufacturer: CMI

Condition:

All of the fuel nozzles remained installed in their cylinders and were undamaged. There were no signs of fuel leaks noted around any of the fuel nozzles.

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LUBRICATION SYSTEM

OIL SUMP

Condition: The oil sump remained attached and was undamaged. There were no signs of oil leaks around the oil sump.

OIL FILTER

Manufacturer: Tempest

P/N: AA48108-2

Condition: Due to the type of inspection performed the oil filter was not removed and inspected.



OIL COOLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

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

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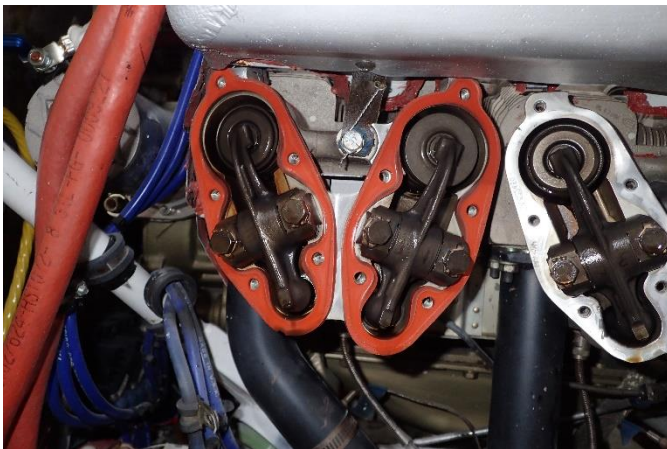
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CYLINDERS

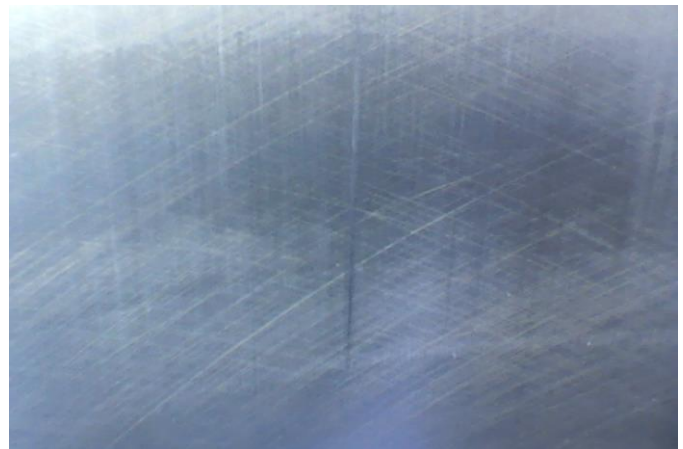
CYLINDERS

Condition:

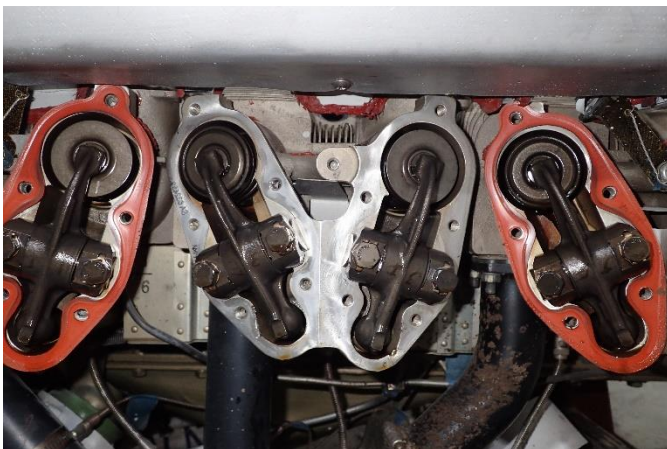
All six cylinders remained attached to their cylinder bays and the #3 and the #4 cylinders displayed impact damage to the rocker arm box covers; the rest of the cylinders were undamaged. The cylinders were inspected using a lighted borescope; the cylinder bores and valve heads displayed normal operating and combustion signatures. The #3 piston face was noted to have a semicircular impression consistent with a valve strike; it was noted that the #3 cylinder intake rocker arm box cover had impact damage and was pushing against the rocker arm. The rest of the piston faces displayed normal operating and combustion signatures. During crankshaft rotation the cylinders displayed good thumb compression and suction and after removing the rocker arm box covers, all of the rocker arms and valves operated normally.



#1 Cylinder Overhead



#1 Cylinder Bore



#3 Cylinder Overhead



#3 Cylinder Bore

ENGINE FIELD INSPECTION REPORT

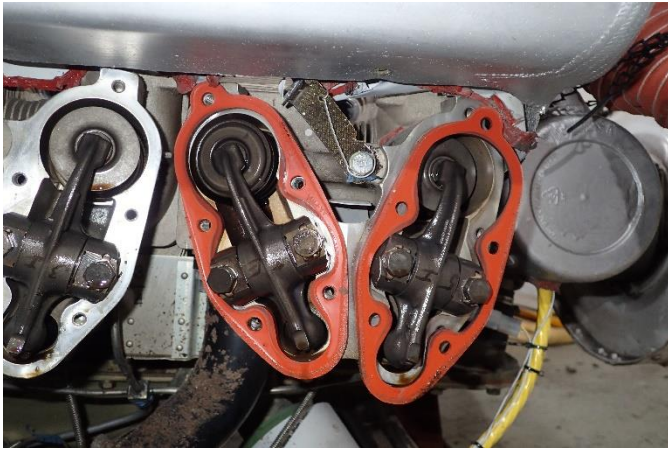
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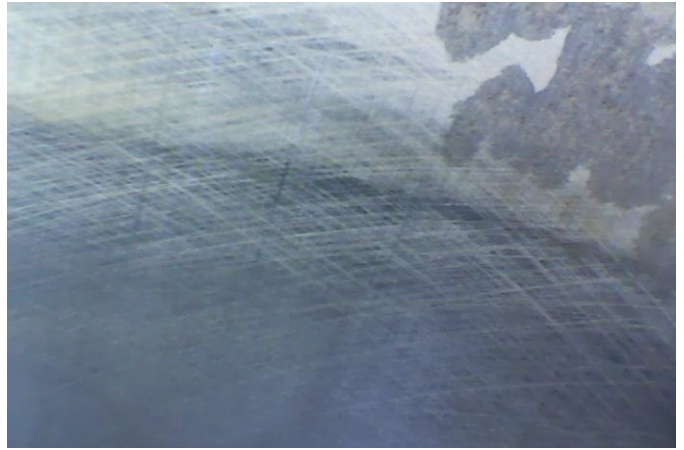
ENGINE S/N:

917998

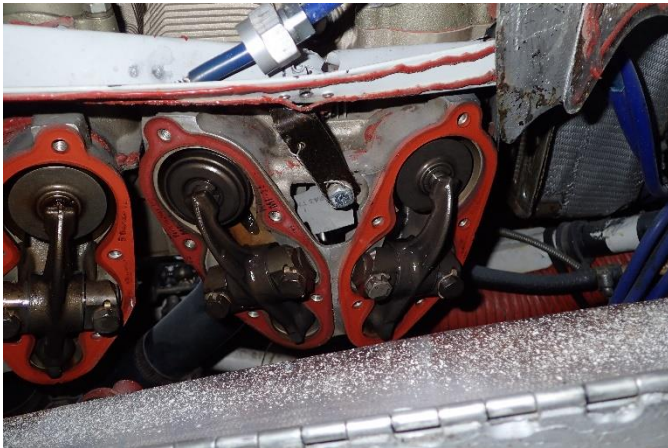
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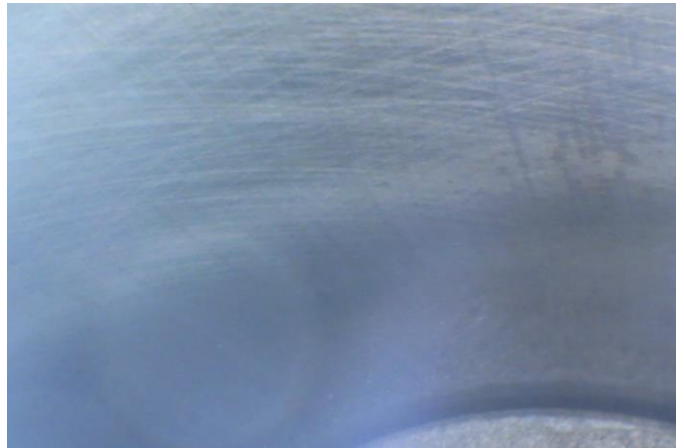
#5 Cylinder Overhead



#5 Cylinder Bore



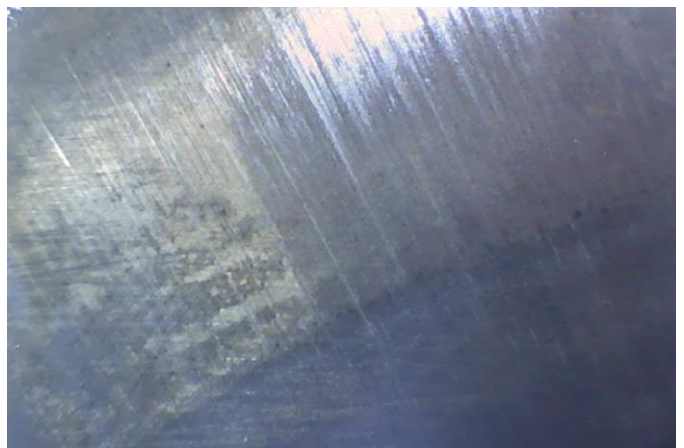
#2 Cylinder Overhead



#2 Cylinder Bore



#4 Cylinder Overhead



#4 Cylinder Bore

ENGINE FIELD INSPECTION REPORT

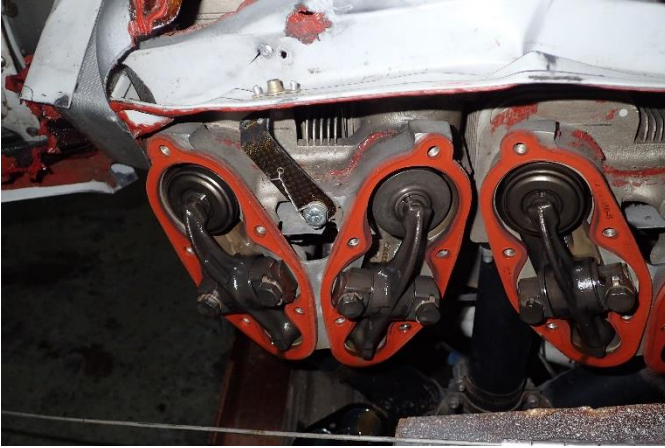
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#6 Cylinder Overhead



#6 Cylinder Bore

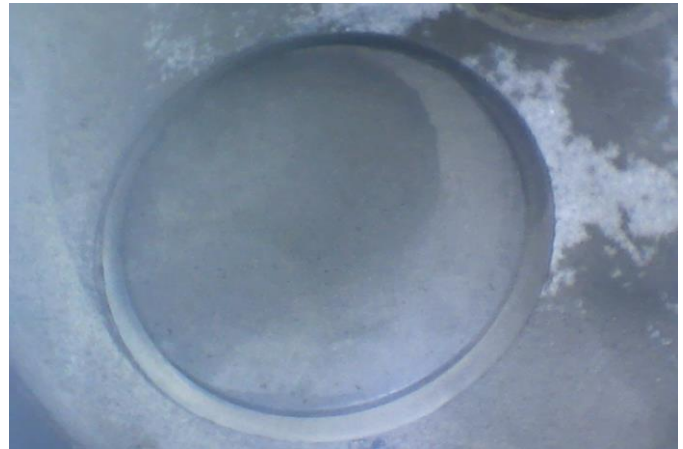
VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope; 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



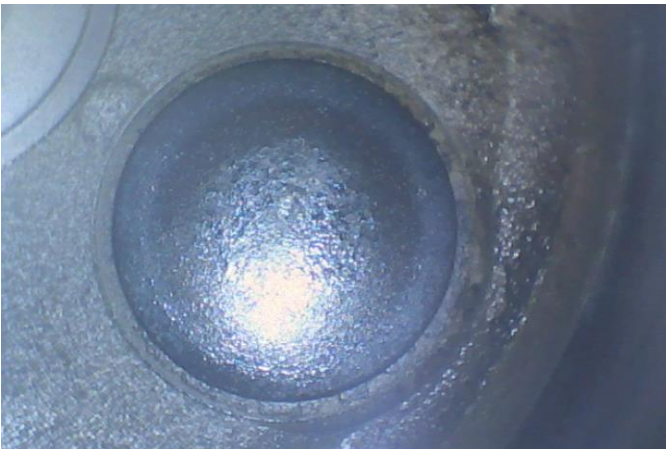
#3 Intake Valve



#5 Exhaust Valve



#5 Intake Valve



#2 Exhaust Valve



#2 Intake Valve

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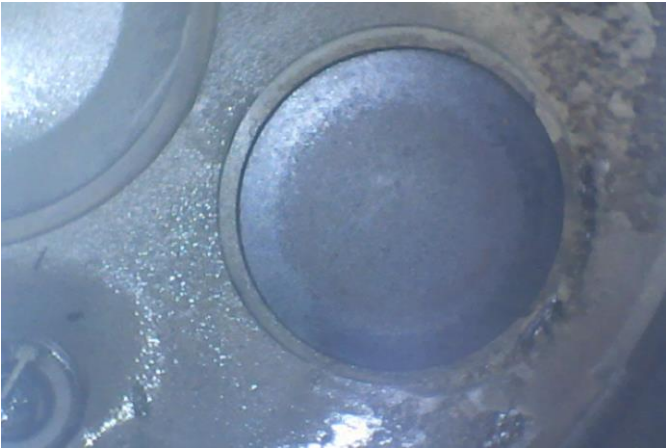
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#4 Exhaust Valve



#4 Intake Valve



#6 Exhaust Valve



#6 Intake Valve

ROCKER ARMS AND SHAFTS

Condition:

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



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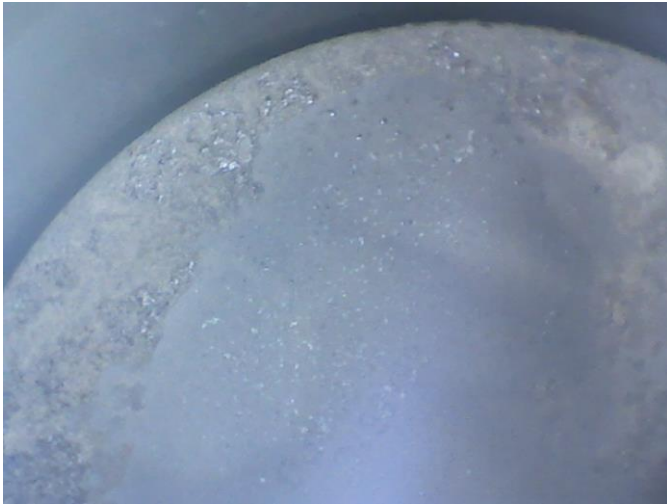
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PISTONS

Piston P/N: Not observed

Condition:

The piston faces were inspected using a lighted borescope. The #3 cylinder was observed to have a small semicircular impression consistent with a valve strike; it was noted that the intake rocker box cover was impact damaged and pressing against the rocker arm. The rest of the cylinders displayed normal operating and combustion signatures and all of the pistons operated normally during crankshaft rotation.



#1 Piston



#3 Piston (with indentation consistent with a valve strike)



#5 Piston



#2 Piston

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#4 Piston



#6 Piston

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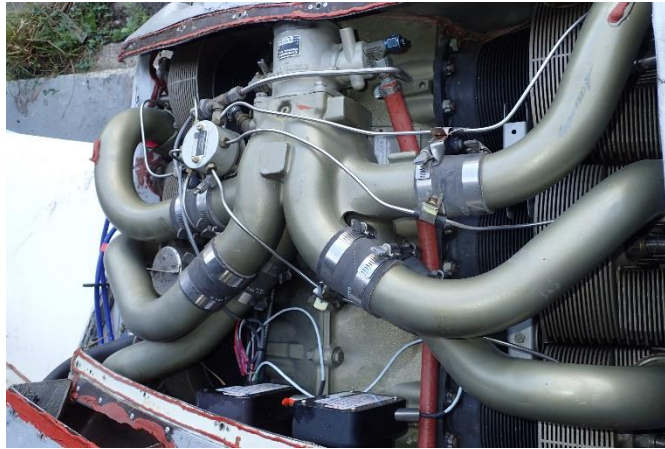
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CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: Not observed	2-4-6: Not observed	S/N: Not observed
Condition:	The crankcase remained intact and was undamaged. There were no holes in the crankcase that would indicate a catastrophic internal engine failure.			



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PAGE 22 of 25**CRANKSHAFT ASSEMBLY****CRANKSHAFT**Forging Number:
Inaccessible

S/N: Not observed

Heat code: Inaccessible

Condition:

The crankshaft remained intact and there were no visible signs of impact damage. The crankshaft was rotated using both the starter as well as by rotating the propeller; 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:

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

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ACCESSORIES

STARTER

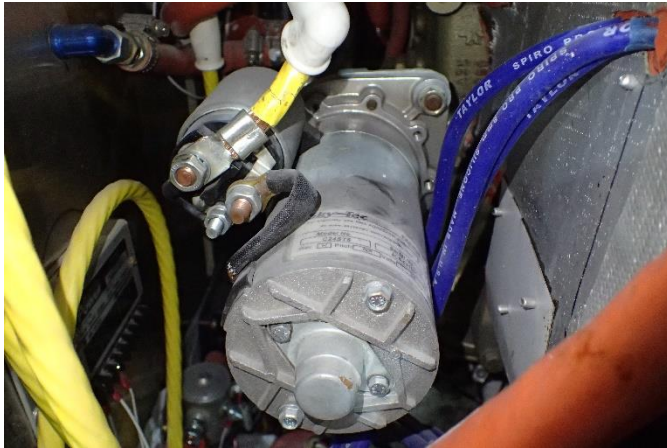
Manufacturer: Sky-Tec

P/N: C24ST5

S/N: 4C5-031601

Condition:

The starter remained attached to the starter adapter and was undamaged. The power was turned onto the aircraft's electrical system and it was noted that the starter button would not engage the starter which was consistent with the impact damage to the wiring harnesses. A jumper switch was placed on the starter solenoid and was actuated; the starter operated normally.



STARTER ADAPTER

P/N: Not observed

Condition:

The starter adapter remained attached to its installation point and was undamaged. During starter engagement, the starter adapter operated normally.

ALTERNATOR

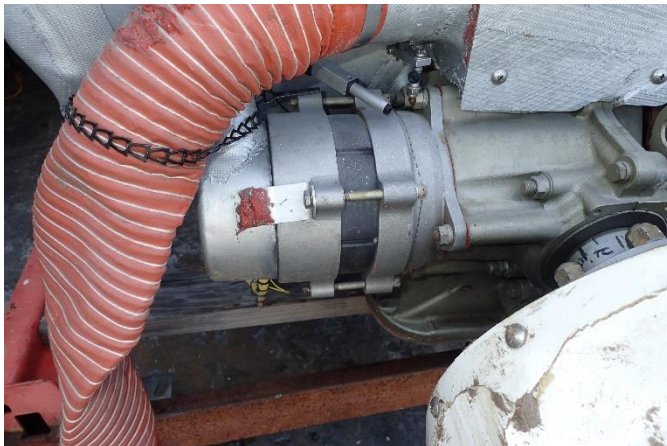
Manufacturer:

P/N:

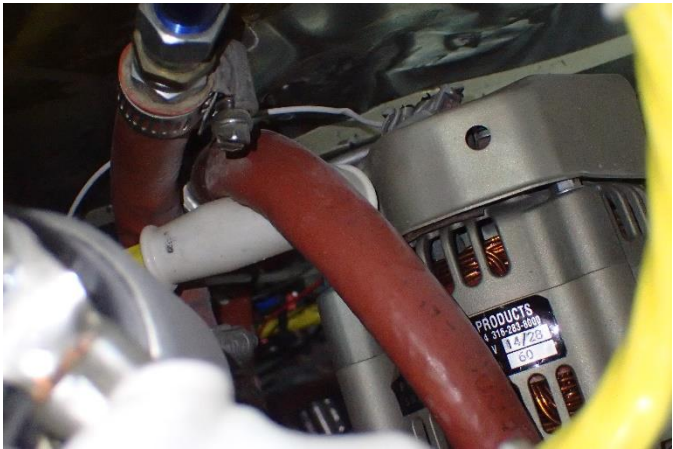
S/N:

Condition:

The alternator remained attached to its installation point and was undamaged.



STANDBY ALTERNATOR	Manufacturer: Not observed	P/N: Not observed	S/N: Not observed
Condition:	The standby alternator remained attached to its installation point and was undamaged. It was noted that the primary wire was loose on the terminal.		



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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. The propeller control cable rod end remained secured to the governor control arm and was capable of movement.		
PROPELLER	Manufacturer: MT Propellers	P/N: Not observed	S/N: Not observed
Condition:	The three-blade, constant speed propeller remained attached to the propeller flange; however, all three propeller blades were broken. Only a small portion of each propeller blade root remained attached to the propeller hub and the remaining portions of the blades were not observed.		

