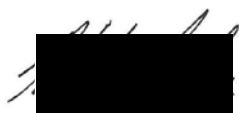




Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	O-170-3
ENGINE SERIAL NUMBER	31051
AIRCRAFT MAKE & MODEL	Nunley Bryant J KR2
AIRCRAFT SERIAL NUMBER	8362
AIRCRAFT REGISTRATION	N269HJ
FILE NUMBER	16-696

NAME	SIGNATURE	DATE
Kurt Gibson		07/07/2017

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	07/03/2017	NTSB ACCIDENT #	ERA17LA220
FACILITY	Sky Ranch Airport	NTSB INVESTIGATOR	Ralph Hicks
ADDRESS	[REDACTED] Baker, FL 32531	FAA INVESTIGATOR	Dale White
		ACCIDENT DATE	06/30/2017
		ACCIDENT LOCATION	Baker, Florida

ENGINE INFORMATION

ENGINE POSITION	Single engine (front)
TOTAL TIME	Unknown
TIME SOH	Unknown
TYPE & TIME SLI	Unknown
BUILD DATE	Unknown
IN SERVICE DATE	Unknown

Significant logbook information:

The logbooks were not recovered at the time of this report's writing.

Report Summary:

Search Code(s):

The throttle control arm was found loose on the throttle control shaft; however, due to the design of the control arm and shaft it could not be determined if this was a result of impact damage or occurred prior to the accident. There were no further anomalies noted that would have prevented normal operation or production of rated horsepower.

Disposition of engine following exam:

The engine remained in a storage shed at the Sky Ranch Airport in Baker, Florida.

INSPECTION WITNESSES			
NAME	Kurt Gibson	NAME	Dale White
ADDRESS	Mobile, Alabama	ADDRESS	Birmingham, Alabama
ORGANIZATION	Continental Motors	ORGANIZATION	FAA
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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The engine remained attached to the firewall through the engine mounts, cables, wires, and hoses. The engine displayed impact damage signatures with the most damage occurring to the bottom and to the left side of the engine. The two blade, fixed pitch, wooden propeller hub remained attached to the crankshaft; both propeller blades had shattered. The crankcase remained intact and displayed minor impact damage signatures. All four cylinders remained attached to their cylinder bays and displayed varying amounts of impact damage; the #4 cylinder displayed the most impact damage signatures.

The carburetor displayed a significant amount of impact damage. The carburetor had broken free from the induction system and the air box was crushed. The carburetor inlet fuel line had broken free from the carburetor.

Both of the magnetos remained attached to their installation points. The left magneto displayed impact damage signatures to the distributor portion of the magneto. The right magneto was undamaged. The ignition harness displayed impact damage signatures with the bottom ignition harness displaying the most impact damage. All of the spark plugs remained installed in their cylinders and displayed varying amounts of impact damage signatures with the bottom spark plugs displaying the most impact damage.

The induction system displayed impact damage signatures with the most damage occurring to the #4 cylinder induction riser and to the carburetor mounting flange. The exhaust system remained attached to the engine and displayed impact damage signatures with the left side exhaust risers displaying the most impact damage.

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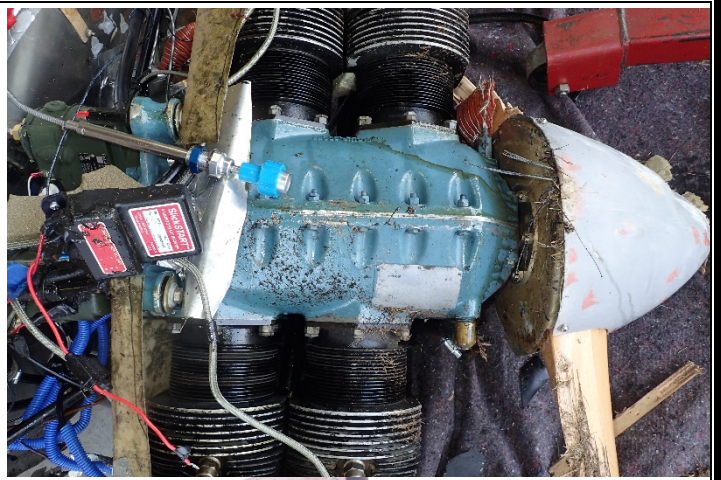
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ENGINE TEARDOWN AND COMPONENT EXAMINATION

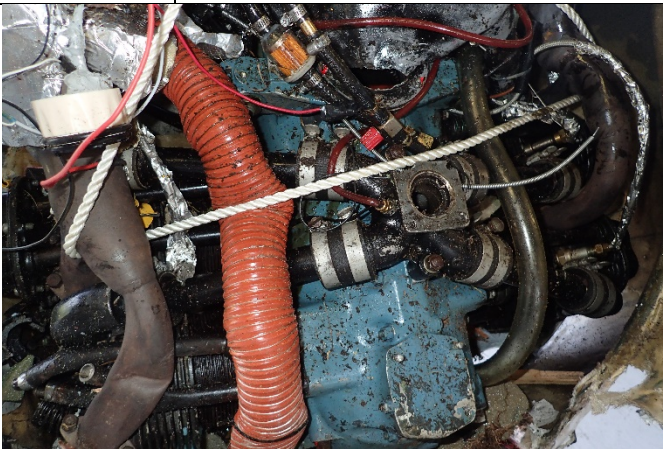
EXHAUST SYSTEM

Condition: The exhaust system remained attached to the engine and displayed impact damage signatures. The left side exhaust system displayed the most impact damage. There were no anomalies noted with the exhaust system.



INDUCTION SYSTEM

Condition: The induction system displayed impact damage signatures with the #4 cylinder exhaust riser and the carburetor mounting flange displaying the most impact damage. There were no signs of induction leaks noted with the induction system. There were no anomalies noted.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

P/N: 4220

S/N: 88090149

Condition:

The magneto remained attached to its installation point and displayed impact damage signatures to the distributor section of the magneto. During crankshaft rotation it was noted that the magneto would only produce a spark on one of the posts. The magneto was removed and visually inspected; it was noted that the distributor was impact damaged and the distributor gear was displaced. There were no pre-impact damage anomalies noted.



RIGHT MAGNETO

Manufacturer: Slick

P/N: 4220

S/N: 88100142

Condition:

The right magneto remained attached to its installation point and was undamaged. During crankshaft rotation, it was noted that the magneto was capable of producing a spark to all of the ignition lead ends and was in the correct firing order. There were no anomalies noted.



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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness displayed impact damage signatures with the most damage occurring to the bottom ignition leads. All of the top ignition leads and the #2 bottom ignition lead were capable of conducting a spark from the magneto to the ignition lead end; the remaining bottom ignition leads were unable to be tested due to the damage to the left magneto.

SPARK PLUGS

Manufacturer: Unisom and Champion

P/N: Unisom: UREM38E, Champion: REM40E

Condition:

The spark plugs remained secured in their cylinders and displayed varying amount of impact damage with the bottom spark plugs displaying the most impact damage. The top spark plugs were removed and visually inspected. The spark plug electrodes displayed normal operating and wear signatures. The bottom spark plugs were inspected using a lighted borescope. The bottom spark plugs displayed normal operating and wear signatures; the bottom #4 spark plug insulator was broken which was consistent with impact damage. It was noted that the top #2 spark plug was a different manufacture and had a different heat range.



#1 Top Spark Plug



#1 Bottom Spark Plug

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#3 Top Spark Plug



#3 Bottom Spark Plug



#2 Top Spark Plug



#2 Bottom Spark Plug



#4 Top Spark Plug



#4 Bottom Spark Plug

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FUEL SYSTEM

CARBURETOR

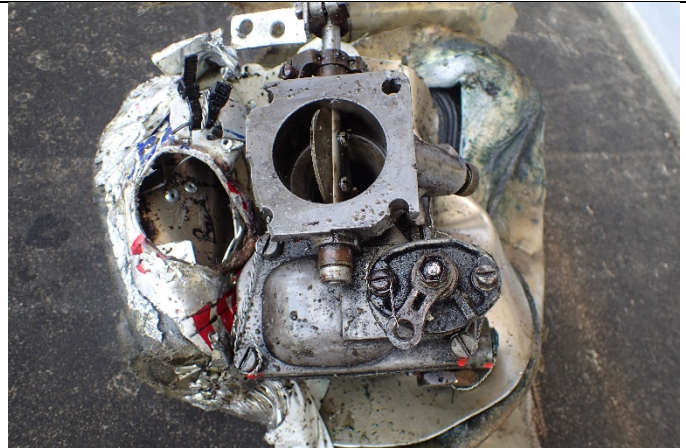
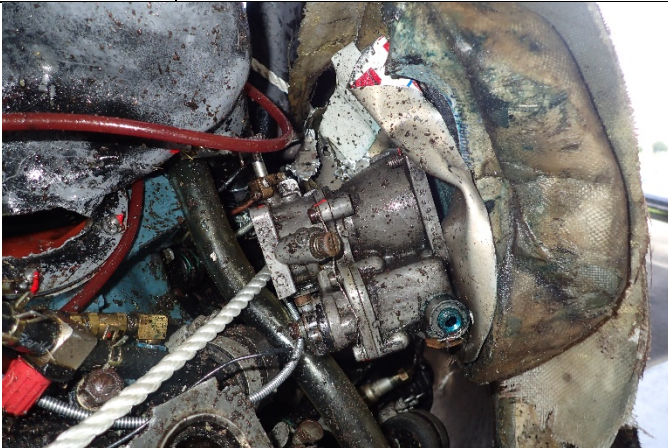
Manufacturer: Stromberg

P/N: Not observed

S/N: Not observed

Condition:

The carburetor had broken free from its installation point and displayed impact damage signatures. The throttle control cable remained attached to the control arm. The carburetor was removed from the airframe and visually inspected. It was noted that the control arm was loose on the control shaft and the investigators were able to pull the control arm off the control shaft without having to loosen the control arm clamp. Due to the impact damage to the carburetor and the design of the arm and shaft the investigators could not determine whether it became loose as a result of the accident or occurred prior to impact. The carburetor was disassembled and the internal components were visually inspected. The internal components displayed normal operating signatures and the fuel inlet filter was clear of contaminants.



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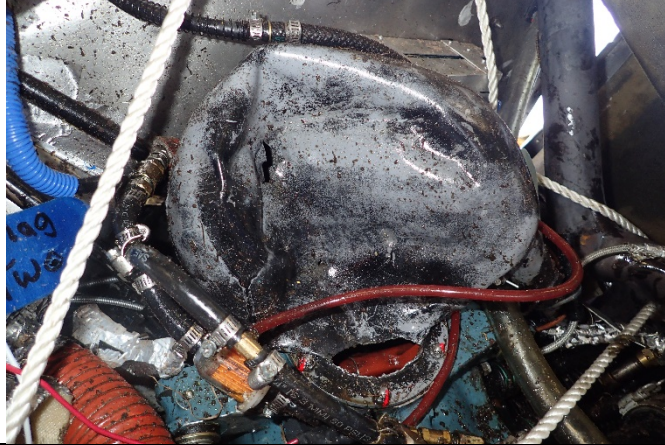
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LUBRICATION SYSTEM

OIL SUMP

Condition: The oil sump displayed a significant amount of impact damage and was breached. When the engine was turned right side up a significant amount of oil leaked out from the breached oil sump. There were no anomalies noted.



OIL SCREEN

Manufacturer: CMI

Condition: The oil screen remained secured in its installation point and was undamaged. The oil screen was removed and visually inspected. There was a significant amount of carbon noted within the screen. There were no further anomalies noted with the oil screen inspection.



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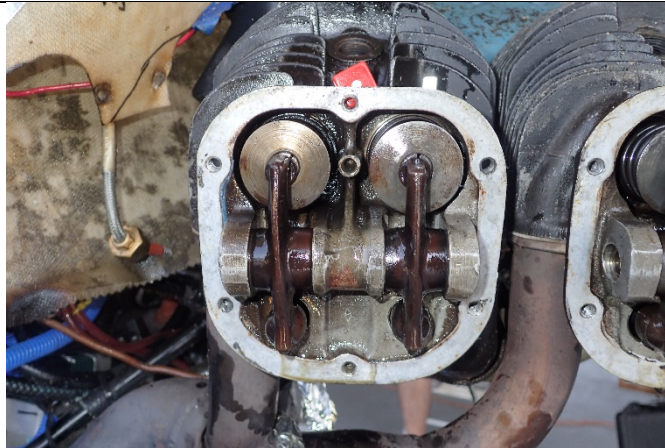
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ENGINE S/N:

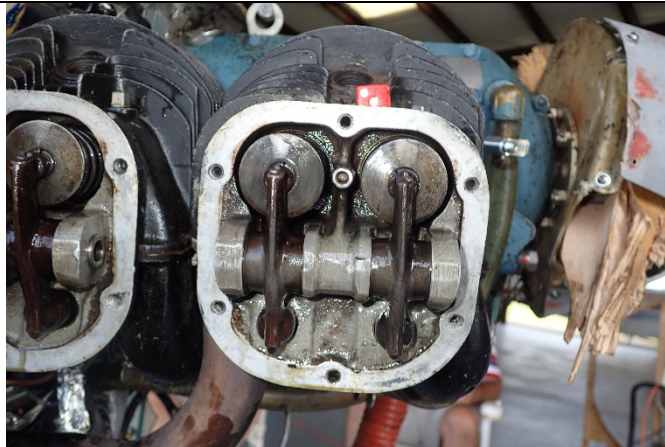
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CYLINDER #1	P/N: Not observed	S/N: Not observed
Condition:	The cylinder remained attached to its installation point and was undamaged. The internal portion of the cylinder was inspected using a lighted borescope. The piston face, cylinder bore, and valve heads displayed normal operating and combustion signatures. The overhead components (valves, springs, rocker arms, and push rods) displayed normal operating and lubrication signatures. During crankshaft rotation the cylinder displayed good thumb compression and suction.	



CYLINDER #3	P/N: Not observed	S/N: Not observed
Condition:	The cylinder remained attached to its installation point and was undamaged. The internal portion of the cylinder was inspected using a lighted borescope. The piston face, cylinder bore, and valve heads displayed normal operating and combustion signatures. The overhead components (valves, springs, rocker arms, and push rods) displayed normal operating and lubrication signatures. During crankshaft rotation the cylinder displayed good thumb compression and suction.	



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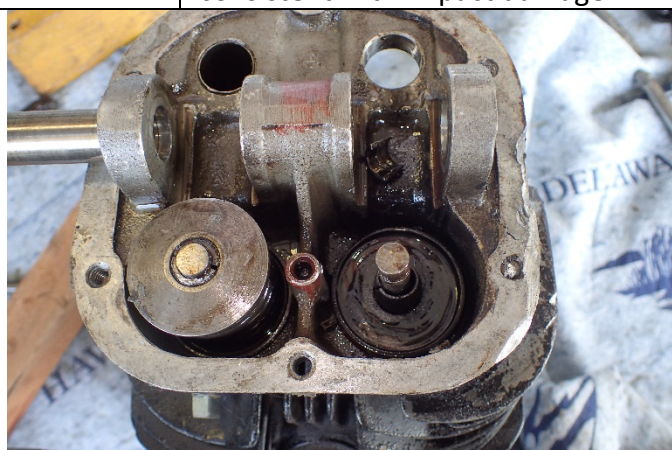
CYLINDER #2

P/N: Not observed

S/N: Not observed

Condition:

The cylinder remained attached to its cylinder bay and displayed impact damage signatures to the cylinder head. The internal portion of the cylinder was inspected using a lighted borescope. The piston face and cylinder bore displayed normal operating and combustion signatures. The inspection of the valves revealed a foreign object was underneath the intake valve and the exhaust valve was stuck in the open position. The cylinder was removed and the foreign object was removed from the intake valve; it was determined that the object was one of the mounting studs for the carburetor that had broken free during impact. The exhaust rocker arm was removed and it was noted that it was impinged in its installation point which was consistent with the impact damage to the cylinder. The exhaust valve was removed and it was noted to be bent which was consistent with impact damage.



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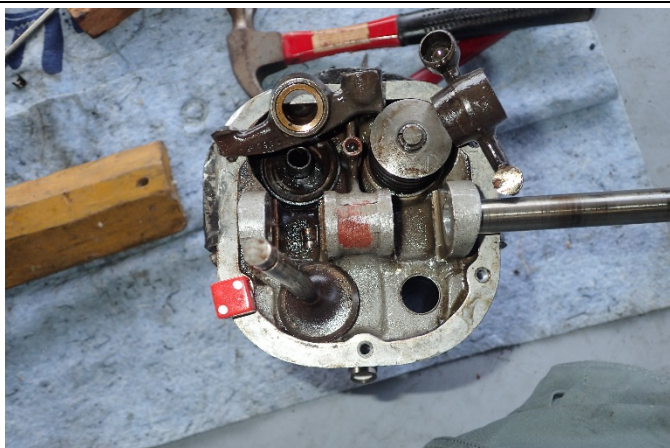
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CYLINDER #4

P/N: Not observed

S/N: Not observed

Condition:

The cylinder remained attached to its cylinder bay and displayed a significant amount of impact damage to the cylinder head. A large portion of the cylinder head had broken free from the rest of the cylinder and both of the valves were bent. The internal portion of the cylinder was inspected using a lighted borescope. The piston face and cylinder bore displayed normal operating and combustion signatures. The valves heads were displaced from their seats which was consistent with impact damage. Both of the valve heads displayed normal combustion signatures. The overhead components (valves, springs, rocker arms, and push rods) displayed impact damage signatures, normal operating signatures and lubrication signatures.



VALVES AND GUIDES

Condition:

The #2 cylinder exhaust valve was found stuck in the open position. The exhaust valve was removed and it was found to be bent which was consistent with impact damage. The #2 intake valve had a foreign object under the valve; after the cylinder was removed it was determined the object was a stud that had broken free from the carburetor mounting flange during the accident sequence. The #4 valves displayed impact damage signatures and were bent and the valve heads were displaced from their seats. All of the valve heads displayed normal combustion signatures and the #1 and #3 valves operated normally during crankshaft rotation.

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#1 Intake Valve



#1 Exhaust Valve



#3 Intake Valve



#3 Exhaust Valve



#2 Intake and Exhaust Valves with Debris



Bolt and nut found between the #2 intake valve head and seat

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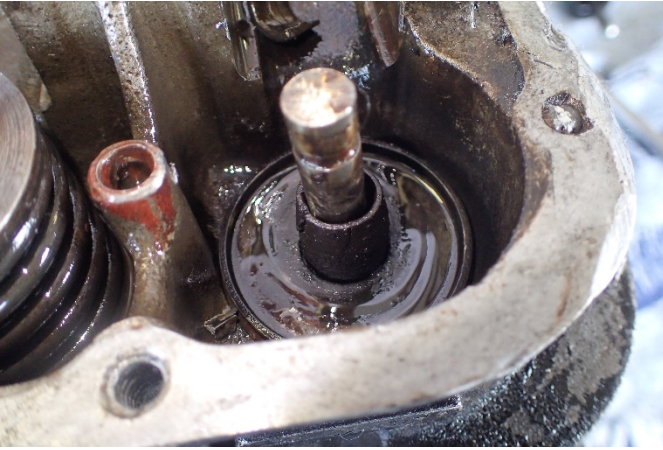
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#2 Exhaust Valve Stem and Guide



#2 Exhaust Valve Stem



#4 Intake Valve

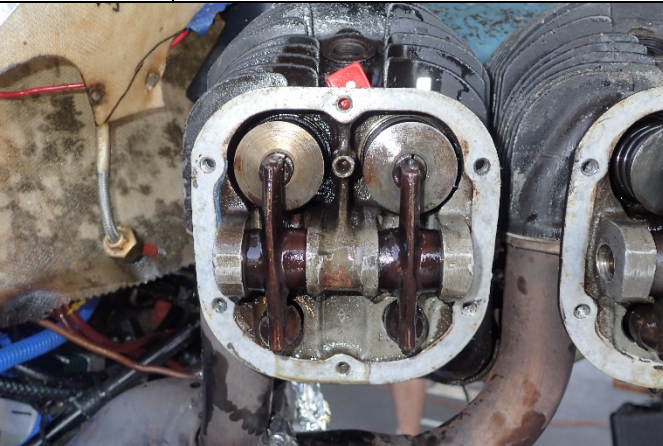


#4 Exhaust Valve

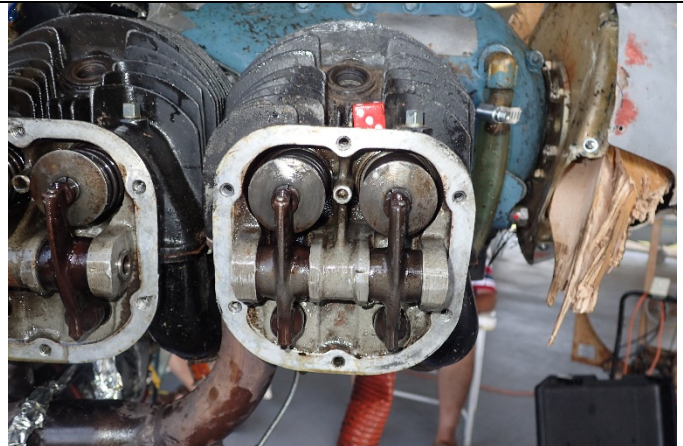
ROCKER ARMS AND SHAFTS

Condition:

The #2 exhaust rocker arm was noted to be impinged in its installation point which was consistent with impact damage to the cylinder. The rocker arms displayed normal operating and lubrication signatures.



#1 Rocker Arms



#3 Rocker Arms

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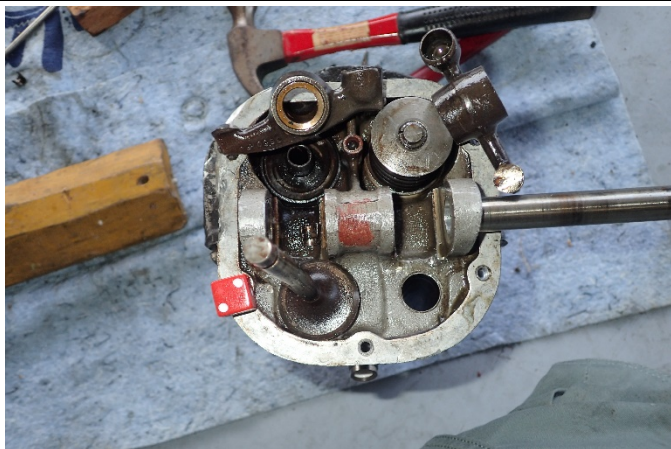
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#2 Rocker Arms after Removal



#4 Rocker Arms

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PISTONS

Piston P/N: Not observed

Condition:

The pistons were inspected using a lighted borescope; the #2 piston was examined further after the cylinder was removed. All of the pistons displayed normal operating and combustion signatures. The piston rings on the #2 piston displayed normal operating signatures and were capable of normal movement.



#1 Piston



#3 Piston



#2 Piston after Removal



#4 Piston

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 displayed minor impact damage signatures. There were no anomalies noted with the crankcase.			



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CRANKSHAFT	Forging: Inaccessible	S/N: Inaccessible	Heat code: Inaccessible
Condition:	The crankshaft remained intact and was undamaged. The crankshaft was rotated using the remains of the propeller; continuity was established between the crankshaft, camshaft, connecting rods, and associated components. There were no anomalies noted with the crankshaft.		
CONNECTING RODS			
Condition:	The #2 connecting rod was observed after the cylinder was removed; the rod was capable of normal movement on its journal and displayed normal operating and lubrication signatures. Operation of the remaining connecting rods was verified by rotating the crankshaft and observing piston movement; the connecting rods operated normally.		

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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. A portion of the camshaft was visible after removing the #2 cylinder; the visible portion of the camshaft displayed normal operating signatures.

**ACCESSORY
GEARS**

Condition:

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

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PROPELLER

PROPELLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The two blade, fixed pitch, wooden propeller remained attached to the propeller flange and displayed impact damage to both propeller blades. Both of the propeller blades had shattered into multiple pieces.

