



Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	GTSIO-520-L
ENGINE SERIAL NUMBER	292352-R
AIRCRAFT MAKE & MODEL	Cessna 421C
AIRCRAFT SERIAL NUMBER	421C-0874
AIRCRAFT REGISTRATION	N421NS
FILE NUMBER	18-363

NAME	SIGNATURE	DATE
Kurt Gibson		02/28/2019

ENGINE FIELD INSPECTION REPORT

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	02/16/2019 – 02/17/2019	NTSB ACCIDENT #	CEN19FA082
FACILITY	Hemphill County Airport	NTSB INVESTIGATOR	Joshua Lindberg
ADDRESS	255 Airport Rd Canadian, TX 79014	FAA INVESTIGATOR	William Fitzgerald
		ACCIDENT DATE	02/15/2019
		ACCIDENT LOCATION	Canadian, Texas

ENGINE INFORMATION

ENGINE POSITION	Left
TOTAL TIME	4243.0 (time taken from last annual inspection entry on 06/24/2018)
TIME SOH	208.0 (time taken from last annual inspection entry on 06/24/2018)
TYPE & TIME SLI	Unknown
BUILD DATE	10/06/1998
IN SERVICE DATE	Unknown

Significant logbook information:

The last annual inspection was performed on 06/24/2018 at a Hobbs time of 6227.4. The engine was overhauled by America's Aircraft Engines, Inc. on 06/13/2012 and was installed on the aircraft on 08/21/2012 at a Hobbs time of 6019.4.

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 was recovered to Crotts Aircraft Services in Dodge City, Kansas.

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INSPECTION WITNESSES

NAME	Kurt Gibson	NAME	Joshua Lindberg
ADDRESS	Mobile, Alabama	ADDRESS	Central Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Andrew Hall	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 sustained a significant amount of impact and thermal damage to the entire engine and its components. The forward portion of the crankcase that houses the propeller shaft and reduction gear had broken free from the rest of the crankcase; the damage was consistent with impact damage. The three blade, variable pitch propeller had broken free from the propeller shaft and all three propeller blades displayed varying amounts of impact damage. All six cylinders remained attached to the engine and displayed impact damage signatures with the most damage occurring to the bottom of the cylinders.

The fuel pump and the throttle and metering assembly had broken free from their installation points and displayed impact damage signatures; the metering assembly also displayed thermal damage signatures. The fuel manifold valve remained attached to the engine and displayed a significant amount of thermal damage to the housing. The fuel nozzles displayed varying amounts of impact damage signatures and several of the nozzles had broken free from their cylinders.

Both of the magnetos had broken free from their installation points and were mostly destroyed by thermal damage. The ignition harness displayed thermal and impact damage signatures; several of the ignition leads were severed. The spark plugs remained installed in their cylinders and displayed varying amounts of impact damage with the bottom spark plugs displaying more impact damage than the top spark plugs.

The turbocharger remained attached to its installation point and displayed significant impact damage and some thermal damage signatures. The wastegate, controller, and overboost valve also displayed impact damage and thermal damage signatures.

The exhaust system displayed significant impact damage signatures with the exhaust risers showing the most damage; the risers were crushed upwards against the engine cylinders. The induction system displayed significant impact and thermal damage signatures; several of the induction tubes were partially melted.

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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition:

The exhaust system remained attached to the engine and displayed a significant amount of impact damage. The exhaust risers displayed the most impact damage and were crushed upwards against the engine; several of the risers were crushed almost completely flat. There were no signs of exhaust leaks noted.



INDUCTION SYSTEM

Condition:

The induction system displayed a significant amount of impact and thermal damage signatures; several of the induction tubes had partially melted. There were no signs of induction leaks noted with the remaining induction tubes.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The magneto had broken free from its installation point and was almost destroyed by thermal forces; the housing had almost completely melted and all of the internal components displayed significant thermal damage.



RIGHT MAGNETO

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The magneto had broken free from its installation point and was almost destroyed by thermal forces; the housing had almost completely melted and all of the internal components displayed significant thermal damage.



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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness displayed a significant amount of impact and thermal damage signatures; several of the ignition leads were completely severed and the insulation was melted in several locations.

SPARK PLUGS

Manufacturer: Tempest

P/N: URHB32E

Condition:

The spark plugs remained installed in their cylinders and displayed varying amounts of impact damage signatures; the bottom spark plugs displayed the most impact damage. The top spark plugs were removed, and the electrodes were visually inspected. The electrodes displayed normal operating and wear signatures. The bottom spark plugs were inspected using a lighted borescope; it was noted that the #3 and the #5 bottom spark plugs were submersed in water/oil. The rest of the bottom spark plugs displayed normal operating signatures.



#1, #3, #5 Top Spark Plugs



#2, #4, #6 Top Spark Plugs

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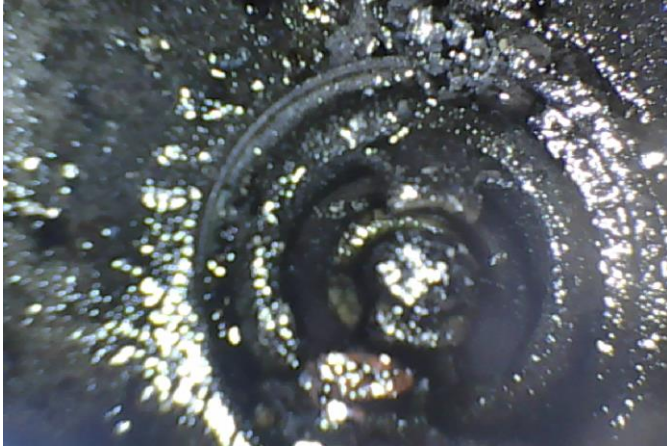
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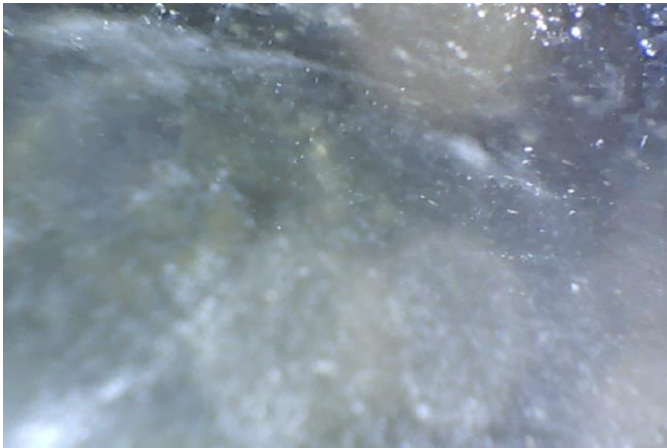
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#1 Bottom Spark Plug



#2 Bottom Spark Plug



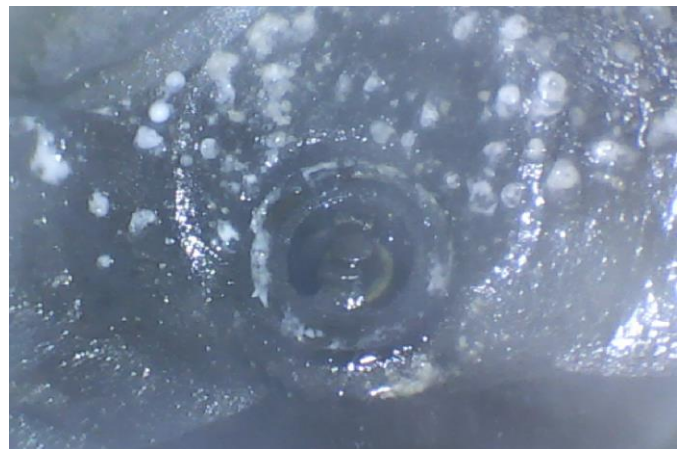
#3 Bottom Spark Plug (submersed)



#4 Bottom Spark Plug



#5 Bottom Spark Plug (submersed)



#6 Bottom Spark Plug

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FUEL SYSTEM

FUEL PUMP

Manufacturer: CMG

P/N: 646210-3A5

S/N: L039101B

Condition:

The fuel pump had broken free from its installation point and displayed a significant amount of impact damage signatures; several portions of the fuel pump were not located at the time of the examination. The fuel pump drive shaft and drive gear were located and were found to be intact. The fuel pump drive shaft and vanes were noted to have remained intact and displayed some impact damage signatures. There were no anomalies noted with the recovered portions of the fuel pump.



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THROTTLE BODY METERING UNIT

Manufacturer: Not located

P/N: Not located

S/N: Not located

Condition:

The throttle body and metering unit had broken free from its installation point and displayed a significant amount of impact and thermal damage signatures; the metering assembly had broken free from the throttle body and was not located at the time of the examination. There were no anomalies noted with the recovered portion of the throttle and metering assembly.



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FUEL MANIFOLD VALVE

Manufacturer: CMI

P/N: 641032-1A6

S/N: C00EA279R

Condition:

The fuel manifold valve remained partially attached to the engine and displayed some impact and a significant amount of thermal damage; the manifold valve cap had almost completely melted. The internal components displayed thermal damage signatures. There were no anomalies noted.



FUEL NOZZLES AND LINES

Manufacturer: Not observed

Condition:

The fuel nozzles displayed varying amounts of impact damage signatures; several of the nozzles had broken free from their cylinders. There were no signs of fuel leaks around the fuel nozzles and the fuel lines remained secured to the nozzles.

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LUBRICATION SYSTEM

OIL SUMP

Condition:

The oil sump displayed a significant amount of impact damage and was crushed upwards and was breached. There were no anomalies noted.



OIL PICK-UP TUBE & SCREEN

Condition:

The oil pick-up tube and screen were visible through the broken oil sump. The pick-up tube and screen displayed significant impact damage signatures and the screen had material consistent with dirt/mud in the screen. There was no metallic material found in the oil pick-up screen. There were no anomalies noted.



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OIL PUMP

Condition:

The oil pump had broken free from the engine and displayed a significant amount of impact damage signatures. It was noted that the oil pump drive shaft had broken, and a portion of the shaft remained within the camshaft gear; the damage was consistent with impact damage. There were no anomalies noted with the oil pump.



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OIL FILTER

Manufacturer: Tempest

P/N: Not observed

Condition:

The oil filter remained partially attached to the oil filter adapter and displayed a significant amount of impact damage. Due to the impact damage the filter could not be removed.



OIL COOLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The oil cooler remained attached to the engine and displayed impact damage signatures. There were no anomalies noted with the oil cooler.



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CYLINDERS

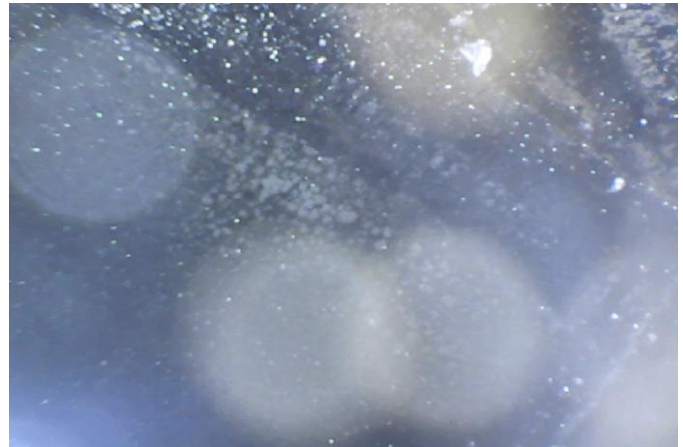
CYLINDERS

Condition:

The cylinders remained attached to their cylinder bays and displayed impact damage signatures with most of the damage occurring to the bottom of the cylinders. The cylinders were inspected using a lighted borescope. The cylinder bores, piston faces, and valve heads displayed normal operating and combustion signatures. The overhead components (springs, valves, and rocker arms) displayed thermal damage signatures to the left side cylinders; all of the overhead components also displayed normal operating signatures. All of the rocker arms and valve were capable of movement when actuating manually. There were no anomalies noted.



#1 Cylinder



#3 Cylinder

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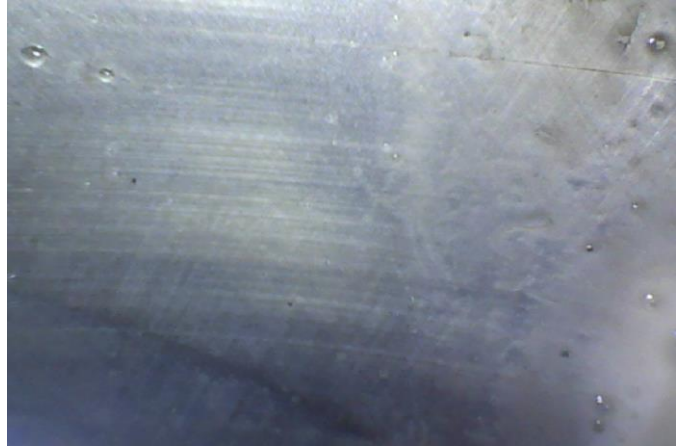
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#5 Cylinder



#2 Cylinder



#4 Cylinder

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#6 Cylinder

VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope; the valve heads displayed normal operating and combustion signatures. All of the valves were capable of movement when actuating the rocker arms manually; there were no anomalies noted.



#1 Exhaust Valve



#1 Intake Valve

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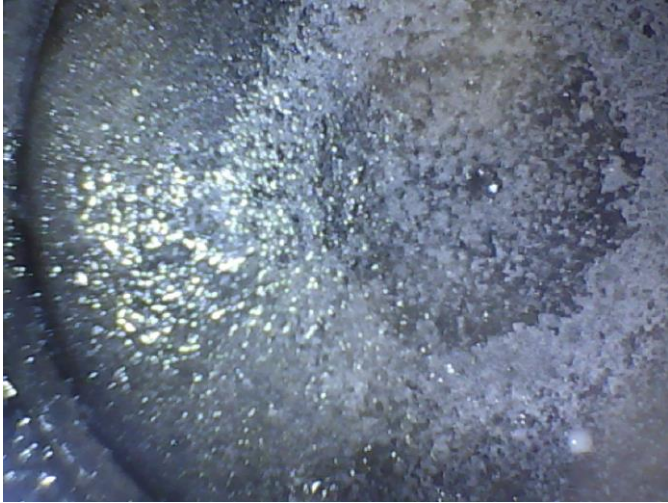
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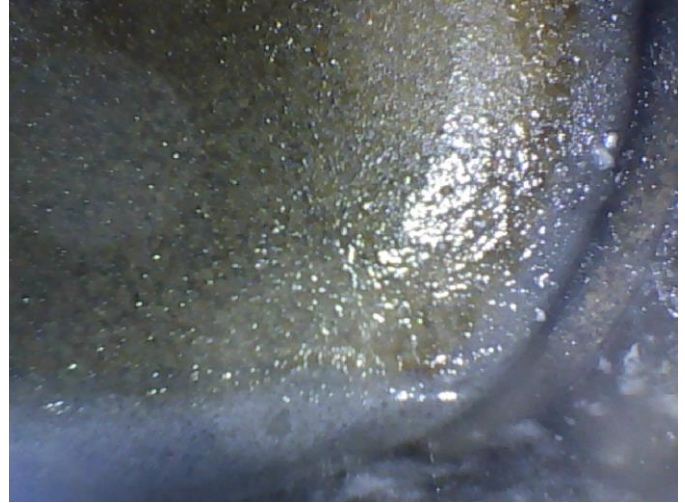
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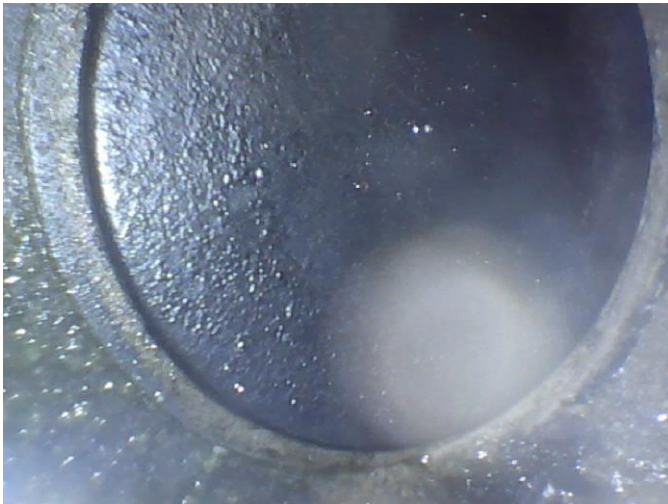
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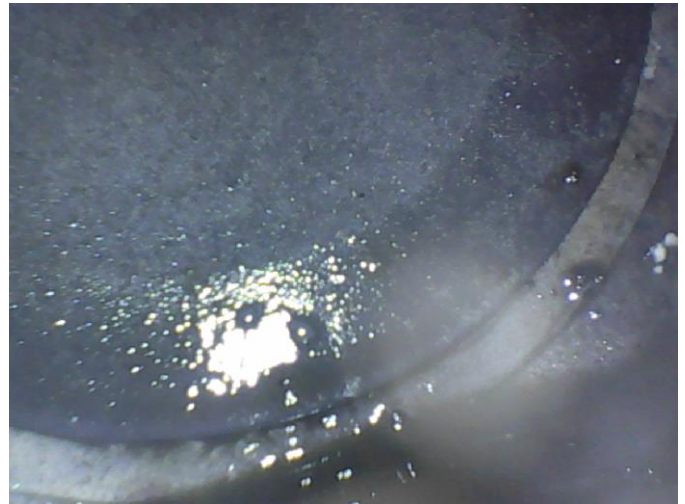
#3 Exhaust Valve



#3 Intake Valve



#5 Exhaust Valve



#5 Intake Valve

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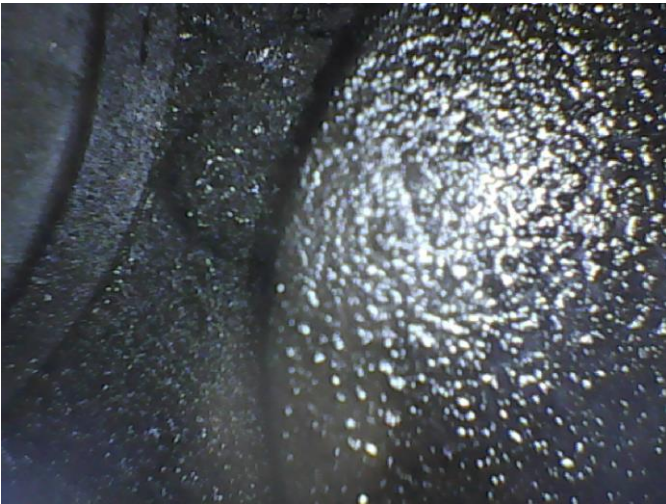
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#2 Exhaust Valve



#2 Intake Valve



#4 Exhaust Valve



#4 Intake Valve

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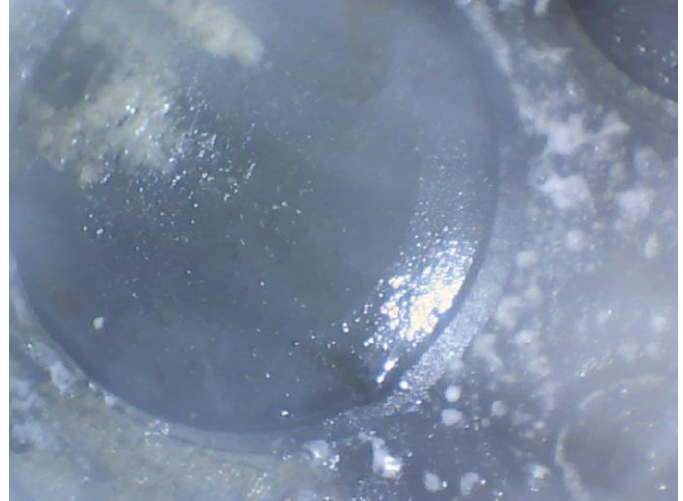
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#6 Exhaust Valve



#6 Intake Valve

ROCKER ARMS AND SHAFTS

Condition:

All of the rocker arms remained attached to their cylinders and displayed varying amounts of thermal damage signatures with the left side rocker arms showing the most thermal damage. The rocker arms also displayed normal operating signatures and were capable of movement when actuating the rocker arms manually.



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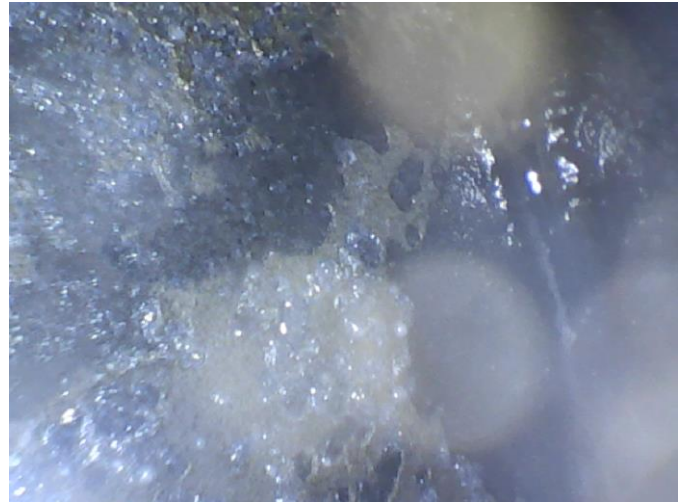
Piston P/N: Inaccessible

Condition:

All of the piston faces were inspected using a lighted borescope. The piston faces displayed normal operating and combustion signatures. There were no anomalies noted with the pistons.



#1 Piston



#3 Piston



#5 Piston



#2 Piston

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#4 Piston



#6 Piston

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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 displayed a significant amount of impact damage with most of the damage occurring to the forward portion of the crankcase; the portion of the crankcase that houses the propeller shaft and reduction gear had broken free from the rest of the crankcase. There were no breaches in the crankcase that would indicate a catastrophic internal engine failure. Holes were drilled into the top of the crankcase to facilitate inserting a lighted borescope to inspect portions of the internal components; there were no anomalies noted with the visible internal portions of the crankcase.			



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

Forging Number:
Inaccessible

S/N: Inaccessible

Heat code: Inaccessible

Condition:

The forward portion of the crankshaft was visible through the broken crankcase and displayed impact damage signatures. The crankshaft was unable to be rotated which was consistent with the extensive impact damage to the engine. The crankshaft gear was noted to be intact and properly secured. Small portions of the crankshaft were visible by drilling holes in the crankcase and using a lighted borescope; the visible portions of the crankshaft displayed normal operating signatures and there were no anomalies noted with the visible portions of the crankshaft.



REDUCTION GEAR

Condition:

The reduction gear was partially visible through the broken crankcase; the visible portion of the reduction gear displayed normal operating signatures.



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The propeller flange remained attached to the propeller shaft and displayed impact damage signatures. A portion of the rear part of the propeller shaft was visible and displayed impact damage and normal operating signatures.

**QUILL SHAFT****Condition:**

The quill shaft displayed impact damage signatures and was broken into two pieces. The fracture surface displayed some 45° cracks and ratcheting marks.

**INTERNAL TIMING****Condition:**

The internal timing was verified to be correct by counting the teeth between the crankshaft timing mark and the camshaft timing mark.

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CONNECTING RODS

P/N: Inaccessible

Forging or Serial Number: Inaccessible

Condition:

The connecting rods were able to be partially inspected by drilling holes in the crankcase and inserting a lighted borescope. It was noted that all six connecting rods remained on their journal and there were no signs of lubrication distress to any of the rods.



#1 Connecting Rod



#3 Connecting Rod



#5 Connecting Rod



#2 Connecting Rod

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#4 Connecting Rod



#6 Connecting Rod

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CAMSHAFT

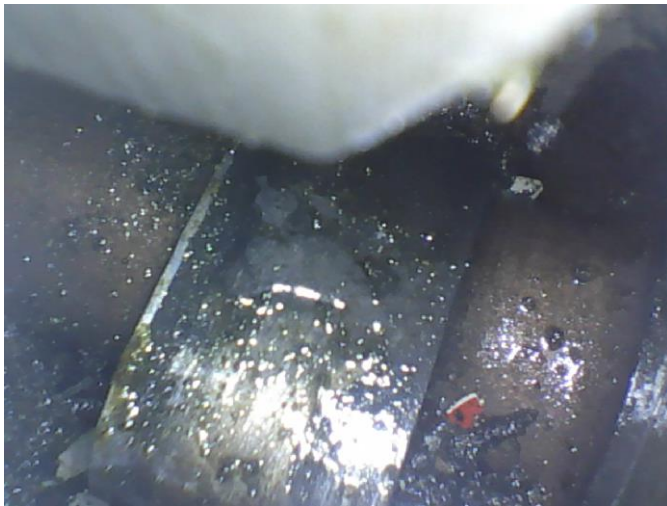
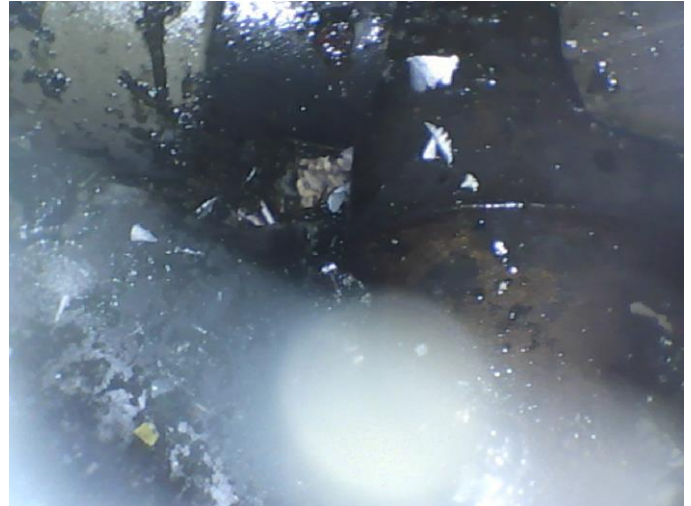
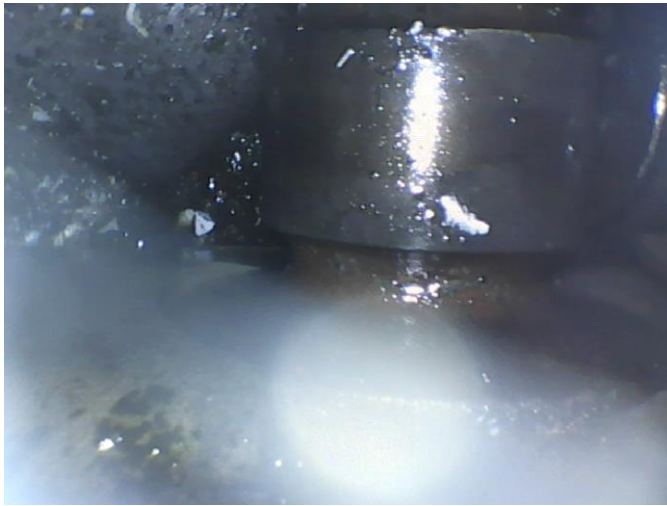
CAMSHAFT

P/N: Inaccessible

S/N: Inaccessible

Condition:

The forward portion of the camshaft was visible through the broken crankcase; the camshaft displayed impact damage signatures and a portion of the camshaft had broken free from the rest of the camshaft. The rest of the camshaft was partially visible by inserting a lighted borescope into drilled holes in the crankcase. The visible portions of the camshaft displayed normal operating and lubrication signatures.



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ACCESSORY GEARS

Condition:

The accessory gears displayed varying amounts of thermal damage signatures. All of the gears remained intact and displayed normal operating signatures and varying amounts of thermal damage signatures.

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ACCESSORIES

STARTER

Manufacturer: CMI

P/N: 646275

S/N: Y-??97??

Condition:

The starter remained attached to its mounting flange; however, the mounting flange had broken free from the rest of the starter adapter. The starter displayed impact and significant thermal damage signatures. There were no anomalies noted.

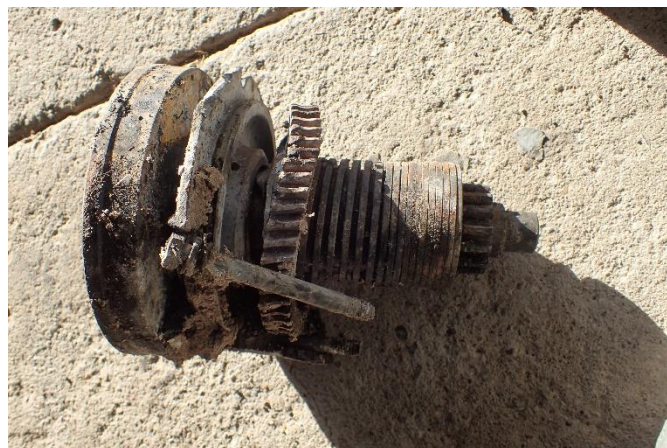


STARTER ADAPTER

P/N: Illegible

Condition:

The starter adapter remained partially attached to its installation point and displayed a significant amount of impact damage and thermal damage. The adapter was removed, and it was noted that the gears displayed significant impact damage. There were no anomalies noted.



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ALTERNATOR

Manufacturer: Plane Power

P/N: Dataplate damaged

S/N: Dataplate damaged

Condition:

The alternator had broken free from its installation point and displayed significant impact damage signatures and the drive shaft was unable to be rotated. There were no anomalies noted.



VACUUM PUMP

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The vacuum pump had broken free from the engine and only the vacuum pump housing was located at the time of the examination. There were no anomalies noted with the recovered portion of the vacuum pump.



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TURBO

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The turbocharger remained attached to its installation point and displayed impact and thermal damage signatures. It was noted that the V-band clamp remained attached to the turbocharger exhaust; however, the tailpipe had broken free from the turbocharger exhaust which was consistent with impact damage. It was noted that the turbine and compressor were unable to be rotated which was consistent with the impact and thermal damage. The compressor blades and turbine blades displayed normal operating signatures.



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TURBO CONTROLLER

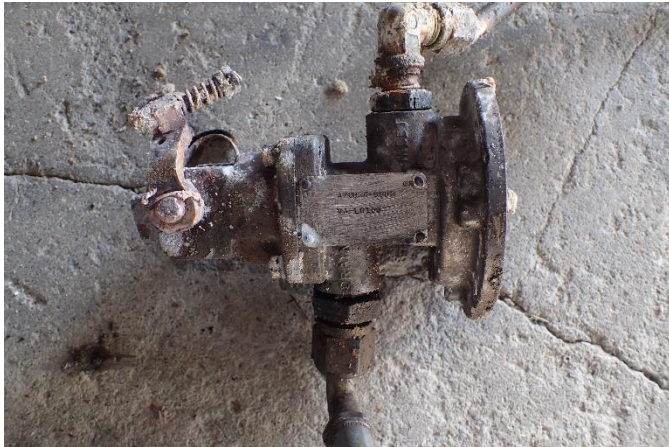
Manufacturer: Illegible

P/N: 470836-9003

S/N: VA-L0108

Condition:

The turbocharger controller had broken free from its installation point and displayed a significant amount of impact damage signatures. There were no anomalies noted with the recovered portions of the controller.



WASTEGATE

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The wastegate remained attached to its installation point and displayed impact and thermal damage signatures. There were no anomalies noted with the wastegate.



OVERBOOST VALVE	Manufacturer: Not observed	P/N: Not observed	S/N: Not observed
Condition:	The overboost valve had broken free from its installation point and displayed a significant amount of impact damage signatures. There were no anomalies noted with the overboost valve.		



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PROPELLER

PROPELLER GOVERNOR

Manufacturer: McCauley

P/N: DCF52900 9-F/T?

S/N: 070266

Condition:

The propeller governor remained attached to its installation point and displayed impact damage signatures. There were no anomalies noted.



PROPELLER

Manufacturer: McCauley

P/N: 3FF32C501-A

S/N: 800841

Condition:

The three blade, constant speed propeller had broken free from the propeller shaft and the propeller hub was found to be fractured into multiple pieces. Two of the three propeller blades remained attached to portions of the propeller hub; the third propeller blade had completely separated from the propeller hub. The propeller blade marked "A" displayed a large gouge in the trailing edge, twisting deformation, leading edge polishing and chordwise scratches. The propeller blade marked "B" displayed S-bending deformation, significant polishing of the cambered side, and chordwise scratches. The propeller blade marked "C" displayed chordwise scratches and minor forward bending deformation.



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Propeller Blade "A"



Propeller Blade "B"



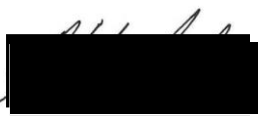
Propeller Blade "C"



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ENGINE MODEL	GTSIO-520-McL
ENGINE SERIAL NUMBER	823573-R
AIRCRAFT MAKE & MODEL	Cessna 421C
AIRCRAFT SERIAL NUMBER	421C-0874
AIRCRAFT REGISTRATION	N421NS
FILE NUMBER	18-363

NAME	SIGNATURE	DATE
Kurt Gibson		02/28/2019

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ENGINE S/N:

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	02/16/2019 – 02/17/2019	NTSB ACCIDENT #	CEN19FA082
FACILITY	Hemphill County Airport	NTSB INVESTIGATOR	Joshua Lindberg
ADDRESS	255 Airport Rd Canadian, TX 79014	FAA INVESTIGATOR	William Fitzgerald
		ACCIDENT DATE	02/15/2019
		ACCIDENT LOCATION	Canadian, Texas

ENGINE INFORMATION

ENGINE POSITION	Right
TOTAL TIME	2264.9 (time at the annual inspection on 06/24/2018)
TIME SOH	371.? (time at the annual inspection on 06/24/2018)
TYPE & TIME SLI	Unknown
BUILD DATE	02/14/2003
IN SERVICE DATE	Unknown

Significant logbook information:

The last annual inspection was performed on 06/24/2018 at a Hobbs time of 6227.4. The engine was overhauled by RAM Aircraft on 02/22/08; the engine was then installed on the aircraft on 03/04/2008 at a Hobbs time of 5854.9.

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 was recovered to Crotts Aircraft Services in Dodge City, Kansas.

INSPECTION WITNESSES			
NAME	Kurt Gibson	NAME	Joshua Lindberg
ADDRESS	Mobile, Alabama	ADDRESS	Central Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Andrew Hall	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 hoses, cables, and wires; all four engine mounts had broken. The engine displayed a significant amount of impact damage signatures throughout the entire engine; the engine also displayed thermal damage signatures concentrated to the rear mounted accessories. The three blade, constant speed propeller remained partially attached to the propeller shaft; two of the three blades and portions of the hub had broken free. All three propeller blades displayed impact damage signatures. The crankcase displayed impact damage signatures and there were no breaches in the crankcase that would indicate a catastrophic internal engine failure. The forward portion of the crankcase that houses the propeller shaft and reduction gear assembly was noted to be cracked and slightly displaced consistent with impact damage. All six cylinders remained attached to their cylinder bays and displayed varying amounts of impact damage; the most damage occurred to the bottom of the cylinders.

Both magnetos had broken free from their installation points and displayed impact and thermal damage signatures. The ignition harness displayed significant impact damage signatures; several of the leads were torn and severed. All the spark plugs remained installed in their cylinders and displayed varying amounts of impact damage with the bottom spark plugs displaying the most impact damage.

The fuel pump had broken free from its installation point and displayed a significant amount of impact damage signatures. The throttle and fuel metering assembly had broken free from its installation point and displayed impact and thermal damage signatures. The fuel manifold valve remained attached to the engine and displayed a significant amount of impact damage signatures; the manifold valve cap had broken free from the rest of the valve. The fuel nozzles displayed varying amounts of impact damage signatures; several of the nozzles were broken into two pieces.

The turbocharger remained attached to the engine and displayed a significant amount of impact damage signatures. The rest of the turbocharger control components displayed varying amounts of impact and thermal damage signatures. The exhaust system displayed a significant amount of impact damage signatures; the exhaust risers had crushed upwards and several of the risers had crushed almost completely flat. The induction system displayed a significant amount of impact damage signatures; several of the induction tubes had broken free from their installation points.

ENGINE FIELD INSPECTION REPORT

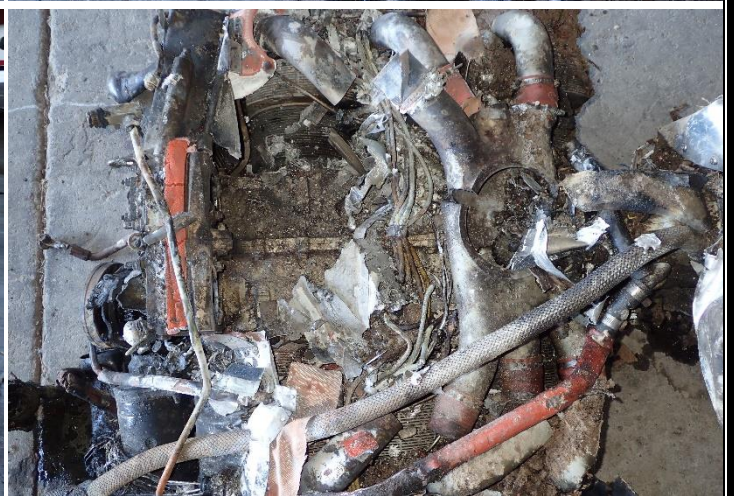
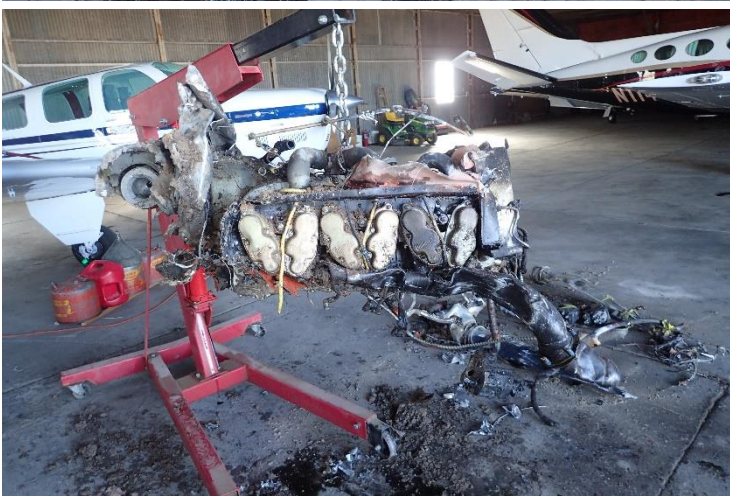
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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition:

The exhaust system displayed a significant amount of impact damage signatures; the risers had crushed upwards and several of the risers were crushed almost completely flat in areas. The turbocharger V-band clamp was noted to have remained attached to the tailpipe; however, it had broken free from the turbocharger which was consistent with impact damage.



INDUCTION SYSTEM

Condition:

The induction system displayed a significant amount of impact damage signatures throughout the system. There were no signs of an induction leak or blockage noted.



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IGNITION SYSTEM

LEFT MAGNETO

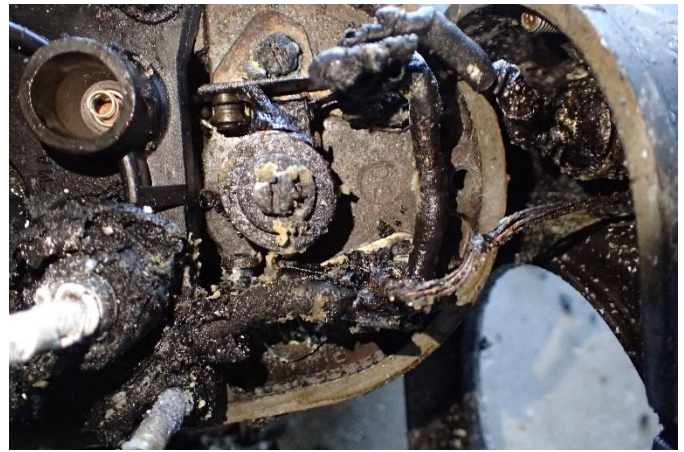
Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The magneto had broken free from its installation point and displayed impact and thermal damage signatures. The drive shaft was noted to be capable of rotation; however, it was noted that magneto was unable to produce a spark. The magneto was partially disassembled, and it was noted that all of the internal components displayed significant thermal damage signatures.

RIGHT
MAGNETO

Manufacturer: CMI

P/N: 10-349260-7

S/N: H115365

Condition:

The magneto had broken free from its installation point and displayed impact and thermal damage signatures. The magneto drive was rotated, and it was noted that the driven gear was not rotating, and the magneto was unable to produce a spark. The magneto was disassembled, and it was noted that several gear teeth were broken that were in contact with the drive gear; there were no signs that the engine operated with the broken gear teeth and the damage was consistent with impact damage. The rest of the internal components displayed impact and thermal damage signatures.

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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness displayed significant impact damage signatures as well as some thermal damage; several of the ignition leads were torn and completely severed.

SPARK PLUGS

Manufacturer: Champion

P/N: Top: RHB32E, Bottom: Not observed (fine wire type)

Condition:

All of the spark plugs remained installed in their cylinders and displayed varying degrees of impact damage with the bottom spark plugs showing the most impact damage. The top spark plugs were removed and their electrodes were visually inspected; the electrodes displayed normal operating and wear signatures. The bottom spark plugs were inspected using a lighted borescope; it was note that the #1, #5, and the #4 bottom spark plugs were completely submersed in oil and were not visible, the #3 and the #2 bottom spark plugs were submersed in water and were partially visible. The visible electrodes displayed normal operating and wear signatures.

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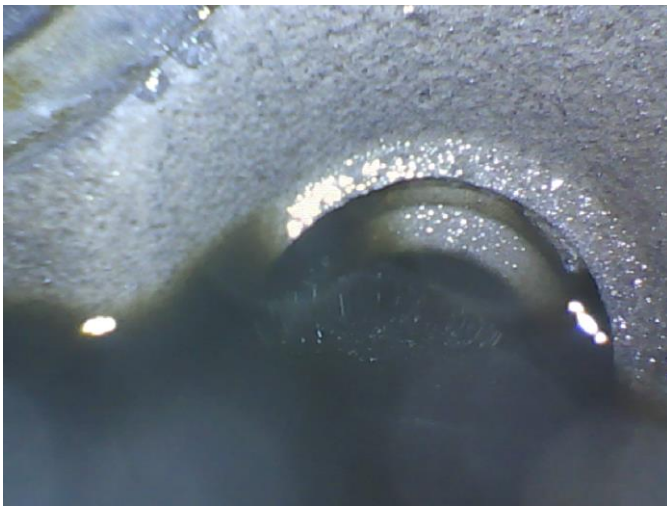
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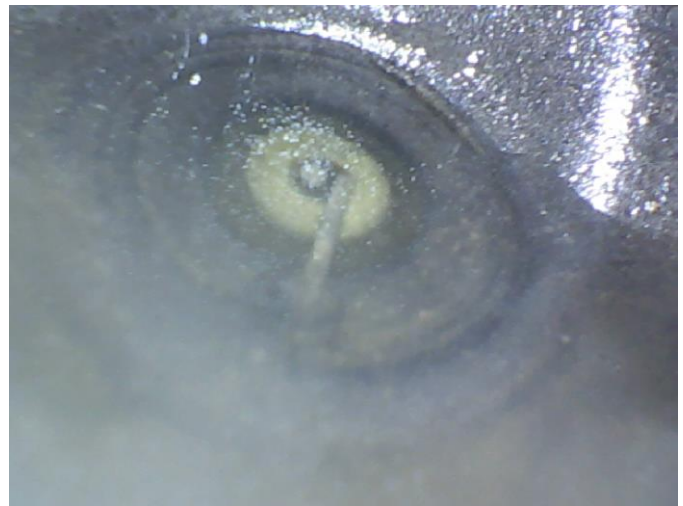
#1, #3, #5 Top Spark Plugs



#2, #4, #6 Top Spark Plugs



#1 Bottom Spark Plug (submersed)



#3 Bottom Spark Plug

ENGINE FIELD INSPECTION REPORT

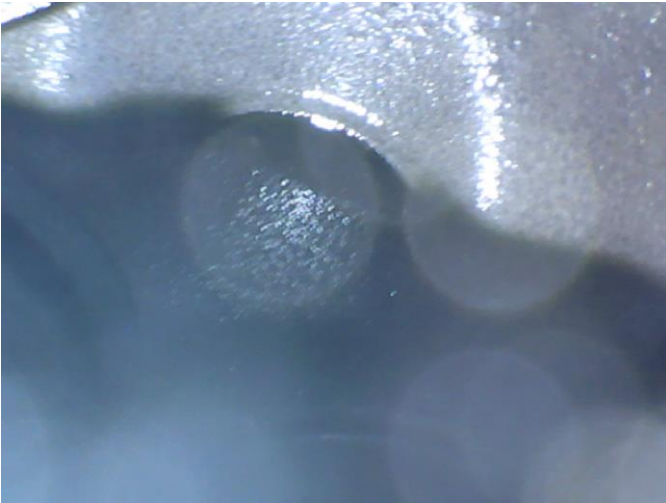
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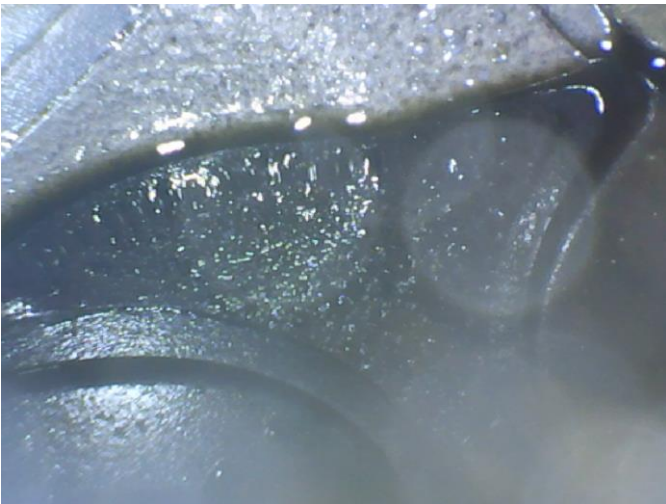
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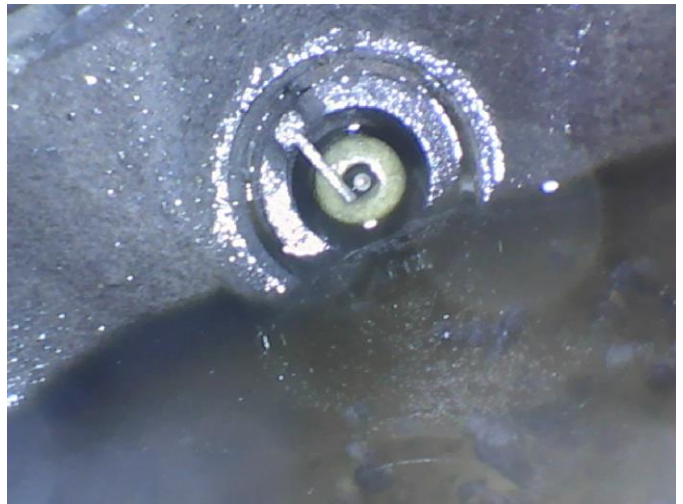
#5 Bottom Spark Plug (submersed)



#2 Bottom Spark Plug (submersed)



#4 Bottom Spark Plug (submersed)



#6 Bottom Spark Plug (partially submersed)

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FUEL SYSTEM

FUEL PUMP

Manufacturer: CMI

P/N: 646210-3

S/N: F308715BR

Condition:

The fuel pump had broken free from its installation point and displayed impact and thermal damage signatures. It was noted that the fuel pump drive coupling remained with the drive gear and was bent; the damage was consistent with impact damage. It was noted that the fuel pump drive shaft was capable of rotation. The fuel pump was disassembled, and the internal components were visually inspected; the components displayed impact damage, some thermal damage, and normal operating signatures. There were no anomalies noted.



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THROTTLE BODY METERING UNIT

Manufacturer: CMI

P/N: 633573-9

S/N: J189476A

Condition:

The throttle and fuel metering assembly had broken free from its installation point and displayed significant impact and thermal damage signatures. The metering assembly had broken free from the throttle body and most of the throttle body had broken free from the throttle valve. It was noted that the mixture and throttle control cable rod ends remained secured to their control arms. The fuel inlet screen was removed and was noted to contain a small amount of burnt debris but was not blocked. There were no anomalies noted.



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FUEL MANIFOLD VALVE

Manufacturer: CMI

P/N: Dataplate Missing

S/N: Dataplate Missing

Condition:

The fuel manifold valve remained partially attached to the engine through the fuel lines. The valve displayed a significant amount of impact damage; the fuel manifold valve cap had broken free from the rest of the valve and the diaphragm was torn. The internal components displayed impact damage and were covered in material consistent with dirt. There were no anomalies noted.



FUEL NOZZLES AND LINES

Manufacturer: Not observed

Condition:

The fuel nozzles displayed varying amounts of impact damage signatures; the #5 nozzle remained intact, the rest of the nozzles were broken into two parts. There were no signs of fuel leaks noted around the nozzles.

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LUBRICATION SYSTEM

OIL SUMP

Condition:

The oil sump displayed a significant amount of impact damage and was crushed upwards and breached. There were no anomalies noted.



OIL PICK-UP TUBE & SCREEN

Condition:

Due to the type of inspection performed the oil pick-up tube and screen were not observed

OIL PUMP

Condition:

The oil pump had broken free from its installation point and displayed a significant amount of impact damage and some thermal damage signatures. The oil pump drive shaft was noted to be partially broken which was consistent with impact damage.



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OIL FILTER

Manufacturer: Not observed

P/N: Not observed

Condition:

The oil filter had broken free from the oil filter adapter and was not located at the time of the examination.



OIL COOLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The oil cooler remained attached to the engine and displayed a significant amount of impact damage and some thermal damage signatures. There were no anomalies noted with the oil cooler.



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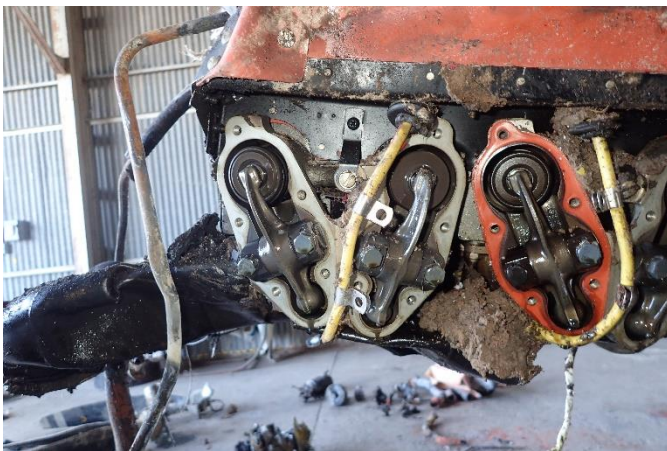
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CYLINDERS

CYLINDERS

Condition:

All six cylinders remained attached to their cylinder bays and displayed impact damage signatures with the bottoms of the cylinders showing the most damage. All of the cylinders were inspected using a lighted borescope; the valve heads, cylinder bores, and piston faces displayed normal operating and combustion signatures. The overhead components (valves, springs, and rocker arms) displayed normal operating and lubrication signatures. All of the rocker arms and valves were capable of movement when actuating the rocker arms manually.



#1 Cylinder



#3 Cylinder

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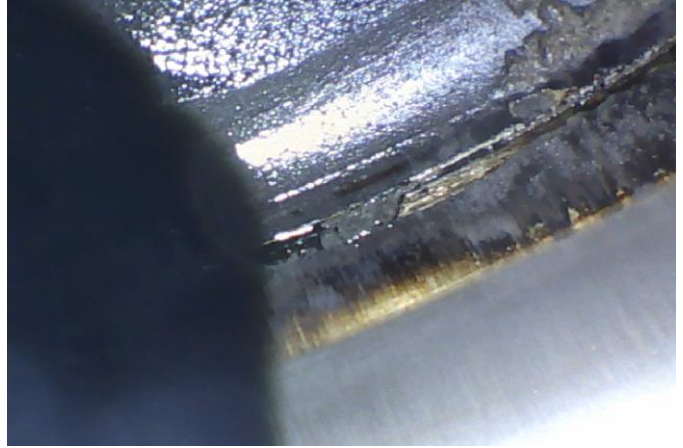
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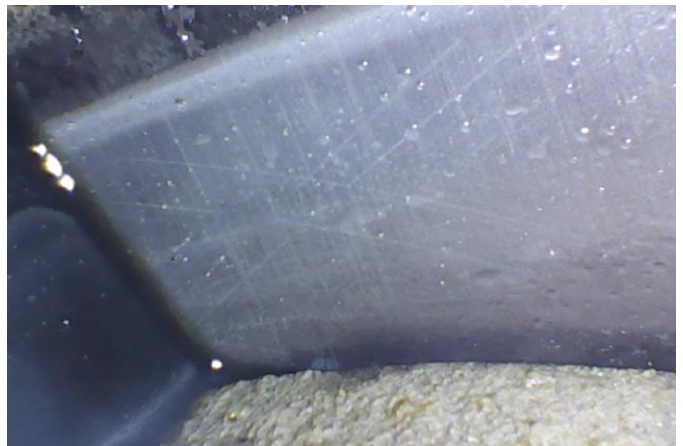
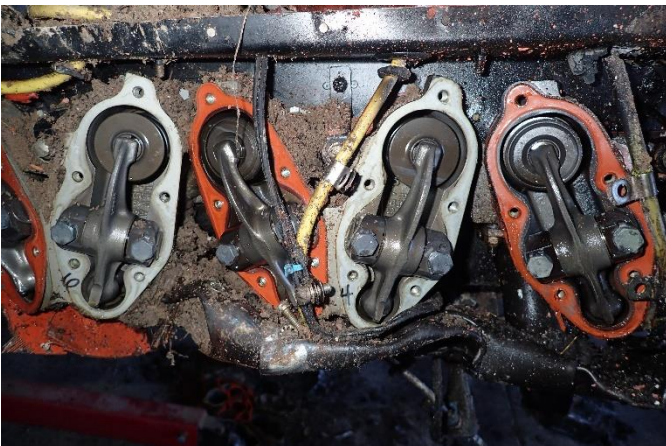
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#5 Cylinder



#2 Cylinder



#4 Cylinder

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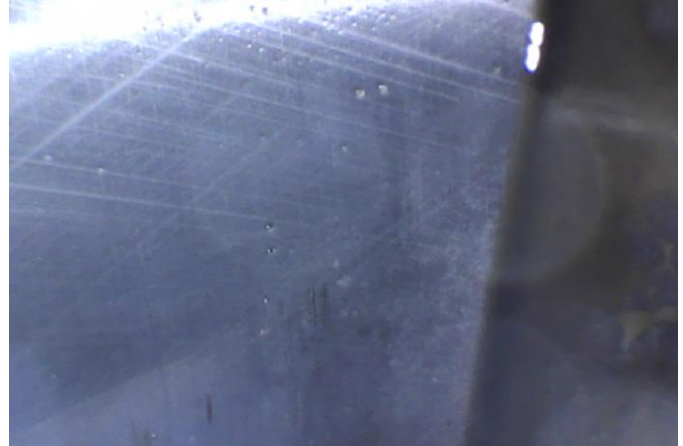
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#6 Cylinder

VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope. The valve heads displayed normal operating and combustion signatures. It was noted that the valves were capable of movement when the rocker arms were actuated manually.



#1 Exhaust Valve



#1 Intake Valve

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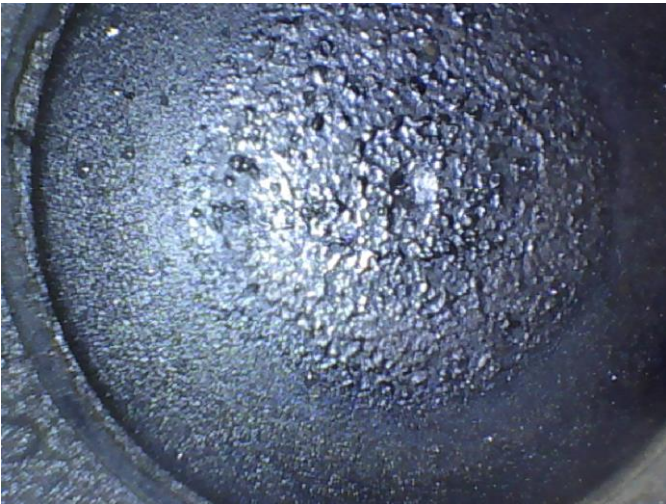
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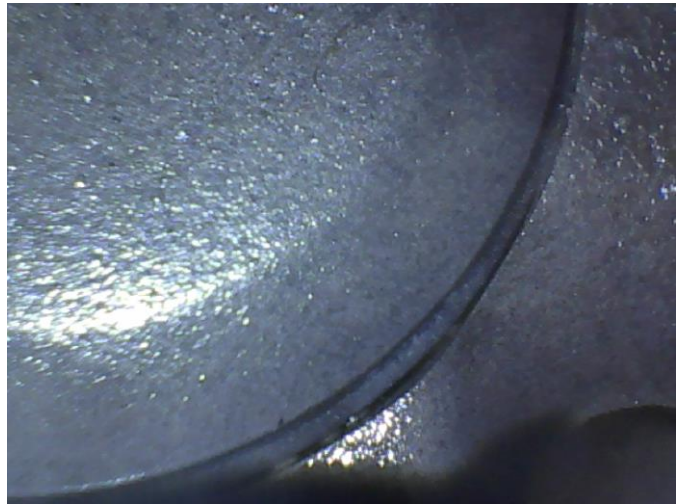
#3 Exhaust Valve



#3 Intake Valve



#5 Exhaust Valve



#5 Intake Valve

ENGINE FIELD INSPECTION REPORT

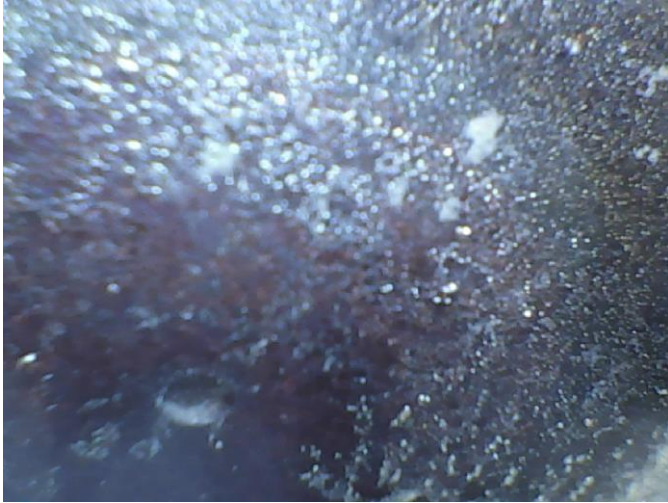
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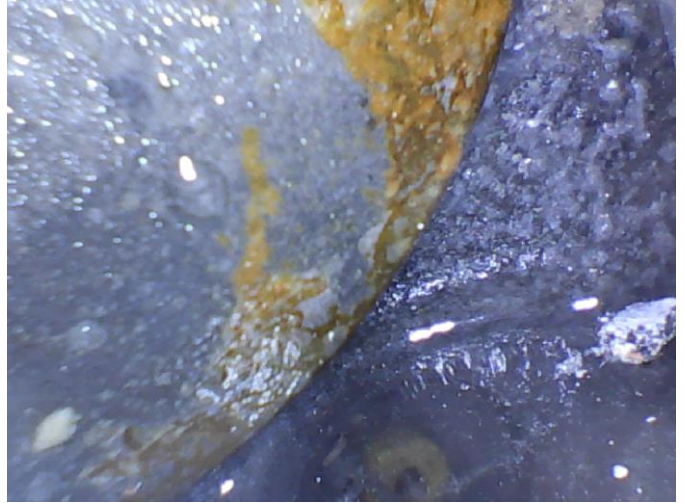
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#2 Exhaust Valve



#2 Intake Valve



#4 Exhaust Valve



#4 Intake Valve

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#6 Exhaust Valve



#6 Intake Valve

ROCKER ARMS AND SHAFTS

Condition:

The rocker arms remained attached to their installation points and displayed normal operating and lubrication signatures. The rocker arms were operated manually, and it was noted that all of the rocker arms were capable of movement.



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Piston P/N: Inaccessible

Condition:

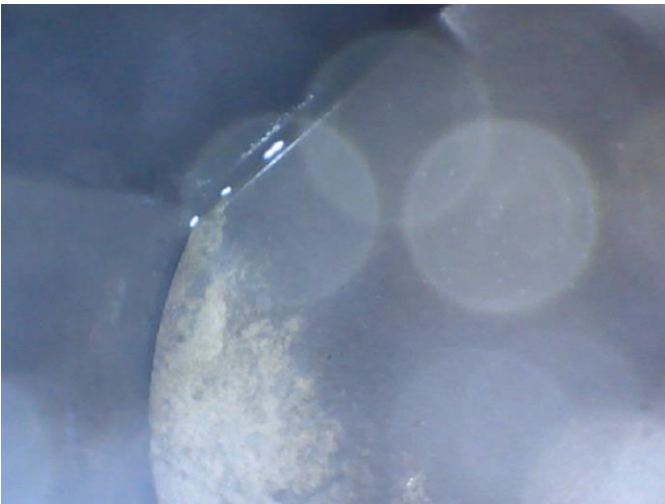
The piston faces were inspected using a lighted borescope. The piston faces displayed normal operating and combustion signatures. There were no anomalies noted with the pistons.



#1 Piston



#3 Piston



#5 Piston



#2 Piston

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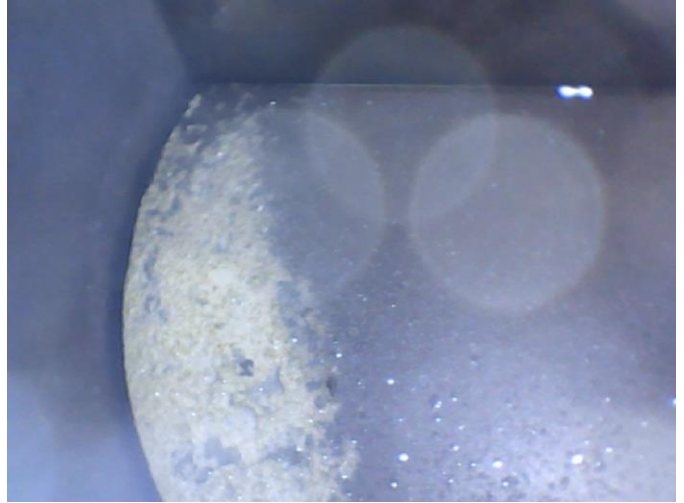
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#4 Piston



#6 Piston

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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 displayed impact damage signatures with the most damage occurring to the bottom and front of the crankcase; the portion of the crankcase that houses the propeller shaft and reduction gear assembly was cracked and had partially separated. There were no breaches in the crankcase that would indicate a catastrophic internal engine failure. Holes were drilled in the top of the crankcase to facilitate inspection of the internal components; there were no anomalies noted with any of the internal portions of the crankcase.			



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CRANKSHAFT	Forging Number: Inaccessible	S/N: Inaccessible	Heat code: Inaccessible
Condition:	The crankshaft gear was visible with the removed starter adapter; the gear remained intact and was secured properly. Attempts to rotate the crankshaft were unsuccessful which is consistent with the significant impact damage. Portions of the crankshaft were visible by inserting a lighted borescope into holes that were drilled into the crankcase. The visible portions of the crankshaft displayed normal operating and lubrication signatures and it was noted that all six connecting rods remained attached to their journals.		
QUILL SHAFT			
Condition:	Due to the type of inspection performed the quill shaft was not visible.		
REDUCTION GEAR			
Condition:	The reduction gear was partially visible through the alternator installation hole. The visible portion of the gear was impacted with mud and displayed normal operating signatures.		



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PROPELLER SHAFT

Condition:

The propeller flange remained attached to the rest of the shaft; the propeller shaft displayed impact damage signatures.



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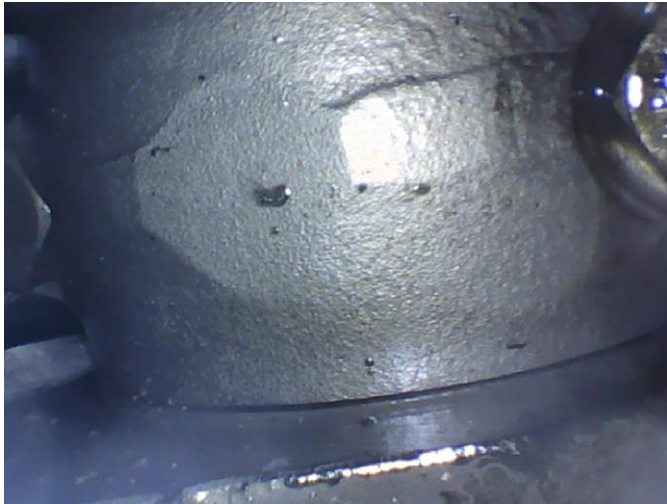
CONNECTING RODS

P/N: Not observed

Forging or Serial Number: Not observed

Condition:

The connecting rods were inspected using a lighted borescope that was inserted into holes that were drilled into the crankcase. All of the connecting rods remained attached to their journals and displayed normal operating and lubrication signatures. There were no anomalies noted.



#1 Connecting Rod



#3 Connecting Rod



#5 Connecting Rod



#2 Connecting Rod

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#4 Connecting Rod



#6 Connecting Rod

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CAMSHAFT

CAMSHAFT

P/N: Inaccessible

S/N: Inaccessible

Condition:

The camshaft gear remained intact and displayed normal operating signatures. Portions of the camshaft were visible by inserting a lighted borescope into drilled holes in the crankcase. The visible portions of the camshaft displayed normal operating signatures.



ACCESSORY GEARS

Condition:

Only the fuel pump drive gear and one of the rear accessory/magneto drive gears were able to be inspected at the time of the examination; the gears displayed thermal damage and normal operating signatures.

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ACCESSORIES

STARTER

Manufacturer: Kelly Aerospace

P/N: MHJ-40038

S/N: H032423

Condition:

The starter remained attached to the starter adapter attach flange; however, the attach flange had broken free from the rest of the adapter. The starter displayed impact and thermal damage signatures. There were no anomalies noted.

STARTER
ADAPTER

P/N: Illegible

Condition:

The starter adapter remained partially attached to its installation point and displayed a significant amount of impact damage and some thermal damage signatures. There were no anomalies noted.



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ALTERNATOR

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The alternator had broken free from its installation point and was not located at the time of the examination.

VACUUM PUMP

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The vacuum pump had broken free from its installation point and displayed a significant amount of impact and thermal damage signatures. The drive coupling was not located at the time of the examination. The internal components were visible due to impact damage; the vanes and rotor displayed significant impact damage.



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TURBO

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The turbocharger remained attached to its installation point and displayed impact and thermal damage signatures. It was noted that the V-band clamp remained attached to the tailpipe; however, it had disconnected from the turbocharger, the damage was consistent with impact damage. The turbine was visible and displayed normal operating signatures; it was noted that it was unable to be rotated which is consistent with the impact damage. The compressor was also visible and displayed impact and thermal damage signatures, the blades were bent and appeared to have partially melted.



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TURBO CONTROLLER

Manufacturer: Illegible

P/N: 470836-9003

S/N: WE-L0108

Condition:

The turbocharger controller had broken free from its installation point and displayed significant impact damage signatures. Several portions of the controller had broken free and were not located at the time of the examination. There were no anomalies noted.



WASTEGATE

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The wastegate had broken free from its installation point and displayed impact and thermal damage signatures. There were no anomalies noted.



OVERBOOST VALVE	Manufacturer: Not observed	P/N: Not observed	S/N: Not observed
Condition:	The overboost valve remained attached to its installation point and displayed thermal damage signatures. There were no anomalies noted.		



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PROPELLER

PROPELLER
GOVERNOR

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The governor remained partially attached to the engine and displayed a significant amount of impact damage; the housing had fractured, and the internal components were exposed and also displayed significant impact damage.



PROPELLER

Manufacturer: McCauley

P/N: 3FF32C 501-A

S/N: 800825

Condition:

The three blade, constant speed propeller remained partially attached to the propeller shaft; only one propeller blade and a portion of the propeller hub remained attached. The other two propeller blades and the rest of the hub had broken free. The propeller blade marked "A" displayed forward bending deformation and chordwise scratches. The propeller blade marked "B" displayed leading edge polishing, minor twisting deformation, and a small portion of the blade tip trailing edge was curled. The propeller blade marked "C" displayed significant leading edge and cambered side polishing, and aft bending deformation.

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Propeller Blade "A"



Propeller Blade "B"



Propeller Blade "C"