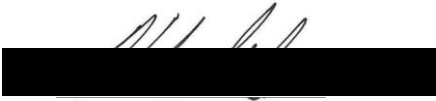




ENGINE EXAMINATION REPORT

ENGINE MODEL	GTSIO-520-D
ENGINE SERIAL NUMBER	188783-9-D
AIRCRAFT MAKE & MODEL	Cessna 421
AIRCRAFT SERIAL NUMBER	421-0164
AIRCRAFT REGISTRATION	N731PF
FILE NUMBER	19-104

NAME	SIGNATURE	DATE
Kurt Gibson		11/18/2019

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	10/03/2019	NTSB ACCIDENT #	ERA19FA283
FACILITY	Florida Air Recovery	NTSB INVESTIGATOR	Eric Alleyne
ADDRESS	7403 Philips Hwy Jacksonville, FL 32256	FAA INVESTIGATOR	Antonia Gonzalez
		ACCIDENT DATE	09/29/2019
		ACCIDENT LOCATION	Deland, Florida

ENGINE INFORMATION

ENGINE POSITION	Right
TOTAL TIME	Unknown
TIME SOH	1190.3 (time was taken from the last 100-hour inspection entry)
TYPE & TIME SLI	Unknown
BUILD DATE	01/30/1970 (shipped date)
IN SERVICE DATE	Unknown

Significant logbook information:

The last 100-hour/annual inspection was performed on 02/15/2014 at a Hobbs time of 858.3.

Report Summary:

Search Code(s):

15-12-68

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

Disposition of engine following exam:

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

ENGINE FIELD INSPECTION REPORT

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INSPECTION WITNESSES

NAME	Kurt Gibson	NAME	Eric Alleyne
ADDRESS	Mobile, Alabama	ADDRESS	Eastern Region
ORGANIZATION	Continental Aerospace	ORGANIZATION	NTSB
PHONE	██████████	PHONE	██████████
NAME	Casey Love	NAME	
ADDRESS	Wichita, Kansas	ADDRESS	
ORGANIZATION	Textron Aviation	ORGANIZATION	
PHONE	██████████	PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

ENGINE FIELD INSPECTION REPORT**FILE NUMBER:**

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PAGE 4 of 37**EXTERNAL INSPECTION OF ENGINE**

The engine remained partially attached to the airframe and displayed significant impact and thermal damage signatures. Most of the impact damage occurred to the bottom of the engine and most of the thermal damage occurred to the rear portions of the engine. The crankcase remained intact and displayed thermal discoloration; there were no holes in the crankcase that would indicate a catastrophic internal engine failure. The propeller flange remained attached to the rest of the propeller shaft and displayed impact damage signatures. All six cylinders remained attached to their cylinder bays and displayed varying amounts of impact and thermal damage signatures. The three-blade, constant speed propeller remained attached to the propeller shaft and displayed impact damage signatures.

Both magnetos remained attached to their installation points and displayed thermal damage signatures. The ignition harness remained attached to both magnetos and to the spark plugs and displayed significant thermal damage to all of the ignition leads. All of the spark plugs remained installed in their cylinders and displayed varying amounts of impact damage.

The fuel pump remained attached to its installation point and displayed thermal damage signatures as well as impact damage signatures. The throttle and metering assembly displayed significant thermal damage signatures and remained attached to its installation point on the engine nacelle. The fuel manifold valve remained attached to its installation point and displayed minor thermal damage signatures. There were no signs of fuel leaks observed with any of the fuel components.

The exhaust system displayed a significant amount of impact damage signatures; the risers and tubes were bent and crushed in several locations. There were no external signs of exhaust leaks observed. The induction system displayed thermal and impact damage signatures. There were no visible signs of intake leaks observed.

The turbocharger remained attached to its installation point and displayed impact and thermal damage signatures; the V-band clamp was noted to be installed and was secure. The wastegate, turbocharger controller, and turbocharger regulator displayed thermal damage signatures.

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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition:

The exhaust system displayed significant impact damage signatures with the most damage occurring to the risers and balance tube. The exhaust tube that attaches to the wastegate was noted to contain several cracks that were not consistent with impact damage.



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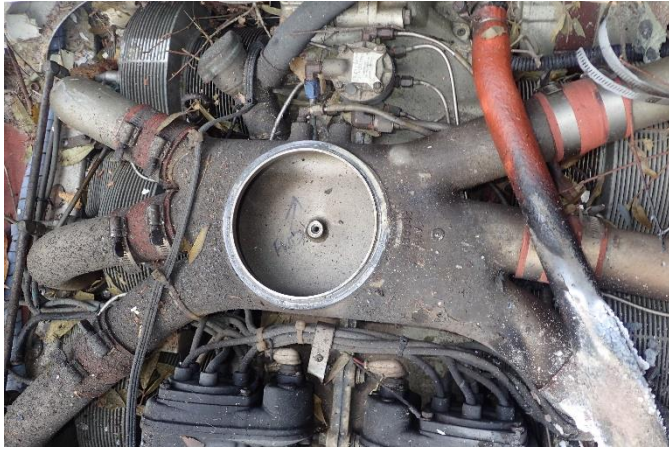
188783-9-D

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**INDUCTION
SYSTEM**

Condition:

The induction system displayed impact and thermal damage signatures with the most damage occurring to the induction tubes at the rear of the engine and attached to the engine nacelle. There were no signs of intake leaks or obstructions noted.



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IGNITION SYSTEM

LEFT MAGNETO	Manufacturer: TCM	P/N: 10-349220-4	S/N: C010372
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Condition: The magneto remained attached to its installation point and displayed thermal damage signatures. The magneto was removed, and it was observed that the driveshaft was capable of rotation. The driveshaft was rotated using a drill and the magneto was observed to be capable of producing a spark on all six posts in the correct firing order.



RIGHT MAGNETO	Manufacturer: TCM	P/N: 10-349260-7R	S/N: C043045
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Condition: The magneto remained attached to its installation point and displayed thermal damage signatures. The magneto was removed, and it was observed that the driveshaft was capable of rotation. The driveshaft was rotated using a drill and the magneto was observed to be capable of producing a spark on all six posts in the correct firing order.



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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness displayed significant thermal damage signatures; the harness insulation was burned in several locations. There were no anomalies observed.



SPARK PLUGS

Manufacturer: Champion

P/N: RHB32E

Condition:

The spark plugs remained installed in their cylinders and displayed varying amounts of impact damage. 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 a few of the spark plugs were in a normal worn-out condition when compared with Champion Aviation Service Manual AV6-R.



#1 Top Spark Plug



#1 Bottom Spark Plug

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#3 Top Spark Plug



#3 Bottom Spark Plug



#5 Top Spark Plug



#5 Bottom Spark Plug



#2 Top Spark Plug



#2 Bottom Spark Plug

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#4 Top Spark Plug



#4 Bottom Spark Plug



#6 Top Spark Plug



#6 Bottom Spark Plug

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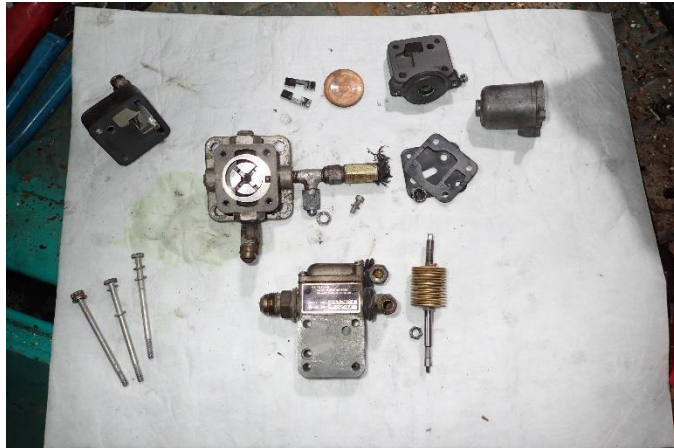
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FUEL SYSTEM

FUEL PUMP	Manufacturer: TCM	P/N: 630751-4	S/N: C217519B
Condition:	The fuel pump remained attached to its installation point and displayed minor thermal and impact damage signatures. The pump was removed, and the driveshaft was observed to be intact and capable of normal rotation. The fuel pump was disassembled, and the internal components displayed normal operating signatures. There was a small amount of fluid inside the fuel pump that smelled similar to fuel.		



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THROTTLE BODY
METERING UNIT

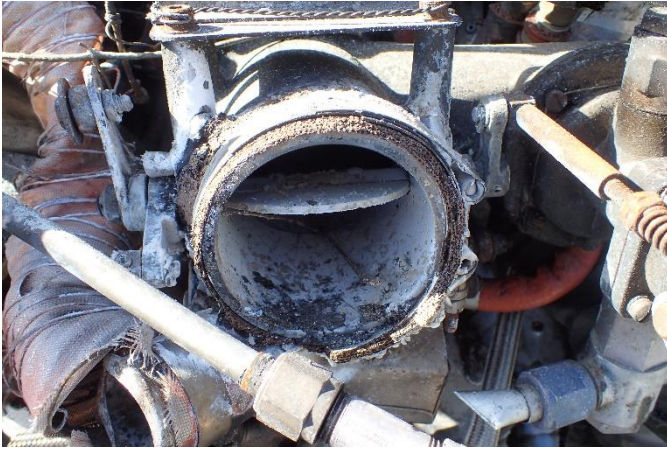
Manufacturer: TCM

P/N: 633573-9

S/N: D257513A

Condition:

The throttle and metering assembly remained attached to its installation point and displayed significant thermal damage signatures. The assembly was removed, and the metering assembly was disassembled. The internal components displayed thermal damage signatures as well as normal operating signatures. The fuel inlet screen contained a small amount of debris; however, the screen was not blocked.



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FUEL MANIFOLD VALVE

Manufacturer: CMI
(overhauled by Aircraft
Accessories of Oklahoma)

P/N: 634326-7

S/N: M2634

Condition: The fuel manifold valve remained attached to its installation point and displayed minor thermal damage signatures. The valve was disassembled, and the internal components were visually inspected. There was a small amount of fluid noted on both the wet and dry side of the manifold valve; however, there were no tears or cracks observed in the diaphragm. The remaining components displayed normal operating signatures and the screen was clear of debris.



FUEL NOZZLES AND LINES

Manufacturer: CMI

Condition: The fuel nozzles remained installed in their cylinders and displayed varying amounts of thermal damage. The nozzles were removed and were observed to be clear of obstructions.



#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 displayed impact damage signatures and was crushed upwards.



OIL PICK-UP TUBE & SCREEN

Condition:

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

OIL PUMP

Condition:

The oil pump remained attached to its installation point and displayed thermal damage signatures. The oil pump was removed and disassembled; the oil pump gears, housing, oil pressure relief valve, and scavenge pump displayed normal operating signatures.



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OIL FILTER

Manufacturer: Not observed

P/N: Not observed

Condition:

The oil filter had broken free from its installation point and was not observed at the time of the examination.

OIL COOLER

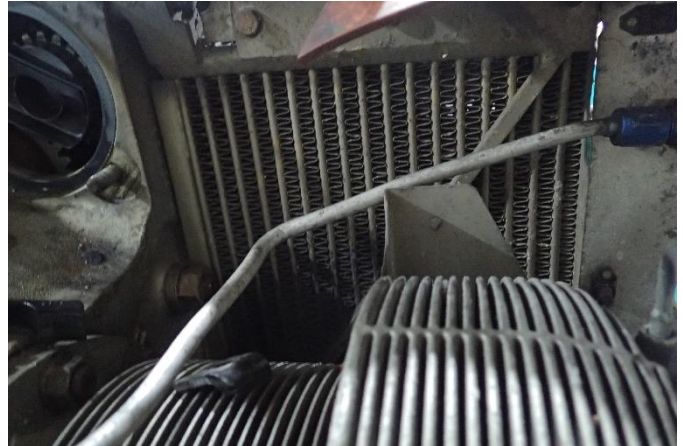
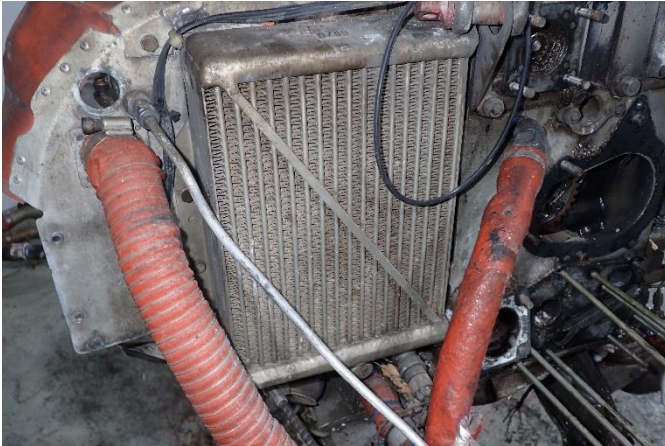
Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The oil cooler remained attached to its installation point and displayed thermal damage signatures. There were no oil leaks noted around the oil cooler.



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CYLINDERS

CYLINDERS

Condition:

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



#1 Cylinder Overhead



#1 Cylinder Bore



#3 Cylinder Overhead



#3 Cylinder Bore

ENGINE FIELD INSPECTION REPORT

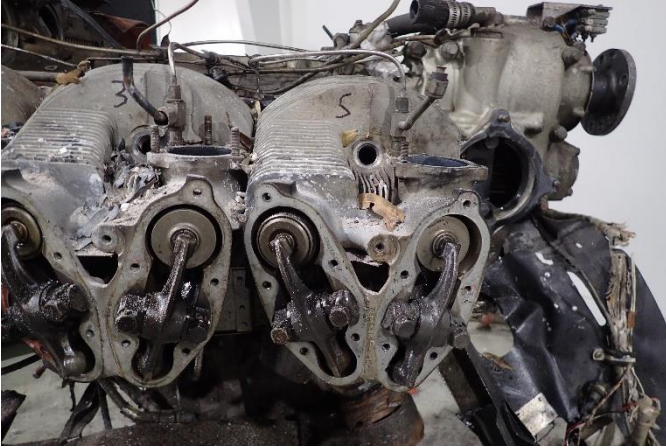
FILE NUMBER:

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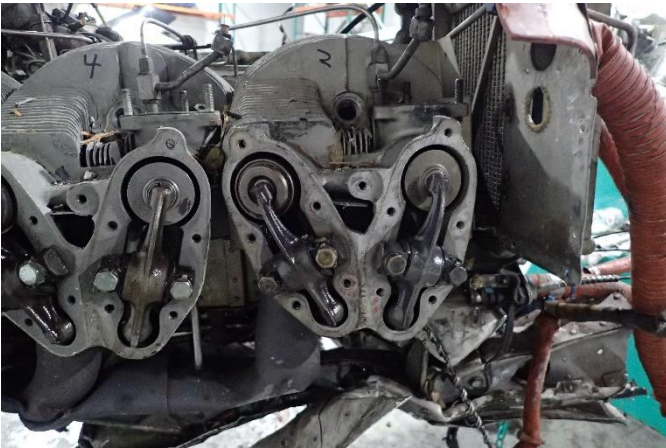
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#5 Cylinder Overhead



#5 Cylinder Bore



#2 Cylinder Overhead



#2 Cylinder Bore



#4 Cylinder Overhead



#4 Cylinder Bore

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#6 Cylinder Overhead



#6 Cylinder Bore

VALVES AND GUIDES

Condition:

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



#1 Exhaust Valve



#1 Intake Valve

ENGINE FIELD INSPECTION REPORT

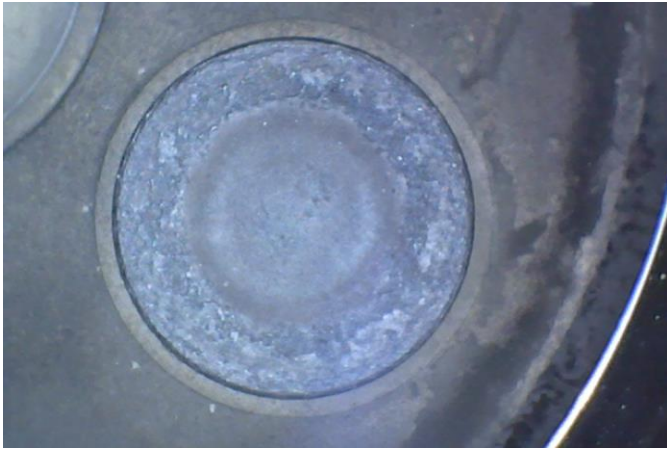
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#3 Exhaust Valve



#3 Intake Valve



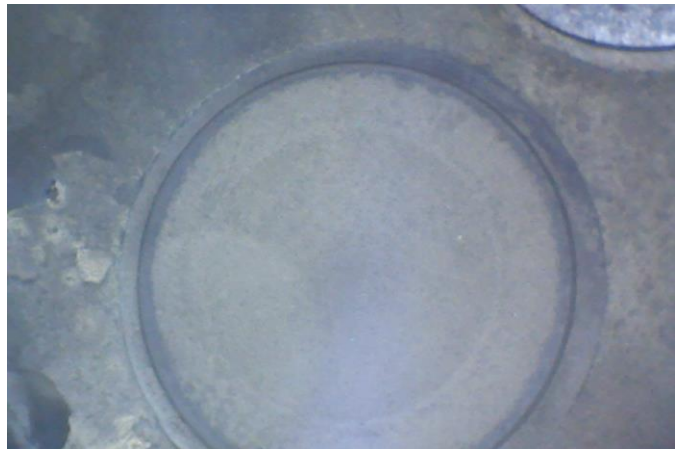
#5 Exhaust Valve



#5 Intake Valve



#2 Exhaust Valve



#2 Intake Valve

ENGINE FIELD INSPECTION REPORT

FILE NUMBER:

19-104

ENGINE S/N:

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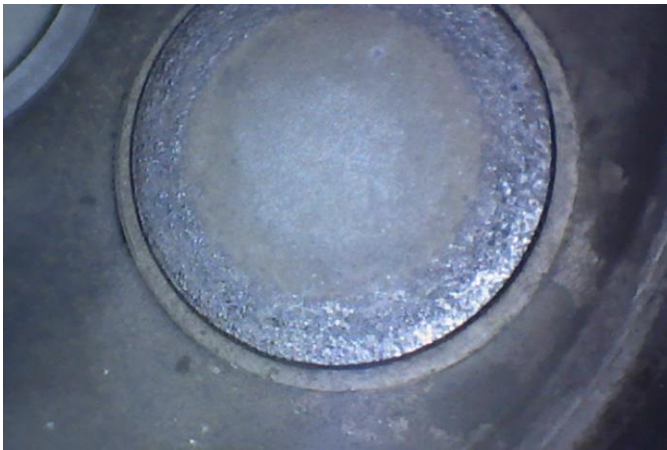
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#4 Exhaust Valve



#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, the rocker arms operated normally.



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PISTONS

Piston P/N: Inaccessible

Condition:

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



#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: 642081	2-4-6: 642080	S/N: J9A-3534-OR-B
Condition:	The crankcase remained intact and displayed thermal damage signatures concentrated to the rear of the crankcase. There were no holes in the crankcase that would indicate a catastrophic internal engine failure.			



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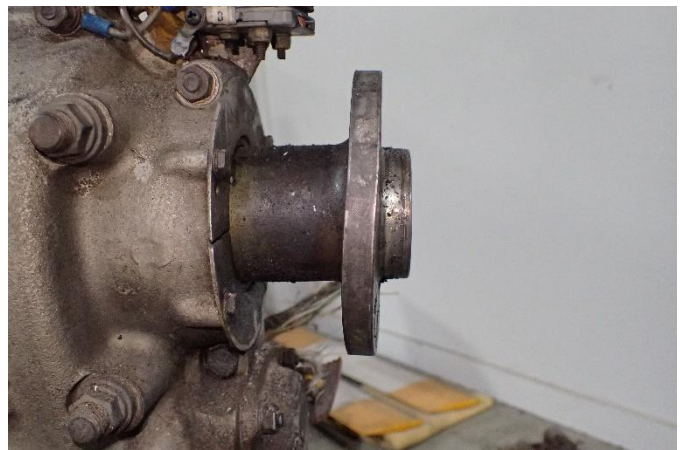
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CRANKSHAFT ASSEMBLY

PROPELLER SHAFT

Condition: The propeller flange remained attached to the propeller shaft and displayed impact damage signatures. The propeller shaft gear was partially visible after removing the alternator and displayed normal operating signatures. The propeller shaft was rotated using a hand tool and continuity was established between the propeller shaft, reduction gear, quill shaft, crankshaft, camshaft, connecting rods, and associated components. There were no anomalies observed.



REDUCTION GEAR

Condition: The reduction gear was partially visible after removing the alternator and the gear displayed normal operating signatures. During propeller shaft rotation the reduction gear operated normally.



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CRANKSHAFT

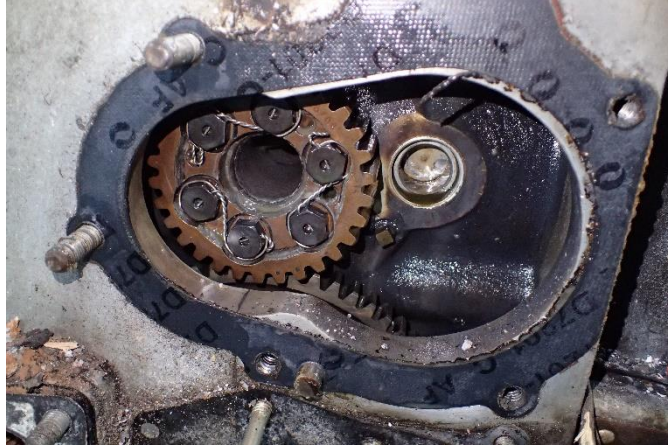
Forging Number:

S/N:

Heat code:

Condition:

The crankshaft gear was observed after removing the starter adapter; the gear remained secure, was undamaged, and displayed normal operating signatures. The operation of the crankshaft was verified by rotating the propeller flange and observing piston movement; the crankshaft operated normally.



QUILL SHAFT

Condition:

The operation of the quill shaft was verified by rotating the quill shaft and observing the crankshaft gear operation; the quill shaft operated normally. The quill shaft was removed, and the shaft displayed normal operating signatures.



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INTERNAL TIMING	
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Condition:	The internal timing was verified to be correct.
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CONNECTING RODS	P/N: Inaccessible	Forging or Serial Number: Inaccessible
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Condition:	The operation of the connecting rods was verified by rotating the propeller shaft and observing piston movement. The connecting rods operated normally.
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CAMSHAFT

CAMSHAFT	P/N: Inaccessible	S/N: Inaccessible
Condition:	The operation of the camshaft was verified by rotating the propeller shaft and observing rocker arm movement. The camshaft operated normally.	
ACCESSORY GEARS		
Condition:	The magneto and governor drive gears displayed normal operating signatures and rotated normally while rotating the propeller shaft.	



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ACCESSORIES

STARTER	Manufacturer: Not observed	P/N: Not observed	S/N: Not observed
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Condition: The starter had broken free from the starter adapter and displayed impact and thermal damage signatures.

STARTER ADAPTER	P/N: Not observed
------------------------	-------------------

Condition: The starter adapter remained attached to its installation point and displayed impact and thermal damage signatures; it was observed that the dampener remained secured to the starter adapter. The adapter was removed, and it was observed that the gear displayed normal operating signatures and was capable of normal rotation.



ALTERNATOR	Manufacturer: Electrosystems	P/N: ALV-9510	S/N: B091903
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Condition: The alternator remained attached to its installation point and displayed impact damage signatures. The alternator was removed, and the drive coupling was observed to have remained intact and the alternator drive was capable of normal rotation.



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VACUUM PUMP

Manufacturer: Pesco

P/N: 3P207JA

S/N: 3052

Condition:

The vacuum pump remained attached to its installation point and displayed thermal damage signatures. The vacuum pump was removed, and it was observed that the drive coupling was sheared.



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TURBO

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The turbocharger remained partially attached to its installation point and displayed impact and thermal damage signatures. The tailpipe and the compressor inlet airbox were removed and the turbine and compressor were examined. The turbine and compressor blades displayed normal operating signatures and were capable of normal rotation.



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TURBO RATE CONTROLLER	Manufacturer: Garrett	P/N: 708?8-1	S/N: 01081
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Condition: The controller remained attached to its installation point and displayed significant thermal damage signatures.



WASTEGATE	Manufacturer: Garrett	P/N: 470830-9020	S/N: BJ044705
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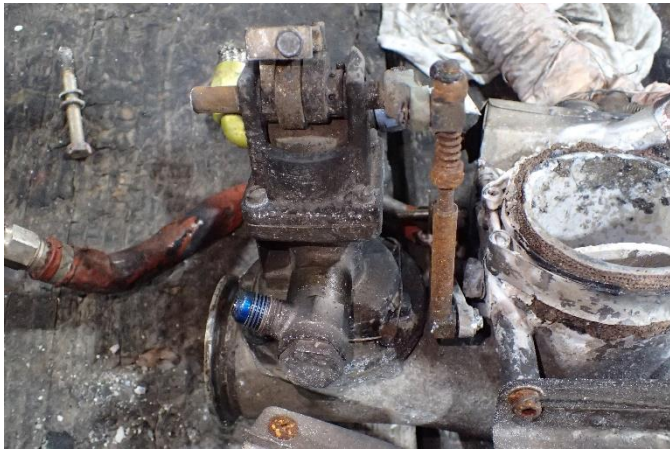
Condition: The wastegate remained attached to its installation point and displayed thermal damage signatures. The wastegate actuator arm remained secured to the wastegate valve and the valve was found to be in the approximate full open position.



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TURBO CONTROLLER	Manufacturer: Not observed	P/N: Not observed	S/N: Not observed
Condition:	The controller remained attached to its installation point and displayed thermal damage signatures.		



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PROPELLER

PROPELLER GOVERNOR	Manufacturer: Woodward	P/N: 210595 B	S/N: 874880
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Condition: The governor remained attached to its installation point and displayed impact damage signatures. The governor was removed, and the governor gasket screen was noted to be clear of any metallic material. The driveshaft was observed to be intact; however, it was seized which was consistent with the impact damage to the governor. The governor was partially disassembled, and the observed internal components displayed normal operating signatures.



PROPELLER	Manufacturer: McCauley	P/N: 3AF32098-NR	S/N: 751090
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Condition: The three-blade, constant speed propeller remained partially attached to the propeller flange and displayed impact damage signatures. The propeller blade marked "A" displayed minor impact damage to the blade root and was not bent. The propeller blade marked "B" displayed S-bending, twisting, and aft bending deformation as well as significant polishing of the cambered side. The propeller blade marked "C" displayed aft bending deformation and leading-edge polishing near the tip. During the on-scene portion of the investigation, several tree branches were found with clean approximate 45-degree angle cuts and appeared to have black paint transfer.

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Propeller Blade "A"



Propeller Blade "B"

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Propeller Blade "C"



Cut branches found at the accident site