Continental Motors

ENGINE FIELD INSPECTION REPORT

ENGINE MODEL	TSIO-520-B11B
ENGINE SERIAL NUMBER	176759-R
AIRCRAFT MAKE & MODEL	Cessna T310Q
AIRCRAFT SERIAL NUMBER	T310Q-0611
AIRCRAFT REGISTRATION	N310JA
FILE NUMBER	15-199

NAME	SIGNATURE	DATE
Nicole L. Charnon		09/29/2015

GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	09/27 and 28/2015	**NTSB ACCIDENT #**	CEN15FA425
FACILITY	Accident Site	**NTSB INVESTIGATOR**	Courtney Leidler
ADDRESS	410 S. Wetmore Wichita, KS 67209	**FAA INVESTIGATOR**	Bobby Warren
		ACCIDENT DATE	09/25/2015
		ACCIDENT LOCATION	Wichita, Kansas

ENGINE INFORMATION

ENGINE POSITION	Right Engine
TOTAL TIME	Unknown
TIME SOH	187.7 hours at time of last annual inspection
TYPE & TIME SLI	Unknown
BUILD DATE	08/30/1998
IN SERVICE DATE	Unknown

Significant logbook information:

At the time this report was written, the aircraft logbooks had not been acquired by the NTSB investigator-in-charge (IIC). The NTSB IIC obtained a copy of the last annual inspection maintenance entries. According to the maintenance entry, the last annual inspection took place on May 8, 2015, at a tachometer (hobbs) time of 187.7 hours. At the time of the annual inspection, the engine accumulated 227.5 hours since its last overhaul and an unknown total time. The hobbs meter was not located during the examination.

Report Summary: Search Code(s): 15-12-68

There were no pre-accident anomalies noted with the engine or the engine-related systems that would have prevented its ability to produce full rated power.

Disposition of engine following exam:

The aircraft wreckage (including the engines) was taken to Beegles Aircraft Service, Inc. in Greeley, Colorado where it will be stored until the investigation is complete.

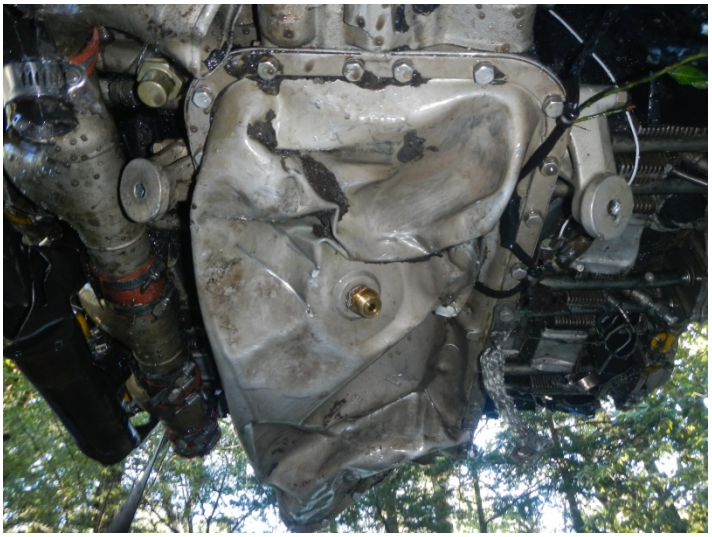
INSPECTION WITNESSES

NAME	Nicole L. Charnon	**NAME**	Courtney Liedler
ADDRESS	Washington, DC	**ADDRESS**	Denver, CO
ORGANIZATION	Continental Motors	**ORGANIZATION**	NTSB Central Region
PHONE	[redacted]	**PHONE**	[redacted]
NAME	John Clark	**NAME**	Bobby Warren
ADDRESS	Wichita, KS	**ADDRESS**	Wichita, KS
ORGANIZATION	NTSB Aviation Safety	**ORGANIZATION**	Wichita FSDO
PHONE	[redacted]	**PHONE**	[redacted]
NAME	Ernie Hall	**NAME**	Jon George
ADDRESS	Wichita, KS	**ADDRESS**	Wichita, KS
ORGANIZATION	Textron Aviation	**ORGANIZATION**	Wichita FSDO
PHONE	[redacted]	**PHONE**	[redacted]

EXTERNAL INSPECTION OF ENGINE

The engine was recovered from a pond in a residential area prior to this investigator's arrival. The engine was covered in mud and organic debris. The engine was cleaned using fresh water. The propeller was separated from the engine. The alternator remained attached to the front right side of the engine, but it was distorted and displaced aft into the #5 cylinder. The #5 cylinder sustained damage that separated the cooling fins on the top front side of the cylinder. The #5 and #4 rocker covers were fractured. The front crankcase sustained damage that fractured the case, permitting a view of the alternator face gear, the camshaft bevel gear, and the propeller governor drive gear. The propeller governor was separated from the engine. Both magnetos were separated from the engine and only one was recovered.

There were no external signs of pre-accident operational distress with any of the engine components or systems.



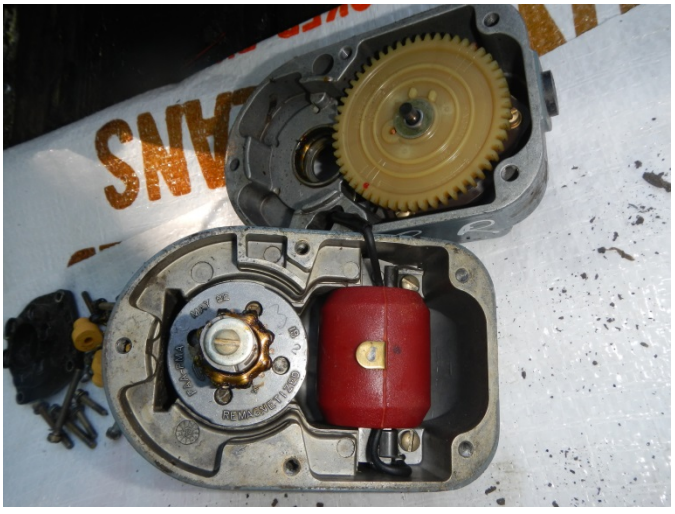
ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM	
Condition:	The exhaust risers remained attached to their respective cylinders and the exhaust manifolds remained in place on the left side of the engine; however, they sustained deformation damage and were filled with mud and debris. The right side exhaust system was separated from the engine. The turbocharger exhaust system was separated from the exhaust manifold. No pre-accident anomalies were noted with the observed exhaust system components.

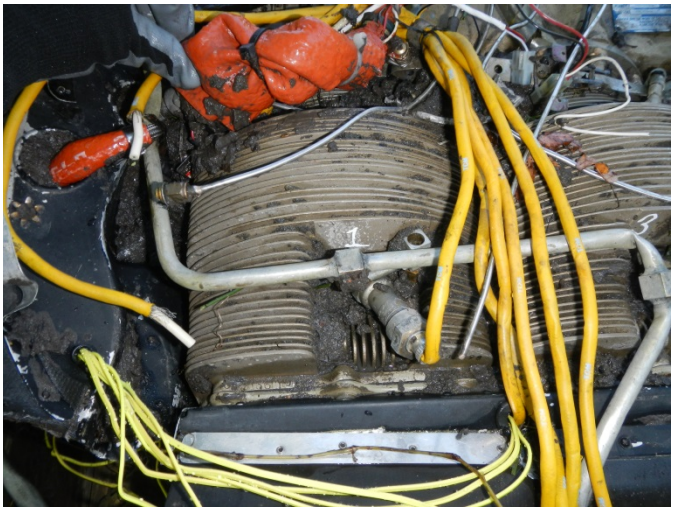
INDUCTION SYSTEM	
Condition:	The left side intake risers and manifold remained in place and attached to the engine. The right side intake risers and manifold was separated and not observed. The throttle body was attached to turbocharger section of the engine nacelle.

IGNITION SYSTEM

LEFT MAGNETO	Manufacturer: Unknown	P/N: Unknown	S/N: Unknown
Condition:	The magneto was separated from the engine and was not located during the examination.		
RIGHT MAGNETO	Manufacturer: CMI S6RSC-205	P/N: 10-600656-1	S/N: H299806ER
Condition:	The magneto was separated from the engine. The mounting flange of the right magneto was fractured in an area that coincided with the attach washers. The ignition harness cap was removed from the right magneto. The drive shaft was rotated with some binding noted. The magneto was disassembled and when the housing was removed the drive shaft rotated with some binding noted at the drive end. The distributor gear rotated freely. The points were intact and opened/closed with driveshaft rotation. No internal, pre-accident anomalies, besides water emersion and mud contamination, were observed with the magneto.		



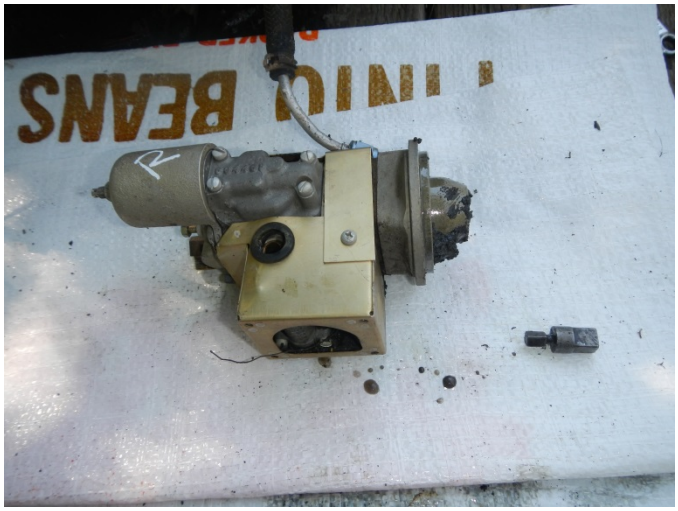
IGNITION HARNESS	Manufacturer: CMI	P/N: Unknown	S/N: Unknown
Condition:	All of the ignition terminal ends remained attached to their respective sparkplugs though some displayed some accident-related damage.		

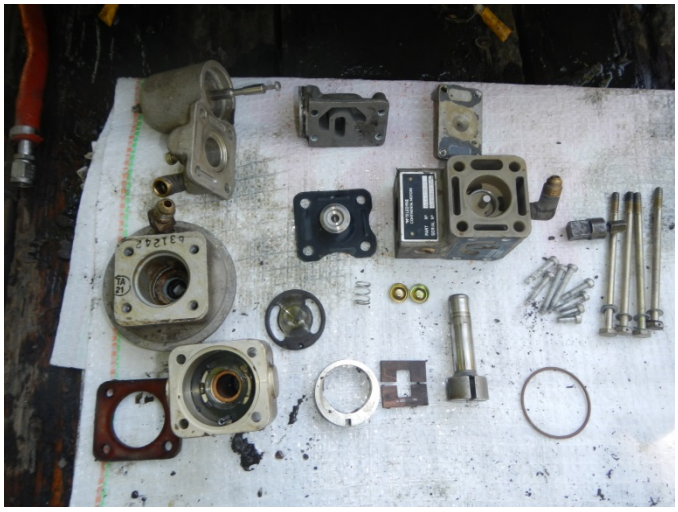


SPARK PLUGS	Manufacturer: Champion	P/N: RHB32E
Condition:	All of the sparkplugs remained secured to their respective cylinders. Removal of the top sparkplugs revealed that they were covered with mud, water, and oil. All electrodes displayed a normal worn condition when compared to the Champion Aviation Service Manual (AV6-R).	

FUEL SYSTEM

FUEL PUMP	Manufacturer: CMI	P/N: 646210-1	S/N: H129817BR
Condition:	The engine-driven fuel pump was attached to the backside of the engine. The engine-driven fuel pump was removed from the backside of the engine and fuel poured from the housing fittings. The drive coupling was intact and rotation of the drive coupling while installed in the driveshaft resulted in rotation of the driveshaft with no binding noted. The fuel pump was disassembled and no pre-accident anomalies were noted with any of the internal components.		





THROTTLE BODY METERING UNIT	Manufacturer: CMI	P/N: 632916-8	S/N: C129804AR

Condition:	The throttle body/fuel metering unit remained attached to the engine nacelle. The throttle and mixture cables remained attached to the throttle body and metering unit levers, which remained attached to their respective shafts. The linkage between the throttle valve shaft and the metering unit's throttle cam shaft was fractured and bending deformation was noted at the fracture. Rotation of the levers resulted in a coinciding rotation of the shafts with no binding noted. The metering unit fuel inlet filter was removed and no obstructions or blockage was noted, but mud and dirty water was observed. The metering unit was disassembled and besides water and dirt contamination, no pre-accident anomalies were noted with the internal components.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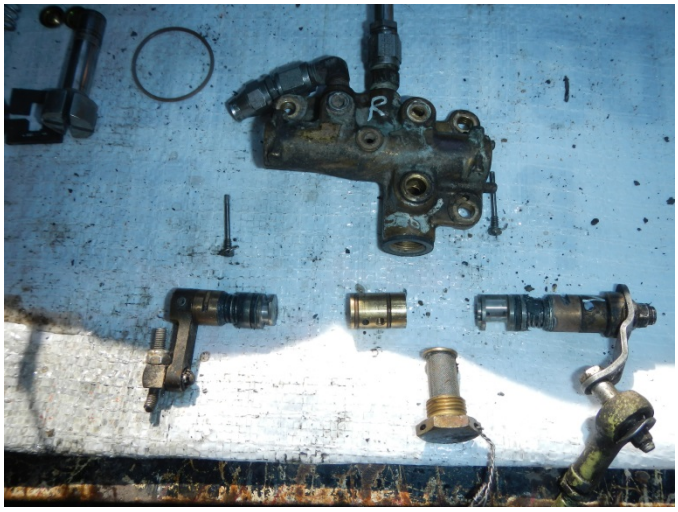
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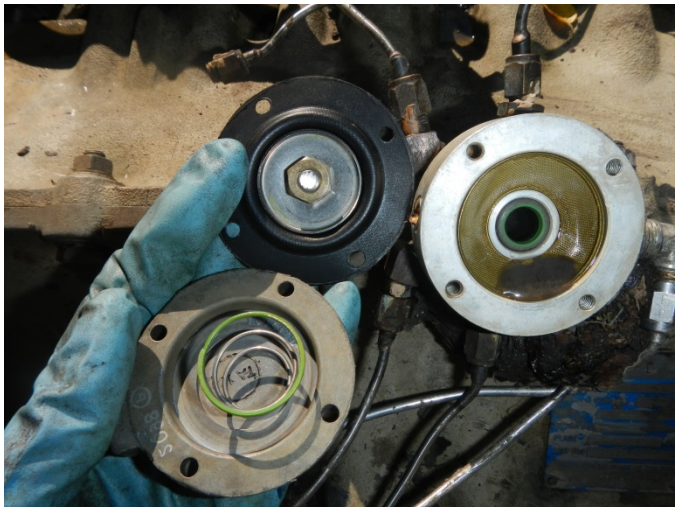
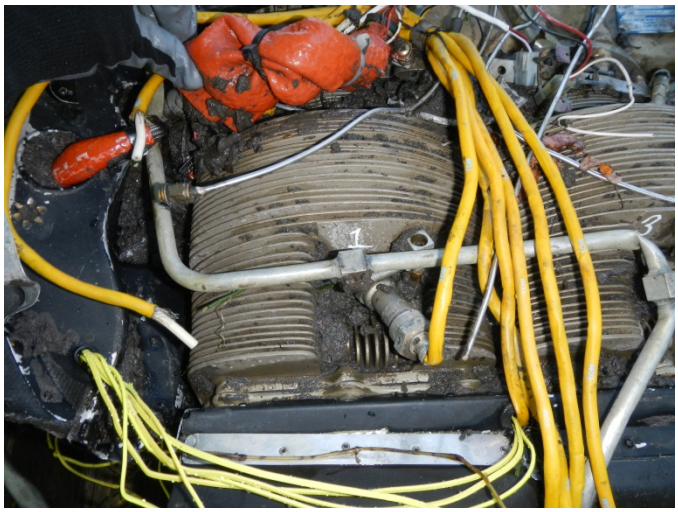
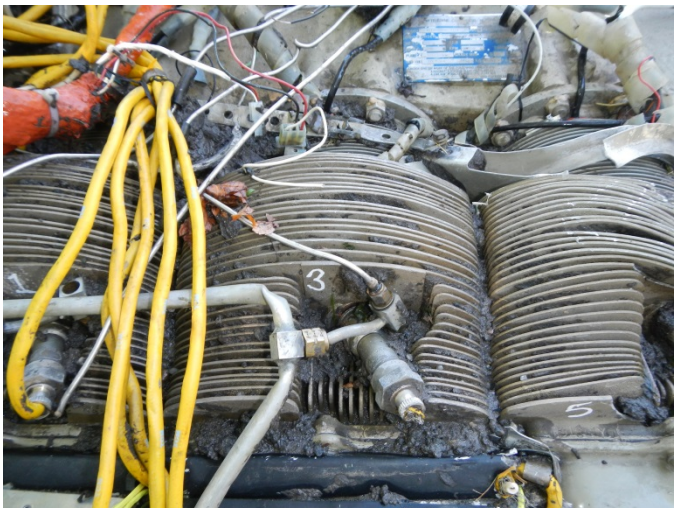
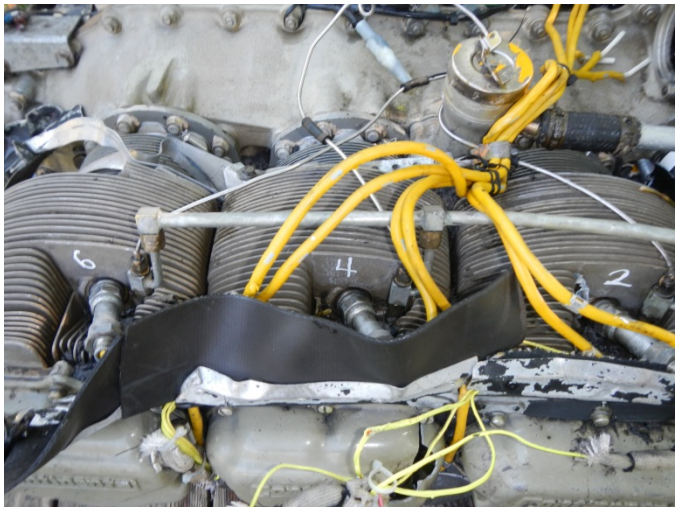
FUEL MANIFOLD VALVE	Manufacturer: CMI	P/N: 631351-18A2	S/N: HI29818CR
Condition:	The fuel manifold valve remained attached to the topside of the engine; however, some of the fuel injection lines were fractured and it was separated from its mount. The cap was secured to the body with safety-wire. The fuel manifold valve was disassembled and aviation gasoline, mud and water were noted in the manifold. No pre-accident anomalies were noted with the diaphragm, plunger, spring, or screen.		



FUEL NOZZLES AND LINES	Manufacturer: CMI
Condition:	The #5 fuel injector nozzle was separated from its cylinder and its line was displaced aft toward the #1 cylinder. The #1 fuel injector line was separated from the #1 fuel nozzle. The upper deck reference line was attached to the right side fuel nozzles, but the #5 upper deck reference line, with nozzle installed, was bent aft toward the #3 cylinder. The #6 fuel injector line was separated from the fuel manifold valve but the nozzles and upper deck reference lines remained attached to the left side cylinders.



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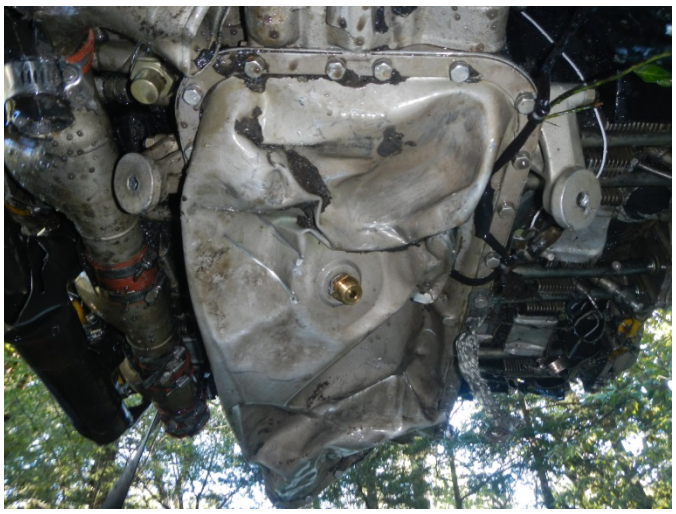
LUBRICATION SYSTEM

OIL SUMP	
Condition:	The oil sump was displaced up around the bottom side of the engine. It remained attached to its bottom side of the engine, but the bottom front end of the engine was fractured and the oil sump was displaced aft. No pre-accident anomalies were noted with the oil sump.



OIL PICK-UP TUBE & SCREEN	
Condition:	The oil pickup tube and screen were not observed

OIL PUMP	
Condition:	The oil pump remained attached to the backside of the engine. No external pre-accident anomalies were noted. The oil pump was not disassembled, but all of the visible components of the engine appeared to be well lubricated with no signs of thermal distress noted.

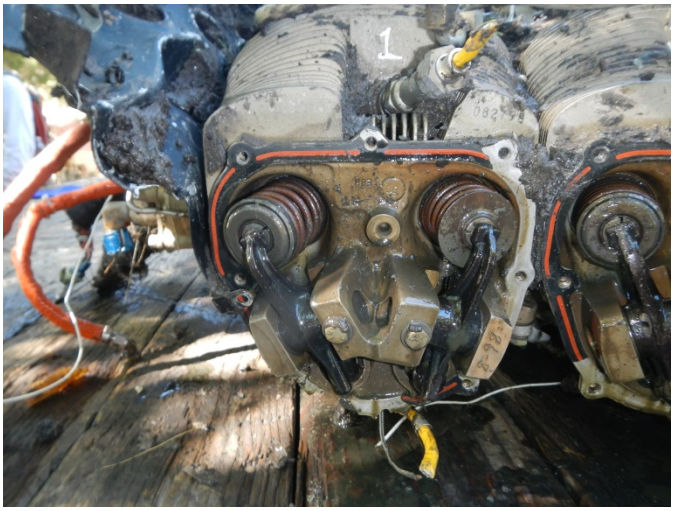
OIL FILTER	Manufacturer: Champion
Condition:	The oil filter remained secured with safety-wire to the engine. There were no signs of pre-accident anomalies with the oil filter. The date of 4/29/15 was written on the oil filter with a tachometer time listed as 187.7. The filter indicated that it was utilized on the right engine.

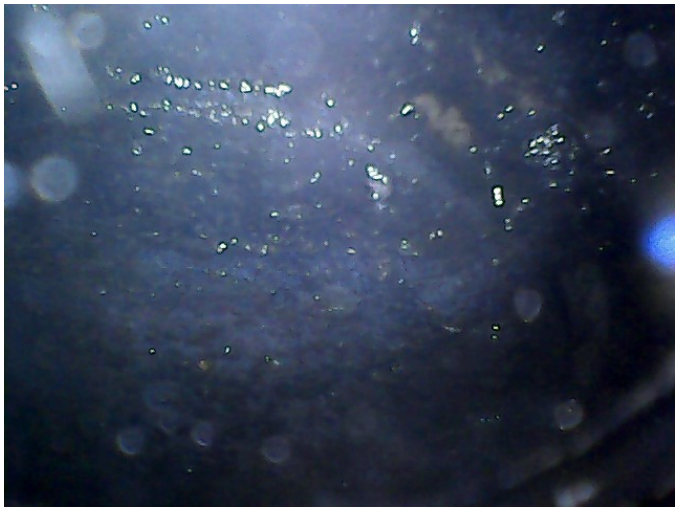
OIL COOLER	Manufacturer: Niagara Development & Manufacturing Co.	P/N: 654572	S/N: G98-2750-783
Condition:	The oil cooler remained attached to the engine and no pre-accident anomalies were noted.		

CYLINDERS

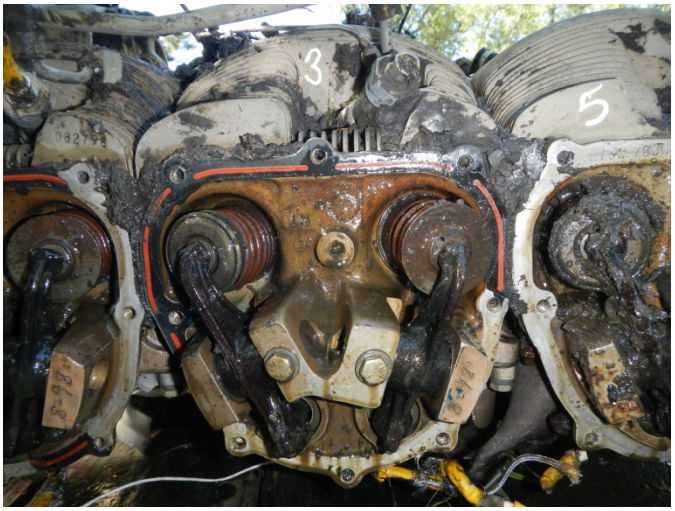
NOTE: The photographs that follow the cylinder condition description represent the cylinder head components, the piston, the intake valve, and the exhaust valve, in that order unless otherwise noted.

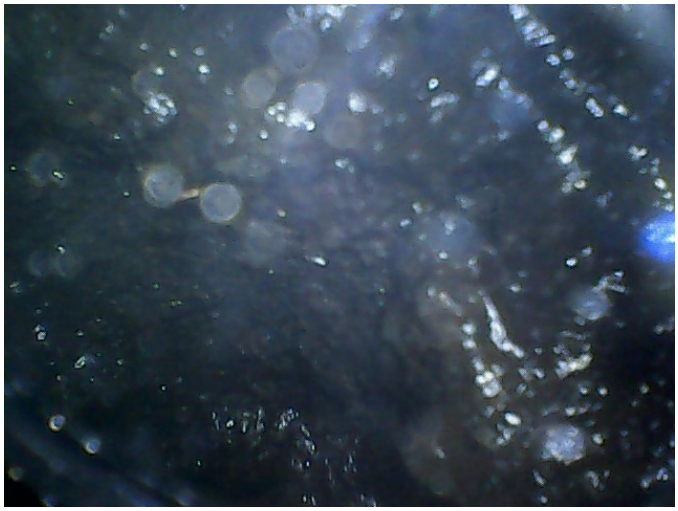
CYLINDER #1	P/N: 658552A1	S/N: Unknown	Head Date: 8-98
Condition:	The cylinder remained attached to the engine and torque putty from the last overhaul was evident on the cylinder flange hardware. No pre-accident anomalies were noted externally. The top sparkplug was removed from the engine and the cylinder was inspected using a lighted borescope. Mud and water were observed in the cylinder. The crankshaft was rotated and the rockers, valves, and valve springs functioned properly and piston movement was observed. No pre-accident anomalies were noted with the cylinder components.		

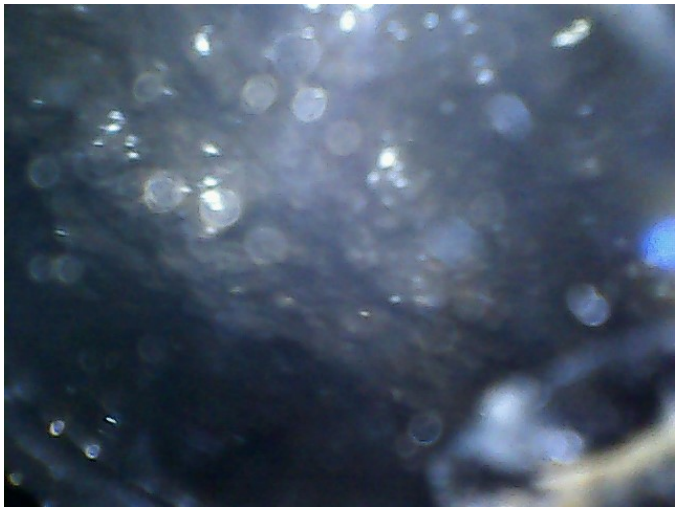




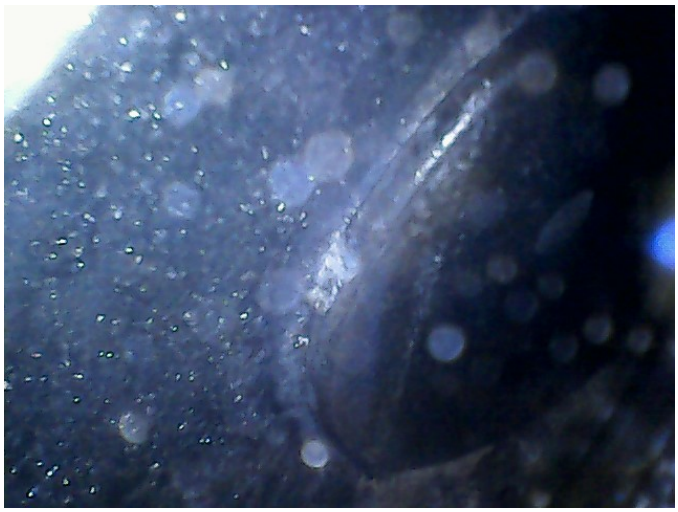
CYLINDER #3	P/N: 658552A1	S/N: Unknown	Head Date: 8-98
Condition:	The cylinder remained attached to the engine and torque putty from the last overhaul was evident on the cylinder flange hardware. No pre-accident anomalies were noted externally. The top sparkplug was removed from the engine and the cylinder was inspected using a lighted borescope. Mud and water were observed in the cylinder. The crankshaft was rotated and the rockers, valves, and valve springs functioned properly and piston movement was observed. No pre-accident anomalies were noted with the cylinder components.		



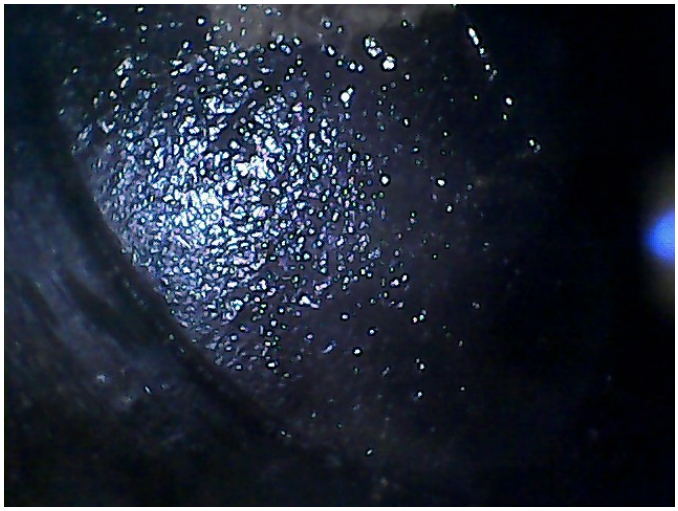


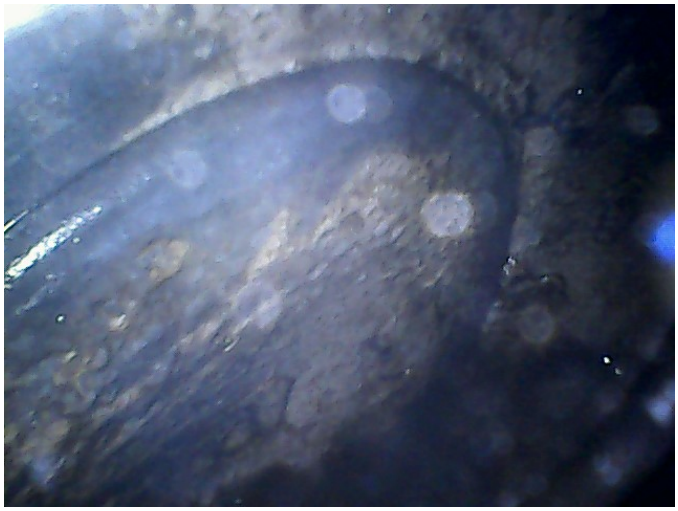


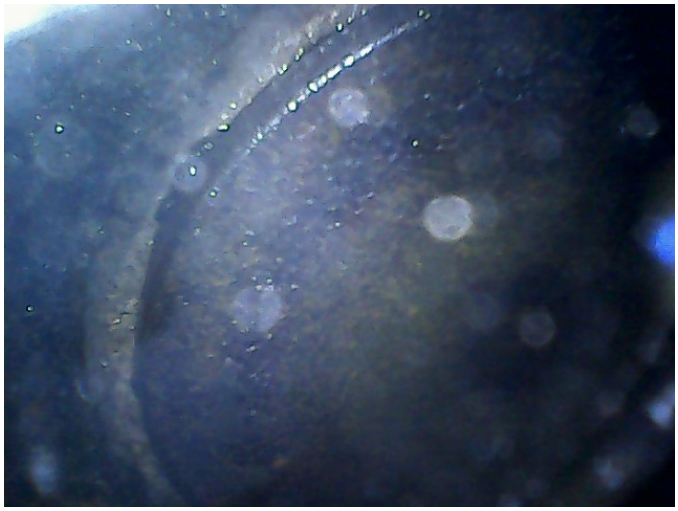
CYLINDER #5	P/N: 658552A1	S/N: Unknown	Head Date: 8-98
Condition:	The cylinder remained attached to the engine and torque putty from the last overhaul was evident on the cylinder flange hardware. The cooling fins on the top front side of the cylinder were fractured and the fuel injector nozzle was separated. No pre-accident operational anomalies were noted externally. The top sparkplug was removed from the engine and the cylinder was inspected using a lighted borescope. Mud and water were observed in the cylinder. The crankshaft was rotated and the rockers, valves, and valve springs functioned properly and piston movement was observed. A line of discoloration was noted on the exhaust valve and a piece of debris was noted in the circumference of the valve in the area of the discoloration. Besides the valve signatures, no other pre-accident anomalies were noted with the cylinder components.		



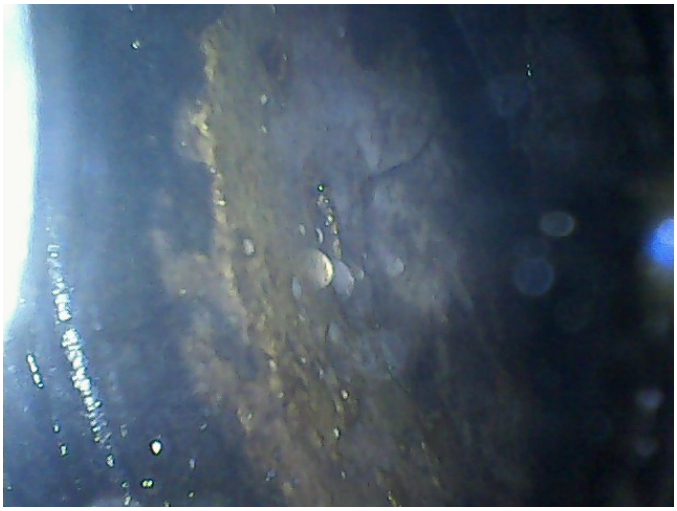
CYLINDER #2	P/N: 658552A1	S/N: Unknown	Head Date: 8-98
Condition:	The cylinder remained attached to the engine and torque putty from the last overhaul was evident on the cylinder flange hardware. No pre-accident anomalies were noted externally. The top sparkplug was removed from the engine and the cylinder was inspected using a lighted borescope. Mud and water were observed in the cylinder. The crankshaft was rotated and the rockers, valves, and valve springs functioned properly and piston movement was observed. No pre-accident anomalies were noted with the cylinder components.		







CYLINDER #4	P/N: 658552A1	S/N: Unknown	Head Date: 8-98
Condition:	The cylinder remained attached to the engine and torque putty from the last overhaul was evident on the cylinder flange hardware. No pre-accident anomalies were noted externally. The top sparkplug was removed from the engine and the cylinder was inspected using a lighted borescope. Mud and water were observed in the cylinder. The crankshaft was rotated and the rockers, valves, and valve springs functioned properly and piston movement was observed. No pre-accident anomalies were noted with the cylinder components.		



CYLINDER #6	P/N: 658552A1	S/N: Unknown	Head Date: 8-98
Condition:	The cylinder remained attached to the engine and torque putty from the last overhaul was evident on the cylinder flange hardware. No pre-accident anomalies were noted externally. The top sparkplug was removed from the engine and the cylinder was inspected using a lighted borescope. Mud and water were observed in the cylinder. The crankshaft was rotated and the rockers, valves, and valve springs functioned properly and piston movement was observed. No pre-accident anomalies were noted with the cylinder components.		

CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: Not Observed	2-4-6: Not Observed	S/N: OB148P
Condition:	The crankcase was fractured on the bottom front end which permitted visible examination of the alternator face gear, the camshaft bevel gear, and the propeller governor drive gear. No pre-accident anomalies were noted with the crankcase.			

CRANKSHAFT ASSEMBLY

CRANKSHAFT	Forging Number: Not Observed	S/N: H189402N	Heat code: Not Observed
Condition:	Though the crankshaft was not viewed in its entirety, crankshaft continuity was visually observed during manual rotation of the propeller flange. The crankshaft gear rotated in conjunction with the propeller flange and all pistons moved within their respective cylinders during crankshaft rotation.		

CAMSHAFT

CAMSHAFT	P/N: Not Observed	S/N: Not Observed
Condition:	Though the entirety of the camshaft was not visually observed, camshaft continuity was observed on the bevel gear and on all of the rockers during manual rotation of the crankshaft.	

ACCESSORIES

STARTER	Manufacturer: Unknown	P/N: Unknown	S/N: Unknown
Condition:	The starter motor was separated from its mounting pad. Only one starter motor (Energizer 24 PN: 646275 SN: A08269806) was recovered from the pond. No pre-accident anomalies were noted with the recovered motor.		

STARTER ADAPTER	
Condition:	The starter adapter remained attached to the backside of the engine with no pre-accident anomalies noted.

ALT/GEN #1	Manufacturer: Unknown	P/N: Unknown	S/N: Unknown
Condition:	The alternator remained attached to the engine, but its housing was destroyed and the remaining portions were displaced aft into the #5 cylinder barrel.		

VACUUM PUMP	Manufacturer: Tempest	P/N: AA3216CW	S/N: N41588
Condition:	The vacuum pump remained attached to the backside of the engine. It was removed and its drive shaft and drive coupling remained intact. Rotation of the drive shaft revealed no anomalies.		

TURBO	Manufacturer: Garrett	P/N: 632729-11	S/N: BH017656
Condition:	The turbocharger, wastegate, overboost valve and controller remained with the engine nacelle. Dirt and mud were observed in both the impeller and turbine sections of the turbocharger. Removal of the turbocharger impeller shroud revealed that the impeller was intact and the shaft to the turbine was intact; however, the turbine was binding on the turbine shroud and would only permit partial rotation. A small area of rotational scoring was noted on the impeller shroud.		

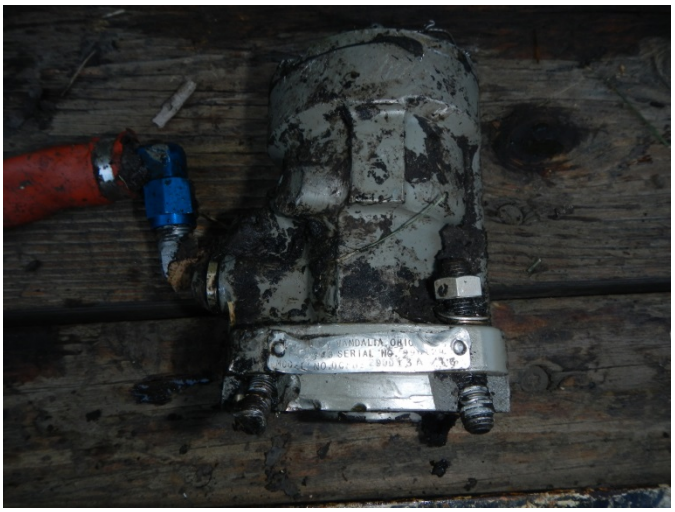
TURBO CONTROLLER	Manufacturer: Garrett	P/N: 470948-1	S/N: FKRO113
Condition:	The controller remained with the turbocharger components in the engine nacelle piece. The controller was intact with no external signs of operational distress. Residual oil poured from the controller during the examination.		

WASTEGATE	Manufacturer: Garrett	P/N: 5050154-15	S/N: GIRO327
Condition:	The wastegate actuator remained attached to the wastegate linkage and no pre-accident anomalies or disconnects were noted.		

OVERBOOST VALVE	Manufacturer: Garrett	P/N: 470930-1	S/N: GD0101
Condition:	The overboost valve remained attached to the turbocharger impeller shroud and was intact and its poppet valve could be opened and the spring was intact.		

PROPELLER

PROPELLER GOVERNOR	Manufacturer: McCauley	P/N: DCFU3290D13A/16	S/N: 99?124
Condition:	The propeller governor was separated from the engine. A governor was located at the accident site, and based on fracture features, was determined to be from the right engine. The		



PROPELLER	Manufacturer: McCauley	P/N: 3AF32C504-B	S/N: 861365
Condition:	The right propeller hub was fractured and two of the three blades remained attached to the hub. The separated blade was recovered. All of the blades' pitch change links were fractured. All three blades were twisted toward low pitch. Blade #1 displayed heavy s-bending, leading edge gouging, and was bent in a u-shape. The #1 blade also displayed a chicken wire pattern on its camber side, and investigators observed chicken wire in one of the trees that was cut by the propeller.		


#2 R