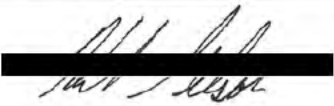




Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	IO-550-B (converted by Tornado Alley Turbo for turbo normalized)
ENGINE SERIAL NUMBER	686071
AIRCRAFT MAKE & MODEL	Beechcraft A36
AIRCRAFT SERIAL NUMBER	E-3503
AIRCRAFT REGISTRATION	N207PC
FILE NUMBER	17-440

NAME	SIGNATURE	DATE
Kurt Gibson		06/22/2018

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EXAMINATION		ACCIDENT DATA	
DATE	06/12/2018	NTSB ACCIDENT #	WPR18LA098
FACILITY	Continental Motors Inc.	NTSB INVESTIGATOR	Tom Little
ADDRESS	[REDACTED] Mobile, AL 36615	FAA INVESTIGATOR	Roy Dunn
		ACCIDENT DATE	03/04/2018
		ACCIDENT LOCATION	Enumclaw, Washington

ENGINE INFORMATION

ENGINE POSITION	Front (single engine)
TOTAL TIME	1069.1
TIME SOH	N/A
TYPE & TIME SLI	59.9 since the last annual inspection.
BUILD DATE	02/21/2003
IN SERVICE DATE	04/28/2003

Significant logbook information:

On 11/10/2011 and a hobbs time of 516.6, the engine was disassembled, repaired, and the cylinders were overhauled; the reason for the disassembly was due to low compression on the #4 and the #6 cylinders. On 11/25/2018 the engine was modified by STC SA5223NM and STC SE5222NM to convert the engine from a normally aspirated engine to a turbo-normalized engine by Tornado Alley Turbo Inc. On 10/17/2017 the aircraft and engine were inspected for an annual inspection at a hobbs time of 1009.2. The last engine maintenance entry was on 01/09/2018 at an engine total time of 1041.2 for the removal and replacement of the #2 cylinder.

Report Summary:

Search Code(s):

The engine displayed signatures of oil starvation. Three of the connecting rods had separated from the crankshaft and the #2, #3, #4, #5, and the #6 connecting rod bearings displayed lubrication distress. The #3 and the #4 main bearings displayed signatures of lubrication distress. According to the NTSB the oil line B-nut that attaches to the turbocharger scavenge check valve on the outlet side was found loose during the initial examination.

Disposition of engine following exam:

The engine was shipped back to AvTech Services in Kent, Washington

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NAME	Kurt Gibson	NAME	Jack Vanover
ADDRESS	Mobile, Alabama	ADDRESS	Seattle, Washington
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Henry Soderlund	NAME	Phillip Grice
ADDRESS	Wichita, Kansas	ADDRESS	Mobile, Alabama
ORGANIZATION	Textron Aviation	ORGANIZATION	Continental Motors
PHONE		PHONE	
NAME	Greg Eastburn	NAME	James Blackwell
ADDRESS	Mobile, Alabama	ADDRESS	Mobile, Alabama
ORGANIZATION	Continental Motors Inc.	ORGANIZATION	Continental Motors Inc.
PHONE	N/A	PHONE	N/A

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The engine displayed impact damage signatures; only one of engine mounts remained intact. There were three holes noted in the crankcase consistent with an internal engine failure. The largest hole was towards the rear of the crankcase that went across both crankcase halves, there was one additional hole in the right crankcase half near the #3 cylinder and one hole in the left crankcase half near the #4 cylinder. All six cylinders remained attached to their cylinder bays; there was no signs of impact damage. The propeller flange remained attached to the crankshaft and there were no cracks noted aft of the propeller flange.

Both of the magnetos remained attached to their installation points; the left magneto displayed mechanical damage consistent with impact with one of the internal engine components. The ignition harness remained attached to both magnetos and to each of the spark plugs; the harness displayed some impact damage signatures to some of the ignition leads and displayed mechanical damage to the left magneto ignition harness cap. All of spark plugs remained installed in their cylinders and were undamaged.

The fuel pump remained attached to its installation point and was undamaged. There were no signs of fuel or oil leaks around the fuel pump. The throttle and fuel metering assembly had been removed from its installation point and remained attached to the engine through fuel lines. The assembly remained intact and displayed minor impact damage; there were no signs of fuel leaks around the throttle and fuel metering assembly. The manifold valve remained attached to its installation point and was undamaged. There were no signs of fuel leaks noted around the fuel manifold valve. All six injectors remained installed in their cylinders and were undamaged; there were no signs of fuel leaks around the nozzles.

The turbocharger had been removed from the engine and displayed impact damage signatures; the compressor housing had broken free from the rest of the turbocharger and the compressor blades displayed bending and tearing consistent with impact damage. According to the Textron Aviation investigator and the NTSB IIC the oil line attached to the turbocharger scavenge check valve outlet was found loose during the initial examination. The wastegate had broken free from its installation point and displayed impact damage signatures. The overboost valve and the turbo controller were not shipped with the engine by the recovery personnel.

The induction system displayed impact damage signatures concentrated at the induction Y-tube. There were no signs of induction leaks noted around any of the attached induction tubes and risers. Some of the induction system was not shipped with the engine by the recovery personnel. The exhaust risers remained attached to the engine and were undamaged. The exhaust tailpipe had been removed from the turbocharger and displayed impact damage signatures; the V-band clamp had been removed from the tailpipe and remained intact.

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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: The exhaust risers remained attached to the engine and were undamaged. The exhaust tailpipe had been removed from the turbocharger and displayed impact damage signatures; the V-band clamp had been removed from the tailpipe and remained intact.



INDUCTION SYSTEM

Condition: The induction system displayed impact damage signatures concentrated at the induction Y-tube. There were no signs of induction leaks noted around any of the attached induction tubes and risers. Some of the induction system was not shipped with the engine by the recovery personnel.



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MAGNETO**

Manufacturer: Slick

P/N: 6310

S/N: 03020094

Condition: The left magneto remained attached to its installation point and displayed mechanical damage; the magneto also displayed signs of slippage on its mounting flange. The mechanical damage was concentrated to the magneto top housing and the capacitor had detached and was not located. The magneto was removed and it was noted that the drive was capable of normal rotation and the points were able to open and close. The top housing was replaced with the right magneto top housing; the magneto was then placed on a test bench. The magneto was capable of producing a spark on all six posts. There were no anomalies noted.

**RIGHT
MAGNETO**

Manufacturer: Slick

P/N: 631?

S/N: 03020093

Condition: The magneto remained attached to its installation point and displayed minor mechanical damage. The magneto was removed and it was noted that the drive was capable of normal rotation. The magneto was placed on a test bench and it was noted that the magneto was capable of producing a spark on all six posts. The top housing was removed and the visible internal components displayed normal operating signatures. There were no anomalies noted with the magneto.



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IGNITION HARNESS

Manufacturer: CMI

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness remained attached to both of the magnetos and to each spark plug. The ignition harness displayed impact damage signatures to several of the leads in the form of tearing. There were no anomalies noted with the ignition harness.



SPARK PLUGS

Manufacturer: Tempest

P/N: URHB32E

Condition:

All of the spark plugs remained installed in their cylinders and were undamaged. The spark plugs were removed and the electrodes were visually inspected. The electrodes displayed normal wear signatures. The #1 electrodes displayed sooting consistent with a rich mixture and the #2 and the #6 bottom spark plugs were oil soaked consistent with post-accident accumulation.



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Turbo

P/N: FT-B8.5/1-632818-2-11

S/N: GP0913

Condition: The fuel pump remained attached to its installation point and displayed impact damage signatures; the fuel inlet AN elbow was broken. The fuel pump was removed and it was noted that the drive coupling remained intact. The fuel pump drive was rotated by hand and it was noted that there was significant resistance to rotation. The fuel pump was disassembled and it was noted that the drive shaft displayed corrosion consistent with post-accident accumulation. The internal components displayed normal operating signatures.

**THROTTLE
BODY
METERING UNIT**Manufacturer: Great
Planes

P/N: FT-38.5 /1-442

S/N: A06CA094

Condition: The throttle and metering assembly remained intact and displayed minor impact damage signatures. Both of the control arms remained secured to their shafts and were capable of normal movement. The fuel inlet screen was removed and it was noted that it was clear of contaminants.



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FUEL MANIFOLD VALVE

Manufacturer: CMI

P/N: 646508-17A7

S/N: C03BA043

Condition: The fuel manifold valve remained intact and was undamaged. There were no signs of fuel leaks around the manifold valve. There were no anomalies noted with the manifold valve



FUEL NOZZLES AND LINES

Manufacturer: GAMI

Position	#1	#3	#5	#2	#4	#6
Size	GA262	GM246	GF235	GA262	GM246	GF235

Condition: The fuel nozzles remained intact and were undamaged. The nozzles were removed and it was noted that all of the nozzles were clear of any blockages. There were no anomalies noted with the nozzles.



#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 remained attached and displayed some impact damage signatures. The oil sump was removed and it was noted that there was a significant amounts of metallic material within the sump.



OIL PICK-UP TUBE & SCREEN

Condition: The oil pick-up tube and screen remained attached to its installation point and was undamaged. The pick-up screen displayed metallic material within the screen.



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OIL PUMP

Condition:

The oil pump remained attached to its installation point and was undamaged. The oil pump was removed and disassembled. The internal portion of the oil pump housing displayed scoring consistent with hard particle passage. The oil pump gears and oil pressure relief valve remained intact and displayed normal operating signatures.



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OIL FILTER

Manufacturer: Tempest

P/N: AA48109

Condition:

The oil filter remained attached to the oil filter adapter and was undamaged. The oil filter housing was cut open and the filter pleats were visually inspected; there was a significant amount of metallic material within the filter pleats.



OIL COOLER

Manufacturer: NDM

P/N: 1028A

S/N: A03-2146-11

Condition:

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



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P/N: 655484

S/N: Not observed

Condition:

The cylinder remained attached to its cylinder bay and there wasn't any noticeable impact damage. The cylinder was removed and it was noted that the cylinder skirt displayed mechanical damage signatures. The cylinder bore and valve heads displayed normal operating and combustions signatures. The overhead components (valves, valve springs, and rocker arms) displayed normal operating and lubrication signatures.

**CYLINDER #3**

P/N: 655484

S/N: Not observed

Condition:

The cylinder remained attached to its cylinder bay and there wasn't any noticeable impact damage. The cylinder was removed and it was noted that the cylinder skirt displayed mechanical damage signatures. The cylinder bore and valve heads displayed normal operating and combustions signatures. The overhead components (valves, valve springs, and rocker arms) displayed normal operating and lubrication signatures.



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CYLINDER #5

P/N: 655484

S/N: Not observed

Condition: The cylinder remained attached to its cylinder bay and there wasn't any noticeable impact damage. The cylinder was removed and it was noted that the cylinder skirt displayed mechanical damage signatures. The cylinder bore and valve heads displayed normal operating and combustions signatures. The overhead components (valves, valve springs, and rocker arms) displayed normal operating and lubrication signatures.



CYLINDER #2

P/N: SA52006-A1

S/N: Not observed

Condition: The cylinder remained attached to its cylinder bay and there wasn't any noticeable impact damage. The cylinder was removed and it was noted that the cylinder skirt displayed mechanical damage signatures. The cylinder bore and valve heads displayed normal operating and combustions signatures. The overhead components (valves, valve springs, and rocker arms) displayed normal operating and lubrication signatures.



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P/N: 655484

S/N: Not observed

Condition: The cylinder remained attached to its cylinder bay and there wasn't any noticeable impact damage. The cylinder was removed and it was noted that the cylinder skirt displayed mechanical damage signatures. The cylinder bore and valve heads displayed normal operating and combustions signatures. The overhead components (valves, valve springs, and rocker arms) displayed normal operating and lubrication signatures.

**CYLINDER #6**

P/N: 655484

S/N: Not observed

Condition: The cylinder remained attached to its cylinder bay and there wasn't any noticeable impact damage. The cylinder was removed and it was noted that the cylinder skirt displayed mechanical damage signatures. The cylinder bore and valve heads displayed normal operating and combustions signatures. The overhead components (valves, valve springs, and rocker arms) displayed normal operating and lubrication signatures.



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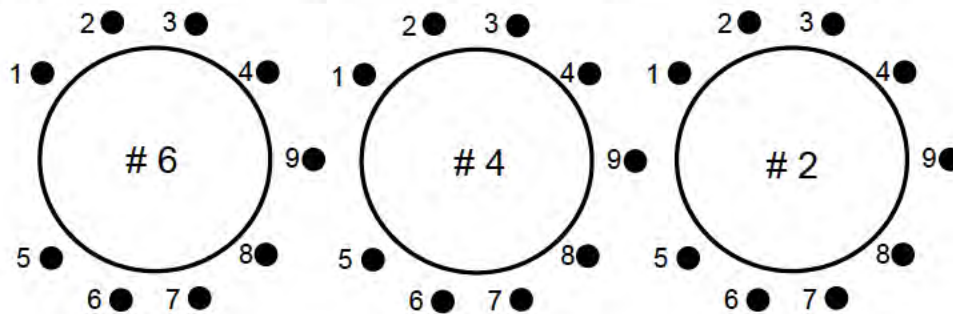
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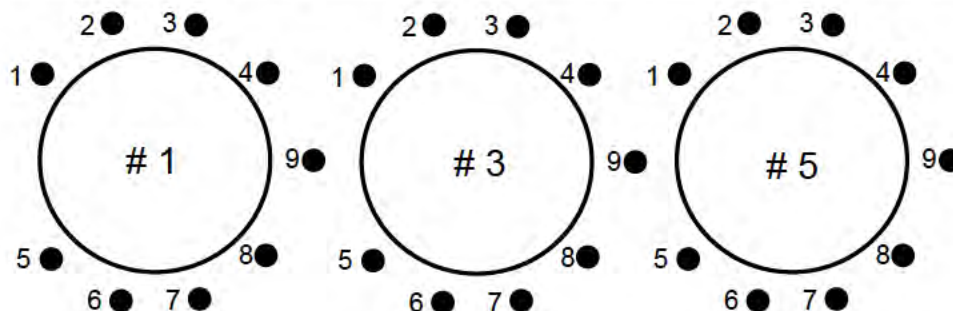
Cylinder Through-Bolt and Deck Stud Break-Away (Tightening/Loosening) Torque Measurements (in-lbs)

(NOTE: Position numbers 1 and 5 are through-bolts)

	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder #2	894/720	Stud loose	Missing nut	420/324	834/700	726/578	788/583	541/460	624/720
Cylinder #4	1200/960	Stud loose	492/432	492/756	1155/1011	747/646	823/646	630/578	696/564
Cylinder #6	1068/1044	720/684	768/796	756/720	1086/935	774/709	903/709	Loose	756/612



	Bolt 1	Stud 2	Stud 3	Stud 4	Bolt 5	Stud 6	Stud 7	Stud 8	Stud 9
	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose	Tight / Loose
Cylinder # 1	996/840	768/684	804/684	624/564	984/864	886/740	871/774	864/748	768/588
Cylinder # 3	1092/960	Stud loose	564/492	744/672	934/801	991/806	996/862	907/801	720/552
Cylinder # 5	1080/972	828/Error	828/1020	348/360	1141/998	899/828	898/746	864/783	756/612



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VALVES AND GUIDES

Condition: All of the valves remained intact and were undamaged. All of the valve heads displayed normal operating and combustion signatures. There were no anomalies noted with the valves.

ROCKER ARMS AND SHAFTS

Condition: All of the rocker arms remained intact and were undamaged. The rocker arms displayed normal operating and lubrication signatures. There were no anomalies noted with the rocker arms.



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RINGS AND PIN**

Piston P/N: Illegible

Condition:

The piston remained attached to its connecting rod and displayed a significant amount of mechanical damage to the rear of the piston. The piston face displayed normal operating and combustion signatures. The rear piston ring displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged. There were no anomalies noted with the piston.

**#3 PISTON,
RINGS AND PIN**

Piston P/N: Illegible

Condition:

The piston remained attached to its connecting rod and displayed scoring along the piston skirt. The piston face displayed normal operating and combustion signatures. The piston rings remained within their grooves and displayed normal operating signatures.



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#5 PISTON, RINGS AND PIN

Piston P/N: Illegible

Condition:

The piston remained attached to its connecting rod and displayed a significant amount of mechanical damage to the rear of the piston. The piston face displayed normal operating and combustion signatures. The rear piston ring displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged. There were no anomalies noted with the piston.



#2 PISTON, RINGS AND PIN

Piston P/N: Illegible

Condition:

The piston remained attached to its connecting rod and displayed a significant amount of mechanical damage to the rear of the piston. The piston face displayed normal operating and combustion signatures. The rear piston ring displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged. There were no anomalies noted with the piston.



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RINGS AND PIN**

Piston P/N: Illegible

Condition:

The piston remained attached to its connecting rod and displayed a significant amount of mechanical damage to the rear of the piston. The piston face displayed semicircular indentations consistent with valve strikes; there were no signs of detonation or preignition. The rear piston ring displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged. There were no anomalies noted with the piston.

**#6 PISTON,
RINGS AND PIN**

Piston P/N: Illegible

Condition:

The piston remained attached to its connecting rod and displayed a significant amount of mechanical damage to the rear of the piston. The piston face displayed normal operating and combustion signatures. The rear piston ring displayed mechanical damage and was broken; the rest of the piston rings remained within their grooves and were undamaged. There were no anomalies noted with the piston.



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CRANKCASE ASSEMBLY

CRANKCASE

Casting
Number:

1-3-5: 653921

2-4-6: 653920

S/N: R03AA555

Condition:

The crankcase displayed two large holes in the top of the crankcase consistent with an internal engine failure. The crankcase halves were removed and the internal portions of the crankcase were visually inspected. The internal crankcase displayed mechanical damage to several locations. The bearing supports displayed normal operating signatures and there were no signs of fretting or bearing shift. It was noted that there was a coating of grey sealant material consistent with silicon sealant applied to the crankcase backbone mating surfaces.



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#1 MAIN BEARINGS

P/N: 634503

Date Code: 1-03

Condition:

The bearings remained within the bearing supports and there were no signs of bearing shift. The bearings displayed normal operating and lubrication signatures.



#2 MAIN BEARINGS

P/N: 634503

Date Code: 1-03

Condition:

The bearings remained within the bearing supports and there were no signs of bearing shift. The bearings displayed normal operating and lubrication signatures.



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#3 MAIN BEARINGS

P/N: 634503

Date Code: 1-03

Condition:

The bearings remained within the bearing supports and there were no signs of bearing shift. The bearings displayed smearing and damage consistent with lubrication distress.



#4 MAIN BEARINGS

P/N: 653547

Date Code: 8-02

Condition:

The bearings remained within the bearing supports and there were no signs of bearing shift. The bearings displayed smearing and damage consistent with lubrication distress.



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#5 MAIN BEARINGS

P/N: 653547

Date Code: 8-02

Condition:

The bearings remained within the bearing supports and there were no signs of bearing shift. The bearings displayed normal operating and lubrication signatures.



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

Forging: 649878

S/N: N02LA103

Heat code: KAJM

Condition:

The crankshaft remained intact and there were no signs of impact damage signatures. The main bearing journals displayed normal operating signatures. The #1 and the #6 connecting rod journals displayed normal operating signatures. The #2, #3, #4, and the #5 connecting rod journals displayed thermal damage signatures consistent with lack of lubrication; the #4 and the #5 connecting rod journals displayed mechanical damage. The #4 connecting rod oil galley was blocked with redeposited metal. The rest of the oil galleries were clear of any blockages. The crankshaft gear remained intact and was undamaged.



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COLLAR****Condition:**

The transfer collar remained attached to its installation point and was undamaged. There were no anomalies noted with the transfer collar.

**COUNTER
WEIGHTS****Condition:**

All of the counterweights remained attached to their hangers and displayed varying amounts of mechanical damage signatures. The counterweights were capable of normal movement on their hangers. There were no anomalies noted with the counterweights.

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

The internal timing could not be verified.

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#1 CONNECTING ROD

Forging: 646126-U

S/N: AE02JC451

Condition: The connecting rod remained attached to its journal and to the piston pin. The connecting rod displayed mechanical damage to the connecting rod cap; the rod also displayed normal operating signatures. There were no anomalies noted with the connecting rod.

#1 CONNECTING ROD BEARING

P/N: 642398

Condition: The bearings remained within the bearing supports and displayed mechanical damage signatures. The bearings displayed the initial signatures of lubrication distress.



#3 CONNECTING ROD

Forging: 646126-U

S/N: AE02JC460

Condition: The connecting rod remained attached to its connecting rod journal and to its piston pin. The connecting rod displayed thermal discoloration consistent with lubrication distress.

#3 CONNECTING ROD BEARING

P/N: 642398

Condition: The bearings remained within the bearing supports and displayed significant amount of damage consistent with lack of lubrication; the bearing surfaces were smeared and the bearings were slightly extruded.



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#5 CONNECTING ROD

Forging: 646126-U

S/N: AE02JC467

Condition: The connecting rod had released from its journal and remained attached to its piston pin. The connecting rod displayed a significant amount of thermal damage consistent with lubrication distress as well as mechanical damage.

#5 CONNECTING ROD BEARING

P/N: Illegible

Condition: Small portions of bearing material were located within the oil sump. The located bearing material displayed significant thermal damage signatures consistent with lubrication distress.



#2 CONNECTING ROD

Forging: 646126-U

S/N: AE02JC454

Condition: The connecting rod had released from its journal and remained attached to its piston pin. The connecting rod displayed a significant amount of thermal damage consistent with lubrication distress as well as mechanical damage.

#2 CONNECTING ROD BEARING

P/N: Illegible

Condition: Small portions of bearing material were located within the oil sump. The located bearing material displayed significant thermal damage signatures consistent with lubrication distress.



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#4 CONNECTING ROD

Forging: 646126-U

S/N: AE02JC461

Condition:

The connecting rod had released from its journal and remained attached to its piston pin. The connecting rod displayed a significant amount of thermal damage consistent with lubrication distress as well as mechanical damage.

#4 CONNECTING ROD BEARING

P/N: Illegible

Condition:

Small portions of bearing material were located within the oil sump. The located bearing material displayed significant thermal damage signatures consistent with lubrication distress.



#6 CONNECTING ROD

Forging: 646126-U

S/N: AE02JC469

Condition:

The connecting rod remained attached to its journal and to its piston pin. The connecting rod displayed mechanical damage signatures as well as normal operating signatures. There were no anomalies noted with the connecting rod.

#6 CONNECTING ROD BEARING

P/N: 642398

Condition:

The bearings remained within the bearing supports and displayed minor mechanical damage signatures. The bearings displayed the initial stages of lubrication distress.



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CAMSHAFT

CAMSHAFT

P/N: 649322

S/N: Not marked

Condition:

The camshaft displayed significant mechanical damage and was broken into two pieces. The fracture was at the #3 camshaft journal; the forward portion of the camshaft displayed bending and impact marks and the damage corresponded with the same area as the released #5 connecting rod.



LIFTERS	#1	#3	#5	#2	#4	#6
INTAKE	628488	628488	Unknown	628488	Unknown	Unknown
EXHAUST	SA-646277	Unknown	Unknown	Unknown	Unknown	Unknown
Condition:	The lifters remained installed in their installation points and displayed varying amounts of mechanical damage. There were no anomalies noted with the lifters.					



#1 Lifters



#3 Lifters



#5 Lifters



#2 Lifters



#4 Lifters



#6 Lifters

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ACCESSORY GEARS

Condition:

All of the accessory gears remained installed in their installation points and displayed normal operating and lubrication signatures. There were no anomalies noted with the gears.



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Manufacturer: Hartzell

P/N: 646275-1R

S/N: H-L041426

Condition:

The starter remained attached to its installation point and was undamaged. There were no anomalies noted with the starter.

**STARTER ADAPTER**

P/N: Illegible

Condition:

The starter adapter remained attached to its installation point and was undamaged. The starter adapter was removed and was partially disassembled to view the scavenge pump. The scavenge pump displayed normal operating signatures. There were no anomalies noted.



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ALTERNATOR

Manufacturer: CMI

P/N: 649304

S/N: 003BA033

Condition:

The alternator remained attached to its installation point and was undamaged. The alternator was removed and it was noted that the drive coupling remained intact. There were no signs of oil leaks around the alternator. There were no anomalies noted with the alternator.



STANDBY ALTERNATOR

Manufacturer: B&C Specialty Products

P/N: BC410-1

S/N: 0921497

Condition:

The standby alternator remained attached to its installation point and was undamaged. There were no oil leaks noted around the alternator installation point. There were no anomalies noted with the alternator.



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PUMP**

Manufacturer: Rapco

P/N: RAP216CW

S/N: B27916

Condition:

The vacuum pump remained attached to its installation point and displayed minor impact damage signatures. The vacuum pump was removed and it was noted that the vacuum pump was capable of normal rotation and the drive coupling was intact. There were no signs of oil leaks around the vacuum pump.

**PROPELLER
GOVERNOR**

Manufacturer: Woodward

P/N: D210760

S/N: 00411

Condition:

The propeller governor remained attached to its installation point and was undamaged. The governor was removed; it was noted that the drive coupling remained intact and the gasket screen was not blocked. The governor was disassembled and it was noted that all of the internal components displayed normal operating signatures.



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TURBO

Manufacturer: Kelly Aerospace

P/N: 406610-9029

S/N: HBR00944

Condition: The turbocharger had been removed by the recovery personnel to facilitate shipping. The turbocharger displayed some impact damage signatures. The turbine and compressor wheels were capable of normal rotation and displayed normal operating signatures. According to the Textron Aviation investigator the oil line B-nut attached to the scavenge pump check valve was found loose during the initial examination at the salvage facility.



TURBO CONTROLLER

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition: The turbo controller was not shipped with the engine to facilitate examination.

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Aerospace

P/N: 470908-011

S/N: LEN00269

Condition:

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

**OVERBOOST
VALVE**

Manufacturer: Unknown

P/N: Unknown

S/N: Unknown

Condition:

The overboost valve was not shipped with the engine to facilitate examination.