



Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	TSIO-550-C1B
ENGINE SERIAL NUMBER	814575
AIRCRAFT MAKE & MODEL	Piper PA46-310P
AIRCRAFT SERIAL NUMBER	4608087
AIRCRAFT REGISTRATION	N9126V
FILE NUMBER	14-243

NAME	SIGNATURE	DATE
Nicole L. Charnon		06/15/2016

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EXAMINATION		ACCIDENT DATA	
DATE	06/16/2016	NTSB ACCIDENT #	CEN15FA008
FACILITY	Continental Motors	NTSB INVESTIGATOR	David Bowling
ADDRESS	2039 South Broad Street Mobile, AL 36615	FAA INVESTIGATOR	Jim Koenig
		ACCIDENT DATE	10/13/2014
		ACCIDENT LOCATION	Dubuque, Iowa

ENGINE INFORMATION

ENGINE POSITION	Single-Engine
TOTAL TIME	Unknown
TIME SOH	N/A
TYPE & TIME SLI	Unknown (last maintenance included an oil and oil filter change on July 28, 2014 at a recorded Hobbs time of 4,850.5)
BUILD DATE	08/17/2005
IN SERVICE DATE	08/26/2005

Significant logbook information:

According to the NTSB, the Hobbs meter and tachometer were destroyed. The last maintenance entry was recorded on July 28, 2014, at a Hobbs time of 4,850.5, and included an oil and oil filter change. At a Hobbs time of 4,785.3 hours and an engine total time of 1,093.7 hours, an annual inspection was completed, during which the #4, #5, and #6 cylinders were removed and reinstalled after being reworked. At that same time, the left and right magnetos were removed and replaced after regular adjustments. On April 22, 2011, at a Hobbs time of 4,144.5 hours at a total engine time of 452.9 hours, the #2 and #4 cylinders were removed, repaired, and reinstalled.

Report Summary:

Search Code(s): 15-12-68

The engine sustained impact damage that precluded functional testing of the components. However, disassembly of the engine did not reveal any anomalies that would have precluded its normal operation or the production of full, rated power.

Disposition of engine following exam:

The disassembled engine components were boxed and shipped to the salvage facility as instructed by the NTSB investigator who oversaw the examination.

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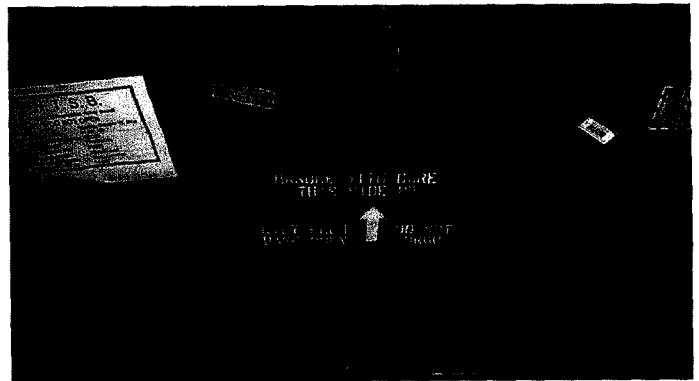
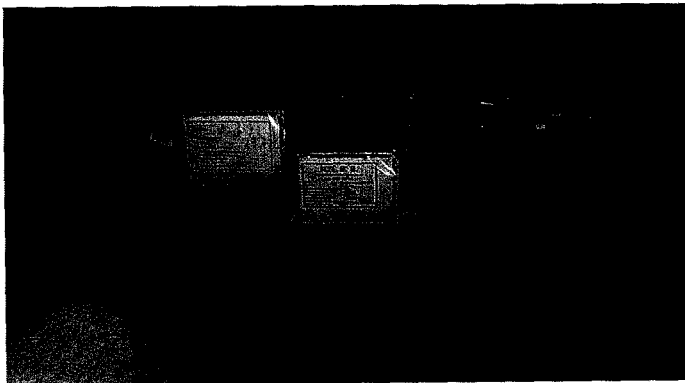
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PAGE 3 of 32**INSPECTION WITNESSES**

NAME	Nicole Charnon	NAME	Greg Eastburn
ADDRESS	Washington, DC	ADDRESS	Mobile, AL
ORGANIZATION	Continental Motors	ORGANIZATION	Continental Motors
PHONE	251-436-8310	PHONE	251-436-8481
NAME	Matthew Phillips	NAME	David Bowling
ADDRESS	Mobile, AL	ADDRESS	Denver, CO
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB – Central Region
PHONE	251-436-8481	PHONE	303-373-3502

EXTERNAL INSPECTION OF ENGINE

The engine was strapped to the bottom side of the crate with many of the components that would normally be positioned on the topside of the engine being separated and not observed or separated and located in boxes found within the shipping crate. The magnetos, fuel manifold valve, fuel injection lines, and oil cap were separated. The propeller hub remained attached to the crankshaft and all of the blade shanks remained attached to the hub, but the blades were separated. The engine-driven and belt-driven alternators remained attached to the engine. Both turbochargers were separated and were lying on the bottom of the crate.



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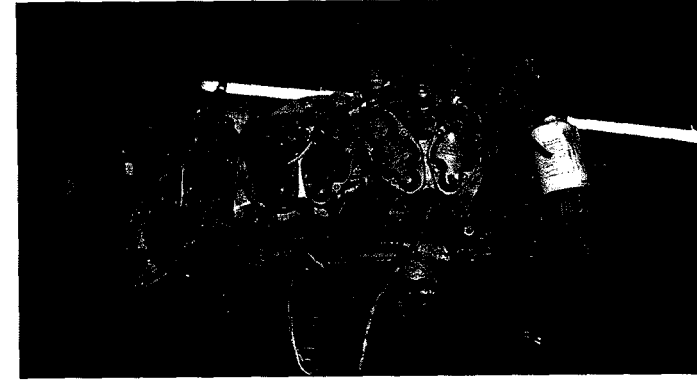
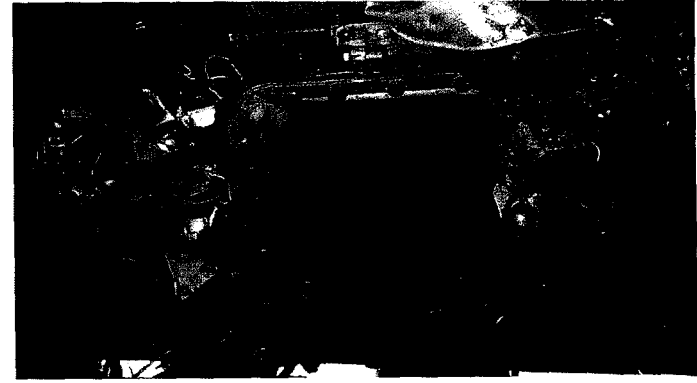
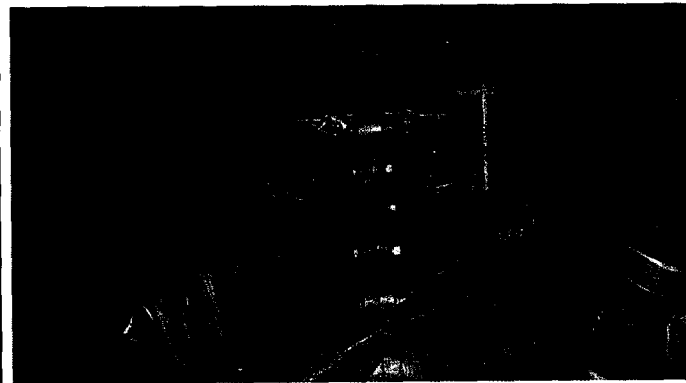
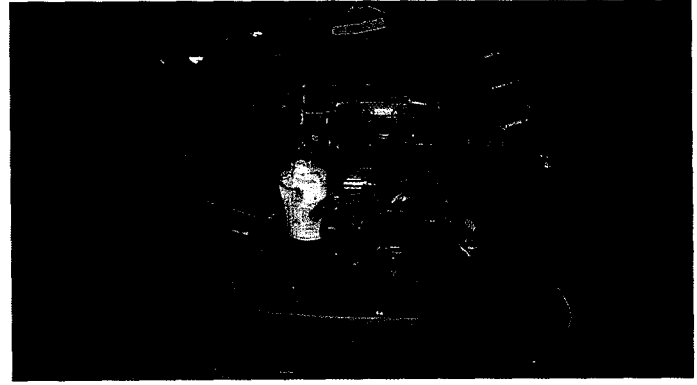
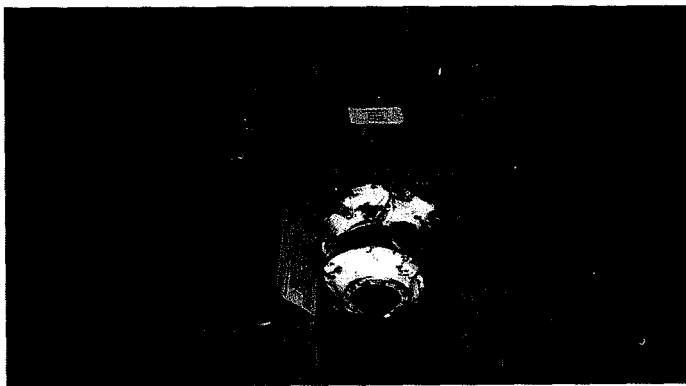
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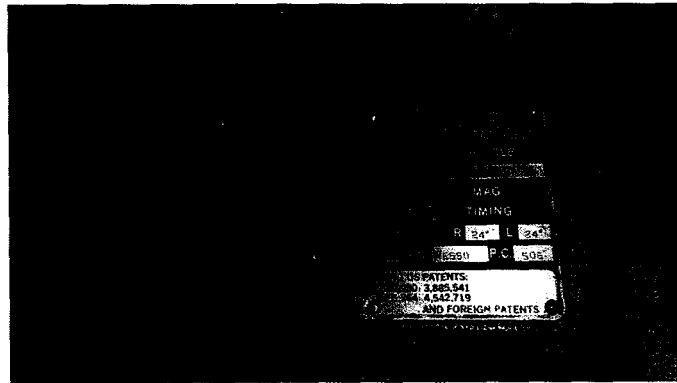
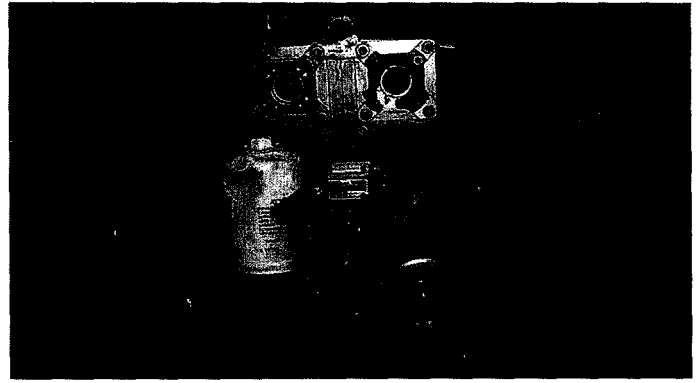
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AIRFRAME COMPONENTS RETURNED WITH ENGINE

The propeller hub, propeller spinner, propeller governor, and propeller deicing equipment remained attached to the engine. Portions of cooling baffle remained with the engine. The vacuum pump was separated from the engine, but was included in the shipping crate. Sections of the EGT and CHT probes and wiring remained attached to engine. Portions of the airframe mount remained attached to the fractured engine mounts as well.

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PAGE 6 of 32**ENGINE TEARDOWN AND COMPONENT EXAMINATION****EXHAUST
SYSTEM**

Condition: The right side exhaust risers remained attached to the right side cylinders, but they were displaced and slightly deformed. The left side exhaust risers remained attached to the left side cylinders; however, they were flattened, displaced, and deformed.

**INDUCTION
SYSTEM**

Condition: All of the intake tubes, with the exception of the #2, were separated from the engine and were not observed. The throttle body was not observed, nor were the intercoolers.



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MAGNETO**

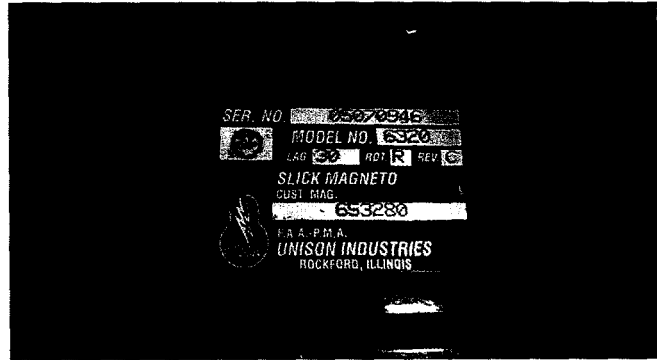
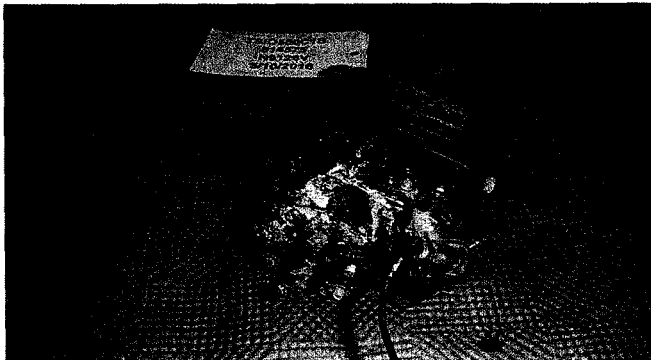
Manufacturer: Slick

P/N: 6320

S/N: 05070946

Condition:

The left magneto was separated from this mounting pad and was returned in a box inside the shipping crate. The mounting flange was fractured. Manual rotation of the drive gear resulted in rotation of the drive shaft and an audible snap of the impulse coupling.

**RIGHT
MAGNETO**

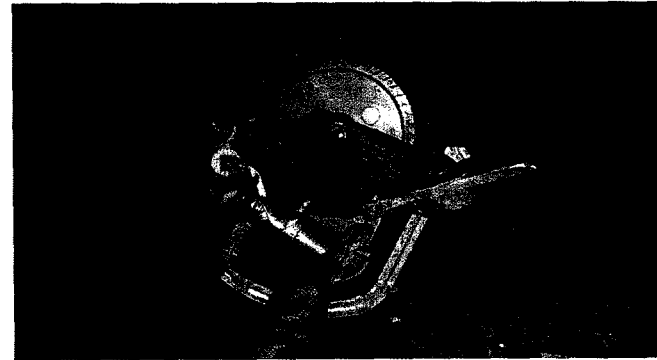
Manufacturer: Destroyed

P/N: Not Legible

S/N: Not Legible

Condition:

The right magneto was separated from its mounting pad and only portions of the right magneto were returned with the engine. Of the returned components, no pre-accident anomalies were observed.

**IGNITION
HARNESS**

Manufacturer: Continental Motors

P/N: Not Legible

S/N: Not Legible

Condition:

The ignition harness cap remained attached to the left magneto but all of the leads were destroyed. The ignition harness cap for the right magneto was also recovered. Functional testing of the ignition harness was not possible.

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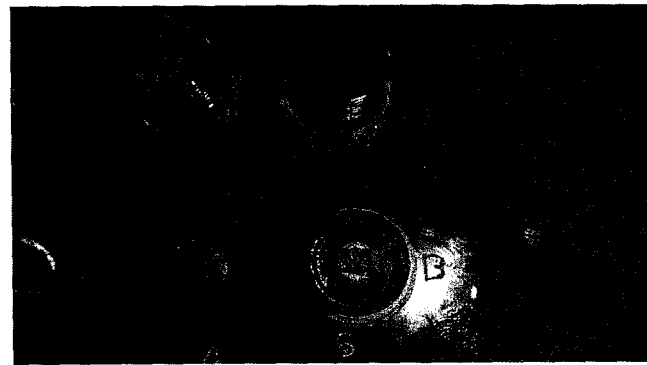
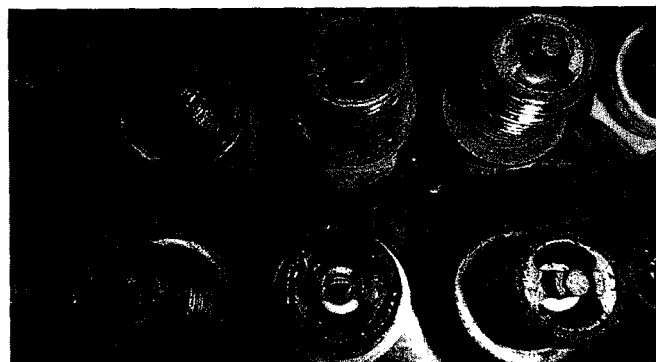
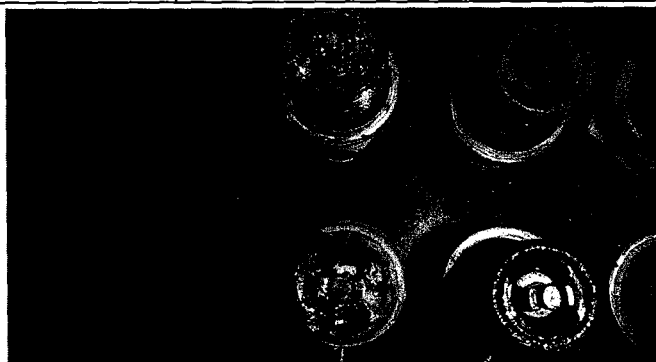
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SPARK
PLUGS

Manufacturer: Champion

P/N: RHB32E

Condition: All of the sparkplugs were removed from their respective cylinders. The #1 and #4 sparkplugs were corroded and impacted with mud and debris. All of the electrodes displayed a normal worn condition when compared to the Champion Aviation Service Manual (AVR-6) and there was no evidence of carbon or lead fouling.



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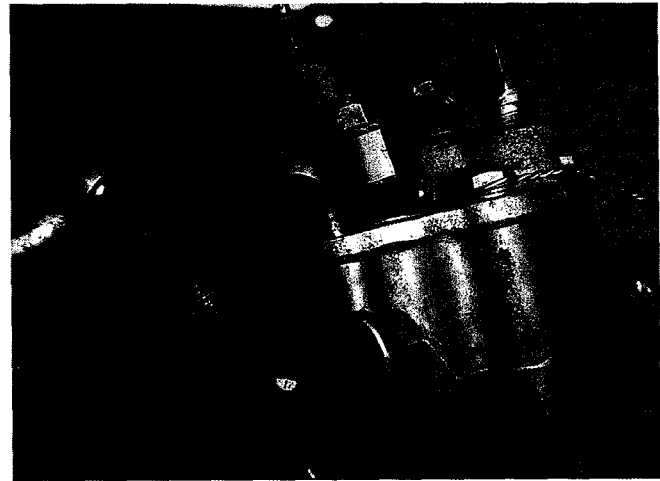
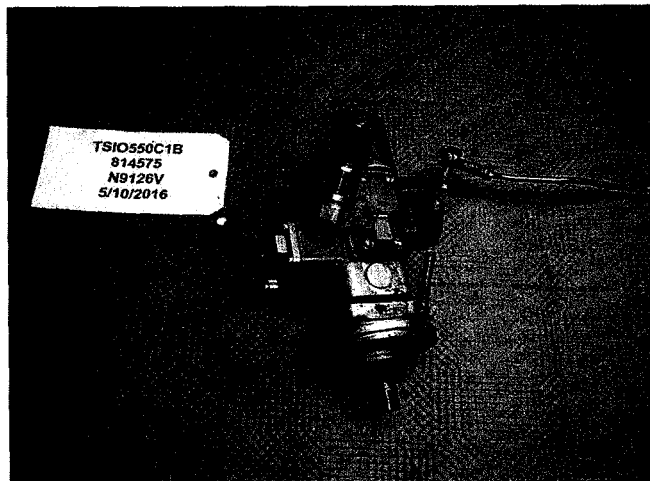
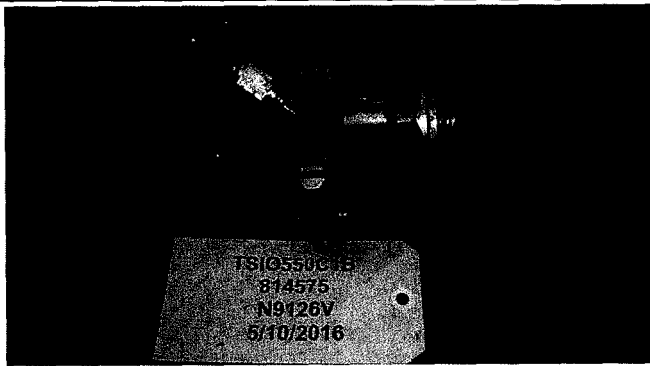
PAGE 9 of 32**FUEL SYSTEM****FUEL PUMP**Manufacturer: Continental
Motors

P/N: 649368-44A2

S/N: B05HA112R

Condition:

The fuel pump remained attached to the backside of the engine. The mixture control lever was deformed, but the mixture cable end remained attached to the lever. The mixture control shaft was deformed. The pump was removed from the engine and the drive coupling was found intact. The original torque seal was still present on the safety wire. Disassembly of the fuel pump revealed no pre-accident anomalies with any of the internal components. The fuel pump vanes and drive shaft were corroded and would not rotate freely.

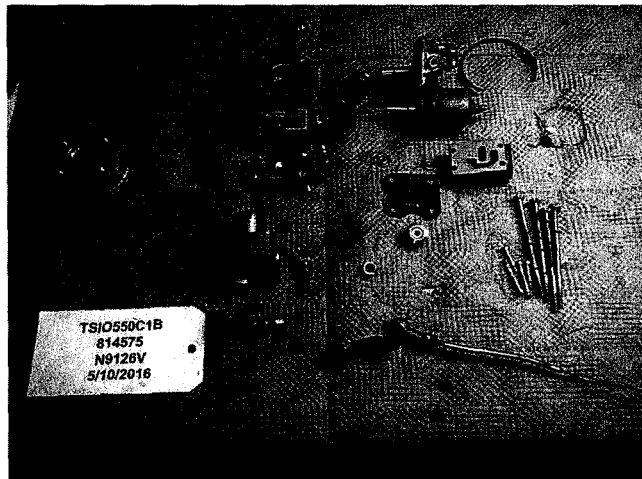
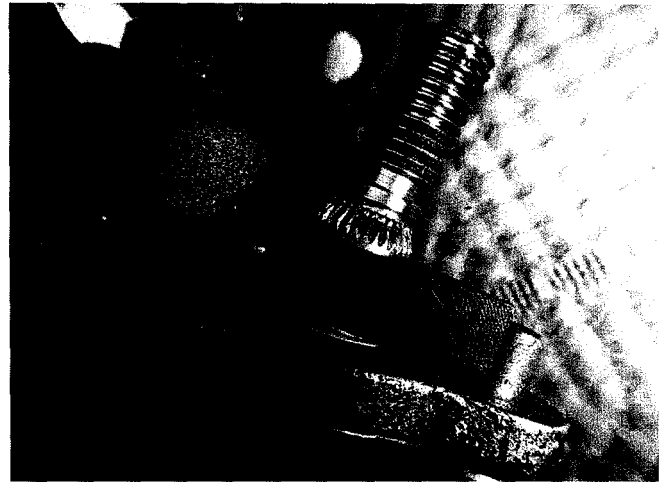
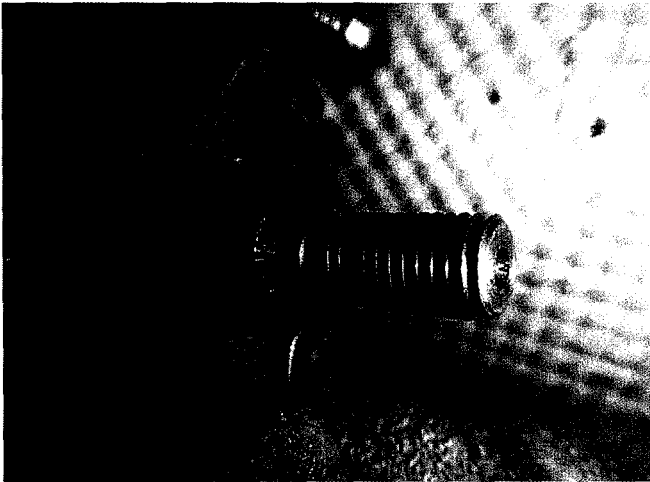


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N0126V
5/10/2016

**THROTTLE
BODY
METERING UNIT**Manufacturer: Not
Observed

P/N: Not Observed

S/N: Not Observed

Condition: The throttle body and fuel metering unit were not returned with the engine.

**FUEL MANIFOLD
VALVE**Manufacturer: Not
Observed

P/N: Not Observed

S/N: Not Observed

Condition: The manifold valve was separated from the engine as were all of the fuel injector lines. The nozzles were fractured, with the exception of the #2, and only a portion of the upper deck reference line remained attached to the #2 nozzle.

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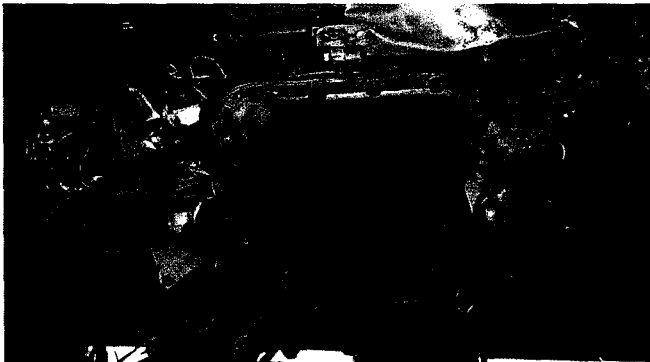
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PAGE 11 of 32**LUBRICATION SYSTEM****OIL SUMP**

Condition: The oil sump was flattened up around the bottom side of the engine. The sump was punctured and only residual oil remained. No pre-accident anomalies were observed.

**OIL PICK-UP
TUBE &
SCREEN**

Condition: The oil pickup tube and screen were displaced and deformed to one side of the engine; however, there was no evidence of blockage or obstructions in the screen.



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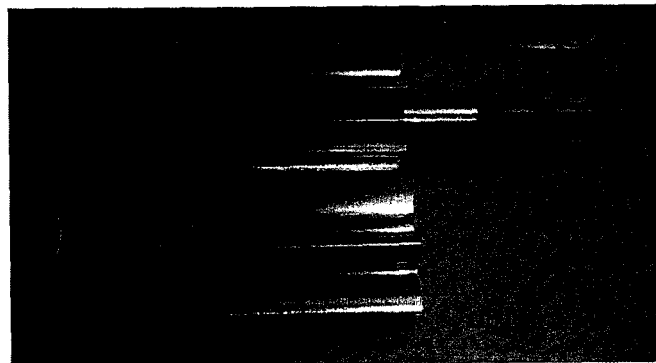
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OIL PUMP

Condition:

The oil pump remained attached to the backside of the engine. Removal of the pump revealed residual oil in the unit. The pump gears were intact with no signs of operational distress on the gears. The housing walls displayed two deep gouges that only extended through a short segment of the housing circumference.



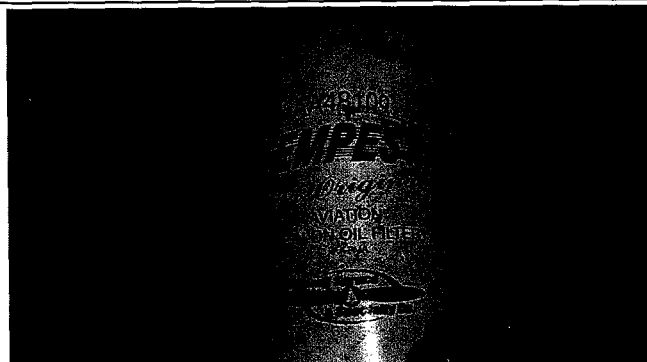
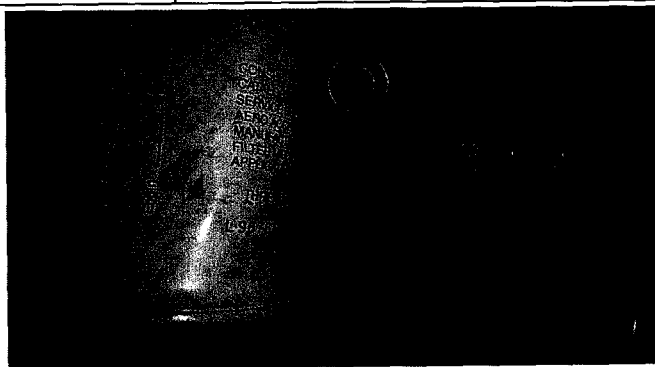
OIL FILTER

Manufacturer: Tempest

P/N: AA48109

Condition:

The oil filter remained attached to its mounting pad and safety wire was present. The oil filter had the date and Hobbs time hand-written in as 7/28/14 and 4850.5, respectively. The filter was dented but no pre-accident anomalies were noted. The oil filter was opened and no visible contaminants were observed.



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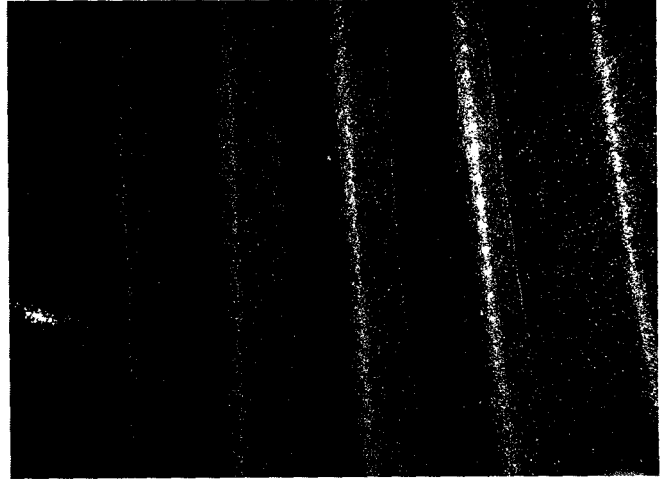
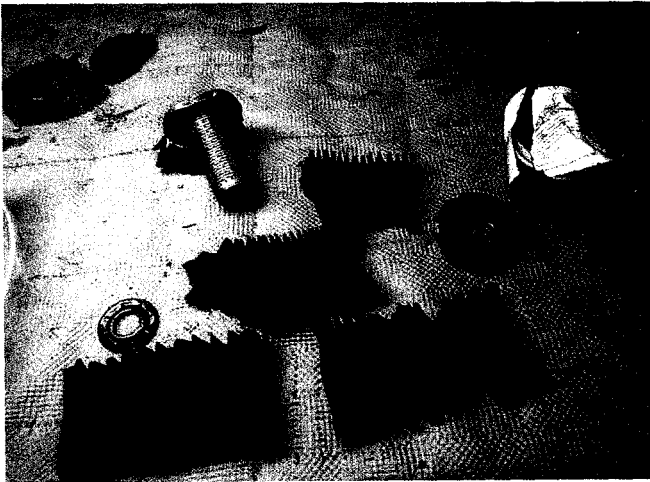
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OIL COOLER

Manufacturer: Not Observed

P/N: Not Observed

S/N: Not Observed

Condition:

The oil cooler mount was fractured and the cooler was not observed.

CYLINDERS

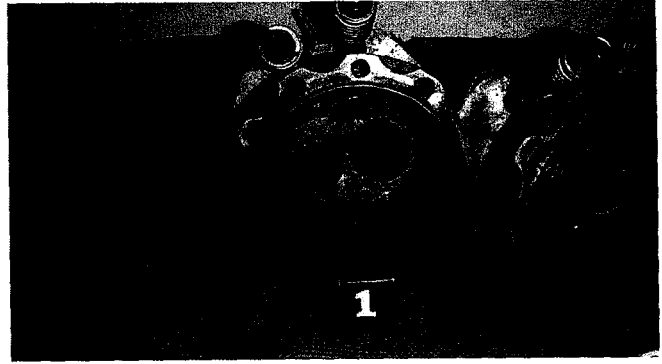
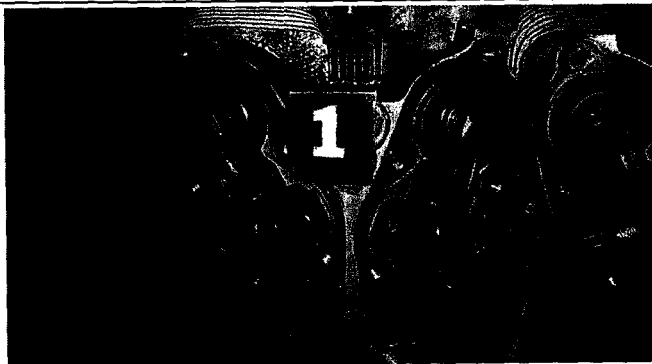
CYLINDER #1

P/N: 658180A1

S/N: AC12KA110

Condition:

The cylinder remained attached to the crankcase with no external signs of operational distress noted. The rocker covers were removed and the rockers and springs were intact and appeared to be well lubricated. The cylinder was removed and organic debris and rust were noted internally. No pre-accident anomalies were noted with the valves, valves seats, barrel or cylinder head.



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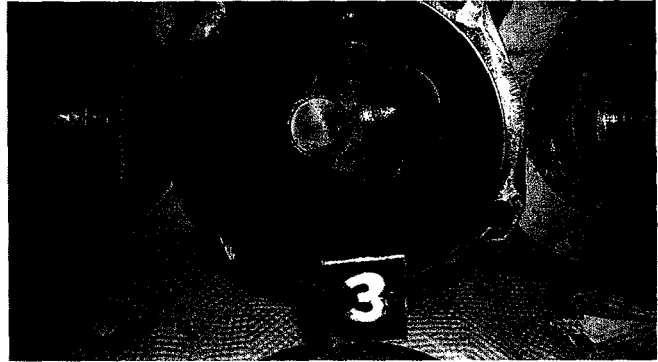
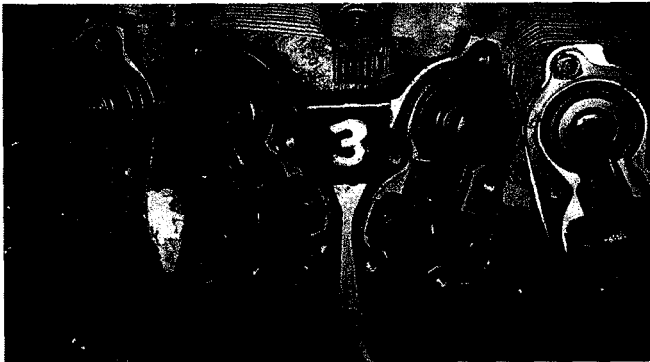
PAGE 14 of 32**CYLINDER #3**

P/N: 658180A1

S/N: AC12KA385

Condition:

The cylinder remained attached to the crankcase with no external signs of operational distress noted. The rocker covers were removed and the rockers and springs were intact and appeared to be well lubricated. The cylinder was removed and oil coated the interior components. No pre-accident anomalies were noted with the valves, valves seats, barrel or cylinder head.

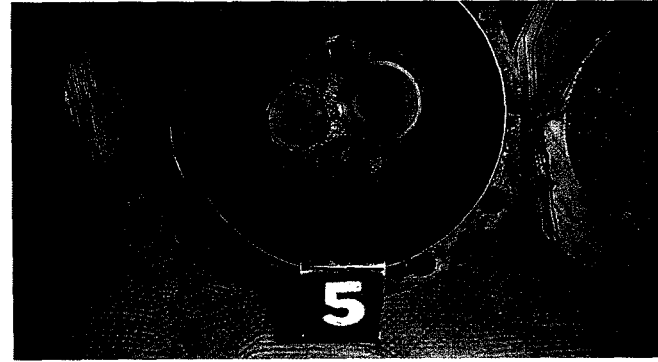
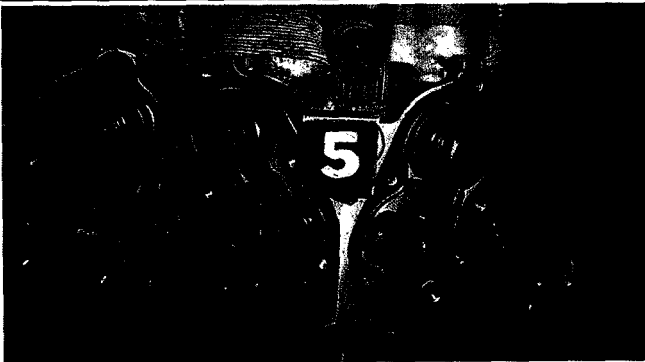
**CYLINDER #5**

P/N: 658180A1

S/N: AC12KA400

Condition:

The cylinder remained attached to the crankcase with no external signs of operational distress noted. The rocker covers were removed and the rockers and springs were intact and appeared to be well lubricated. The cylinder was removed and organic debris and rust were noted internally. No pre-accident anomalies were noted with the valves, valves seats, barrel or cylinder head.



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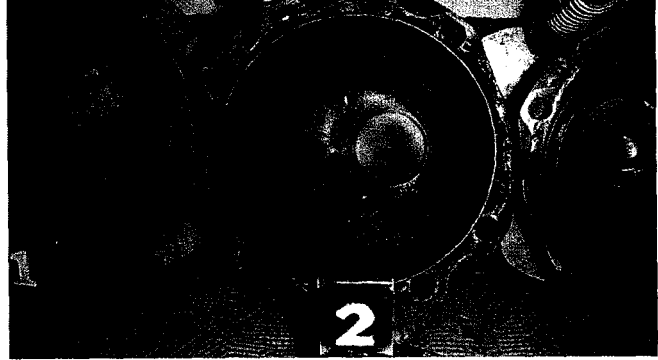
PAGE 15 of 32**CYLINDER #2**

P/N: 658180A1

S/N: AC12KA406

Condition:

The cylinder remained attached to the crankcase with no external signs of operational distress noted. The rocker covers were removed and the rockers and springs were intact and appeared to be well lubricated. The cylinder was removed and organic debris and rust were noted internally. No pre-accident anomalies were noted with the valves, valves seats, barrel or cylinder head.

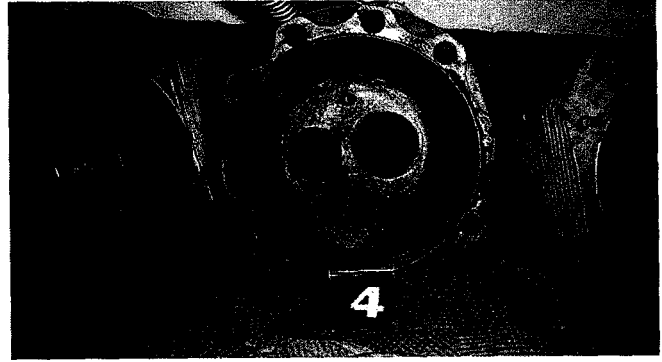
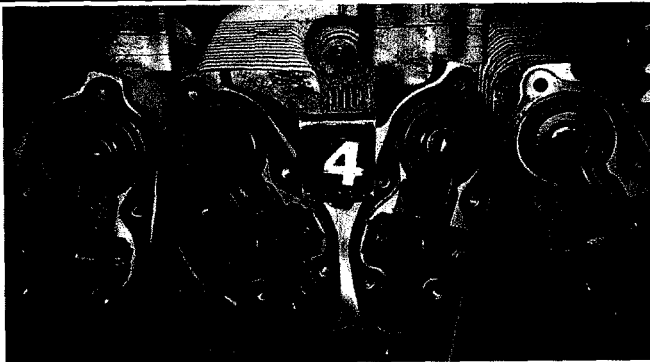
**CYLINDER #4**

P/N: 658180A1

S/N: AC12KA373

Condition:

The cylinder remained attached to the crankcase with no external signs of operational distress noted. The rocker covers were removed and the rockers and springs were intact and appeared to be well lubricated. The cylinder was removed and organic debris and rust were noted internally. No pre-accident anomalies were noted with the valves, valves seats, barrel or cylinder head.



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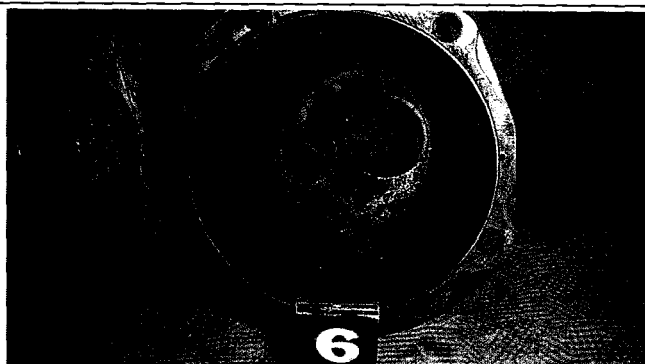
CYLINDER #6

P/N: 658180A1

S/N: AC12KA681

Condition:

The cylinder remained attached to the crankcase with no external signs of operational distress noted. The rocker covers were removed and the rockers and springs were intact and appeared to be well lubricated. The cylinder was removed and organic debris and rust were noted internally. No pre-accident anomalies were noted with the valves, valves seats, barrel or cylinder head.



#1 PISTON, RINGS AND PIN

Piston P/N: 657989

Condition:

The piston, piston pin, and piston rings all displayed normal conditions, with the exception of post-accident corrosion. No pre-accident anomalies were noted.



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RINGS AND PIN**

Piston P/N: 657989

Condition:

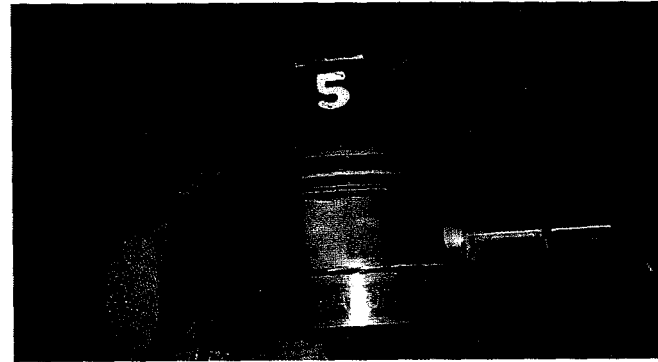
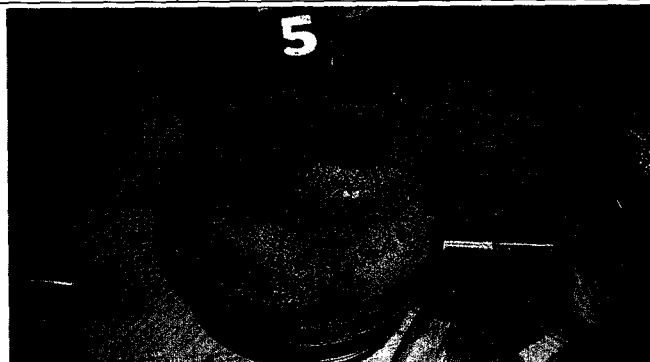
The piston, piston pin, and piston rings all displayed normal conditions, with the exception of post-accident corrosion. No pre-accident anomalies were noted.

**#5 PISTON,
RINGS AND PIN**

Piston P/N: 657989

Condition:

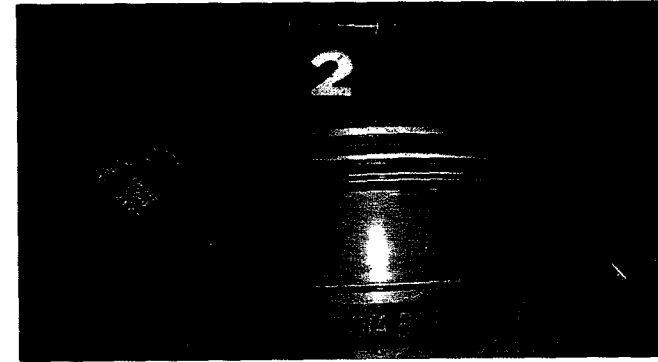
The piston, piston pin, and piston rings all displayed normal conditions, with the exception of post-accident corrosion. No pre-accident anomalies were noted.

**#2 PISTON,
RINGS AND PIN**

Piston P/N: 657989

Condition:

The piston, piston pin, and piston rings all displayed normal conditions, with the exception of post-accident corrosion. No pre-accident anomalies were noted.



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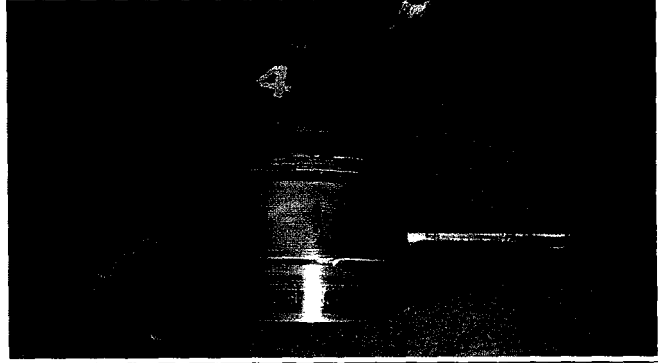
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#4 PISTON, RINGS AND PIN

Piston P/N: 657989

Condition:

The piston, piston pin, and piston rings all displayed normal conditions, with the exception of post-accident corrosion. No pre-accident anomalies were noted.

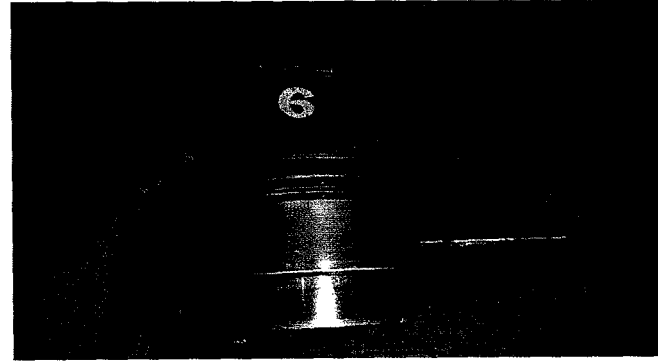


#6 PISTON, RINGS AND PIN

Piston P/N: 657989

Condition:

The piston, piston pin, and piston rings all displayed normal conditions, with the exception of post-accident corrosion. No pre-accident anomalies were noted.



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CRANKCASE ASSEMBLY

CRANKCASE

Casting
Number:

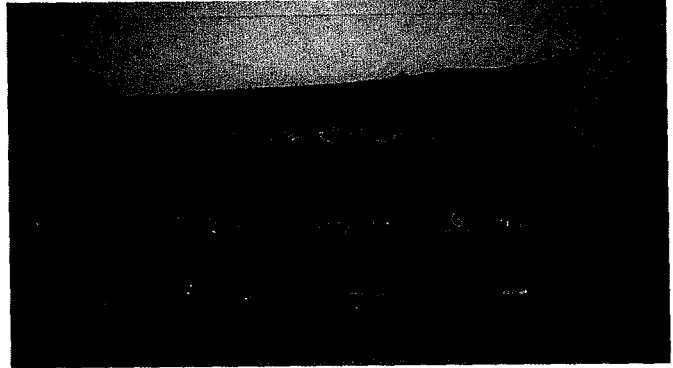
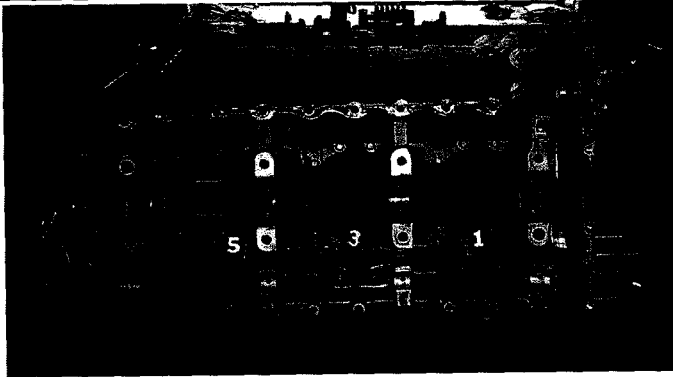
1-3-5: 655435

2-4-6: 655434

S/N: R05GA137

Condition:

The crankcase remained intact with no external evidence of pre-accident anomalies. Disassembly of the crankcase revealed no pre-accident anomalies. The mating halves did not show any evidence of fretting or abnormal wear. All of the internal components were coated with residual oil.



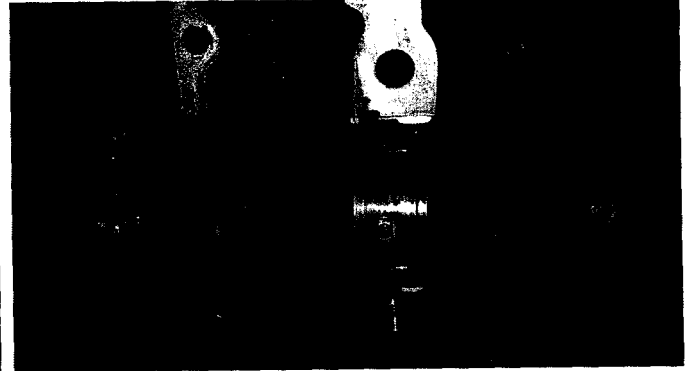
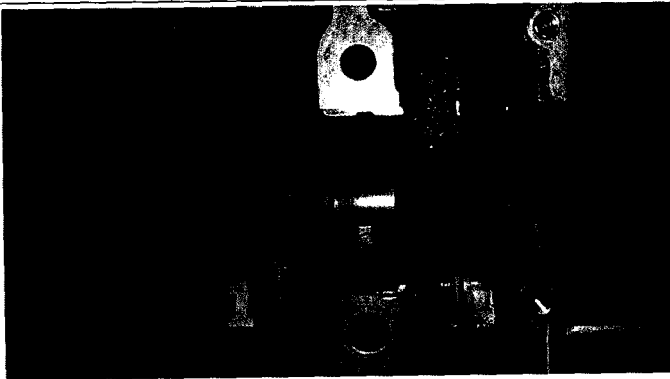
#1 MAIN BEARINGS

P/N: 634503

Date Code: 3-05

Condition:

The bearing was in place and displayed a normal wear condition with no signs of lock slot elongation or bearing rotation.



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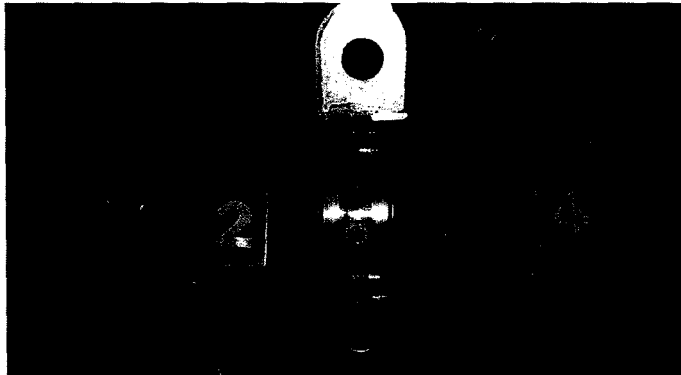
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#2 MAIN BEARINGS

P/N: 634503

Date Code: 3-05

Condition: The bearing was in place and displayed a normal wear condition with no signs of lock slot elongation or bearing rotation.

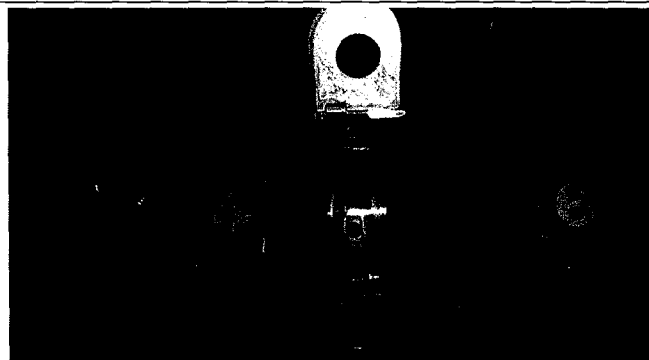
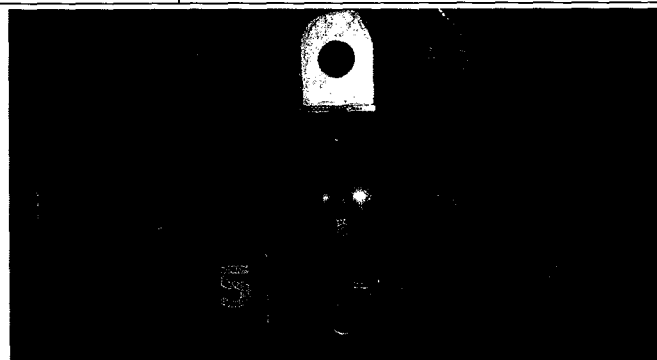


#3 MAIN BEARINGS

P/N: 634503

Date Code: 3-05

Condition: The bearing was in place and displayed a normal wear condition with no signs of lock slot elongation or bearing rotation.

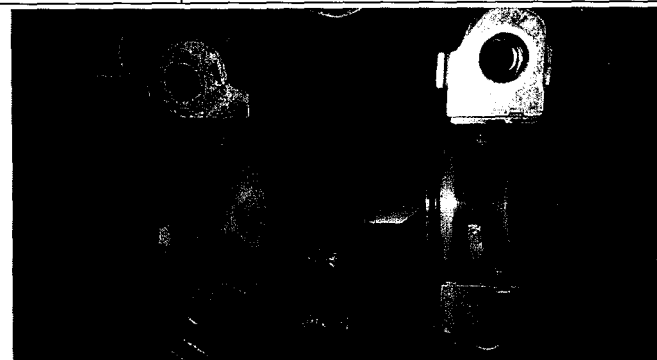


#4 MAIN BEARINGS

P/N: 653547

Date Code: 1-05

Condition: The bearing was in place and displayed a normal wear condition with no signs of lock slot elongation or bearing rotation.



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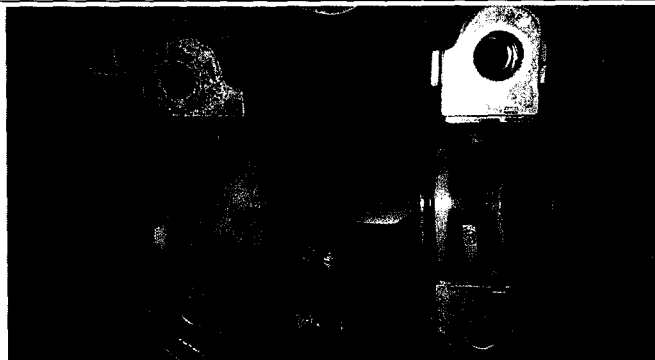
#5 MAIN BEARINGS

P/N: 653547

Date Code: 1-05

Condition:

The bearing was in place and displayed a normal wear condition with no signs of lock slot elongation or bearing rotation.



CRANKSHAFT ASSEMBLY

CRANKSHAFT

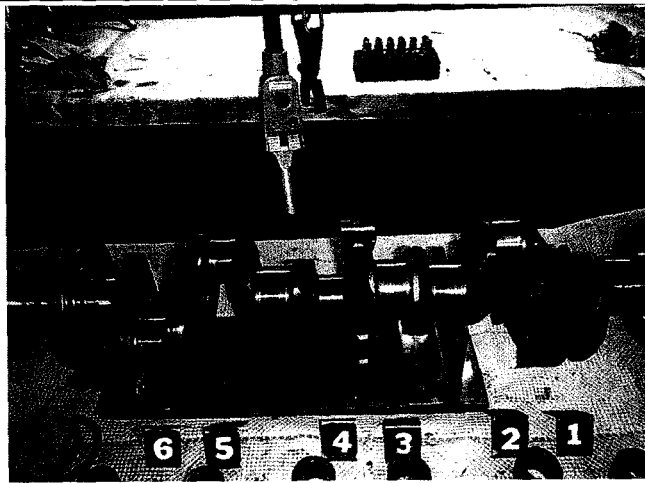
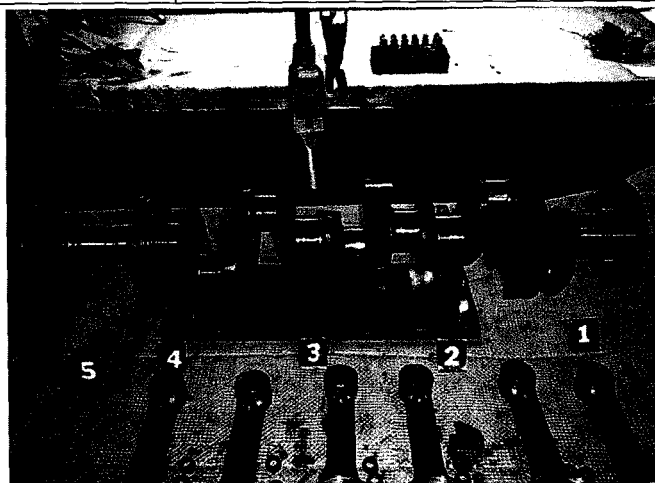
Forging Number: 649878

S/N: F189608N

Heat code: RRD

Condition:

The crankshaft was intact with no pre-accident anomalies noted with the main or connecting rod journals. Residual oil coated the entire crankshaft and the crankshaft gear remained in place and all the bolts' safety-wire was intact.

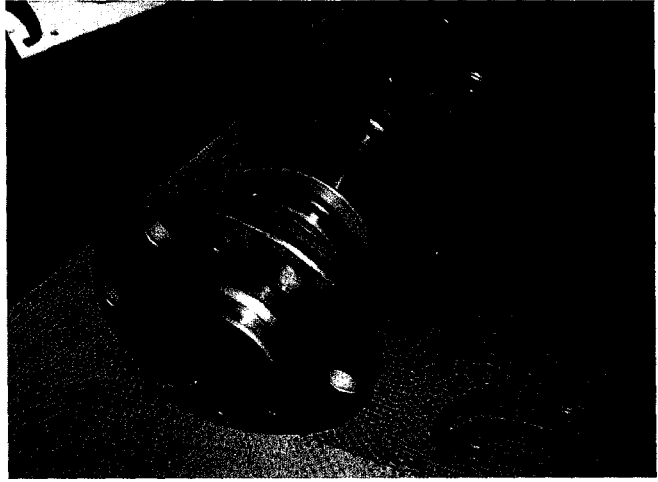


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COLLAR**

Condition: The oil transfer collar was intact and in place with no pre-accident anomalies noted.

**COUNTER
WEIGHTS**

Condition: The counterweights were intact and in place and the counterweight were free to move on their hangar blades. No pre-accident anomalies were noted with the counterweights.

**INTERNAL
TIMING**

Condition: The internal timing was verified to be correct.



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ROD**

P/N: 646126

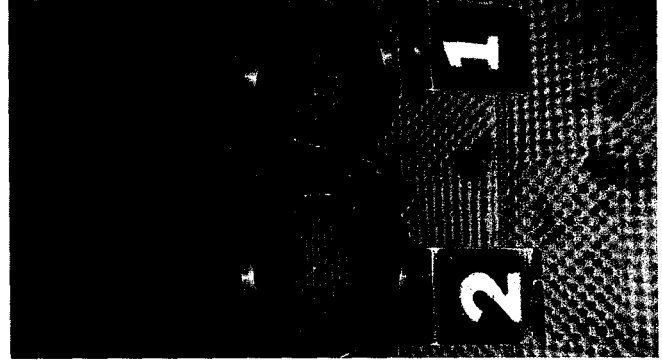
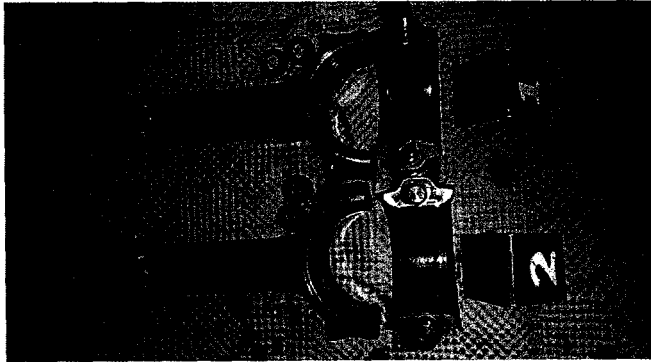
Forging or Serial Number: AE05FB403

Condition: The connecting rod was intact and remained attached to the crankshaft and piston pin. No pre-accident anomalies or signs of operational distress were noted.

**#1 CONNECTING
ROD BEARING**

P/N: 642398

Condition: The bearing was in place and showed normal signs of wear. No pre-accident anomalies were noted.

**#3 CONNECTING
ROD**

P/N: 646126

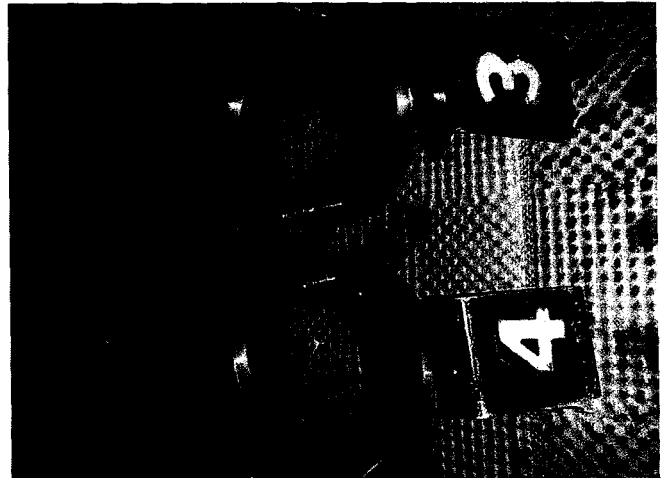
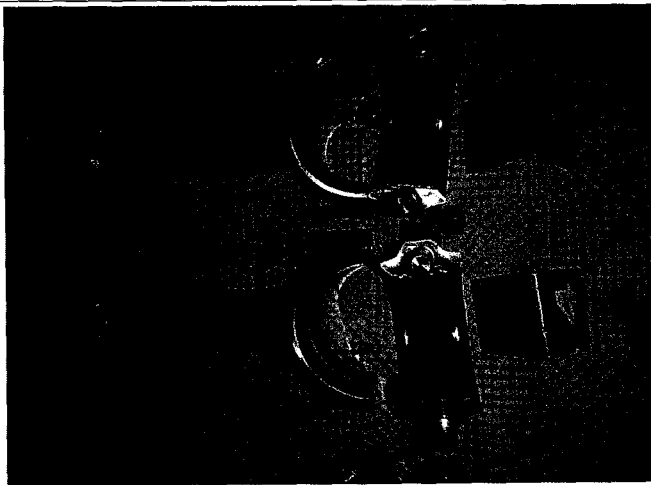
Forging or Serial Number: AE05FA960

Condition: The connecting rod was intact and remained attached to the crankshaft and piston pin. No pre-accident anomalies or signs of operational distress were noted.

**#3 CONNECTING
ROD BEARING**

P/N: 642398

Condition: The bearing was in place and showed normal signs of wear. No pre-accident anomalies were noted.



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#5 CONNECTING ROD

P/N: 646126

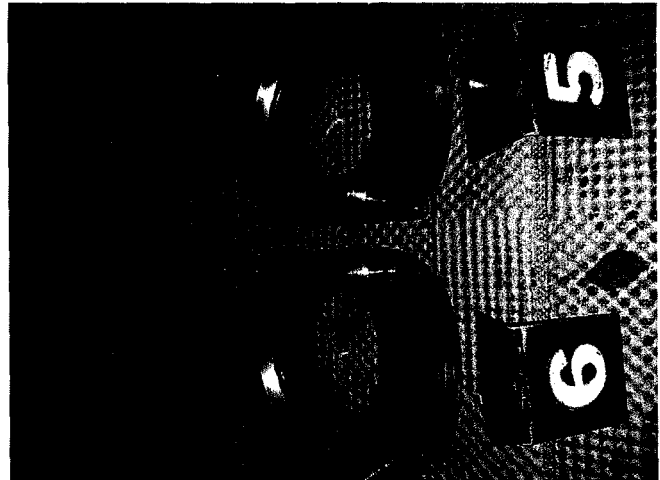
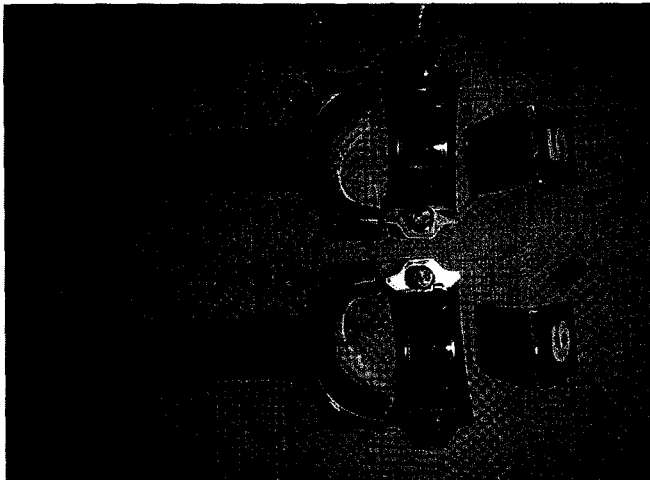
Forging or Serial Number: AE05GA022

Condition: The connecting rod was intact and remained attached to the crankshaft and piston pin. No pre-accident anomalies or signs of operational distress were noted.

#5 CONNECTING ROD BEARING

P/N: 642398

Condition: The bearing was in place and showed normal signs of wear. No pre-accident anomalies were noted.



#2 CONNECTING ROD

P/N: 646126

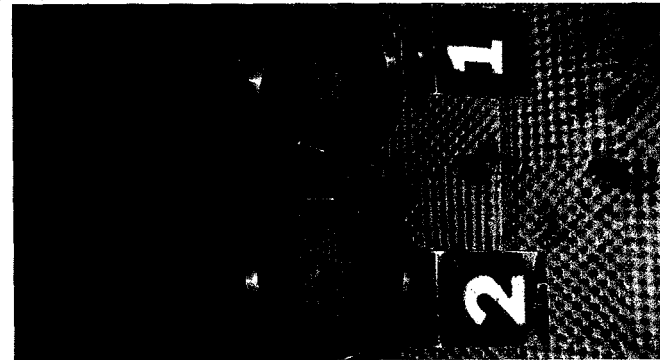
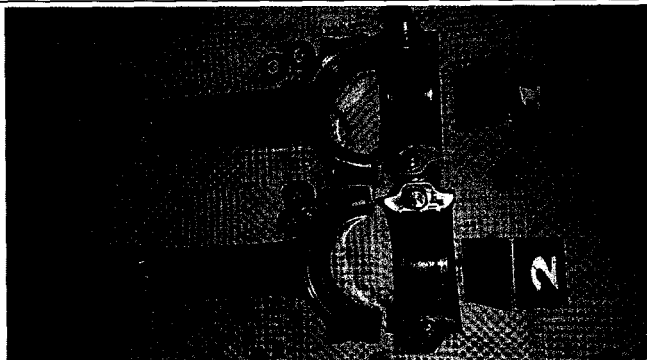
Forging or Serial Number: AE05FB285

Condition: The connecting rod was intact and remained attached to the crankshaft and piston pin. No pre-accident anomalies or signs of operational distress were noted.

#2 CONNECTING ROD BEARING

P/N: 642398

Condition: The bearing was in place and showed normal signs of wear. No pre-accident anomalies were noted.



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ROD**

P/N: 646126

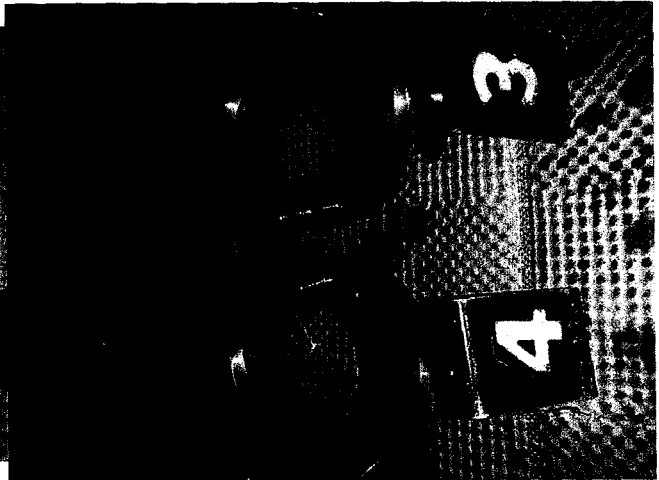
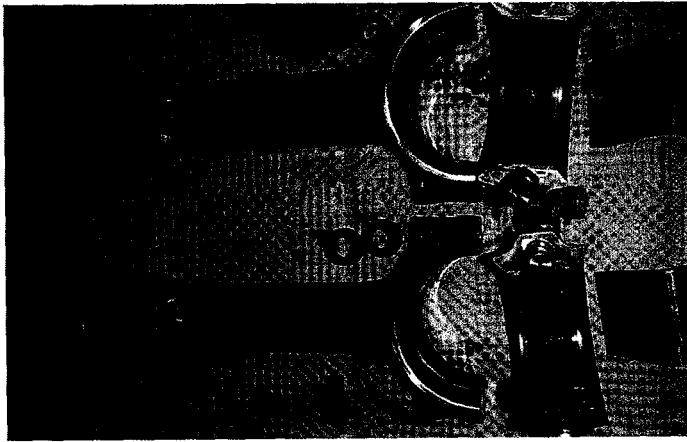
Forging or Serial Number: AE05FB912

Condition: The connecting rod was intact and remained attached to the crankshaft and piston pin. No pre-accident anomalies or signs of operational distress were noted.

**#4 CONNECTING
ROD BEARING**

P/N: 642398

Condition: The bearing was in place and showed normal signs of wear. No pre-accident anomalies were noted.

**#6 CONNECTING
ROD**

P/N: 646126

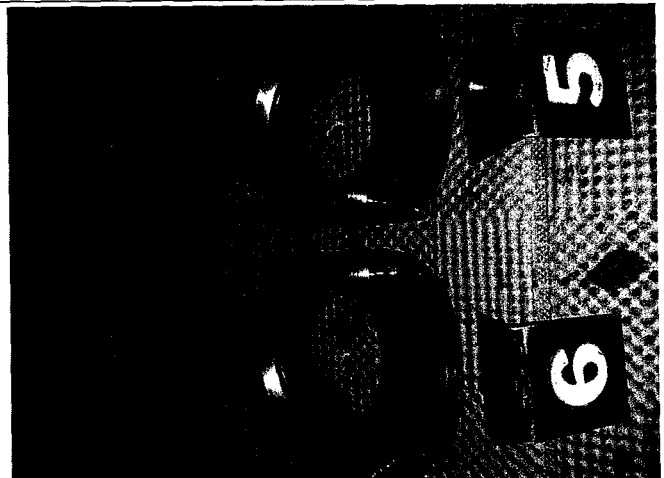
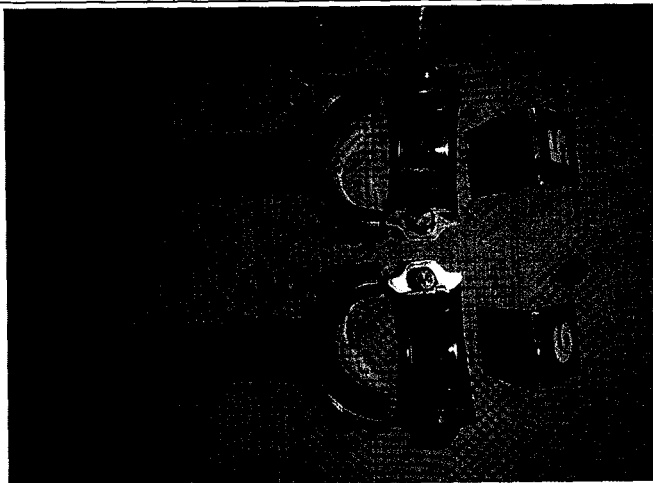
Forging or Serial Number: AE05FB841

Condition: The connecting rod was intact and remained attached to the crankshaft and piston pin. No pre-accident anomalies or signs of operational distress were noted.

**#6 CONNECTING
ROD BEARING**

P/N: 642398

Condition: The bearing was in place and showed normal signs of wear. No pre-accident anomalies were noted.



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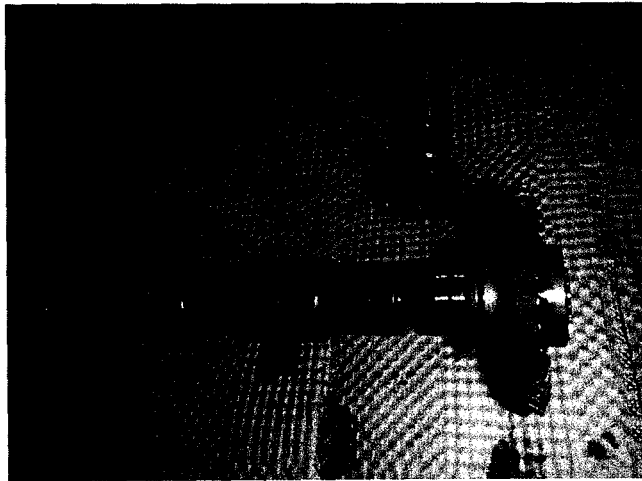
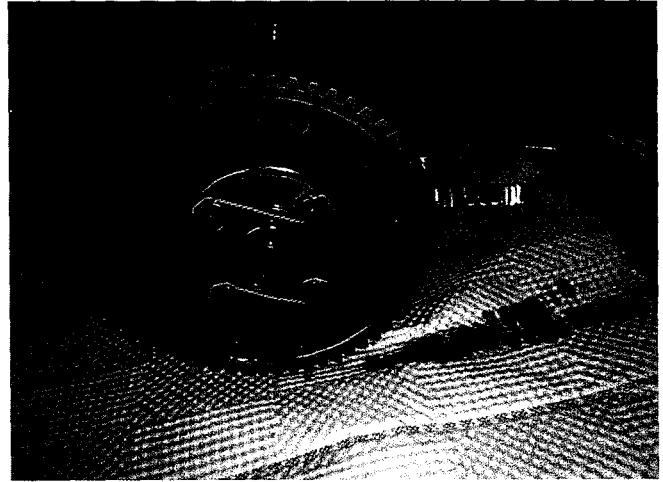
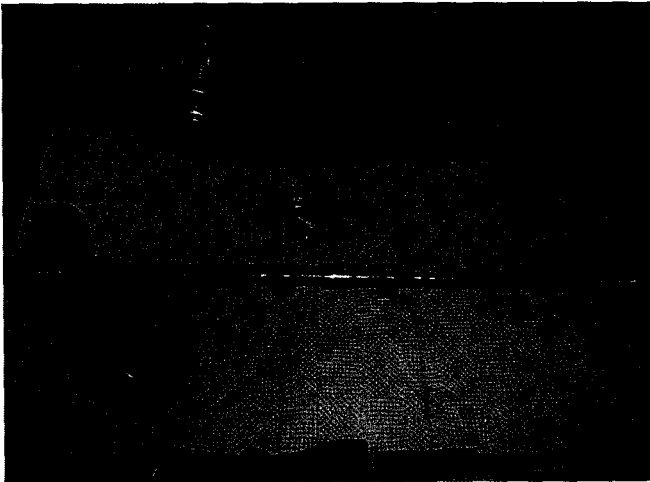
PAGE 26 of 32**CAMSHAFT****CAMSHAFT**

P/N: 654084

S/N: Z05FA256

Condition:

The camshaft was intact and the lobes displayed a normal wear. The camshaft gear was in place and the bolt safety-wire was intact. The bevel gear displayed normal wear. No pre-accident anomalies were noted.

**LIFTERS****Condition:**

The lifters were intact with no signs of operational distress noted with the exception of a small portion of spalling noted on the #4 intake lifter face.

**ACCESSORY
GEARS****Condition:**

No pre-accident anomalies were noted with the accessory gears.

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Manufacturer: Not Observed

P/N: Not Observed

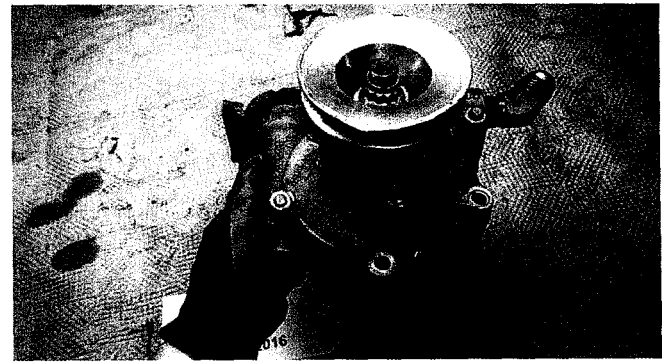
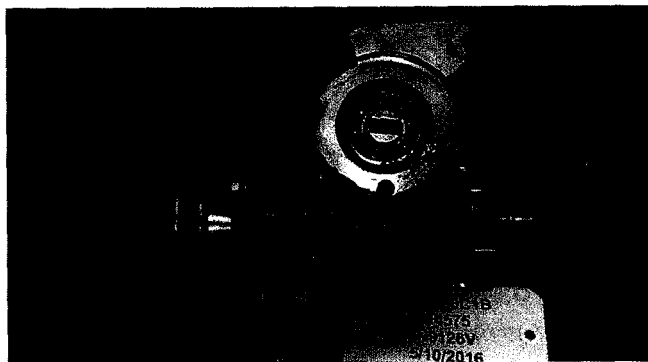
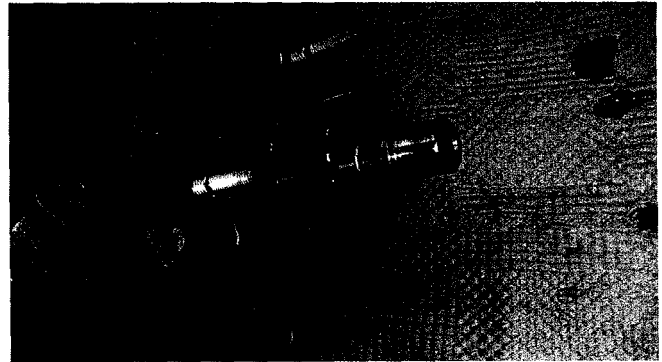
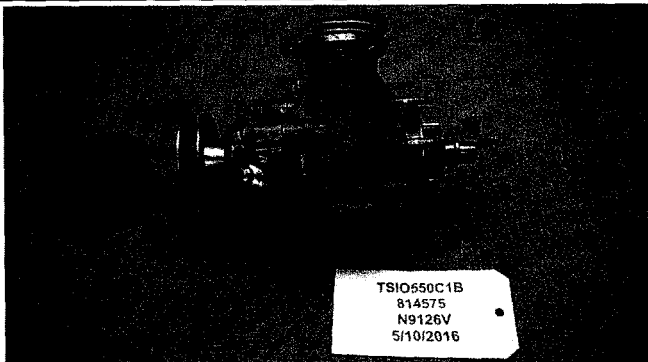
S/N: Not Observed

Condition:

The starter motor was not returned with the engine.

**STARTER
ADAPTER****Condition:**

The starter adapter remained attached to the backside of the engine and the starter motor mounting pad was fractured. The starter gear was intact with no pre-accident anomalies noted.



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ALT/GEN #1

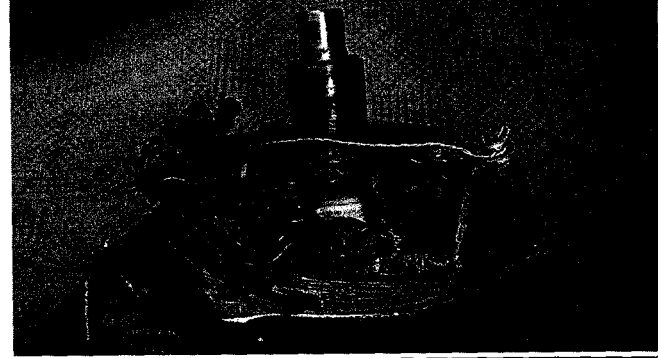
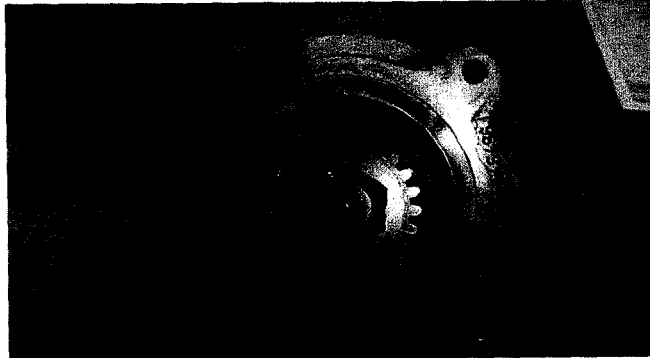
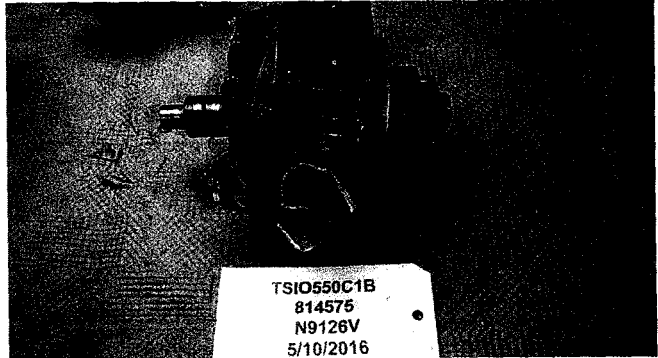
Manufacturer: No Data Plate

P/N: No Data Plate

S/N: No Data Plate

Condition:

The gear-driven alternator remained attached to the mounting pad but the housing sustained impact damage that destroyed the outer components and bent the drive shaft. The alternator drive clutch was intact and secured to the shaft. The alternator face gear remained secured to the crankshaft.



ALT/GEN #2

Manufacturer: Kelly Aerospace

P/N: E3FF10300BAR

S/N: F122215

Condition:

The belt-driven alternator remained attached to the mounting bracket positioned opposite of the gear-driven alternator. The #2 alternator housing was fractured and the drive belt was separated; however, the belt remained in place pinched between the crankcase and the propeller spinner. No pre-accident anomalies were noted with the unit.



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VACUUM PUMP

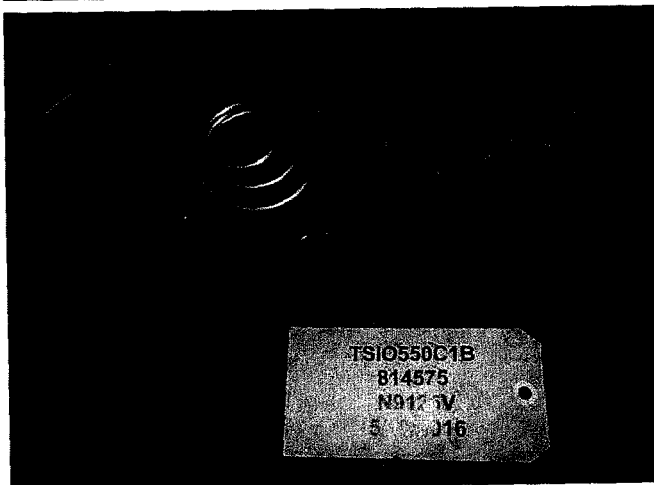
Manufacturer: Tempest

P/N: AA442CW-4

S/N: 60052

Condition:

The vacuum pump was separated from the engine and was found in a box located in the shipping crate. The housing sustained impact-related damage. Disassembly of the unit revealed that the vanes were intact and the rotor was fractured. No pre-accident anomalies were noted with the unit.



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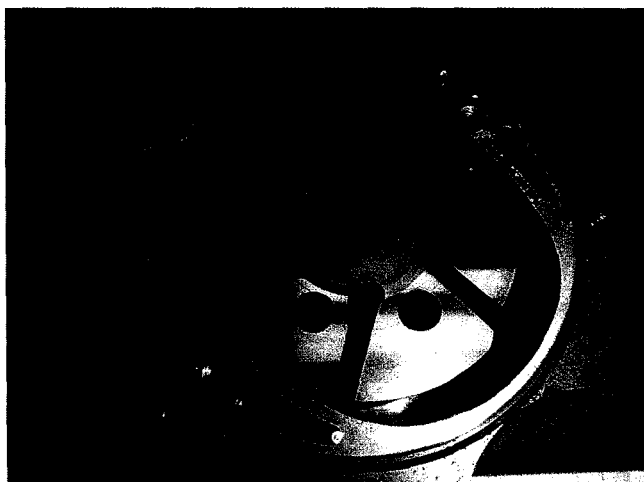
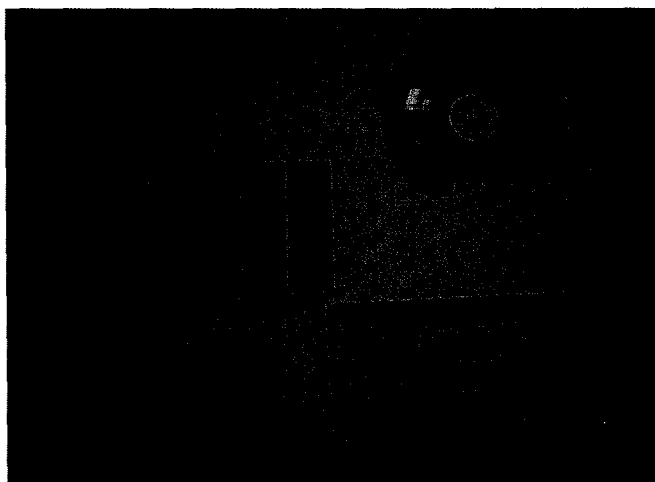
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PROPELLER GOVERNOR

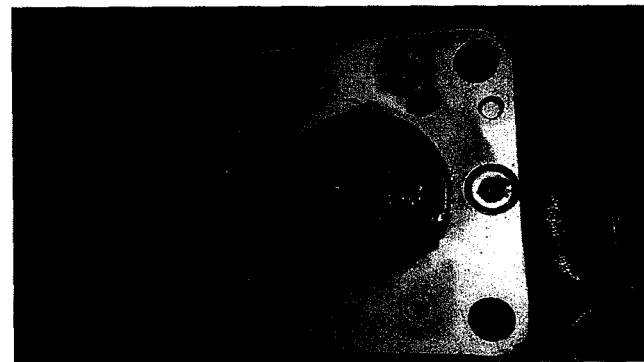
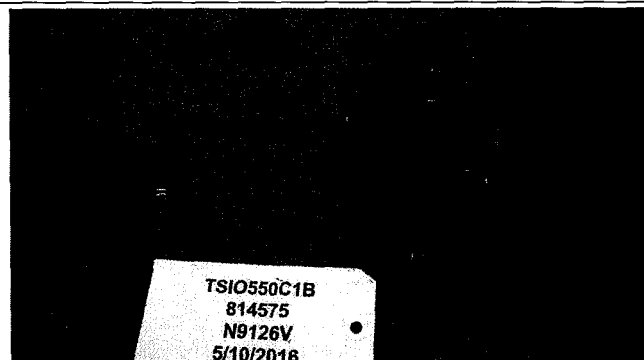
Manufacturer: No Data Plate

P/N: No Data Plate

S/N: No Data Plate

Condition:

The propeller governor remained attached to the front left side of the engine. The control cable end remained attached to the control lever and the lever was free to rotate. Removal of the propeller governor from the engine revealed that the screen gasket was free from contaminants or obstructions. Rotation of the drive gear resulted in rotation of the drive shaft and the pumping of residual oil from the housing.



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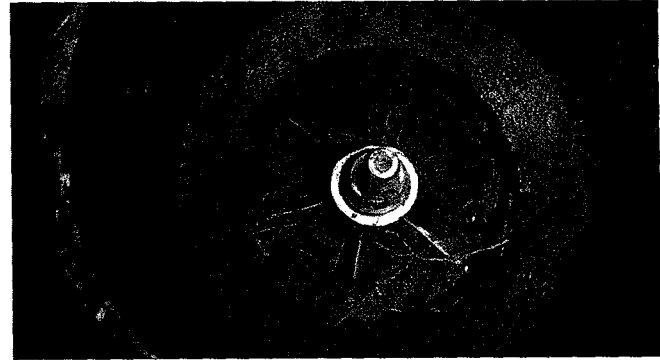
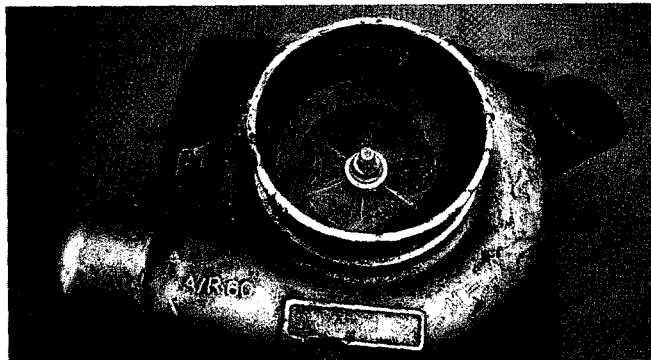
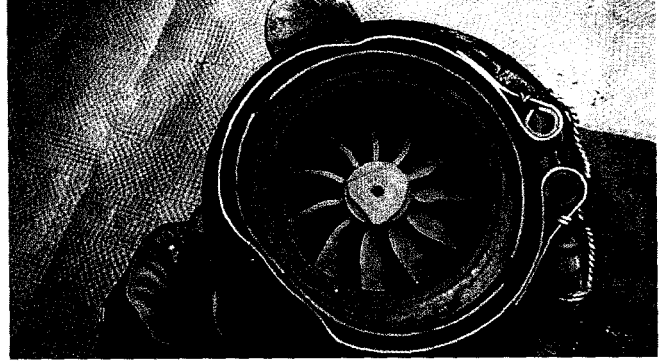
LEFT TURBO

Manufacturer: No Data Plate

P/N: No Data Plate

S/N: No Data Plate

Condition: The left turbocharger was separated from the engine and was lying in the shipping crate. A letter "L" was written on the turbocharger shroud and it is assumed that it was the left turbocharger. Mud was impacted into the compressor impeller and rotation of the turbine and compressor was not possible. Rotational scoring was noted on behind the turbine. The compressor impeller blades were deformed.



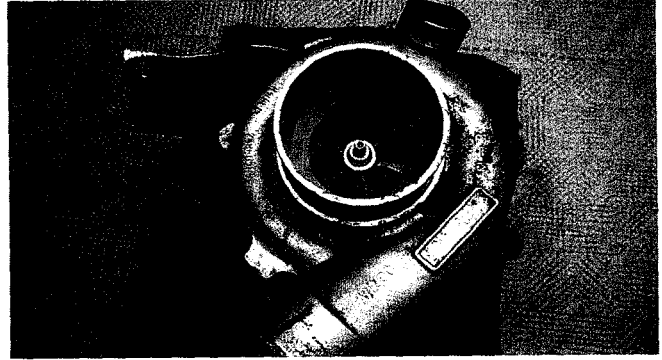
RIGHT TURBO

Manufacturer: No Data Plate

P/N: No Data Plate

S/N: No Data Plate

Condition: The right turbocharger was separated from the engine and was lying in the shipping crate. A letter "R" was written on the turbocharger shroud and it is assumed that it was the right turbocharger. No pre-accident anomalies were noted with the turbine or compressor but the turbine was displaced within the shroud.



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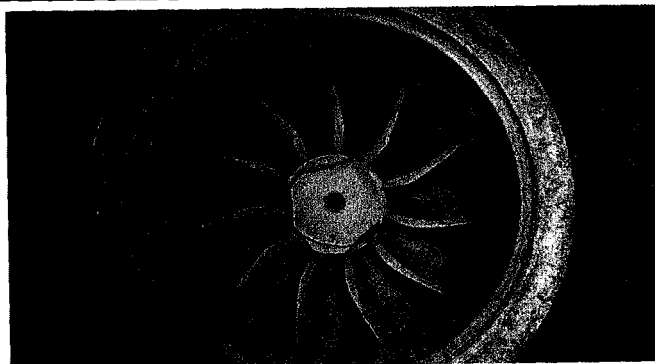
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TURBO CONTROLLER

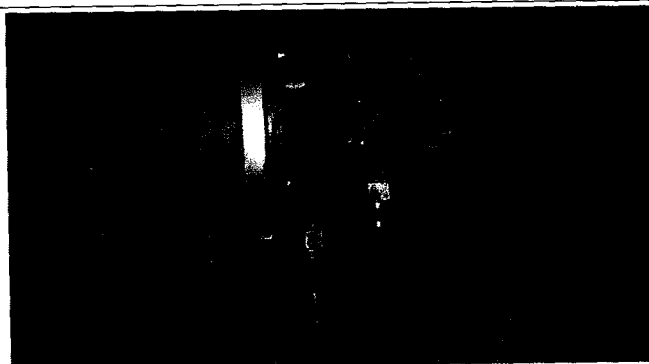
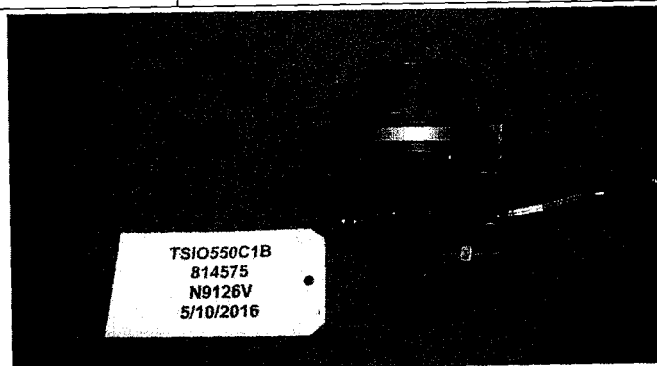
Manufacturer: No Data Plate

P/N: No Data Plate

S/N: No Data Plate

Condition:

The controller was separated from the engine and was in a box located within the shipping crate. No external anomalies were noted with the unit and residual oil poured from the fittings.



WASTEGATE

Manufacturer: Not Observed

P/N: Not Observed

S/N: Not Observed

Condition:

The wastegate was not returned with the engine.

OVERBOOST VALVE

Manufacturer: Not Observed

P/N: Not Observed

S/N: Not Observed

Condition:

The overboost valve was not returned with the engine.