



# Continental Motors

## ENGINE EXAMINATION REPORT

|                        |                        |
|------------------------|------------------------|
| ENGINE MODEL           | IO550B (6F)            |
| ENGINE SERIAL NUMBER   | 690407                 |
| AIRCRAFT MAKE & MODEL  | Beechcraft A36 Bonanza |
| AIRCRAFT SERIAL NUMBER | E-2598                 |
| AIRCRAFT REGISTRATION  | N8169Y                 |
| FILE NUMBER            | 16-507                 |

| NAME          | SIGNATURE                                                                            | DATE       |
|---------------|--------------------------------------------------------------------------------------|------------|
| Phillip Grice |  | 06/07/2017 |

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| <b>EXAMINATION</b> |                                | <b>ACCIDENT DATA</b>     |                                |
|--------------------|--------------------------------|--------------------------|--------------------------------|
| <b>DATE</b>        | 5-16-2017                      | <b>NTSB ACCIDENT #</b>   | ERA17FA140                     |
| <b>FACILITY</b>    | Continental Motors Inc.        | <b>NTSB INVESTIGATOR</b> | Brian Rayner                   |
| <b>ADDRESS</b>     | [REDACTED]<br>Mobile, AL 36615 | <b>FAA INVESTIGATOR</b>  | Joel Clark, Birmingham<br>FSDO |
|                    |                                | <b>ACCIDENT DATE</b>     | 3-28-2017                      |
|                    |                                | <b>ACCIDENT LOCATION</b> | Dadeville, Alabama             |

**ENGINE INFORMATION**

|                            |              |
|----------------------------|--------------|
| <b>ENGINE POSITION</b>     | Single       |
| <b>TOTAL TIME</b>          | Undetermined |
| <b>TIME SOH</b>            | Undetermined |
| <b>TYPE &amp; TIME SLI</b> | Undetermined |
| <b>BUILD DATE</b>          | 1-18-2007    |
| <b>IN SERVICE DATE</b>     | Undetermined |

**Significant logbook information:** No logbooks have been recovered as of 6-07-2017**Report Summary:**

Search Code(s):

15-12-68

The engine had extreme thermal damage from the post-crash fire. The internal components of the engine were intact and thermally damaged from the post-crash fire. There were no indications aside from the thermal damage from the external fire, which would have prevented the production of rated power. All of the external parts of the engine magnetos, fuel system, starter, alternator and instrument air pump received thermal damage and could not be tested.

**Disposition of engine following exam:** The engine was returned to Atlanta Air Salvage after release by the NTSB IIC

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|                     |                     |                     |                    |
|---------------------|---------------------|---------------------|--------------------|
| <b>NAME</b>         | Phillip Grice       | <b>NAME</b>         | Greg Eastburn      |
| <b>ADDRESS</b>      | Mobile, Alabama     | <b>ADDRESS</b>      | Mobile, Alabama    |
| <b>ORGANIZATION</b> | Continental Motors  | <b>ORGANIZATION</b> | Continental Motors |
| <b>PHONE</b>        | ██████████          | <b>PHONE</b>        | ██████████         |
|                     |                     |                     |                    |
| <b>NAME</b>         | Lisa Jersild        | <b>NAME</b>         | Mike Council       |
| <b>ADDRESS</b>      | Mobile, Alabama     | <b>ADDRESS</b>      | Mobile, Alabama    |
| <b>ORGANIZATION</b> | Continental Motors  | <b>ORGANIZATION</b> | Continental Motors |
| <b>PHONE</b>        | ██████████          | <b>PHONE</b>        | ██████████         |
|                     |                     |                     |                    |
| <b>NAME</b>         | Joel Clark          | <b>NAME</b>         |                    |
| <b>ADDRESS</b>      | Birmingham, Alabama | <b>ADDRESS</b>      |                    |
| <b>ORGANIZATION</b> | FAA                 | <b>ORGANIZATION</b> |                    |
| <b>PHONE</b>        | ██████████          | <b>PHONE</b>        |                    |

**EXTERNAL INSPECTION OF ENGINE**

The engine was received in the shipping crate provided by Continental Motors. The damaged engine and a sealed cardboard box was discovered inside the shipping container. The cardboard box contained the engine driven fuel pump, the airframe fuel boost pump and the remains of a thermally damaged magneto.

The engine exhibited thermal and impact damage overall. Cylinders one, three and five exhibited extreme thermal damage. Rocker box covers for cylinders one, three and five were thermally damaged and valve train components were visible. The engine data plate remained intact and indicated that this engine was a model IO-550B (6), serial number 690407.

The fuel system throttle body/mixture control remained attached but received thermal damage. The throttle plate was discovered in the full open throttle position. The throttle control and fuel mixture control arms remained attached and secured.

External engine accessories were also impact and thermally damaged. The left and right magnetos had separated from the engine. The engine was equipped with an air conditioning compressor mount but no compressor was present.

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### AIRFRAME COMPONENTS RETURNED WITH ENGINE

- 1) Instrument air pump
- 2) Fuel flow transmitter
- 3) Airframe fuel boost pump
- 4) Lower forward engine cooling baffles

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### ENGINE TEARDOWN AND COMPONENT EXAMINATION

#### EXHAUST SYSTEM

Condition:

The right and left exhaust headers/collectors remained attached but exhibited impact damage.



#### INDUCTION SYSTEM

Condition:

The right and left induction elbows remained intact but the rubber connectors were thermally damaged. The forward balance tube was impact damaged but remained attached. The rear mounted wye induction pipes were thermally damaged.



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## IGNITION SYSTEM

| MAGNETO-TO-ENGINE TIMING                                                                    | Specification: 22° BTDC                                                                                               | L/H Magneto: Undetermined | R/H Magneto: Undetermined |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------|
| The engine could not be rotated manually. Magneto to engine timing could not be determined. |                                                                                                                       |                           |                           |
| MAGNETO                                                                                     | Manufacturer: Slick                                                                                                   | M/N: 6310                 | S/N: 15030342             |
| Condition:                                                                                  | The orientation of this magneto could not be determined. The magneto was thermally destroyed and could not be tested. |                           |                           |



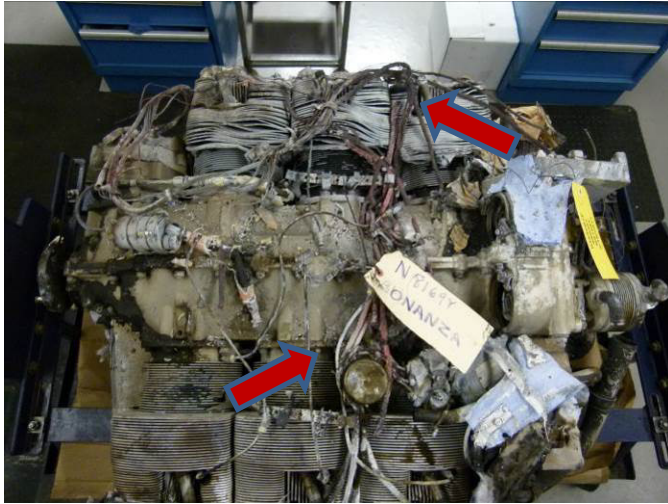
| MAGNETO    | Manufacturer: Slick                                                                                                                             | M/N: Undetermined | S/N: Undetermined |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|
| Condition: | The orientation of this magneto could not be determined. The magneto was thermally destroyed and could not be tested. Data plate was destroyed. |                   |                   |



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|                         |                                             |                   |                   |
|-------------------------|---------------------------------------------|-------------------|-------------------|
| <b>IGNITION HARNESS</b> | Manufacturer: Undetermined                  | P/N: Undetermined | S/N: Undetermined |
| Condition:              | The ignition harness was thermally damaged. |                   |                   |



|                    |                                                                                                                                                                                                                                                                                                       |              |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>SPARK PLUGS</b> | Manufacturer: Tempest                                                                                                                                                                                                                                                                                 | P/N: URHB32E |
| Condition:         | Sparkplugs from cylinders one, three and five appeared normal in wear and coloration when compared to a Champion Check-A-Plug chart. Sparkplugs from cylinders two, four and six were oil contaminated. This oil contamination is possibly the result of the engine orientation at the accident site. |              |



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### FUEL SYSTEM

#### FUEL PUMP

Manufacturer: TCM

P/N: 646766-9A1

S/N: 807AA060

Condition: The fuel pump had been removed at the accident site, photographed and secured to ship with the engine. The drive coupling was intact. The pump could not be rotated due to thermal damage. The aneroid bellows were elongated due to thermal damage when compared to an exemplar. No fuel was present in the fuel pump.



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## THROTTLE BODY METERING UNIT

Manufacturer: TCM

P/N: 657021A1

S/N: A07AA040

Condition: The throttle body/metering unit received thermal damage but remained intact. The fuel screen was removed and inspected. No contamination was noted. Both the throttle and mixture control arms remained secured to their respective shaft. No fuel was present in the metering unit.



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|                     |                                                                                                                                                         |                   |                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|
| FUEL MANIFOLD VALVE | Manufacturer:<br>Undetermined                                                                                                                           | P/N: Undetermined | S/N: Undetermined |
| Condition:          | Not recovered at accident site. Only the mounting base was recovered. The four screws remaining are assembly screws for the valve body which separated. |                   |                   |



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## FUEL NOZZLES AND LINES

Manufacturer: TCM

| Position   | #1                                                                                                                                                         | #3   | #5           | #2   | #4   | #6   |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------|------|------|------|
| Size       | 1250                                                                                                                                                       | 3248 | Undetermined | 2245 | 4241 | 6243 |
| Condition: | All fuel injectors were intact except # 5 which was not recovered. All injectors were open and appeared normal except thermal damage to exterior surfaces. |      |              |      |      |      |



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#5 fuel nozzle separated and was not  
presented for inspection



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### LUBRICATION SYSTEM

#### OIL SUMP

Condition:

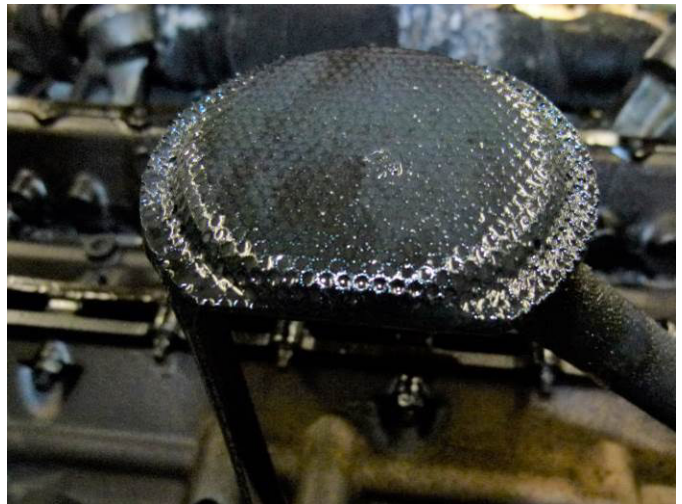
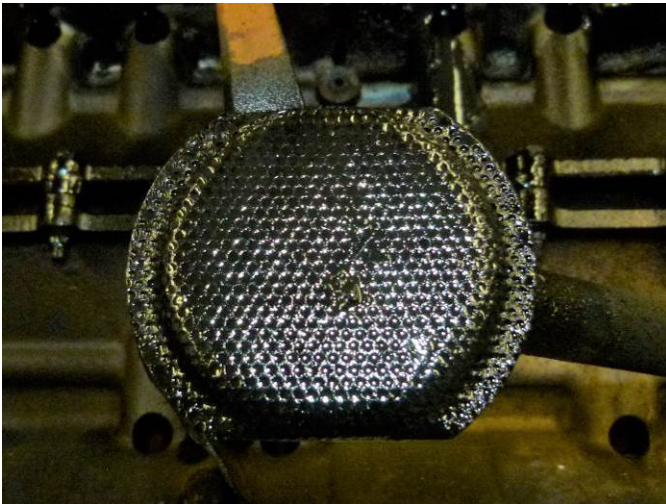
The oil sump was thermally damaged but remained intact.



#### OIL PICK-UP TUBE & SCREEN

Condition:

The oil pick-up screen was intact and no contamination was present.



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### OIL PUMP

Condition:

The pump was disassembled and inspected. There was no scoring or scratching in the pump chamber to indicate hard particle passage. The gears were normal in condition and the oil pressure relief valve and spring were intact.



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## OIL FILTER

Manufacturer: Undetermined

P/N: Undetermined

Condition:

The exterior of the oil filter was thermally damaged and manufacturer and model number were unreadable. The filter was opened and the filter media inspected. No metal contamination was exhibited.



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### OIL COOLER

Manufacturer: Undetermined

P/N: Undetermined

S/N: Undetermined

**Condition:** The oil cooler was intact. No data plate was found. The exterior surfaces of the oil cooler exhibited thermal damage.



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### CYLINDERS

|                    |                                                                  |             |                  |
|--------------------|------------------------------------------------------------------|-------------|------------------|
| <b>CYLINDER #1</b> | P/N: 658175A1                                                    | S/N: AC14IA | Head Date: 10-14 |
| Work Orders:       | Undetermined                                                     |             |                  |
| Condition:         | Cooling fins were damaged by impact forces and thermal distress. |             |                  |



|                    |                                                                  |             |                  |
|--------------------|------------------------------------------------------------------|-------------|------------------|
| <b>CYLINDER #3</b> | P/N: 658175A1                                                    | S/N: AC14IA | Head Date: 10-14 |
| Work Orders:       | Undetermined                                                     |             |                  |
| Condition:         | Cooling fins were damaged by impact forces and thermal distress. |             |                  |



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|                    |                                                                  |             |                  |
|--------------------|------------------------------------------------------------------|-------------|------------------|
| <b>CYLINDER #5</b> | P/N: 658175A1                                                    | S/N: AC14IA | Head Date: 10-14 |
| Work Orders:       | Undetermined                                                     |             |                  |
| Condition:         | Cooling fins were damaged by impact forces and thermal distress. |             |                  |



|                    |                                                           |             |                  |
|--------------------|-----------------------------------------------------------|-------------|------------------|
| <b>CYLINDER #2</b> | P/N: 658175A1                                             | S/N: AC14IA | Head Date: 10-14 |
| Work Orders:       | Undetermined                                              |             |                  |
| Condition:         | Cylinder was intact with minor external thermal distress. |             |                  |



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|                    |               |             |                 |
|--------------------|---------------|-------------|-----------------|
| <b>CYLINDER #4</b> | P/N: 658175A1 | S/N: AC14IA | Head Date: 9-14 |
|--------------------|---------------|-------------|-----------------|

|              |              |
|--------------|--------------|
| Work Orders: | Undetermined |
|--------------|--------------|

|            |                                                           |
|------------|-----------------------------------------------------------|
| Condition: | Cylinder was intact with minor external thermal distress. |
|------------|-----------------------------------------------------------|



|                    |               |             |                  |
|--------------------|---------------|-------------|------------------|
| <b>CYLINDER #6</b> | P/N: 658175A1 | S/N: AC14IA | Head Date: 10-14 |
|--------------------|---------------|-------------|------------------|

|              |              |
|--------------|--------------|
| Work Orders: | Undetermined |
|--------------|--------------|

|            |                                                           |
|------------|-----------------------------------------------------------|
| Condition: | Cylinder was intact with minor external thermal distress. |
|------------|-----------------------------------------------------------|



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## VALVES

Condition: All valves were intact and in place.



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### ROCKER ARMS AND SHAFTS

Condition: All rocker arms and shafts were intact. Cylinders one, three and five were exposed to an after impact fire destroying rocker covers and exposing components to thermal distress.



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### #1 PISTON, RINGS AND PIN

Piston P/N: 644857

Condition:

Normal wear. Surface oxidation due to normal lubrication being destroyed by external fire after impact. This piston was stuck inside of the cylinder and manual manipulation was required to remove it.



### #3 PISTON, RINGS AND PIN

Piston P/N: 644857

Condition:

Normal wear patterns and combustion signatures.



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### #5 PISTON, RINGS AND PIN

Piston P/N: 644857

Condition:

Normal wear. Surface oxidation due to normal lubrication being destroyed by external fire after impact.



### #2 PISTON, RINGS AND PIN

Piston P/N: 644857

Condition:

Normal wear and combustion signatures. The surfaces are oil contaminated due to orientation of the engine after impact.



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### #4 PISTON, RINGS AND PIN

Piston P/N: 644857

Condition:

Normal wear and combustion signatures. The surfaces are oil contaminated due to orientation of the engine after impact.



### #6 PISTON, RINGS AND PIN

Piston P/N: 644857

Condition:

Normal wear and combustion signatures. The surfaces are oil contaminated due to orientation of the engine after impact.

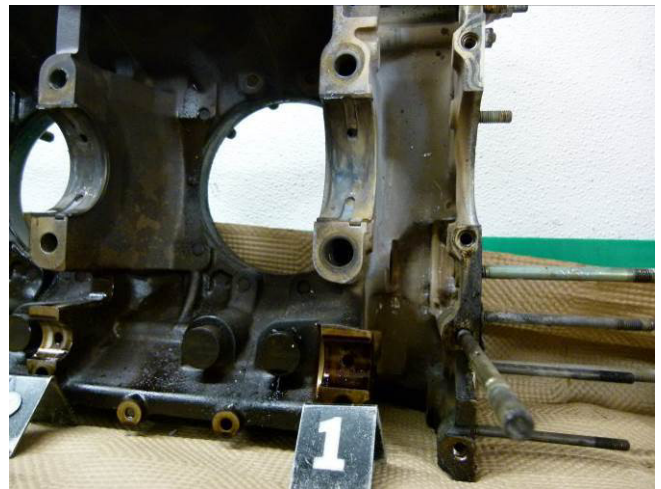


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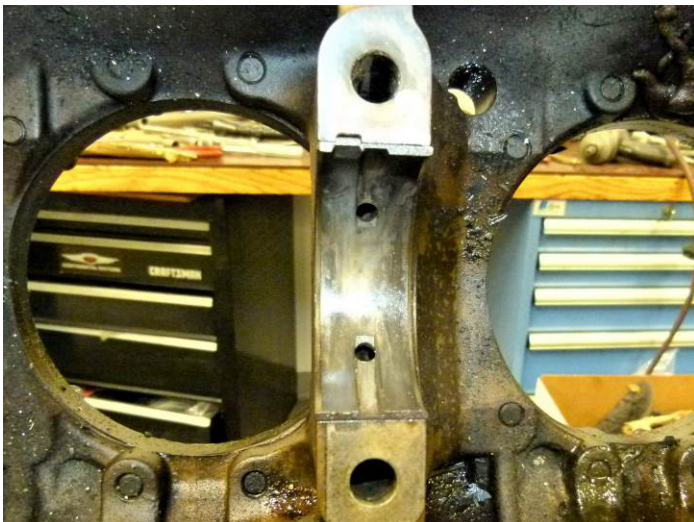
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## CRANKCASE ASSEMBLY

|                         |                                                                                                                      |                 |               |                  |               |
|-------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------|---------------|------------------|---------------|
| <b>CRANKCASE</b>        |                                                                                                                      | Casting Number: | 1-3-5: 655435 | 2-4-6: 655434    | S/N: R06KA116 |
| Condition:              | The crankcase was intact but exhibited thermal damage to external surfaces and heat signatures on internal surfaces. |                 |               |                  |               |
| <b>#1 MAIN BEARINGS</b> |                                                                                                                      | P/N: 634503     |               | Date Code: 06-14 |               |
| Condition:              | #1 main bearing exhibited thermal damage to the bearing surface.                                                     |                 |               |                  |               |



|                  |                                                                  |             |                  |
|------------------|------------------------------------------------------------------|-------------|------------------|
| #2 MAIN BEARINGS |                                                                  | P/N: 634503 | Date Code: 06-14 |
| Condition:       | #2 main bearing exhibited thermal damage to the bearing surface. |             |                  |



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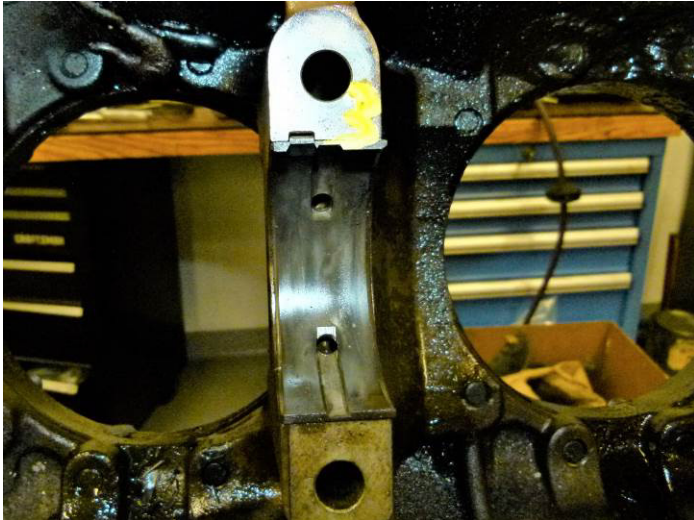
|              |        |             |        |               |
|--------------|--------|-------------|--------|---------------|
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## #3 MAIN BEARINGS

P/N: 634503

Date Code: 06-14

Condition: Normal wear patterns.

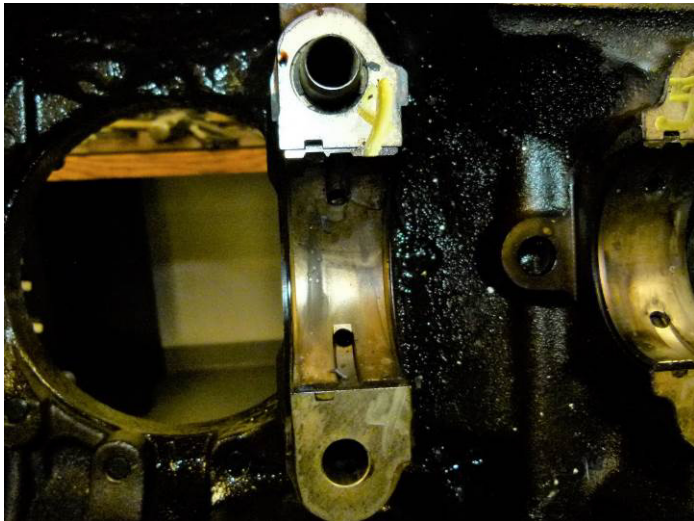


## #4 MAIN BEARINGS

P/N: 653547

Date Code: 08-14

Condition: # 4 main bearings exhibited thermal damage to the bearing surface.



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|------------------|--------------------------------------------------------------------|------------------|
| #5 MAIN BEARINGS | P/N:653547                                                         | Date Code: 08-14 |
| Condition:       | # 5 main bearings exhibited thermal damage to the bearing surface. |                  |



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### CRANKSHAFT ASSEMBLY

#### CRANKSHAFT

Forging Number: 649878

S/N: N06JA213

Heat code: KLP6

Condition:

The crankshaft was intact but exhibited thermal damage.



#### TRANSFER COLLAR

Condition:

The transfer collar exhibited normal wear patterns.



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### COUNTER WEIGHTS

**Condition:**

The counter weights were free to move on pins. The plates and clips were intact but exhibited thermal damage.



### INTERNAL TIMING

**Condition:**

The engine could not be rotated manually. The internal timing could not be verified without rotating the crankshaft.

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## #1 CONNECTING ROD

P/N: 646126-Y

Forging or Serial Number: AE06LB264

Condition: The connecting rod appeared normal except for the thermal damage to the beam surface.

## #1 CONNECTING ROD BEARING

P/N: 642398

Condition: The rod bearing surfaces were thermally damaged.



## #3 CONNECTING ROD

P/N: 646126-Y

Forging or Serial Number: AE06LB275

Condition: The connecting rod appeared normal.

## #3 CONNECTING ROD BEARING

P/N: 642398

Condition: The rod bearing surfaces were thermally damaged.



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## #5 CONNECTING ROD

P/N: 646126-Y

Forging or Serial Number: AE06LB143

Condition: The connecting rod appeared normal except for the thermal damage to the beam surface.

## #5 CONNECTING ROD BEARING

P/N: 642398

Condition: The rod bearing surfaces were thermally damaged.



## #2 CONNECTING ROD

P/N: 646126-Y

Forging or Serial Number: AE06LB148

Condition: The connecting rod appeared normal except for the thermal damage to the beam surface.

## #2 CONNECTING ROD BEARING

P/N: 642398

Condition: The rod bearing surfaces were thermally damaged.



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## #4 CONNECTING ROD

P/N: 646126-Y

Forging or Serial Number: AE06LB173

Condition: The connecting rod appeared normal.

## #4 CONNECTING ROD BEARING

P/N: 642398

Condition: The rod bearing surfaces were thermally damaged.



## #6 CONNECTING ROD

P/N: 646126-Y

Forging or Serial Number: AE06LB139

Condition: The connecting rod appeared normal except for the thermal damage to the beam surface.

## #6 CONNECTING ROD BEARING

P/N: 642398

Condition: The rod bearing surfaces were thermally damaged.



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### CAMSHAFT

|                 |                                              |               |
|-----------------|----------------------------------------------|---------------|
| <b>CAMSHAFT</b> | P/N: 654084-J                                | S/N: Z06LA170 |
| Condition:      | The camshaft exhibited normal wear patterns. |               |



| LIFTERS    | #1                                          | #3     | #5     | #2     | #4     | #6     |
|------------|---------------------------------------------|--------|--------|--------|--------|--------|
| INTAKE     | 658088                                      | 658088 | 658088 | 658088 | 658088 | 658088 |
| EXHAUST    | 658077                                      | 658077 | 658077 | 658077 | 658077 | 658077 |
| Condition: | The lifters exhibited normal wear patterns. |        |        |        |        |        |



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### ACCESSORIES

**STARTER**Manufacturer:  
Undetermined

P/N: Undetermined

S/N: Undetermined

Condition:

The starter motor was intact but thermally damaged. No data plate was found.

**STARTER  
ADAPTER**

P/N: Undetermined

Condition:

The starter adapter was intact but exhibited thermal damage. The adapter could be rotated manually.



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## ALTERNATOR

Manufacturer: TCM

P/N: 649304

S/N: 007AA028

Condition: Thermally destroyed



## VACUUM PUMP

Manufacturer: Undetermined

P/N: Undetermined

S/N: Undetermined

Condition: Data tag was thermally destroyed. The plastic drive coupling was thermally destroyed. The pump was disassembled. The carbon rotor and vanes were intact.



# ENGINE EXAMINATION REPORT

|              |        |             |        |               |
|--------------|--------|-------------|--------|---------------|
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## PROPELLER GOVERNOR

Manufacturer: McCauley

M/N: C290D3-K/T23

S/N: 970178

Condition: The governor rotates freely when the drive gear is rotated manually. The governor control cable had been cut but the control arm remained attached and secured properly.

