



# Continental Motors

## ENGINE EXAMINATION REPORT

|                        |                                              |
|------------------------|----------------------------------------------|
| ENGINE MODEL           | IO-550-N (Turbo normalized by Tornado Alley) |
| ENGINE SERIAL NUMBER   | 691904                                       |
| AIRCRAFT MAKE & MODEL  | Cirrus SR22                                  |
| AIRCRAFT SERIAL NUMBER | 3262                                         |
| AIRCRAFT REGISTRATION  | N418CP                                       |
| FILE NUMBER            | 17-227                                       |

| NAME        | SIGNATURE                                                                            | DATE       |
|-------------|--------------------------------------------------------------------------------------|------------|
| Kurt Gibson |  | 05/10/2018 |

## ENGINE FIELD INSPECTION REPORT

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## GENERAL INFORMATION

| EXAMINATION |                                 | ACCIDENT DATA     |                    |
|-------------|---------------------------------|-------------------|--------------------|
| DATE        | 04/10/2018                      | NTSB ACCIDENT #   | WPR18LA018         |
| FACILITY    | Air Transport                   | NTSB INVESTIGATOR | Albert Nixon       |
| ADDRESS     | [REDACTED]<br>Phoenix, AZ 85009 | FAA INVESTIGATOR  | Robert Michaelson  |
|             |                                 | ACCIDENT DATE     | 10/03/2017         |
|             |                                 | ACCIDENT LOCATION | Blythe, California |

## ENGINE INFORMATION

|                 |                                                      |
|-----------------|------------------------------------------------------|
| ENGINE POSITION | Single (front)                                       |
| TOTAL TIME      | 1027.8                                               |
| TIME SOH        | N/A                                                  |
| TYPE & TIME SLI | 1.5 hours since the last annual/100 hour inspection. |
| BUILD DATE      | 08/07/2008                                           |
| IN SERVICE DATE | Unknown                                              |

**Significant logbook information:**

The last annual inspection was performed on 10/03/2017 at a flight hour meter time of 1026.3. During the time of the inspection the repair station work order stated "C/W TAT SB 11-04 by inspection and cleaning of turbocharger oil supply inlet screens and check valves".

**Report Summary:**

Search Code(s):

15-12-40

39-03-13

The engine displayed damage consistent with lubrication distress. The oil line B-nut going to the turbocharger check valve was found to be loose and there were signs of oil leaks around the immediate area around the loose B-nut.

**Disposition of engine following exam:**

The engine remained at Air Transport in Phoenix, Arizona.

| INSPECTION WITNESSES |                    |              |                        |
|----------------------|--------------------|--------------|------------------------|
| NAME                 | Kurt Gibson        | NAME         | Albert Nixon           |
| ADDRESS              | Mobile, Alabama    | ADDRESS      | Western Pacific Region |
| ORGANIZATION         | Continental Motors | ORGANIZATION | NTSB                   |
| PHONE                |                    | PHONE        |                        |
|                      |                    |              |                        |
| NAME                 |                    | NAME         |                        |
| ADDRESS              |                    | ADDRESS      |                        |
| ORGANIZATION         |                    | ORGANIZATION |                        |
| PHONE                |                    | PHONE        |                        |
|                      |                    |              |                        |
| NAME                 |                    | NAME         |                        |
| ADDRESS              |                    | ADDRESS      |                        |
| ORGANIZATION         |                    | ORGANIZATION |                        |
| PHONE                |                    | PHONE        |                        |

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**PAGE 4 of 29****EXTERNAL INSPECTION OF ENGINE**

The engine remained attached to the airframe through the engine mounts, cables, hoses, and wires. There was a small hole noted at the top of the engine crankcase consistent with an internal engine failure. The propeller remained attached to the crankshaft and displayed impact damage signatures to the propeller blades. All six cylinders remained attached to their cylinder bays and there was no external damage noted to the cylinders.

The fuel pump, throttle and metering assembly, and the fuel manifold valve all remained attached to their installation points and were undamaged; there were no signs of fuel leaks noted around any of the fuel components. There were no signs of oil leaks around the fuel pump.

Both of the magnetos remained attached to their installation points and were undamaged; there were no signs of oil leaks around the magneto installation points. The ignition harness remained attached to both of the magnetos and to each spark plug; there were no anomalies noted with the harness. All of the spark plugs remained installed in their cylinders and were undamaged. There were no anomalies noted with any of the ignition components.

The oil pump, oil filter, and oil sump were attached to their installation points and were undamaged; there were no signs of oil leaks around the components. There was a significant amount of oil noted on the right side of the engine near the turbocharger. The B-nut going to the turbocharger inlet check valve was noted to be loose and was able to be moved by hand; there was fresh oil around the B-nut.

The exhaust system remained attached to the engine and displayed impact damage signatures in the forms of bending and crushing to the tail pipes and mufflers. The turbocharger remained attached to the exhaust system and the V-band clamp was noted to be intact.

The induction system remained intact and was undamaged. There were no signs of induction leaks noted.

# ENGINE FIELD INSPECTION REPORT

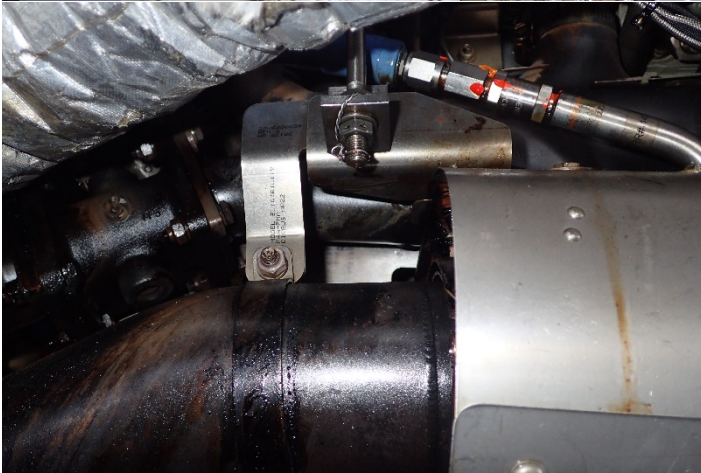
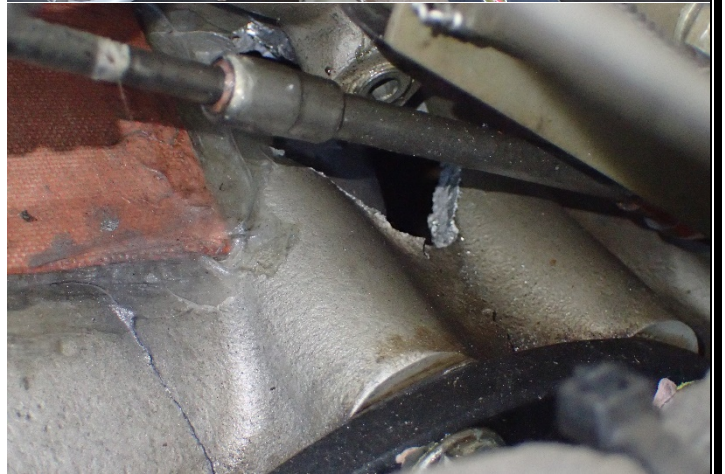
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**PAGE 6 of 29****ENGINE TEARDOWN AND COMPONENT EXAMINATION****EXHAUST  
SYSTEM****Condition:**

The exhaust system remained attached to the engine and displayed impact damage signatures to the tail pipes; the damage consisted of bending and crushing. The V-band clamp attaching the turbocharger to the exhaust system was noted to be intact.

**INDUCTION  
SYSTEM****Condition:**

The induction system remained intact and was undamaged. There were no signs of induction leaks or other anomalies noted.



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## IGNITION SYSTEM

### LEFT MAGNETO

Manufacturer: CMI

P/N: 10-500556-101

S/N: D08FA403

Condition:

The magneto remained attached to its installation point and was undamaged. There were no signs of oil leaks around the magneto installation flange. There were no anomalies noted with the magneto.



### RIGHT MAGNETO

Manufacturer: CMI

P/N: 10-500556-101

S/N: D08FA388

Condition:

The magneto remained attached to its installation point and was undamaged. There were no signs of oil leaks around the magneto installation flange. There were no anomalies noted with the magneto.



### IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness remained attached to both the magnetos and to each spark plug. There were no anomalies noted with the ignition harness.

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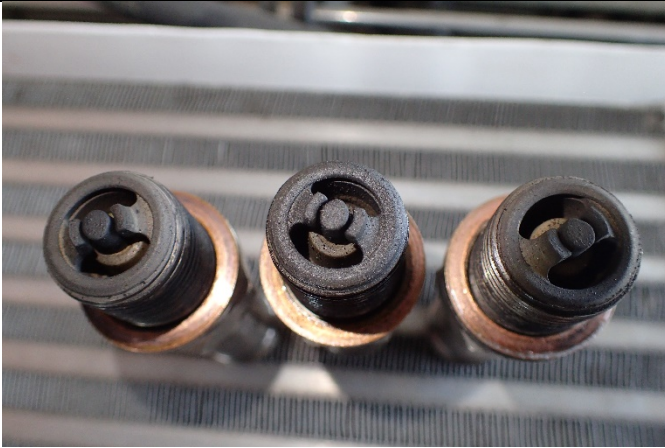
## SPARK PLUGS

Manufacturer: Tempest

P/N: URHB32E

### Condition:

All of the spark plugs remained installed in their cylinders and were undamaged. The bottom spark plugs were removed and the electrodes were visually inspected; the electrodes displayed normal wear and operating signatures. It was noted that in order to remove the #1 bottom spark plug, the turbocharger inlet check valve oil line was needed to be disconnected and moved to the side.



#1, #3, #5 Bottom Spark Plugs



#2, #4, #6 Bottom Spark Plugs

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## FUEL SYSTEM

### FUEL PUMP

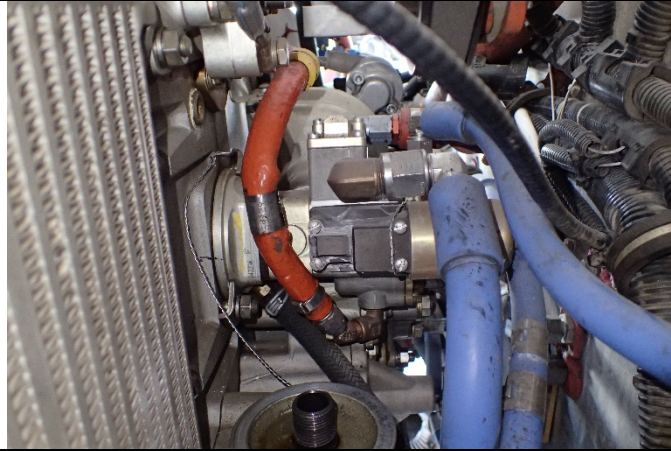
Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The fuel pump remained attached to its installation point and was undamaged. All of the fuel lines remained secured to the fuel pump and there were no signs of fuel leaks. There were no signs of oil leaks around the fuel pump installation flange. There were no anomalies noted with the fuel pump.



### THROTTLE BODY METERING UNIT

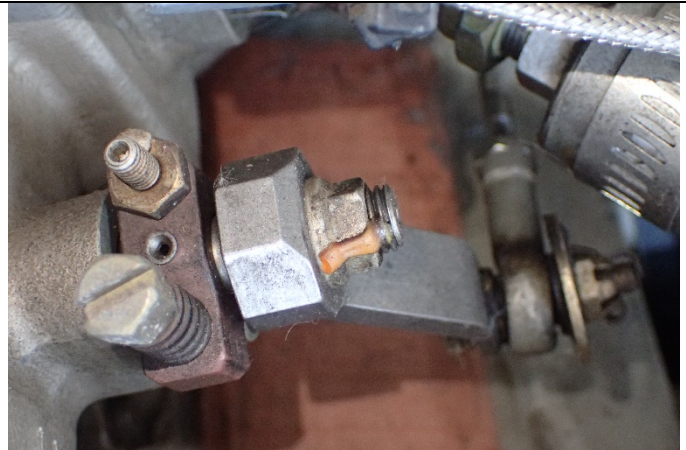
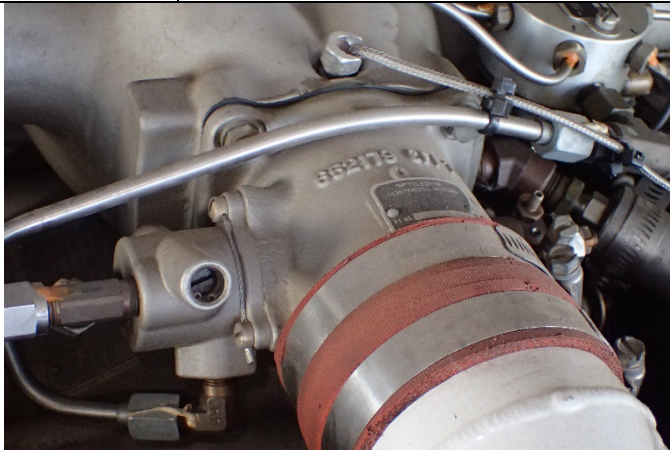
Manufacturer: CMI

P/N: 653353-8A1

S/N: A08GA275

Condition:

The throttle and metering assembly remained attached to its installation point and was undamaged. The throttle control arm remained secured to the control shaft and the throttle cable rod end remained secured to the control arm. There were no anomalies noted with the throttle and metering assembly.



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VALVE**

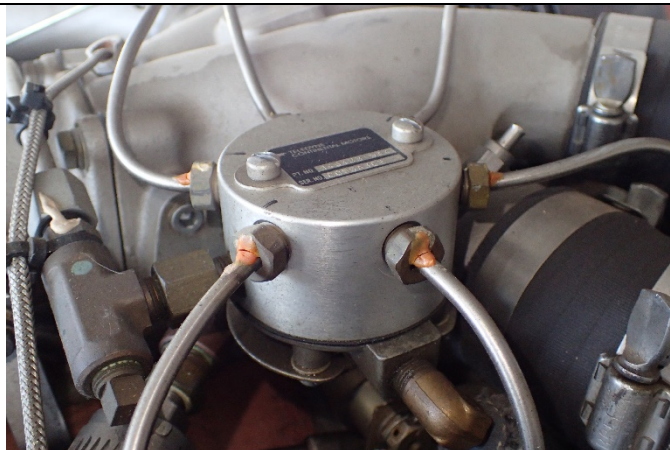
Manufacturer: CMI

P/N: 646433-9A4

S/N: C08GA302

**Condition:**

The fuel manifold valve remained attached to its installation point and was undamaged. There were no signs of fuel leaks or other anomalies noted with the manifold valve.

**FUEL NOZZLES AND  
LINES**

Manufacturer: GAMI

**Condition:**

All of the fuel nozzles remained installed in their cylinders and were undamaged. There were no anomalies noted with the nozzles.

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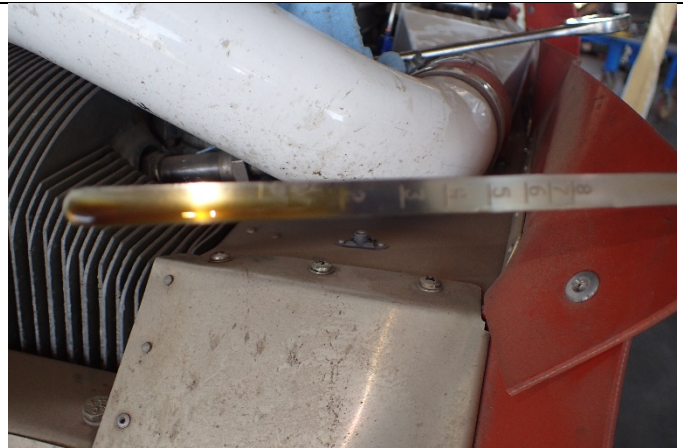
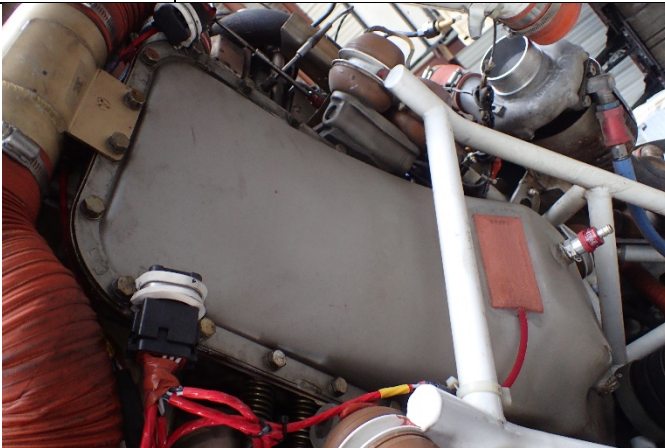
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### LUBRICATION SYSTEM

#### OIL SUMP

Condition:

The oil sump remained intact and was undamaged; it was noted that the quick drain remained secured and was in the closed position. The oil gage was checked for the oil quantity; the gage indicated there was 2 quarts of oil within the sump. The oil sump was partially drained and then partially removed from the engine. There was a significant amount of metallic material within the oil sump; the material was consistent with bearing material, piston material, and crankcase material.



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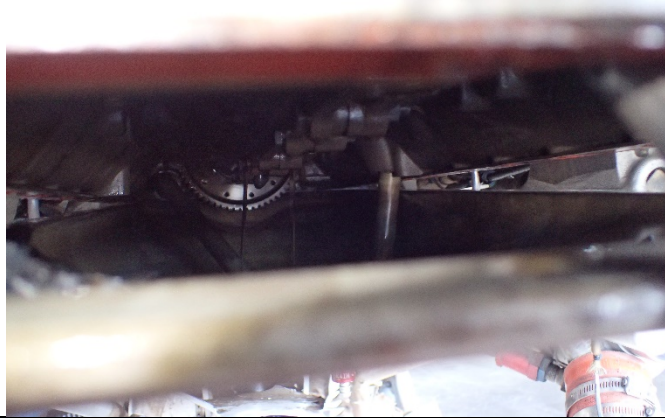
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## OIL PICK-UP TUBE & SCREEN

Condition:

The oil pick-up screen was not observed due to the fact that the oil sump could not be completely removed. The pick-up tube was partially visible; there were no anomalies noted with the visible portion of the tube.



## OIL PUMP

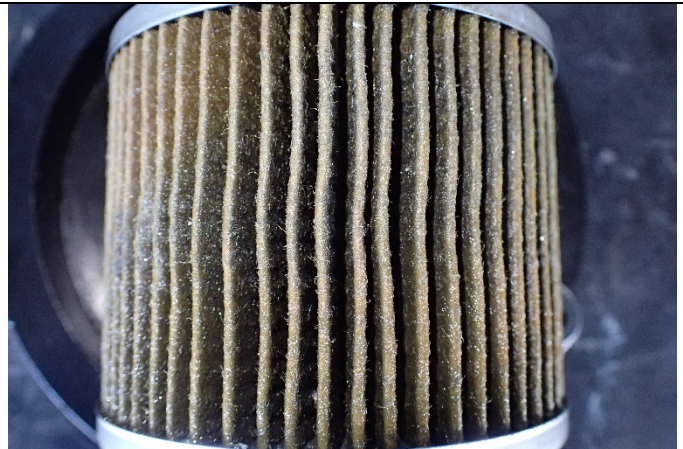
Condition:

The oil pump remained attached to its installation point and was undamaged. There were no signs of oil leaks noted around the oil pump.

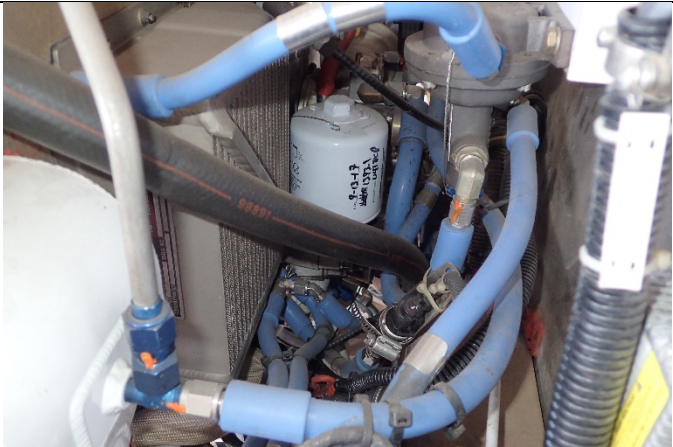
## OIL FILTER

Condition:

The oil filter remained secured to the oil filter adapter; there were no signs of oil leaks around the oil filter. The oil filter was removed and the housing was cut open. The filter pleats were visually inspected; there was several pieces of metallic material noted within the filter pleats. It was noted that there was very little residual oil within the filter and filter pleats.



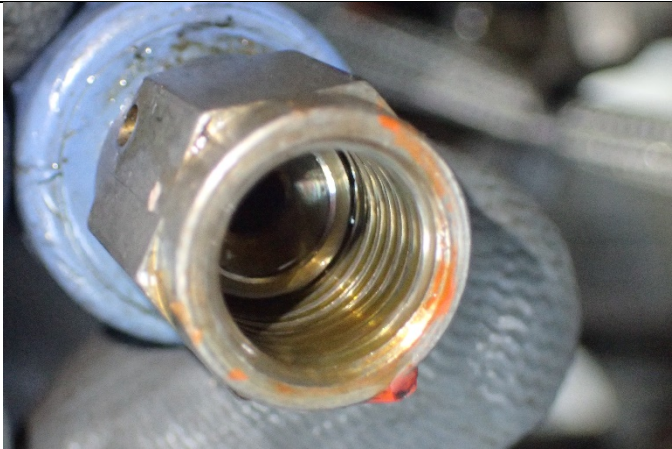
|            |                                                                                                                                                                  |                   |                   |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|
| OIL COOLER | Manufacturer: Not observed                                                                                                                                       | P/N: Not observed | S/N: Not observed |
| Condition: | The oil cooler remained attached to its installation point and was undamaged. There were no signs of oil leaks around the oil cooler or the attaching oil lines. |                   |                   |



|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OIL LINES  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Condition: | The oil lines were checked for security and signs of oil leaks. It was noted that the B-nut for the oil line going into the right turbocharger inlet check valve was loose and was able to be removed by hand. There was a significant amount of oil located in the vicinity of the loose B-nut and the right side of the bottom cowling displayed significantly more oil staining than the left side bottom cowling. The B-nut was removed and the threads were visually inspected; there were no signs of damage to the B-nut or the check valve threads. There was a small amount of fresh oil around the wastegate drain port; however, there was not a significant amount of oil located around the drain port or on the left bottom cowling (the wastegate is located on the left side of the engine). There were no further oil leaks noted and all of the other oil lines remained secure. |



Right turbocharger check valve with loose B-nut



Loose B-nut threads

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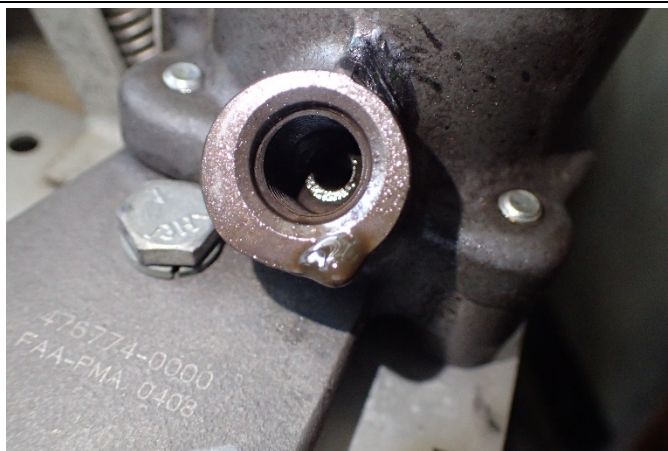
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Check valve inlet fitting threads



Wastegate drain port

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### CYLINDERS

#### CYLINDERS

**Condition:** All of the cylinders remained attached to their cylinder bays and there were no signs of external damage to any of the cylinders. The cylinders were inspected using a lighted borescope; the #3 connecting rod had released from the crankshaft and the piston was near the top dead center position which restricted the #3 cylinder inspection. It was also noted that the #4 connecting rod had released from the crankshaft; however, the piston was up far enough in the cylinder to facilitate a borescope inspection. The visible cylinder bore, valves heads, and piston faces displayed normal operating and combustion signatures.



#### VALVES AND GUIDES

**Condition:** All of the valve heads were inspected using a lighted borescope; the #3 intake and exhaust valve were only partially visible due to the position of the #3 piston. All of the visible valve heads displayed normal operating and combustion signatures.



#1 Exhaust Valve



#1 Intake Valve

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#5 Exhaust Valve



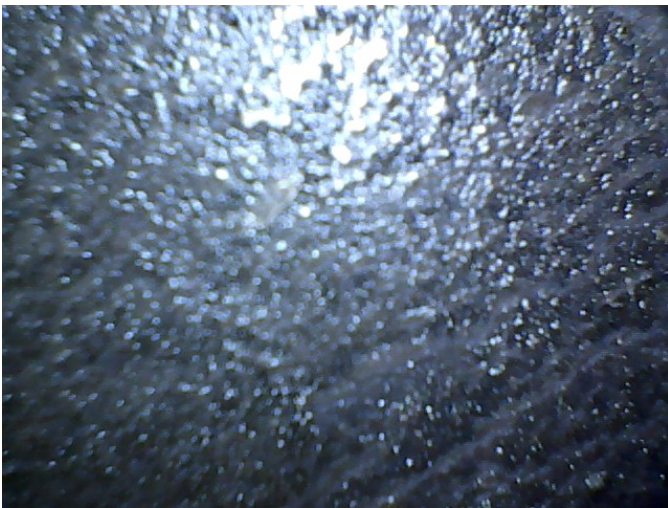
#5 Intake Valve



#2 Exhaust and Intake Valve



#2 Intake Valve



#4 Exhaust Valve



#4 Intake Valve



#6 Exhaust Valve



#6 Intake Valve

| ROCKER ARMS AND SHAFTS |                                                                                                                                                                                                                      |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Condition:             | Due to the type of inspection performed the rocker arms were not visible. The rocker arm box covers were inspected for signs of oil leaks; there were no signs of oil leaks around any of the rocker arm box covers. |

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## PISTONS

Piston P/N: Inaccessible

Condition:

The piston faces were inspected using a lighted borescope. The piston faces displayed normal operating and combustion signatures; there were no signs of detonation noted. It was noted that during crankshaft rotation the #3 and the #4 pistons would not move consistent with the #3 and #4 connecting rods releasing from the crankshaft. The rest of the pistons moved normally during crankshaft rotation.



#1 Piston



#3 Piston



#5 Piston



#2 Piston

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#4 Piston



#6 Piston

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## CRANKCASE ASSEMBLY

### CRANKCASE

Casting  
Number:

1-3-5: Not observed

2-4-6: Not observed

S/N: R08GA164

Condition:

The crankcase was noted to have a small hole at the top of the crankcase consistent with an internal engine failure. There were no further anomalies noted with the crankcase.



### MAIN BEARINGS

P/N: Inaccessible

Date Code: Inaccessible

Condition:

Due to the type of inspection performed the main bearings were not visible.

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## CRANKSHAFT ASSEMBLY

| CRANKSHAFT | Forging Number:<br>Inaccessible                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | S/N: Not observed | Heat code: Inaccessible |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------|
| Condition: | The propeller flange remained attached to the crankshaft and there were no signs of cracks in the external portion of the crankshaft. The crankshaft was capable of rotation with noticeable resistance; continuity was established between the crankshaft and the camshaft. It was discovered during crankshaft rotation that the #3 and the #4 connecting rods had released from the crankshaft. A lighted borescope was inserted into the hole in the top of the crankcase; the journal for one of the released connecting rods was visible during the inspection. The journal displayed thermal damage consistent with lubrication distress. |                   |                         |



Counterweight observed during borescope



Either the #3 or the #4 connecting rod journal  
(unable to determine which due to difficult access)

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## CONNECTING RODS

P/N: Inaccessible

Forging or Serial Number: Inaccessible

Condition:

It was determined that the #3 and the #4 connecting rod had released from the crankshaft. The rest of the connecting rods remained attached to the crankshaft.

## CONNECTING ROD BEARINGS

P/N: Illegible

Condition:

Several pieces of bearing material were located in the oil sump. The bearing displayed thermal damage signatures consistent with lubrication distress.



Bearing material found in oil sump

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P/N: Inaccessible

S/N: Inaccessible

Condition:

Operation of the camshaft was verified by rotating the crankshaft and observing valve movement in several of the cylinders; the camshaft operated normally.

**ACCESSORY  
GEARS**

Condition:

Operation of the magneto drive gears was verified by rotating the crankshaft and observing impulse coupling operation; the magneto drive gears operated normally.

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|                        |                                                                                                                                                                    |                   |                   |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|
| <b>STARTER</b>         | Manufacturer: Not observed                                                                                                                                         | P/N: Not observed | S/N: Not observed |
| Condition:             | The starter remained attached to the starter adapter and was undamaged. There were no anomalies noted with the starter.                                            |                   |                   |
| <b>STARTER ADAPTER</b> | P/N: Not observed                                                                                                                                                  |                   |                   |
| Condition:             | The starter adapter remained attached to the engine and was undamaged. There were no signs of oil leaks around the starter adapter. There were no anomalies noted. |                   |                   |

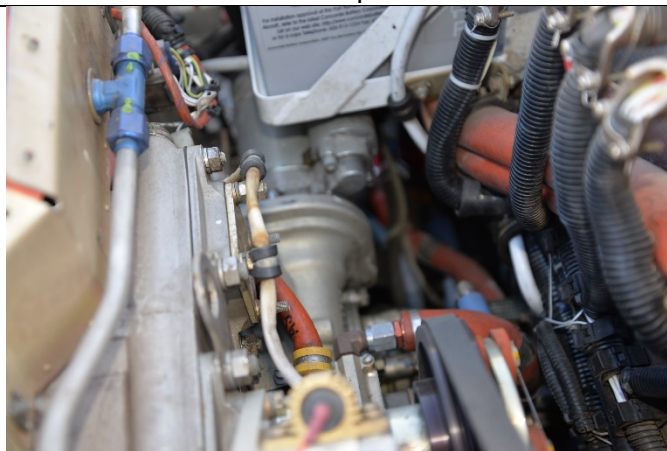


Photo courtesy of Cirrus Aircraft

|                   |                                                                                                                                                                                         |             |                |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|
| <b>ALT/GEN #1</b> | Manufacturer: Hartzell                                                                                                                                                                  | P/N: 656802 | S/N: H-N040148 |
| Condition:        | The alternator remained attached to its installation point and was undamaged. There were no signs of oil leaks around the alternator installation point. There were no anomalies noted. |             |                |



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## RIGHT TURBO

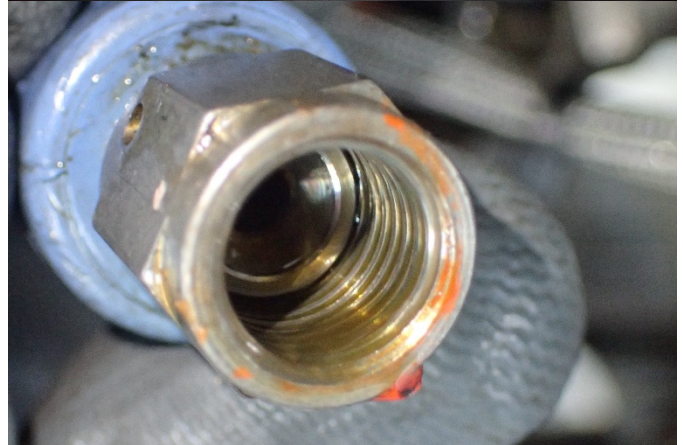
Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

### Condition:

The turbocharger remained attached to its installation point and was undamaged. IT was noted that there was a significant amount of oil around the turbocharger. The B-nut going to the right turbocharger inlet check valve was noted to be loose and was able to be removed by hand. The threads were visually inspected on the B-nut and the attachment fitting and there was no damage noted to the threads. The compressor was visually inspected and displayed normal operating signatures; the compressor was capable of normal rotation.



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## LEFT TURBO

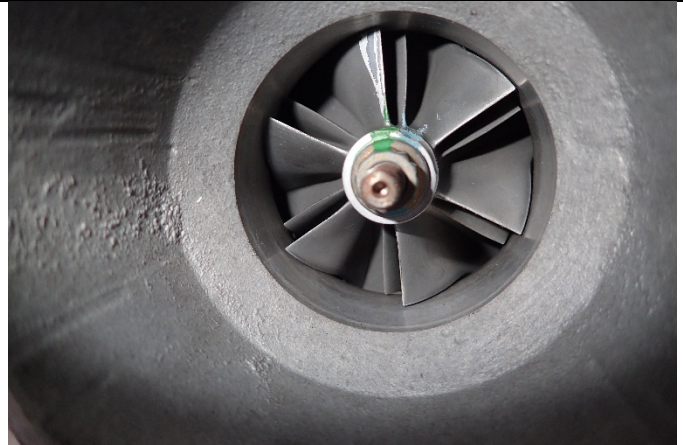
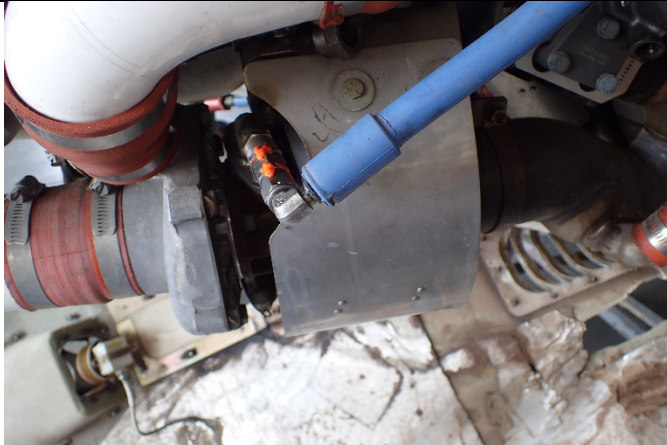
Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The turbocharger remained attached to its installation point and was undamaged. The oil lines going to the turbocharger were noted to be secure and there were no signs of an oil leak. The induction hose going to the compressor was removed and the compressor was visually inspected; the compressor blades displayed normal operating signatures and the compressor was capable of normal rotation. There were no anomalies noted with the left turbocharger.



## TURBO CONTROLLER

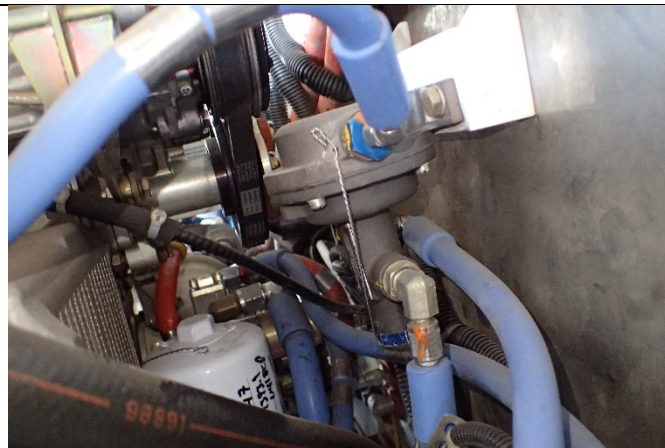
Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The controller remained attached to its installation point and was undamaged. All of the oil lines remained secure to the controller. There were no anomalies noted.



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## WASTEGATE

Manufacturer: Kelly Aerospace

P/N: Not recorded

S/N: Not recorded

Condition:

The wastegate remained attached to its installation point and was undamaged. The inlet and outlet oil lines were noted to be secure. It was noted that there was no drain line attached to the drain port; there was a small amount of oil noted around the drain port; however, there was no significant oil staining or spray around the port or on the cowling directly below the wastegate.



## OVERBOOST VALVE

Manufacturer: Kelly Aerospace

P/N: 470944-0017

S/N: KKN00269

Condition:

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



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## PROPELLER

### PROPELLER GOVERNOR

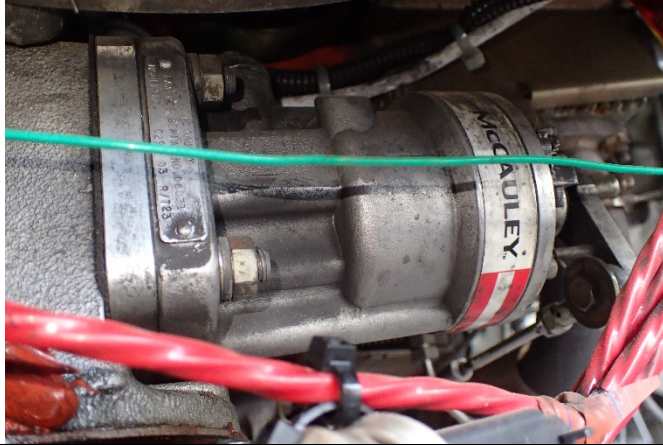
Manufacturer: McCauley

P/N: C290 D3-R/T23

S/N: 080313

Condition:

The governor remained attached to its installation point and was undamaged. There were no signs of oil leaks around the propeller governor.



### PROPELLER

Manufacturer: McCauley

P/N: Not observed

S/N: Not observed

Condition:

The three blade, variable pitch, composite propeller remained attached to the crankshaft and displayed impact damage to all three propeller blade tips. There were no leaks noted around the propeller hub/propeller flange. There were no anomalies noted with the propeller.



Blade S/N: A2514

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Blade S/N: A2511



Blade S/N: A2523