



## **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Western Pacific Region

### **MAINTENANCE INFORMATION**

**WPR17LA172**

Accident Date: July 31, 2017

This document contains 8 embedded images

## **A. ACCIDENT**

Location: Llano, California  
Date: July 31, 2017  
Aircraft: Cessna T-210F, N6109R, Serial # T210-0009  
NTSB IIC: Michael Huhn

## **B. SUMMARY**

While on a cross-country flight, the pilot was unable to achieve the target/normal manifold pressure (MP) values. He made a precautionary landing, and had an aircraft mechanic examine the engine; no anomalies were noted. The pilot then departed on the continuation of his trip. While in cruise, the pilot noticed that the oil pressure had dropped to 0 psi. The pilot retarded the throttle, and diverted towards Crystal Airport. The airplane touched down in the desert terrain about 1 mile short of the diversion airport. The airplane was substantially damaged during the forced landing near Llano, California. Subsequent to the accident, the pilot reported that a "top overhaul" of the engine had been completed about 11 flight hours prior to the accident.

On-scene FAA examination of the airplane revealed that there was no measurable oil in the engine; there were no obvious indications of an oil leak or overboard venting, or any catastrophic internal mechanical failures of the engine. The airplane was recovered to Air Transport in Phoenix where it was examined in more detail. That examination by representatives of Continental Motors (CMI) and the NTSB was conducted on August 9-10, 2017. When the engine was manually rotated, the No. 1 piston was immobile in its cylinder, the No. 1 exhaust valve was stuck open, and the No. 1 intake valve remained closed. All other cylinders appeared to be normal.

This report documents the maintenance- and maintenance records-related information. Other examination results are documented separately.

### C. MAINTENANCE RECORDS and HISTORY

The pilot provided copies of some of the maintenance records, including those regarding the recent top overhaul. Selected engine maintenance activity is presented in the table below. Maintenance vendors are depicted in parentheses.

| DATE     | TACH | SMOH | ACTIVITY                                                                                                                                            |
|----------|------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 7/31/17  | 3534 |      | Accident                                                                                                                                            |
| 7/12/17  | 3523 | 1665 | Top OH (Corona Engines & Procraft)                                                                                                                  |
| 11/21/16 | 3470 | 1613 | Annual & Oil & filter (Hemet Ryan Aviation)                                                                                                         |
| 5/5/16   | 3422 |      | Oil & filter (Hemet-Ryan Aviation)                                                                                                                  |
| 11/24/15 | 3385 |      | Oil & filter                                                                                                                                        |
| 10/1/15  | 3365 | 1509 | Annual & Oil & filter (Hemet-Ryan Aviation)                                                                                                         |
| 7/9/15   | 3325 |      | Oil & filter (Hemet-Ryan Aviation)                                                                                                                  |
| 4/2/15   | 3290 |      | Oil & filter (Hemet-Ryan Aviation)                                                                                                                  |
| 1/22/15  | 3256 |      | Right Slick Mag (Gibbs, San Diego)                                                                                                                  |
| 1/12/15  | 3252 |      | Oil & filter; Oil Dipstick O-ring (Hemet-Ryan Av)                                                                                                   |
| 11/10/14 | 3020 |      | 212CW Vacuum pump (Shaw Av, Paso Robles)                                                                                                            |
| 5/22/14  | 3123 |      | Oil & filter                                                                                                                                        |
| 9/13/13  | 2972 |      | Lube turbo waste gate; Oil & filter (Hemet Ryan Av)                                                                                                 |
| 8/2/13   | 2936 |      | Annual (Hemet-Ryan Aviation)                                                                                                                        |
| 7/3/12   | 2725 | 868  | 100 hour (Hemet-Ryan Aviation)                                                                                                                      |
| 6/11/11  | 2507 | 647  | Annual; "replaced turbo inlet hose"                                                                                                                 |
| 5/1/10   | 2401 | 541  | Annual; Oil & filter                                                                                                                                |
| 4/4/09   | 2332 | 472  | Annual; unclear/ambiguous reference to possible 2007 installation of 6 Superior cylinders by "Corona Cylinder and Engine Overhaul"; New spark plugs |
| 1/1/07   | 2136 | 276  | Annual; Mags; External Oil filter installed                                                                                                         |
| 2/2/05   | 2068 | 208  | Annual                                                                                                                                              |
| 11/7/04  | 1860 | 0    | Installed "new TSIO-520 engine" sn 140012-5-C, Annual                                                                                               |
| 10/22/04 |      |      | Overhaul (Corona Cylinder and Engine Overhaul). "Turbo & waste gate OH"                                                                             |

A maintenance entry dated 4/4/09 (Fig 3) appeared to contain a reference to cylinder replacements that occurred in 2007. According to the owner/pilot, the maintenance records did not contain any references to a 2007 overhaul, cylinder replacement or overhaul, or similar. The accident pilot purchased the airplane in 2011, and therefore did not have any direct knowledge of any 2007 maintenance activities. The investigation was unable to determine the circumstances of the event cited in the 4/4/09 entry, or any cylinder maintenance/overhaul activity that was accomplished in 2007.

**HEMET-RYAN AVIATION, INC.**

DATE 11/21/16 COMPLETED 100 HR. INSPECTION AND  
SERVICING OF ENGINE AND PROP. IAW Cessna T210  
SERVICE MANUAL AND 100 HR. CHECKLIST, CHANGED

OIL, ADDED 12 QUARTS - TYPE 15W50 WASHED  
AND RAN ENGINE. ALL OPS NORMAL.

TACH: 3470.17 HOBBS: \_\_\_\_\_

TTSMOH: 1612.97 TSPOH: 1779.35

COMP. TEST: 1) 70 2) 65 3) 50 EX  
4) 60 5) 70 6) 70

**ANNUAL INSPECTION**  
ENGINE  
1) Induction air box has hole chaffed through  
center area. - Patched holes.

I certify that this Engine/Prop has been  
inspected in accordance with a Annual  
inspection and was determined to be in an  
Satisfactory condition.

Authorized Signature \_\_\_\_\_  
\_\_\_\_\_  
Date 11/21/16

Recorded Time 3470.17  
Hemet Ryan Aviation, Inc.  
\_\_\_\_\_  
Hemet California 92545

Figure 1 - Most Recent Annual Inspection

8/8/11 2549.6 changed oil + filter added 10 qts  
A/S 15-50  
Replaced TURBO inlet Hose, checked  
EXHAUST, INTAKE  
Pilot \_\_\_\_\_

Figure 2 - Entry re "Turbo Inlet Hose"

| INSPECTION & MAINTENANCE RECORD |            | INSPECTION OR MAINTENANCE PERFORMED<br>AGENCY & CERTIFICATE NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DATE                            | TOTAL TIME |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 04/04/07                        |            | TSMOH 472.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| TACK                            | 2332       | REPLACED SPARK PLUGS, CHECKED TIMING<br>CHANGED OIL & FILTER, SHELL 100 CHECKED<br>ALT BVT, ALL HOSES, COMPRESSION<br>CHECK ① 79 ② 76 ③ 76<br>④ 79 ⑤ 78 ⑥ 78<br>RETORQUED PROPELLOR LOCK NUTS, CHECKED<br>EXHAUST SYSTEM AND HEAT MUFF<br>INSPECTED THE INSTALLATION OF 6 EACH<br>SA 52006-A22P SUPERIOR CYLINDERS AND<br>2 ea 5-12453-2 LORD MOUNTS BY<br>CORONA CYLINDER AND ENG. OVERHAUL<br>ON APRIL 4 2007<br>I CERTIFY THAT THIS ENGINE WAS INSPECTED<br>ACCORDANCE WITH A MANUAL INSPECTION<br>AND WAS DETERMINED TO BE IN AIRWORTHY<br>CONDITION [REDACTED] FA |

Figure 3 - Entry Alluding to Cylinder Installation

| INSPECTION & MAINTENANCE RECORD |            | INSPECTION OR MAINTENANCE PERFORMED<br>AGENCY & CERTIFICATE NO.                                                                                                                                                                                                  |
|---------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DATE                            | TOTAL TIME |                                                                                                                                                                                                                                                                  |
| 11/7/04                         | 1860.      | TSN-O-<br>INSTALLED NEW TS10-520 ENGINE SERIAL<br>NO. 140013.5-C USING ALL NEW HARDWARE<br>HOSES, LORD MOUNTS, INSTALLATION COMPLETED<br>AS PER MAINTENANCE MANUAL.<br>ADDED 12 QTS MINERAL OIL RUN-UP<br>HOOKED UP NO LEAKS NOTED.<br>[REDACTED] ADD [REDACTED] |
| 11/7/04                         | 1860.      | I CERTIFY THAT THIS ENGINE WAS INSPECTED<br>IN ACCORDANCE WITH AN ANNUAL INSPECTION<br>AND WAS DETERMINED TO BE IN<br>AIRWORTHY CONDITION [REDACTED] FA                                                                                                          |

Figure 4 - 2004 Engine Installation

| INSPECTION & MAINTENANCE RECORD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                |                                                                 |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
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| DATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | TOTAL TIME                     | INSPECTION OR MAINTENANCE PERFORMED<br>AGENCY & CERTIFICATE NO. |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 10/22/04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                | O-SMOH This DATE                                                |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| <p><b>CONTINENTAL TSIO-520-CCM</b> SER# 140012-5-C RAM STC# SA2689SW</p> <p>This engine was cleaned and inspected for overhaul per CONTINENTAL OVERHAUL MANUAL and TABLE OF LIMITS. All steel parts were cleaned, inspected and magnafluxed. The crankshaft was inspected both ndt and ultrasonic by cceo var crank. The rods were cleaned, inspected, rebushed and magnafluxed and certified. The camshaft was new and furnished by lycon engines inv, # 51504. The lifter s were o/h'd by aircraft spec w/o # 139828/134646. The cylinders were o/hd by cceo and chromed. Port and polish by performance aero. The engine was reassembled in accordance with CONTINENTAL OVERHAUL MANUAL and TABLE OF LIMITS. The following parts were replaced at overhaul</p> <table border="0"> <tr> <td>8 ea. aec 642720 std main bearings</td> <td>12ea. Sa630826 rod beari</td> <td>6ea. 536379 screws</td> </tr> <tr> <td>e641250 crankshaft seal</td> <td>2 ea. 653547 std main bearings</td> <td>4ea. 535666 screws</td> </tr> <tr> <td>12 ea 628109 rod nuts</td> <td>12 ea sa 629340 rod bolts</td> <td>6 ea 530658 rod bushings</td> </tr> <tr> <td>2 ea. 639195 cw bushings</td> <td>2 ea. 639196 cw bushings</td> <td>6 ea. 536379 crankshaft bolts</td> </tr> <tr> <td>6 ea sa 646277 lifters</td> <td>1ea. slick kit mags pr</td> <td>16ea. 639193 c/w bushings</td> </tr> <tr> <td>4 ea 537019 camshaft bolts</td> <td>2 ea 643626-104 pins</td> <td>4 ea 643626-101 pins</td> </tr> <tr> <td>2 ea 643626-103 c/w pins</td> <td>16 ea 629104 circlip</td> <td>16 ea 643629 plates</td> </tr> <tr> <td>2 ea ms 35756-8 wood keys</td> <td>10 ea 654439-1 int hoses</td> <td>16 ea 631972 int clamps</td> </tr> <tr> <td>1ea537721 needle bearing</td> <td>2 ea 629163-5 double clamp</td> <td>. 639150 oil pressure spring</td> </tr> <tr> <td>1 ea. 535810 case bolts</td> <td>4 ea. aec 646288 thrust wash</td> <td>1ea. 655384c camshaft</td> </tr> <tr> <td>6 ea. 628488 lifters</td> <td>8 ea. 350998 crank damp bush</td> <td>2 ea 531178 mag retainer</td> </tr> <tr> <td>1 ea starter drive adp o/h</td> <td>1 ea 1f1884 oil cooler o/h</td> <td>2 ea. sa632443a-4 trans. Coller nut</td> </tr> <tr> <td>4 ea 628321-.38 bolts</td> <td>1 ea. turbo and waste gate o/h</td> <td>4 ea 638172 bushing</td> </tr> <tr> <td>1 ea. cam 08k1 m28 st. adp. kit</td> <td>2 ea. sa 25102 seals</td> <td>1 ea.m-model fuel sys. West. Sky17872 w/o</td> </tr> <tr> <td>1 ea. prop gov. o/h ac prop.</td> <td>18 ea. as 3578-011 o-rings</td> <td>1ea. sa537721 bearing</td> </tr> <tr> <td>24 ea. 534610 seals</td> <td>4 ea. 638172 bushings</td> <td>12 ea. 630979 0-rings</td> </tr> <tr> <td>1ea. 631684 0/p gear</td> <td></td> <td></td> </tr> </table> <p>. All pertinent data on file at Corona Cylinder and Engine Overhaul, Inc. under work order 10728<br/>F.A.A. REPAIR STATION# 09VR726Y</p> <p>Signed _____ Dated October 22, 2004</p> |                                |                                                                 | 8 ea. aec 642720 std main bearings | 12ea. Sa630826 rod beari | 6ea. 536379 screws | e641250 crankshaft seal | 2 ea. 653547 std main bearings | 4ea. 535666 screws | 12 ea 628109 rod nuts | 12 ea sa 629340 rod bolts | 6 ea 530658 rod bushings | 2 ea. 639195 cw bushings | 2 ea. 639196 cw bushings | 6 ea. 536379 crankshaft bolts | 6 ea sa 646277 lifters | 1ea. slick kit mags pr | 16ea. 639193 c/w bushings | 4 ea 537019 camshaft bolts | 2 ea 643626-104 pins | 4 ea 643626-101 pins | 2 ea 643626-103 c/w pins | 16 ea 629104 circlip | 16 ea 643629 plates | 2 ea ms 35756-8 wood keys | 10 ea 654439-1 int hoses | 16 ea 631972 int clamps | 1ea537721 needle bearing | 2 ea 629163-5 double clamp | . 639150 oil pressure spring | 1 ea. 535810 case bolts | 4 ea. aec 646288 thrust wash | 1ea. 655384c camshaft | 6 ea. 628488 lifters | 8 ea. 350998 crank damp bush | 2 ea 531178 mag retainer | 1 ea starter drive adp o/h | 1 ea 1f1884 oil cooler o/h | 2 ea. sa632443a-4 trans. Coller nut | 4 ea 628321-.38 bolts | 1 ea. turbo and waste gate o/h | 4 ea 638172 bushing | 1 ea. cam 08k1 m28 st. adp. kit | 2 ea. sa 25102 seals | 1 ea.m-model fuel sys. West. Sky17872 w/o | 1 ea. prop gov. o/h ac prop. | 18 ea. as 3578-011 o-rings | 1ea. sa537721 bearing | 24 ea. 534610 seals | 4 ea. 638172 bushings | 12 ea. 630979 0-rings | 1ea. 631684 0/p gear |  |  |
| 8 ea. aec 642720 std main bearings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 12ea. Sa630826 rod beari       | 6ea. 536379 screws                                              |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| e641250 crankshaft seal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2 ea. 653547 std main bearings | 4ea. 535666 screws                                              |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 12 ea 628109 rod nuts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12 ea sa 629340 rod bolts      | 6 ea 530658 rod bushings                                        |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 2 ea. 639195 cw bushings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2 ea. 639196 cw bushings       | 6 ea. 536379 crankshaft bolts                                   |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 6 ea sa 646277 lifters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1ea. slick kit mags pr         | 16ea. 639193 c/w bushings                                       |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 4 ea 537019 camshaft bolts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2 ea 643626-104 pins           | 4 ea 643626-101 pins                                            |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 2 ea 643626-103 c/w pins                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 16 ea 629104 circlip           | 16 ea 643629 plates                                             |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 2 ea ms 35756-8 wood keys                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10 ea 654439-1 int hoses       | 16 ea 631972 int clamps                                         |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 1ea537721 needle bearing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2 ea 629163-5 double clamp     | . 639150 oil pressure spring                                    |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 1 ea. 535810 case bolts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4 ea. aec 646288 thrust wash   | 1ea. 655384c camshaft                                           |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 6 ea. 628488 lifters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8 ea. 350998 crank damp bush   | 2 ea 531178 mag retainer                                        |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 1 ea starter drive adp o/h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1 ea 1f1884 oil cooler o/h     | 2 ea. sa632443a-4 trans. Coller nut                             |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 4 ea 628321-.38 bolts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1 ea. turbo and waste gate o/h | 4 ea 638172 bushing                                             |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 1 ea. cam 08k1 m28 st. adp. kit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2 ea. sa 25102 seals           | 1 ea.m-model fuel sys. West. Sky17872 w/o                       |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 1 ea. prop gov. o/h ac prop.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 18 ea. as 3578-011 o-rings     | 1ea. sa537721 bearing                                           |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 24 ea. 534610 seals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4 ea. 638172 bushings          | 12 ea. 630979 0-rings                                           |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |
| 1ea. 631684 0/p gear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                |                                                                 |                                    |                          |                    |                         |                                |                    |                       |                           |                          |                          |                          |                               |                        |                        |                           |                            |                      |                      |                          |                      |                     |                           |                          |                         |                          |                            |                              |                         |                              |                       |                      |                              |                          |                            |                            |                                     |                       |                                |                     |                                 |                      |                                           |                              |                            |                       |                     |                       |                       |                      |  |  |

Figure 5 - 2004 Engine & "Turbo" Overhaul

#### D. JULY 2017 TOP OVERHAUL INFORMATION

A "top overhaul" is an informal term for an overhaul of cylinders and some associated hardware, that excludes case separation or overhaul or replacement of crankshaft, camshaft, and certain associated internal components (e.g. bearings). According to the pilot, a top overhaul on this engine was completed a few weeks, and about 11 flight hours, before the accident.

Review of maintenance records indicated that an FAA certificated repair shop (approved to conduct maintenance on all models of Continental engines (among others) known as "Procraft Aviation," and based at Corona Airport (AJO) Corona, California, accomplished the disassembly and reassembly of the engine; the cylinder overhauls were conducted by another AJO-based FAA-certificated repair facility, Corona Aircraft Engines (formerly "Corona Aircraft and Engine Overhaul"). The engine logbook indicated that the work was completed on July 12, 2017.

Based on the documentation, five of the six cylinders were from the engine and were overhauled, and the sixth was an overhauled cylinder from another, unspecified source. The records did not indicate which cylinders were installed in which positions. All cylinders were provided with new pistons, piston pins, ring sets, valves, valve guides and springs, and rocker shafts.

| INSPECTION & MAINTENANCE RECORD                                                                                                                                                                                                                                                                                                                                                                                            |                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| TOTAL TIME                                                                                                                                                                                                                                                                                                                                                                                                                 | INSPECTION OR MAINTENANCE PERFORMED<br>AGENCY & CERTIFICATE NO. |
| Tach: 3523                                                                                                                                                                                                                                                                                                                                                                                                                 | Aircraft Model- Cessna T210F N6109R W.O.# 21655 7/12/17         |
| <p>Removed and reinstalled all cylinders after overhaul. All cylinder work performed by Corona Aircraft Engines under w.o.# H147. Changed oil and filter, Replaced airfilter. New engine mounts installed and induction coupling heat shields installed. All sprkplugs cleaned gapped and tested / Ignition harness tested. Magneto timing checked Fuel flow / Pressures sert in accordance with Continental SID 97-3G</p> |                                                                 |
| <p>For Procraft Aviation, Inc.<br/>FAA Certified Repair Station J13R606L</p>                                                                                                                                                                                                                                                                                                                                               |                                                                 |
| <p>Signed _____<br/>Stephen Panagotacos</p>                                                                                                                                                                                                                                                                                                                                                                                |                                                                 |

Figure 6 - Log Entry re Most Recent Top Overhaul

**Corona Aircraft Engines, Inc.**

Corona, CA 92880

FAA Certified Repair Station O9VR726Y

Phone # [REDACTED] m

Fax # [REDACTED]



| Date      | Invoice # |
|-----------|-----------|
| 7/12/2017 | 2015093   |

|                                                                   |
|-------------------------------------------------------------------|
| <b>Bill To</b>                                                    |
| RANDY RECORD<br>[REDACTED]<br>SAN JACINTO, CA 92581<br>[REDACTED] |

|                |
|----------------|
| <b>Ship To</b> |
| PROCRAFT       |

| WORK ORDER | MAKE        | MODEL    | SERIAL NUMBER | Terms          |
|------------|-------------|----------|---------------|----------------|
| H147       | CONTINENTAL | TSIO-520 | N/A           | Due on receipt |

| Quantity  | Description                        | Rate | Amount |
|-----------|------------------------------------|------|--------|
| 1         | CYLINDER STUD ASSEMBLY EXCHANGE    |      |        |
| 5         | CYLINDER OVERHAUL LABOR ONLY       |      |        |
| 6         | EXHAUST VALVE                      |      |        |
| 6         | INTAKE GUIDE                       |      |        |
| 6         | GUIDE EXHAUST                      |      |        |
| 12        | VALVE SPRING                       |      |        |
| 12        | VALVE SPRING                       |      |        |
| 24        | VALVE KEEPER                       |      |        |
| 6         | PISTON STANDARD G/TSIO 520         |      |        |
| 6         | INTAKE GUIDE SEAL                  |      |        |
| 6         | RING SET                           |      |        |
| 6         | GASKET SET SINGLE CYLINDER 520/550 |      |        |
| 12        | ROCKER SHAFT                       |      |        |
| 6         | PISTON PIN 520/550                 |      |        |
| C/c #1839 |                                    |      |        |

Form 101 **MAINTENANCE RELEASE STATEMENT**

The Aircraft or Component identified above was repaired and inspected in accordance with the current F.A.A. regulations and is approved to return to service. Pertinent details of work are kept on file at this facility under

Work Order No. \_\_\_\_\_

Date: \_\_\_\_\_

Signed \_\_\_\_\_ For

Corona Aircraft Engines, Inc. FAA Repair Station O9VR726Y

|                   |            |
|-------------------|------------|
| Subtotal          | [REDACTED] |
| Sales Tax (7.75%) | [REDACTED] |
| <b>Total</b>      | [REDACTED] |

Payments/Credits \$0.00

**Balance Due** [REDACTED]

**Figure 7 - "Corona" Top Overhaul Parts Invoice**

## PROCRAFT AVIATION, INC.

Corona, California 92880-9602

REPAIR ORDER

NAME: Bandy Record DATE: 7/12/17

ADDRESS: [REDACTED] CITY: [REDACTED]

AIRCRAFT: Mike SERIAL NO: [REDACTED]

ENGINE: C-210B R OR FWD: [REDACTED]

REGISTRATION NO: N6109R L OR AFT: Tach 3523

APPROX ESTIMATE \$ 100/Hr LABOR \$ [REDACTED] PARTS \$ [REDACTED]

| COST | QTY | PARTS                | PRICE EACH | TOTAL | DESCRIPTION                                     | OPER NO. | DESCRIPTION | LABOR CHARGE |
|------|-----|----------------------|------------|-------|-------------------------------------------------|----------|-------------|--------------|
|      | 4   | Eng Mount            |            |       | 6.0 Replace Engine Mounts                       |          |             |              |
|      | 10  | Induction Carburetor |            |       | 3.0 Set Fuel Flow/Pressure Per STB 97-301 Boost |          |             |              |
|      | 1   | Rocker Carburetor    |            |       | 1.0 Inspect & Test Ignition Hardware            |          |             |              |
|      | 3   | Sparkplugs           |            |       | Clean, Cap & Test Sparkplugs                    |          |             |              |
|      | 3   | Heat Shield          |            |       | Install New Induction Heat Shield               |          |             |              |
|      | 12  | Oil Filter           |            |       | Replace Air Filter                              |          |             |              |
|      | 1   | Oil Filter           |            |       | Change Oil & Filter                             |          |             |              |
|      | 1   | Exhaust Hauling      |            |       | Repair Engine/Lubricator Control Valve          |          |             |              |
|      | 1   | Exhaust Ducting      |            |       |                                                 |          |             |              |
|      | 1   | Air Filter           |            |       |                                                 |          |             |              |
|      | 1   | Air Clamp            |            |       |                                                 |          |             |              |
|      |     | TOTAL PARTS          |            |       |                                                 |          |             |              |
|      |     | OUTSIDE WORK         |            |       |                                                 |          |             |              |
|      |     | TOTAL OUTSIDE WORK   |            |       |                                                 |          |             |              |

**MAINTENANCE RELEASE STATEMENT**

The Aircraft or Component identified above was repaired and inspected in accordance with the current F.A.R. regulations and is approved to return to service. Pertinent details of the repair are on file at this agency under work order.

No. 21655 Date 7/12/17

Signed [Signature] for [Signature]

**CUSTOMER SALES SUMMARY**

LABOR

PARTS

OUTSIDE WORK

GAS OIL SOLVENT

FREIGHT

TAX

TOTAL AMOUNT

Figure 8 - "Procraft" Top Overhaul and Parts Invoice