ERA15LA062

Hampton, South Carolina

November 28, 2014

Cirrus Design Corp. SR22T

N227RR

NTSB ENGINE EXAMINATION REPORT

36 Embedded Photographs

May 18,19 and 20, 2015

PARTICIPANTS IN THE EXAMINATION

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HISTORY OF FLIGHT

On November 28, 2014, about 1158 eastern standard time, a Cirrus Design Corporation SR22T, N227RR, descended under canopy of the cirrus airframe parachute system (CAPS) and landed into a wooded area near Hampton-Varnville Airport (3J0), Hampton, South Carolina. The private pilot and two passengers sustained minor injuries, while one passenger sustained serious injuries. The airplane was substantially damaged. The airplane was registered to and operated by Header Bug LLC, under the provisions of 14 Code of Federal Regulations (CFR) Part 91 as a personal flight. Visual meteorological conditions prevailed at the time and an instrument flight rules flight plan was filed. The flight originated from Sarasota/Bradenton International Airport (SRQ), Sarasota, Florida, about 0933 EST, and was destined for Orangeburg Municipal Airport (OGB), Orangeburg, South Carolina.

The pilot stated that the purpose of the accident flight was pleasure. He intended to fly to OGB, which was the half way mark of the flight; however, the ultimate destination was to an airport in Leesburg, Virginia.

After takeoff with full quantity of engine oil, the flight proceeded towards the destination airport. The pilot further stated that he checked the engine parameters; noting all readings citing specifically (oil temperature, oil pressure, and CHT) were in the green. About 3 minutes later, while flying at 9,000 feet mean sea level with the mixture leaned to the mark and the engine between 65 and 70 percent power, or 2,400 rpm, he heard an audible warning that the oil pressure was zero. The airplane at that time was near Savannah, or about 50 to 60 miles from OGB. The engine power went to idle, and he did not hear any sounds from the engine which was running smooth but was idled back. He reported he had no control over the power, and did not observe any oil or mist coming out of the engine and did not notice any smoke from the engine from oil getting onto a hot exhaust. He also reported he did not hear a change in sound from the propeller as if the propeller had changed pitch, and the propeller never stopped. The passenger in the right front seat read the display on the multi-function display (MFD) that the oil pressure displayed in the red showing 0 oil pressure. In addition, on the primary flight display (PFD) a red highlighted "WARNING" about the oil pressure displayed. He fully enrichened the mixture control and moved the throttle in an attempt to restore engine power but there was no result. Using the on-board avionics he confirmed the nearest airport was 3J0, which ATC confirmed. The controller called to the 3J0 airport to inform personnel there of his situation, and he descended at 98 knots (best glide speed is 88 knots).

The pilot stated that after realizing he was unable to land at 3J0, he informed the passengers to tighten their restrains (seatbelts and shoulder harnesses) before activating the CAPS, and pulled the CAPS activation handle at 800 feet; he did not recall the airspeed at chute pull. He reported that the engine stayed at idle during the descent, and while under canopy, the tail came down just as the airplane hit the trees. He attributed this to the altitude of deployment. A portion of a wing was knocked off and the tail was almost separated. The airplane descended to the ground, and he reported the contact was hard.

The airplane came to rest about ¾ nautical mile and 110 degrees from the approach end of runway 29 at 3J0.

Following inspection of the airframe and engine by representatives of the airplane and engine

manufacturer with NTSB oversight, the engine was removed, and placed in a crate for shipping to Continental Motors, Inc., located in Mobile, Alabama.

ENGINE INFORMATION

Engine Manufacturer: Continental Motors
Engine Model Number: TSIO-550-K
Engine Serial Number: 1010829
Time Since New: 51.7 hours
Built: August 15, 2014

INITIAL EXAMINATION AS RECEIVED[1]

The engine was received crated and sealed. After removal of the crate, the engine was examined and the following items were noted included in the shipping crate; however, had been removed from the engine and placed in bubble wrap for shipment:

Item	Part Number	Serial Number
CMI/Hartzell Turbocharge Controller	646318-13	H-RGN00068
CMI/Hartzell Overboost Valve	639319-26 7	H-RFN00017
CMI/Hartzell Wastegate	646317-1 6	H-RGN00016
Niagara Thermal Intercooler	20449A	E14-11677-218
Niagara Thermal Intercooler	20449A	B14-11677-102
Hartzell Alternator[2]	657119H	H0070383

As well as various parts of baffling, air filter, and air flow tubing.

The following items were noted as damaged during the examination:

- Impact crush damage to Cylinder No. 5 exhaust riser (Photo 14)
- Throttle Cable disconnected from throttle body/metering unit[3] (Photo 13 and 20)
- Aneroid adjustment screw on the engine driven fuel pump was bent (Photo 18).
- Cylinder No. 5 rocker box covers exhibited impact damage on the lower approximate 1 inch of the cover

The engine was mounted to a portable cart utilizing mount legs for further examination and engine run preparation.

[1] All engine directions are as viewed from the pilot seat when mounted on the airplane
[2] There were two (2) alternators associated with this engine, alternator No. 1 remained attached to the front of the engine, as described below, alternator No. 2 had been removed as noted in the table above.
[3] According to photographs taken by a representative of CMI the throttle arm on the throttle body was attached as first viewed at the salvage facility prior to shipment

Photo 1: Side View of Engine Crate

Photo 2: Shipping NTSB Label as Viewed (Serial Number Verified as Correct)

Photo 3: Front View of Shipping Crate

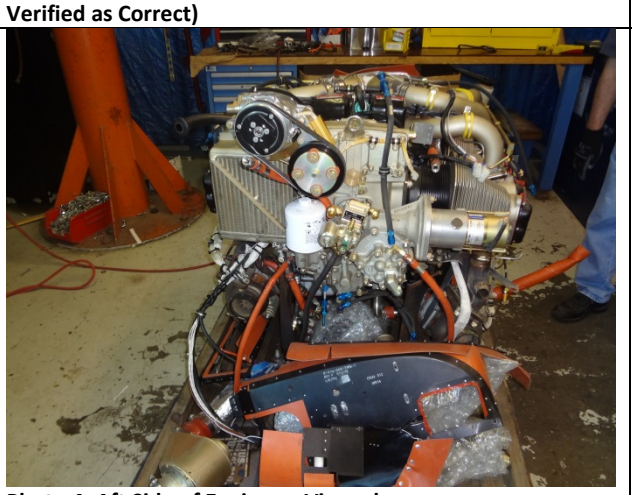

Photo 4: Aft Side of Engine as Viewed

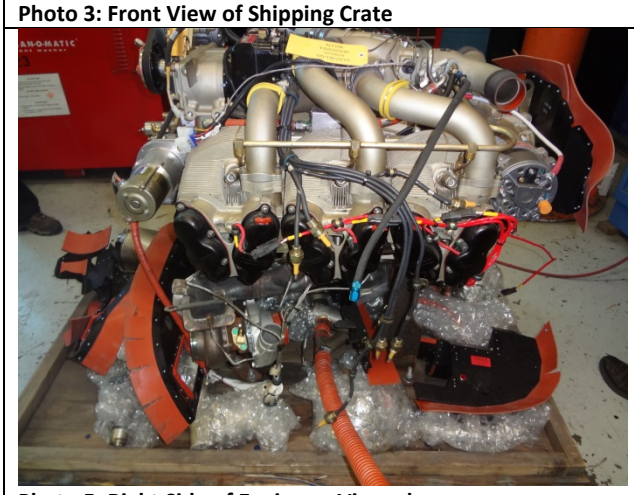

Photo 5: Right Side of Engine as Viewed

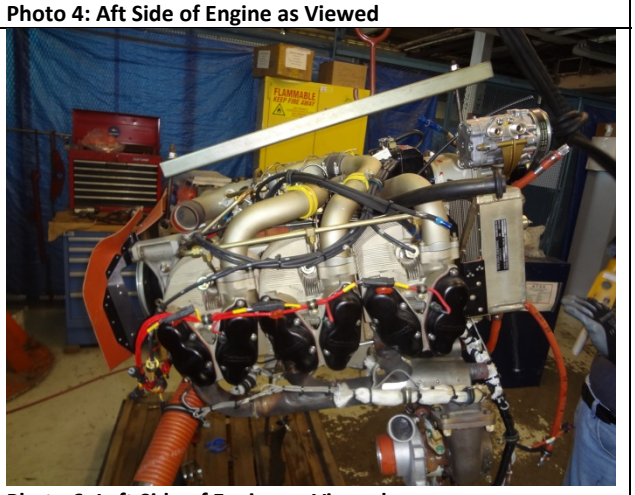

Photo 6: Left Side of Engine as Viewed

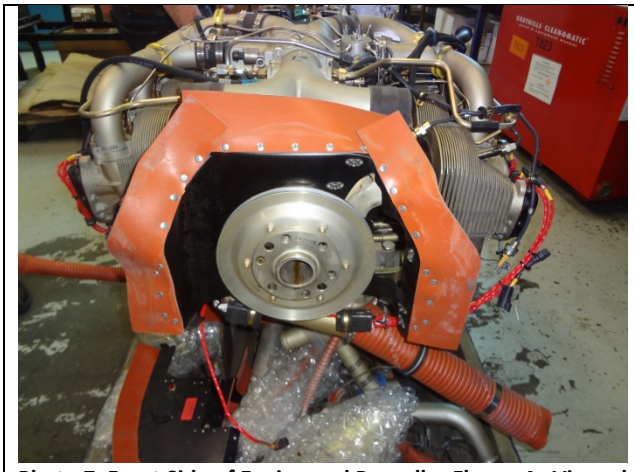

Photo 7: Front Side of Engine and Propeller Flange As Viewed

Photo 8: Top of Engine as Viewed

Photo 9: Items Received - Removed

Photo 10: Items Received - Removed

DETAILED EXAMINATION

During examination the oil dipstick was found in place, examined and revealed about 8 quarts of oil. The oil was drained and appeared free of debris and was unremarkable. The oil pump cover which had been previously removed at the salvage facility, was re-strung with silk thread. Numerous fuel and oil lines were not sent with the engine and stock lines were utilized to facilitate the engine run. The Nos. 1, 3, and 5 exhaust riser was replaced with a similar riser, due to impact damage noted at the No. 5 cylinder elbow. The intercoolers were reattached to the engine. Fuel lines were reattached.

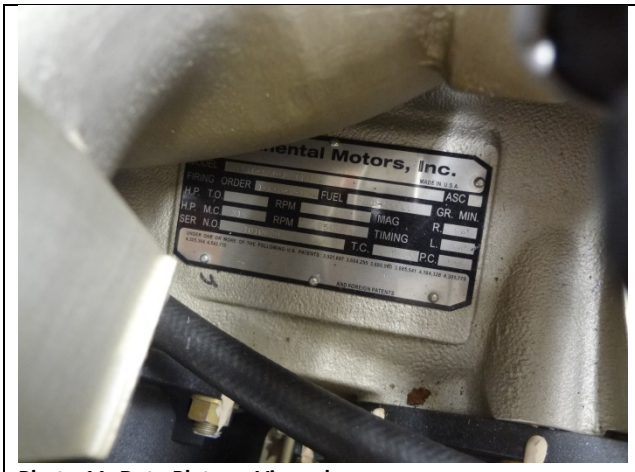

Photo 11: Data Plate as Viewed

Photo 12: Oil Pump as Viewed

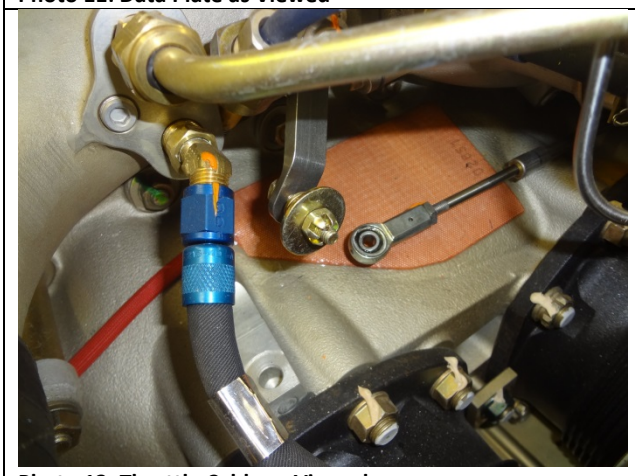

Photo 13: Throttle Cable as Viewed

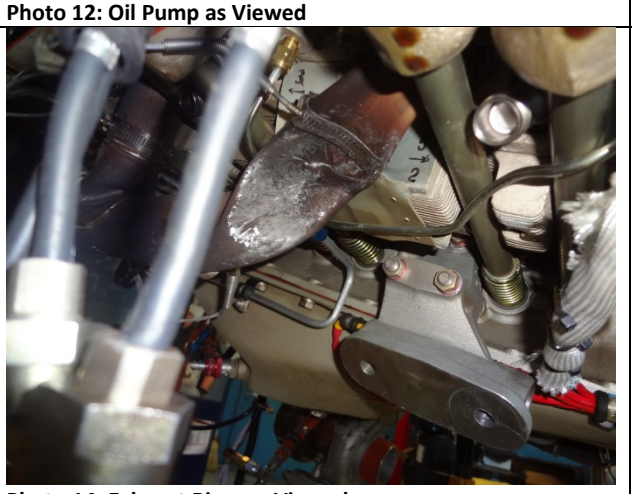

Photo 14: Exhaust Riser as Viewed

Engine Crankcase

The engine crankcase had a Serial No. R146A330 and the crankshaft Serial No. N14EA074. The cylinders Serial Nos. were:

Cylinder 1: AC14FA478
Cylinder 2: AC14FA399
Cylinder 3: AC14FA478
Cylinder 4: AC14FA402
Cylinder 5: AC14FA099
Cylinder 6: AC14FA312

The oil cooler was manufactured by Niagara Thermal, Part No. 10281A, Serial No. B14-11679-117. It remained attached to the engine.

No defects or abnormalities were noted that would preclude and engine test run.

Propeller Governor

The propeller Governor was manufactured by Hartzell, Model No. 8-1-44F, Serial No. G2153NJ. The unit was removed, as it was not needed for the engine run. The oil screen was examined and was free of debris and unremarkable.

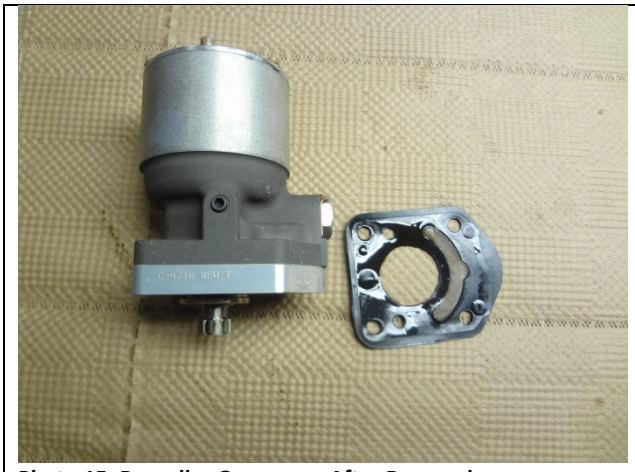

Photo 15: Propeller Governor - After Removal

Photo 16: Propeller Governor Gear Teeth

Starter Motor

Skytec, Part No. C24T3, Serial Number 4C3-271420.The unit remained attached to the rear accessory pad of the engine.

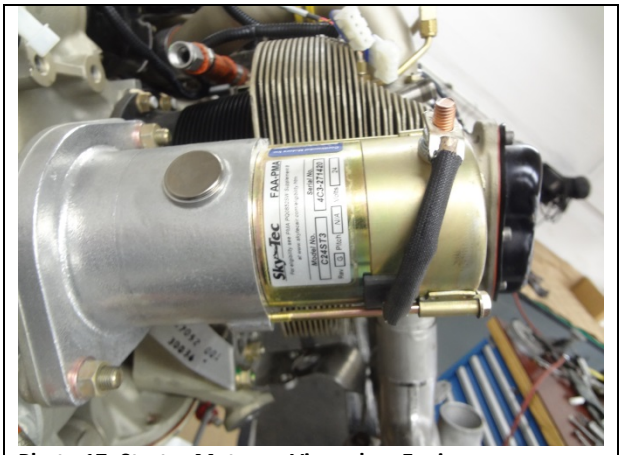

Photo 17: Starter Motor as Viewed on Engine

Alternator

Hartzell, Part No. 656802, Serial Number H-0071153 and remained attached to the right front section of the engine. The other alternator had been removed prior to shipment as noted above.

Photo 18: Alternator as Viewed Mounted on Engine

Engine Driven Fuel Pump

The engine driven fuel pump remained attached to the rear side of the engine. The pump was unremarkable except for the aneroid adjustment set screw which was bent in the negative direction about 45 degrees and to the right about 10 degrees.

Photo 19: Engine Driven Fuel Pump as Viewed

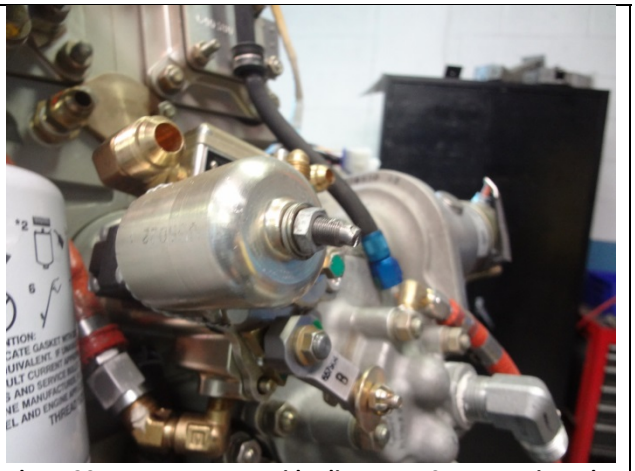

Photo 20: Damage to Aneroid Adjustment Screw as Viewed

Turbocharger

Was manufactured by Hartzell, the right hand unit, Part number 646677, Serial No H-RGL00112. The left hand unit was Part No. 646677, Serial No. H-RGL00078

Magnetos

The magnetos remained in place on the engine and securely mounted to the accessory pad.

Left Magneto

The left magneto was a CMI manufactured, Part No. 10-500556-101, Serial No. D146A334. The magneto was found timed at 25°. Optimal timing was 24°.

Right Magneto

The right magneto was a CMI manufactured, Part No. 10-500556-101, Serial No. D146A332. The magneto was found timed at 26°. Optimal timing was 24°.

Photo 21: Both Magnetos as Viewed Mounted to Engine

Ignition Harness

The harness was manufactured by CMI, Part No. 10-421674-21, Serial No. K146.

Sparkplugs

The sparkplugs were Tempest, Part No. URHB32E. The top sparkplugs were removed to check compression. The top sparkplugs appeared normal in color and like new.

Photo 22: Top Spark Plugs

Throttle Body Metering Unit

Was manufactured by CMI, Part No. 656785-4, Serial No. A146A184. The interface plate was examined and the torque stripe remained in place, with no evidence of slippage. The throttle body operated as expected and no abnormalities were noted.

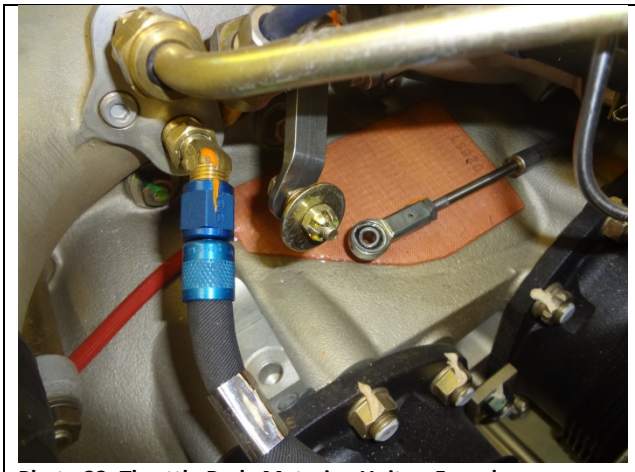

Photo 23: Throttle Body Metering Unit as Found

Photo 24: Throttle Body Interface Plate Torque Stripe as Found

Fuel Manifold

The fuel manifold was manufactured by CMI, Part No. 646433-13A1, Serial No. C146A111. The unit remained attached to the top of the engine and looked unremarkable.

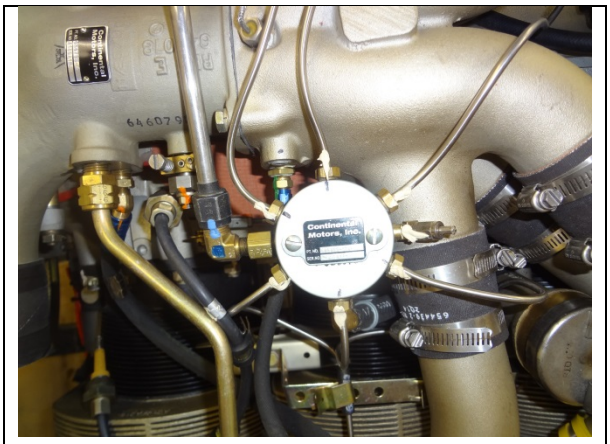

Photo 25: Fuel Manifold as Viewed Mounted on Top of Engine

Oil Pressure Transducer Wiring

The oil pressure transducer electrical wiring was examined. The wire remained attached to the plug unit and wire continuity was confirmed from the plug to the firewall. Wire continuity was confirmed from the oil pressure plug to ports marked "B" and "C" on the firewall connector plug, as expected. The shielded line was traced from the oil pressure plug to a bundled ground line with continuity confirmed from oil pressure plug, to the soldered bundle, to the recovery cut made to separate the engine from the airframe.

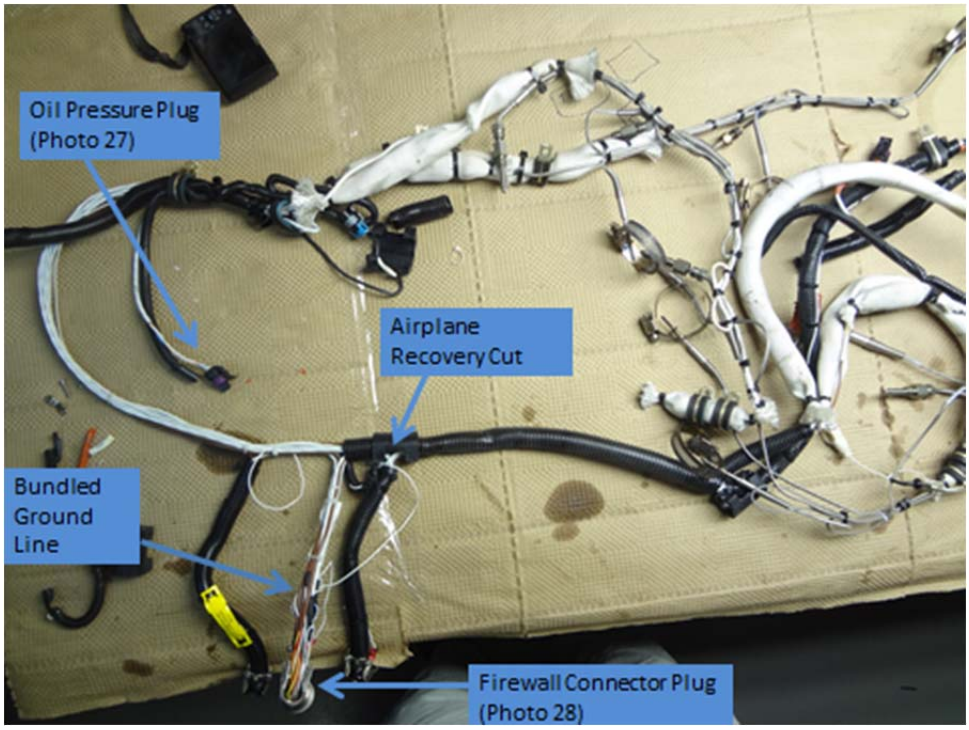

Photo 26: Oil Pressure Transducer Wiring

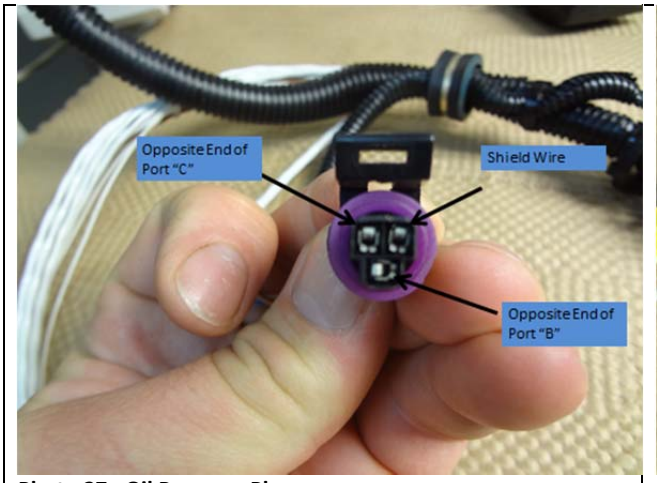

Photo 27 : Oil Pressure Plug

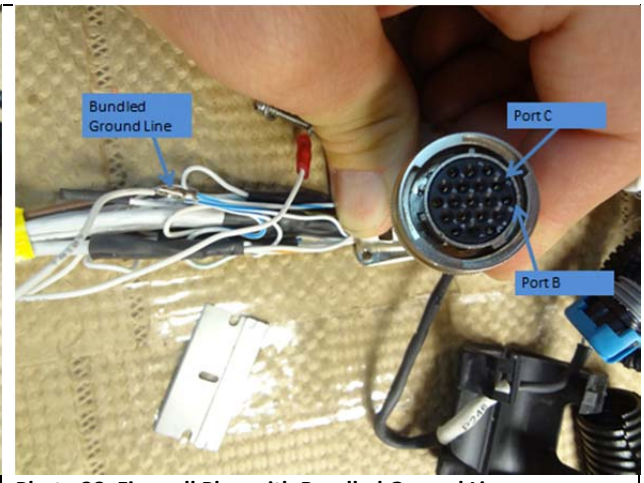

Photo 28: Firewall Plug with Bundled Ground Line

Compression Test

	Pre-Engine Run	Post Engine Run
Cylinder No. 1	65/80	75/80
Cylinder No. 2	71/80	77/80
Cylinder No. 3	67/80	74/80
Cylinder No. 4	73/80	74/80
Cylinder No. 5	50/80	75/80
Cylinder No. 6	71/80	70/80

The end play on the crankshaft was 0.011 inches with a run out of 0.004 of an inch of deflection.

ENGINE RUN

The engine was mounted in a test stand and fitted with a test cell propeller. Prior to engine start 8 quarts of oil was added to the oil reservoir. During the first engine run attempt the oil pump was

noted as having a leak. The engine was secured, the oil pump cap was removed, and the silk thread was repositioned. The oil pump cap was reinstalled. The engine was started and the oil pressure was noted as 76 psi; however, within moments the oil pressure stabilized about 62 psi. The engine run began. During the run the following was noted:

Engine RPM	Oil Temp °C	Oil Pressure (psi)
2442	197	60
2452	215	56
1740	226	46
772	217	18
1300	200	40

The engine was idled and no hesitations were noted. The engine was shutdown and removed from the test cell to perform the hot compression checks. The engine operated at various power settings, as indicated in the engine run report in Appendix A, and no abnormalities or malfunctions were noted.

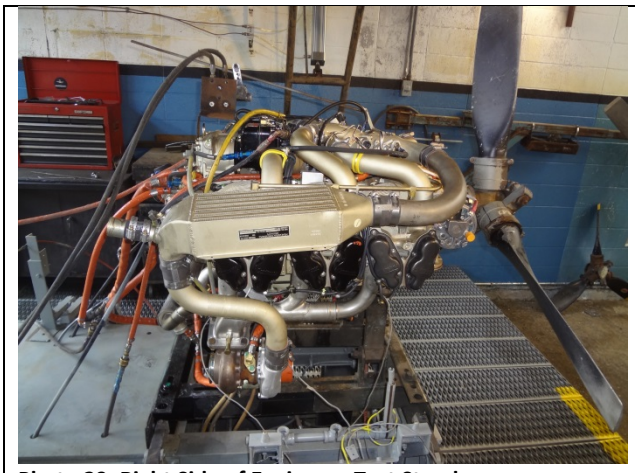

Photo 29: Right Side of Engine on Test Stand

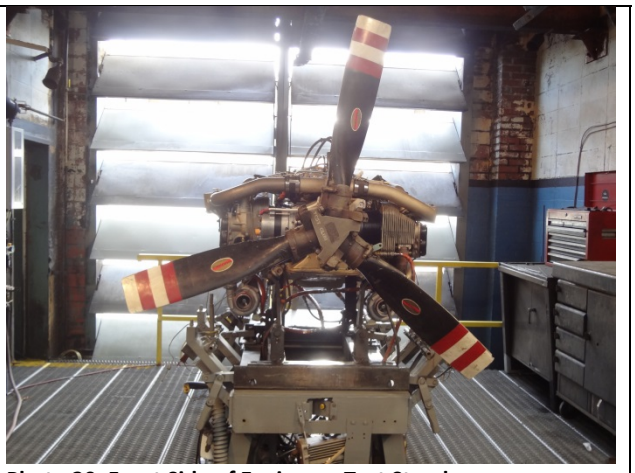

Photo 30: Front Side of Engine on Test Stand

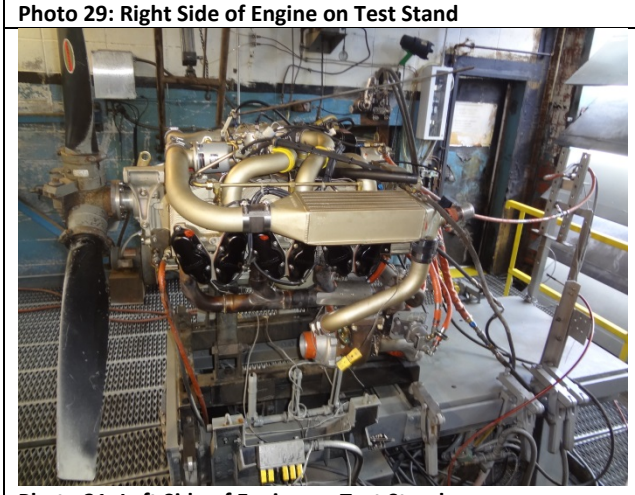

Photo 31: Left Side of Engine on Test Stand

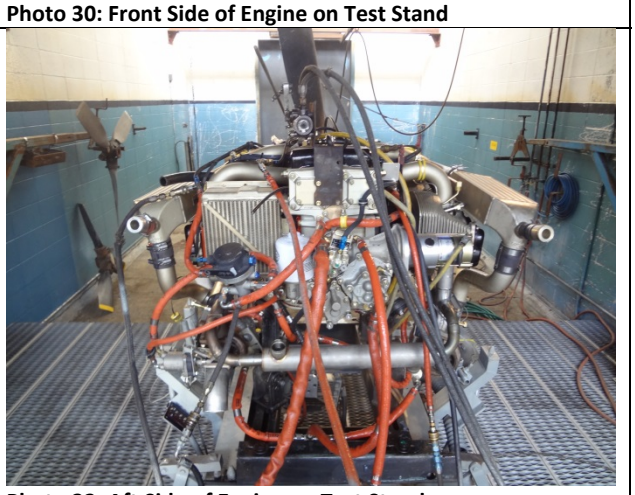

Photo 32: Aft Side of Engine on Test Stand

FUTURE ACTIVITES

None are planned at this time for this engine. The stock lines, and Nos.1, 3, and 5 exhaust riser were removed. The No. 5 rocker box covers were left on the No. 5 Cylinder and the original

items were bagged and placed within the shipping crate. Miscellaneous hard ware was placed in bags and placed within the shipping crate. The oil was drained from the engine and looked normal in appearance. The engine was re-crated and sealed in the shipping container in front of this investigator and noted as secured. The engine will be returned to storage at Continental Motors in Mobile, Alabama in preparation for shipment as/when authorized by the Investigator-In-Charge (IIC) in preparation for release by the National Transportation Safety Board IIC.

Photo 33: Engine Mounted in Shipping Crate - Post Run

Photo 34: Left side of engine remounted in shipping crate

Photo 35: Front side of engine and misc hardware

Photo 36: Shipping crate resealed

APPENDIX INDEX

- Appendix A – Engine Run Report

APPENDIX A

Engine Run Report