# Continental Motors

# ENGINE EXAMINATION REPORT

| | |
|---|---|
| **ENGINE MODEL** | IO-550-N7B |
| **ENGINE SERIAL NUMBER** | 685788 |
| **AIRCRAFT MAKE & MODEL** | Cirrus SR22 |
| **AIRCRAFT SERIAL NUMBER** | 0064 |
| **AIRCRAFT REGISTRATION** | N451TD |
| **FILE NUMBER** | 17-508 |

| NAME | SIGNATURE | DATE |
|---|---|---|
| Nicole L. Charnon | [redacted] | 04/21/2018 |

Template Issue Date: 06/2017

## GENERAL INFORMATION

| EXAMINATION | | ACCIDENT DATA | |
|---|---|---|---|
| **DATE** | 04/20/2018 | **NTSB ACCIDENT #** | CEN18FA144 |
| **FACILITY** | Accident Site | **NTSB INVESTIGATOR** | Josh Lindberg |
| **ADDRESS** | [redacted]<br>Williamsburg, PA 16693 | **FAA INVESTIGATOR** | Michael Shannon |
| | | **ACCIDENT DATE** | 04/19/2018 |
| | | **ACCIDENT LOCATION** | Williamsburg, PA |

## ENGINE INFORMATION

| | |
|---|---|
| **ENGINE POSITION** | Single Engine |
| **TOTAL TIME** | Unknown |
| **TIME SOH** | Unknown |
| **TYPE & TIME SLI** | Unknown |
| **BUILD DATE** | 06/13/2001 |
| **IN SERVICE DATE** | Unknown |

**Significant logbook information:**

The aircraft maintenance records have not been received or reviewed at the time of this report's writing.

**Report Summary:** Search Code(s): 15-12-68

The engine was embedded in a crater and sustained significant impact damage. However, examination of the engine and engine-related components revealed no pre-accident anomalies that would have affected the engine's ability to produce full, rated power.

**Disposition of engine following exam:**

The engine was recovered along with the remaining wreckage by AMF Aviation and will be stored in their Springfield, Massachusetts facility upon final release by the NTSB investigator-in-charge (IIC).

| INSPECTION WITNESSES | | | |
|---|---|---|---|
| **NAME** | Nicole L. Charnon | **NAME** | Josh Lindberg |
| **ADDRESS** | Washington, DC | **ADDRESS** | Dallas, TX |
| **ORGANIZATION** | Continental Motors | **ORGANIZATION** | NTSB – Central Region |
| **PHONE** | [redacted] | **PHONE** | [redacted] |
| | | | |
| **NAME** | Michael Shannon | **NAME** | Brad Miller |
| **ADDRESS** | Pittsburgh, PA | **ADDRESS** | Duluth, MN |
| **ORGANIZATION** | FAA – Pittsburgh FSDO | **ORGANIZATION** | Cirrus Aircraft |
| **PHONE** | [redacted] | **PHONE** | [redacted] |

## EXTERNAL ENGINE CONDITION

The engine was buried in a crater that was associated with the initial impact area. The engine was pulled from the crater utilizing a backhoe. The airframe mounts and nose landing gear brace remained attached to the engine as did the firewall. The throttle, mixture, and propeller control cables remained attached to their respective control levers. The cables and electrical wires were cut to facilitate the removal of the firewall. The front portion of the oil sump was flattened up against the bottom side of the engine while the aft portion of the oil sump was torn away and displaced aft, exposing the bottom crankcase halves.

The three-blade, constant speed propeller remained attached to the crankshaft, but two of the blades were separated just outboard of the shank. The third blade remained attached to the hub, but it was bent aft around the left side of the engine and twisted toward low pitch with the outboard tip torn from the blade. The leading edge of one of the separated blades displayed heavy gouges. The spinner was crushed aft around the propeller hub.

## ENGINE COMPONENT EXAMINATION

| EXHAUST SYSTEM | |
|---|---|
| Condition: | The exhaust system was flattened and displaced from its original position. |

| INDUCTION SYSTEM | |
|---|---|
| Condition: | The intake tubes were crushed. The intake air filter was deformed but remained attached to the intake tube. The throttle body and intake plenum remained attached to the topside of the engine via the throttle control cable and a hose. |

## IGNITION SYSTEM

| **LEFT MAGNETO** | Manufacturer: Continental Motors S6RSC-25 | P/N: 10-500556-1 | S/N: D01EA087 |
|---|---|---|---|
| Condition: | The magneto was separated from the mounting pads but remained attached to the engine via the ignition leads. The magneto drive was intact, but dirt and debris was in the impulse coupling area which bound up the rotation of the drive shaft. Rotation of the left drive shaft resulted in a spark from the ignition harness. | | |

| **RIGHT MAGNETO** | Manufacturer: Continental Motors S6RSC-25 | P/N: 10-500556-1 | S/N: D01LA085 |
|---|---|---|---|
| Condition: | The magneto was separated from the mounting pads but remained attached to the engine via the ignition leads. The magneto drive was intact, but dirt and debris was in the impulse coupling area which bound up the rotation of the drive shaft. The right magneto did not produce a spark on the occasions in which the drive shaft was rotated and the impulse coupling snapped. Removal of the vent plug revealed that the distributor gear teeth were intact. Removal of the damaged capacitor cover revealed the cam follower was intact and the points opened and closed appropriately with drive rotation. No pre-accident anomalies were noted with either magneto. | | |

| **IGNITION HARNESS** | Manufacturer: Continental Motors | P/N: Unknown | S/N: Unknown |
|---|---|---|---|
| Condition: | The ignition harness remained attached to the magnetos, but many of leads displayed pinching damage. The terminal ends remained attached to the sparkplugs. | | |

| **SPARK PLUGS** | Manufacturer: Champion | P/N: RHB32E |
|---|---|---|
| Condition: | The top sparkplugs were removed from their respective cylinders. All displayed a normal worn condition with no signs of lead or carbon fouling. | |

1T

2T

3T

4T

5T

6T

## FUEL SYSTEM

| **FUEL PUMP** | Manufacturer: Continental Motors | P/N: 649364-4 | S/N: B01EA047 |
|---|---|---|---|
| Condition: | The engine-driven fuel pump remained attached to the backside of the engine and all fuel lines to and from the pump remained attached to their respective fittings. The mixture control cable remained attached to the mixture control lever but the lever was bent. Movement of the lever resulted in a coinciding movement of the shaft with no slipping noted. The low pressure relief valve set screw was displaced into the cap. Removal of the pump from the backside of the engine revealed the drive coupling was intact. Manual rotation of the drive coupling while it was installed in the drive shaft resulted in rotation of the pump with no binding noted. Residual fuel was observed coming from the pump housing. | | |

| **THROTTLE BODY METERING UNIT** | Manufacturer: Continental Motors | P/N: 653353-5 | S/N: A01EA035 |
|---|---|---|---|
| Condition: | The throttle body and intake plenum remained attached to the topside of the engine via the control cable and hose. The throttle lever remained attached to the throttle valve shaft. Movement of the throttle lever resulted in a coinciding movement of the throttle valve with no slipping between the shaft and lever and no binding noted. | | |

| **FUEL MANIFOLD VALVE** | Manufacturer: Continental Motors | P/N: 646433-5?2 | S/N: C01EA050 |
|---|---|---|---|
| Condition: | The fuel manifold valve remained in place on top of the engine and all of the fuel lines remained attached. The manifold valve was removed from the engine and the cap was removed. The diaphragm was intact and the plunger was secured in place. The screen was clear and free from obstructions. Residual fuel was noted in the housing. | | |

| **FUEL NOZZLES AND LINES** | |
|---|---|
| Condition: | The nozzles remained in place except for the #1 and #6 nozzles which were fractured at the cylinder threads. The lines remained attached to all of the nozzles. |

## LUBRICATION SYSTEM

| **OIL SUMP** | |
|---|---|
| Condition: | The front portion of the oil sump was flattened up against the bottom side of the engine while the aft portion of the oil sump was torn away and displaced aft, exposing the bottom crankcase portions. |

| **OIL PICKUP TUBE & SCREEN** | |
|---|---|
| Condition: | The oil pickup tube and screen were not observed. |

| **OIL PUMP** | |
|---|---|
| Condition: | The oil pump housing remained attached to the backside of the engine with no signs of oil leaks noted. Though the oil pump was not disassembled, there was no signs of lubrication distress noted on any of the engine components. |

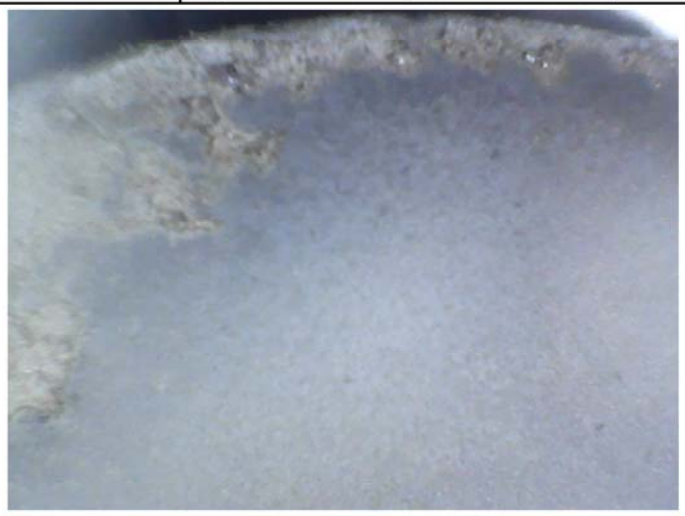
| **OIL FILTER** | Manufacturer: Tempest | P/N: AA48108-2 |
|---|---|---|
| Condition: | The oil filter remained in place on the adapter with the safety-wire intact. It sustained impact-related deformation damage that partially displaced it from the adapter. The tachometer time of 1,269.5 was hand-written on the side of the filter, but the date was not recorded. Removal of the filter revealed residual oil. | |


| **OIL COOLER** | Manufacturer: Not Recorded | P/N: Not Recorded | S/N: Not Recorded |
|---|---|---|---|
| Condition: | The oil cooler remained in place, with no signs of pre-accident anomalies noted. | | |

## CYLINDERS

***NOTE:*** The images that follow each cylinder condition description represent the piston, intake valve, exhaust valve, and bottom sparkplug.

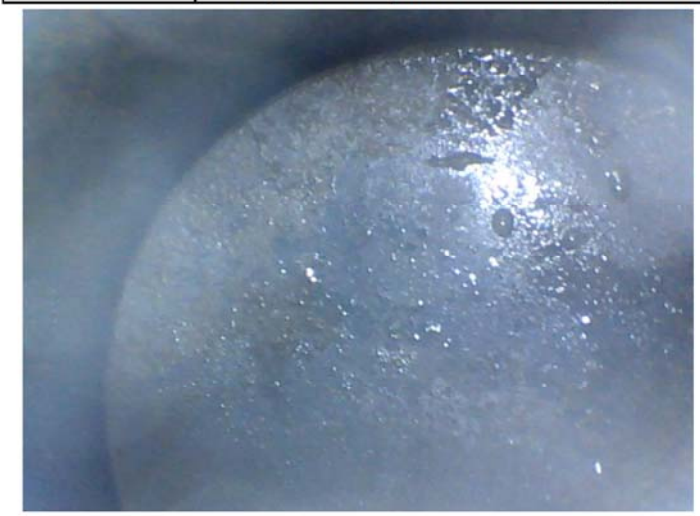
| **CYLINDER #1** | |
|---|---|
| Condition: | The cylinder remained attached to the crankcase and sustained cooling fin damage. There were no external pre-accident anomalies noted. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, cylinder barrel, cylinder head, valves, or valve seats. |

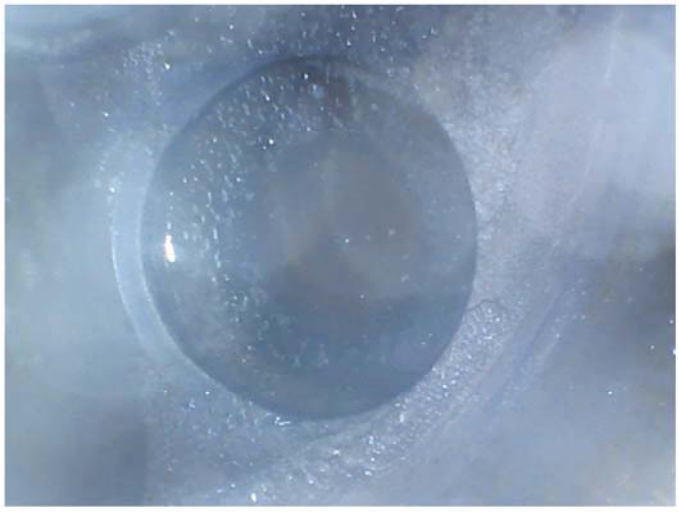


| **CYLINDER #3** | |
|---|---|
| Condition: | The cylinder remained attached to the crankcase with no external pre-accident anomalies noted. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, cylinder barrel, cylinder head, valves, or valve seats. |




| **CYLINDER #5** | |
|---|---|
| Condition: | The cylinder remained attached to the crankcase and sustained cooling fin damage. There were no external pre-accident anomalies noted. Water was pooled in the intake port. Borescope examination of the cylinder revealed water was present in the low-lying areas of the cylinder, but no pre-accident anomalies with the piston, cylinder barrel, cylinder head, valves, or valve seats. |

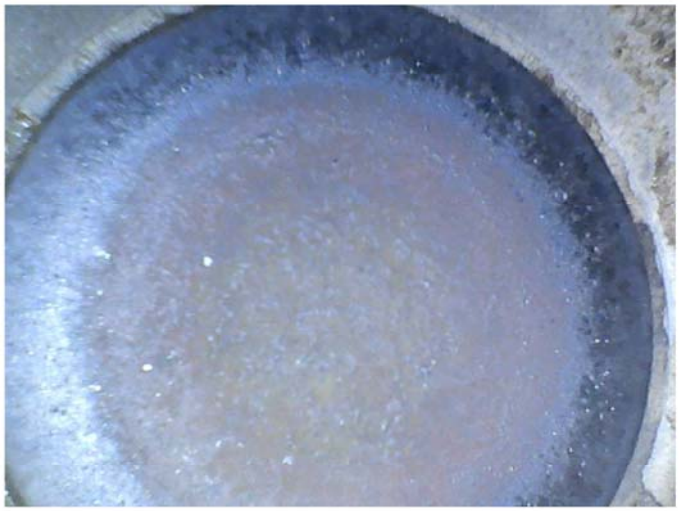




Bottom Sparkplug was Not Observed

| **CYLINDER #2** | |
|---|---|
| Condition: | The cylinder remained attached to the crankcase with no external pre-accident anomalies noted. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, cylinder barrel, cylinder head, valves, or valve seats. |

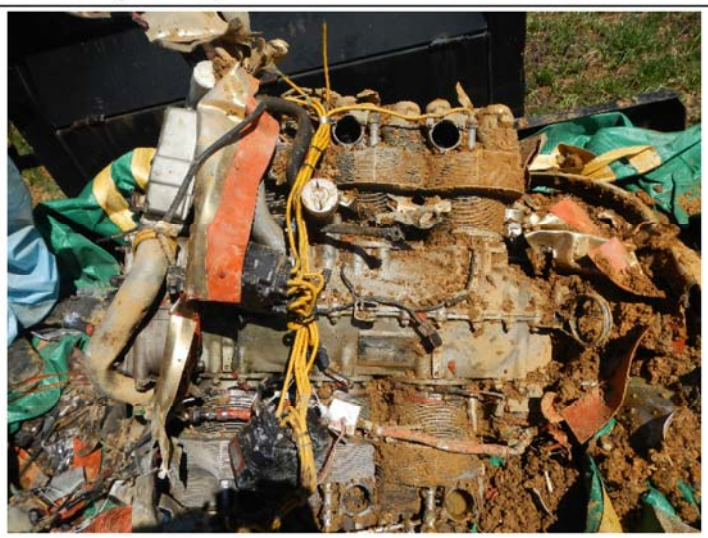
| **CYLINDER #4** | |
|---|---|
| Condition: | The cylinder remained attached to the crankcase with no external pre-accident anomalies noted. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, cylinder barrel, cylinder head, valves, or valve seats. |



| **CYLINDER #6** | |
|---|---|
| Condition: | The cylinder remained attached to the crankcase and sustained cooling fin damage. There were no external pre-accident anomalies noted. Borescope examination of the cylinder revealed no pre-accident anomalies with the piston, cylinder barrel, cylinder head, valves, or valve seats. |

## CRANKCASE ASSEMBLY

| **CRANKCASE** | Casting Number: | 1-3-5: Not Recorded | 2-4-6: Not Recorded | S/N: Not Recorded |
|---|---|---|---|---|
| Condition: | The crankcase halves remained intact with no pre-accident anomalies noted. There was no external sign of operational distress with the internal components. | | | |



## CRANKSHAFT ASSEMBLY

| **CRANKSHAFT** | Forging Number: Not Observed | S/N: Not Observed | Heat code: Not Observed |
|---|---|---|---|
| Condition: | The crankshaft was not observed in its entirety. The propeller remained attached but one of the blades was bent aft around the side of the engine, prohibiting rotation of the crankshaft. Though it could not be rotated completely, crankshaft continuity to the crankshaft gear was confirmed with miniscule rotations of the propeller flange. The crankshaft gear bolts remained in place and the safety-wire was intact. | | |

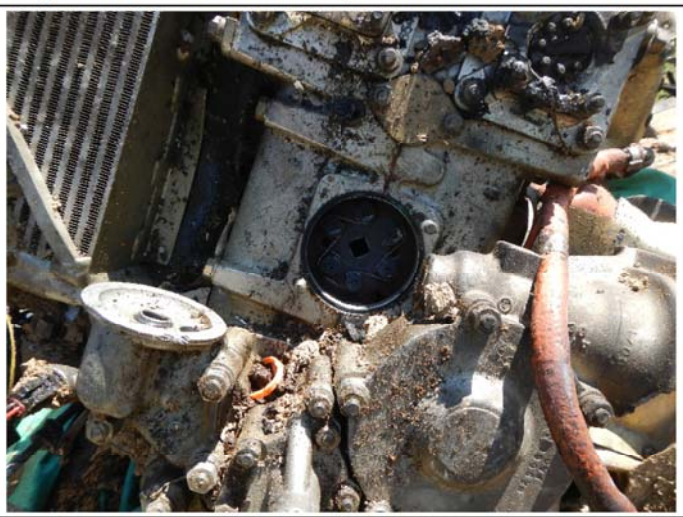
## CAMSHAFT

| **CAMSHAFT** | |
|---|---|
| Condition: | The camshaft was partially observed through the displaced oil sump and the bottom crankcase halves. There were no signs of discoloration or pre-impact anomalies with the observable camshaft portion or the observable lifters. |
| **ACCESSORY GEARS** | |
| Condition: | The idler gear and magneto drive gears were observed through the magneto drive pads and no discoloration or pre-impact anomalies were noted. |

## ACCESSORIES

| **STARTER** | Manufacturer: Energizer 24 | P/N: 646275 | S/N: Z-010036 |
|---|---|---|---|
| Condition: | The starter motor was separated from the adapter but remained attached to the firewall via the electrical connections. | | |

| **STARTER ADAPTER** | |
|---|---|
| Condition: | The starter adapter remained attached to the backside of the engine. The motor mounting flange was fractured. No pre-accident anomalies were noted externally. |



| **ALT/GEN #1** | Manufacturer: Not Recorded | P/N: Not Recorded | S/N: Not Recorded |
|---|---|---|---|
| Condition: | The engine-driven alternator remained attached to the front right side of the engine, but it sustained impact damage. It was not examined in detail at the accident site. | | |
| **ALT/GEN #2** | Manufacturer: Unknown | P/N: Not Recorded | S/N: Not Recorded |
| Condition: | The accessory-gear-driven alternator was separated from the accessory end of the engine, but remained attached to the firewall via its electrical connections. It was not examined in detail at the accident site. | | |

## PROPELLER

| **PROPELLER GOVERNOR** | Manufacturer: Unknown | P/N: Unknown | S/N: Unknown |
|---|---|---|---|
| Condition: | The propeller governor remained attached to the front left side of the engine. The control lever was fractured and separated from the housing. | | |

| **PROPELLER** | Manufacturer: Hartzell | P/N: Unknown | S/N: Unknown |
|---|---|---|---|
| Condition: | The three-blade, variable pitch propeller remained attached to the engine crankshaft. Two of the three blades were fractured just outboard of the spinner area. The third propeller blade was bent aft along the left side of the engine. One of the separated blades was bent forward slightly and displayed a heavy leading edge gouge near the tip. The blade that remained attached to the hub was bent aft, twisted toward low pitch, displayed heavy leading edge gouges, and the outboard tip was missing. | | |