



## **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Western Pacific Region

Date: April 23, 2021

### **SUMMARY OF AIRCRAFT EXAMINATION**

**(WPR19LA064)**

This document contains 72 embedded photos.

#### **A. ACCIDENT**

Location:	Port Hadlock, Washington
Date:	January 13, 2019
Aircraft:	Beech B35
NTSB Investigator-in-Charge	Thomas M. Little

## **B. EXAMINATION PARTICIPANTS**

Thomas M. Little  
Senior Aviation Accident Investigator  
National Transportation Safety Board  
Western Pacific Region  
Federal Way, Washington

Kurt Gibson  
Senior Air Safety Investigator  
Continental Motors  
Mobile, Alabama

## **C. SUMMARY**

On January 13, 2019, about 1400 Pacific standard time, a Beech B35 airplane, N5093C collided with trees following a loss of engine power near Port Hadlock, Washington, . The commercial pilot received minor injuries. The airplane was substantially damaged. The airplane was registered to ABCS Association and operated by the pilot under the provision of Title 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed at the time and no flight plan was filed.

In a report submitted to the National Transportation Safety Board (NTSB) investigator-in-charge, the pilot reported that the flight originated from Jefferson County International Airport (OS9), Port Townsend, Washington about 1350, and was destined for Paine Field (PAE), Everett, Washington. The pilot reported that shortly after takeoff the cockpit door opened, and that while turning onto left downwind to return to OS9, the engine lost power. The pilot subsequently initiated an off airport forced landing, during which the airplane struck a stand of trees and came to rest behind a church. All components of the airplane necessary for flight were accounted for at the accident site. The wreckage was recovered to a secured storage facility for future investigative purposes.

On March 13, 2019, under the supervision of the NTSB IIC, an examination of the airframe and engine was performed at the facilities of AvTech Services, LLC, Auburn, Washington. As a result of the examinations, no anomalies with either the airframe or the engine were detected that would have preclude normal operations with the airplane. The investigation was unable to determine the pilot's reported loss of engine power.

## **D. DETAILS OF THE EXAMINATION**

### **1.0 Engine examination**

Engine model:	IO-470-K
Serial number:	92779-R
Engine total time:	2,779.6 hrs
Time since overhaul:	1,115.8 hrs

Time since last inspection: 6.21 hrs  
Build date: 11/11/1978

### External inspection of engine

The engine had been removed from the airframe prior to the investigator's arrival. The engine displayed impact damage signatures with the majority of the damage having occurred to the front right side of the engine. The crankcase remained intact and there were no breaches that would indicate an internal engine failure. The propeller flange remained attached to the crankshaft; however, a portion of the propeller flange had broken free and remained attached to the propeller hub. All six cylinders remained attached to their cylinder bays and displayed varying amounts impact damage signatures, with the #5 cylinder displaying the most damage.

Both magnetos remained attached to their respective installation points and were undamaged. The ignition harness remained attached to both magnetos and to each spark plug; however, the harness displayed impact damage to the #5 ignition leads. All spark plugs remained secured in their cylinders and were undamaged.

The fuel pump remained attached to its installation point and displayed impact damage signatures. The throttle and fuel metering assembly remained attached to its installation point and displayed minor impact damage signatures. The fuel manifold valve remained attached to its installation point and was undamaged. The #5 fuel nozzle was broken into two pieces consistent with impact damage; the rest of the nozzles remained installed and were undamaged. There were no signs of fuel leaks around any of the components.

The exhaust system displayed impact damage signatures; there were no signs of exhaust leaks noted. The induction system displayed impact damage signatures concentrated to the Y-pipe and balance tube. There were no signs of induction leaks noted.



Figure 1 - view of right side of engine as received



Figure 2 - view of left side of engine as received



Figure 3 - view of front of engine as received



Figure 4 - view of rear of engine as received

## Exhaust System

The exhaust system displayed impact damage signatures with the right-side exhaust showing the most damage. There were no signs of exhaust leaks or blockages noted.



Figure 5 - right side of exhaust system



Figure 6 - left side of exhaust system

## Induction System

The induction system displayed impact damage signatures with the most damage occurring to the Y-pipe and the balance tube. There were no signs of induction leaks noted.



Figure 7 - view of right side of induction system



Figure 8 - view of left side of induction system

## Ignition System

Left magneto: manufacturer – Bendix P/N: 10-79020-10 S/N: 926206

Condition: The magneto remained attached to its installation point and was undamaged. During crankshaft rotation it was noted that the impulse coupling was capable of operation. During impulse coupling operation, it was noted that the magneto could produce a spark on all six ignition leads.

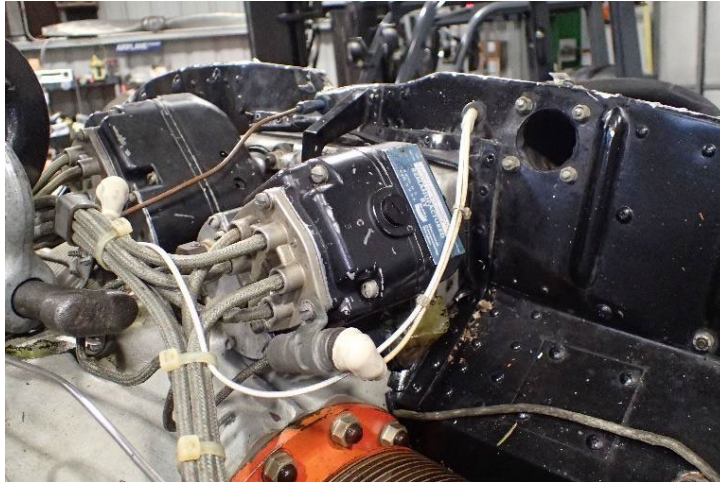


Figure 9 - left magneto

Right magneto: manufacturer – Bendix P/N: 10-79020-10 S/N: 926037

Condition: The magneto remained attached to its installation point and was undamaged. During crankshaft rotation it was noted that the impulse coupling was capable of operation. During impulse coupling operation it was noted that the magneto could produce a spark on all six ignition leads.



Figure 10 - right magneto

Ignition Harness

Condition: The ignition harness displayed varying amounts of impact damage; the #5 top and bottom leads were torn, and the rest of the harness displayed minor impact damage. The ignition harness could conduct a spark on all twelve ignition leads.

## Spark Plugs

Condition: The top spark plugs were removed, and the spark plug electrodes were visually inspected. It was noted that the #1 top spark plug insulator was cracked in two places. The #1, #3, and the #5 spark plugs were grey in color with no combustion deposits noted. The #2, #4, and the #6 top spark plug electrodes were oil coated consistent with post-accident accumulation. The bottom spark plugs were inspected using a lighted borescope. The #2 bottom spark plug was submerged in oil and was unobserved; the rest of the bottom spark plugs displayed normal operating and wear signatures.

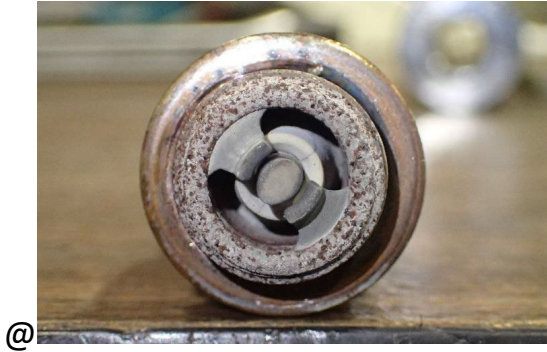


Figure 11 - #1 top spark plug



Figure 12 - #1 bottom spark plug



Figure 13 - #2 top spark plug

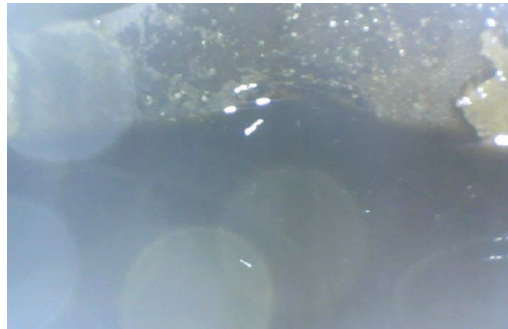


Figure 14 - #2 bottom spark plug (submerged)





Figure 15 - #3 top spark plug



Figure 16 - #3 bottom spark plug

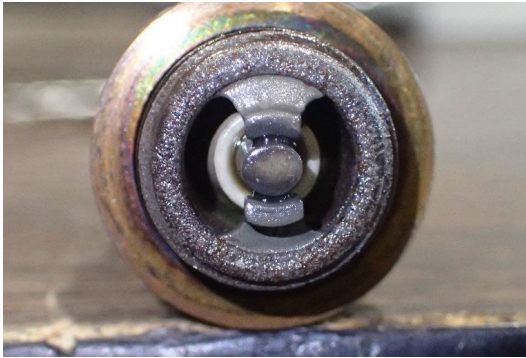


Figure 17 - #4 top spark plug



Figure 18 - #4 bottom spark plug



Figure 19 - #5 top spark plug



Figure 20 - #5 bottom spark plug



Figure 21 - #6 top spark plug

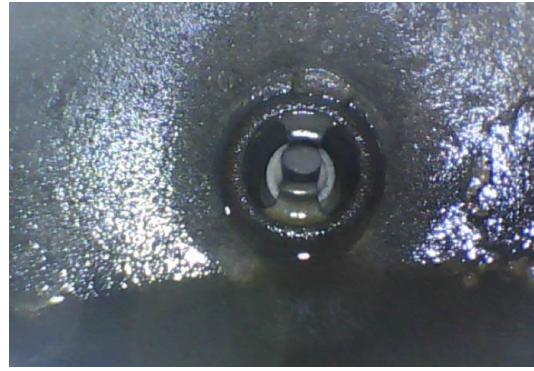


Figure 22 - #6 bottom spark plug

## FUEL SYSTEM

Fuel Pump: manufacturer – CMI P/N: 638154-12 S/N: J117812RB

Condition: The fuel pump remained attached to its installation point and displayed impact damage signatures; the fuel return AN fitting was broken and the adjustment bolt was bent. The fuel pump was removed, and it was noted that the drive coupling and gear remained intact and were undamaged. The fuel pump was primed with solvent and the drive shaft was rotated using a drill; the fuel pump as capable of pumping the solvent and was able to vary the rate with varying the RPM of the drill. There were not anomalies noted the fuel pump.



Figure 23 - fuel pump

Throttle body metering unit: manufacturer – CMI P/N: 625219-1 S/N: 1147801RA

Condition:

The throttle and metering assembly remained attached to its installation point and displayed impact damage signatures; one of the fuel AN fittings had broken free from the assembly. The throttle and mixture cable rod ends remained attached to the control arms and the control arms were secured to their shafts. Compressed air was blown into the assembly inlet and the assembly was able to meter the amount of air with adjusting the throttle and the mixture. The fuel inlet screen was removed, and it was noted to be clear of contaminants. There were no anomalies noted with the throttle and fuel metering assembly.



Figure 24 - throttle body metering unit



Figure 25 - throttle body metering unit

Fuel manifold valve: manufacturer – CMI P/N: 631427A19 S/N: J167810RC

Condition:

The fuel manifold valve remained attached to its installation point and was undamaged; there were no signs of fuel staining around the manifold valve. The manifold valve was disassembled, and the internal components were visually inspected. The components displayed normal operating signatures and the screen was clear of contaminants. There were no anomalies noted.

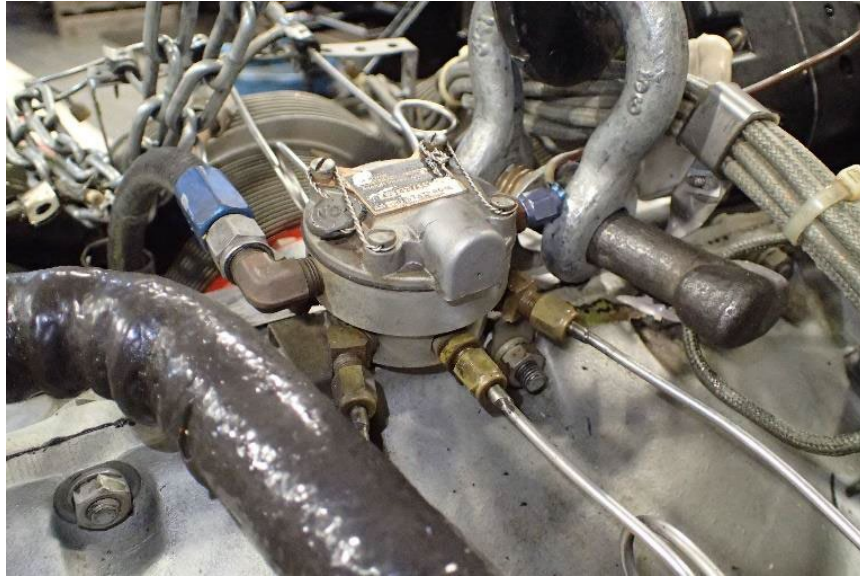


Figure 26 - fuel manifold valve



Figure 27 - fuel manifold valve

Fuel nozzles and lines: manufacturer - CMI

Condition:

The #5 fuel nozzle displayed impact damage and was broken into two pieces, the rest of the fuel nozzles remained intact and were undamaged. The nozzles were removed and checked for blockages; it was noted that the #2 and the #4 nozzles were blocked. Air was blown through the two blocked nozzles and engine oil came out of the nozzle which was consistent with post-accident accumulation; after removing the engine oil the nozzles were clear. There were no anomalies noted with the nozzles.

### Lubrication System

Oil sump: The oil sump remained intact and was undamaged. The oil gage was checked and there was approximately 10 quarts of oil remaining in the sump. There were no anomalies noted.

Oil pick-up tube and screen: Due to the type of inspection performed the oil pick-up tube and screen was not observed.

Oil pump: The oil pump remained intact and was undamaged. During crankshaft rotation it was noted that the oil pump was capable of pumping oil out of the oil filter adapter. There were no anomalies noted.

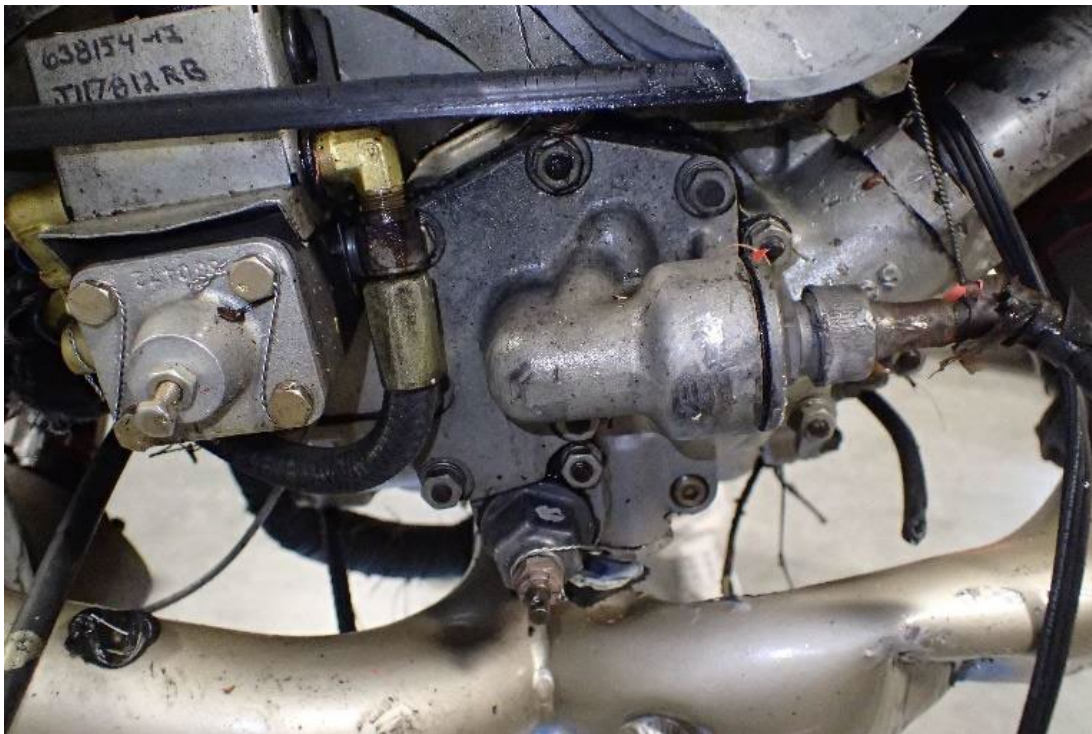


Figure 28 - Oil pump

Oil filter: manufacturer – Tempest P/N: AA48103-2

Condition:

The oil filter remained attached to the oil filter adapter and displayed impact damage signatures. The oil filter was removed, and the housing was cut open. The filter pleats visually inspected; there was no metallic material noted within the filter pleats. There anomalies noted with the filter.



Figure 29 - oil filter

Oil cooler: manufacturer (not observed) P/N & S/N (not observed)

Condition:

The oil cooler remained attached to its installation point and displayed significant impact damage. There were no anomalies noted.



Figure 30 - Oil cooler

## Cylinders

### Condition:

All of the cylinders remained attached to their cylinder bays and the #5 cylinder displayed impact damage signatures, the rest of the cylinders were undamaged. The cylinders were inspected using a lighted borescope; the piston faces, cylinder bores, and valve heads displayed normal operating and combustion signatures. During crankshaft rotation all of the cylinders displayed good thumb compression and suction. All of the overhead components (valves, springs, and rocker arms) displayed normal operating and lubrication signatures. There were no anomalies noted.

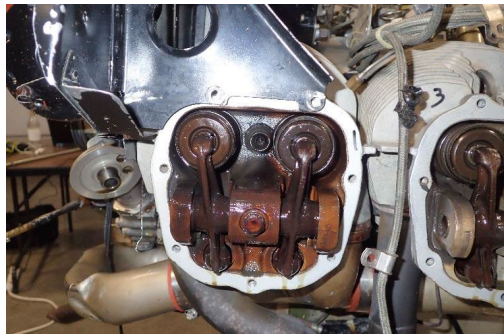


Figure 31 - cylinder #1

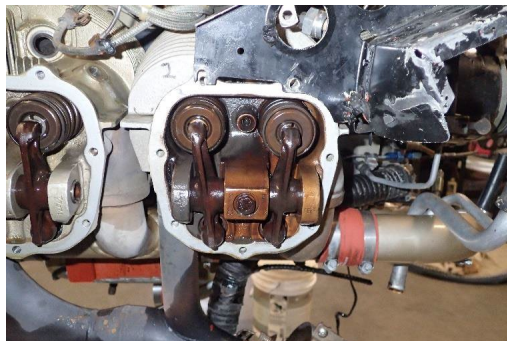


Figure 32 - cylinder #2

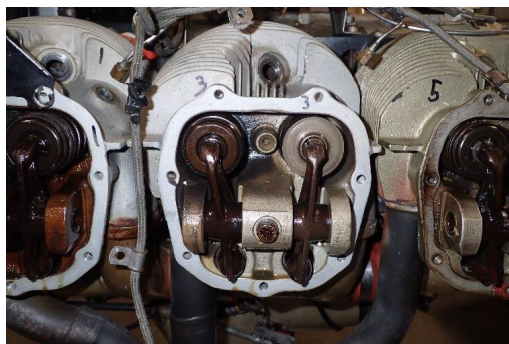


Figure 11 - cylinder #3

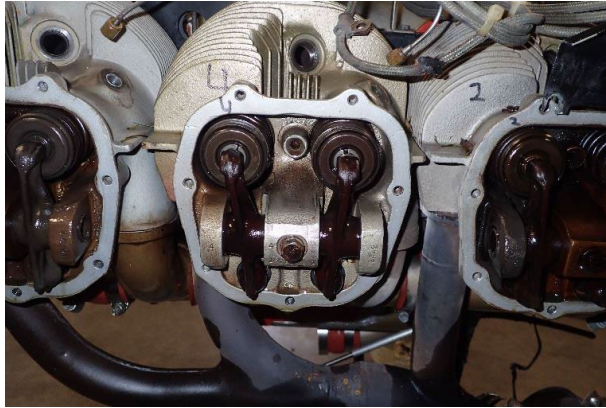


Figure 12 - cylinder #4

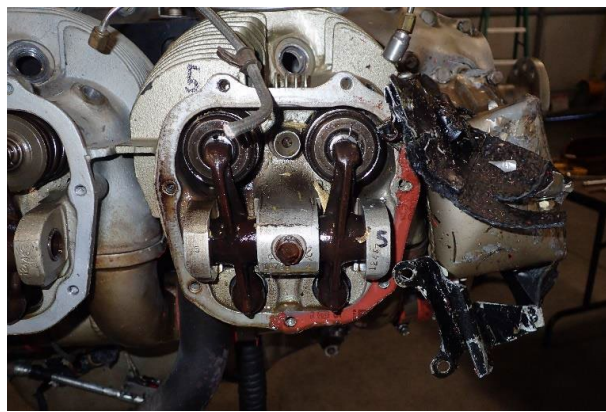


Figure 13 - cylinder #5



Figure 36 - cylinder #6

## Valves and guides

### Condition:

The valve heads were inspected using a lighted borescope. The valve heads displayed normal operating and combustion signatures. During crankshaft rotation all valves operated normally.



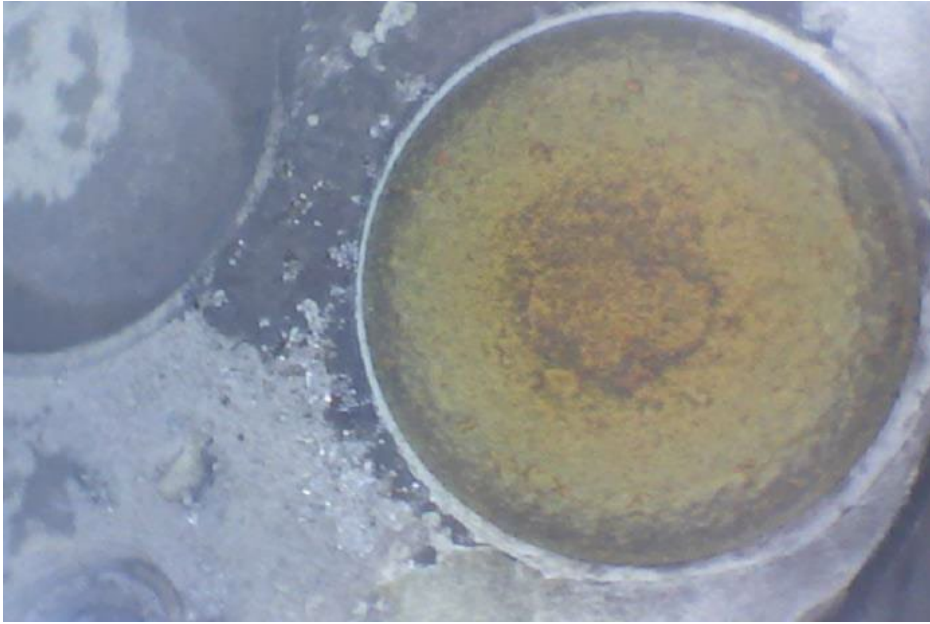


Figure 37 - #1 exhaust valve

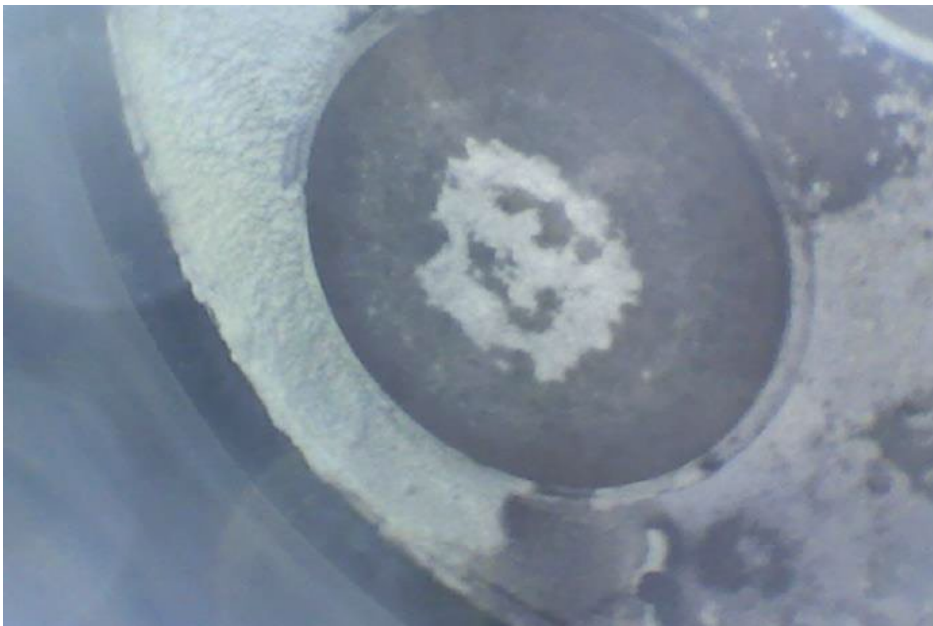


Figure 38 - #1 intake valve

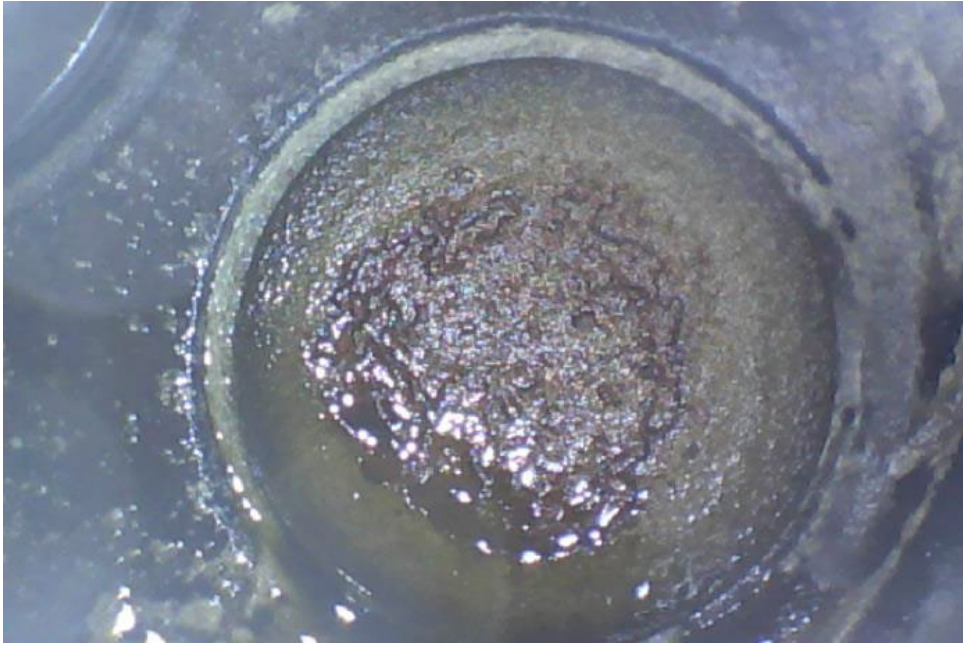


Figure 39 - #2 exhaust valve



Figure 40 - #2 intake valve

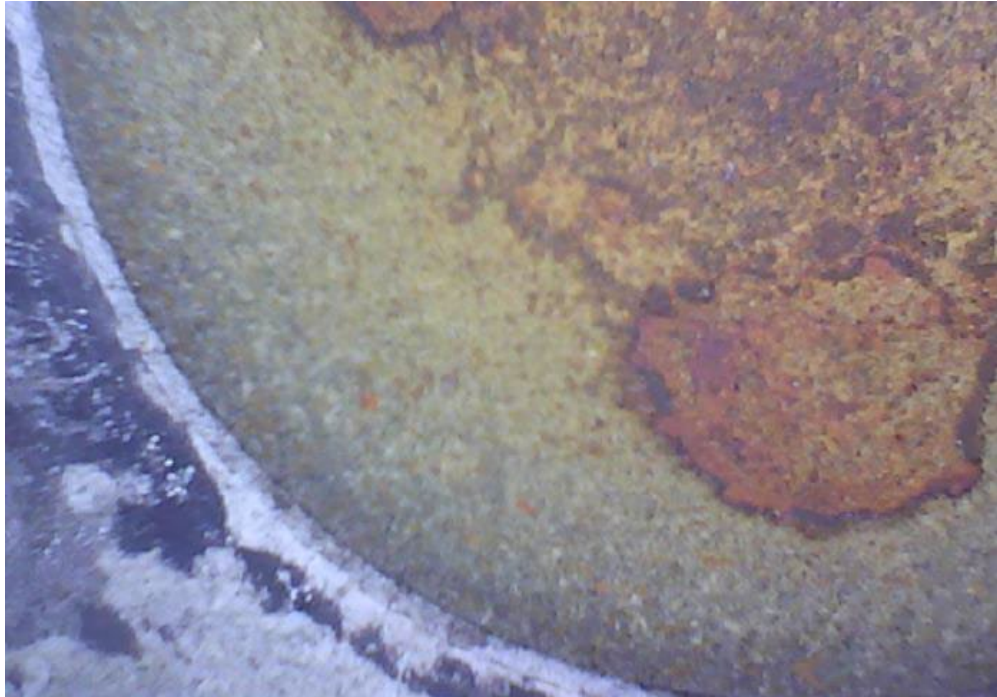


Figure 41 - #3 exhaust valve



Figure 42 - #3 intake valve



Figure 43 - #4 exhaust valve



Figure 44 - #4 intake valve

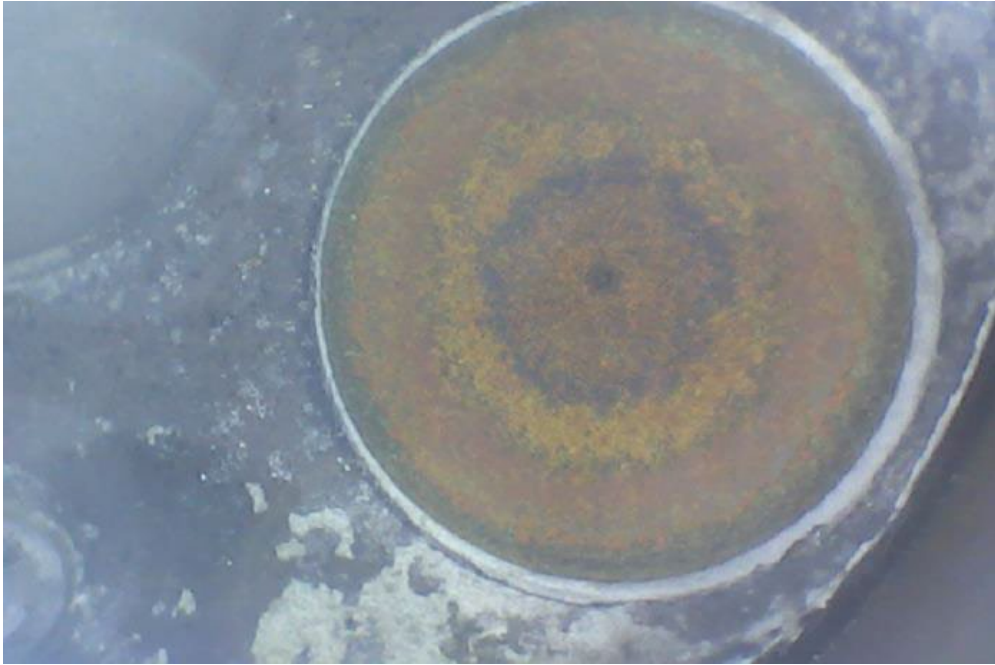


Figure 45 - #5 exhaust valve

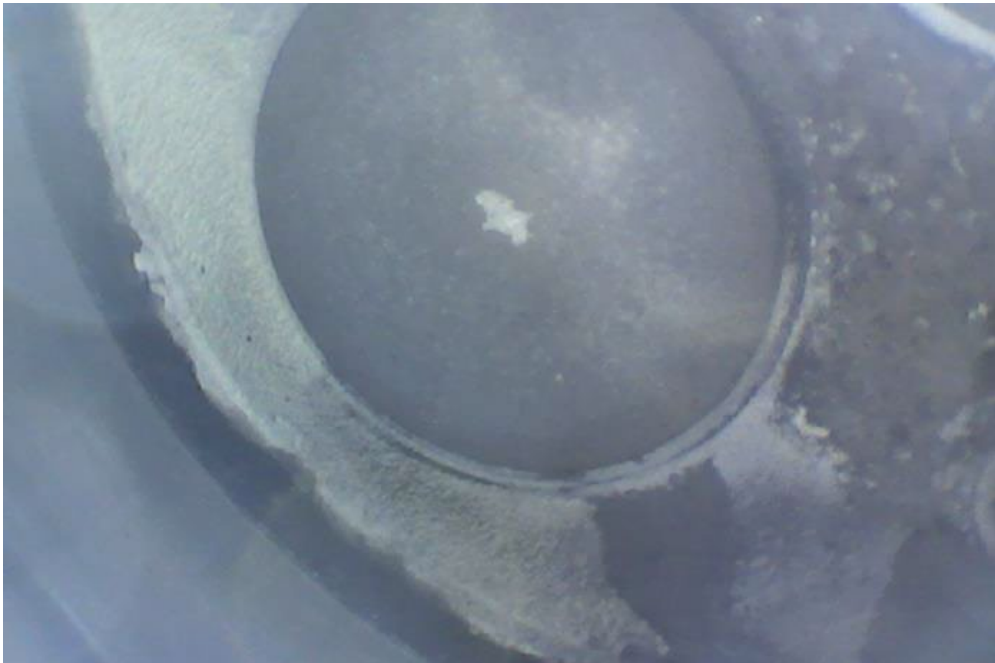


Figure 46 - #5 intake valve



Figure 47 - #6 exhaust valve



Figure 48 - #6 intake valve

## Rocker Arms and Shafts

Condition:

All of the rocker arms remained attached to their installation points and were undamaged. Rocker arms displayed normal operating and lubrication signatures, during crankshaft rotation all of the rocker arms operated normally.

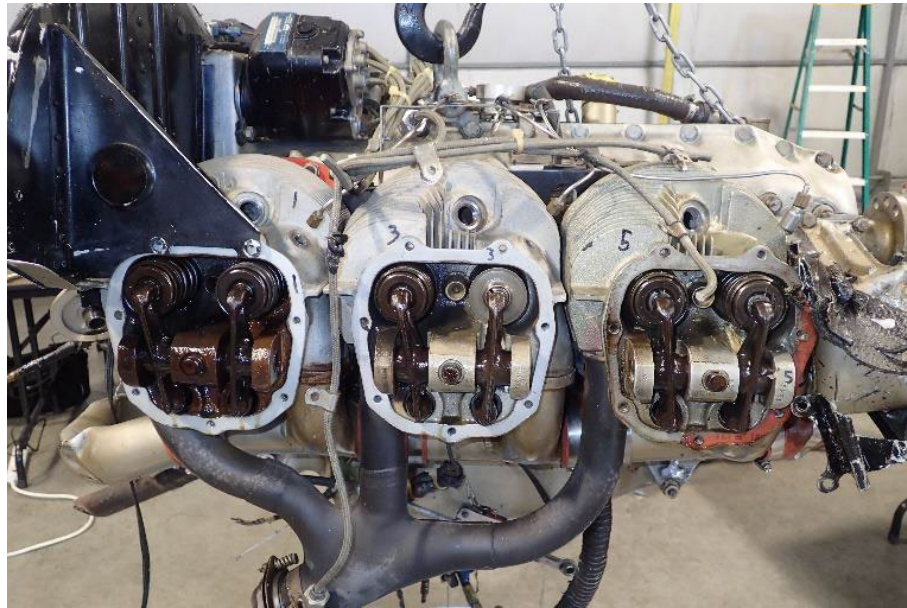


Figure 49 - view of right side of engine

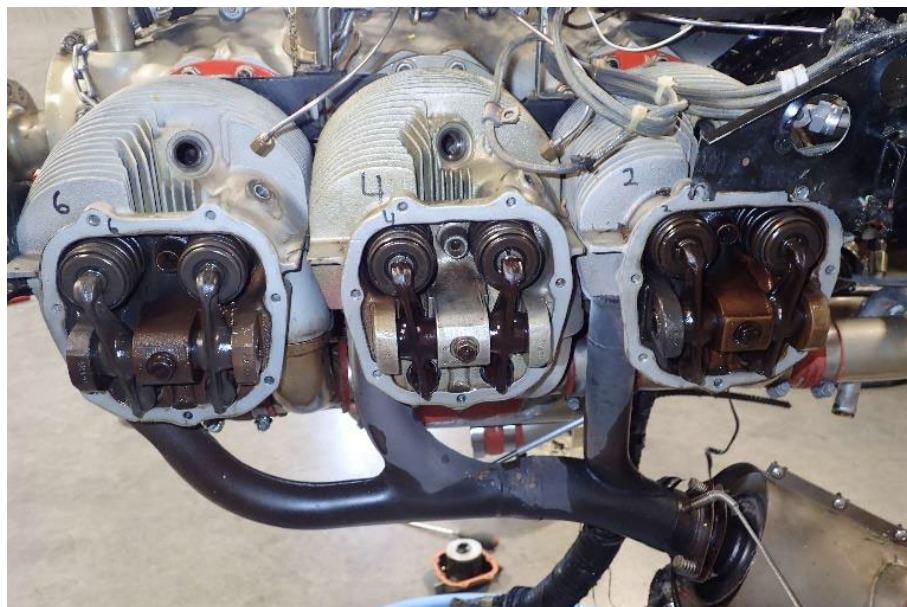


Figure 50 - view of left side of engine

## Pistons

Condition:

All of the rocker arms remained attached to their installation points and were undamaged. The rocker arms displayed normal operating and lubrication signatures, during crankshaft rotation all of the rocker arms operated normally.



Figure 14 - #1 piston



Figure 52- #2 piston



Figure 53 - #3 piston



Figure 54 - #4 piston



Figure 15 - #5 piston



Figure 56 - #6 piston



## Crankcase Assembly

Condition: Casting number – not observed S/N: 723

The crankcase remained intact and was undamaged. There were no breaches in the crankcase that would indicate an internal engine failure. There were no anomalies noted.



Figure 57 – Crankcase

## Crankshaft Assembly

Condition:

The crankshaft displayed impact damage signatures; a portion of the propeller flange had broken free and there were several cracks just aft of the propeller flange. The crankshaft was rotated using a hand tool and continuity was established between the crankshaft, camshaft, connecting rods and associated components. There were no anomalies noted with the crankshaft.



Figure 58 - view #1 of crankshaft assembly



Figure 59 - view #2 of crankshaft assembly

**Connecting Rods:** P/N: inaccessible Forging or serial number: inaccessible

Condition:

Operation of the connecting rods was verified by rotating the crankshaft and observing piston movement. The connecting rods operated normally.

## ACCESSORIES

**Camshaft:** P/N: inaccessible S/N: inaccessible

Condition:

Operation of the camshaft was verified by rotating the crankshaft and observing rocker arm movement. The camshaft operated normally.

**Starter:** Manufacturer – Prestolite P/N: MCL6501 S/N: A-98235

Condition:

The starter remained attached to the starter adapter and displayed minor impact damage signatures.

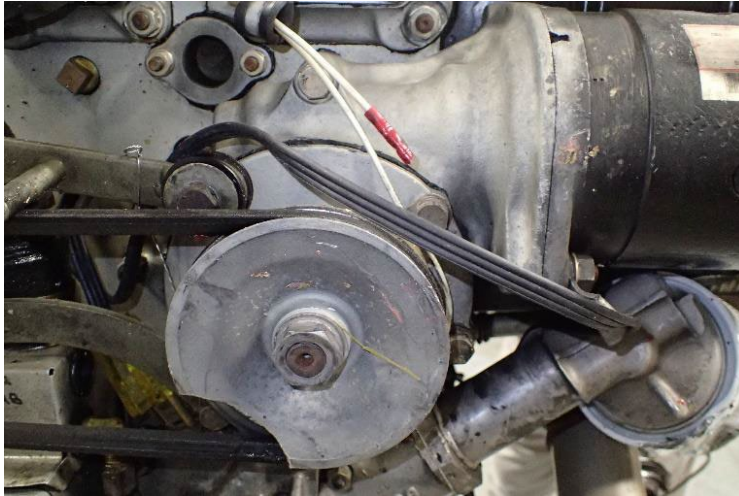


Figure 16 – Starter

**Starter Adapter:** P/N: illegible

Condition:

The starter adapter remained attached to the engine and displayed impact damage signatures to the pulley. During crankshaft rotation it was noted that the pulley rotated normally.



**Figure 61 - Starter Adapter**

**Alternator/Generator #1:** Manufacturer – Delco-Remy P/N: L101912 S/N: 50A2400

Condition:

The alternator remained attached to its installation point and the alternator belt remained attached to the drive pulley; it was noted that the drive belt displayed dry rot. The alternator drive was capable of normal rotation.



**Figure 62 - Alternator/Generator #1**

**Vacuum Pump:** Manufacturer – Pesco P/N: 3P-194-F S/N: 75126

Condition:

The vacuum pump remained attached to its installation point and displayed impact Damage signature.

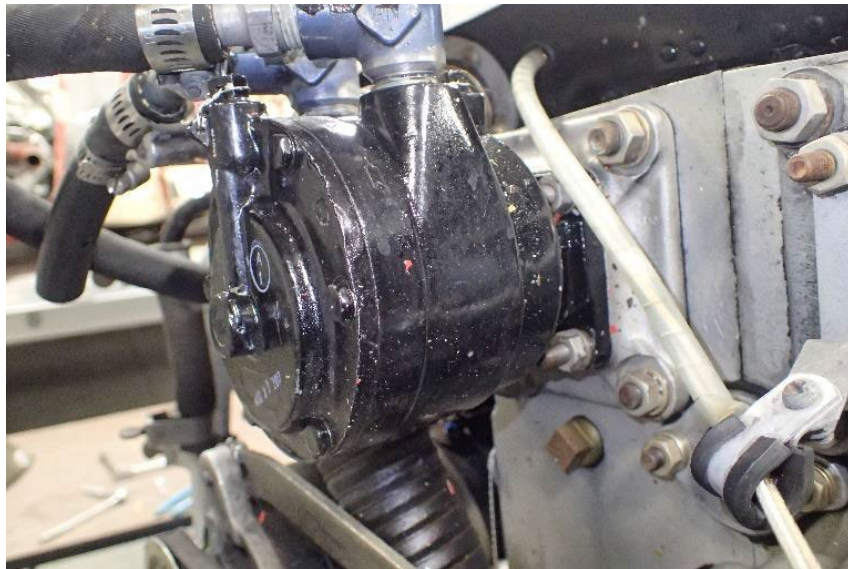


Figure 63 - Vacuum pump view #1



Figure 617 - Vacuum pump view #2

## Propeller

Propeller Governor: Manufacturer: Woodward P/N: 210680 S/N: 586788

Condition:

The governor remained attached to its installation point and was undamaged. It was noted that the propeller governor control arm spring was disconnected; however, the control arm was capable of normal movement. After the governor was removed, it was noted that the drive shaft was capable of normal movement.



Figure 18 - Propeller Governor



Figure 19 - Propeller Governor

Propeller: Manufacturer: McCauley P/N: 2A36C23-P-0184B-0 S/N: 760581

Condition:

The two blade, constant speed propeller had broken free from the crankshaft; a small portion of the propeller flange remained attached to the propeller hub. Both propeller blades remained within the hub; one blade was loose in the hub. Propeller blade "A" displayed minor twisting deformation. Propeller blade "B" displayed aft bending deformation. Blade signature revealed that the propeller was rotating at the time of impact. There were no anomalies noted with the propeller.



Figure 20 - Propeller hub with a portion of the propeller flange



Figure 21 - Propeller



Figure 22 - propeller blade "A"



Figure 23 - propeller blade "A"



Figure 24 - propeller blade "B"



Figure 25 - propeller blade "B"