



Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	IO-550-B
ENGINE SERIAL NUMBER	675950
AIRCRAFT MAKE & MODEL	Beechcraft A36
AIRCRAFT SERIAL NUMBER	E-2931
AIRCRAFT REGISTRATION	N248SB
FILE NUMBER	17-337

NAME	SIGNATURE	DATE
Kurt Gibson		01/24/2018

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	12/20/2017	NTSB ACCIDENT #	WPR18FA046
FACILITY	Air Transport	NTSB INVESTIGATOR	Maja Smith
ADDRESS	[REDACTED] Phoenix, AZ 85009	FAA INVESTIGATOR	Oded Moore
		ACCIDENT DATE	12/09/2017
		ACCIDENT LOCATION	San Diego, California

ENGINE INFORMATION

ENGINE POSITION	Single (Front)
TOTAL TIME	1354.7 (time at the last 100 hour inspection)
TIME SOH	N/A
TIME SLI	Unknown
BUILD DATE	11/07/1994
IN SERVICE DATE	Unknown

Significant logbook information:

The last 100 hour inspection was performed on 09/08/2017 at a engine total time of 1354.7

Report Summary:

Search Code(s):

15-12-68

The engine sustained a significant amount of thermal damage. There were no pre-accident anomalies noted that would have prevented normal operation or production of rated horsepower.

Disposition of engine following exam:

The engine remained at Air Transport in Phoenix, Arizona.

INSPECTION WITNESSES			
NAME	Kurt Gibson	NAME	Daniel Boggs
ADDRESS	Mobile, Alabama	ADDRESS	NTSB Eastern Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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The engine had been removed from the airframe prior to the investigators' arrival. The engine sustained a significant amount of thermal damage throughout the entire engine; the thermal damage was consistent with a post-crash fire. There was also a small amount of impact damage noted to the engine. The crankcase remained intact and there was no mechanical damage noted to the crankcase. All six cylinders remained attached to their cylinder bays and had varying degrees of thermal damage. The three blade, constant speed propeller remained attached to the crankshaft and displayed a significant amount of thermal damage to the blades; two of the propeller blades had large portions of the blades melted off, the third propeller blade displayed a small amount of melting damage.

The fuel pump remained attached to its installation point and displayed a significant amount of thermal damage and some impact damage. The throttle and metering assembly remained attached to its installation point and displayed a significant amount of thermal damage. Both control arms remained secured to their shafts. The fuel manifold valve remained attached to its installation point and displayed thermal damage signatures. There were no signs of unsecured fuel lines noted.

Both of the magnetos remained attached to their installation points and displayed a significant amount of thermal damage signatures. The ignition harness sustained a significant amount of thermal damage; several of the leads were melted and had broken free from the ignition lead ends. All of the spark plugs remained installed in their cylinders and displayed varying degrees of thermal damage signatures.

The induction system displayed a significant amount of thermal damage signatures. Several of the induction tubes were partially melted. All of the induction risers remained secured to their cylinders; there were no signs of induction leaks noted. The exhaust system remained attached to the engine and displayed impact damage signatures. There were no signs of exhaust leaks noted.

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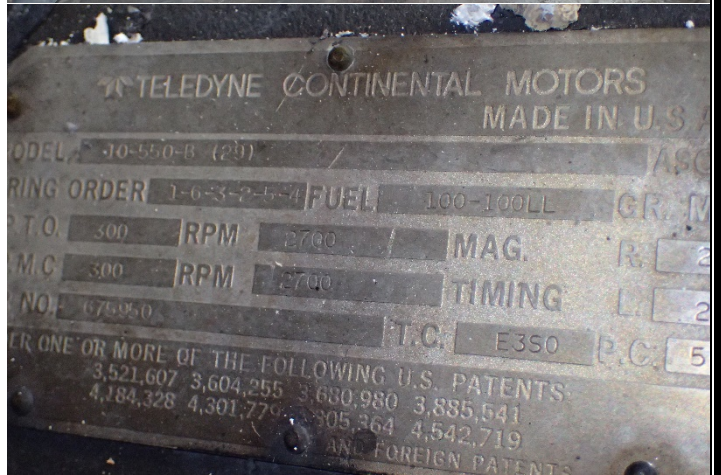
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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: The exhaust system remained attached to the engine and displayed impact damage signatures in the forms of bending and minor crushing. There were no signs of exhaust leaks or any other anomalies noted.



INDUCTION SYSTEM

Condition: The induction system displayed a significant amount of thermal damage signatures. Several of the induction tubes were partially melted. The balance tube displayed impact damage signatures; a portion of the balance tube was fractured. There were no signs of induction leaks or any other anomalies noted.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

P/N: 6310

S/N: 13072026

Condition:

The left magneto remained attached to its installation point and displayed a significant amount of thermal damage signatures. The magneto was removed and it was noted that the magneto was not capable of producing a spark. Due to the significant thermal damage, the magneto could not be disassembled by nondestructive means. There were no anomalies noted.



RIGHT MAGNETO

Manufacturer: Slick

P/N: Illegible

S/N: Illegible

Condition:

The right magneto remained attached to its installation point and displayed a significant amount of thermal damage signatures. The magneto was removed and it was noted that the magneto was not capable of producing a spark. The magneto was disassembled with all of the internal components displayed significant thermal damage which was consistent with a post-crash fire. There were no anomalies noted.



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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness displayed a significant amount of thermal damage signatures throughout the ignition harness. There were no anomalies noted with the harness.



SPARK PLUGS

Manufacturer: Champion

P/N: RHB32E

Condition:

All of the spark plugs remained installed in their cylinders and displayed varying amounts of thermal damage signatures. The top spark plugs were removed and visually inspected and the bottom spark plugs were inspected using a lighted borescope. The electrodes displayed normal operating and wear signatures when compared with Champion Aviation Service Manual AV6-R. There were no anomalies noted.



#1 Top



#1 Bottom

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#3 Top



#3 Bottom



#5 Top



#5 Bottom



#2 Top



#2 Bottom

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#4 Top



#4 Bottom



#6 Top



#6 Bottom

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FUEL SYSTEM

FUEL PUMP

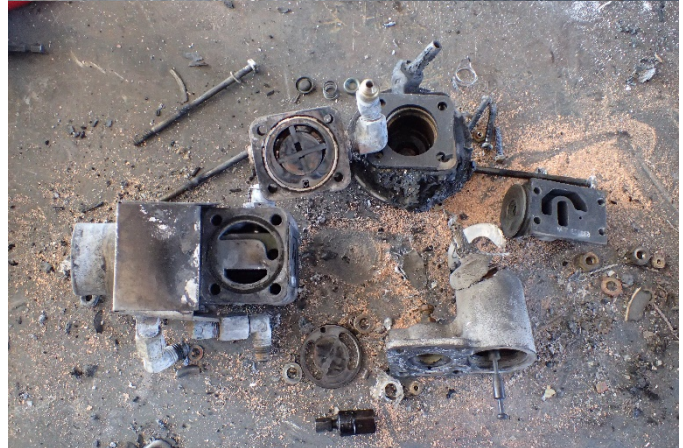
Manufacturer: CMI

P/N: 646766-3

S/N: J189417B

Condition:

The fuel pump remained attached to its installation point and displayed some impact damage signatures to the aneroid housing and significant thermal damage signatures throughout the fuel pump. The fuel pump was removed and the drive coupling was noted to have remained intact. The fuel pump was disassembled and the internal components were visually inspected. All of the internal components displayed thermal damage signatures and the aneroid also displayed impact damage signatures. There were no anomalies noted with the fuel pump.



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THROTTLE BODY METERING UNIT

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The throttle and metering assembly remained attached to its installation point. The mixture and control rod ends remained secured to their control arms and the control arms remained secured to their shafts. The fuel inlet screen was removed and there were no anomalies noted within the fuel screen. Due to the extensive thermal damage, the assembly could not be disassembled. There were no anomalies noted during the inspection.



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FUEL MANIFOLD VALVE

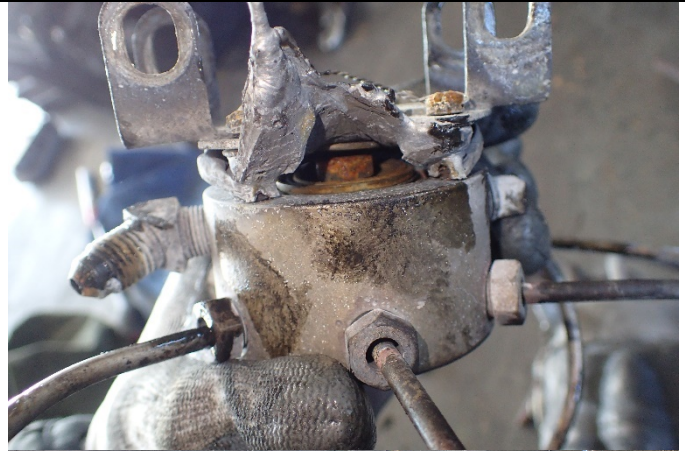
Manufacturer: CMI

P/N: 646508-6410

S/N: J184408C

Condition:

The fuel manifold valve remained attached to its installation point and displayed a significant amount of thermal damage signatures. The manifold valve was removed and disassembled. The diaphragm had been destroyed by thermal forces and the rest of the components displayed thermal damage signatures. There were no anomalies noted with the manifold valve.



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FUEL NOZZLES AND
LINES

Manufacturer: GAMI

Position	#1	#3	#5	#2	#4	#6
Size	GA168	GM151	GF143	GA168	GM151	GF143
Condition:	All of the fuel nozzles remained installed in their cylinders and displayed minor thermal damage signatures; the #1 injector also displayed impact damage signatures and was bent. All of the nozzles were removed and checked for blockages; only a small amount of light was visible through the #1 injector which was consistent with the nozzle being bent, the remaining injectors were clear of any obstructions. There were no anomalies noted with the fuel nozzles.					



#1 Nozzle



Bend in the #1 Nozzle



#3 Nozzle



#5 Nozzle

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#2 Nozzle



#4 Nozzle



#6 Nozzle

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Condition: The oil sump remained attached to its installation point and remained intact. Several quarts of oil were drained from the oil sump. There were no anomalies noted.

**OIL PICK-UP
TUBE & SCREEN**

Condition: The oil pick-up tube and screen were not observed at the time of the examination.

OIL PUMP

Condition: The oil pump housing remained intact and displayed thermal damage signatures. There were no anomalies noted.



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OIL FILTER

Manufacturer: Illegible

P/N: Illegible

Condition:

The oil filter remained attached to the oil filter adapter and displayed thermal damage signatures. The oil filter housing was cut open and the filter pleats were visually inspected. The filter pleats were thermally damaged consistent with a post-crash fire; there were no metallic contaminants noted within the filter pleats. There were no anomalies noted with the oil filter inspection.



OIL COOLER

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The oil cooler remained attached to its installation point and displayed a significant amount of thermal damage. A portion of the oil cooler had melted off and exposed some of the internal portions of the cooler. There were no anomalies noted with the oil cooler.



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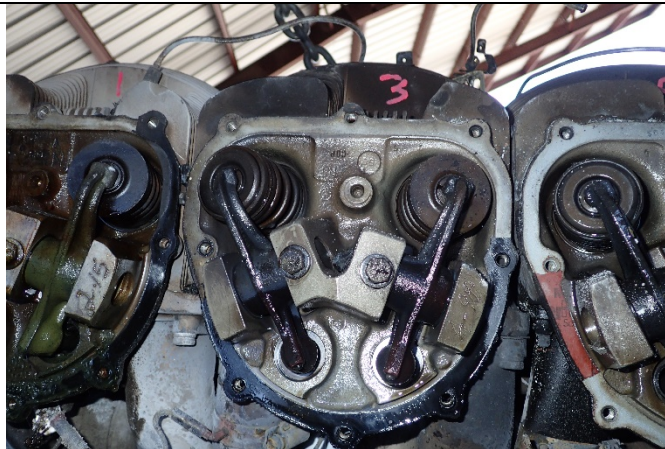
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CYLINDERS

CYLINDER #1	P/N: Not observed	S/N: AC15AA987	Head Date: 2-15
Condition:	The cylinder remained attached to its cylinder bay and displayed thermal damage signatures. The internal portion of the cylinder was inspected using a lighted borescope; the cylinder bore, piston face, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated and the cylinder displayed good thumb compression and suction. The cylinder overhead components (valves, springs, and rocker arms) displayed thermal damage signatures consistent with a post-crash fire and normal operating signatures.		



CYLINDER #3	P/N: Not observed	S/N: Not observed	Head Date: 6-98
Condition:	The cylinder remained attached to its cylinder bay and displayed thermal damage signatures. The internal portion of the cylinder was inspected using a lighted borescope; the cylinder bore, piston face, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated and the cylinder displayed good thumb compression and suction. The cylinder overhead components (valves, springs, and rocker arms) displayed minor thermal damage signatures consistent with a post-crash fire and normal operating signatures.		



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CYLINDER #5

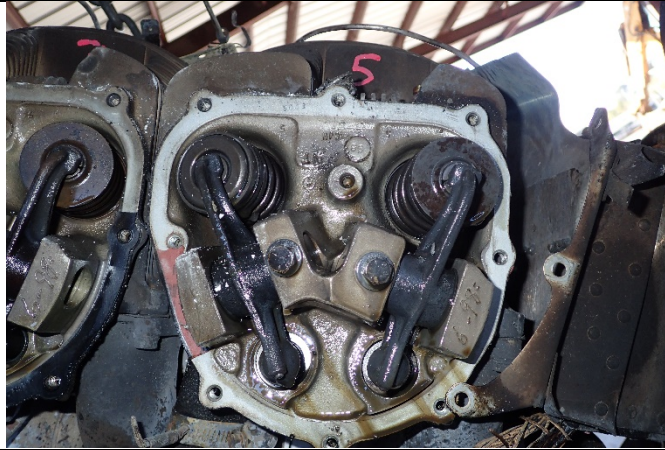
P/N: Not observed

S/N: Not observed

Head Date: 6-98

Condition:

The cylinder remained attached to its cylinder bay and displayed thermal damage signatures. The internal portion of the cylinder was inspected using a lighted borescope; the cylinder bore, piston face, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated and the cylinder displayed good thumb compression and suction. The cylinder overhead components (valves, springs, and rocker arms) displayed minor thermal damage signatures consistent with a post-crash fire and normal operating signatures.



CYLINDER #2

P/N: Not observed

S/N: Not observed

Head Date: 6-98

Condition:

The cylinder remained attached to its cylinder bay and displayed thermal damage signatures. The internal portion of the cylinder was inspected using a lighted borescope; the cylinder bore, piston face, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated and it was noted that the cylinder did not have any thumb compression or suction. The cylinder was removed and visually inspected; it was noted that the intake valve was not seating completely which is consistent with the thermal damage to the overhead components. The overhead components (valves, springs, and rocker arms) displayed a significant amount of thermal damage consistent with a post-crash fire.



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#2 Intake Valve and Valve Seat

CYLINDER #4	P/N: Not observed	S/N: Not observed	Head Date: 10-94
Condition:	The cylinder remained attached to its cylinder bay and displayed thermal damage signatures. The internal portion of the cylinder was inspected using a lighted borescope; the cylinder bore, piston face, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated and the cylinder displayed good thumb compression and suction. The cylinder overhead components (valves, springs, and rocker arms) displayed minor thermal damage signatures consistent with a post-crash fire and normal operating signatures. The cylinder was removed and visually inspected; there were no anomalies noted.		



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CYLINDER #6

P/N: Not observed

S/N: Not observed

Head Date: 10-94

Condition:

The cylinder remained attached to its cylinder bay and displayed thermal damage signatures. The internal portion of the cylinder was inspected using a lighted borescope; the cylinder bore, piston face, and valve heads displayed normal operating and combustion signatures. The crankshaft was rotated and the cylinder displayed good thumb compression and suction. The cylinder overhead components (valves, springs, and rocker arms) displayed minor thermal damage signatures consistent with a post-crash fire and normal operating signatures. The cylinder was removed and visually inspected; there were no anomalies noted.



VALVES AND GUIDES

Condition:

All of the valve heads displayed normal operating and combustions signatures. The #2 intake valve was noted to not fully seat which was consistent with the thermal damage to that cylinder. During crankshaft rotation, all of the valves operated normally. There were no anomalies noted.



#1 Exhaust



#1 Intake

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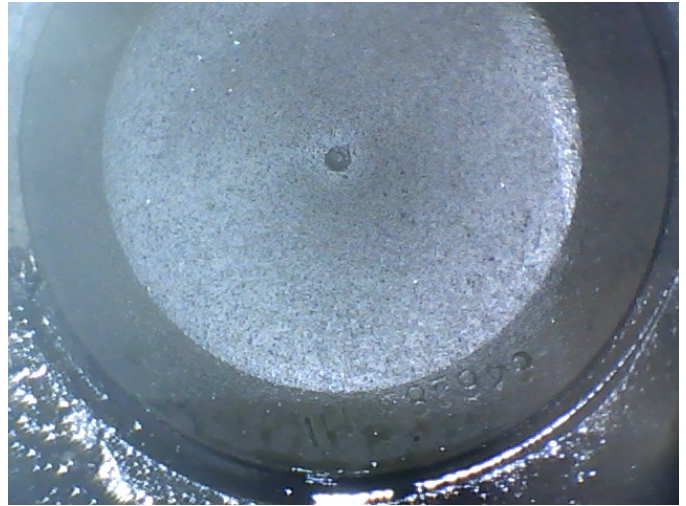
#3 Exhaust



#3 Intake



#5 Exhaust



#5 Intake



#2 Exhaust



#2 Intake

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#4 Exhaust



#4 Intake



#6 Exhaust



#6 Intake

ROCKER ARMS AND SHAFTS

Condition:

All of the rocker arms displayed varying degrees of thermal damage with the #2 rocker arms displaying the most thermal damage. The rocker arms operated normally during crankshaft rotation; there were no anomalies noted.



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Piston P/N: Not observed

Condition:

The piston faces were inspected using a lighted borescope. The piston faces displayed normal operating and combustion signatures. During crankshaft rotation, all of the pistons operated normally. After the #2, #4, and the #6 cylinders were removed the pistons were examined again. The #2, #4, and the #6 piston skirts and piston rings displayed normal operating signatures. The back side of the #1, #3, and the #5 pistons were inspected through the opened cylinder bays; the pistons displayed normal operating signatures. There were no anomalies noted.



#1 Piston



#3 Piston



#5 Piston

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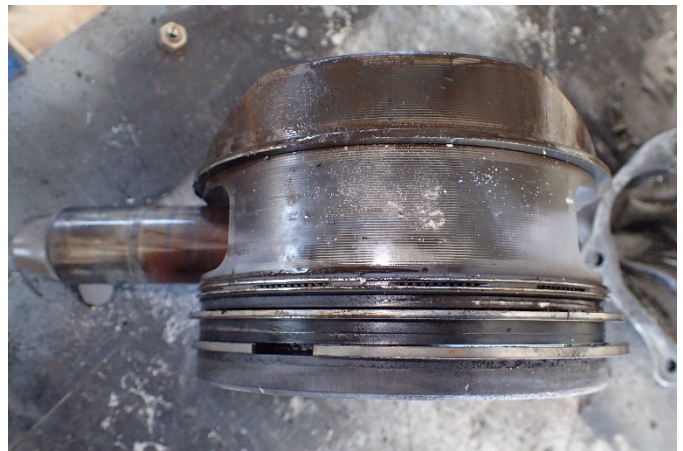
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#2 Piston



#4 Piston



#6 Piston

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CRANKCASE ASSEMBLY

CRANKCASE	Casting Number:	1-3-5: Not observed	2-4-6: Not observed	S/N: 08 94 16 RPL
Condition:	The crankcase remained intact and displayed thermal damage signatures. The inside of the crankcase was visually inspected after the removal of the #2, #4, and the #6 cylinders through the open cylinder bays. There were no signs of bearings being extruded out of their bearing supports. There were no anomalies noted with the crankcase.			



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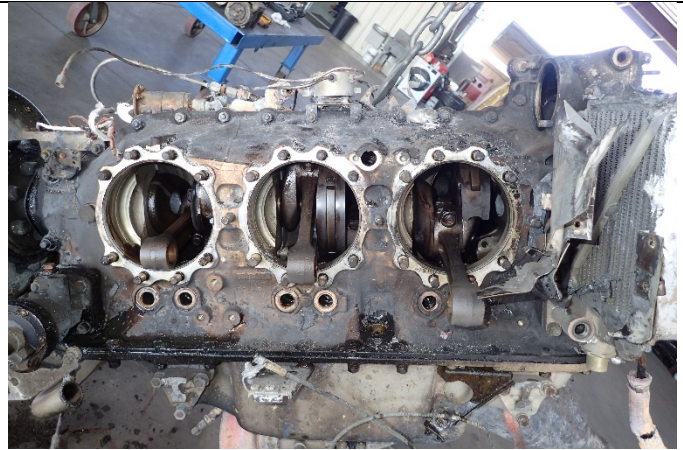
Forging Number: 649878

S/N: Not observed

Heat code: OLD

Condition:

The crankshaft remained intact and displayed thermal damage signatures consistent with a post-crash fire. The crankshaft was rotated by hand and continuity was established between the crankshaft, camshaft, connecting rods, and associated components. The crankshaft rotated smoothly without any binding noted. The crankshaft was visually inspected after the #2, #4, and the #6 cylinders were removed. The visible portions of the crankshaft displayed normal operating and lubrication signatures.

**COUNTERWEIGHTS****Condition:**

The counterweights remained attached to their hangers and displayed normal operating signatures. The counterweights were capable of normal movement on their hangers. There were no anomalies noted with the counterweights.

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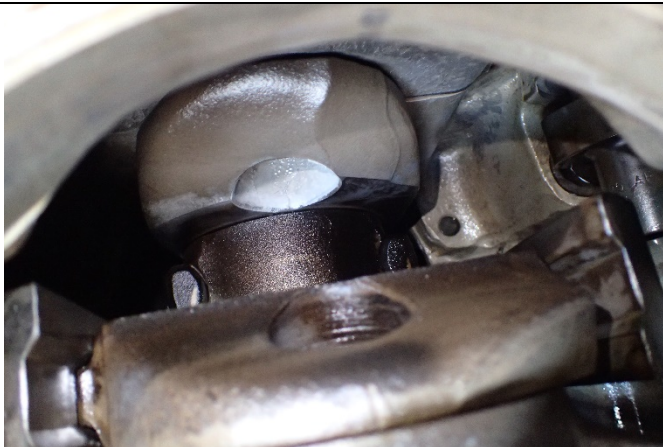
#1 CONNECTING
ROD

P/N: Not observed

Forging or Serial Number: Not observed

Condition:

Operation of the connecting rod was verified by rotating the crankshaft and observing piston movement; the connecting rod operated normally. The connecting rod was partially visible after removing the cylinders on the 2, 4, 6 side of the engine. The visible portions of the connecting rod displayed normal operating and lubrication signatures. There were no anomalies noted.

#3 CONNECTING
ROD

P/N: Not observed

Forging or Serial Number: Not observed

Condition:

Operation of the connecting rod was verified by rotating the crankshaft and observing piston movement; the connecting rod operated normally. The connecting rod was partially visible after removing the cylinders on the 2, 4, 6 side of the engine. The visible portions of the connecting rod displayed normal operating and lubrication signatures. There were no anomalies noted.

#5 CONNECTING
ROD

P/N: Not observed

Forging or Serial Number: Not observed

Condition:

Operation of the connecting rod was verified by rotating the crankshaft and observing piston movement; the connecting rod operated normally. The connecting rod was partially visible after removing the cylinders on the 2, 4, 6 side of the engine. The visible portions of the connecting rod displayed normal operating and lubrication signatures. There were no anomalies noted.

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#2 CONNECTING ROD

P/N: Not observed

Forging Number: 646126

Condition:

Operation of the connecting rod was verified by rotating the crankshaft and observing piston movement; the connecting rod operated normally. The connecting rod was visually inspected after the #2 cylinder was removed. The connecting rod displayed normal operating and lubrication signatures and was capable of normal movement around the connecting rod journal. There were no anomalies noted.



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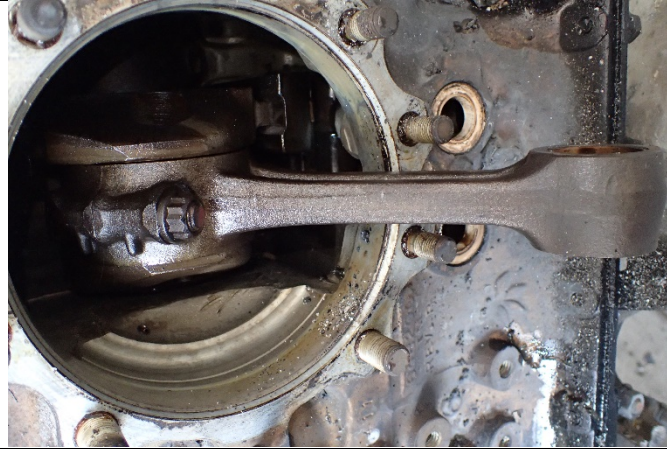
#4 CONNECTING ROD

P/N: Not observed

Forging Number: 646126

Condition:

Operation of the connecting rod was verified by rotating the crankshaft and observing piston movement; the connecting rod operated normally. The connecting rod was visually inspected after the #2 cylinder was removed. The connecting rod displayed normal operating and lubrication signatures and was capable of normal movement around the connecting rod journal. There were no anomalies noted.



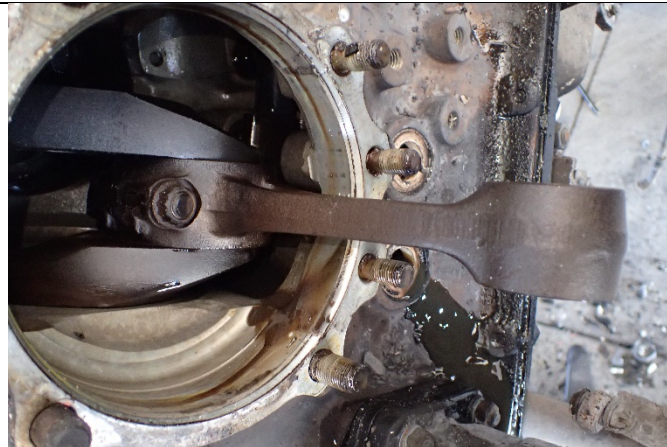
#6 CONNECTING ROD

P/N: Not observed

Forging Number: 646126

Condition:

Operation of the connecting rod was verified by rotating the crankshaft and observing piston movement; the connecting rod operated normally. The connecting rod was visually inspected after the #2 cylinder was removed. The connecting rod displayed normal operating and lubrication signatures and was capable of normal movement around the connecting rod journal. There were no anomalies noted.



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CAMSHAFT

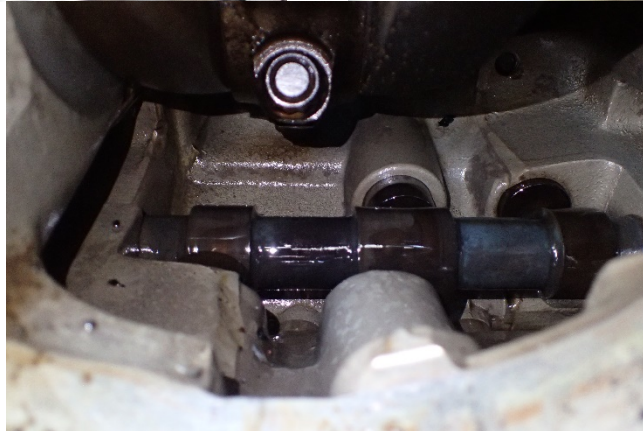
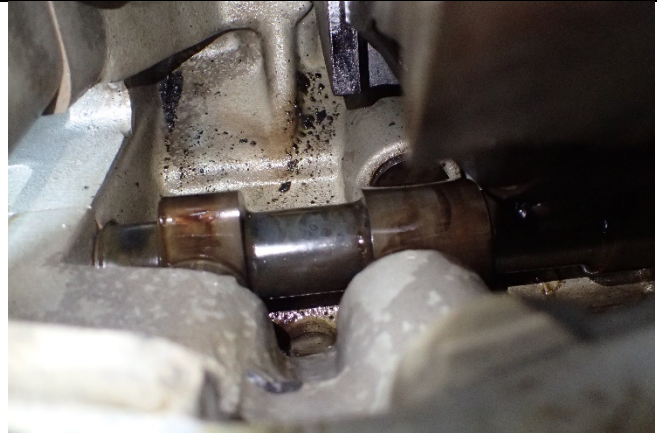
CAMSHAFT

P/N: Not observed

S/N: Not observed

Condition:

Operation of the camshaft was verified by rotating the crankshaft and observing rocker arm movement; the camshaft operated normally. After the #2, #4, and the #6 cylinders were removed the camshaft was partially visible. The camshaft displayed normal operating and lubrication signatures. There were no anomalies noted with the camshaft.



ACCESSORY GEARS

Condition:

The accessory gears displayed normal operating signatures. There were no anomalies noted with any of the gears.



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ACCESSORIES

STARTER

Manufacturer: CMI

P/N: 646275-1

S/N: X-049405

Condition:

The starter remained attached to the starter adapter and displayed thermal damage signatures. There were no anomalies noted with the starter.

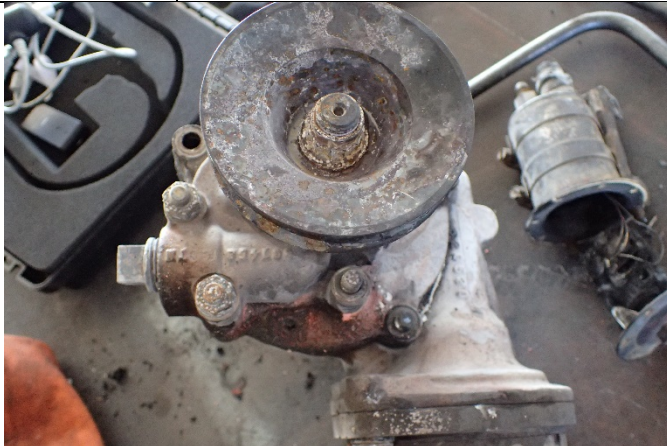


STARTER ADAPTER

P/N: Illegible

Condition:

The starter adapter remained attached to the engine and displayed thermal damage signatures. The starter adapter was removed; the starter adapter gear displayed normal operating signatures. There were no anomalies noted.



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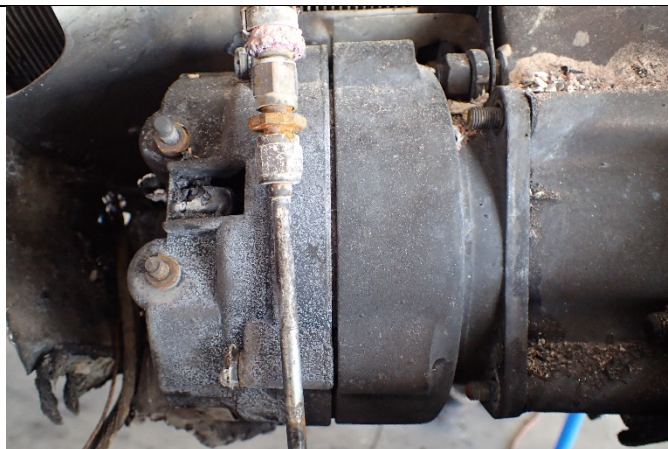
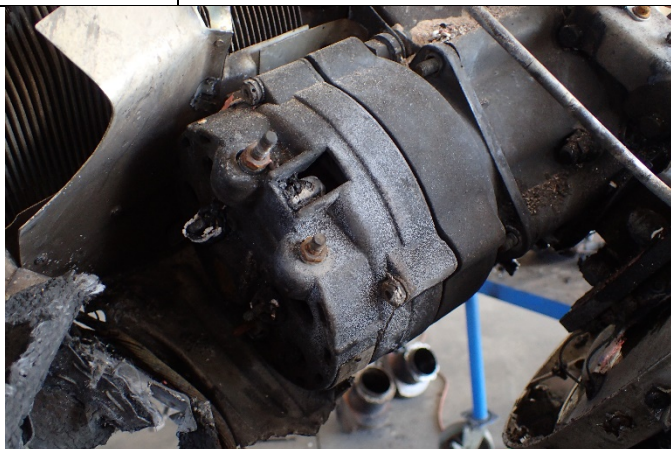
**ALTERNATOR
#1**Manufacturer: CMI (overhauled
by Aerotech)

P/N: 649304

S/N: A606059

Condition:

The alternator remained attached to the engine and displayed thermal damage signatures. There were no anomalies noted with the alternator.

**ALTERNATOR
#2**

Manufacturer: Illegible

P/N: Illegible

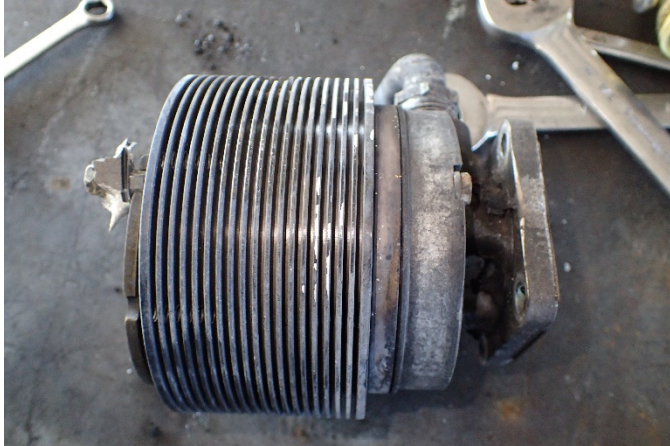
S/N: Illegible

Condition:

The alternator remained attached to its installation point and displayed a significant amount of thermal damage signatures. There were no anomalies noted with the alternator.



VACUUM PUMP	Manufacturer: Illegible	P/N: Illegible	S/N: Illegible
Condition:	The vacuum pump remained attached to its installation point and displayed a significant amount of thermal damage signatures. The vacuum pump was removed and the drive shaft was noted to have melted. There were no anomalies noted with the vacuum pump.		



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PROPELLER

PROPELLER
GOVERNOR

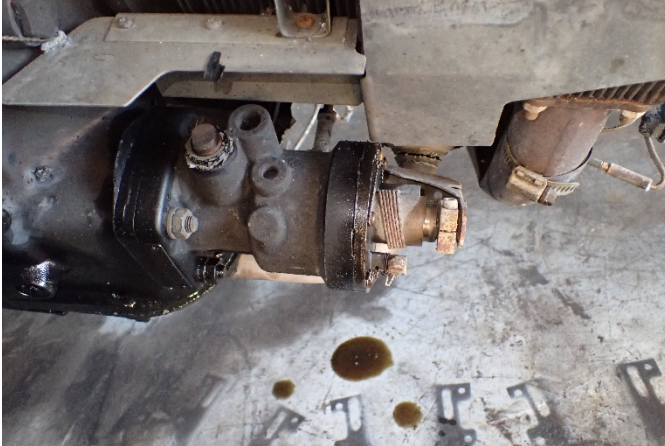
Manufacturer: McCauley

P/N: C290D3 K/T23

S/N: N0970357

Condition:

The governor remained attached to its installation point and displayed minor thermal damage signatures. The governor was removed and it was noted that the gasket screen was clear of any contaminants. The governor was noted to be capable of pump oil during drive shaft rotation. The governor was partially disassembled and it was noted that the flyweights and the valve displayed normal operating signatures.



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PROPELLER

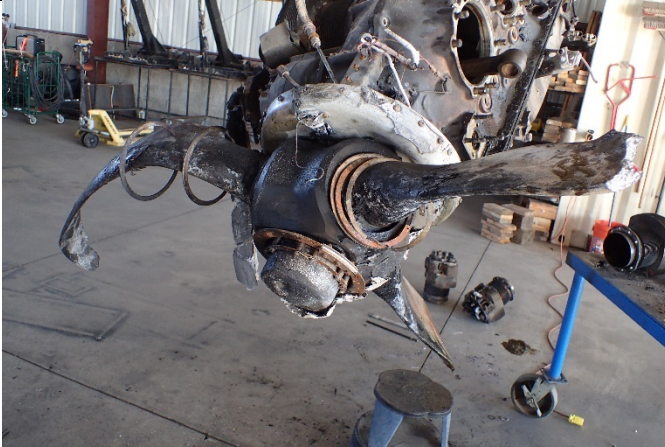
Manufacturer: McCauley

P/N: Not observed

S/N: Not observed

Condition:

The propeller remained attached to the crankshaft and displayed a significant amount of thermal damage signatures consistent with a post-crash fire. Two of the propeller blades were melted approximately in half. The third propeller blade displayed aft bending deformation and thermal damage signatures.



Propeller



Propeller Blade "A"



Propeller Blade "B"



Propeller Blade "C"