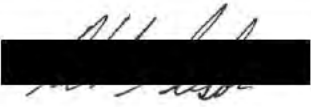




ENGINE EXAMINATION REPORT

ENGINE MODEL	IO-520-BA
ENGINE SERIAL NUMBER	120558-5-B
AIRCRAFT MAKE & MODEL	Beechcraft F33A
AIRCRAFT SERIAL NUMBER	CE-478
AIRCRAFT REGISTRATION	N711JA
FILE NUMBER	19-199

NAME	SIGNATURE	DATE
Kurt Gibson		09/21/2020

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	09/03/2020	NTSB ACCIDENT #	ERA20LA179
FACILITY	Florida Air Recovery	NTSB INVESTIGATOR	Robert Gretz
ADDRESS	7403 Philips Hwy Jacksonville, FL 32256	FAA INVESTIGATOR	Mark Keefer
		ACCIDENT DATE	05/12/2020
		ACCIDENT LOCATION	Land O Lakes, Florida

ENGINE INFORMATION

ENGINE POSITION	Front (single engine)
TOTAL TIME	1786.8 (the time was taken from the last annual inspection on 03/02/2020)
TIME SOH	195.9 (the time was taken from the last annual inspection on 03/02/2020)
TYPE & TIME SLI	Unknown
BUILD DATE	03/30/1965
IN SERVICE DATE	Unknown

Significant logbook information:

The last 100-hour inspection on the engine was performed on 03/02/2020 at a tachometer time of 88.2.
The engine was overhauled on 07/11/2017 by Zephyr Aircraft Engines Inc.

Report Summary:

Search Code(s):

30-09-22

During the disassembly of the manifold valve, it was observed that the manifold valve contained a significant amount of corrosion. There were no further anomalies observed with the engine examination.

Disposition of engine following exam:

The engine remained at Florida Air Recovery

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INSPECTION WITNESSES

NAME	Kurt Gibson	NAME	Daniel Boggs
ADDRESS	Mobile, Alabama	ADDRESS	Eastern Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Andrew Hall	NAME	
ADDRESS	Wichita, Kansas	ADDRESS	
ORGANIZATION	Textron Aviation	ORGANIZATION	
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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PAGE 4 of 32**EXTERNAL INSPECTION OF ENGINE**

The engine displayed significant thermal and impact damage signatures with the bottom of the engine displaying the most thermal damage. The crankcase remained intact and there were no holes in the crankcase that would indicate a catastrophic internal engine failure. The three-blade, constant speed propeller remained attached to the crankshaft and the three propeller blades remained within the propeller hub. All six cylinders remained attached to their cylinder bays and displayed varying amounts of thermal damage.

Both magnetos remained attached to their installation points and displayed thermal discoloration. The ignition harness displayed impact and thermal damage signatures with the most thermal damage occurring to the bottom spark plug leads. All of the spark plugs remained installed in their cylinder and displayed varying amounts of thermal damage.

The fuel pump remained attached to its installation point and displayed thermal damage signatures. The throttle and metering assembly displayed significant thermal damage and remained attached to its installation point. The fuel manifold valve displayed minor thermal discoloration and remained secured to its installation point. The fuel nozzles remained secured in their cylinders and were undamaged.

The exhaust system displayed impact damage signatures with the most damage occurring to the tailpipes. There were no signs of exhaust leaks observed. The induction system displayed significant thermal damage and several of the intake components were partially melted. There were no signs of induction leaks observed.

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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. The tailpipes were removed, and it was observed that both of the flame cones remained intact. There were no signs of exhaust leaks or blockages observed.



INDUCTION SYSTEM

Condition:

The induction system displayed significant thermal damage signatures and some impact damage signatures; a portion of the induction system had melted from the post-crash fire. The examination did not reveal any signs of intake leaks or blockages.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

P/N: 6310

S/N: 17040406

Condition:

The magneto remained attached to its installation point and displayed thermal damage signatures. The magneto timing was checked and was found to be at 21° BTDC. During crankshaft rotation, it was observed that the impulse couplings were capable of normal operation. During impulse coupling operation the magneto displayed the ability to produce a spark on each post and was in sync with the right magneto.



RIGHT MAGNETO

Manufacturer: Slick

P/N: 6310

S/N: 17040393

Condition:

The magneto remained attached to its installation point and displayed thermal damage signatures. The magneto timing was checked and was found to be at 22° BTDC. During crankshaft rotation, it was observed that the impulse couplings were capable of normal operation. During impulse coupling operation the magneto displayed the ability to produce a spark on each post and was in sync with the left magneto.



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IGNITION HARNESS

Manufacturer: Slick

P/N: RH: Not observed, LH: M2380

Condition:

The ignition harness displayed impact and thermal damage signatures. There were no pre-impact anomalies observed.



SPARK PLUGS

Manufacturer: Champion

Condition:

The spark plugs remained installed in their cylinders and displayed varying amounts of thermal damage signatures. The top spark plugs were removed for examination and the bottom spark plug electrodes were examined using a lighted borescope. Several of the bottom spark plug electrodes were partially submerged in oil which was consistent with post-accident accumulation. The observed electrodes displayed normal operating and wear signatures, several of the spark plugs were in a normal worn-out condition when compared with Champion Aviation Service Manual AV6-R



#1 Top Spark Plug



#1 Bottom Spark Plug (submerged in oil)

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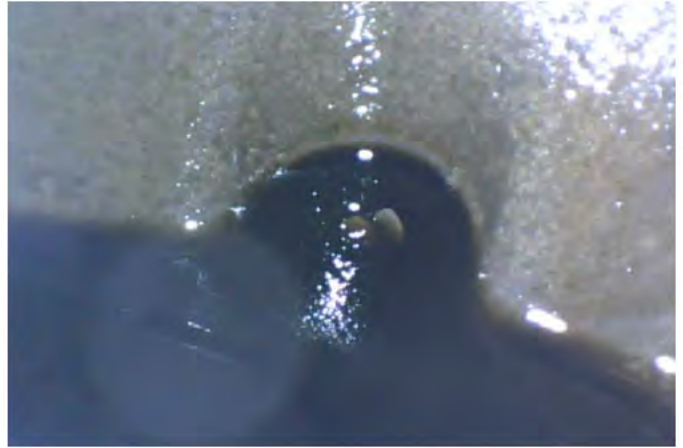
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#3 Top Spark Plug



#3 Bottom Spark Plug (submerged in oil)



#5 Top Spark Plug



#5 Bottom Spark Plug (submerged in oil)



#2 Top Spark Plug



#2 Bottom Spark Plug

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#4 Top Spark Plug



#4 Bottom Spark Plug



#6 Top Spark Plug



#6 Bottom Spark Plug

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FUEL SYSTEM

FUEL PUMP	Manufacturer: CMI	P/N: Not observed	S/N: Not observed
Condition:	The fuel pump remained attached to its installation point and displayed impact and thermal damage signatures. The fuel pump was removed and the drive coupling was noted to be intact. The fuel pump drive shaft was unable to be rotated by hand which was consistent with the thermal damage observed. The fuel pump was disassembled and the internal components were visually examined. The components displayed thermal damage signatures as well as normal operating signatures. There were no anomalies observed.		



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THROTTLE BODY
METERING UNIT

Manufacturer: CMI

P/N: 631415A7

S/N: A05BA203R

Condition:

The throttle and metering assembly displayed significant thermal damage as well as impact damage. The throttle and mixture control rod ends remained attached to their respective control arms and the control arms were secured to their shafts. The fuel inlet screen was removed and there were no contaminants noted. The investigator was unable to disassemble the assembly any further due to the extensive thermal damage.



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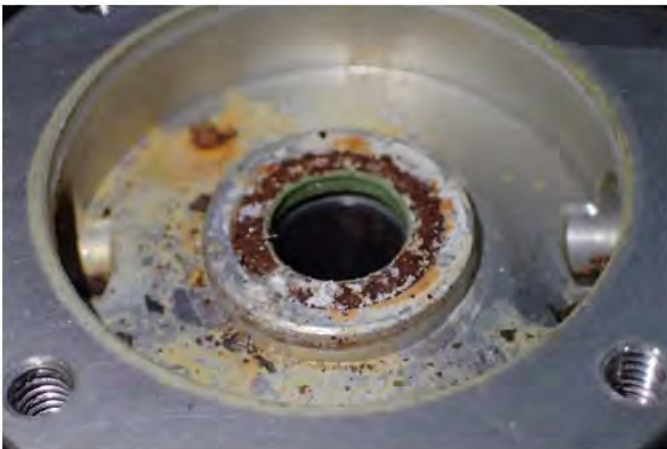
FUEL MANIFOLD
VALVEManufacturer: CMI
(overhauled by Great Planes
Fuel Metering Inc.)

P/N: 631427-2A21

S/N: C05BA198R

Condition:

The manifold valve remained attached to its installation point and displayed minor thermal damage signatures. All of the fuel lines remained secure to the manifold valve. The manifold valve was disassembled and it was observed that there was a significant amount of corrosion as well as loose material associated with corrosion inside the manifold valve.



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FUEL NOZZLES AND
LINES

Manufacturer: GAMI

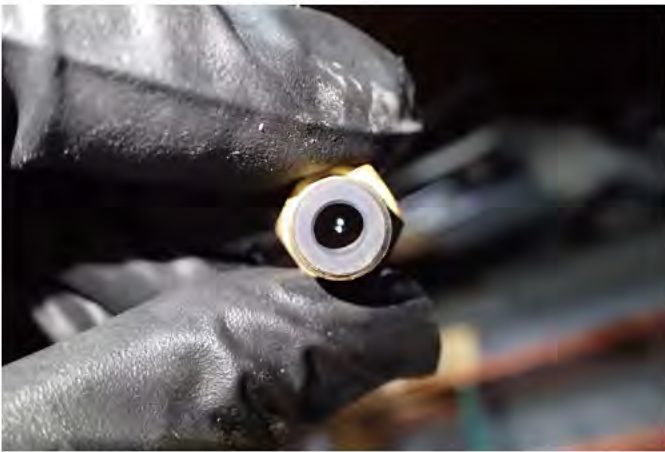
Position	#1	#3	#5	#2	#4	#6
Size	GA173	GM156	GF147	GA173	GM156	GF147
Condition:	All of the fuel nozzles remained installed in their installation point and displayed minor thermal damage signatures. The nozzles were removed and were noted to be clear of any obstructions.					



#1 Nozzle



#3 Nozzle



#5 Nozzle



#2 Nozzle

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#4 Nozzle



#6 Nozzle

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LUBRICATION SYSTEM

OIL SUMP

Condition:

The oil sump remained attached to its installation point and displayed minor thermal discoloration.



OIL PICK-UP TUBE & SCREEN

Condition:

Due to the type of inspection performed, the oil pick-up tube and screen were not observed.

OIL PUMP

Condition:

The oil pump remained attached to its installation point and displayed thermal damage signatures. There were no signs of lubrication distress to any observed components.



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OIL FILTER

Manufacturer: Illegible

P/N: Illegible

Condition:

The oil filter remained attached to its installation point and displayed thermal damage signatures. It was noted that the oil filter was loose which is consistent with the thermal damage observed. The oil filter was removed and the filter housing was cut open. The filter pleats displayed thermal damage, however, there was no metallic material observed inside the filter pleats.



OIL COOLER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The oil cooler remained attached to its installation point and displayed thermal damage signatures. There were no anomalies observed.



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CYLINDERS

CYLINDERS

Condition:

All of the cylinders remained attached to their cylinder bays and displayed varying amounts of thermal and impact damage. The cylinders were inspected using a lighted borescope; the piston faces, cylinder walls, and valve heads displayed normal operating and combustion signatures. The overhead components (valves, springs, and rocker arms) displayed normal operating signatures and operated normally during crankshaft rotation. During crankshaft rotation, it was observed that all six cylinders displayed good thumb compression and suction. There were no anomalies observed.



#1 Cylinder



#3 Cylinder

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#5 Cylinder



#2 Cylinder



#4 Cylinder

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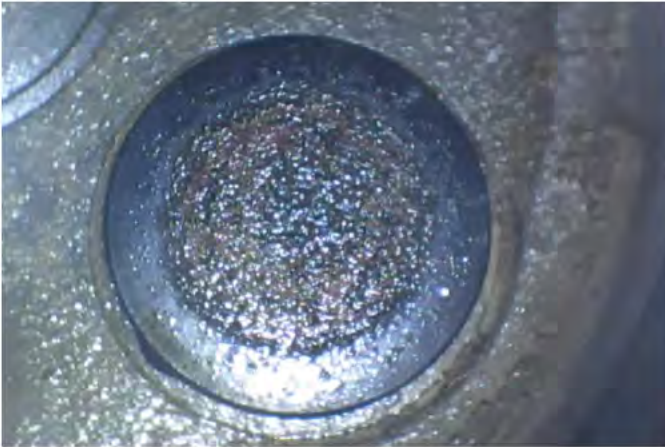


#6 Cylinder

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 of the valves operated normally.



#1 Exhaust Valve



#1 Intake Valve

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#3 Exhaust Valve



#3 Intake Valve



#5 Exhaust Valve



#5 Intake Valve



#2 Exhaust Valve



#2 Intake Valve

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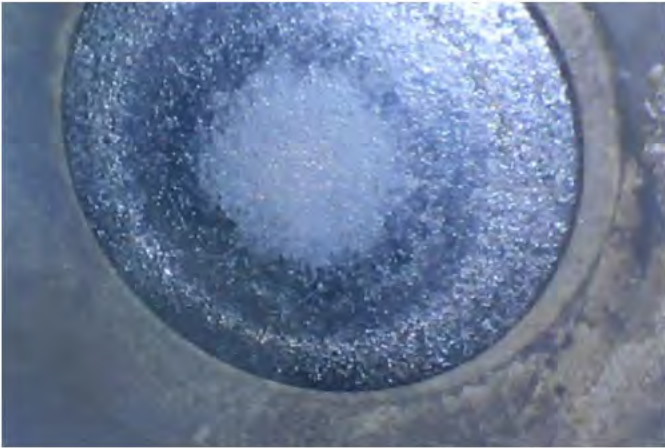
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#4 Exhaust Valve



#4 Intake Valve



#6 Exhaust Valve



#6 Intake Valve

ROCKER ARMS AND SHAFTS

Condition:

The rocker arms displayed normal operating and lubrication signatures. During crankshaft rotation, the rocker arms operated normally.



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PISTONS

Piston P/N: Inaccessible

Condition:

The piston faces were inspected using a lighted borescope. The piston faces displayed normal operating and combustion signatures. During crankshaft rotation, it was observed that all of the pistons operated normally.



#1 Piston



#3 Piston



#5 Piston



#2 Piston

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#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: F268911R
Condition:	The crankcase remained intact and displayed minor thermal damage signatures. There were no holes in the crankcase that would indicate a catastrophic internal engine failure. There were no anomalies observed.			



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CRANKSHAFT ASSEMBLY

CRANKSHAFT	Forging Number: Inaccessible	S/N: N04CA280	Heat code: Inaccessible
Condition:	The propeller flange remained attached to the rest of the propeller and was undamaged. The crankshaft was rotated by using a hand tool and continuity was established between the crankshaft, camshaft, connecting rods, and associated components. The crankshaft gear remained secure and displayed normal operating signatures. It was noted that there was a significant amount of sludge inside the crankshaft propeller oil cavity. There were no anomalies observed that would have prevented normal operation.		



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The crankshaft to camshaft timing was verified by lining up the crankshaft gear and camshaft gear timing marks.

**CONNECTING RODS**

P/N: Inaccessible

Forging or Serial Number: Inaccessible

Condition:

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

CAMSHAFT AND ACCESSORY GEARS**CAMSHAFT**

P/N: Inaccessible

S/N: Inaccessible

Condition:

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

**ACCESSORY
GEARS****Condition:**

The operation of the magneto drive gears was verified by rotating the crankshaft and observing magneto impulse coupling operation, the magneto drive gears operated normally. The governor drive gear was observed after removing the propeller governor and the gear displayed normal operating signatures.

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ACCESSORIES

STARTER

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

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

STARTER
ADAPTER

Condition:

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



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ALT/GEN #1

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The alternator remained attached to its installation point and displayed thermal damage signatures. There were no anomalies observed.



VACUUM
PUMP

Manufacturer: Illegible

P/N: Illegible

S/N: Illegible

Condition:

The vacuum pump remained attached to its installation point and displayed thermal damage signatures.



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PROPELLER

PROPELLER
GOVERNOR

Manufacturer: Woodward

P/N: D210680

S/N: 1582155//Y

Condition:

The propeller governor remained attached to its installation point and displayed thermal and impact damage signatures. The governor was removed and it was observed that the drive shaft remained intact and was capable of rotation with some resistance, the resistance was consistent with the thermal damage observed.



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PROPELLER

Manufacturer: Hartzell

P/N: Not observed

S/N: Not observed

Condition:

The three-blade, constant speed propeller remained attached to the crankshaft and all three propeller blades remained within the hub. The blades displayed varying amounts of impact and thermal damage signatures. The propeller blade marked "A" displayed significant thermal damage to the blade tip, minor S-bending deformation, and significant aft bending deformation. The propeller blade marked "B" displayed minor S-bending deformation. The propeller blade marked "C" displayed thermal damage signatures and minor aft bending deformation.



Propeller before removal



Propeller after removal



Propeller Blade "A"

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Propeller Blade "B"



Propeller Blade "C"