



Continental Motors

ENGINE EXAMINATION REPORT

ENGINE MODEL	IO-520-BA
ENGINE SERIAL NUMBER	813388-R
AIRCRAFT MAKE & MODEL	Beechcraft V35
AIRCRAFT SERIAL NUMBER	D-8277
AIRCRAFT REGISTRATION	N7997M
FILE NUMBER	18-216

NAME	SIGNATURE	DATE
Kurt Gibson		12/20/2018

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	10/18/2018	NTSB ACCIDENT #	WPR19FA001
FACILITY	Air Transport	NTSB INVESTIGATOR	Joshua Cawthra
ADDRESS	[REDACTED] Phoenix, AZ 85009	FAA INVESTIGATOR	Steve Sonneson
		ACCIDENT DATE	10/01/2018
		ACCIDENT LOCATION	La Verne, CA

ENGINE INFORMATION

ENGINE POSITION	Front (single engine)
TOTAL TIME	921.77 (time taken from last maintenance entry)
TIME SOH	N/A
TYPE & TIME SLI	88.36 (time taken from last maintenance entry)
BUILD DATE	04/28/1999
IN SERVICE DATE	05/21/1999

Significant logbook information:

The last engine 100 hour inspection was performed on 11/01/2017 at a tachometer time of 833.41. The last maintenance entry was for an oil change and was performed on 09/23/2018 at a tachometer time of 921.77.

Report Summary:

Search Code(s):

15-12-68

There were no 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, AZ

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INSPECTION WITNESSES

NAME	Kurt Gibson	NAME	Joshua Cawthra
ADDRESS	Mobile, Alabama	ADDRESS	Western Pacific Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB
PHONE		PHONE	
NAME	Pete Basile	NAME	Jennifer Barclay
ADDRESS	Wichita, Kansas	ADDRESS	Wichita, Kansas
ORGANIZATION	Textron Aviation	ORGANIZATION	Textron Aviation
PHONE		PHONE	
NAME		NAME	
ADDRESS		ADDRESS	
ORGANIZATION		ORGANIZATION	
PHONE		PHONE	

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The engine remained partially attached to the airframe and displayed impact damage and a significant amount of thermal damage. The crankcase remained intact and displayed thermal damage signatures; there were no signs of a catastrophic engine failure with the crankcase. The propeller flange remained attached to the rest of the crankshaft and displayed impact damage signatures to the propeller flange. The propeller had broken free from the propeller flange; the propeller studs had pulled out of the propeller hub and remained with the propeller flange. The propeller displayed impact damage signatures. All six cylinders remained attached to their cylinder bays and displayed thermal and impact damage signatures.

Both of the magnetos remained attached to their installation point and displayed thermal damage signatures. The ignition harness remained attached to both of the magnetos and to the spark plugs; the harness leads displayed a significant amount of thermal damage signatures. All of the ignition leads were severely burned. All of the spark plugs remained installed in their cylinders and displayed varying amounts of thermal damage signatures.

The fuel pump remained attached to its installation point and displayed impact damage signature and a significant amount of thermal damage signatures. The throttle and metering assembly remained attached to its installation point and displayed a significant amount impact and thermal damage signatures. The manifold valve remained attached to its installation point and displayed thermal damage signatures.

The induction system displayed a significant amount of thermal damage signatures with the most damage occurring to the rear induction tubes and risers. The exhaust system remained attached to the engine and displayed impact damage signatures.

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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 cabin heat exchanger shield was removed, and the exhaust was visually inspected; there were no signs of exhaust leaks anywhere in the exhaust system.



INDUCTION SYSTEM

Condition:

The majority of the induction system remained attached to the engine and displayed varying amounts of thermal damage and impact damage. Most of the damage occurred to the rear portions of the induction system. There were no signs of induction leaks or blockages noted. There were no anomalies noted.



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

P/N: 6310

S/N: 99032246

Condition:

The magneto remained attached to its installation point and displayed thermal damage signatures. The magneto was removed, and it was noted that the drive shaft was capable of rotation and the impulse coupling was capable of operation. During impulse coupling operation it was noted that the magneto was capable of producing a spark on all six posts in the correct order. The magneto was partially disassembled, and it displayed thermal damage signatures and normal operating signatures.

RIGHT
MAGNETO

Manufacturer: Slick

P/N: 6310

S/N: 99032245

Condition:

The magneto remained attached to its installation point and displayed thermal damage signatures. The magneto was removed, and it was noted that the drive shaft was capable of rotation and the impulse coupling operated normally. It was noted that the magneto was unable to produce a spark. The magneto was partially disassembled, and it was noted that the capacitor and wire displayed a significant amount of thermal damage; the rest of the components displayed minor thermal damage and normal operating signatures. The top housing and capacitor was replaced with the capacitor and top housing from the left magneto. It was noted that after replacing the capacitor and top housing the magneto was capable of producing a spark on all six posts in the correct order.

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IGNITION HARNESS

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The ignition harness remained attached to the engine and displayed a significant amount thermal and impact damage signatures. There were no anomalies noted with the ignition harness.



SPARK PLUGS

Manufacturer: Autolite

P/N: URHB32S

Condition:

The spark plugs remained installed in their cylinders and displayed varying amounts of thermal damage signatures. The top spark plugs were removed, and the electrodes were visually inspected; the electrodes displayed normal operating and wear signatures. The bottom spark plugs were inspected using a lighted borescope; the electrodes displayed normal operating and wear signatures. There were no anomalies noted.

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#1 Top Spark Plug



#1 Bottom Spark Plug



#3 Top Spark Plug



#3 Bottom Spark Plug



#5 Top Spark Plug



#5 Bottom Spark Plug

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#2 Top Spark Plug



#2 Bottom Spark Plug



#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: 646212-2

S/N: A289909BR

Condition:

The fuel pump remained attached to its installation point and displayed impact and thermal damage signatures. The fuel return AN fitting had broken free from the fuel pump; the remaining AN fittings remained attached to the fuel pump; it was noted that all of the B-nuts were loose which is consistent with the thermal damage. The fuel pump was removed, and it was noted that the drive coupling was intact, and the drive shaft was capable of rotation with some noticeable resistance. The fuel pump was disassembled, and the internal components were visually inspected; the components displayed thermal damage signatures, impact damage signatures, and normal operating signatures. There were no anomalies noted with the fuel pump.



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THROTTLE BODY METERING UNIT

Manufacturer: CMI

P/N: 629904-2

S/N: A289909AR

Condition:

The throttle and metering assembly displayed a significant amount of impact damage signatures and thermal damage signatures. The assembly was removed, and it was noted that the throttle control arm was capable of moving freely around the throttle control shaft. The control arm was remove and it was noted that damage to the knurls was consistent with impact damage. The metering assembly was disassembled, and the components were visually inspected. The fuel inlet screen was twisted; there were no contaminates notes within the screen. The mixture and throttle cams displayed thermal damage and normal operating signatures. The metering plug displayed normal operating signatures.



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FUEL MANIFOLD VALVE

Manufacturer: CMI

P/N: 631427-2A2

S/N: A289909CR

Condition:

The fuel manifold valve remained attached to its installation point and displayed thermal damage signatures. The valve was disassembled, and the internal components were visually inspected. The components displayed thermal damage signatures and normal operating signatures. There were no anomalies noted.



FUEL NOZZLES AND LINES

Manufacturer: GAMI

Position

#1

#3

#5

#2

#4

#6

Size

GA168

GM151

GF143

GA168

GM151

GF143

Condition:

All of the nozzles remained installed in their cylinders and displayed minor thermal damage signatures. The nozzles were removed and visually inspected; all of the nozzles were clear of any blockages. There were no anomalies noted.

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#1 Nozzle



#3 Nozzle



#5 Nozzle



#2 Nozzle



#4 Nozzle



#6 Nozzle

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LUBRICATION SYSTEM

OIL SUMP

Condition:

The oil sump remained intact and displayed some impact and thermal damage signatures. There were no anomalies noted.



OIL PICK-UP TUBE & SCREEN

Condition:

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

OIL PUMP

Condition:

The oil pump remained attached to its installation point and displayed thermal and impact damage signatures. There were no anomalies noted.



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OIL FILTER

Manufacturer: Champion

P/N: CH48????

Condition:

The oil filter had broken free from the oil filter adapter and displayed impact and thermal damage signatures. The oil filter housing was cut open and the filter pleats were inspected; there was no metal noted within the filter pleats. There were no anomalies noted.



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OIL COOLER

Manufacturer: NDM

P/N: 70278A

S/N: L99-3264-???

Condition:

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



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CYLINDERS

CYLINDERS

Condition:

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



#1 Cylinder



#3 Cylinder

ENGINE FIELD INSPECTION REPORT

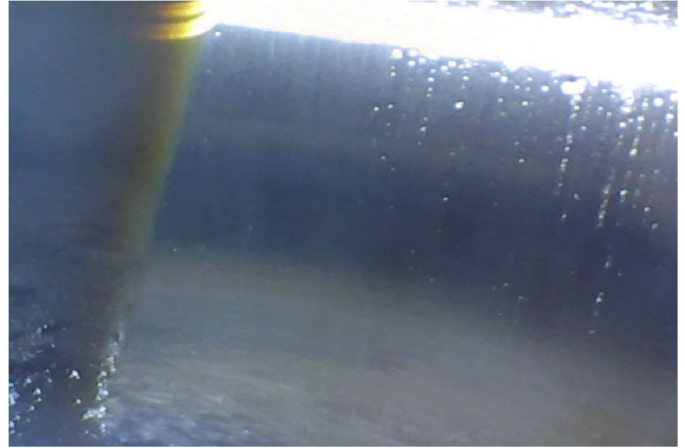
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#5 Cylinder



#2 Cylinder



#4 Cylinder

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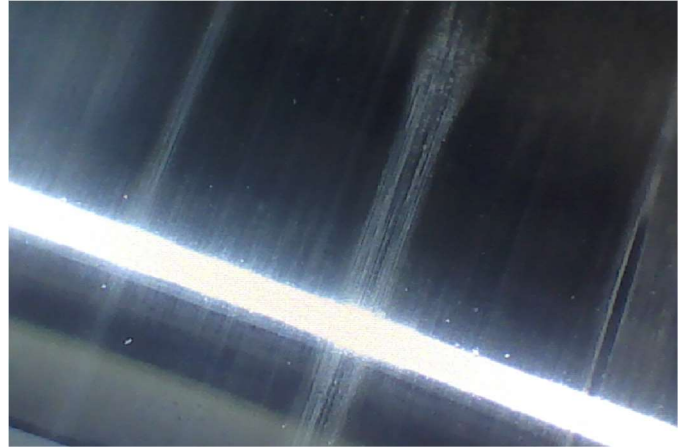
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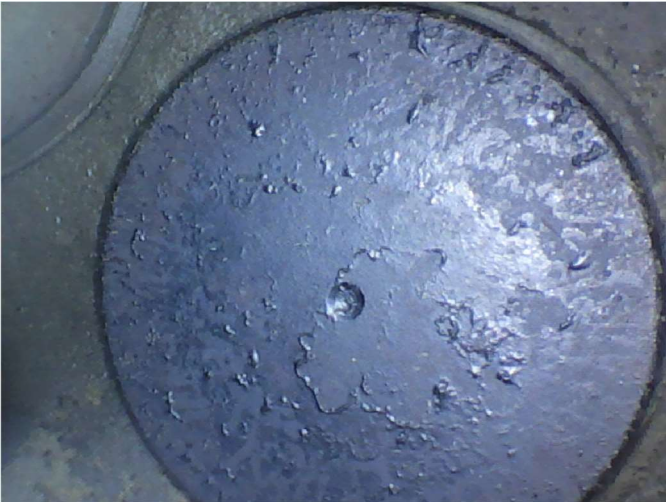


#6 Cylinder

VALVES AND GUIDES

Condition:

The valve heads were inspected using a lighted borescope; the valve heads displayed normal operating and combustion signatures. The valves operated normally during crankshaft rotation. There were no anomalies noted.



#1 Exhaust Valve



#1 Intake Valve

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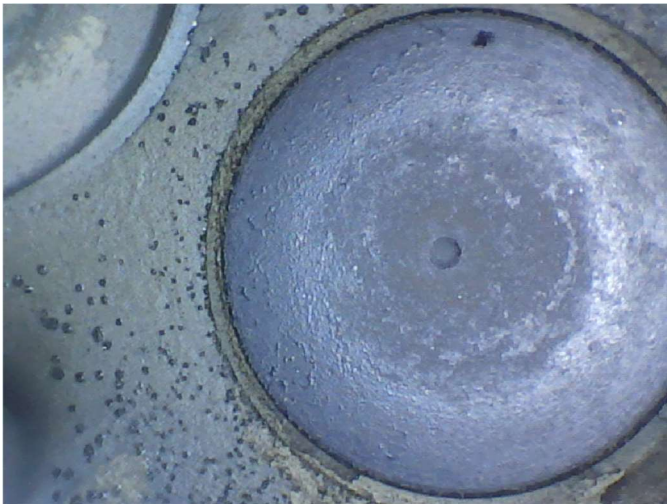
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#3 Exhaust Valve



#3 Intake Valve



#5 Exhaust Valve



#5 Intake Valve

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#2 Exhaust Valve



#2 Intake Valve



#4 Exhaust Valve



#4 Intake Valve

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#6 Exhaust Valve



#6 Intake Valve

ROCKER ARMS AND SHAFTS

Condition:

All of the rocker arms remained attached to their installation points and displayed minor thermal damage signatures. During crankshaft rotation all of the rocker arms operated normally.



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PISTONS

Piston P/N: Inaccessible

Condition:

All of the pistons 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.



#1 Piston



#3 Piston



#5 Piston



#2 Piston

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#4 Piston



#6 Piston

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Number:

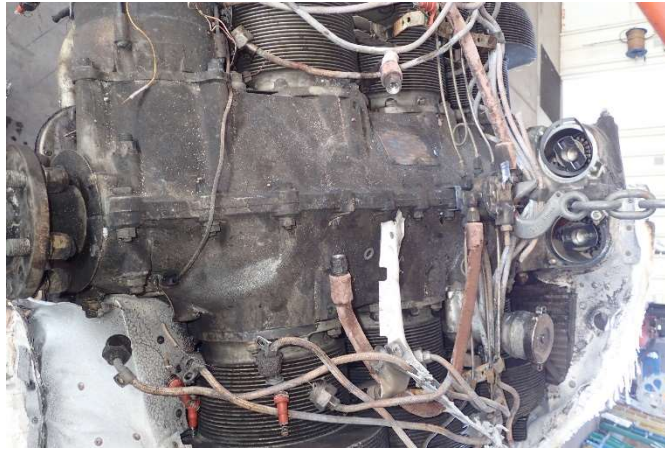
1-3-5: Not observed

2-4-6: Not observed

S/N: C259904R

Condition:

The crankcase remained intact and displayed thermal damage signatures. There were no signs of a catastrophic engine failure. There were no anomalies noted with the crankcase.



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

Forging: Inaccessible

S/N: A146M2

Heat code: Inaccessible

Condition:

The propeller flange remained attached to the rest of the crankshaft and displayed impact damage signatures in the forms of bending deformation and cracks in the propeller flange. The crankshaft was rotated from the rear of the crankshaft using a hand tool; continuity was established between the crankshaft, camshaft, connecting rods, and associated components. There were no anomalies noted.



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TRANSFER COLLAR

Condition:

The transfer collar remained attached to its installation point and was undamaged. There were no anomalies noted with the transfer collar.



INTERNAL TIMING

Condition:

The internal timing was verified to be correct.



CONNECTING RODS

P/N:

Forging or Serial Number:

Condition:

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

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P/N: Inaccessible

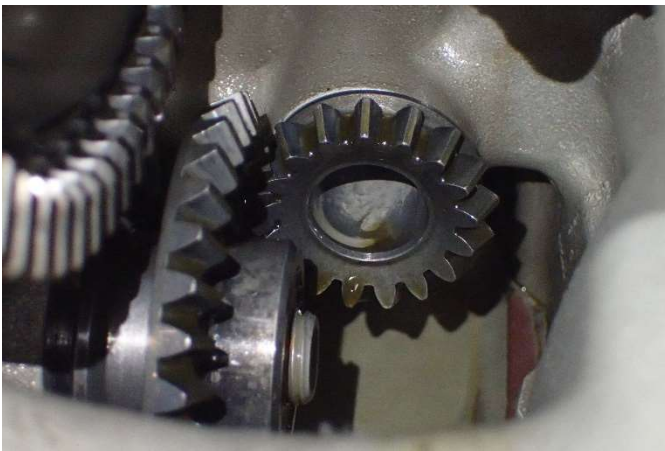
S/N: Inaccessible

Condition:

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

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

The accessory drive gears remained installed and displayed normal operating signatures. There were no anomalies noted.



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ACCESSORIES

STARTER

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The starter remained attached to a portion of the starter adapter; however, the starter attach flange had broken free from the rest of the starter adapter. The starter displayed thermal damage signatures. There were no anomalies noted.

STARTER ADAPTER

P/N:

Condition:

The starter adapter remained attached to the engine and displayed a significant amount of impact damage and thermal damage; a large portion of the adapter had broken free from the rest of the starter adapter. There were no anomalies noted with the adapter.



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ALTERNATOR

Manufacturer: Kelly Aerospace

P/N: ALX-9524R

S/N: H062937

Condition:

The alternator remained attached to its installation point and displayed thermal damage signatures. The alternator was removed, and it was noted that the drive coupling remained intact and was undamaged. The alternator drive was capable of rotation; there were no anomalies noted.



VACUUM PUMP

Manufacturer: Not observed

P/N: Not observed

S/N: Not observed

Condition:

The vacuum pump remained attached to its installation point and displayed thermal damage signatures. The vacuum pump was removed, and it was noted that the drive coupling displayed thermal damage signatures. There were no anomalies noted.



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PROPELLER

PROPELLER GOVERNOR	Manufacturer: Woodward	P/N: D210680	S/N: 2126925
Condition:	The governor remained attached to its installation point and displayed impact damage signatures. The governor was removed, and it was noted that the gasket screen was clear of contaminants. The governor drive was capable of rotation and was capable of pumping oil. The flyweights were visible through the impact damage to the top of the governor and they were noted to be installed and intact. There were no anomalies noted.		



PROPELLER	Manufacturer: McCauley	P/N: 3A32 C76-QR	S/N: 890563
Condition:	The three blade, constant speed propeller had pulled free from the propeller flange and displayed impact damage signatures. The propeller blade marked "A" was loose in the hub, displayed aft bending deformation, and leading-edge polishing and minor chordwise scratches. The propeller blade marked "B" displayed aft bending at the tip of the propeller and displayed minor chordwise scratches. The propeller blade marked "C" was unremarkable. There were no anomalies noted with the propeller.		

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Propeller



Propeller Hub



Blade "A"



Blade "A"



Blade "B"



Blade "B"

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Blade "C"



Blade "C"