



Continental Motors

ENGINE FIELD INSPECTION REPORT

ENGINE MODEL	TSIO520-UB
ENGINE SERIAL NUMBER	809412
AIRCRAFT MAKE & MODEL	Beech A36TC
AIRCRAFT SERIAL NUMBER	EA-250
AIRCRAFT REGISTRATION	N7FG
CMI FILE NUMBER	15-297

NAME	SIGNATURE	DATE
Mike Council		1-21-2016

ENGINE FIELD INSPECTION REPORT**FILE NUMBER:**

15-360

ENGINE S/N:

809412-R

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EXAMINATION		ACCIDENT DATA	
DATE	11-24-2015	NTSB ACCIDENT #	ERA16FA043
FACILITY	Florida Air Recovery	NTSB INVESTIGATOR	Tim Monville
ADDRESS	[REDACTED] Jacksonville, FL [REDACTED]	FAA INVESTIGATOR	Alexander P. M. Honig Richard J. Brown Orlando FAA FSDO
		ACCIDENT DATE	11-20-2015 approximately 11:27 AM, EST
		ACCIDENT LOCATION	Clear Lake, Orlando, FL

ENGINE INFORMATION

ENGINE POSITION	Single
TOTAL TIME	839.6
TIME SOH	NA
TYPE & TIME SLI	100 Hour Inspection, 69.3 hours since last inspection
BUILD DATE	12-13-2002
IN SERVICE DATE	7-25-2003 according to CMI engine serial data

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Significant logbook information:

Engine Service and Maintenance Record
Installations, Inspections, Airworthiness Directives, Special Inspections, Modifications and Service Bulletins

Date	Total Time		Time Since Last Overhaul	
	Hrs.	Min.	Hrs.	Min.
Brought Forward				
June 01, 2015 Engine Logbook Entry N7FG Continental TSIO-520-UB S/N 809412-R Tach: 1779.2 TSOH: 824.3 W/O: 5994				
				
Waypoint Aviation Maintenance KRAL Riverside Municipal Airport Riverside, CA				
Annual inspection completed this date. Changed oil and filter. Drained oil and removed oil filter. Opened and inspected oil filter for metal, none found. Serviced engine with 10 qts. Aeroshell 100W plus oil and replaced oil filter with new, Champion CH48109-1. Replaced spark plugs with new Tempest P/N URHE32E. Checked magneto timing. Cleaned fuel injectors. Replaced all upper deck seals and gaskets. Checked engine controls. Checked for induction leaks, none found. Replaced induction filter, Brackett P/N BA7112. Compression check as follows: 1 - 2 76 3 - 4 73 5 - 6 6 74. Calibrated orifice: 42/80. Removed and replaced #1 and #3 cylinders after overhaul by Corona Aircraft Engines, see W/O F083 dated 05/26/2015 for details. Replaced throttle cylinders installed with new gaskets and seals. Re-torqued crankcase backbone bolts. Replaced manifold control arm, P/N 656209-4. Replaced pressure pump intake filter cover, P/N 58-910021-1. Adjusted manifold pressure to 36." All work accomplished IAW TCM TSIO-520 series Overhaul Manual, Publication X30574 dated 10/2013 and Beech Bonanza series Maintenance Manual, P/N 36-5900001-9C8 dated 04/2014. Removed six (6) Continental fuel nozzles, P/N 632748-16B and installed General Aviation Modifications, Inc. turboGAMIjectors, kit No. GT17A S/N 24685, in accordance with STC No. SE09289SC and turboGAMIjectors Installation procedure No. IP-97-002 (Rev 005) dated October 05, 2002, FAA form 337 dated 06/01/2015 for details. Engine run-up and leak checked. Aircraft test flown: results satisfactory. All AD's through 06/2015 checked for compliance and recurrence. See AD report for details. AD 2014-05-29. Superior cylinder assemblies. N/A by parts not installed on engine. No further action necessary. I certify that this ENGINE has been Inspected In Accordance with an Annual Inspection and was determined to be in Airworthy Condition. Richard Matano A&P [redacted] IA				

Date: 9/18/2015; Aircraft: N7FG; Type: FIXED WING SNGL-ENG; Hobbs: ; Tach: 1815.60; Total Time: ; Engine - Type: ; S/N: ; Time: ; Prop - Type: ; S/N: ; Time: ;
Changed oil and filter. Added 12 quarts of Aeroshell 15W-50 oil and a new Champion oil filter P/N CH48109-1. Ran engine and performed leak check. Leak check good. Cut open oil filter and inspected for contaminants. No defects noted.

Signature: [redacted] Cert. [redacted]
Rocky Mountain Aircraft Services
F.A.A. Certified Repair Station #JT6R651N
Glacier Park International Airport
Kalispell, Montana 59901

11.24.2015 08:54

Glendale Aero Services
Glendale, AZ

Registration: N7FG
Date: 10/26/2015
Model: A36TC
S/N: EA-250

W/O: 6001397
Tech: 1835.8

ENGINE LOG

Drained existing oil and removed filter. Cut open filter to inspect for metal contamination, filter normal. Installed new CH48109-1 oil filter and serviced engine with 11 qts. Phillips XC 20W50 oil. Performed static run, leak and operational check normal. Removed existing TIT probe. Installed new Insight dual TIT probe p/n 4872 s/n 1170, reference FAA Form 8130-3 from Insight Instruments Corporation, dated 7/16/2015 for details. Performed static run, operational check of OEM and JPI TIT indicators normal.

SIGNATURE: Matt Hatfield

FAA AUTHORIZATION: [redacted] A&P

Report Summary:

Search Code(s):

Examination of the engine was performed by the CMI Investigator under supervision of the NTSB Investigator. [redacted]

Disposition of engine following exam: The engine will remain in storage at Florida Air Recovery until released by the NTSB IIC.

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NAME	Mike Council	NAME	Brian Weber
ADDRESS	[REDACTED] Mobile, Alabama	ADDRESS	[REDACTED] Wichita, KS [REDACTED]
ORGANIZATION	Continental Motors	ORGANIZATION	Textron Aviation
PHONE	[REDACTED]	PHONE	[REDACTED]
NAME	Tim Monville	NAME	William Gill
ADDRESS	Eastern Region	ADDRESS	[REDACTED]
ORGANIZATION	NTSB	ORGANIZATION	Honeywell Aerospace
PHONE	202-314-6197	PHONE	[REDACTED]
NAME	Alexander P. M. Honig	NAME	Richard J. Brown
ADDRESS	[REDACTED] ational Orlando, Fl	ADDRESS	[REDACTED] Orlando, Fl
ORGANIZATION	FAA, Orlando FSDO	ORGANIZATION	FAA, Orlando FSDO
PHONE	[REDACTED]	PHONE	[REDACTED]

NAME	Armo Boyle	NAME	
ADDRESS	[REDACTED] [REDACTED] Kansas City, MO	ADDRESS	
ORGANIZATION	FAA, ACE-FSDO	ORGANIZATION	
PHONE		PHONE	

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EXTERNAL INSPECTION OF ENGINE

All four engine mounts separated from their attach points on the oil sump. The engine separated from the airframe but remained attached by engine control cables which were cut by the dive recovery team to facilitate removal of the wreckage from the lake.

The engine crankcase halves, both right and left, appeared to be undamaged. The engine data plate remained attached and identified this engine as a Continental Motors, Inc. factory rebuilt engine, model TSIO520-UB (8), serial number 809412. This engine was assembled at the Continental Motors factory December 13, 2002.

The engine driven alternator remained intact and attached at its mount located forward of the # 5 cylinder.

The fuel pressure transmitter remained intact and attached to its mounting bracket located on the forward top of the engine crankcase. The rigid metal fuel line remained attached to the outlet of the fuel transmitter and to the inlet of the fuel manifold. The rigid metal fuel line connecting the fuel metering unit to the fuel transmitter separated at the broken inlet fitting. The fuel transmitter electrical source separated at the cannon plug due to impact forces.

The fuel manifold remained intact and in place with all fuel lines intact from the fuel manifold to each fuel injector. All six GAMI fuel injectors remained intact and attached at their respective cylinder head. Right and left upper deck pressure reference air manifolds remained attached to its respective fuel injector.

The CMI left magneto remained intact and attached at its mount. The right magneto was intact but was displaced slightly towards the right due to failure of the mounting ring at the upper hold down clamp. The CMI ignition harness remained intact with the exception of the individual ignition lead for the # 6 cylinder lower spark plug. This ignition lead was cut / pinched during impact and separated from its spark plug.

Top and bottom spark plugs remained attached and intact. Unknown persons had written the word "bad" on the outside of the #4 top spark plug. This spark plug was a Champion RHB32E while all of the remaining spark plugs were Tempest brand URHB32E.

All six cylinders remained attached to their respective mounts.

The exhaust system received impact damage. Both right and left exhaust mufflers separated and were not recovered. The left exhaust collector remained attached but was impact damaged. The exhaust riser separated from cylinder # 6. The right exhaust collector received impact damage and the exhaust riser for cylinder # 1 separated.

The induction system received impact damage including the induction elbows at cylinders three, five and six. These induction elbows fractured but remained attached to their respective cylinder heads. The forward induction balance tube was impact damaged as was the left rear wye pipe. The right rear wye pipe separated but was recovered by the divers. The induction throttle body remained attached only by a metal brace bar and control cables.

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The turbo charger separated but was recovered. The turbine and compressor wheels remained intact but received impact damage. Neither the turbine or compressor wheels could be rotated manually. The turbo charger waste gate remained attached to the turbo charger assembly and appeared to be undamaged. The turbo controller remained attached to the fuel throttle body-metering unit. The engine oil sump remained intact but the oil quick drain valve separated allowing oil to escape and water to enter the oil sump.

The induction/fuel system throttle body remained intact. The throttle body remained attached by a brace bar located on the rear of the engine and flexible fuel hoses. All flexible fuel hoses remained attached with the exception of the main fuel inlet hose which separated from the airframe firewall fitting. The throttle body remained intact and the throttle plate was found in the fully open position. The engine driven fuel pump remained attached and intact with the exception of the mixture control arm which was broken and the control cable separated. The engine driven fuel pump was removed and inspected. The assembly security wire and seal were intact. The fuel pump drive coupling was found intact. The fuel pump operated smoothly when manually rotated.

The engine driven vacuum / pressure pump remained attached to its mount on the rear of the engine. The pump remained intact with the exception of the pneumatic outlet fitting which separated. The drive coupling was intact and the air pump rotated smoothly when the drive coupling was rotated manually. The pump was removed, disassembled and inspected. The carbon rotor veins were intact. The internal chamber did not exhibit any rotational scoring or scratching. The oil cooler remained attached and exhibited minor impact damage to the rear cross brace and cooling fins. The reducer bushing and street elbow located in the oil cooler lower tank separated due to impact forces. The vernatherm valve assembly remained attached with security wire intact.

The oil pump remained attached and appeared undamaged. The oil filter adapter remained attached and intact with a Champion spin on oil filter attached. The spin on oil filter exhibited minor impact damage to the canister. The oil filter was removed and cut opened to inspect the contents. No contamination was found on the paper pleats. The oil filter pressure relief valve and spring was intact and appeared to be seated normally.

The engine oil pump remained attached and undamaged. The oil pressure relief valve remained attached with security wire intact. The relief valve was removed and inspected for condition. The spring and plunger were intact with normal wear patterns on the plunger face and corresponding seat. The starter adapter remained intact with the exception of the scavenge pump inlet fitting which was broken and separated. The electric starter motor remained intact and attached to its mount. The engine was rotated manually and thumb compression was achieved on cylinders one, three, four, and five. Thumb compression on cylinder two was very weak. Cylinder two rocker box cover was removed and valve rocker arm motion was confirmed. No thumb compression could be detected for cylinder six due to the impact damage to the exhaust valve stem.

The propeller hub is identified as a Hartzell model PHC C8YF IRF, serial number EE47. The individual propeller blade serial numbers were undetermined.

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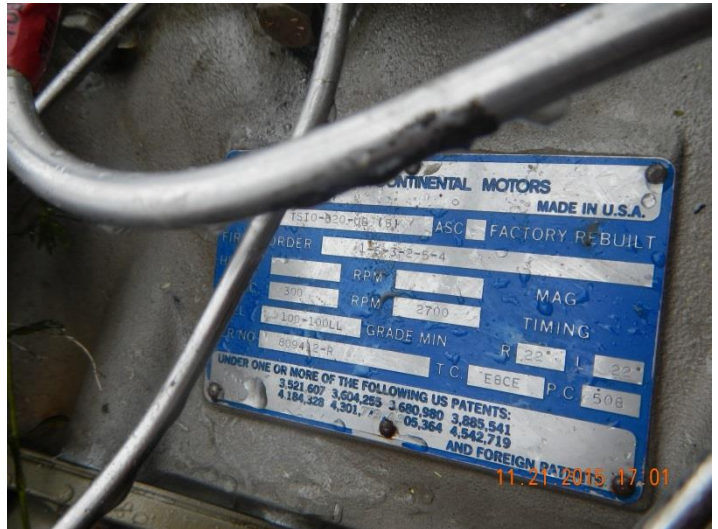
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ENGINE AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: Both right and left exhaust mufflers separated and were not recovered. The left exhaust collector remained attached but was impact damaged. The exhaust riser separated from cylinder # 6. The right exhaust collector received impact damage and the exhaust riser for cylinder # 1 separated.



INDUCTION SYSTEM

Condition: The induction system received impact damage including the induction elbows at cylinders three, five and six. These induction elbows fractured but remained attached to their respective cylinder head. The forward induction balance tube was impact damaged as was the left rear wye pipe.



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IGNITION SYSTEM

LEFT MAGNETO	Manufacturer: TCM	P/N: BL-249220-5	S/N:F02KA084R
Condition:	The left magneto failed to produce spark when the engine was manually rotated. The magneto was removed and partially disassembled, water removed and components dried using shop air. Once reassembled, the left magneto produced spark through each ignition lead when rotated manually using a power drill for a rotation source.		



RIGHT MAGNETO	Manufacturer: TCM	P/N: 10-249260-6	S/N: F02KA269
Condition:	The right magneto failed to produce spark when the engine was manually rotated. The magneto was removed and partially disassembled, water removed and components dried using shop air. Once reassembled, the right magneto produced spark through each ignition lead when rotated manually using a power drill for a rotation source.		

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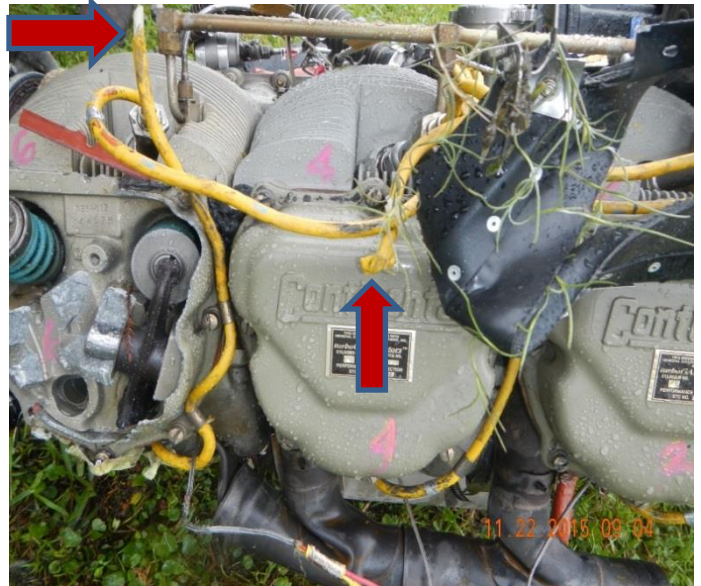
IGNITION HARNESS

Manufacturer: CMI

P/N: 10-823684-1

S/N:K02L

Condition: The ignition harness remained intact with the exception of the individual ignition lead for the # 6 cylinder lower spark plug. This ignition lead was cut / pinched during impact and separated from its spark plug. Red arrows in the photos indicated the damaged ignition lead.



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SPARK PLUGS

Manufacturer: Tempest and Champion (top # 4 only)

P/N: UHB32E (except top # 4, Champion RHB32E)

Condition:

The top spark plugs were removed and inspected. When compared to a Champion Spark Plug "Check A Plug" comparison chart, the top spark plugs were found in the following condition:

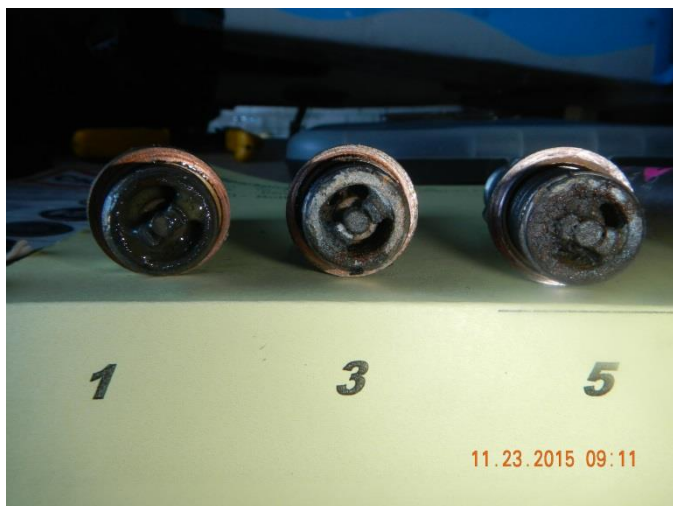
- 1) The spark plug lower cavity containing the core and insulator was oil contaminated. Coloration could not be determined due to contamination. The center electrode appeared "normal" for wear.
- 2) The spark plug lower cavity containing the core and insulator was full of dark black contamination. The center electrode appeared "normal" for wear.
- 3) Only a small amount of contamination was present but the spark plug appeared dark in color. The center electrode appeared "normal" for wear.
- 4) Unknown persons had written the word "bad" on the outside of this spark plug. This spark plug was a Champion RHB32E while all of the remaining spark plugs were Tempest brand URHB32E. The spark plug lower chamber containing the core and insulator was oil contaminated. The center electrode appeared to be in a "worn out" condition.
- 5) The spark plug lower cavity containing the core and insulator was oil contaminated and contained a dark black material. Coloration could not be determined due to contamination. The center electrode appeared "normal" for wear.
- 6) The lower cavity containing the core and insulator was oil contaminated and contained a dark black material. Coloration could not be determined due to contamination. The center electrode appeared "normal" for wear.

The lower spark plugs were removed and inspected. When compared to a Champion Spark Plug "Check A Plug" comparison chart, the bottom speak plugs were found in the following condition:

- 1) The spark plug lower cavity containing the core and insulator was oil contaminated. Coloration could not be determined due to contamination. The center electrode appeared "normal" for wear.
- 2) The spark plug lower cavity containing the core and insulator was oil contaminated and contained a dark black material. Coloration could not be determined due to contamination. The center electrode appeared "normal" for wear.
- 3) Only a small amount of contamination was present but the spark plug appeared dark in color. The center electrode appeared "normal" for wear.
- 4) Only a small amount of contamination was present but the sparkplug appeared dark in color. The center electrode appeared "worn out" for wear.
- 5) The spark plug lower cavity containing the core and insulator was oil contaminated and contained a dark black material. Coloration could not be determined due to contamination. The center electrode appeared "worn out" for wear.
- 6) The spark plug lower cavity containing the core and insulator was full of dark black contamination. Coloration and electrode wear condition could not be determined due to the amount of contamination.

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FUEL SYSTEM

FUEL PUMP	Manufacturer: TCM	P/N: 649368-33A	S/N: B02LA067R
Condition:	The engine driven fuel pump remained intact and in place with the exception of brass hose fittings which were impact damaged. The drive link was intact.		



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THROTTLE BODY METERING UNIT

Manufacturer: TCM

P/N: 642703A60

S/N: A02LA039R

Condition: The throttle body remained attached only by a metal brace bar and control cables. All flexible fuel hoses remained attached with the exception of the main fuel inlet hose which separated from the airframe firewall fitting. The throttle body remained intact and the throttle plate was found in the fully open position.



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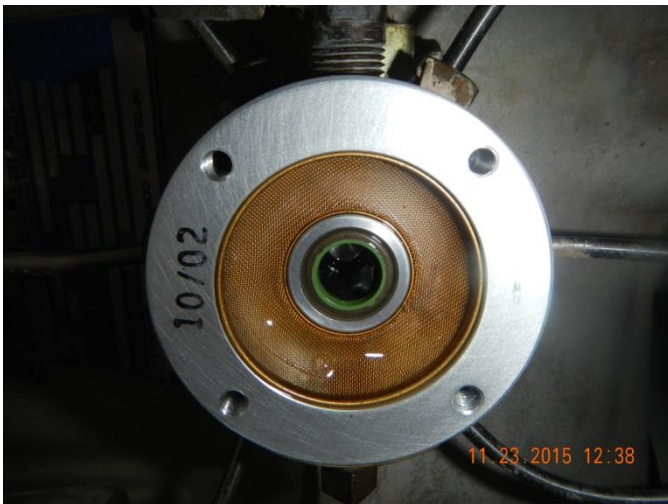
FUEL MANIFOLD VALVE

Manufacturer: TCM

P/N: 641032-15A12

S/N: C02LA041R

Condition: The manifold valve was disassembled and inspected and found to contain a small amount of aviation fuel. A very small amount of water was found on the internal fuel screen.



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FUEL NOZZLES

Manufacturer: GAMI

Position	#1	#3	#5	#2	#4	#6
Size	GA310	GM291	GF278	GA310	GM292	GF278
Condition:	The fuel injectors were removed, inspected and found to be uncontaminated.					



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LUBRICATION SYSTEM

OIL SUMP

Condition:

The oil sump was intact with the exception of the engine mounts which separated. The quick drain valve separated.



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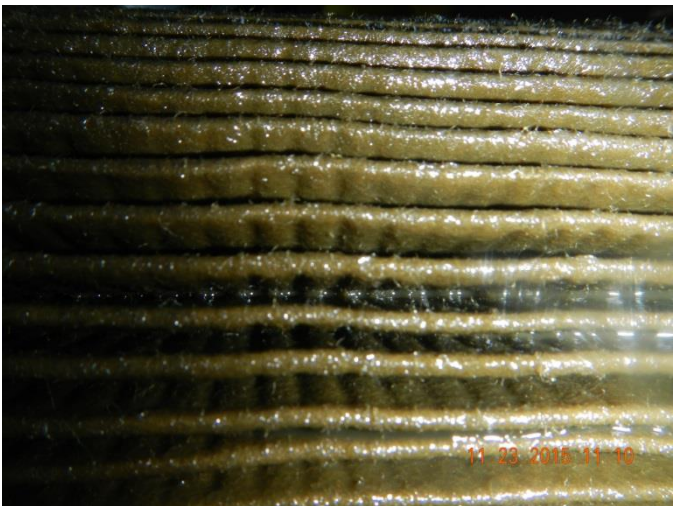
OIL PRESSURE RELIEF VALVE

Condition:

The oil pressure relief valve was removed and inspected. No apparent damage.



OIL FILTER	Manufacturer: Champion	P/N:PH48109
Condition:	The external canister was impact damaged. The filter was opened and examined. No contaminants were found.	



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OIL COOLER

Manufacturer: Undetermined

P/N: Undetermined

S/N: Undetermined

Condition: Minor impact damage to cross brace and cooling fins. The outlet fitting was broken.



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CYLINDERS

Condition:

All six cylinders remained intact with the exception of cylinder # 6 which received impact damage to its cylinder head, exhaust rocker arm bosses, rocker shaft and rocker box cover. The rocker box cover for cylinder # 6 separated and was not recovered. The exhaust valve rocker shaft and shaft bosses separated and were not recovered. The # 6 exhaust valve and valve spring remained attached but were impact damaged.

A lighted borescope inspection was performed on each cylinder. All intake and exhaust valves were in place and intact. Each cylinder contained oil and water contamination. Intake and exhaust valves appeared normal in cylinders one through five even with the amount of contamination present. Cylinder number 6 exhaust valve appeared to be partially open. Impact damage to cylinder number 6 included a bent exhaust valve stem and bent pushrod which would not allow the damaged exhaust valve to fully close.

According to engine maintenance records, cylinders one and three were removed, overhauled by Corona Aircraft Engines, then reinstalled at the last engine 100 hour inspection, tach 1779.2 hours.



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CRANKCASE ASSEMBLY

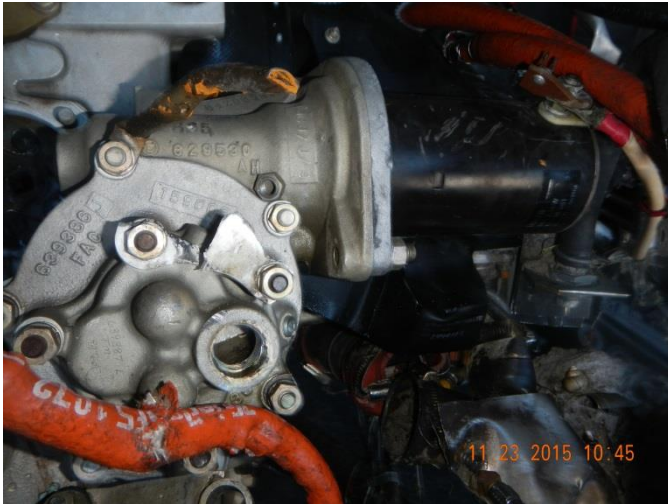
CRANKCASE	Casting Number:	1-3-5: Undetermined	2-4-6: Undetermined	S/N: Undetermined
Condition:	The crankcase halves appeared to be undamaged			

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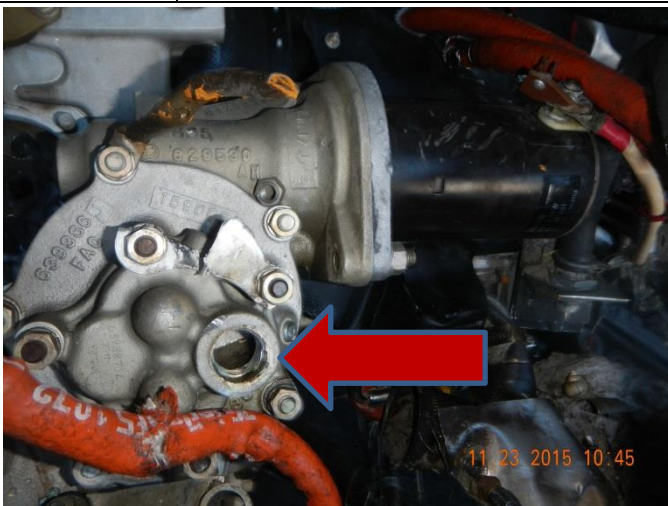
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ACCESSORIES

STARTER	Manufacturer: Iskra (CMI)	P/N: 655566F24V	S/N: 02 280 0253
Condition:	The starting motor appeared to be undamaged		



STARTER ADAPTER	P/N: 642085A16
Condition:	The starter adapter appeared to be undamaged with the exception of the fitting on the rear of the adapter which separated. The red arrow in the photo on the left points to the broken fitting.



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ALTERNATOR	Manufacturer: TCM	P/N: 649304	S/N: Undetermined
Condition:	The engine driven alternator appeared to be undamaged.		



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VACUUM PUMP

Manufacturer: Tempest

P/N: AA3216CW

S/N: 832116

Condition: The vacuum/pressure pump remained intact with the exception of the exhaust fitting which separated. The pump rotated freely when the (intact) drive was manually rotated. The pump was disassembled. The rotor was intact and the carbon veins were found to be locked in the rotor slots by pond contamination. The veins were removed. All were intact and measured 1- 3/8 inches in length.



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TURBO

Manufacturer: Kelly
Aerospace-Overhauled by
Ray Jay

P/N:632729-B3

S/N:FIL00015

Condition: The turbo charger separated but was recovered. The turbine and compressor wheels remained intact but received impact damage. Neither the turbine or compressor wheels could be rotated manually



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TURBO CONTROLLER	Manufacturer: TCM	P/N:642628-6	S/N:FJN00262
Condition:	The controller appeared to be undamaged.		



WASTEGATE/ WASTEGATE CONTROLLER	Manufacturer: Ray Jay-Consolidated Fuel Systems	P/N:636188-17	S/N:FK000034
Condition:	The waste gate remained intact and in place. The red arrow in the photo points to the waste gate.		



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OVERBOOST VALVE

Manufacturer: Rayjay-Consolidated Fuel Systems

P/N: 639319-26

S/N: EJ000326

Condition: The overboost valve separated but was recovered by divers and presented for inspection. There was no apparent damage caused by impact.

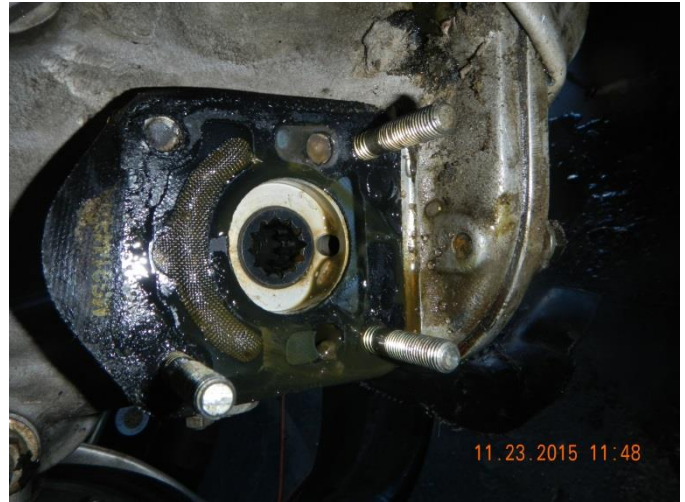


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PROPELLER

PROPELLER GOVERNOR	Manufacturer: Woodward	P/N: Undetermined	S/N: Undetermined
Condition:	The propeller governor received impact damage and was fractured near the mounting collar. The governor housing broke apart when removal was attempted. The control arm was broken from the main housing.		



PROPELLER	Manufacturer: Hartzell	P/N:PHC C8YF1RF	S/N:EE47
Blade 1 S/N:	Undetermined		
Blade 2 S/N:	Undetermined		
Blade 3 S/N:	Undetermined		

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Condition: The three bladed constant speed propeller remained attached with significant impact damage to its spinner and propeller blades. The aluminum spinner was crushed rearward pressing the cone around the propeller dome and hub. The spinner was removed to expose the propeller hub. Each of the three propeller blades was marked with a letter A, B, or C for photo identification.

Blade A received smooth rearward bending due to impact forces beginning approximately 4 inches from the blade root. The blade's leading edge received heavy gouging beginning approximately 10 inches from the blade tip. Blade A was loose in the hub allowing the blade to rotate within the hub mount.

Blade B received smooth rearward bending due to impact forces beginning approximately 7" from the blade root. The propeller blade received significant leading edge gouging beginning approximately 13" from the propeller tip.

Blade C received smooth rearward bending due to impact forces beginning approximately 5" from the blade root. The propeller blade received deep leading edge gouging beginning 15-19" from the blade tip. Blade C was loose in the hub allowing the blade to rotate within the hub mount.



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