



# Continental Motors, Inc.

## ENGINE FIELD INSPECTION REPORT

**Final**


ENGINE MODEL: IO550B (4F)

ENGINE SERIAL: 281690

AIRCRAFT MODEL: Beech A-36

SERIAL NUMBER: E-3075

REGISTRATION: N517DJ

Examiner	Signature	Date
Mike Council		August 15, 2013

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**GENERAL INFORMATION**

EXAMINATION		ACCIDENT DATA	
Date	July 30, 2013	NTSB Accident #:	WPR13LA321
Facility	Air Transport, Inc.	NTSB Investigator:	Patrick Jones
Address	3011 W. Buckeye Road	FAA Investigator:	Troy Lent
City	Phoenix	Law Enforcement:	M. Timmons, Churchill County Sheriff's Office
State and Zip	Arizona 85009	Coroner / Medical Examiner	N/A

**ENGINE INFORMATION**

Make	Continental Motors Inc.
Model	IO550B (4F)
Serial No.	281690
Engine Position	single
Total Time	5383.5
Time SOH	300.9
Build Date	June 4 <sup>th</sup> , 1992
In Service Date	June 30, 1992
Removal Date	July 15, 2013

**AIRCRAFT / ACCIDENT INFORMATION**

Aircraft Make	Beechcraft
Aircraft Model	A-36
Aircraft Serial No.	E3075
Registration No.	N517DJ
Accident Date	July 15, 2013
Accident Location	Fallon, Nevada

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**Significant logbook information:**

1) Eagle Engines, FA A Repair Station NO3R717L logbook entry dated 5/25/12. Engine Model IO-550B, Serial number 281690-R, total time 5082.6 was overhauled:

Engine power section overhauled-"Marquis Series" using factory new Superior cylinders.

Engine was disassembled, cleaned, inspected and reassembled in accordance with all applicable FAA regulations and manufacturer's current overhaul instructions.

Crankcase certified and Crankshaft ultrasonic inspection by Nickson's Machine Shop, Inc.

Engine test run successfully.

Engine not installed by Eagle Engines.

2) Chester M. Ugalde, A&P logbook entry dated 6/8/12, Total engine time 5082.6, Zero since overhaul:

*Installed this engine in Beechcraft A36 S/N 30756 N517DJ after installing **Tornado Alley Turbo** STC SA5223NM and STC SE 5222NM. Installed GAMI injectors.*

**Report Summary:**

**Search Code:**

This engine was found to have a hole in the left crankcase half between cylinder bases # 4 and # 6 with the connecting rod from Cylinder # 5 separated at the rod cap. The crankshaft was broken at the propeller flange and the propeller had separated from the engine. The NTSB Investigator refused an offer of an Analytical Inspection at the CMI factory in Mobile, Alabama.

**Disposition of engine following exam:** The disassembled engine remained with Air Transport, Inc. Phoenix, Az.

**Inspection Witnesses**

Name	Mike Council	Name	Patrick Jones
Address	██████████ Mobile, AL 36615	Address	Western Pacific Region San Dimas, CA. 91773
Organization	Continental Motors, Inc.	Organization	NTSB, IIC
Phone No	██████████	Phone No	██████████
Name	Troy Lent	Name	Kenny Pierard
Address	██████████ 101 Scottsdale, AZ 85255	Address	██████████ Redding, California 96002
Organization	FAA- Scottsdale FSDO	Organization	Ameritech Industries, Eagle Engines- <b>Non Party Member</b>
Phone No	██████████	Phone No	██████████

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## EXTERNAL INSPECTION OF ENGINE:

The engine remained attached to the damaged airframe. A forklift was used to remove the engine and access was gained by removing the exterior cowlings.

The engine was found to have a hole in the crankcase with cylinder #5 damaged and the connecting rod missing. The # 5 crankshaft journal was visible through the hole in the crankcase. The crankcase was broken with material missing between the cylinder bases of cylinders four and six.

The engine driven fuel pump remained attached and undamaged. The engine oil pump remained attached and undamaged as did the alternator, magnetos, induction system and fuel injection system. The exhaust system remained intact with the exception of the mufflers and tailpipes which were missing. The cylinders are Superior brand aftermarket cylinders with rocker covers depicting the word "Millennium". Placards were found on each rocker box cover depicting "GAMI" fuel injector installation. The crankshaft was fractured aft of the propeller flange with jagged shear lips remaining. The propeller separated from the engine but was found near the main wreckage as witnessed by site photos.

The engine has been modified from its original configuration by addition of a Tornado Alley Turbo Normalizing System which includes an upper deck pressure system, turbo charger, turbo charger controller and overboost valve.



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## ENGINE TEARDOWN AND COMPONENT EXAMINATION

Left Magneto: 22 degrees BTDC      Right Magneto: 22 degrees BTDC

Magneto to Engine Timing  
CMI Spec. - 22 ° BTDC



Exhaust System

Condition: The exhaust system was removed including the Turbo Alley installed turbo charger and associated hardware. The compressor wheel would not turn in the turbo housing and minor rotational scoring was noted. The tailpipe was not removed from the turbine section and the wheel was not examined. The exhaust pipe connected to the wastegate was damaged and breached.



Induction System

Condition: The induction system remained attached with minor damage at the turbo inlet.

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### IGNITION SYSTEM:

R/H Magneto      Manufacturer: TCM      Model/Part Number: S6RN1225      Serial #: F08BA083  
 Condition:      The right magneto remained attached and appears to be undamaged.



L/H Magneto      Manufacturer: TCM      Model/Part Number: S6RN1225      Serial #: F08AA009R

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Condition: The left magneto remained attached and appears to be undamaged.



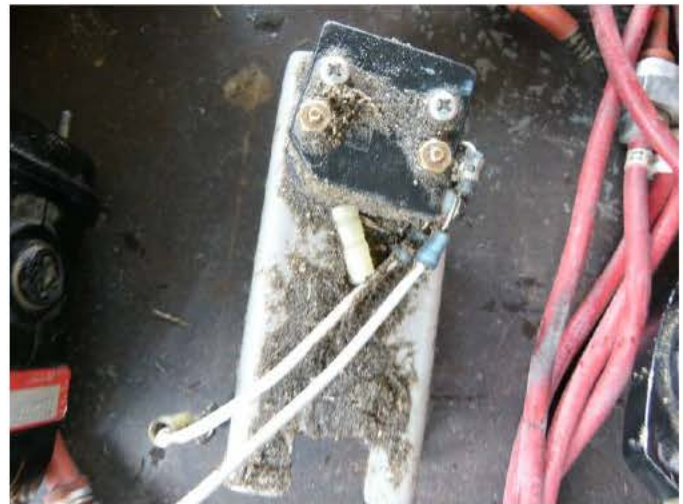
Ignition Harness

Manufacturer: Champion Aerospace

Model/Part Number: Not Marked

Serial #: Not Marked

Condition: The ignition harness appeared to be in working condition and did not sustain major damage.



Spark Plugs

Manufacturer: Champion

Part number: RHB32E

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Condition:

The sparkplugs were removed and compared to a Champion Check-a-plug chart. All sparkplugs appeared normal and in worn but good condition.





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## FUEL SYSTEM:

Fuel Pump

Manufacturer: TCM

Part Number: FT-B8.5/1-632818-2-11

Serial #:6PO25B

Condition: The fuel pump appears to be undamaged and the drive link was found intact. No residual fuel was noted when the fuel hoses were removed.



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Fuel Manifold Valve    Manufacturer: TCM    Part Number: 646508-641D    Serial #: T259605C

Condition:    The fuel manifold valve was undamaged with safety wire securing the assembly screws and lead seal intact.(non TCM) No fuel staining was noted. The part number/serial number has been re-identified in the field.



Fuel Nozzles/Fuel Lines    Manufacturer: GAMI    Size: 1) 262    3) 246    5) 235    2) 262    4) 246  
6) 235

Condition:    All fuel injection lines remained attached between the fuel manifold and the individual fuel injectors. All injectors appear to be unobstructed.



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Metering Unit

Manufacturer: TCM

Part Number:

Serial #:

Condition: The metering unit and throttle body appeared to be undamaged. The identification tag on the metering unit had been changed and the part number/serial number changed from original TCM nomenclature. The fuel control unit was removed and residual fuel tested negative for water. This liquid was light blue in color, smelled and otherwise resembled 100 low lead aviation fuel. The filter screen was removed from the fuel control unit and found to be free of contaminants.



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## LUBRICATION SYSTEM:

Oil Pump

Condition:

The oil pump was removed and disassembled. No damage was noted and dark oily substance resembling oil was present. Minor scratching was noted in the oil pump cavity. The pressure relief valve spring was found intact and no abnormal wear was noted on the plunger.



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Oil Sump

Condition: The engine crankcase sump was found to contain approximately nine and one half quarts of dark, oily liquid which were drained to facilitate removal of the sump. The crankcase oil sump was removed from the engine. The connecting rod for cylinder #5 was recovered from the sump as well as the broken parts of the rod bolt and nut. The parts were retained by NTSB for analysis at the NTSB lab. Red rubber fragments were recovered from the sump which resembles fragments of an alternator drive hub materials. The NTSB IIC called the owner of the airplane who admitted that the previous alternator failed and was changed on this engine approximately 60 hours prior at hobbs time 1220.8.



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**Oil Filter**

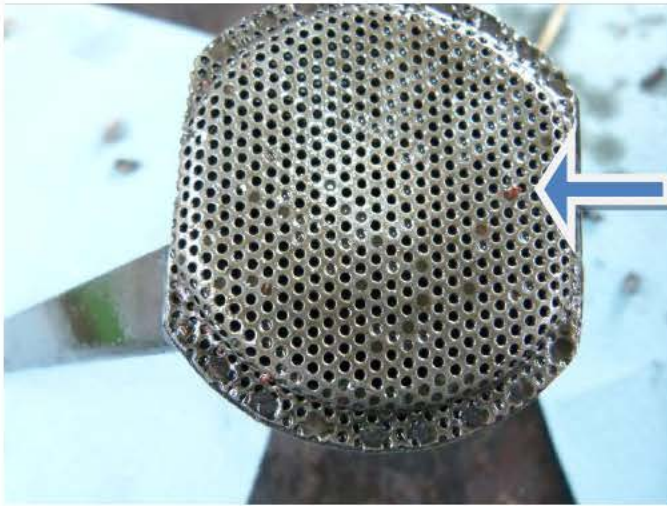
Condition: The Champion oil filter model CH48109 was removed and opened for inspected. Both ferrous and non-ferrous metal chips and foreign particles were found. The exterior oil filter canister sustained minor damage but remained intact.



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Oil Pick-up Tube & Screen

Condition: Undamaged. Note the red rubber debris particles on the screen.



Oil Cooler

Manufacturer: Niagara NDM

Model/Part Number: Undetermined

Serial #: Undetermined

Condition: Minor damage to the lower right mounting bracket.



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## CYLINDERS:

Cylinder #1 Part Number: SA52006-A1

Barrel Surface: Steel

Work Order Numbers: 526E1210341

Condition: Normal wear patterns noted. Few combustion deposits were present.



Cylinder #3 Part Number: SA52006-A1

Barrel Surface: Steel

Work Order Numbers: 526-CR 10014

Condition:

Normal wear patterns noted. Few combustion deposits were present.





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Cylinder #5 Part Number: SA52006-A1

Barrel Surface: Steel

Work Order Numbers: 926C1210018

Condition: The lower portion of the cylinder barrel was mechanically damaged and the piston could not be removed.



Cylinder #2 Part Number: SA52006-A1

Barrel Surface: Steel

Work Order Numbers: 526E121001

Condition: The upper cylinder area and the head were undamaged. Mechanical damage was noted on the cylinder skirt. Few combustion deposits were present.



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Cylinder #4 Part Number: SA52006-A1

Barrel Surface: Steel

Work Order Numbers: 526E12100542

Condition: The upper cylinder area and the head were undamaged. Mechanical damage was noted on the cylinder skirt.



Cylinder #6 Part Number: SA52006-A1

Barrel Surface: Steel

Work Order Numbers: 526C1210017

Condition: The lower portion of the cylinder barrel was mechanically damaged and the piston could not be removed.



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#1 Piston, Rings and Pin      Piston Part Number:    ECI    AEC654857

Condition:    The piston was found undamaged but with a very small amount of combustion deposits on the piston face.



#3 Piston, Rings and Pin      Piston Part Number:    ECI    AEC654857

Condition:    The lower ring land on the piston skirt was broken. Note that there was few combustion deposits located on the piston face.



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#5 Piston, Rings and Pin      Piston Part Number:    ECI    AEC654857

Condition:    The piston was heavily damaged with fracturing of the pin boss and separation of the lower piston skirt. Due to the amount of damage to the cylinder, the piston could not be removed.



#2 Piston, Rings and Pin      Piston Part Number:    ECI    AEC654857

Condition:    The mechanical damage to the piston skirt was due to the difficulty removing the cylinder from the crankcase.



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#4 Piston, Rings and Pin      Piston Part Number:    ECI    AEC654857

Condition:      Normal wear patterns were noted. There were few combustion deposits found on the piston face.



#6 Piston, Rings and Pin      Piston Part Number:    ECI    AEC654857

Condition:      The piston skirt and pin boss were heavily damaged. The piston could not be removed from the cylinder due to the amount of damage to the cylinder skirt below the mounting flange.



**CRANKCASE ASSEMBLY:**

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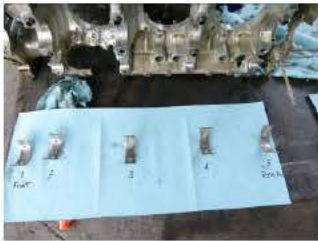
Crankcase Casting Number 1-3-5 Side: WDC61 2-4-6 Side: Ukn. Serial number: D309204RPL  
828

Condition: The crankcase was found to have a hole located between cylinders four and six cylinder bases. Additional damage was found below cylinder # 5.



Main Bearing Part Number	Rear	Intermediate	Front
	634503	634503	653547

Condition The crankshaft main bearings exhibited normal operating signatures.



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## CRANKSHAFT ASSEMBLY:

Crankshaft Forging number: 6A6126-8 Serial number: N41327 Heat code: D309204RPL

Condition: The crankshaft was found broken aft of the propeller flange.



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Transfer Collar: Condition: Normal wear. No damage noted.



Counter Weights: Condition: Normal wear patterns



#1 Connecting Rod Part Number: 655911

Forging number: Undetermined

Condition: No damage noted.

#1 Connecting Rod  
Bearing

Part Number: 642398

Condition: Bearings exhibit accelerated wear patterns from unknown causes.



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#3 Connecting Rod Part Number: 655911

Forging number: Undetermined

Condition: No damage noted.

#3 Connecting Rod Bearing Part Number: 642398

Condition: Bearings exhibit accelerated wear patterns from unknown causes.



#5 Connecting Rod Part Number: 655911

Forging number: 646126-B

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Condition: Mechanically damaged and bent. The rod cap was damaged with one rod bolt and nut remaining attached. The remains of the second rod bolt and nut were found with other debris in the crankcase oil sump. The NTSB retained these parts for analysis at the NTSB laboratory.



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#5 Connecting Rod Bearing Part Number: 642398

Condition: Bearings exhibit accelerated wear patterns from unknown causes.



#2 Connecting Rod Part Number: 655911

Forging number: Undetermined

Condition: Mechanical damage was found on connecting rod cap.

#2 Connecting Rod Bearing Part Number: 642398

Condition: Bearings exhibit accelerated wear patterns from unknown causes.



#4 Connecting Rod Part Number: 655911

Forging number: Undetermined

Condition: Normal wear. No damage noted.

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#4 Connecting Rod Bearing Part Number: 642398

Condition: Bearings exhibit accelerated wear patterns from unknown causes.



#6 Connecting Rod Part Number: 655911

Forging number: Undetermined

Condition: Mechanical damage was noted on the connecting rod and rod cap.



#6 Connecting Rod Bearing

Part Number: 642398

Condition: Bearings exhibit accelerated wear patterns from unknown causes.

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## CAMSHAFT:

Camshaft Part number: 654084A1

Serial Number: N/A

Condition: . The camshaft exhibited mechanical damage to the shaft and lifter lobes adjacent from the number 5 connecting rod location.



## LIFTERS:

Condition: All lifters remained in their respective receptacles except cylinder # 6 which were found in the oil sump. The lifters did not exhibit mechanical damage.

## Accessory Gears

Camshaft and crankshaft continuity was confirmed by rotating the crankshaft using an adapter inserted in the instrument air pump drive pad. The accessory gears appear to be undamaged.



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## ACCESSORIES:

Starter Manufacturer: Part Number: 646275-1 Serial #: U239683

Condition: Starter appears to be undamaged.



Starter Adapter Part Number: Illegible.

Condition: No damage noted.



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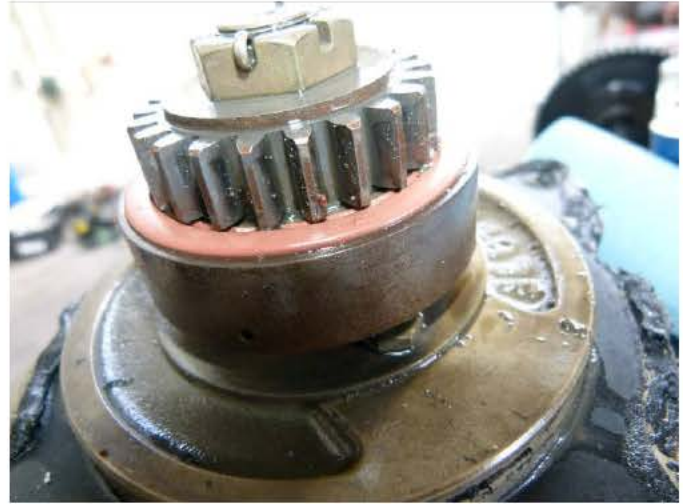
Alternator /  
Generator #1

Manufacturer: TCM

Part Number: R649304

Serial #: not noted

Condition:



Vacuum Pump

Part number: Airborne 216CW

Serial Number: 45947

Condition: The pump shaft turned freely and the drive link was intact.



Turbocharger

Part number: 406610-0029

Serial Number: LFL00176

Condition: The cold air compressor wheel would not freely turn and minor scratching was noted in the turbocharger inlet housing.

Controller

Part number: 470908-0011

Serial Number: LAN00336

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Condition: No physical damage was noted

Propeller Governor Part number: PCU 5000

Serial Number: ATD210760

Condition: No physical damage was noted.

Propeller: MFG/Model: Hartzell PHC-C3Y-1RF/F8068K

S/N: QG434B

HUB S/N:

