



Continental Motors

ENGINE FIELD INSPECTION REPORT

ENGINE MODEL	TSIO550C (9B)
ENGINE SERIAL NUMBER	914445
AIRCRAFT MAKE & MODEL	Columbia LC41-550G
AIRCRAFT SERIAL NUMBER	41605
AIRCRAFT REGISTRATION	N8725
FILE NUMBER	17-083

NAME	SIGNATURE	DATE
Mike Council		8-25-2017

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GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	8-8-2017	NTSB ACCIDENT #	WPR17IA173
FACILITY	Air Transport	NTSB INVESTIGATOR	Andrew Swick
ADDRESS	[REDACTED] Phoenix, AZ	FAA INVESTIGATOR	Christopher Kennedy, Scottsdale, AZ FSDO Mark Pritchett, Scottsdale, AZ FSDO
		ACCIDENT DATE	7-31-2017
		ACCIDENT LOCATION	Chandler, AZ

ENGINE INFORMATION

ENGINE POSITION	Single
TOTAL TIME	478.2
TIME SOH	NA
TYPE & TIME SLI	5014 since 100-hour inspection (according to pilot/owner)
BUILD DATE	5-16-2006
IN SERVICE DATE	5-26-2006

Significant logbook information:

REG NO: NB728 CHANDLER AVIATION INC DATE: 07/31/17
 MODEL: 6041-5500B CHANDLER MUNICIPAL REG# 54192
 S/N: 41605 CHANDLER, AZ HOURS: 474.0
 ENG NO: FA105502 (400) 732-9118 TACH: 381
 ENG S/N: 914445 TOTAL: 474.0
 AUTH: NO 2307335 1A
 SIGNATURE: [REDACTED]
 Drain oil and service with date of Phillips 20W50. Remove and install new oil filter. Performed satisfactory cylinder compression tests: #1 7200, #2 7400, #3 7400, #4 7200, #5 7200, #6 7200. Bore scope all cylinder per TCM SB 03-3 with no defects noted at this time. Clean, gap, test and reinstall spark plugs with new gaskets. Remove and replace o-ring with new at base of starter. Remove induction filter, clean screen and install new filter. Replace gasket on #4 cylinder with new. Remove fuel injectors and solvent clean, replace o-rings, seals and gaskets with new and reinstall fuel injectors in numbered cylinders. Washed engine, ground run, test & ops check satisfactory. I certify this engine has been inspected in accordance with a 100 hour inspection and is in air worthy condition.
 END

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10/26/2016

Make / Model

LC41-550FG TSIO-550

Unit/Serial

N8725/

Compartment

Single

Fluid Type

AEROSHELL

WO / Reference

Current Interpretation

IRON APPEARS HIGH. NICKEL APPEARS HIGH. CHECK OIL FILTER FOR CHIPS. RESAMPLE 15 TO 20 HOURS TO MONITOR WEAR TREND.

08.09.2017 13

Report Summary:

Search Code(s):

The engine suffered an oil starvation event, cause undetermined. The #1,2 & 3 connecting rods separated.

Disposition of engine following exam: The engine was disassembled and examined at Air Transport at the request of the NTSB IIC. The engine will remain at Air Transport until released by the NTSB IIC.

INSPECTION WITNESSES

NAME	Mike Council	NAME	Andrew Swick
ADDRESS	[REDACTED] Mobile, Alabama	ADDRESS	Western Pacific Region
ORGANIZATION	Continental Motors	ORGANIZATION	NTSB, IIC
PHONE	[REDACTED]	PHONE	[REDACTED]
NAME	Christopher L. Kennedy	NAME	Mark Pritchett
ADDRESS	Scottsdale, AZ FSDO	ADDRESS	Scottsdale, AZ FSDO
ORGANIZATION	FAA	ORGANIZATION	FAA
PHONE	[REDACTED]	PHONE	[REDACTED]

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EXTERNAL INSPECTION OF ENGINE

The upper and lower engine cowlings, three blade Hartzell constant speed propeller and spinner were intact and did not exhibit impact damage. The propeller could be rotated manually but only approximately one tenth of one revolution. When the propeller was manually rotated, continuity was confirmed at the rear of the engine by observing rotation of the starter adapter power take-off shaft. The pulley located on the starter adapter PTO was free to wobble on the shaft.

The propeller and spinner assembly were removed. The upper and lower engine cowlings were removed to facilitate an examination of the engine and accessories. The lower cowlings and fuselage belly did not display large amounts of oil contamination. The engine oil rod was removed, wiped dry then reinserted. The oil level indication was less than two quarts of engine oil remaining in the oil sump. The engine did not exhibit excessive oil contamination. The recovery crew reported that the horizontal stabilizer and elevators did not exhibit any oil contamination at the accident site.

Two holes were discovered in the top of the engine crankcase assembly; one slightly forward and inboard of cylinder number-one attachment base and the other directly above cylinder number-two attachment base. Oil was observed on the right turbocharger and tailpipe. All flexible hoses connecting both turbochargers to the oil pump and the oil return hoses attaching both turbocharger oil reservoirs to the scavenge pump were intact. Torque putty was visible on the b-nuts and fittings. All T-fittings were intact and flexible hose b-nuts were tight.

The fuel injectors installed in cylinders one and two were loose in their respective cylinder heads. All other fuel injectors were correctly installed. The right and left Slick brand magnetos remained in place but the left magneto attachment ring was damaged at the magneto hold down washer. The left magneto condenser received impact damage.

The NTSB IIC refused an offer to ship the engine to Continental Motors for an analytical examination.



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ENGINE TEARDOWN AND COMPONENT EXAMINATION

EXHAUST SYSTEM

Condition: The exhaust components did not exhibit impact damage. The right exhaust pipe exiting the right turbocharger exhibited a small amount of oil inside. The rear mounted exhaust cross-over exhibited burned on oil deposits.



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INDUCTION SYSTEM

Condition:

The induction system did not exhibit damage



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IGNITION SYSTEM

LEFT MAGNETO

Manufacturer: Slick

M/N: 6230

S/N: 06031017

Condition:

The mounting ring was damaged at the mounting washer. The condenser was impact damaged. When the magneto was rotated manually, the impulse coupler released normally and spark was produced.



RIGHT MAGNETO

Manufacturer: Slick

M/N: 6320

S/N: 06031014

Condition:

No damage was noted. When the magneto was rotated manually, the impulse coupler released normally and spark was produced.



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IGNITION HARNESS

Manufacturer: TCM

P/N: 10-423604-21

S/N: NA

Condition: The ignition harness did not exhibit physical damage.

TOP SPARK PLUGS

Manufacturer: Champion

P/N: RHB32S

Condition: When compared to a Champion Check-A- Plug chart, the sparkplugs appear to be normal in wear and slightly dark in color



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BOTTOM SPARK PLUGS

Manufacturer: Tempest

P/N: URHB32S

Condition: When compared to a Champion Check-A- Plug chart, the sparkplugs appear to be normal in wear. Number 1 sparkplug internal insulator was damaged. Sparkplugs one and two are slightly dark in color.



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FUEL SYSTEM

FUEL PUMP

Manufacturer: TCM

P/N: 649368-44A4

S/N: B06EA077

Condition: The engine driven fuel pump was intact and undamaged. The drive coupling was intact and the fuel discharged a small amount of fuel when the drive coupling was manually rotated.



THROTTLE BODY METERING UNIT

Manufacturer: TCM

P/N: 656785-2

S/N: A06EA050

Condition: No damage was exhibited. The throttle arm was properly secured



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FUEL MANIFOLD VALVE

Manufacturer: TCM

P/N: 646433-14A1

S/N: C06EA088

Condition: There was not visible damage to the fuel manifold



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LUBRICATION SYSTEM

OIL SUMP

Condition: The oil sump received impact damage internally. The impression of gear teeth was visible on the lower rear. When the oil sump was removed, the camshaft gear was found adjacent to where the damage was exhibited. The oil sump contained damaged bearing material, broken rod bolts and nuts and other metal debris including the separated oil pump input shaft.



OIL PICK-UP TUBE & SCREEN

Condition: The oil pick-up tube was damaged where the camshaft gear became lodged after the camshaft separated. The screen exhibited metal material and contaminated oil.



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OIL PUMP

Condition:

The oil pump input shaft separated but was recovered from the oil sump. The oil pump gears could not be removed from the oil pump cavity due to the burr on the spline shaft. The oil pump and gears will be sent to CMI for an analytical and metallurgical examination at the request of the NTSB IIC.



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OIL FILTER

Manufacturer: Champion

P/N: CH48109-1

Condition:

The oil filter was opened and examined. The filter paper media pleats contained metal particles.



OIL COOLER

Manufacturer: Niagara Thermal Products

P/N: 10279A
TCM 654580

S/N: A06-4770-22

Condition:

The oil cooler was not externally damaged

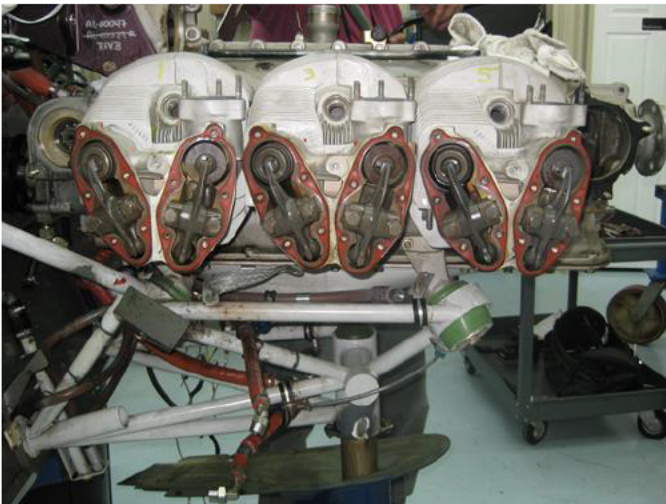


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CYLINDERS

CYLINDER #1	P/N:658603-A4	S/N: AC06BA238	Head Date: 02-14-06
CYLINDER #3	P/N: 658603-A4	S/N: AC06BA575	Head Date: 02-24-06
CYLINDER #5	P/N: 658603-A4	S/N: AC06BB484	Head Date: 03-02-06
CYLINDER #2	P/N: 658603-A4	S/N: AC06BB477	Head Date: 03-21-06
CYLINDER #4	P/N: 658603-A4	S/N:AC06BA588	Head Date: 02-24-06
CYLINDER #6	P/N: 658603-A4	S/N:AC06BA543	Head Date: 02-20-06
Condition:	Externally, all cylinders appear to be normal		



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VALVES

Condition:

An electronic lighted borescope examination was performed. All intake and exhaust valves were intact and exhibited normal combustion signatures. When cylinders were removed, pistons for cylinders 1, 2, & 3 were stuck inside their respective cylinders and could not be removed. Cylinders 4, 5 & 6 were normal.



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ROCKER ARMS AND SHAFTS

Condition:

All rocker arms and shafts were intact.



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PISTONS, RINGS AND PINS

Piston P/N: 657989 (# 4,5 & 6)
All others, undetermined

Condition:

Pistons for cylinders 1, 2, & 3 were stuck inside their respective cylinders and could not be removed.



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CRANKCASE ASSEMBLY

CRANKCASE

S/N: R06BA783

Condition:

The left upper crankcase half was damaged above the cylinder # 2 mount.

The right upper crankcase half was damaged above the cylinder # 1 mount



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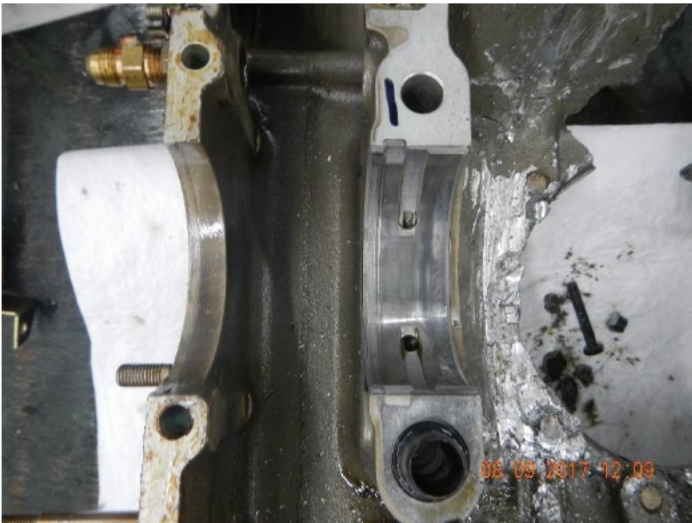
#1 MAIN BEARINGS

P/N: 634503

Date Code: 3-2006

Condition:

Normal wear conditions were exhibited



#2 MAIN BEARINGS

P/N: 634503

Date Code: 3-2006

Condition:

Normal wear conditions were exhibited



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#3 MAIN BEARINGS	P/N: 634503	Date Code: 6-2006
Condition:	Normal wear conditions were exhibited	

Date Code: 6-2006

Condition: Normal wear conditions were exhibited



#4 MAIN BEARINGS	P/N: 653547	Date Code: 10-2005
Condition:	Normal wear conditions were exhibited	

Date Code: 10-2005

Condition:	Normal wear conditions were exhibited
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#5 MAIN BEARINGS

P/N: 653547

Date Code: 10-2005

Condition:

Normal wear conditions were exhibited



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CRANKSHAFT ASSEMBLY

CRANKSHAFT

Forging Number:
Undetermined

S/N: N06CA106

Heat code:
Undetermined

Condition:

The # 3 main journal exhibited heat signatures. The corresponding main bearing did not.



TRANSFER COLLAR

Condition:

The transfer collar was not damaged.



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WEIGHTS****Condition:**

The counter weights remained intact but received mechanical damage from other components. All plates, pins and clips remained intact and in place.

**INTERNAL
TIMING****Condition:**

Internal timing could not be determined. The engine could not be manually rotated due to internal damage.

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#1 CONNECTING ROD

P/N: 655911

Forging or Serial Number: Undetermined

Condition: The rod separated at the connecting rod cap/bolts and piston pin boss

#1 CONNECTING ROD BEARING

P/N: Undetermined

Condition: The rod bearing separated. Rod bearing material was located in the oil sump



#2 CONNECTING ROD

P/N: 655911

Forging or Serial Number: Undetermined

Condition: The rod separated above the connecting rod cap.

#2 CONNECTING ROD BEARING

P/N: Undetermined

Condition: Destroyed



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#3 CONNECTING ROD

P/N: 655911

Forging or Serial Number: Undetermined

Condition: The rod separated above the connecting rod cap

#3 CONNECTING ROD BEARING

P/N: 642398

Condition: Destroyed



#4 CONNECTING ROD

P/N: 655911

Forging or Serial Number: Undetermined

Condition: The rod exhibited thermal distress

#4 CONNECTING ROD BEARING

P/N: Undetermined

Condition: Destroyed



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#5 CONNECTING ROD

P/N: 655911

Forging or Serial Number: Undetermined

Condition: The rod exhibited thermal distress

#5 CONNECTING ROD BEARING

P/N: 642398

Condition: Undetermined



#6 CONNECTING ROD

P/N: 655911

Forging or Serial Number: Undetermined

Condition: The rod exhibited thermal distress

#6 CONNECTING ROD BEARING

P/N: 642398

Condition: Undetermined



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CAMSHAFT

CAMSHAFT

P/N: 654084A1

S/N: Undetermined

Condition:

The camshaft was broken and the camshaft gear (PN# 656818A) exhibited several damaged teeth.



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ACCESSORY GEARS

Condition:

The crankshaft and idler gears were intact. The cam gear exhibited damaged teeth. The cam gear contacted the oil pick up tube when the camshaft was damaged. See above.



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ACCESSORIES

STARTER

Manufacturer: Iskra

P/N: 655566G24V

S/N: 06420395

Condition:

The starter was undamaged



STARTER ADAPTER

P/N: Undetermined

Condition:

The starter adapter appeared undamaged with the possible exception of the PTO shaft. The pulley wobbled on the shaft. The starter adapter and pulley were sent to CMI Analytical for further examination.



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ALT/GEN #1	Manufacturer: Kelly Aerospace	P/N: ES-10024	S/N: J122401
Condition:	The alternator appeared to be undamaged		



ALT/GEN #2	Manufacturer: Kelly Aerospace	P/N: ALU6526	S/N: CO41548
Condition:	The alternator appeared to be undamaged		



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LEFT TURBO

Manufacturer: Kelly Aerospace

P/N: 646677

S/N: JDL00317

Condition: The left turbo exterior had a small amount of oil contamination and the exhaust pipe contained a small amount of oil. The compressor blades were undamaged and exhibit neither oil or oil stains. The turbo was retained by the NTSB to be shipped to CMI for an analytical examination by the Hartzell ASI.



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RIGHT TURBO

Manufacturer: Kelly Aerospace

P/N: 646677

S/N: JDL00318

Condition:

No impact damage or oil contamination was exhibited by the right turbo. The turbo was retained by the NTSB to be shipped to CMI for an analytical examination by the Hartzell ASI. Connecting flexible hoses and fittings used to provide and return oil to/from the turbochargers were tight and contained torque (witness) putty.



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TURBO CONTROLLER	Manufacturer: Kelly Aerospace	P/N:646318-4	S/N: JGN00588
Condition:	The turbo controller was undamaged.		



WASTEGATE	Manufacturer: Kelly Aerospace	P/N: 646317	S/N: JCN00077
Condition:	The wastegate did not exhibit any impact damage.		



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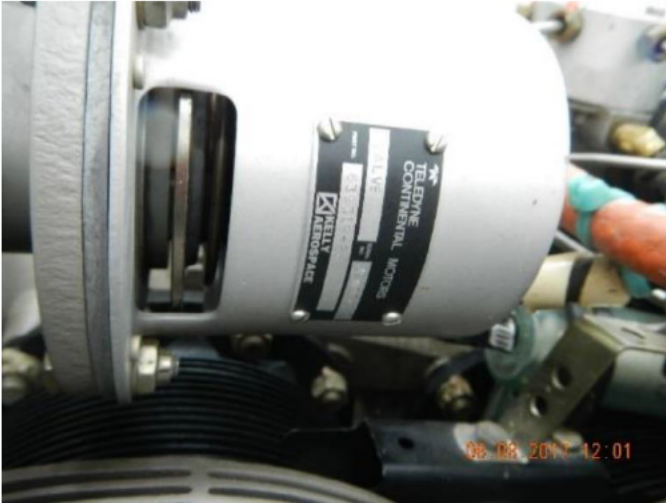
OVERBOOST VALVE

Manufacturer: Kelly Aerospace

P/N:639319-26

S/N: JBN00087

Condition: The overboost valve was intact. When manually forced open, the spring-loaded valve closed normally.



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PROPELLER

PROPELLER GOVERNOR	Manufacturer: McCauley	M/N:C230D3R/T43	S/N: 050335
Condition:	No damage was noted. The throttle control arm was properly attached. The gasket/screen was clean		



PROPELLER	Manufacturer: Hartzell	M/N: HC-H3YF-1RF	S/N: LXZ69B
Blade 1 S/N:	K39717		
Blade 2 S/N:	K39719		
Blade 3 S/N:	K39718		
Condition:	The propeller hub and/or propeller blades did not exhibit any damage.		

