Continental Motors

ENGINE RUN REPORT

ENGINE MODEL	TSIO520R
ENGINE SERIAL NUMBER	294045-R
AIRCRAFT MAKE & MODEL	Cessna T210M
AIRCRAFT SERIAL NUMBER	21061884
AIRCRAFT REGISTRATION	N732YQ
FILE NUMBER	14-491

NAME	SIGNATURE	DATE
Phillip Grice		06-16-2015

GENERAL INFORMATION

EXAMINATION		ACCIDENT DATA	
DATE	June 15, 2015	**NTSB ACCIDENT #**	WPR15FA143
FACILITY	Mobile Alabama	**NTSB INVESTIGATOR**	Zoe Keliher
ADDRESS	2039Broad Street Mobil, Alabama 36615	**FAA INVESTIGATOR**	Not reported
		ACCIDENT DATE	04/10/2015
		ACCIDENT LOCATION	Challis, Idaho

ENGINE INFORMATION

ENGINE POSITION	Single
TOTAL TIME	12/08/2014 3669.4 last annual entry.
TIME SOH	12/08/2014 1341.1 last annual entry.
TYPE & TIME SLI	Not Reported
BUILD DATE	02/04/1999
IN SERVICE DATE	02/24/1999

Significant logbook information: Last 100 hour inspection was completed 12/08/2014. There were no anomalies noted in the last log book entry.

Report Summary: Search Code(s): 15-12-68

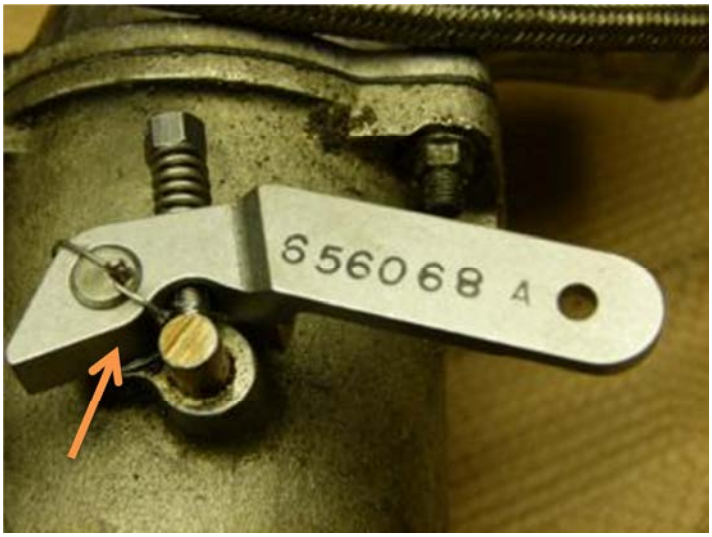
There were no pre-impact conditions found that would have prevented the engine from producing rated power.

Disposition of engine following exam:
Engine was returned to AP Aircraft Boise ID.

INSPECTION WITNESSES			
NAME	Phillip Grice	**NAME**	Johnny Little
ADDRESS	Mobile, AL	**ADDRESS**	Mobile, AL
ORGANIZATION	Continental Motors	**ORGANIZATION**	Continental Motors
PHONE	251-436-8310	**PHONE**	251-436-8481
NAME	Zoe Keliher	**NAME**	Greg Eastburn
ADDRESS	Portland OR 97209	**ADDRESS**	Mobile, AL
ORGANIZATION	NTSB	**ORGANIZATION**	Continental Motors
PHONE	208-352-0235	**PHONE**	251-436-8481

EXTERNAL INSPECTION OF ENGINE

The engine exhibited impact damage to the left front side of the engine. The number six cylinder push rod housing seat was fractured away and the cylinder was replaced for test run. The oil sump was crushed upward to the bottom of the engine and was replaced for the test run. The inlet fuel fitting on the fuel pump was fracture and replaced for the test run. The throttle arm was not returned with the engine and was replaced. The induction runners and exhaust system were impact damaged and replaced with slave units for the test run. The left front and rear engine mounts were fractured and replaced. The number six rocker cover was fractured and replaced for the test run. The right magneto was impact damaged and the flange fractured at the mount hold down clip. The oil cooler lower mounting studs were fractured and replaced for the test run.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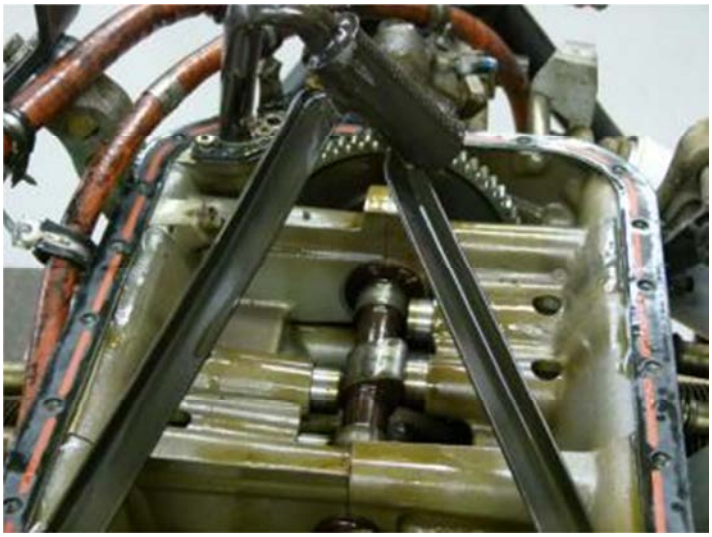



NTSB
TSIO520R
294045

ENGINE PREPARATION PRIOR TO RUN

There were a number of airframe related items removed in preparation for operation on the CMI test bed.

Items removed:
Cooling baffles
Vacuum pumps.
Alternator.
Propeller deice block.
Propeller governor.
Turbo Controller and Waste gate
Exhaust system.

The following substitute or repaired parts were required for engine operation:

Oil Sump
Number six cylinder and piston. (Original cylinder was P.015)
Fitting inlet fuel pump
Throttle Arm
Exhaust System
Induction runners Number 3 and 2, 4, 6 side.
Induction elbow and balance tube.
Engine mount legs.
Oil cooler mount studs.
Push rod housing seals number two intake valve.

The cylinders were bore-scoped and the following was observed:
All of the cylinders, pistons, and valves displayed normal operating and combustion signatures.
There were no anomalies noted during the bore-scope inspection.

The magneto-to-engine timing was checked and with the following results: The left magneto was impact damaged and the flange fractured from the magneto case. The timing was reset to match the right magneto at 24°before the test run.

Magneto-to-Engine Timing (Specified):	Left Magneto:	Right Magneto:
22°BTDC	27°BTDC	24°BTDC

A cylinder leakage test was performed prior to the test run in accordance with the latest revision of CMI Service Bulletin SB03-3 with the engine at room temperature with the following results:

Cylinder #1 - 08/80 PSI (exhaust valve/rings)
Cylinder #2 - 14/80 PSI (exhaust valve)
Cylinder #3 - 25/80 PSI (exhaust valve/rings)
Cylinder #4 - 32/80 PSI (exhaust valve)
Cylinder #5 - 45/80 PSI (exhaust valve/rings)
Cylinder #6 - 20/80 PSI (exhaust valve)
(*) – Leakage Source

The engine was not disassembled prior to the engine run. The crankshaft end-play measured 0.013” and the run-out was 0.002”.

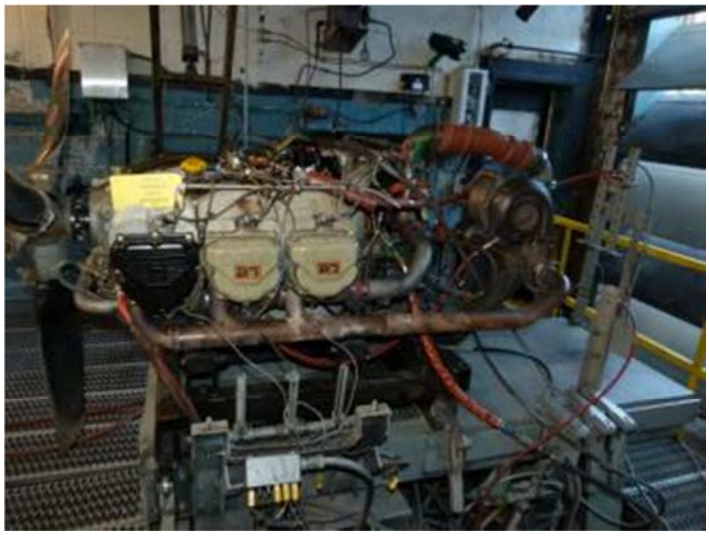
The engine was then prepared for operation by installing the appropriate thermocouples, pressure lines and test pads for monitoring purposes. The engine was then moved to CMI test cell number 43 and mounted for operation. The engine was fitted with a test club propeller for the TSIO520R engine model.

DESCRIPTION OF RUN

The engine experienced a normal start on the first attempt without hesitation or stumbling in observed RPM. The engine RPM was advanced in steps for warm-up in preparation for full power operation. The engine throttle was advanced to 1200 RPM and held for five (5) minutes to stabilize. The engine throttle was advanced to 1600 RPM and held for five (5) minutes to stabilize. The engine throttle was advanced to 2450 RPM and held for five (5) minutes to stabilize. The engine throttle was advanced to full open position and held for five (5) minutes to stabilize. The engine throttle was rapidly advanced from idle to full throttle five times where it performed normally without any hesitation, stumbling or interruption in power. Turbo boost was slow to advance; slave exhaust manifold was inspected for leaks and corrected. Turbo response was rapid and capable of in excess of 40” manifold pressure. Number two intake push rod housing had impact damage and leaked oil. The seals were replaced and the run completed with no leaks observed.

Throughout the test phase, the engine accelerated normally without any hesitation, stumbling or interruption in power and demonstrated the ability to produce rated horsepower.

The turbo controller was disassembled and no anomalies noted. The waste gate actuator was inspected and determined to be at or near full extension, indicating waste gate closed.




OUTBOARD
CYL.
SIDE

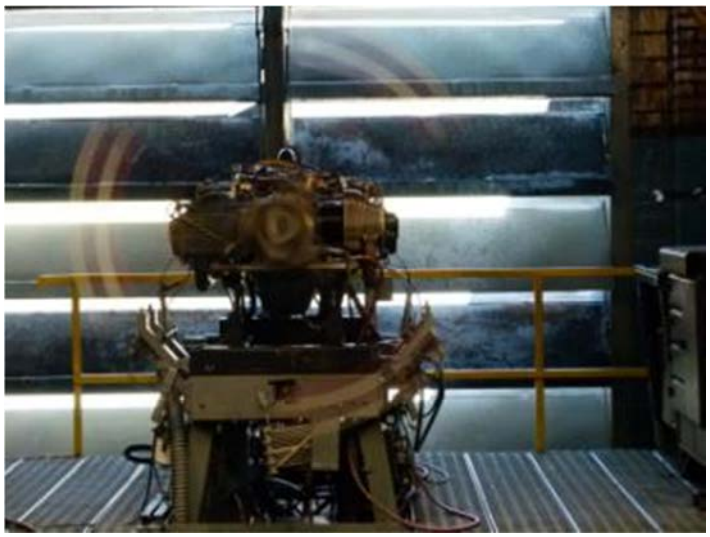

RED LION CONTROLS
Model DT30
2708
Prop RPM


36.55


BLEED
792
222
TEMP.


19.89
29.68


Engine Oil PSI
0
20
40
60
80
100
120
140
160
180
200



A cylinder leakage test was performed after the test run in accordance with the latest revision of CMI Service Bulletin SB03-3 with the engine hot with the following results:

Cylinder #1 - 63/80 PSI (rings)
Cylinder #2 - 65/80 PSI (rings)
Cylinder #3 - 66/80 PSI (rings)
Cylinder #4 - 60/80 PSI (rings)
Cylinder #5 - 70/80 PSI (rings)
Cylinder #6 - 74/80 PSI (rings)

(*) – Leakage Source

ENGINE RUN PARAMETERS

Time		RPM	MP / TDP " Hg	Oil		Fuel				Cell °F	Cylinder Head Temperature °F					
Reading	Minutes			PSI	°F	Lbs./Hr.	Nozzle PSI	Pump PSI	Fuel °F		# 1	# 2	# 3	# 4	# 5	# 6
1	5	1200	17/30	20	238	25	4.7	14.8	95	99	298	349	316	305	312	249
2	5	1600	19/30	25	220	37	5.1	16.5	94	98	291	341	301	298	304	248
3	5	2100	24.7/31.7	40	209	81	8.0	20.4	94	91	317	361	329	324	333	283
4	5	2450	29.5/33.5	44	213	124	10.9	24.6	94	91	350	388	375	349	380	321
5	5	F/T 2708	36.5/38.8	35	241	183	19.8	41	95	91	353	423	415	384	422	357
6	5	Idle 660	17.8/30.3	10	232	20	3.8	9.8	93	97	319	356	328	322	299	238

Ambient Air Temperature °F	Ambient Air Pressure	Transfer Collar Δ P		Maximum Rated Power Engine Operational Parameters				
		IN	OUT	RPM	" Hg MP	Fuel Flow Lbs./Hr.	Metered PSI	Unmetered PSI
90.1	29.29	35	33	2700	36.5	170-186	16.9-19.9	33-37

Notes: Operator – Johnny Little, 30524. Transfer collar pressure delta measured at full throttle power setting.

Engine Performance Test				
Test RPM	Left Magneto	Left Magneto	Right Magneto	Right Magneto
	RPM	RPM Drop	RPM	RPM Drop
2100	2132	76	2124	88