



Continental Motors, Inc.

ENGINE OPERATIONAL TEST

REPORT

DATE	December 17, 2013
REGISTRATION #	N406DC
ENGINE MODEL	IO360ES
ENGINE SERIAL	357900
INSPECTOR	Phillip Grice
SEARCH CODE	15-12-68

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GENERAL INFORMATION	
DATE OF RUN:	12/17/2013
FACILITY:	Continental Motors
ADDRESS:	[REDACTED]
TELEPHONE:	[REDACTED]

ENGINE INFORMATION			
MAKE:	Continental Motors		
MODEL:	IO360ES		
SERIAL NO.:	357900	POSITION:	Single
BUILD DATE:	10/25/2004	DATE IN SERVICE:	Not reported
TIME SINCE TOP OVERHAUL:	Not reported	DATE OF TOH:	Not reported
TIME SINCE MAJOR OVERHAUL:	Not reported	DATE OF MOH:	Not reported
TOTAL TIME:	Not reported		
REMARKS:	No historical data furnished with the engine.		

AIRCRAFT INFORMATION			
ACCIDENT DATE:	August 25, 2013	LOCATION:	Bolingbrook IL.
MANUFACTURER:	Cirrus	MODEL:	SR-20

ATTENDEES	
NAME:	Phillip Grice – Manager, Product Field Performance Johnny Little – Mechanic/Inspector Greg Eastburn – Mechanic/Inspector
ORGANIZATION:	Continental Motors
ADDRESS:	[REDACTED]
TELEPHONE:	[REDACTED]
NAME:	Josh Lindberg
ORGANIZATION:	IIC National Transportation Safety Board
NAME:	Brannon Mayer
ORGANIZATION:	Cirrus Aircraft.

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ENGINE COMPONENT INFORMATION			
COMPONENT	MANUFACTURER / OVERHAULED BY	PART NUMBER	SERIAL NUMBER / DATE CODES / WORK ORDER #s
Alternator	Kelly	ES-4024LP	E091770
Crankcase	CMI	Casting # (L/H):642332 Casting # (R/H):654333	S04HA017
Crankshaft	CMI	Part #: Not Accessible Forging #: Not Accessible	Serial #: N04IA032 Heat Code: Not Accessible
Cylinders	CMI	Part Number: 655479A11	Serial Number: 1 –AC04AA531 , 3 –AC10I107 , 5 – AC04DC713 2 – AC04AB636, 4 –AC04DC754 , 6 –AC04DA056
Fuel Pump	CMI	649363-46A4	BO4IA211
Fuel Manifold Valve	CMI	646508-10A6	C04IA210
Fuel Metering Unit	CMI	652844-1A4	A04IA194
Fuel Nozzles	CMI	Size: 10K	Not Applicable
Magneto - Left	Slick	6314	08051230
Magneto - Right	Slick	6314	A04IA194
Prop Governor	McCauley	C290	Illegible
Spark Plugs	Champion	RHN38E	N/A
Starter	Lamar	PM2407	85F77102
Starter Adapter	CMI	646220A53	Not Applicable
Tachometer Generator	Rochester	T60101465010	1937
Alternator 2	B&C Specialties	BC410-1	0797508K
Oil Cooler	NDM	646880	104-2152-80C
Oil Filter	Champion	CH48108-1	N/A

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ENGINE HISTORY

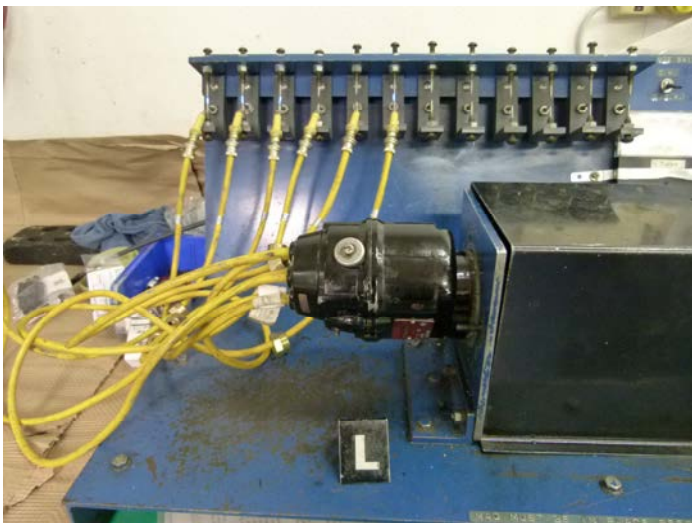
There were no engine logbooks, work orders or any other historical information returned with this engine.

EXTERNAL EXAMINATION

The engine exhibited impact damage concentrated at the bottom rear of the engine. The external surfaces of the engine were impact damaged. The left magneto was replaced for the engine run. The left magneto was tested on the magneto test bench and then disassembled with no anomalies noted, with the exception of the impact damage to the flange.



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ENGINE PREPARATION PRIOR TO OPERATIONAL TEST

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

Items removed:

1. Alternator
2. Cooling baffles.
3. Crankcase breather tube and associated hoses and clamps.
4. Propeller governor.
5. Exhaust system.
6. Oil filter and adaptor
7. Left magneto

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

1. Housing, push-rod
2. Mounts, engine – Front, left and right, Rear, left and right.
3. Oil filter and adaptor
4. Left magneto

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The cylinders were borescoped and the following was observed:

- Cylinder #1 – There were combustion deposits present in the combustion chamber and on the piston head. There was oil present on the cylinder bore. The cylinder head combustion chamber, intake and exhaust valve faces, piston head and cylinder bore exhibit normal operating signatures. The cylinder bore finish appears to be steel.
- Cylinder #2 – There were combustion deposits present in the combustion chamber and on the piston head. There was oil present on the cylinder bore. The cylinder head combustion chamber, intake and exhaust valve faces, piston head and cylinder bore exhibit normal operating signatures. The cylinder bore finish appears to be steel.
- Cylinder #3 – There were combustion deposits present in the combustion chamber and on the piston head. There was oil present on the cylinder bore. The cylinder head combustion chamber, intake and exhaust valve faces, piston head and cylinder bore exhibit normal operating signatures. The cylinder bore finish appears to be steel.
- Cylinder #4 – There were combustion deposits present in the combustion chamber and on the piston head. There was oil present on the cylinder bore. The cylinder head combustion chamber, intake and exhaust valve faces, piston head and cylinder bore exhibit normal operating signatures. The cylinder bore finish appears to be steel.
- Cylinder #5 – There were combustion deposits present in the combustion chamber and on the piston head. There was oil present on the cylinder bore. The cylinder head combustion chamber, intake and exhaust valve faces, piston head and cylinder bore exhibit normal operating signatures. The cylinder bore finish appears to be steel.
- Cylinder #6 – There were combustion deposits present in the combustion chamber and on the piston head. There was oil present on the cylinder bore. The cylinder head combustion chamber, intake and exhaust valve faces, piston head and cylinder bore exhibit normal operating signatures. The cylinder bore finish appears to be steel.

A pre engine test cylinder leakage test was performed in accordance with the latest revision of CMI Service Bulletin SB03-3 on each cylinder prior to operation and with the engine at room temperature with the following results: Master orifice reading – 39 PSI

Cylinder #1 - 10/80 PSI (exhaust valve/rings) Cylinder #2 - 20/80 PSI (exhaust valve/rings)

Cylinder #3 - 75/80 PSI (exhaust valve/rings) Cylinder #4 - 10/80 PSI (exhaust valve/rings)

Cylinder #5 - 48/80 PSI (exhaust valve/rings) Cylinder #6 - 35/80 PSI (exhaust valve/rings)

(*) – Leakage Source

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Magneto to Engine Timing CMI Spec. - 24° BTDC	Left Magneto: Off Engine	Right Magneto: 24° BTDC
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The engine was not disassembled prior to the engine run.

The crankshaft end-play measured .007" and the crankshaft flange run-out was .007"

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 IO360ES engine model.

DESCRIPTION OF OPERATIONAL TEST

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 six times where it performed normally without any hesitation, stumbling or interruption in power.

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

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Engine Operational Test Log

Time		RPM	MP "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	13.5	55	135	16.4	4.0	11.2	56	51	277	219	254	196	197	172
2	5	1600	17.0	54	154	25.2	4.3	13.7	57	55	288	234	267	207	199	179
3	5	2100	22	50	171	46.6	5.6	17.9	59	52	319	269	313	250	203	211
4	5	2450	26	47	186	75.0	8.6	20.4	59	52	339	295	333	286	221	247
5	5	F/T 2680	29	49	203	98.4	14.4	21.1	62	52	378	341	365	320	271	263
6	5	Idle 544	16	20	208	9.1	3.4	7.9	59	53	295	261	291	252	186	198
Ambient Air Temperature °F		Ambient Air Pressure		Transfer Collar ΔP		Maximum Rated Power Engine Operational Parameters										
53.2		30.09		In	Out	RPM	" Hg MP	Fuel Flow Lbs/Hr	Metered PSI	Unmetered PSI						
				45	40	2700	N/A	96-102	13.8-15.5	21.0-24.0						

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	2012	88	2064	36

A post engine test cylinder leakage test was performed in accordance with the latest revision of CMI Service Bulletin SB03-3 on each cylinder with the engine hot. The results are as follows:

Master orifice reading – 39 PSI

Cylinder #1 - 72/80 PSI (rings)

Cylinder #2 - 58/80 PSI (rings)

Cylinder #3 - 70/80 PSI (rings)

Cylinder #4 - 72/80 PSI (rings)

Cylinder #5 - 60/80 PSI (rings)

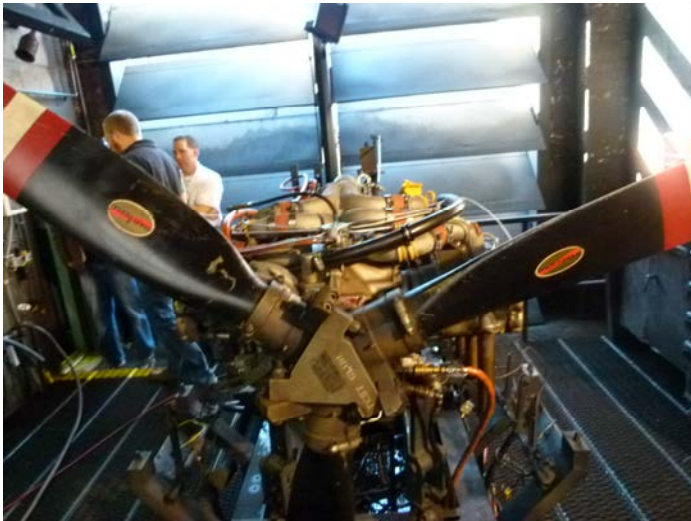
Cylinder #6 - 58/80 PSI (rings)

(*) – Leakage Source

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ENGINE OPERATIONAL TEST CONCLUSION

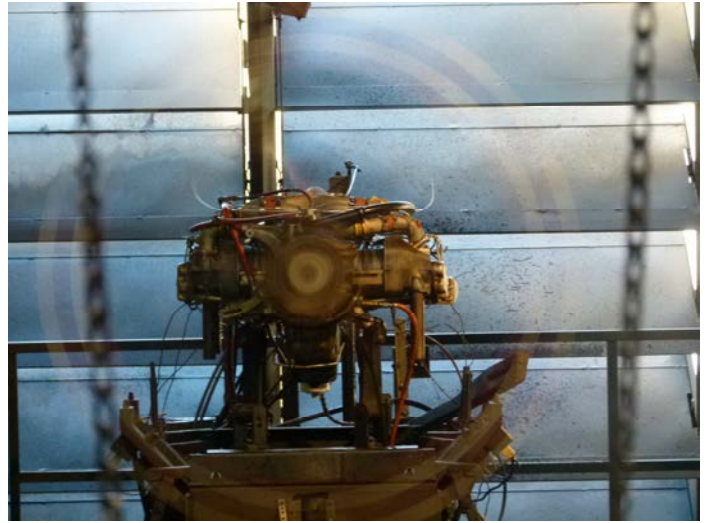
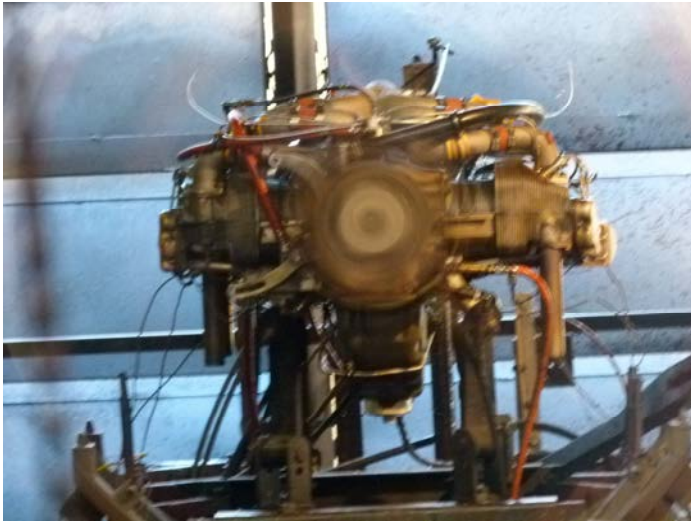
The operation of this engine was normal and did not reveal any abnormalities that would have prevented normal operation and production of rated horsepower.



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ENGINE DISPOSITION

The engine was shipped 12/20/2013 to the following address per the NTSB IIC upon the completion of the operational test:

Aircraft Storage Service

11619 Route 76

Poplar Grove, IL. 61065