

CEN15LA418, N813CA, Right Engine Test Run Notes

A test run of the right engine from N813CA was performed by a CMI Investigator on January 4-5, 2015 at Continental Motors in Mobile, Alabama. This test run was completed under supervision of the NTSB Investigator-in-Charge.

External Inspection of Engine

The engine remained intact and there were no signs of significant impact damage. The throttle and fuel metering assembly, turbocharger, wastegate assembly, and turbocharger controller assembly had been removed from the engine by the recovery personnel. All of the remaining induction tubes were secure and there were no visible signs of induction leaks. The exhaust system remained intact and there were no anomalies noted with the exhaust system.

Engine Preparation Prior to Test Run

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

1. Engine crankcase breather tube.
2. Propeller governor.

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

1. Exhaust system
2. Wastegate
3. Induction tube going from induction manifold to the throttle body

The cylinders were borescoped and the following was observed:

All of the cylinders, piston faces, and valve heads displayed normal operating and combustion signatures.

The magneto-to-engine timing was checked and with the following results:

Magneto-to-Engine Timing (Specified): 20°BTDC

Left Magneto: about 15°BTDC

Right Magneto: about 15°BTDC

The exact engine timing was not determined due to the fact that the magneto points opened past the timing scale visible from the engine timing plug.

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 (master orifice reading – 42 PSI):

Cylinder #1 - 40/80 PSI (exhaust valve/rings) Cylinder #2 - 72/80 PSI (exhaust valve/rings)
Cylinder #3 - 59/80 PSI (exhaust valve/rings) Cylinder #4 - 50/80 PSI (exhaust valve/rings)
Cylinder #5 - 4/80 PSI (exhaust valve/rings) Cylinder #6 - 65/80 PSI (exhaust valve/rings)

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 GTSIO-520-H engine model.

Description of Test Run

The engine experienced a normal start on the first attempt without hesitation or stumbling in observed RPM. It was noted that during the initial start the propeller was significantly out of track. Upon further inspection it was noted that the propeller flange was bent; shims were placed between the flange and the propeller hub to bring the propeller in track. The engine was restarted and the engine RPM was advanced in steps for warm-up in preparation for full power operation; the engine run time was limited due to the damage to the propeller flange. The engine throttle was advanced to 1200 RPM and held for five (3) minutes to stabilize. The engine throttle was advanced to 1600 RPM and held for five (3) minutes to stabilize. The engine throttle was advanced to full open position and held for five (3) 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.

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

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 (master orifice reading – 43 PSI):

Cylinder #1 - 61/80 PSI (rings) Cylinder #2 - 60/80 PSI (rings)
 Cylinder #3 - 70/80 PSI (rings) Cylinder #4 - 68/80 PSI (rings)
 Cylinder #5 - 45/80 PSI (rings) Cylinder #6 - 68/80 PSI (rings)

Engine Test Run Parameters

		RPM	MP / TDP “ Hg	Oil		Fuel				Cell °F	Cylinder Head Temperature °F					
Reading	Minute s			PSI	°F	Lbs/Hr	Nozzle PSI	Pump PSI	Fuel °F		# 1	# 2	# 3	# 4	# 5	# 6
1	3	1280	20.6/31.23	48	Inop	54.2	9.06	12.64	61	53	219	329	213	293	233	193
2	3	1600	25.07/32.6	46	Inop	96	10.47	16.7	62	54	249	388	244	336	263	211
3	3	2100	37.24/39.4	50	Inop	237	18.6	31.71	55	51	266	408	270	363	285	226
4	3	F/T 2172	40.39/42.6 2	50	Inop	292	21.98	38.60	62	54	292	301	284	295	314	197
5	3	Idle 744	15.63/30.3 7	38	Inop	20.5	3.67	7.86	60	54	207	314	208	287	210	190
Ambient Air Temperatur		Ambient Air Pressure		Transfer Collar Δ P		Maximum Rated Power Engine Operational Parameters										
55		30.28		IN	OUT	RPM	“ Hg MP		Fuel Flow		Metered PSI		Unmetered PSI			
				-	-	2267	39.5		250-260		15.7-17.3		30.5-35.0			

Notes: 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
1632	1544	88	1532	100

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