ERA12LA535

Millville, New Jersey

August 29, 2012

1445 EDT

Beech Aircraft Corporation 95-A55 – N71BM

NTSB ENGINE EXAMINATION NOTES

RIGHT ENGINE

PARTICIPANTS IN THE EXAMINATION

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Company: Continental Motors Inc (CMI)
City and Zip Code: Mobile, AL

HISTORY OF FLIGHT

On August 29, 2012, about 1445 eastern daylight time, a Beech 95-A55, N71BM, impacted the ground while landing at Millville Municipal Airport (MIV), Millville, New Jersey. The certificated flight instructor (CFI) sustained serious injuries, and the pilot-rated student was fatally injured. The airplane sustained substantial damage to the fuselage and all flight control surfaces. The airplane was registered to the pilot-rated student and was operated under the provisions of 14 Code of Federal Regulations Part 91 as an instructional flight. Visual meteorological conditions prevailed and no flight plan was filed.

According to recordings obtained from Lockheed Martin Flight Service, the accident flight's first transmission over the airport advisory service frequency stated that it was about five miles from the airport. The last recorded transmission from the accident airplane occurred a few minutes prior to the accident, when they reported simulating an engine failure. No other transmissions were recorded from the accident airplane.

Several eyewitnesses reported that the airplane appeared to have touched down and while on the ground, veered to the left, "cartwheeled," and then came to rest about 500 feet from the edge of the runway. Other witnesses reported that the airplane was approximately 20 feet above ground level, rolled to the left, climbed, then nosed over, impacted the ground and "cartwheeled."

Photo 1: Airplane at Rest (Courtesy of the FAA)

Photo 2: Right Engine at Rest (Courtesy of the FAA)

ENGINE INFORMATION

Engine Manufacturer: Continental Motors
Engine Model Number: IO-470-L
Engine Serial Number: CS192145-8-L-R
Recent Inspection: Annual – July 1, 2012
Recent Recorded TSMOH: 1771.8 – Recorded at the Annual Inspection
Time Sine Inspection: 27.7 flight hours per the FAA

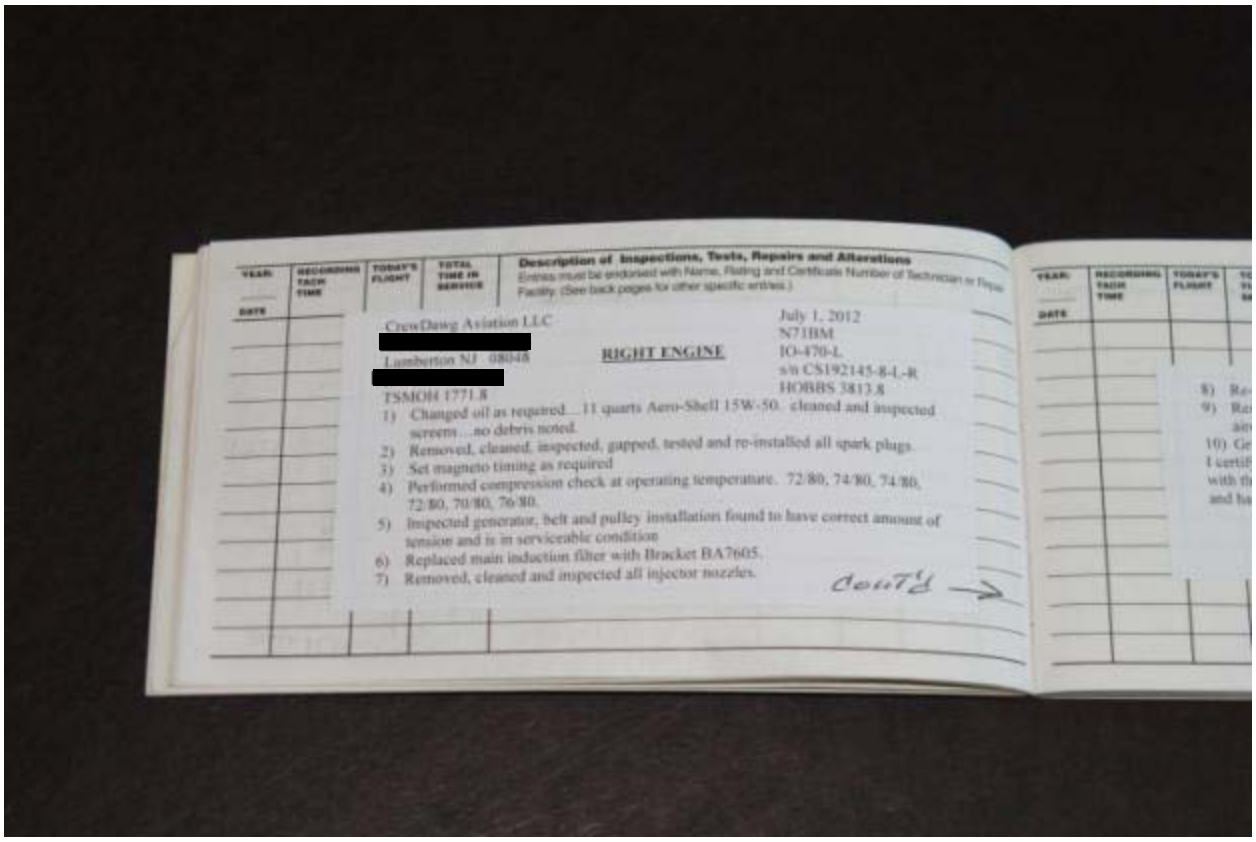

Photo 3: Recent Annual Inspection Pg. 1

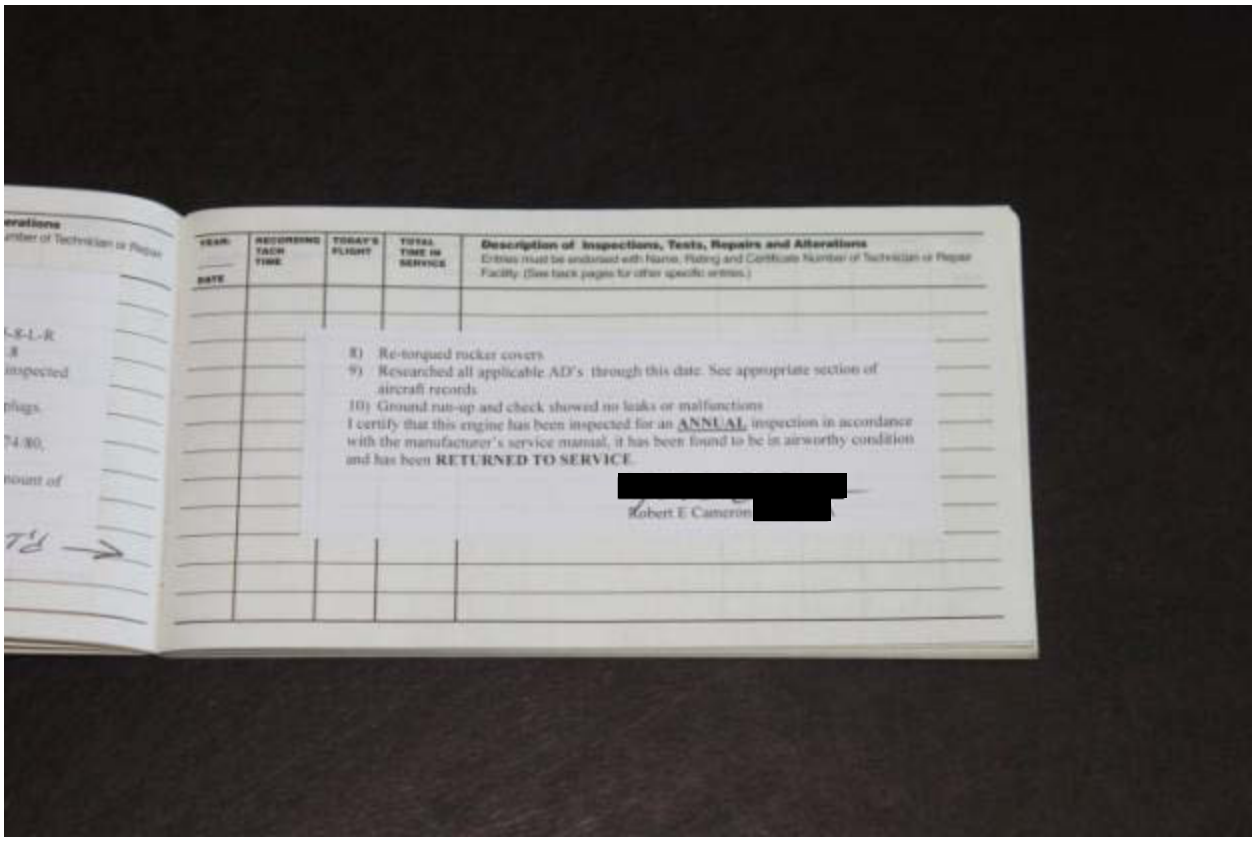

Photo 4: Recent Annual Inspection Pg. 2

INITIAL EXAMINATION AS RECEIVED

The engine was shipped from the accident airport to CMI's facilities in Mobile, Alabama via crate and bonded shipment. Upon receipt the engine was immediately logged and placed in bonded/secure storage and was not opened. The crate was viewed by the IIC as unopened; it was photographed and opened for examination. The examination revealed that four (4) mounting legs were impact separated and will need to be replaced in order to facilitate examination. The oil sump exhibited a breach of the structure which resulted in a loss of engine oil. The left side exhaust exhibited compression damage near the No. 1 Cylinder area. The right side exhaust exhibited slight compression damage on the aft side of the engine which resulted in a breach of the tubing. The generator pulley rim exhibited impact damage; however, the generator remained attached to the rear accessory drive. The starter was impact separated; however, was found placed on the right side of the engine's exhaust. Induction tubes exhibited impact damage at the coupling near cylinders No.s 1 and 2.

Photo 5: Right Engine Packaged

Photo 6: Right Engine Before Exam

DETAILED EXAMINATION

After removal of the rear accessory drive rotation was achieved from the propeller flange to the rear of the engine utilizing a wrench and rotating by hand. Rotation was smooth and unremarkable. Crankshaft end play was 0.0011 inches as measured at the propeller flange. Runout was 0.008. The exhaust was unable to be removed due to the attach bolts exhibited severe corrosion and attempt to remove one caused the bolt to shear with little pressure. The oil sump was breached on the bottom and exhibited a slight concave on the trailing edge of the sump. The oil sump was removed and examined and the camshaft, gears, and risers appeared unremarkable with no visible damage noted. The oil sump was replaced to facilitate an engine run in an engine test cell. The balanced tube exhibited slight bending, was removed and replaced to facilitate an engine run.

	Pre-Engine Run	Post Engine Run
Cylinder No. 1	0/80	65/80
Cylinder No. 2	15/80	62/80
Cylinder No. 3	10/80	65/80
Cylinder No. 4	10/80	39/80
Cylinder No. 5	65/80	70/80
Cylinder No. 6	45/80	70/80

Removed/Replaced Items

- Oil sump
- Intake tubes for cylinders one and two
- Generator removed
- Four mount legs
- Oil pickup tube inside sump
- Starter adapter removed
- Balance tube

Starter

Part number 1108234. Serial number 29041R. Impact damage was located at mounting points. Rotation was smooth and no anomalies were noted.

Photo 7: Starter

Starter Drive Adapter

Casting number 534957. The adapter was impact fractured at the mounting surface. There was impact damage to 30 percent of starter adapter flange. Looking at the face of the flange, the damage was noted from 12 o'clock to 3'oclock. A small portion of starter flange was still attached at bolt to starter adapter flange. Attach point to starter rotated freely with slight resistance, was rotated for one turn and rotated back. The timing plate remained in place, although not required and should have been removed. Rotation of the gears was smooth and no anomalies were noted.

Photo 8: Starter Drive Adapter

Propeller Governor

Woodward propeller governor, type 210355K, serial number 600122, and part number was unable to be determined. The screen was free and clear of debris and rotation was smooth and unremarkable. There was impact damage to the propeller control arm that caused it to bend 30 degrees. Propeller control arm was free of binding and rotated smoothly to stops.

Photo 9: Propeller Governor

Fuel Metering Unit

Part number 625219-2 and serial number B109505AR. Metering unit remained attached during the impact sequence. No anomalies were noted. Unit used for engine test.

Photo 10: Fuel Metering Unit

Fuel Manifold

Part number 631427-348 and serial number B109505CR. Manifold remained attached during the impact sequence. No anomalies were noted. Unit used for engine test.

Photo 11: Fuel Manifold

Fuel Pump

Part number 646212-9 and serial number B109515BR. The unit rotated smoothly and freely by hand and no anomalies were noted. There was impact damage to the fuel inlet fitting and vapor return fitting. The drive coupling was intact. The low end adjustment on the rear housing was replaced due to a circumferential crack. Needle valve was also replaced.

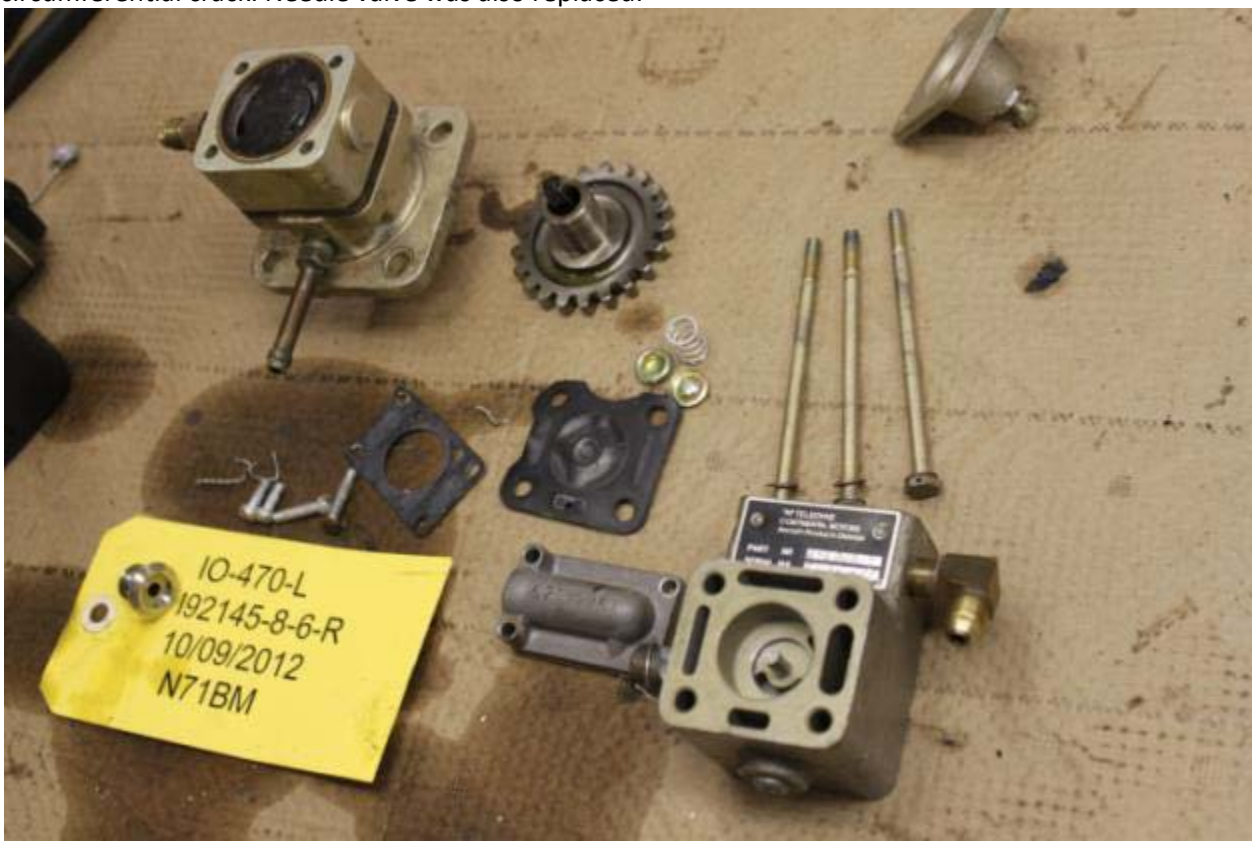

Photo 12: Fuel Pump

Generator

Part number and serial number were unable to be determined due to impact damage to the data plate. The unit was removed and rotated freely by hand that the pulley. Both forward and aft rim were 50 percent impact damaged around the circumference of the face.

Photo 13: Generator

Magneto

22 degrees from top dead center.

Photo 14: Magnetos

Left Magneto

The left magneto remained attached to the engine case. It was a Slick Magneto, M-6309.

Right Magneto

Serial number 95060004. Slick Aircraft Company Magneto, Model 6313. Magneto remained attached during the impact sequence. Unit used for engine test.

Vacuum Pump

Part number G455 and serial number 15982. Wet vacuum pump system. Unit remained attached to rear accessory pad. The unit rotated smoothly at spline; no mechanical malfunctions or anomalies were noted.

Photo 15: Vacuum Pump

ENGINE RUN

The engine was mounted in the test stand and attached with test stand fuel lines as well as refilled with oil to the full line. The engine was run for a total of 27 minutes, first at idle then accelerated through different rpm settings up to and included 2678 rpm or full throttle and exhibited no signs of hesitations, malfunctions, or anomalies. The engine operated at normal parameters with no abnormalities or malfunctions noted.

SUMMARY

The engine operated at normal power settings and other than the damaged parts that were noted above. No abnormalities or malfunctions were noted and therefore the probability exists that the engine was capable of producing full power with no delay or hesitations. The probability also exists that the engine should have been able to operate as required and produce normal power for a go-around or normal takeoff and climb.

APPENDIX A – FUEL FLOW DATA

Paragraph Name : ----

Test Point	supply temp F	pump speed RPM	pump flow Min	pump flow PPH	pump flow Max	discharge pressure Min	discharge pressure PSIG	discharge pressure Max
3	72.2	600.1	6.500	6.770	7.000	10.50	10.85	12.00
4	73.0	2599.6	149.000	150.350	151.000	28.70	29.07	29.30
5	72.4	1600.0	37.000	37.980	38.000	18.50	18.74	21.50
6	72.0	599.2	6.500	6.830	7.000	10.50	10.84	12.00

-------- Continental Motors, Inc. --------

Airframe Name	:	632845 -1	Model Number	:	
Part Number	:	646212-9	Test Document	:	632845
Accy Name	:	632845 -1			
Test Type	:	calibration-1_CCW			
Serial Number	:	[redacted]	Operator	:	jsobolic
Test Station ID	:	R678	Work Order	:	ntsb
Run Date/Time	:	10/10/2012 2:30:32 PM	Report Type	:	Final

-------- Data Variance Report --------

Paragraph Number : 1
Paragraph Name : ----
All data points are within limits

[redacted]

APPENDIX B – ENGINE RUN DATA

Date	Engine Model	Engine Serial No.	Aircraft Registration	Page
10-11-2011	IO470L11	CS192145-8-6-R	N71BM	7 of 8

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	14.5	56	121	27.3	2.5	14.0	72	67	272	245	251	230	240	156
2	5	1600	17.0	57	140	36.4	3.0	15.4	67	73	264	289	250	267	250	174
3	5	2100	21.8	50	159	62.3	5.3	19.3	74	67	306	338	300	304	264	206
4	5	2450	25.1	46	169	96.5	9.2	23.2	74	70	341	381	334	340	288	235
5	5	F/T 2668	28.8	38	184	129.6	13.9	25.2	75	67	342	397	340	351	291	247
6	5	Idle 948	11.5	54	96	16.4	2.2	11.7	72	68	237	216	213	197	192	139

Ambient Air Temperature °F	Ambient Air Pressure	Transfer Collar ΔP		Maximum Rated Power Engine Operational Parameters				
		In	Out	RPM	" Hg MP	Fuel Flow Lbs/Hr	Metered PSI	Unmetered PSI
70.0	30.20	N/A	N/A	2668	N/A	129.6	13.9	25.2

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

Engine Performance Test				
Test RPM	Left Magneto RPM	Left Magneto RPM Drop	Right Magneto RPM	Right Magneto RPM Drop
2100	1980	120	1960	140

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 - 65/80 PSI (rings)
Cylinder #2 - 62/80 PSI (rings)
Cylinder #3 - 65/80 PSI (rings)
Cylinder #4 - 39/80 PSI (rings\exhaust valves)
Cylinder #5 - 70/80 PSI (rings)
Cylinder #6 - 70/80 PSI (rings)
(*) – Leakage Source