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INVESTIGATION REPORT

<u>ACCIDENT INFORMATION</u>			
Date of accident:	07/09/2016	NTSB file number:	ERA16LA247
Location of accident:	Pittsfield, ME	FAA Inspector:	David Roakes
Location of Investigation:	[REDACTED] Pittsfield, ME 04967	Law Enforcement:	Unknown
Investigator In charge:	Leah D. Read	Coroner/Medical Examiner	Unknown
<u>AIRCRAFT INFORMATION</u>			
Aircraft Make:	Adventurea	Aircraft registration:	N932MC
Aircraft Model:	11	Aircraft S/N	AA2A0138
Propeller make, model & S/N	3 Blade Warp Drive S/N N15872		
<u>ENGINE INFORMATION</u>			
Engine Type:	Rotax 912 ULS	Engine TTSN	Unknown
Engine Serial Number:	5648772	Engine TTSOH	Unknown
Engine Manufacture date:	2007/05/09	Engine position:	Pusher
<u>ADDITIONAL INFORMATION</u>			
Persons in attendance:	David Roakes – Portland, Maine FSDO		
	Samuel Candors – Aircraft Owner/Accident Pilot		
	Jordan Paskevich – Rotech Flight Safety – Rotax Aircraft Engines		
Date of Report:	June / 6 / 2017		
RFS File number:	2016-028		

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07 / 09 / 2016	Rotax 912 ULS	5648772	N932MC	2016-028

NTSB Preliminary

On July 9, 2016, about 1542 eastern daylight time, an experimental amateur-built Aventura II, N932MC, was substantially damaged when it impacted terrain while on approach to a private airfield in Pittsfield, Maine. The pilot/owner sustained minor injuries. The airplane was registered to and operated by the pilot. Visual meteorological conditions prevailed for the personal flight conducted under the provisions of 14 Code of Federal Regulations Part 91.

No flight plan was filed for the flight that departed the private airfield about 1535. The pilot stated that the purpose of the flight was to perform a functional test of the retractable landing gear. He said he started the engine and taxied for about 10 minutes before he departed.

The takeoff was normal and the pilot made a left turn to stay in the traffic pattern and climbed to an altitude of about 200 feet. The pilot said that when he was making the turn toward the final approach leg of the traffic pattern, he noticed the controls were very stiff when he tried to roll level. He needed two hands to move the control wheel. The pilot also noticed that he was descending and was unable to avoid trees off the side of the runway. The airplane struck the trees and impacted the ground in a nose-down attitude. A review of photographs taken by law enforcement revealed the airplane sustained substantial damage to the fuselage and both wings. Two witnesses reported that the engine stopped producing power prior to the airplane impacting the trees. The pilot said he was wearing a full size helmet and was unaware that the engine had failed and was focused on trying to level the airplane. The airplane and engine were recovered for further examination.

Updated on Jul 13 2016 4:04PM



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Initial Inspection

The on-site investigation took place on September 9th 2016, under the supervision of FAA Airworthiness Inspector, David Roakes out of the Portland, ME FAA office. The aircraft wreckage was located in the pilot/owners hanger Near Pittsfield, ME.

The aircraft sustained severe frontal impact damage. The Rotax 912 ULS, S/N 5648772 was still attached to the engine mount and airframe.

All three propeller blades were still attached to the hub and were undamaged. The engine and its components were in good physical condition with no impact damage. There was no coolant in the coolant system as the coolant radiator was breached from recovery or impact damage.



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Detailed Inspection

Spark Plugs: The Rotax 912ULS is equipped with 8 spark plugs (two per cylinder). The spark plugs were removed from engine and inspected for condition and conformity.

#1 Top Spark Plug	- NGK DCPR8E (Proper Type) - Bent threaded Terminal - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	
#1 Bottom Spark Plug	- NGK DCPR8E (Proper Type) - Good Physical Condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	
#2 Top Spark Plug	- NGK DCPR8E (Proper Type) - Good Physical Condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	
#2 Bottom Spark Plug	- NGK DCPR8E (Proper Type) - Good Physical Condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	
#3 Top Spark Plug	- NGK DCPR8E (Proper Type) - Good Physical Condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	
#3 Bottom Spark Plug	- NGK DCPR8E (Proper Type) - Good physical condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	
#4 Top Spark Plug	- NGK DCPR8E (Proper Type) - Good physical condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Wet with oil due to angle of engine during recovery. - Normal electrode coloring with no other anomalies.	
#4 Bottom Spark Plug	- NGK DCPR8E (Proper Type) - Good physical condition - Electrode gap of .026 (Proper gap is .023 – 0.27) - Normal electrode coloring	

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Continuity check & Thumb Compression: With the spark plugs removed, a continuity and thumb compression check was done. During rotation of the engine by the propeller hub, continuity and thumb compression was felt. No anomalies were found during the continuity and thumb compression check.

Exhaust system: The 912ULS exhaust system consists of the following:

-4 exhaust pipes from each cylinder.

-1 muffler

The exhaust system was examined for condition, modifications and conformity. The exhaust system was an aftermarket non-Rotax exhaust that was mounted above the engine in close proximity to temperature sensitive electronic components and fuel lines. No heat shielding was installed to protect these heat sensitive components from radiant heat that the exhaust would produce.

Fuel lines with no firesleeve or heat protection in close proximity to exhaust system. The Rotax installation manual states "To avoid vapour lock keep the temperature of the fuel lines, float chamber and related devices below 113 F (45C). The electronic ignition modules were also found in close proximity to the exhaust system with no heat protection. The electronic ignition modules have a max ambient temperatures of 176 F (89 C). The exhaust system can reach temperatures of 1616 F (880 C)



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Ignition system: The Rotax 912ULS engine is equipped with a dual capacitor discharge ignition system which consists of the following:

- 2 CDI electronic modules
- 4 double ignition coils with cables and connectors
- 4 external triggers
- 1 stator
- 1 magneto flywheel

The ignition system was examined for condition modifications and conformity.

CDI Electronic Modules: No anomalies were found with the CDI electronic modules



Ignition coils and cables: No anomalies were found with the ignition coils and cables.



External Triggers: No anomalies were found with the external triggers.



Stator & Magneto Flywheel: The stator and magneto flywheel are located behind a cover and were not physically examined due to the engine mount blocking access.

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Fuel System: The standard Rotax 912ULS fuel system consists of the following:

- Diaphragm fuel pump fitted on the gearbox that is actuated by an eccentric on propeller shaft
- Fuel rated rubber fire sleeved fuel line that runs from the fuel pump to both carburetors and a return fuel line.
- Rubber fuel line from distribution block to carburetors
- 2 Bing Constant depression diaphragm carburetors
- Fuel pressure indication

The fuel system was examined for condition, modifications and conformity. No fuel return line was installed on this aircraft as per the Rotax installation manual requirements. The Rotax installation manual states the following: **“NOTICE. The installation of a fuel return line is mandatory”**. **“The return line prevents malfunctions caused by the formation of vapor lock”**.

Fuel Pump: No anomalies were found with the diaphragm fuel pump.

- P/N 893 110
- S/N 13.6284



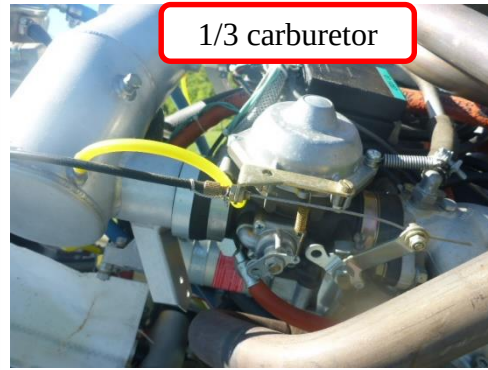
Gascolator: The gascolator bowl was removed and examined. The gascolator was approximately half full of fuel with no contamination found. No anomalies were found with the gascolator and its contents.



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Carburetors: The carburetors were found attached to there respective intake manifolds. Both carburetors were examined for condition, modification and conformity.



1/3 Carburetor: The 1/3 Carburetor float bowl was removed and examined for fuel contamination. Corrosion was found within the 1/3 float bowl underneath the float. No fuel was contained inside.



The main jet was removed and examined for any obstructions and proper size. No obstructions were seen and it was the stock 155 size main jet.



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2/4 Carburetor: The 2/4 Carburetor float bowl was removed and examined for fuel contamination.

Corrosion was found within the 2/4 float bowl underneath the float. No fuel was contained inside.



The main jet was removed and examined for any obstructions and proper size. No obstructions were seen and it was the stock 155 size main jet.



Corrosion found within both the 1/3 and 2/4 Carburetor float bowls was the only anomalies found with the 1/3 and 2/4 carburetors.

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Fuel Pressure Indication: A fuel pressure indicator was installed but was not connected electrically. This aircraft had no other means of measuring fuel pressure.



Cooling system: The Rotax 912ULS cylinder heads are liquid-cooled. The coolant is pumped by the water pump driven by the camshaft from the radiator to the cylinder heads. The Rotax 912ULS cooling system normally consists of the following:

- Expansion tank
- Overflow bottle
- Radiator
- Water pump
- Rubber Coolant lines

The coolant system was examined for condition, modifications and conformity.

Expansion tank: The expansion tank cap was removed to examine the contents within. No coolant remained within the expansion tank due to a breach in the system from impact or wreckage recovery. No anomalies were found with the coolant expansion tank.



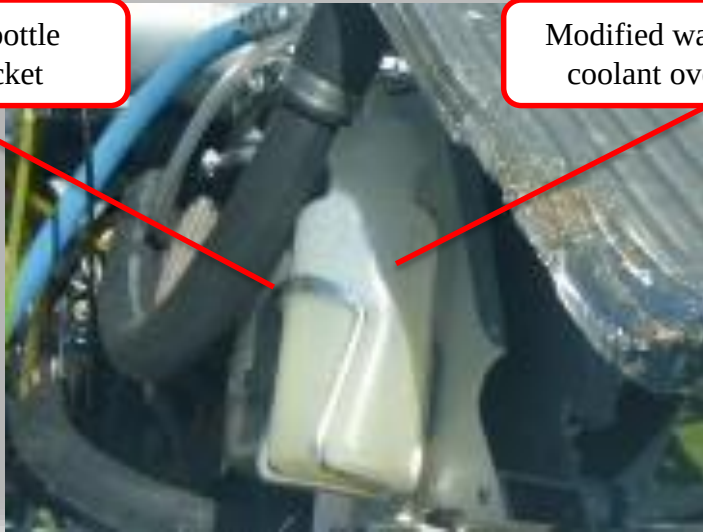
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Overflow bottle: The coolant overflow bottle was a modified water bottle with a bicycle water bottle mounting bracket. No coolant was seen inside the tank due to the system being breached. Other than the overflow tank was a modified water bottle, no anomalies were found with the overflow tank.

Bicycle water bottle mounting bracket

Modified water bottle for coolant overflow tank



Radiator: The radiator was substantially damaged from impact or aircraft recovery. There was no coolant contained within the coolant radiator due to the system being breached. No anomalies were found with the coolant radiator.



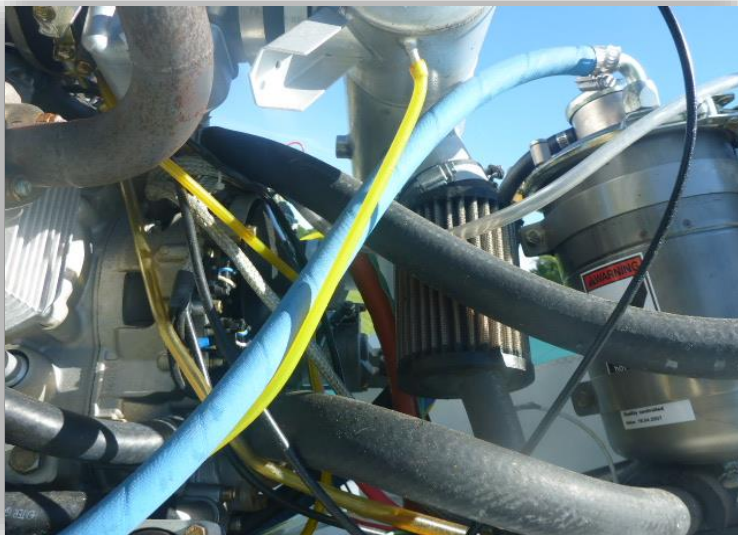
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Water Pump: The Coolant Water Pump was examined for condition and modifications. No anomalies were seen with the Coolant Water Pump.



Coolant Lines: The coolant lines were examined for condition. All coolant lines were in good condition. No anomalies were seen with the coolant lines.



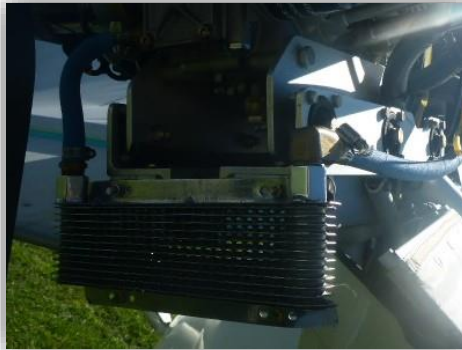
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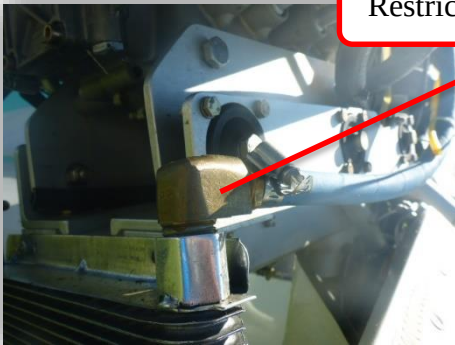
Detailed Inspection

Oil Cooler: The oil cooler was examined for condition, conformity and installation. The oil cooler was in good physical condition and mounted correctly. No further anomalies were found with the oil cooler.



Oil lines: The oil lines were examined for condition and proper type. The oil lines were the proper type but two of the oil line fittings from the oil cooler and the oil tank were restrictive and could cause cavitation within the oil system resulting in improper lubrication of the engine and its internal components/

Restrictive oil line fittings



Oil Filter: The oil filter was examined for condition and proper type. No other anomalies were found with the oil filter.



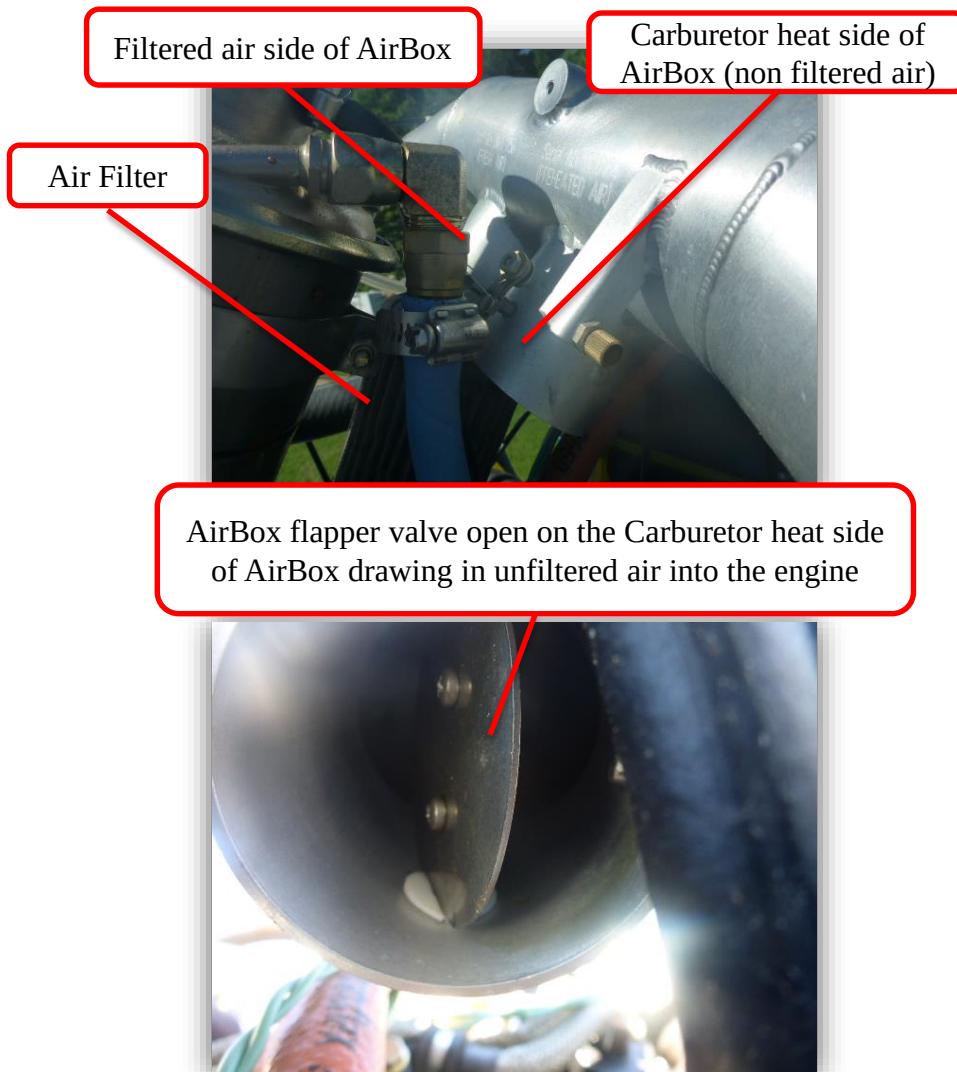
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Induction system: The Rotax induction system normally consists of the following components.

- AirBox (optional)
- Air Filter
- Carburetor heat

AirBox: The engine was equipped with the optional Rotax AirBox. The AirBox was examined for condition, modifications and anomalies. The control linkage to switch from filtered air to carburetor heat was not connected and the lever was positioned so induction air was being pulled from the carburetor heat side of the AirBox (non filtered air).



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Air Filter: The air filter was examined for condition and proper type. The air filter was a K&N brand and the filter pleats were grey with no protecting oil. The filter oil acts as a tacking agent designed to grab fine particles of dirt so it does not enter the engine.

Grey “non oiled” filter pleats on accident aircraft air filter



Air filter protection oil (Red spray)



“Example” Properly oiled air filter with red pleats



Carburetor Heat: The carburetor heat system was examined for condition and conformity. The engine was equipped with the proper Rotax AirBox that would allow the owner to use a carburetor heat system in the form of a heat muff. The carburetor heat system was not operational as the aircraft was not fully equipped with the additional components required.

Filtered air section of AirBox

Carburetor heat section of AirBox



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Gearbox: The Rotax engine comes equipped with a reduction gearbox. The reduction gearbox was externally examined and the propeller shaft rotated by hand to hear and feel anything unusual. No anomalies were found with the gearbox as everything fled and sounded normal during hand rotation.



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Preparation for Test Run

The aircraft was modified to prepare for an engine run as many of the aircrafts electrical, fuel and coolant systems were damaged from impact or wreckage recovery.

The tail of the aircraft was tied down and an automotive battery with battery cables was connected to charge and boost the aircrafts battery. It took several attempts to get a proper connection to the aircraft battery before the engine would properly start.

Test Run

After several attempts with the carburetor choke applied the aircraft started and ran. The engine was first ran at idle for several minutes and then the throttle was advanced to a higher power setting. The engine was ran at a high power setting for several minutes until it was manually shut down. A portion of the test run was recorded by the FAA IIC and the owner/accident pilot.

No anomalies were found during the test run of the engine.

Conclusion

No mechanical anomalies were found during the engine examination and test run. Several of the aircrafts components were not fully functional or connected.

One possibility for the loss of engine power is vapor lock as the aircrafts fuel system did not incorporate a fuel return line or protect the aircrafts fuel system from the high temperatures of the exhaust system.