ROTECH FLIGHT SAFETY INC.

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INVESTIGATION REPORT

ACCIDENT INFORMATION			
Date of accident:	02/28/2016	**NTSB file number:**	ERA16LA120
Location of accident:	Atlanta, GA	**FAA Inspector:**	Andre Cummings
Location of Investigation:	Atlanta, GA	**Law Enforcement:**	Unknown
Investigator In charge:	Leah D Read	**Corner/Medical Examiner**	None
AIRCRAFT INFORMATION			
Aircraft Make:	Czech Aircraft Works	**Aircraft registration:**	N187SF
Aircraft Model:	SportCruiser SRO	**Aircraft S/N**	08SC190
Propeller make, model & S/N	Sensenich 3 blade		
ENGINE INFORMATION			
Engine Type:	Rotax 912 ULS	**Engine TTSN**	Unknown
Engine Serial Number:	6779682	**Engine TTSOH**	Unknown
Engine Manufacture date:	01/26/2012	**Engine position:**	Tractor
ADDITIONAL INFORMATION			
Persons in attendance:	Ralph Hicks – NTSB Senior Air Safety Investigator – Atlanta, GA		
	Sandy Asman – Owner and Pilot of accident aircraft		
	Jordan Paskevich – Rotech Flight Safety – Rotax Aircraft Engines		
Date of Report:	March 14 2016		
RFS File number:	2016-006		

DATE	ENGINE MODEL	ENGINE SERIAL NO	REGISTRATION	File number
03/14/2016	Rotax 912 ULS	6779682	N187SF	2016-006

NTSB Preliminary

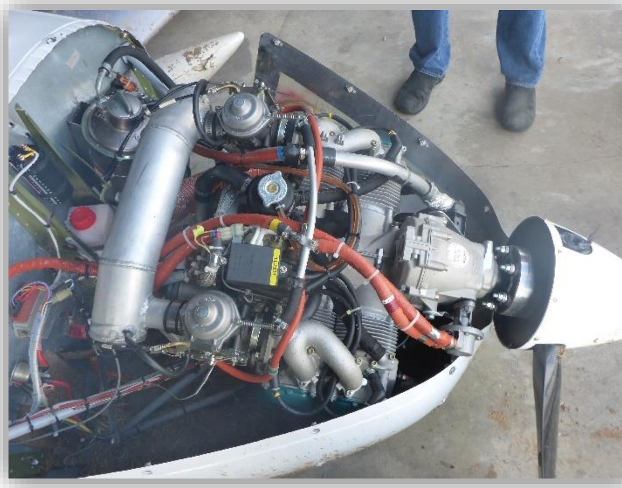
On February 28, 2016, at 1337 eastern standard time, N187SF, a light-sport Czech Sport Aircraft - SportCruiser, made a forced landing after a total loss of engine power while on takeoff from DeKalb-Peachtree Airport (PDK), Atlanta, Georgia. The airplane's left wing, firewall, landing gear and propeller were damaged. The private pilot/owner was not injured. Visual flight rules conditions existed at the time of the accident and no flight plan was filed for the flight that was being conducted as a 14 Code of Federal Regulations Part 91 personal flight. The flight was originating at the time of the accident.

The pilot stated that this was his first flight of the day. He conducted a thorough pre-flight inspection of the airplane before he started the engine and then let it warm up to normal operating temperature before taxing to the runway. The pilot said he performed an engine run-up before taking-off and everything was normal. Both fuel tanks were full with about 15 gallons of auto-gas, and the fuel selector was on the left tank. The fuel pump was "on." The pilot said the engine run-up was normal and proceeded to takeoff on runway 21R. As the airplane began to climb, the engine lost power. He switched fuel tanks, but the engine did not re-start. The pilot declared an emergency and attempted to land on runway 3R, but landed about 300 ft southeast of the runway. The airplane and engine were retained for further examination.

Initial Inspection

The on-site investigation took place on March 4 2016, under the supervision of NTSB Senior Air Safety Investigator, Ralph Hicks. The aircraft wreckage was located in the pilot/owners hanger at the DeKalb–Peachtree Airport in Atlanta, GA.

The aircraft sustained minor impact damage and two of the three propeller blades were broken off at the hub. The Rotax 912 ULS, S/N 6779682 engine suffered no impact damage and was still attached to the airframe and engine mount. Both carburetors were found displaced from there respective carburetor sockets and the gascolator bowl was displaced from its mounting location due to impact. The coolant and oil radiators were still in good physical condition and had not been breached.



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Initial Inspection

The bottom engine cowling was removed to gain further access to the engine and its components. Inspection of the fuel system revealed that the aircraft did not have a fuel return line installed as per the Rotax 912ULS installation instructions (See Appendix **A & B** on page 8 & 9**)**

The Airframe Maintenance Manual with an issue date of 2011-03-08 (See Appendix **C** on page 10) , shows the aircrafts fuel system design layout with a fuel return line installed. This CzechSport Cruiser aircraft was manufactured in 2008 and based on the information provided by the NTSB Investigator in charge, no Czech SportCruiser aircraft that was manufactured prior to 2010 had a fuel return line installed. The fuel return line was made standard in September 2010 as the design modification no. S - K - 0084 and a change to the MM Revision 6, aircraft Sport Cruiser was made in January 2011. There is no SB to retrofit older models with a fuel return line

Based off the engine's S/N 6779682, the Rotax 912ULS installed was not the original engine to the accident aircraft, as it was manufactured in January 26 2012. Information provided by the NTSB Investigator in charge revealed that the Rotax 912ULS engine S/N 6779682 was installed on December 2013 and in January 2016 the aircrafts fuel lines were replaced by US Sport aircraft, the US distributor for the Czech SportCruiser. No fuel return line was installed during the fuel line replacement that occurred on January 2016 and NTSB investigator in charge stated that the owner/operator was not made aware of the mandatory fuel return line requirements.

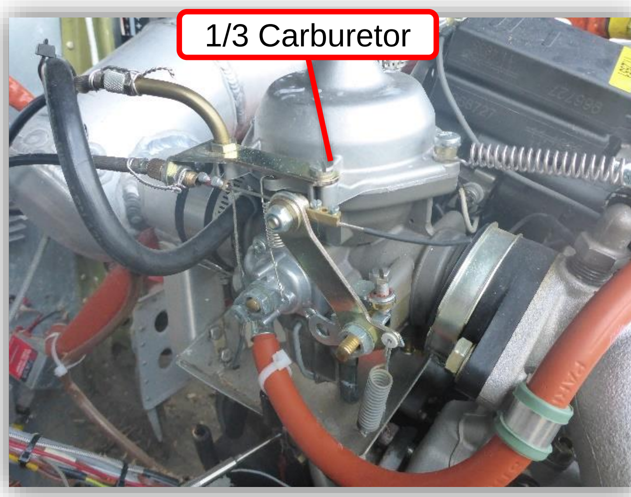
It states in the Rotax 912 ULS installation manual section **73-00-00** (**Description of system) page 3 - Return Line**, **NOTE:** The return line prevents malfunctions caused by the formation of vapor lock.
Secondary information to the mandatory fuel return line is also found in Section **73-00-00**, **(Requirements of the fuel system) page 6 - Fuel return line**, **NOTICE:** The installation of a fuel return line is mandatory. If the fuel distributor piece with regulator from Rotax is not available, the fuel pressure must be regulated by a restriction in the fuel return line, which ensures that the fuel pressure is under all operation condition within the operating limits specified by Rotax.

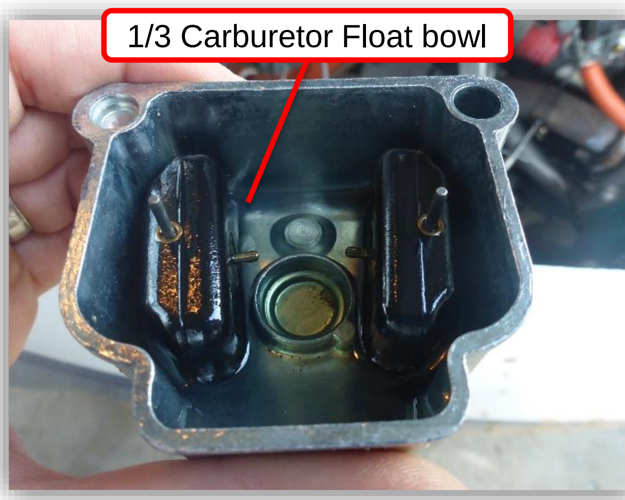
No fuel return line or restrictor regulator was installed on this aircraft as per the Rotax installation instructions.

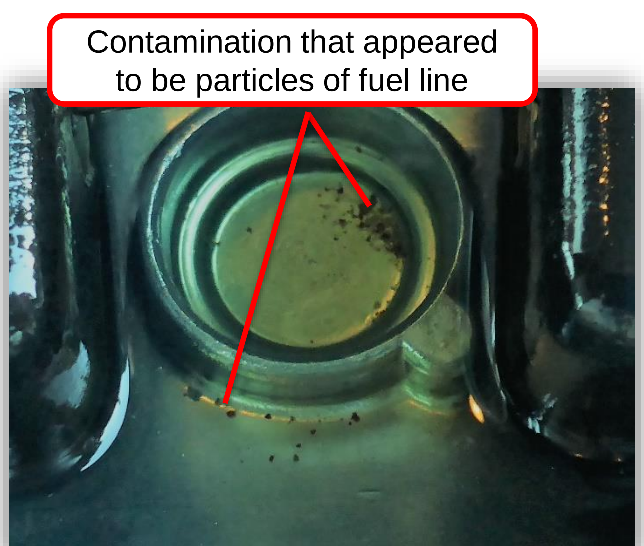
Detailed Inspection

Carburetors: The Rotax 912 ULS engine is equipped with dual Bing 64 constant depression carburetors. The carburetors are identified as 1/3 and 2/4. The carburetors were inspected for condition, conformity and proper components.

1/3 Carburetor: The carburetor float bowl was removed for inspection and contained a small amount of liquid that was consistent with fuel. Contamination could be seen at the bottom of the 1/3 carburetor float bowl that appeared to be particles of fuel line. The Main jet was removed and inspected for obstructions and proper size. No obstructions were found with the main jet and it was the proper stock size of 155. No further anomalies were found with the 1/3 Carburetor.



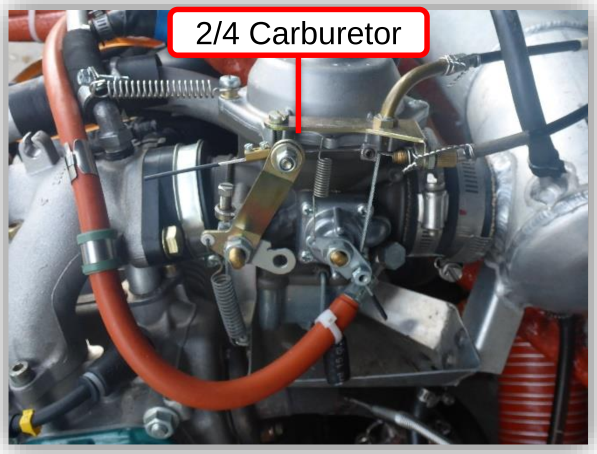


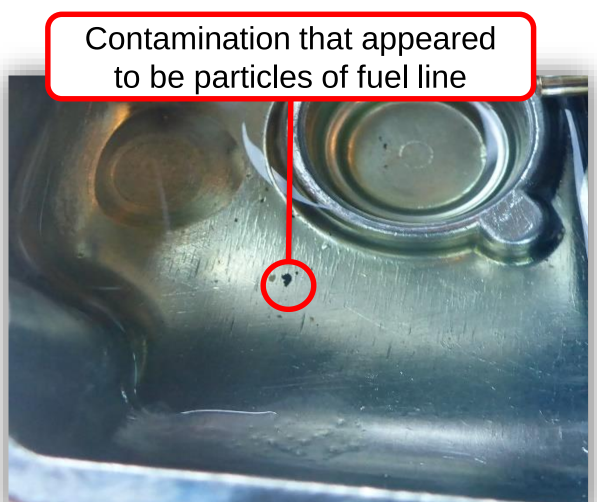


DATE	ENGINE MODEL	ENGINE SERIAL NO	REGISTRATION	File number
03/14/2016	Rotax 912 ULS	6779682	N187SF	2016-006

Detailed Inspection

2/4 Carburetor: The carburetor float bowl was removed for inspection and contained a small amount of liquid that was consistent with fuel. Small amounts of contamination could be seen at the bottom of the 2/4 carburetor float bowl that appeared to be a small particle of fuel line. The Main jet was removed and inspected for obstructions and proper size. No obstructions were found with the main jet and it was the proper stock size of 155. No further anomalies were found with the 2/4 Carburetor.





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03/14/2016	Rotax 912 ULS	6779682	N187SF	2016-006

Detailed Inspection

Continuity and compression: The spark plugs were removed and thumb compression and a continuity check was done. The engine rotated with ease, no unusual noises were heard and good thumb compression was felt. No anomalies were found during the continuity and compression check.

Test Run

At this point of the investigation it was determined that the engine was in good enough physical condition to attempt an engine test run. The airframe and engine was prepped for an engine run by removing the fuel pump inlet fuel line from the firewall and placed in a fuel container with fresh fuel. The remaining propeller blade was cut down to the hub so it was even with the two other broken blades. The oil and coolant level was check and determined sufficient for the test run.

The key switch was turned and the engine rotated with the use of the elect start indicated there was enough battery charge to start the engine.

The engine was then started and it ran at idle for few moments before the throttle was advanced bringing the engine to 5700 RPM (Max RPM is 5800). The fuel pressure indicated 5.8 PSI and was within the normal pressure range. No fluctuation or hesitation in RPM was noted and the engine ran without issues for several minutes before manual shutting it down by turning the key switch to off and shutting of the mags. No anomalies were found during the engine test run.

Data Downlaod

The accident aircraft had two Dynon Avionic instruments that was capable of capturing data. The accident pilot/owner obtained the instrument memory card and downloaded the data that captured the accident flight and provided it to the NTSB investigator in charge. The captured downloaded data indicated that the accident aircraft may have encountered vapor lock within the fuel system during the accident flight causing a loss of engine power.

Conclusion

The only anomalies found during the on-site investigation was the fuel system not having a fuel return line as per the Rotax installation instructions and the contamination found contained within the carburetor float bowls. The test run did not reveal any mechanical anomalies and the loss of power could not be recreated as the engine made full power for several minutes before manual shutting it down. Data that was captured from the Dynon Avionics instrument and download by the pilot/owner indicates possible vapor lock occurred during the accident flight.

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APENDIX A

1) Fuel system

1.1) Description of system

General note

See Fig. 2.

NOTE: The fuel system from tank to the inlet of engine-driven fuel pump has to be installed by the aircraft manufacturer.

Fuel

The fuel flows from the tank (1) via a coarse filter and fire cock (3) continue to water trap/fine (4) to the mechanical fuel pump (5), from the pumps fuel passes on via the fuel manifold (6) to the two carburetors.

Fuel lines

Depending on the configuration of the engine the fuel lines from fuel pump to the carburetors are already installed by the manufacturer (optional on some engine).

Only the following connections per Fig. 2 have to be established:

- Feeding lines to suction side of the mechanical fuel pump (5).
- Lines from pressure side of the mechanical fuel pump to inlet of fuel manifold (6).
- Returnline from fuel pressure control to fuel tank.

Return line

Via the return line (5) surplus fuel flows back to the fuel tank and suction side of fuel system.

NOTE: The return line prevents malfunctions caused by the formation of vapor lock.

Components

The fuel system includes the following items:

- Tank
- Coarse filter
- Fine filter/water trap
- Fuel shut off valve
- Electrical fuel pump
- Manometer
- Return line from engine to tank (with integrated adapter sleeve)

as well as the required fuel lines and connections.

DATE	ENGINE MODEL	ENGINE SERIAL NO	REGISTRATION	File number
03/14/2016	Rotax 912 ULS	6779682	N187SF	2016-006

APENDIX B

1.2.2) Electrical fuel pump

General note

The engine manufacturer requests the use of an electrical auxiliary fuel pump.

The electrical auxiliary fuel pump is not just required in case of a malfunction or defect of the mechanical fuel pump, but also provides required fuel supply e.g. in case of vapour formation at high altitudes and temperatures.

Operating limits

NOTE: If an electrical auxiliary fuel pump is installed, the whole fuel system has to be designed to warrant engine operation within the specified pressure limits.

NOTICE The fuel pressure of an additional auxiliary fuel pump should not exceed 0.3 bar (4.4 psi).

1.3) Requirements of the fuel system

Delivery rate

Electric or mechanical fuel pump:

- Min. 35 l/h (8.2 US gal/h).

Fuel lines

See Fig. 2.

NOTICE Fuel lines have to be established to the latest requirements such as FAR or EASA by the aircraft manufacturer.

NOTICE For prevention of vapour locks, all the fuel lines on the suction side of the fuel pump have to be insulated against heat in the engine compartment and routed at distance from hot engine components, without kinks and protected appropriately.

At very critical conditions e.g. problems with vapour formation the fuel lines could be routed in a hose with cold air flow.

Secure fuel hoses with suitable screw clamps or by crimp connection.

Fuel return line

NOTICE The installation of a fuel return line is mandatory. If the fuel distributor piece with regulator from ROTAX is not available, the fuel pressure must be regulated by a restriction in the fuel return line, which ensures that the fuel pressure is under all operating conditions within the operating limits specified by ROTAX.

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DATE	ENGINE MODEL	ENGINE SERIAL NO	REGISTRATION	File number
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APENDIX C

9.1 General

The fuel system (see Fig. 9.1) is used for storing fuel in the airplane and its delivering to the engine. The fuel system of PS-28 Cruiser / SportCruiser airplane consists of the following parts: two fuel tanks, fuel tubing, selector valve, gascolator, mechanical fuel pump (located on the engine), electrical fuel pump, fuel quantity sensor, fuel flow-meter, fuel pressure sensor and drain valves of the fuel tanks.

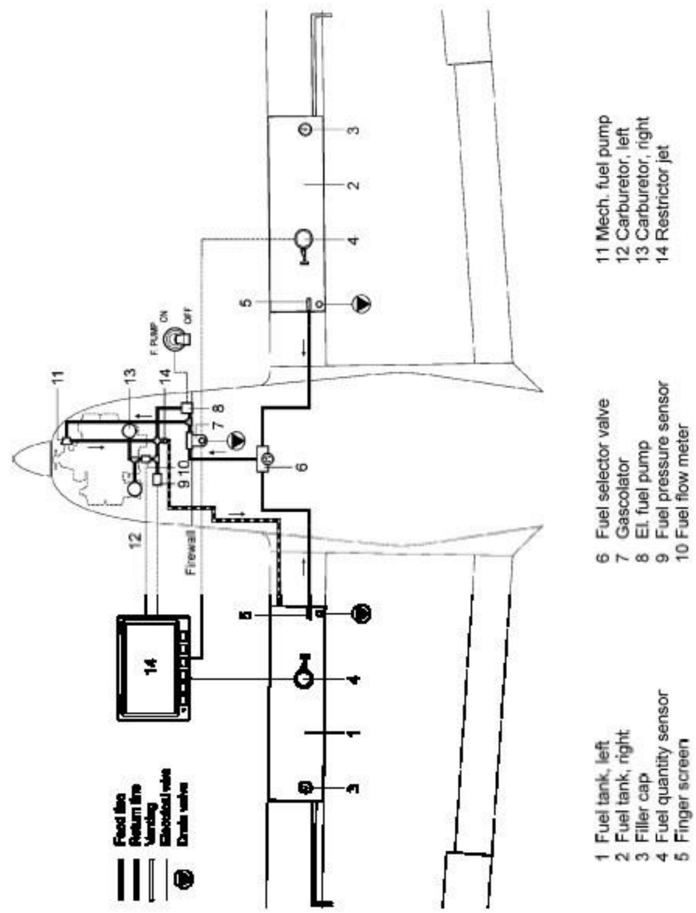

Fig. 9-1: Fuel system layout