National Transportation Safety Board
Aviation Accident Final Report

Location:	Willimantic, CT	**Accident Number:**	ERA12LA131
Date & Time:	01/01/2012, 1211 EST	**Registration:**	N667JH
Aircraft:	HANEY JOHN F B SEASTAR XP	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

Before the experimental, amateur-built, amphibious biplane's first test flight, the pilot/owner/builder ran the engine for about 20 minutes. He then taxied to the runway and departed. He flew for about 25 minutes before returning to the airport. After landing, he then taxied back to the runway, departed, circled the field for an additional 20 minutes, then returned to perform a touch-and-go landing. After touching down, adding power, and beginning the initial climb, the engine lost partial power and the engine's rpm decreased to about 3,000 rpm. Because the airplane was past the departure end of the runway, the pilot performed a water landing on a nearby reservoir. During the landing, the left lower wing struck the water and separated from its mounting location. After the airplane slowed, the pilot noticed that the engine was still running; however, when he advanced the throttle, the rpm would initially increase and then immediately decrease to 2,000 rpm. Examination of the airplane and engine revealed no mechanical failure or malfunction that would have precluded normal operation. It was further noted that the engine was not equipped with a carburetor heat system or insulated fuel hoses, as recommended by the engine manufacturer. Due to the ambient air temperature at the time of the accident, it was improbable that vapor lock caused the partial loss of power. Review of a carburetor icing probability chart revealed that weather conditions were conducive for serious carburetor icing. Therefore, it is likely that had a carburetor heat system been installed and the pilot had applied carburetor heat before his initial power reduction, the formation of carburetor ice would have been prevented.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A partial loss of engine power due to carburetor icing. Contributing to the accident was the lack of an installed manufacturer-recommended carburetor heat system.

Findings

Aircraft	Intake anti-ice, deice - Design (Factor) Fuel control/carburetor - Capability exceeded (Cause)
Personnel issues	Installation - Owner/builder (Factor)
Environmental issues	Conducive to carburetor icing - Effect on equipment (Cause)

Factual Information

HISTORY OF FLIGHT

On January 1, 2012 about 1211 eastern standard time, an experimental, amateur-built Seastar XP, N667JH, was substantially damaged during a forced water landing after a partial loss of power during initial climb at Windham Airport (IJD), Willimantic, Connecticut. The private pilot/owner was not injured. Visual meteorological conditions prevailed and no flight plan was filed for the local personal flight that was conducted under the provisions of 14 Code of Federal Regulations (CFR) Part 91.

According to the pilot, he ran the amphibious biplane's engine up for approximately 20 minutes before the airplane's first test flight. He then taxied to runway 27 and took off. He flew for about 25 minutes before returning to IJD. After landing he taxied back to the runway 27 and took off once again and "circled" the field for an additional 20 minutes. He subsequently landed on runway 27, but this time elected to do a "touch and go" After touching down, adding power, and initiating the initial climb, the engine lost partial power, the engine's rpm decreased from approximately 5,500 rpm to approximately 3000 rpm, and there was a decrease in cylinder head temperature. He realized that he was past the departure end of the runway and elected to perform a water landing on the Willimantic Reservoir which was close to the end of the runway. He realized that he had too much speed and not enough area to land in and turned 90 degrees to the right and then to the right again to reduce his airspeed. After the 2nd right 90 degree turn, the left lower wing struck the water and separated from the airplane. After the airplane slowed to taxi speed the pilot noticed that the engine was still running. However, when he advanced the throttle, the rpm would initially increase subsequently the engine rpm almost immediately would decrease to 2000 RPM.

PERSONNEL INFORMATION

According to Federal Aviation Administration (FAA) and pilot records, the pilot held a private pilot certificate with ratings for airplane single-engine land, airplane single-engine sea, and instrument airplane. His most recent FAA third-class medical certificate was issued on September 2, 2011. He reported that he had accrued 693 total hours of flight experience.

AIRCRAFT INFORMATION

The aircraft was a two-seat amphibious strut braced biplane. The cockpit was contained in the hull and floats were attached to its lower wings. The ailerons were located in the upper wings and the tail was conventional, with the horizontal stabilizer mounted half way up the tail fin.

It was constructed primarily of fiberglass, carbon fiber, Kevlar, and aluminum, and was reinforced by fiberglass/PVC foam bulkheads.

It was powered by a 100-horsepower Rotax 912 ULS engine mounted on the upper wing pylon, aft of the cockpit, in a pusher configuration. The engine utilized a dual carburetor system and primarily used automotive fuel.

According to the pilot and FAA records, the airplane was purchased as a kit from Amphibian Airplanes of Canada (AAC) and imported into the United States. The airplane's engine was also sold to the pilot by AAC. At the time of the accident, the airplane had accrued approximately 50 minutes of operation, and the engine had accrued approximately 3 total hours of operation.

Review of the FAA's Listing of Amateur-Built Aircraft Kits did not list AAC as being evaluated and found eligible in meeting the "major portion" requirement of 14 CFR Part 21. Review of airworthiness and registration documents, as well as interviews of AAC's owner by Transportation Safety Board of Canada (TSBC) investigators also revealed that AAC was not actually manufacturing the kit but was purchasing parts and kits from EDRA Aeronautica of Brazil (EDRA), rebranding, and then selling the airplane as the "AAC Seastar".

Further inquires revealed that the airplane design had originated in France in 1983 as the Hydroplum. Over the intervening years the airplane had gone through a series of design changes which included changes in materials, powerplants, and size. It had been manufactured by multiple entities including the Societe Morbihannaise d'Aero Navigation (SMAN), Billie Marine, Stone Engineering, and eventually starting in 1996 by EDRA when EDRA purchased the design from SMAN. The airplane since that time has been marketed as the Paturi, and the Super Petrel, and was offered in kit form or as a fully assembled airplane.

METEOROLOGICAL INFORMATION

The 1151 recorded weather observation at Bradley International Airport (BDL), Windsor Locks, Connecticut, located 25 nautical miles northwest of the accident site, included wind from 160 degrees at 7 knots, 10 miles visibility, few clouds at 3,500 feet above ground level (agl), broken clouds at 25,000 feet agl, temperature 9 C, dew point 4 C, and an altimeter setting of 29.99 inches of mercury.

AIRPORT INFORMATION

At the time of the accident IDJ did not have an air traffic control tower and had two runways, which were designated as 18/36 and 9/27. Runway 9/27 was asphalt, and was listed in fair condition. The total length was 4,271-feet-long and 100-feet-wide. It was equipped with medium intensity runway edge lights and was marked with non-precision markings that were in good condition.

WRECKAGE AND IMPACT INFORMATION

Post-accident examination of the wreckage by an FAA inspector revealed that the left lower wing was separated from its mounting location and the left upper wing was bent aft approximately 30 degrees which resulted in substantial damage. Further examination of the airframe and engine revealed no evidence of any preimpact mechanical malfunctions or failures that would have precluded normal operation. The fuel selectors were in the auxiliary fuel tank feed, and return positions. The 10-gallon auxiliary fuel cell contained approximately 6 gallons of automotive gasoline and the 3-gallon header tank contained approximately 1 1/2 gallons of automotive gasoline.

Continuity was confirmed from the throttle and mixture levers to the engine and both engine controls operated freely to their full extent of travel.

The fuel lines were of a visible tubing design and appeared to be made of Tygon. They were covered in some instances with corrugated (ribbed) plastic tubing and in other instances with thin sleeves of fiberglass matting. After removal of the covering, fuel could be seen through them though they were slightly discolored and had a yellowish cast. They were non-rigid and could be easily pinched closed by hand, and where they should have been secured to their fittings with hose clamps they were secured instead with lock wire.

Examination of the fuel filter revealed it was clear and no debris or contamination was visible.

Testing of the carburetors revealed that they functioned normally.

TESTS AND RESEARCH

Examination of Photographic Evidence

Examination of photographs taken during the post accident examination revealed that the engine fuel lines were in close proximity to the engine and though covered in a thin sleeve of fiberglass matting by the owner, were not insulated (fire sleeved). Further examination of the photographs also revealed that the airplane was not equipped with carburetor heat.

AAC and Rotax Recommendations

When asked by the TSBC if they recommended to Seastar kit purchasers that they install carburetor heat systems and/or fire sleeved engine fuel lines, the owner of AAC who had represented himself as the manufacturer of the kits replied that, they would not make those recommendations because they had not found either to be necessary and that they would inform kit purchasers that they (AAC) had chosen to use stiffer, thicker, black automotive fuel lines rather than the "softer PVC-type fuel line recommended by Rotax".

Review of Rotax Guidance revealed however that Rotax recommended installation of carburetor heat and insulated fuel lines. This was discovered during review of the Installation Manual for Rotax 912 UL Aircraft Engine, which contained a warning that "carburetor icing is a common reason for engine trouble and that provisions for preheating of the intake air have to be made to prevent formation of ice." It also advised that for prevention of vapor locks, all of the fuel lines on the suction side of the fuel pump have to be insulated against heat in the engine compartment and routed at a distance from hot engine components, without kinks and protected appropriately.

Review of the Operators Manual for Rotax Engine Type 912 Series also revealed that it included a warning that "carburetor icing due to humidity could occur on the venturi and on the throttle valve due to fuel evaporation which could lead to performance loss and change in mixture and that intake air pre-heating is the only effective remedy".

Use of Automobile Gasoline

According to the pilot, he had been using "Hi Test" automobile gasoline in the airplane as recommended by Rotax.

According to Rotax, they recommended the use of automobile gasoline since continual use of aviation gasoline would increase wear of the valve seats, and increase deposits in the combustion chambers, and lead sediments due to the higher lead content. Therefore they recommended that aviation gasoline only be used if vapor lock problems are encountered or if other fuel types are not available. They also advised to only use fuel suitable for the respective climatic zone and that there is a risk of vapor formation if using winter fuel for summer operation.

FAA Guidance

According to the FAA, vapor pressure of autogas can vary widely as formulations are changed seasonally, and according to local requirements. High vapor pressure can promote vapor lock in aircraft fuel systems causing engine power to be reduced or the engine to completely fail and testing by the FAA William J. Hughes Technical Center concluded that autogas with high vapor pressure can accelerate the formation of carburetor ice.

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A) defines vapor lock as" A problem that mostly affects gasoline-fuelled internal combustion engines. It occurs when liquid fuel changes state from liquid to gas while still in the fuel delivery system. This disrupts the operation of the fuel pump, causing loss of feed pressure to the carburetor or fuel injection system, resulting in transient loss of power or complete stalling. Restarting the engine from this state may be difficult. The fuel can vaporize due to being heated by the engine, by the local climate, or due to a lower boiling point at high altitude."

FAA Advisory Circular 91-51A (Effect of Icing on Aircraft Control and Airplane Deice and Anti-Ice Systems), also states in part "...there are two kinds of icing that are significant to aviation: structural icing and induction icing. Small aircraft engines commonly employ a carburetor fuel system or a pressure fuel injection system to supply fuel for combustion. Both types of induction systems hold the potential for icing which can cause engine failure. This can occur in the carburetor because vaporization of fuel, combined with the expansion of air as it flows through the carburetor, causes sudden cooling, sometimes by a significant amount within a fraction of a second. Carburetor ice can be detected by a drop in rpm in fixed pitch propeller airplanes and a drop in manifold pressure in constant speed propeller airplanes. In both types, usually there will be a roughness in engine operation."

Fuel System Testing

The fuel system on current production Super Petrels is feed by two tanks which are located inside the lower wings leading edges and a header tank located behind the passenger seat. The two tanks are not interconnected but are connected to a fuel valve which has three positions (right wing, left wing, or closed) that feed the header tank. The fuel system also contains a shut-off valve located next to the header tank behind the passenger seat.

At the request of the NTSB, temperature mapping of the fuel system of a Super Petrel equipped with insulated hoses was conducted by EDRA utilizing four digital thermometers with external sensors at the following locations:

1. The Mechanical Fuel Pump

2. The Fuel Manifold

3. The Left Carburetor

4. The Right Carburetor

Temperatures inside of the fuel system hoses from all four locations were recorded during engine warm up, before taking off, climb, cruise, and after landing.

Testing revealed that the temperatures remained within approximately 10 degrees of each other at all locations, with the most significant change in temperature occurring at the mechanical pump during climb, where the difference in temperature was only 11 degrees above the normal ambient temperature at that location.

Review of Regulations

Review of Canadian aviation regulations revealed that the airplane whether manufactured as a kit or a production airplane would have required the inclusion of carburetor heat if it was to be registered in Canada.

Review of FAA regulations revealed that the airplane, if manufactured as a kit, would not have

required the inclusion of carburetor heat. However, if the airplane was manufactured as a production airplane, carburetor heat would have been required.

Carburetor Icing Probability Chart

According to the FAA Special Airworthiness Information Bulletin (SAIB) CE-09-35, based on the recorded temperature and dew point about the time of the accident, the conditions were favorable for serious carburetor icing at cruise power setting.

ADDITIONAL INFORMATION

According to FAA's Winter Flying Tips (FAA P-8740-24), partial throttle (cruise or letdown) is the most critical time for carburetor ice. The recommended practice is to apply carburetor heat before reducing power and to use partial power during letdown to prevent icing and overcooling the engine.

The FAA also advises that to prevent carburetor ice to use carburetor heat during ground checks, to use heat in the icing range, and to use heat on approach and descent and to be aware of the warning signs of carburetor ice including, loss of rpm (with a fixed pitch propeller) or a drop in manifold pressure (with a constant speed propeller), and rough running.

The pilot response to these warning signs should be to apply full carburetor heat immediately (the engine may run rough initially for a short time while the ice melts).

History of Flight

Initial climb	Loss of engine power (partial) (Defining event)
Emergency descent	Loss of engine power (partial)
Landing	Off-field or emergency landing Dragged wing/rotor/float/other Aircraft structural failure

Pilot Information

Certificate:	Private	**Age:**	73, Male
Airplane Rating(s):	Single-engine Land; Single-engine Sea	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without Waivers/Limitations	**Last Medical Exam:**	09/02/2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	04/19/2009
Flight Time:	693 hours (Total, all aircraft), 2 hours (Total, this make and model), 650 hours (Pilot In Command, all aircraft), 4 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	HANEY JOHN F B	**Registration:**	N667JH
Model/Series:	SEASTAR XP	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Experimental	**Serial Number:**	133
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	12/16/2011, Conditional	**Certified Max Gross Wt.:**	1320 lbs
Time Since Last Inspection:	2 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	3 Hours	**Engine Manufacturer:**	Rotax
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	912ULS
Registered Owner:	On file	**Rated Power:**	80 hp
Operator:	On file	**Air Carrier Operating Certificate:**	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	BDL, 173 ft msl	**Observation Time:**	1151 EST
Distance from Accident Site:	25 Nautical Miles	**Condition of Light:**	Day
Direction from Accident Site:	315°	**Conditions at Accident Site:**	Visual Conditions
Lowest Cloud Condition:	Few / 3500 ft agl	**Temperature/Dew Point:**	9°C / 4°C
Lowest Ceiling:	Broken / 25000 ft agl	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	7 knots, 160°	**Visibility (RVR):**	
Altimeter Setting:	29.99 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Willimantic, CT (IJD)	**Type of Flight Plan Filed:**	None
Destination:	Willimantic, CT (IJD)	**Type of Clearance:**	None
Departure Time:	1130 EST	**Type of Airspace:**	

Airport Information

Airport:	Windham Airport (IJD)	**Runway Surface Type:**	
Airport Elevation:	246 ft	**Runway Surface Condition:**	
Runway Used:	N/A	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced Landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None		

Administrative Information

Investigator In Charge (IIC):	Todd G Gunther	**Adopted Date:**	09/05/2013
Additional Participating Persons:	Francis Hoban; FAA / FSDO; Windsor Locks, CT Travis Shelongosky; TSBC; Canada, Geoff Guest; Transport Canada; Canada, Bernhard Kobylik; VERSA; Austria, Jordan Paskevich; Rotech Flight Safety Inc.; Canada, Gustavo Delmonte; CENIPA; Brazil, Rodrigo Scoda; EDRA Aeronautica; Brazil, Brian Boucher; PS-Bird LLC; Port Orange, FL		
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Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=82595		

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