ACCIDENT

Aircraft Type and Registration:	Breezer B600, G-OLSA
No & Type of Engines:	1 Rotax 912ULS piston engine
Year of Manufacture:	2010
Date & Time (UTC):	25 June 2011 at 1600 hrs
Location:	Membury Airfield, Berkshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to nose landing gear, left main landing gear, one propeller blade, engine mount, firewall and wings
Commander's Licence:	Private Pilot's Licence
Commander's Age:	36 years
Commander's Flying Experience:	2,225 hours (of which 31 were on type) Last 90 days - 58 hours Last 28 days - 11 hours
Information Source:	AAIB Field Investigation

Synopsis

Shortly after takeoff the engine stopped due to a loss of fuel pressure and the pilot made a forced landing which resulted in a heavy touchdown. The engine stoppage was probably caused by a fuel restriction when a placard blocked the fuel tank outlet. The fuel tank outlet was not fitted with a strainer or filter as none was required by the regulations for a 'Light Sport Aeroplane' (LSA). The aircraft manufacturer has taken safety action to install a fuel strainer at the fuel tank outlet of all new aircraft and is offering the same modification for retrofit. Two Safety Recommendations are made.

History of the flight

The pilot had completed some general handling and two circuits at the airfield with no problems. Shortly after the third takeoff from Runway 31 the FUEL LOW PRESSURE alarm sounded with a visual alert on the instrument screens. The pilot checked the fuel pressure gauge and saw it briefly indicate in the normal/green section while the aircraft continued to climb. There was no engine rough running or noticeable loss of power, but the alarm continued to sound. The pilot reported that, a couple of seconds later and as the aircraft approached the end of the runway, the engine "died briefly", caught again and then stopped completely. Due to the aircraft's high nose attitude the airspeed reduced rapidly. The pilot lowered the nose as far as he thought safe to regain

some airspeed, and then raised the nose to arrest the aircraft's descent rate just prior to touchdown. The aircraft had some sideways drift at touchdown due to a crosswind and this caused the nose landing gear and left main landing gear to fail. As the aircraft hit the long grass at the side of the runway the wings also sustained some damage. Once the aircraft came to rest, the pilot turned off the electrics and fuel and vacated the aircraft with the passenger.

Description of the aircraft

The Breezer B600 is a factory-built 'Light Sport Aeroplane' (LSA) and is operated under a European Aviation Safety Agency (EASA) Permit to Fly (Figure 1). The 'LSA' is a new category of aircraft that originated in the USA. To qualify as an LSA the aircraft must have a maximum takeoff weight of 600 kg or less, no more than two seats and a stall speed of less than 45 kt. LSAs are designed to an ASTM[1] code F2245 '*Standard Specification for Design and Performance of a Light Sport Airplane*'. EASA have issued some aircraft with a Permit to Fly on the basis that they comply with this voluntary code. EASA have also developed CS-LSA which is a new Certification Specification for LSA that references F2245, but with some differences, and this will be used in the future to provide some LSA aircraft with an EASA Certificate of Airworthiness.

The aircraft is powered by a Rotax 912ULS engine which is supplied fuel from a single tank located between the engine firewall and the instrument panel. Fuel exits through a hole at the base of the tank and then passes through an electric fuel pump, a fuel filter and an engine-driven fuel pump. There is no fuel strainer fitted at the outlet of the fuel tank.

Figure 1

Accident aircraft G-OLSA
(photograph courtesy Brian G Nichols)

Footnote

[1] ASTM International, formerly known as the American Society for Testing and Materials (ASTM), develops international voluntary consensus standards. About 12,000 ASTM standards are used around the world.

Aircraft examination

The aircraft was examined by a maintenance engineer who focussed his initial investigation on the fuel system due to the low fuel pressure warning that had been received. There was sufficient fuel remaining in the fuel tank so he removed the in-line fuel filter inside the engine compartment and this was found to be clear. He then disconnected the fuel pipe at the engine-driven pump and turned on the electric fuel boost pump and this resulted in fuel flowing. He then examined the fuel tank more closely and noticed that there were remains of a placard lying at the base of the tank near the outlet hole and partially covering the drain hole (Figure 2).

The placard was identified by the aircraft manufacturer as being part of the fuel quantity sender. Before the fuel sender is installed in the fuel tank a safety pin needs to be removed and this placard warns the installer to remove the safety pin. The placard should also have been removed prior to installation. In the case of G-OLSA the placard had not been removed and the fuel would have acted as a solvent on the placard adhesive until it eventually detached and sank into the base of the tank. Although the placard was not blocking the outlet hole at the time of examination, the action of sucking fuel from the outlet hole could have drawn the placard towards it when it detached from the fuel sender.

Fuel strainer requirements

The requirement for fuel straining or filtering in ASTM F2245-11[2] is as follows:

> *'7.3.7 A fuel strainer or filter accessible for cleaning and replacement must be included in the system.'*

The Breezer B600 satisfied this requirement with the installation of a fuel filter in the engine compartment.

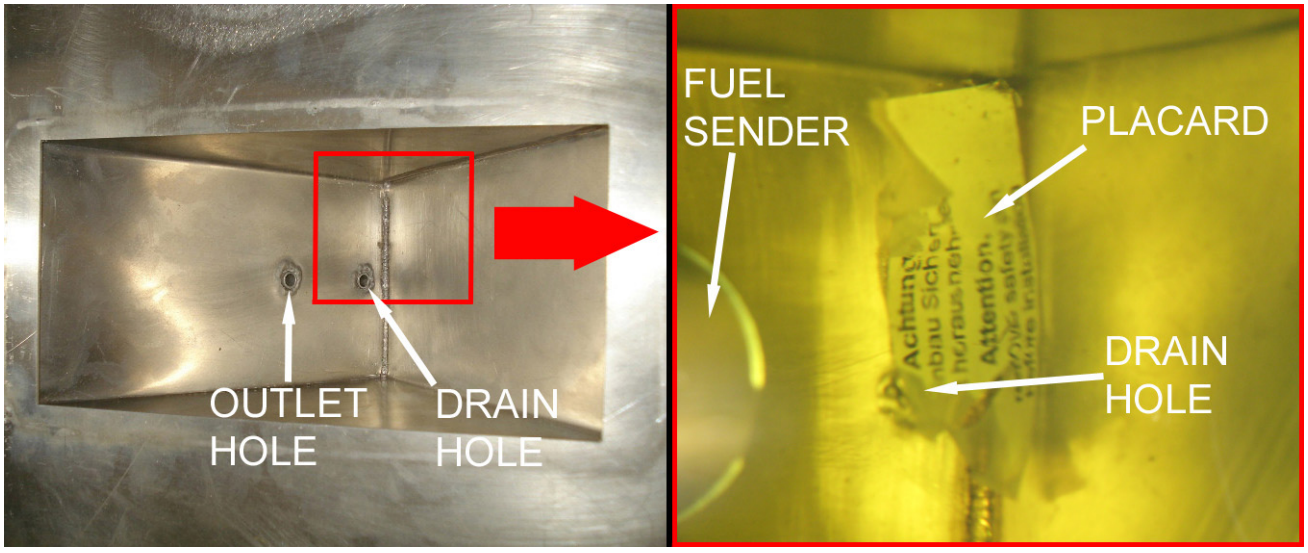

Figure 2

Base of fuel tank (left) showing outlet and drain holes; placard partially blocking drain hole in G-OLSA (right) – outlet hole not visible due to location of fuel quantity sender

Footnote

[2] F2245-11 is the latest 2011 version of the code. The aircraft was designed to F2245-08, but this section had not changed.

There was no requirement for a filter or strainer to be installed at the fuel tank outlet. CS-LSA contains no additional requirements for fuel straining/filtering beyond the ASTM F2245 requirement.

A requirement for a strainer at the fuel tank outlet exists for Very Light Aeroplanes (VLA[3]) as specified in CS-VLA 977 as follows:

> *'CS-VLA 977 Fuel strainer or filter*
>
> *(b) There must be a strainer at the outlet of each fuel tank. This strainer must –*
>
> *(1) Have 3 to 6 meshes per cm;*
>
> *(2) Have a length of at least twice the diameter of the fuel tank outlet;*
>
> *(3) Have a diameter of at least that of the fuel tank outlet; and*
>
> *(4) Be accessible for inspection and cleaning.'*

A similar requirement for a fuel strainer exists for UK microlight aircraft that comply with British Civil Airworthiness Requirement (BCAR) Section S:

> *'S977 Fuel strainer or filter*
>
> *b) There must be a strainer at the outlet to each tank. This strainer must have at least 6 meshes per cm (15 meshes per inch), and must be of such proportions that blockage of the fuel supply by objects entering the tank will be extremely unlikely.'*

Safety action by the aircraft manufacturer

In response to this accident the aircraft manufacturer published a Safety Alert (SA11-001) on 8 July 2011 which required the following actions prior to the next flight:

> *'1. Close examination of the fuel tank for foreign bodies with the help of a torch and mirror*
>
> *2. Close examination of the fuel tank for foreign bodies during the pre-flight check.'*

The Safety Alert was applicable to the Breezer CR, CL and B600. The manufacturer has also designed a fuel strainer modification that is being incorporated in all newly-built aircraft and has published a Service Bulletin (SB11-002) for a strainer retrofit kit for existing aircraft. The manufacturer has also introduced further checks in the assembly process to ensure that the placard on the fuel sender is removed prior to installation.

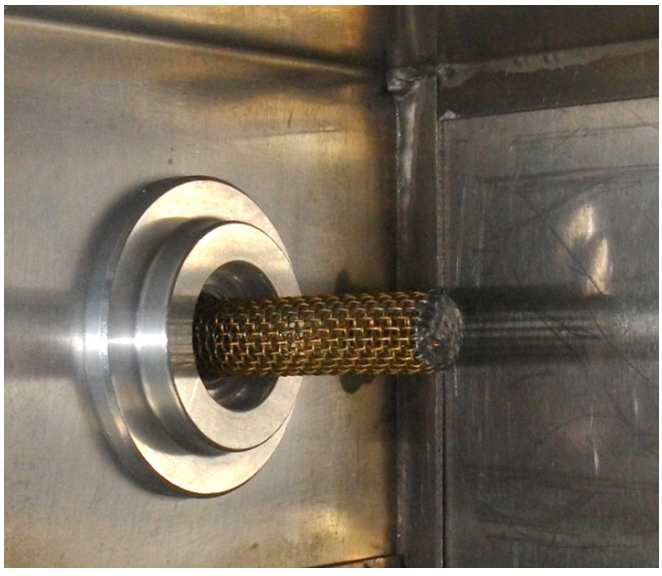

Figure 3

Strainer modification fitted to the fuel tank outlet (Breezer Service Bulletin SB11-002)

Footnote

[3] VLAs have a maximum takeoff weight of up to 750 kg which makes them slightly heavier than LSAs.

Analysis

The engine stoppage was probably caused by a fuel restriction when the placard from the fuel sender blocked the fuel tank outlet. The aircraft manufacturer was not able to establish why the placard had not been removed from the fuel sender prior to installation, but it has introduced further checks to ensure that the placard is removed in future. Although not required by CS-LSA or ASTM F2245, the manufacturer has taken safety action to install a fuel strainer at the fuel tank outlet of all new aircraft and is offering the same modification for retrofit.

UK microlight aircraft designed to BCAR Section S and EASA-certified Very Light Aircraft (VLAs) are required to have a fuel strainer fitted at the fuel tank outlet. Without a fuel strainer a foreign object in the tank, such as a piece of paper or a leaf, could completely restrict the fuel flow and result in engine stoppage. Therefore the following two Safety Recommendations are made.

Safety Recommendation 2012-020

It is recommended that the European Aviation Safety Agency (EASA) amend '*Certification Specifications for Light Sport Aeroplanes*' (CS-LSA) to require the installation of a strainer at the fuel tank outlet, to reduce the risk of foreign objects in the fuel tank restricting the fuel supply.

Safety Recommendation 2012-021

It is recommended that ASTM International amend the '*Standard Specification for Design and Performance of a Light Sport Airplane*' (ASTM F2245) to require the installation of a strainer at the fuel tank outlet, to reduce the risk of foreign objects in the fuel tank restricting the fuel supply.