Jabiru UL-450, G-TYKE

AAIB Bulletin No: 4/2003	**Ref: EW/G2002/09/12**	**Category: 1.3**
Aircraft Type and Registration:	Jabiru UL-450, G-TYKE	
No & Type of Engines:	1 Jabiru 2200A piston engine	
Year of Manufacture:	2001	
Date & Time (UTC):	15 September 2002 at 1515 hrs	
Location:	South Duffield, Near Selby	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Nose wheel leg sheared, wings creased	
Commander's Licence:	Private Pilots Licence with IMC and Night ratings	
Commander's Age:	66 years	
Commander's Flying Experience:	1,657 hours (of which 458 were on type)	
	Last 90 days - 56 hours	
	Last 28 days - 20 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

History of the flight

The Jabiru UL-450 is a high-wing, single engine, two-seater kitplane operated in the microlight category under a Permit to Fly. The aircraft departed Sandtoft for an approximately 20 minute flight to Rufforth with 1.5 hours of fuel onboard (15 litres). The visibility was 15 to 20 km and there was an overcast cloud layer with a base between 3,000 feet and 4,000 feet.

Shortly after takeoff the pilot turned the carburettor heat on and left it on for five to seven minutes before turning it off. He did not notice any indication of carburettor icing. A few minutes later as the aircraft was passing Drax power station at 1,500 feet the engine started to miss-fire. The pilot re-applied carburettor heat and turned the fuel pump on. As he increased the throttle to full, the engine RPM increased initially but then the RPM dropped again. Approximately one to two

minutes after the engine began to misfire, it lost all power. The pilot made a MAYDAY call on the Breighton frequency but there was no response (Breighton is an unlicensed airfield with an Air-to-Ground radio). He then prepared for a forced landing by turning all switches and the fuel tap off, fully tightening his lap and shoulder straps and placing the fire extinguisher in the cockpit side pocket. He flew an approach at 55 kt to a flat field which had reportedly been recently seeded and lightly raked to a depth of one to two inches on a firm base. The aircraft touched down in the field into wind on its main gear and the pilot was able to hold the nose wheel off until approximately 20 kt. As soon as the nose wheel contacted the soil, the nose wheel leg folded backwards causing the nose of the aircraft to drop. The nose dug into the ground and caused the aircraft to somersault upside down onto its back.

The pilot was not injured and was able to vacate the inverted aircraft via the passengers door. He took the fire extinguisher with him but it was not needed. The impact had displaced the fuel cap at a small angle to the filler neck allowing fuel to leak out. The pilot removed the cap and then re-attached it thus preventing further fuel leakage.

Aircraft Examination

The aircraft was recovered and transported to a maintenance organisation for examination. The aircraft was defuelled using the electrical fuel pump which produced 5 litres of fuel. A further 2.5 litres were obtained from the fuel drain (the aircraft had a single fuel tank behind the seats). No evidence of contamination was found in the fuel, in the fuel filter or in the carburettor bowl. The engine had not been shockloaded and so it was test run. The engine started and ran normally.

Weather

An aftercast issued by the Meteorological Office estimated that the temperature and dewpoint in the Selby area at the time of the accident were 13?C and 8?C respectively (relative humidity 75%) at 1,000 feet amsl. The chart of carburettor induction system icing probability in CAA Aeronautical Information Circular (AIC) 145/1997 (Pink 161) indicated that in those conditions there was a serious risk of icing at any power for a typical light aircraft piston engine without carburettor hot air selected. The estimated wind at the time of the accident at 1,500 feet amsl was from 010? at 10 kt.

Drax Power Station

The aircraft was passing approximately a quarter mile west of the Drax power station when the engine began to run roughly. The Drax power station has eight cooling towers and on a typical day the towers will exhaust approximately 3,000 tonnes of water per hour to the atmosphere. The water will mix with the atmosphere downwind of the towers and will initially form a visible plume of saturated air that will become invisible when the humidity falls below 100%. According to an expert on cooling tower design, the ambient humidity would be significantly raised for some distance away from the towers (possibly miles) depending upon the speed and turbulence of the wind. The tops of the cooling towers were at approximately 400 feet amsl.

Pilots experience with carburettor icing

The pilot reported that he had experienced more incidences of carburettor icing with the Jabiru engine than with any other piston engine he had operated. He reported that the carburettor ice would develop quickly but that apart from this incident, the engine had never stopped. To combat

the problem, the pilot had developed the habit of applying carburettor heat every five minutes during most flying conditions. Under certain conditions he would leave carburettor heat on permanently.

Prior to this accident the pilot operated his Jabiru engine at 2,200 RPM which produced a cruise speed of 75 kt with a fuel burn rate of approximately 7 litres/hour. The maximum redline RPM on the Jabiru 2200A engine is 3,300 RPM. Since this accident the pilot has been flying another Jabiru aircraft with the same engine and has been operating it at 2,600 RPM with a resultant cruise speed of 90 kt and a 12 litre/hour burn rate. The pilot has discovered that at this power setting, carburettor icing has been less of a problem than previously when he was operating at 2,200 RPM.

Discussion

The engine ran normally when tested after the accident and the maintenance organisation found no evidence of contamination in either the fuel or the fuel filter. The atmospheric conditions at the time of the accident were conducive to the formation of carburettor icing. The symptoms experienced prior to power failure were also consistent with the formation of carburettor icing. It is therefore highly likely that carburettor icing caused the loss of power.

It is quite possible that the high humidity air emanating from Drax power station was a factor that contributed to the formation of carburettor icing. Pilots should be alert for the symptoms of carburettor icing whenever visible moisture is present.

The fact that the engine in this accident was being operated at a relatively low power setting of 2,200 RPM probably also contributed to the onset of carburettor icing. Carburettor icing forms more readily at low power settings because there is a greater temperature drop at the carburettor venturi and the partially closed butterfly can be more easily restricted by the build-up of ice. Carburettor heat is also less effective at low power settings because the engine exhaust is not as hot as at high power settings. The accident pilot suggested that other pilots should seriously consider operating their Jabiru 2200A engine at or above 2,600 RPM in the cruise to reduce the likelihood of carburettor ice build-up.

The AAIB is currently investigating a number of accidents where carburettor icing is strongly suspected as being the initiator. It is proposed to make a safety recommendation to the CAA in a future AAIB Bulletin.