AAIB Bulletin No: 2/2005 **Ref: EW/G2004/10/06** **Category: 1.3**

Aircraft Type and Registration:	Gulfstream AA-5B Tiger, G-BFZR	
No & Type of Engines:	1 Lycoming O-360-A4K piston engine	
Year of Manufacture:	1979	
Date & Time (UTC):	15 October 2004 at 1545 hrs	
Location:	1 mile west of Oxford Kidlington Airport, Oxfordshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damaged propeller, nose wheel leg and cowlings	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	31 years	
Commander's Flying Experience:	1,020 hours (of which 5 were on type) Last 90 days - 40 hours Last 28 days - 15 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The aircraft, which had been parked outside for two months with each fuel tank less than three-quarters full, was subjected to a thorough pre-flight inspection that included the taking of fuel samples to check for water contamination. Shortly after departure the aircraft suffered a power loss necessitating a forced landing during which the nose landing gear collapsed. Subsequent examination of the fuel system revealed significant amounts of water in the fuel tanks, carburettor bowl, electric fuel pump filter and the fuel lines aft of the firewall. No water was evident from the four drains; one in each fuel tank and one in each sump tank.

History of flight

The pilot, a licensed engineer employed by the maintenance organisation, was demonstrating the aircraft to two potential buyers. He carried out a thorough pre-flight check, taking fuel samples before and immediately after refuelling and again just before the flight. He demonstrated this procedure to the sales manager who was overseeing the sale. On each occasion there was no water

visible in any of the samples. A satisfactory power check was carried out using both fuel tanks, which were approximately three-quarters full for departure.

The aircraft lined up for takeoff with the right hand fuel tank selected. The fuel pump was selected on, in accordance with standard procedure, and a normal fuel pressure of 5.1 psi was observed. All engine indications were satisfactory and the aircraft accelerated normally after the brakes were released.

During the climb, at approximately 800 feet agl, the engine lost power suddenly and stabilised at about 1,500 RPM. The pilot responded by selecting the left fuel tank and applying carburettor heat, but was unable to restore power. During the subsequent forced landing, in a large field of recently sown crop, the nose landing gear leg collapsed but the uninjured occupants, who had all been wearing lap and diagonal harnesses, were able to exit the aircraft without difficulty using the aft-sliding canopy. Local fire services were called to the scene by ATC but were not required to assist.

The weather reported by the Oxford ATIS at the time of the accident was surface wind 270°/10 kt, visibility 10 km with a cloudbase at 2,900 feet, temperature +11°C, dew point +6°C and QNH 995 mbs.

Engineering inspection

The aircraft was recovered by road to Oxford Airport and inspected by another engineer employed by the same maintenance organisation. Damage to the propeller, cowlings and landing gear was consistent with the forces encountered during the forced landing and subsequent nose landing gear collapse. When the aircraft came to rest, part of the damaged engine cowling impinged upon the oil sump 'quick drain' valve, allowing most of the engine oil to drain away.

The aircraft has two fuel tanks, one located outboard of each wing root fairing, which feed into two sump tanks, one in each wing root fairing. There are four drains in the fuel system, one in each fuel tank and one in each sump tank. Samples taken from these after the accident revealed no evidence of water. However, the carburettor bowl, the electric fuel pump filter and the fuel lines aft of the firewall were found to contain significant amounts of rusty water. Visual inspection of the fuel tanks also revealed several large puddles of water in the remaining fuel. The inspecting engineer suggested that the sump drains might not have been at the lowest point of the system when the aircraft was parked.

Maintenance records showed that the fuel system was flushed on 15 March 2004. The aircraft then flew without incident for 30 minutes on 29 March and for 40 minutes on the 12 August 2004. From then until the accident flight it was parked outside with each fuel tank less than three-quarters full.

Previous occurrences

An accident report, in AAIB Bulletin No 11/2004, concerning a Gulfstream AA-5A, G-BGVW, describes a similar occurrence. Furthermore, an operator with considerable experience of the AA-5 mentioned a number of similar instances where pilots of the type had reported rough running. In each case, though the fuel tanks were drained during the pre-flight inspection until no water was present, subsequent examination of the fuel system revealed water in the fuel pump filter and carburettor bowl. On another occasion, three gallons of water were drained from the tanks of an aircraft that had been left outside for a long time. This was found to be due partly to poorly seated or perished fuel cap seals, which admitted water during wet weather.

Conclusion

Although the weather conditions at the time of the accident were conducive to carburettor icing at any power setting, it is most likely that the sudden loss of power was caused by the large amount of water present in the fuel system. The quantity of water present, and the type's reported history of fuel contamination, suggests that a considerable amount of water can collect in the system before causing engine failure, and that such an amount will not necessarily be detected by sampling fuel from the tank or collector drains alone.

Operators of all aircraft are reminded of the need to check the fuel system regularly for evidence of contamination. Pilots should be familiar with the position and operation of all drains provided for this purpose. Nevertheless, the absence of contaminants in fuel sampled in this way does not guarantee that the whole system is uncontaminated, particularly on aircraft such as the AA-5 which are not fitted with a strainer at the lowest point of the system or a drain associated with the fuel filter.

Aircraft parked outside with partially filled fuel tanks are particularly susceptible to water contamination both through condensation and by direct ingress through fuel filler caps. It is suggested that the entire fuel system of any aircraft stored in this manner should be thoroughly inspected immediately before flight.