Gulfstream AA-5A, G-ODAM, 25 January 2002 at 1200 hrs

AAIB Bulletin No: 8/2002	**Ref: EW/G2002/01/15**	**Category: 1.3**
Aircraft Type and Registration:	Gulfstream AA-5A, G-ODAM	
No & Type of Engines:	1 Lycoming O-320-E2G piston engine	
Year of Manufacture:	1979	
Date & Time (UTC):	25 January 2002 at 1200 hrs	
Location:	Biggin Hill Airport, Kent	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Nosewheel strut sheared off; bent propeller and engine shock loaded. Minor dents on wing and underside panels.	
Commander's Licence:	Basic Commercial Pilots Licence with Flight Instructor, IMC and Night Ratings	
Commander's Age:	31 years	
Commander's Flying Experience:	778 hours (of which 408 were on type)	
	Last 90 days - 71 hours	
	Last 28 days - 20 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by AAIB	

History of flight

The Instructor and his student had planned to carry out a series of circuits at Biggin Hill. A stiff carburettor heat lever had been reported on the previous flight. During the engine power check, the carburettor heat lever was exercised four times and although the lever was stiff, it produced a positive RPM drop. The fuel tanks were switched prior to the engine power check and all other checks were found satisfactory.

The engine run-up area at Biggin Hill is located on a taxiway near the mid-point of the main runway. The instructor estimated that it took approximately two to three minutes to taxi the 1000 metres from the run-up area to the threshold of Runway 21. Carburettor heat was not reapplied

prior to takeoff. The student taxied onto the runway and applied full power with the wheel brakes on to practise a short field takeoff. The instructor reported that at full power, the RPM indicated a normal value of approximately 2,250 RPM and all the temperature and pressure gauge readings were within limits. The takeoff and climb proceeded normally until reaching a height of about 300 feet when the engine coughed and spluttered and a small decrease in RPM was observed. The instructor took control of the aircraft and levelled off at 450 feet, checked the power was set to maximum and suspecting carburettor icing, he applied full carburettor heat. When carburettor heat was applied, the RPM dropped instantly and the engine reportedly lost all power. The instructor exercised both the throttle and carburettor heat levers again but neither had any effect on engine performance. The instructor switched fuel tanks but shortly thereafter realised that he was committed to landing in a field and therefore he switched the fuel selector to SHUTOFF and switched off the fuel pump.

The instructor selected a field to the right of the extended runway centreline. Just prior to touchdown the nose wheel struck a low wire fence which sheared off the nosewheel strut and caused the aircraft to slew around to the left. The propeller blades were bent upon impact with the ground and the wing and underside panels also suffered some minor dents. When the aircraft came to rest, both occupants immediately vacated the aircraft.

Observations

The engine was shock loaded by the propeller's impact and could not be run to test its operation. An inspection of the aircraft carried out by the operator's engineer showed no anomalies that could have caused the power failure. The carburettor heat lever was checked and confirmed to be operating the intake flap properly. An inspection of the engine also showed no damage or anomalies that could have caused the loss of power. The magnetos were tested and passed their functional check.

The METAR issued for Biggin Hill at 1150 hrs reported a temperature of 5°C and a dewpoint of 3°C in light rain (relative humidity of approximately 80%). 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. Given the atmospheric conditions it is possible that during the two to three minute period from the last selection of carburettor heat until the takeoff was initiated, ice was forming inside the carburettor. However, had this been the case, a noticeable RPM drop at full power would have been expected but the instructor believed the engine to be performing normally during takeoff. As soon as the instructor noticed a drop in engine performance after takeoff, he applied full carburettor heat whereupon the engine lost all power. Applying carburettor heat when icing is present generally causes a drop in power because the heated air makes the mixture richer and also melts the ice that then passes through the engine as water. However, it does not usually cause a complete loss in power as was experienced in this case.

The symptoms of the power loss could also be attributed to fuel starvation. However, this is unlikely as both tanks had been replenished up to the 'tabs' and both tanks had been used successfully to feed the engine prior to takeoff. The fuel had also been drained and checked for water and sediment by the student pilot prior to flight. The fuel was checked again after the accident and was free of water. The electric fuel pump had been switched on for the takeoff.

Although no definite conclusion can be drawn, the atmospheric conditions at the time of the accident and the lack of evidence of any hardware fault suggest that carburettor icing was the likely

cause of the power failure. The CAA's AIC on carburettor icing (145/1997) includes the following advice:

> *Induction icing can occur when taxiing at low power or when the engine is idling. If the weather conditions appear to be conducive to the formation of induction icing then the HOT position should be selected before takeoff for sufficiently long enough to remove any accumulation which may have occurred. If the aircraft is kept at the holding point in conditions of high humidity it may be necessary to run up the engine to the take-off power setting more than once to clear any ice which may have formed.*

On the same subject the CAA's Safety Sense Leaflet on Piston Engine Icing (14A) recommends the following procedure immediately prior to takeoff:

> *Since icing can occur when taxiing with low power settings, or when the engine is idling, select carb heat ON for 5 seconds and then OFF, immediately before takeoff to clear any build-up.*