

Aircraft Type and Registration:	Piper PA-28-140 Cherokee, G-AYWE	
No & Type of Engines:	1 Lycoming O-320-E2A piston engine	
Year of Manufacture:	1970	
Date & Time (UTC):	7 August 2002 at 1515 hrs	
Location:	Approach to Denham Airfield, Middlesex	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - 1 (Minor)	Passengers - N/A
Nature of Damage:	Severe damage to aircraft	
Commander's Licence:	Airline Transport Pilot's Licence with Flying Instructor Rating	
Commander's Age:	32 years	
Commander's Flying Experience:	6,500 hours (of which 1,500 were on type) Last 90 days - 180 hours Last 28 days - 70 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

History of flight

The purpose of the flight was to conduct a PPL skill test. During the flight, regular carburettor ice checks were carried out and, reportedly, no evidence of ice was apparent. After some two hours airborne the aircraft was flown back to Denham where the student completed a normal circuit for a touch-and-go on Runway 24. During this circuit, carburettor heat was applied on the downwind leg and on final approach and the engine responded normally throughout. Cold air was selected for the subsequent climb back to the circuit height of 750 feet agl. For the next circuit, the student had been briefed for a glide approach and, when on the downwind leg, the pre-landing checks were completed including the selection of full carburettor heat for several seconds. On base leg, the student again selected full carburettor heat and, after a few seconds, closed the throttle and commenced the descent from 750 feet agl. During the subsequent descent, the engine speed indication was showing between 1,100 and 1,200 RPM. Initially, the descent profile was good with an aiming point about $\frac{1}{3}$ distance along the runway. Then, following the selection of 25° flap, a slight undershoot of the aiming point began to develop. As the aircraft approached the normal APAPI descent profile of 4.5°, at about 200

feet agl, the instructor called for the application of power. The student reacted immediately but there was no apparent response from the engine. The instructor called "Go-around" and the student promptly applied full throttle. With no response from the engine, the carburettor heat was selected to 'cold' but with no effect on engine response. The aircraft struck trees in the undershoot area and then impacted the ground; it came to rest on a heading of 040°, some 100 metres short of the runway threshold. Both occupants were able to evacuate unaided from the aircraft. The instructor reported that the AFS arrived promptly on the scene but that there was no fire.

The instructor subsequently commented that he was aware that the weather conditions were conducive to the formation of carburettor icing. The actual conditions at the time of the accident were as follows: surface wind 270°/7 kt; visibility greater than 10 km; isolated showers; temperature of 25°C and dew point of 13°C. Information contained within General Aviation Safety Sense Leaflet 14A: *Piston Engine Icing*, indicate that, in these conditions, serious icing could occur with descent power. Subsequent to the engineering investigation as reported below, the Meteorological Office at Bracknell was contacted for more detailed information on the possibility of carburettor icing in the Denham area, particularly on the day of the accident. This indicated that there were frequent heavy showers in the Denham area around the time of the accident; this activity would have increased the humidity and the possibility of carburettor icing.

Engineering investigation

The aircraft and its engine were examined by the AAIB at Denham Airfield. The aircraft had been severely damaged by impact with trees and the ground. The left wing was severed at the root and all three landing gears had been torn off. The fuselage had sustained damage to the nose section and was also badly buckled behind the cabin area, but the cabin itself was intact. Although a significant amount of fuel was released from the aircraft after impact, no fire had occurred.

Damage to the tips of the propeller blades (chordwise scraping and blade tip deformation) indicated that the engine was running at the time of impact, although it was evident that the engine had not been developing high power. Impact damage to the crankshaft and the carburettor precluded any possibility of functionally testing the engine but it was examined in-situ, as detailed below.

The cold and hot air induction paths were inspected and found to be free from blockage. The throttle cable and mixture controls operated satisfactorily but the carburettor heat control was jammed due to the carburettor heat flap housing having been crushed in the impact. When the cable was cut at its connection to the heat flap operating lever, the carburettor heat control cable could be moved freely. There was no evidence of pre-impact damage to the heat flap mechanism, which was judged to have been open (cold air position) at the time of impact, which could have prevented it from operating correctly prior to impact.

The spark plugs were inspected and found to be in good condition, with the exception of the lower plug on the front right cylinder, which was heavily wetted with oil. This probably occurred after impact, as there was no evidence that the oil had been burnt. Continuity of the crankshaft, pistons, valve gear and accessory drives was confirmed by turning the engine by hand.

The carburettor was returned to the AAIB at Farnborough and disassembled for inspection. The inlet filter was found free of significant debris, there was no blockage of the main jet and the accelerator pump mechanism operated correctly. The electric fuel pump was tested, and also operated satisfactorily, and a sample of fuel obtained from this pump was confirmed to be the correct colour for AVGAS and did not contain any visible water.

In summary, no evidence was found of any mechanical defect to explain the failure of the engine to respond to throttle application.

Discussion

In the existing weather conditions, and with no obvious mechanical defect, the most probable reason for the engine failing to respond would be carburettor icing. However, both the instructor and student considered that they had fully complied with the advice contained within the aircraft, and the relevant CAA publications, to minimise the chances of such icing. The AAIB are studying all recent occurrences of suspected carburettor icing, together with historical data, with a view to making a collective submission on the subject to the CAA.