ACCIDENT

Aircraft Type and Registration:	Cessna 152, G-BGIB
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1979
Date & Time (UTC):	9 October 2005 at 1335 hrs
Location:	Field north of Arlington Reservoir, East Sussex
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Nose landing gear, left wing tip, propeller and underside of the engine cowling
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	38 years
Commander's Flying Experience:	813 hours (of which 514 were on type) Last 90 days - 169 hours Last 28 days - 54 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, further telephone enquiries by AAIB

The flight was planned as a practice 'forced landing without power' exercise for the student. The student carried out a pre-flight inspection, observed by the instructor, following which the instructor confirmed the fuel and oil quantities by visual inspection. The student started the engine in accordance with normal procedure; however a few seconds later the engine stopped. The student re-started the engine which ran briefly before stopping again. The instructor intervened, primed the engine and restarted the engine which ran satisfactorily. The after-start checks were completed and the student taxied the aircraft to the holding point. The power checks were completed satisfactorily, followed by a normal takeoff and climb.

The aircraft was climbed to 2,000 ft and the en-route or 'FREDA' checks were carried out. The aircraft continued the climb to 3,000 ft and the en-route checks were repeated. The instructor then demonstrated the actions and touch drills to be completed in the event of an engine failure during the cruise. The aircraft was descended to 2,000 ft and the instructor handed control of the aircraft back to the student. The aircraft was climbed back to 3,000 ft and the en-route checks repeated. The student then repeated the actions and checks, full carburettor heat was applied before the power reduction, and the engine 'warmed' during the glide descent, by applying full power every 500 ft, in the demonstration and subsequent practice by the student. Following a second practice glide descent from 3,000 ft to 2,000 ft the student was instructed to level at 2,000 ft and following a few minutes of straight and level flight complete another en-route check.

As planned, the next exercise was to include selection of a suitable landing area; once again all checks and touch drills were completed and the carburettor heat was selected to 'HOT' where it remained as the engine power was reduced to idle at 2,000 ft. During the descent the power was increased on two occasions to warm the engine and the carburettor heat remained 'HOT'. At 800 ft the instructor asked the student to initiate a full power climb. The student advanced the throttle but the engine did not respond. The instructor took control and exercised the throttle, again without response from the engine and he then shut down the engine, repeating the student's touch drills in preparation for a forced landing.

The selected field sloped down in the direction of the landing and, following a ground roll of approximately 200 m, the instructor considered that the aircraft was not going to stop before a densely wooded area ahead. He therefore applied heavy braking which resulted in the collapse of the nose landing gear and the aircraft tipped onto its nose. Both occupants exited the aircraft via the doors.

The instructor reported that all checks had been satisfactorily carried out by the student and the engine had been performing 'within limits' with no rough running. Examination at the accident site by the club's Chief Flying Instructor and an engineer from the Maintenance Organisation revealed that the flexible hose supplying hot air to the carburettor air box had a split extending approximately two-thirds of the way round its circumference. The instructor also observed discoloration around the split.

Maintenance information

The engine is fitted with a carburettor air box on the underside which normally allows outside air from a filter intake on the front of the cowling into the carburettor. When carburettor heat is selected to 'HOT' warm air is drawn instead through an air hose from a muff around the exhaust system. The hose fitted was a double-ply 'Sceet' hose rather than the specified single-ply 'Scat' hose which is more commonly used. The installation, in 'as seen at the accident site' condition, was not available for examination by AAIB; however part of the hose was returned to AAIB.

The maintenance organisation reported from their examination on site that the flexible hose was fully connected to the metal tube stub on the carburettor air box and held in place by a metal clamp. They considered a split had developed due to chaffing around the metal clamp.

Weather conditions

The following meteorological observations were made in the Eastbourne area for the 9 October.

Herstmonceux: 1300Z:
Temperature 16.3º
Dew point 7.1º
Humidity 54%

Shoreham: 1300Z:
Temperature 15.2º
Dew point 9.9º
Humidity 71%

Carburettor icing

CAA General Aviation Safety Sense leaflet 14A describes piston engine icing. Piston engine induction system icing, commonly referred to as carburettor icing, is 'caused by the sudden temperature drop due to fuel vaporisation and pressure reduction at the carburettor venturi. The temperature drop of 20–30ºC results in atmospheric moisture turning into ice which gradually blocks the venturi. This upsets the fuel/air ratio causing a progressive, smooth loss of power and slowly 'strangles' the engine. Conventional float type carburettors are more prone to icing than pressure jet types.'

The chart in leaflet 14A shows the wide range of ambient conditions where the formation of carburettor icing is most likely. Particular note should be taken of the much greater risk of serious icing with descent power. The recorded weather conditions at ground level are consistent with a serious risk of at descent power and bordering on the risk of serious icing at cruise power. The conditions were likely to have become increasingly conducive to carburettor icing at higher altitudes.

Discussion

The weather conditions were conducive to carburettor icing. The instructor and student followed the recommended procedures for engine handling in these conditions. Engines at reduced power settings are more prone to icing because engine induction temperatures are lower and also, the partially closed butterfly can more easily be restricted by the ice build-up. The presence of a split in the hose supplying hot air could have allowed colder air from around the engine bay into the carburettor, making carburettor ice build-up more likely, despite the selection of hot air.