ACCIDENT

Aircraft Type and Registration:	Mickleburgh L107, G-BZVC
No & Type of Engines:	1 Martlet VW 1824 piston engine
Year of Manufacture:	2006
Date & Time (UTC):	21 February 2009 at 1053 hrs
Location:	Fenland Airfield, near Spalding, Lincolnshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	FAA Private Pilot's Licence
Commander's Age:	69 years
Commander's Flying Experience:	242 hours (of which 95 were on type) Last 90 days - 1 hour Last 28 days - 35 minutes
Information Source:	AAIB Field Investigation

Synopsis

Shorty after a normal takeoff, at a height of between 400 ft and 700 ft, the aircraft was seen to enter a steep left turn. When asked by the aerodrome Flight Information Service officer (FISO) what his intentions were, the pilot responded with a MAYDAY transmission, stating that he intended to land back at the airfield. After starting to turn to line up with Runway 36, the aircraft was seen to enter a spin to the left and strike the ground. It was determined that a fault existed within the carburettor air heat mechanism which, under the prevailing conditions, may have led to a loss of engine power due to serious carburettor icing.

History of the flight

The pilot towed his aircraft in its trailer to Fenland Airfield, where he rigged it for flight. He talked to staff at the aerodrome, before walking out to inspect the runways and assess their suitability for use. The weather was fine, with a westerly wind of around 10 kt, clear skies, a temperature of 9°C, and a dewpoint of 5°C. He booked out for a flight to Tibenham in Norfolk, started his aircraft, and taxied for departure.

Witnesses observed that he taxied "quite fast", and the FISO on duty commented that he did not stop at the Bravo holding position as instructed, but taxied to the end of Runway 26, before reporting ready for departure. The FISO took no action as there was no other traffic in the vicinity. The pilot was cleared to take off at his

discretion, and the aircraft became airborne before the intersection of Runways 26 and 18/36.

The aircraft climbed normally until, at a height estimated by witnesses of between 400 and 700 ft, it entered a steep left turn which brought the aircraft onto the crosswind leg. The FISO asked the pilot what his intentions were, and the pilot responded with a MAYDAY call, stating that he intended to land on Runway 36. He did not report the nature of his difficulty. Witnesses stated that the left turn was either level or the aircraft was climbing slightly during the turn, and that it appeared controlled.

The FISO activated the crash alarm and the fire crew made their way to their vehicle. The aircraft began a turn onto the final approach for Runway 36, but flew through the extended centreline. Witnesses then saw the aircraft stall and enter a spin, which lasted perhaps two or three turns, before the aircraft struck the ground. The fire and rescue vehicle arrived very promptly, but the pilot had sustained fatal injuries in the impact. There was no post-crash fire.

Pilot's history

The pilot had learnt to fly in America in 1991/2 and gained an FAA PPL. He had undertaken the required Biennial Flight Reviews to retain currency, and the instructor with whom he had flown most recently recalled that there was nothing remarkable about the review flight.

Aircraft information

The pilot had both designed and built the aircraft. The process had been overseen by an inspector from the Popular Flying Association (now the Light Aircraft Association), who ensured that the required construction standards were achieved. The aircraft was then tested by an experienced test pilot, who commented in his report that:

> *'the aircraft is well suited for the issue of Permit to Fly… it has no untoward handling or performance characteristics and should be capable of being flown in a safe manner by an average PPL [holder].'*

With regard to stalling, he stated that:

> *'Airframe buffet is present and increases as the stall approaches commencing around five knots prior to the stall.'*

and that:

> *'Incipient spinning behaviour with immediate recovery action at the wing drop was totally innocuous.'*

The accident site

The accident site was in a field approximately 275 metres from the southern end of Runway 18 at Fenland Airfield. The area between the accident site and the airfield consisted of a flat agricultural field, separated from the airfield by a wide drainage ditch edged by a low sparse hedge, aligned in an east/west direction. The land to the west, south and east of the accident site consisted of large flat agricultural fields interspersed with farm buildings, occasional large trees, small roads and numerous wide drainage ditches.

Information given by some local pilots indicated that the fields surrounding the airfield may not have been suitable for a forced landing as, at the time of the accident, they were waterlogged.

Examination of the accident site showed that all parts of the aircraft were present. The aircraft's initial impact with the ground was with the lower engine cowling, left landing gear wheel and left wing tip. At the time of this initial impact it is estimated that the aircraft was on a heading of about 014°, flying at a speed in the region of 30 kt with a relatively high rate of descent, pitched nose down by about 35°, banked to the left and spinning to the left. After the initial impact, the forward part of the aircraft came to an almost instant halt whilst the rear of the fuselage continued downwards and to the right, causing it to break in the cockpit area, just to the rear of the main landing gear to fuselage attachment.

There was very good evidence that the propeller was not rotating at the time of the impact. The fuel tank was empty, but this had been ruptured in the impact in a manner which would have allowed any fuel to drain away. A slight smell of fuel was apparent around the wreckage.

The fuel cock and the engine ignition switches were found in the ON position. The engine throttle control was found in the idle position and the carburettor air hot/cold control was in the partial hot air position. The lock mechanism on this control was found to be disengaged. No fire occurred and there was no evidence of an airborne collision.

Engineering examination

A detailed examination of the flying control system found no evidence of pre-impact disconnection or restriction. There were witness marks to indicate that, at impact, the ailerons were at the full right wing-down position, the elevator was almost at the full aircraft nose-down position and the rudder was possibly at the full nose-right position. The wing flaps were found to be fully extended.

Examination of the five point seat harness found that the stitching of the strap material of the upper right torso restraint at the rear attachment to the fuselage fitting, had failed. This failure was consistent with having occurred in the impact and was attributed to the poor quality of the stitching.

The engine and engine systems were examined and no pre-impact fault or failure was found, except for the carburettor hot air system,

The carburettor hot air system provides engine-generated warm air to the carburettor air intake, to prevent or remove ice build-up within the carburettor's venturi. Attached to the carburettor's air intake is a hot/cold air box which has two inlets: one draws in ambient air and the other air warmed by the engine exhaust system. Inside the hot/cold air box is a moveable flap which controls the amount of warm and cold air that enters the carburettor's air intake. The position of the movable flap is controlled manually by the pilot from the cockpit.

The carburettor hot/cold air box on this aircraft was constructed from two 'U' shaped rectangular lightweight composite channels, mounted one over the other to form a rectangular box, and held together using two plastic ties, Figure 1.

The movable flap was located inside the upper channel section and attached to a round metal rod which formed the pivot for the flap, mounted across the inside of the section. An operating lever arm was located at one end of the rod and secured by the clamping action of a small screw. A spring attached to the lever arm biased the moveable flap towards the cold air position. The Bowden cable from the carburettor heat control in the cockpit was attached at the end of the lever arm, Figure 2.

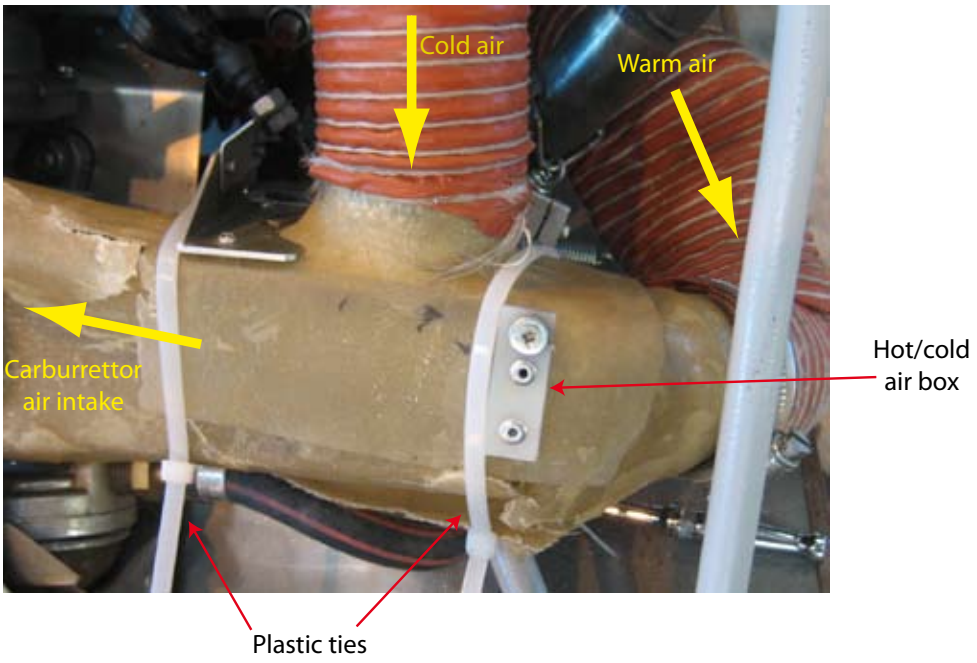

Figure 1

Carburrettor hot/cold air system

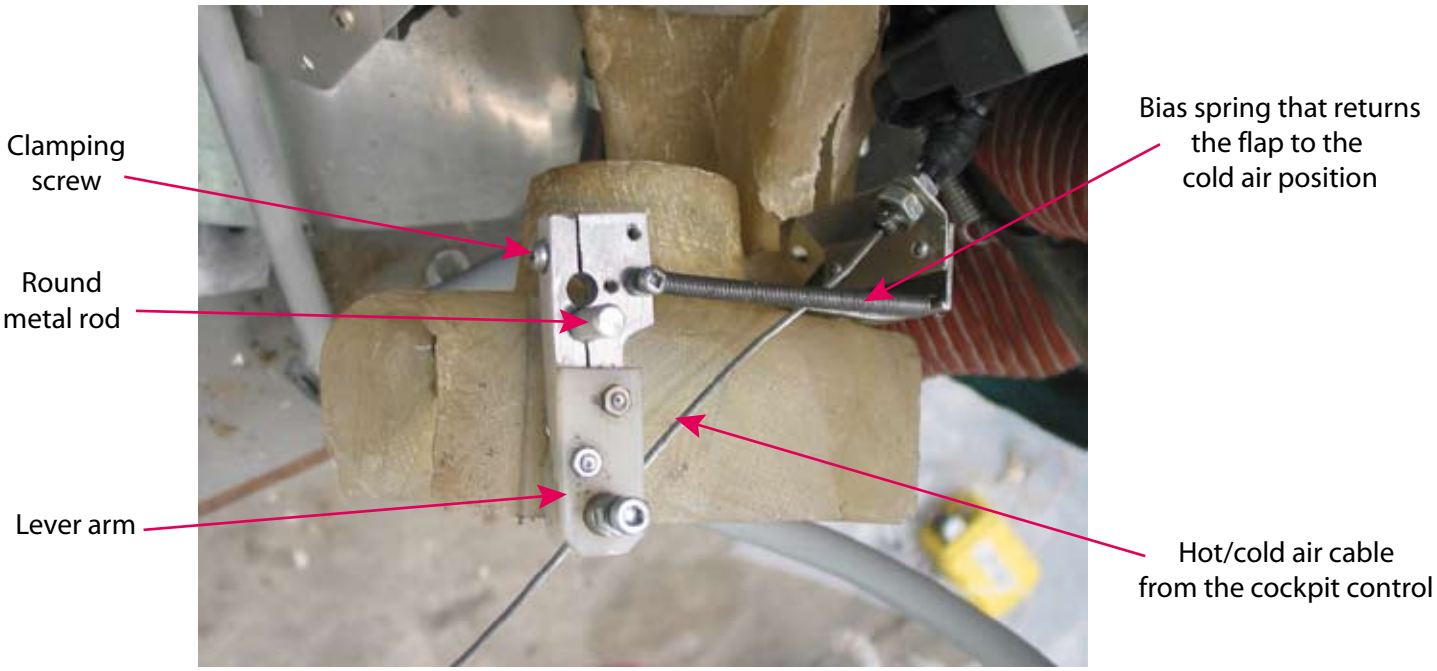

Figure 2

Hot/cold air lever arm mechanism

Examination of the system showed that, although all the components were connected, the lever arm was loose on the flap pivot rod. When the two 'U' shaped channels were separated it was seen that the movable flap was in the cold air position and was catching against one side of the lower 'U' channel, tending to cause the flap to stick in the cold air position. There was good evidence that the movable flap had been rubbing against the inside of the lower 'U' channel over its full range of travel for a considerable period of time. Detailed examination of the lever arm to metal rod connection showed that the arm had become loose as a result of the flap interference with lower 'U' channel, Figure 3.

Meteorology

The Chief Flying Instructor at Fenland described experiencing significant carburettor icing during a flight in a Cessna 152 prior to the time of the accident. He stated that, when he carried out the engine power checks, …"On selecting hot air, the engine speed rose by more than 500 rpm, so there was quite significant carburettor icing building up."

Carburettor icing probability

A weather aftercast was obtained from the Met Office for the Fenland Airfield area for the mid-to-late morning of 21 February which specifically gave air temperature, dew point and humidity from the surface to 1,000 ft. When these figures were plotted on the Civil Aviation Authority's Carburettor Icing Prediction Chart, Figure 4, they gave a prognosis that serious carburettor icing could occur at any power setting between the surface and 1,000 ft above sea level.

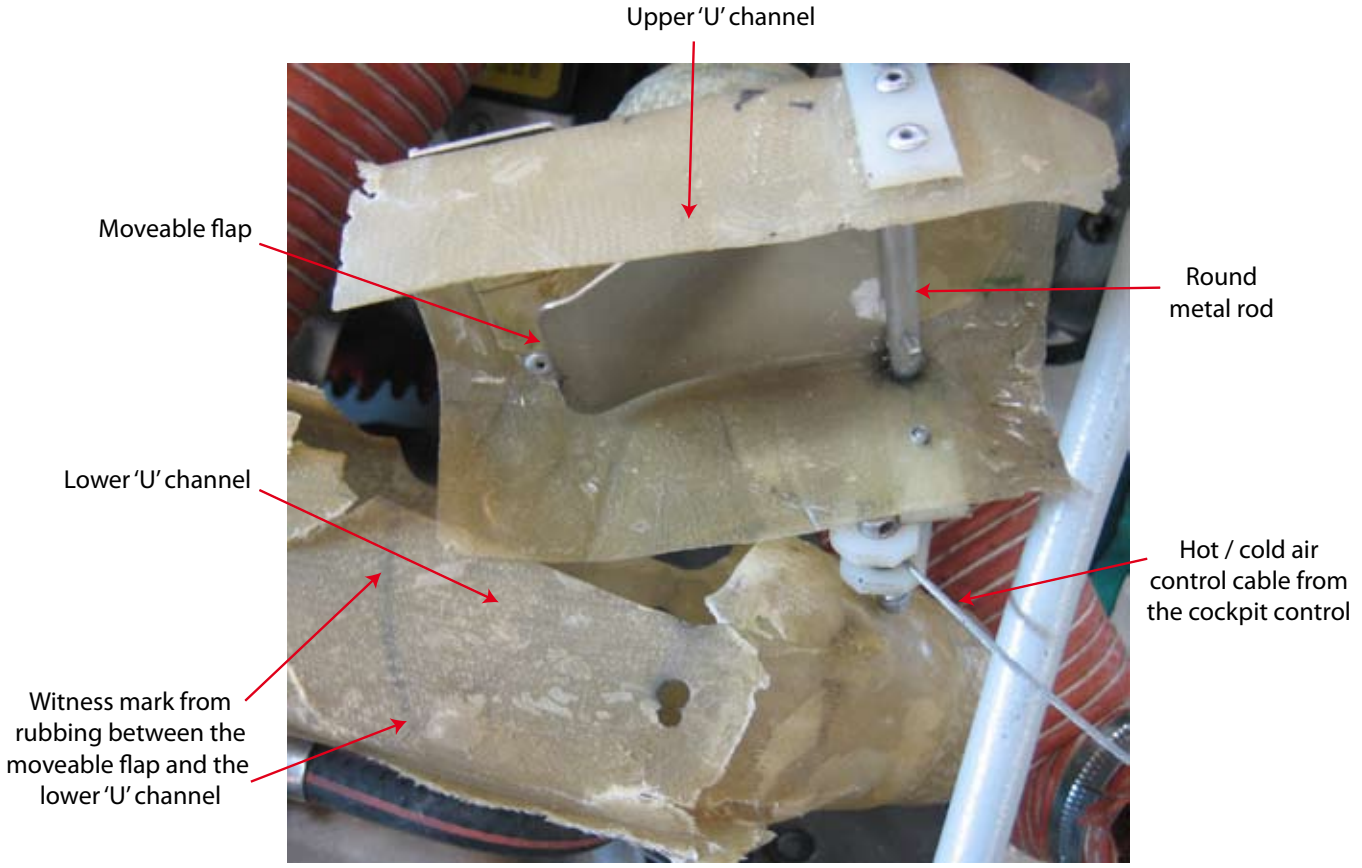

Figure 3

Inside the hot/cold air box

Previous accident

In June 2007, the aircraft and pilot were involved in a landing accident on a grass airstrip[1]. The pilot lost control during the landing roll, and the aircraft pitched over onto its back. Although the canopy shattered, the pilot was trapped in the aircraft for a few minutes until assistance arrived.

Analysis

Aside from the pilot's failure to stop at the holding point when taxiing, and his higher-than-normal taxi speed, there was nothing remarkable about the flight until the aircraft levelled off and entered a steep turn to the left shortly after takeoff. This turn, and the pilot's statement in his MAYDAY call that he intended to return to land on Runway 36, indicated that some problem had arisen which required urgent action on his part. The witness reports that the aircraft flew level or continued to climb indicated the unlikelihood of a complete loss of power at this stage. It seems likely that there was a partial loss of power, probably associated with the carburettor heat malfunction identified by the engineering investigation, and brought about by meteorological conditions conducive to serious carburettor icing at any power

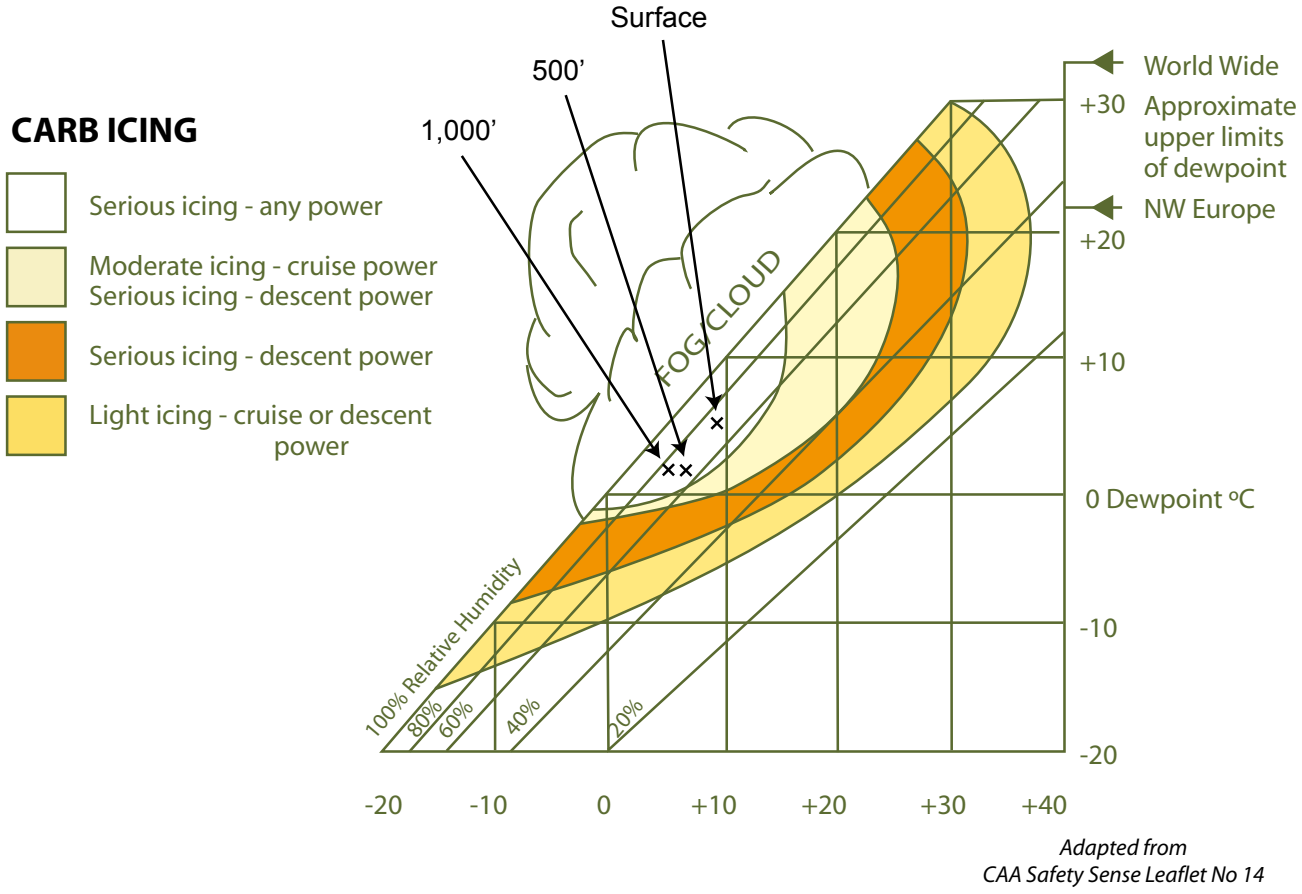

Figure 4

Footnote

[1] AAIB Bulletin 10/2007 reference EW/G2007/06/04.

setting. However, the possibility remains that some other factor, not identified during the investigation, caused the pilot to return to the airfield.

As the pilot announced his intention to land on Runway 36, it is possible that he may have been concerned about the suitability of the surrounding fields for a forced landing, considering the care which he took to examine the airfield surface before flying. Moreover, his previous accident may have led to a concern that the aircraft might pitch onto its back in a forced landing, and that he might become trapped.

However, an aircraft which has achieved sufficient height after takeoff may be able to achieve a safe return to the airfield of departure following engine failure, but manoeuvring an aircraft close to the ground, at low speed, and without engine power, places significant demands on the pilot's handling skills. The flight test reports indicated that the aircraft's handling characteristics were not unusual. However, the pilot's relative lack of currency may have been a factor in his handling of the aircraft in a manner which resulted in the spin.

Witnesses saw the aircraft fly towards, and then through, the extended centreline of Runway 36. In a turn at low speed, slight additional aft stick may be sufficient to prompt an aircraft to stall. If any yaw is present, the stall may develop into a spin. It is possible, therefore, that the accident resulted from such circumstances. Another factor may have been that, as the aircraft was low and flying downwind, the pilot perceived the aircraft's airspeed to be greater than it was.

Conclusions

It is probable that a partial power loss, caused by the failure of the carburettor heat system in conditions conducive to serious carburettor icing at any power setting, prompted the pilot to return to land. During the turn onto final approach, the aircraft entered a spin and struck the ground.