ACCIDENT

Aircraft Type and Registration:	Piper PA-38-112 Tomahawk, G-BOLF
No & Type of Engines:	1 Lycoming O-235-L2C piston engine
Year of Manufacture:	1979
Date & Time (UTC):	17 October 2008 at 1520 hrs
Location:	Robin Hood's Bay, North Yorkshire
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:	Private Pilot's Licence
Commander's Age:	45 years
Commander's Flying Experience:	50 hours (all of which were on type) Last 90 days - 27 hours Last 28 days - 4 hours
Information Source:	AAIB Field Investigation

Synopsis

The aircraft suffered a loss of engine power whilst over the sea just off the North Yorkshire coast. The pilot transmitted a MAYDAY and attempted to ditch the aircraft, but it stalled just above the surface of the sea, causing its right wing to drop into the water. The aircraft then cartwheeled and inverted before sinking. The pilot, who was not wearing a life jacket, drowned. The cause of the power loss could not be positively determined.

History of the flight

The pilot arrived at Durham Tees Valley Airport at about 1400 hrs for a planned navigation trip around the North Yorkshire Moors. He had intended to make the flight earlier in the week, but the weather conditions had not been suitable. The weather on the day of the accident was good, and the aircraft departed from Runway 23 at 1452 hrs. After takeoff the pilot turned to the south-east and climbed to 1,500 ft. Once clear of the airfield he changed radio frequency and obtained a Flight Information Service from the radar controller, who identified the aircraft on radar and verified its transponder Mode C altitude readout. The pilot was cleared for further climb to not above 4,000 ft en route. He resumed climbing and proceeded towards the Whitby area.

Some time later, the controller observed that the aircraft was at 1,300 ft overhead the Whitby area. This did not concern her unduly, as aircraft often descend in this area for a better view of the scenery.

At about 1515 hrs, the pilot of another aircraft on the same frequency heard the transmission: "MAYDAY MAYDAY MAYDAY OSCAR FOXTROT FORCED LANDING". When the radar controller did not reply, the pilot relayed the MAYDAY call to her. The controller, who had not heard the original call, tried to contact G-BOLF, but received no reply. The pilot of the assisting aircraft also tried to contact G-BOLF, unsuccessfully. The controller passed the last known position of G-BOLF to the pilot of the assisting aircraft who carried out a search of the area, just off Robin Hood's Bay, but no signs of the missing aircraft were found.

Witness information

At about 1515 hrs, a witness at Robin Hood's Bay heard the sound of an engine increasing to a high power, reducing to low power then increasing again. He assumed that the sound was from an aircraft which he could not see, that was performing aerobatics. Shortly thereafter he saw an aircraft flying low over the water, on the other side of the bay.

Witnesses at Ravenscar, to the south, saw a small, single-engine aircraft heading in their general direction. It was initially just above cliff top height and descended gently towards the sea in an apparently controlled manner. When it was just above the surface a wingtip suddenly dropped and entered the water, causing the aircraft to cartwheel. It became inverted and quickly sank below the surface.

Emergency response

Search and rescue aircraft, lifeboats and the coastguard were dispatched to the scene. Witnesses confirmed that they were searching in the correct area, but neither the pilot nor the aircraft could be found. The aircraft was found later that evening at low tide; the pilot's body was found the following day.

Recorded data

The Great Dunn Fell and Claxby radar heads recorded the flight from Durham Tees Valley Airport to the Whitby area. The data show the aircraft climbing to a maximum height of 3,500 ft at 1458 hrs, before descending gently to 1,200 ft. It then climbed back up to 1,500 ft at 1513 hrs, then descended more rapidly to 1,000 ft at 1514.35 hrs before disappearing from radar. No other aircraft were recorded in the area at the time.

From recordings of the RTF transmissions obtained by the AAIB, it was confirmed that a MAYDAY call was transmitted at 1514.58 hrs; the words "ROBIN HOOD BAY", and "ATTEMPTING FORCED LANDING" could be heard.

Weather

A weather aftercast obtained from the Met Office for the Robin Hood's Bay area for 1515 hrs on 17 October showed a weak warm front lying off the east coast of England, with much of the country, including the accident site, within a warm sector. Visibility in the area of the accident was 25 to 35 km, with few clouds around 3,000 ft and a more general cloud base around 4,500 ft. At 2,000 ft the wind was likely to have been westerly at 17 kt, the temperature 6ºC and the dew point 3.7ºC, giving a relative humidity of around 85%. The METAR report at Durham Tees Valley airport for 1450 hrs on 17 October gave the weather as wind westerly at 9 kt, more than 10 km visibility, with few clouds at 2,500 ft.

Accident site

The accident site was located in the sea towards the southern end of Robin Hood's Bay. The land at the southern end of the bay comprises, in the main, 200 ft to 300 ft high cliffs above which were fairly small, sloping grass fields interspersed with walls, hedgerows, trees,

telephone/electric cables and the occasional building. The land above the cliffs at the northern end of bay has larger and flatter grass fields with fewer obstacles.

Engineering examination

Examination of the wreckage after the tide had ebbed showed it to be inverted, with major damage to the outer right wing, and a twisting failure of the rear of the fuselage just forward of the empennage. This evidence correlated well with the witness evidence that the aircraft first impacted the sea with its right wing, before rapidly swinging to the right, inverting and sinking. The engine cowlings, right landing gear, cockpit windscreen and cockpit doors were torn off either during the impact or whilst on the sea bed prior to recovery of the aircraft. These items were not found. The propeller showed good evidence that it was not being driven by the engine when it impacted the sea. The wing flaps had been fully deployed, the fuel was selected to the left tank, the throttle was fully open, the fuel mixture was near the fully rich position, the carburettor heat was selected on, the fuel primer control was 'in-and-locked', the electric fuel pump, landing light, anti-collision light and pitot tube heater were selected off and the engine ignition was selected off. The fuel tank drains were found to be firmly closed. There was no evidence of an airborne fire.

A detailed examination of the flying control system, fuel system and engine operating systems did not reveal any evidence of pre-impact failure, disconnection or restriction.

The engine was taken to an overhaul facility for examination. External and internal examination showed no evidence of failure, disconnect or seizure. The general internal condition of the engine was found to be very good and consistent with the hours that the engine had operated since overhaul. During the disassembly of the engine it was found that the engine-driven mechanical fuel pump mechanism was stuck in an unusual position. During the disassembly of the fuel pump it became free to operate. A detailed examination of the pump's internal mechanism revealed possible evidence of stiction on the central spindle. The central spindle was found to be slightly bent in the area of the stiction marks, which could account for why the pump mechanism was found stuck in an unusual position when removed from the engine. The fuel pump had been fitted to the engine as a new item approximately 1,500 operating hours prior to the accident and there had been no reported problems associated with the pump. Two other mechanical fuel pumps of the same type were internally examined for comparison and both had similar, but less pronounced stiction marks on the central spindle, but neither spindle was bent. It was not possible to determine how or when the spindle of the accident mechanical fuel pump became bent.

The electric fuel pump was tested and, even after immersion in the sea for about 24 hours, it functioned satisfactorily.

Carburettor icing

The Met Office aftercast for the Robin Hood's Bay area at the time of the accident gave the air temperature, dew point and humidity from the surface to 3,000 feet in bands of 500 ft. When these figures were plotted on the Civil Aviation Authority (CAA) Carburettor Icing Prediction Chart it gave a prognosis that serious carburettor icing could occur at any power setting between 1,000 and 3,000 feet amsl (Figure 1).

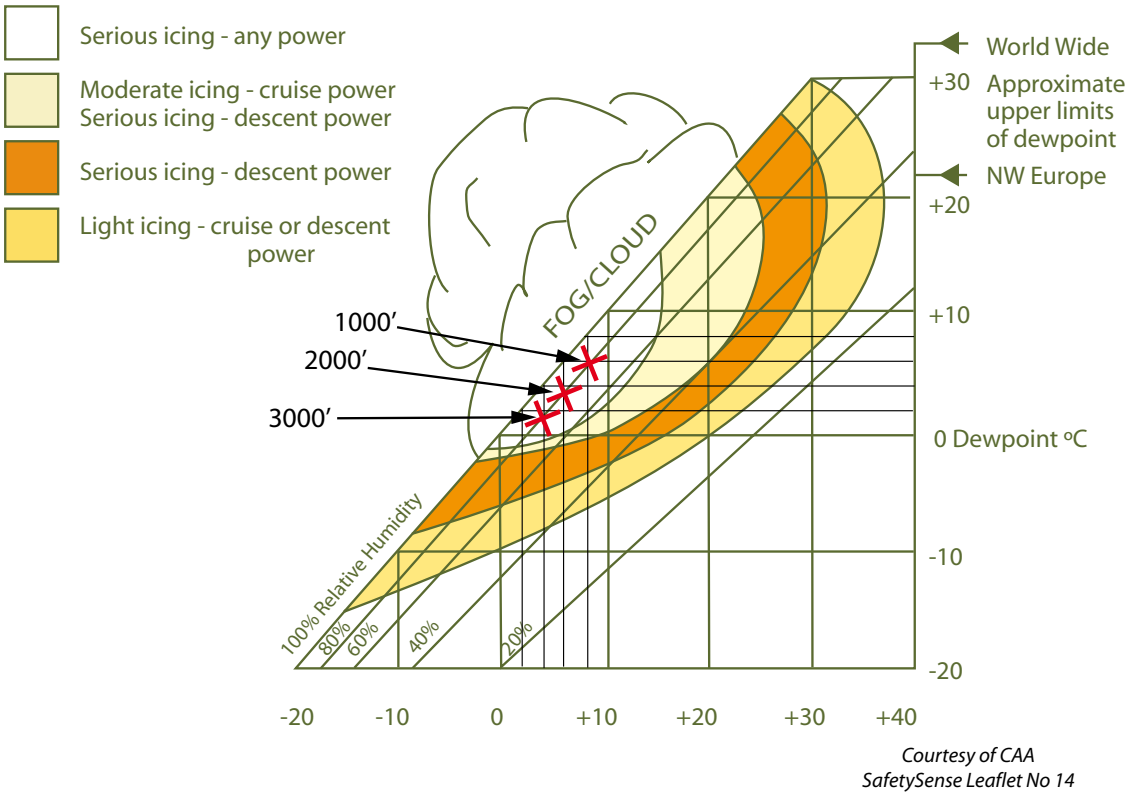

Figure 1

CAA carburettor icing probability chart

Maintenance

Documentation showed that the aircraft had sufficient fuel on board for the intended flight and that it had been maintained in accordance with CAA regulations. A 50-hour maintenance check was completed on the 13 October 2008.

Pilot training

The pilot had obtained his licence after 45 hours of training. He made his first solo flight after 17.5 hours and he was considered by his instructor to have made satisfactory progress throughout his training. The examiner who conducted the pilot's PPL Skills Test on 15 September 2008 considered that the test was flown to a good standard.

Investigation flight

During the investigation the AAIB conducted a flight in a PA-38-112, following the route of the accident flight as closely as possible. This showed that when the MAYDAY call was transmitted, it was theoretically possible for the pilot to achieve a forced landing on land. However, the nearest land would have been behind the aircraft and hidden by the wing. It would not, therefore, have been immediately visible to the pilot.

Pathology

The post-mortem examination revealed that the pilot had survived the impact with the water and had died from drowning. This evidence, and the fact that his body was found outside the aircraft, suggests that he was able to extricate himself from the aircraft after it impacted the water, but had then drowned.

None of the witnesses to the accident reported seeing the pilot on the surface of the water. He was not wearing any form of flotation aid.

There was no evidence of significant pre-existing natural disease which could have caused or contributed to the accident and toxicology revealed no evidence of alcohol or drugs in the pilot's body.

Discussion

It was apparent that the aircraft had suffered a loss of engine power. Given that the conditions at the time were conducive to carburettor icing at any power setting, the possibility of loss of engine power due to carburettor icing could not be ruled out, but this does not appear consistent with the witness report of hearing an engine increasing to high power, then decreasing and increasing again. It could not be determined how or when the spindle of the fuel pump had become bent. It was not possible to positively determine the reason for the loss of engine power from the available evidence.

When the engine failed, the pilot could have achieved a forced landing on land, but the location of the nearest land would not have been obvious to him as it was behind the aircraft and hidden by the wing. He may have been initially occupied with making a MAYDAY call and trying to restore engine power. By the time he had completed these actions the aircraft may have been beyond gliding distance of land. It appears that the aircraft stalled just prior to entering the water, causing the right wing to drop into the water and the aircraft to cartwheel into the sea.

CAA Safety Sense Leaflet No 21 contains advice on ditching an aircraft. It points out that the main cause of death after ditching is drowning, and that in many cases the deceased person either was not wearing a life jacket, or did not have one readily available. This accident reinforces the importance of wearing a suitable life jacket to maximise the chances of survival whenever there is a risk of ditching.