

ACCIDENT

Aircraft Type and Registration:	Cessna A152, G-BHAC	
No & Type of Engines:	1 Lycoming O-235-L2C piston engine	
Year of Manufacture:	1978	
Date & Time (UTC):	11 September 2006 at 1611 hrs	
Location:	Near Bethesda, Gwynedd, Wales	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - 1 (Serious)	Passengers - 1 (Fatal)
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	60 years	
Commander's Flying Experience:	116 hours (of which 114 were on type) Last 90 days - 12 hours Last 28 days - 6 hours	
Information Source:	AAIB Field Investigation	

Synopsis

The pilot and his passenger flew from Shobdon to Caernarfon Airfield and planned to return late in the afternoon. On their first attempt to return, they chose a direct route back but encountered poor weather and returned to Caernarfon Airfield. After refuelling, they took off and embarked on an alternative return route via Colwyn Bay and the north Welsh coast. Eleven minutes after departing Caernarfon Airfield they struck a mountainside at 1,970 ft amsl, fatally injuring the passenger and seriously injuring the pilot.

History of the flight

The pilot and his passenger arrived at Shobdon on the morning of the accident, intending to fly to Caernarfon Airfield and return to Shobdon later the same day. This

was the first time that the pilot had flown to Caernarfon Airfield although he had visited the airfield as a passenger three years previously. The weather was checked using the flying club's internet facilities and a flight log prepared for the route. The Minimum Safe Altitude (MSA) for the Colwyn Bay-Caernarfon leg of the route was noted as 4,900 ft on the flight log. On the pilot's chart a triangular route was drawn; Shobdon to Colwyn Bay to Caernarfon Airfield to Shobdon (see Figure 1). Wind corrected headings and timings were added to the chart for the first two legs of the route.

At approximately 1100 hrs they took off from Shobdon and flew to Caernarfon Airfield via Colwyn Bay and the Menai Straits, arriving at 1200 hrs. The pilot reported the

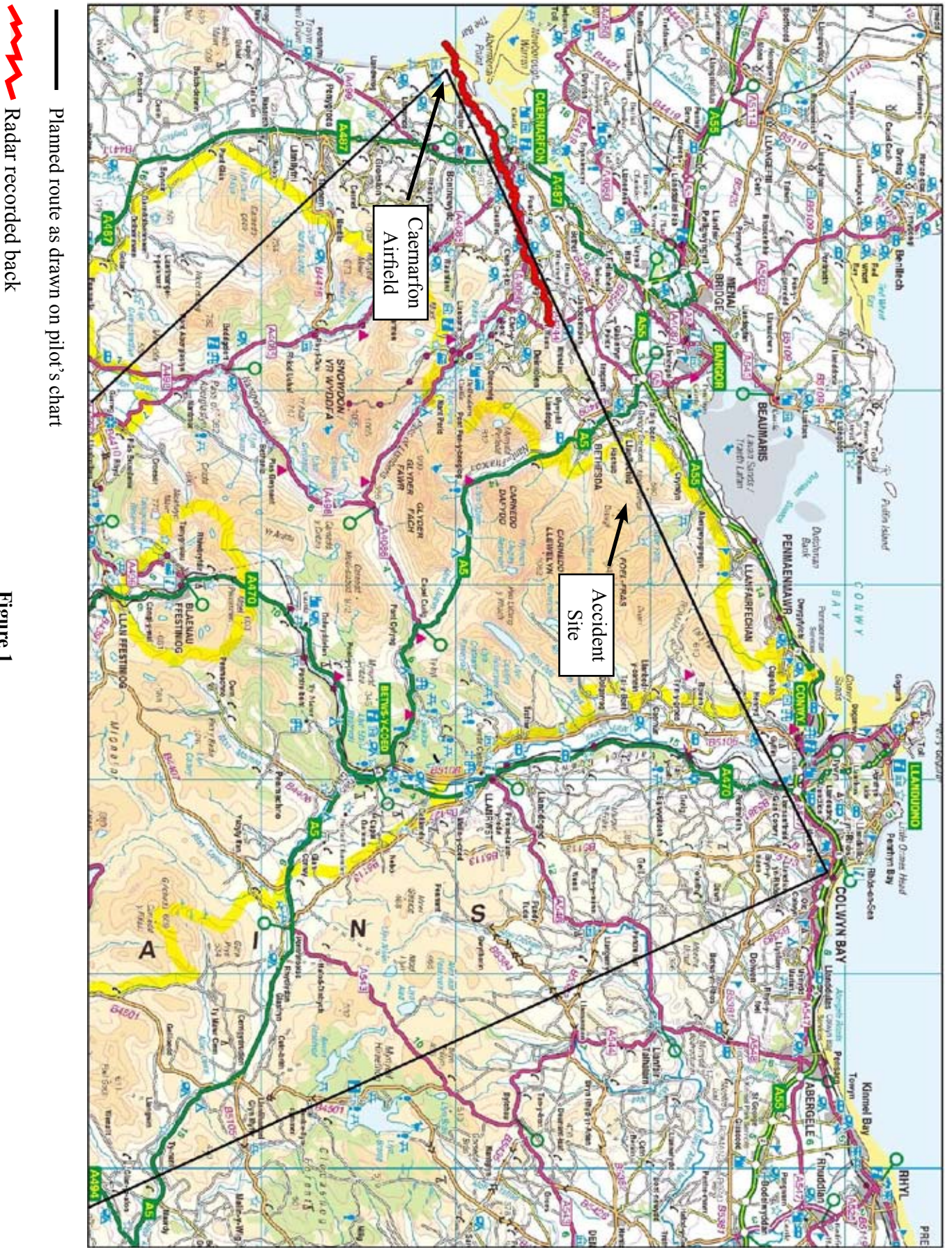


Figure 1

weather at their en-route cruising altitude of 2,500 ft amsl as '*good with little cloud, hazy visibility and no or little turbulence*'. They had lunch at the airfield and checked the latest weather forecasts for the local area and Shobdon, observing that there was now more cloud in the local area than on their arrival. They discussed the route home and decided that if the direct route back proved unsuitable, they would consider flying the reverse of the outbound route ie flying to Shobdon via Colwyn Bay. At 1505 hrs they departed from Caernarfon Airfield and climbed out on a southerly heading, intending to fly a direct route home.

The pilot recalled getting airborne on this flight but, due to injuries sustained in the accident, subsequently remembered nothing else until several days afterwards. The following events are thus derived from recorded ground radar data and eye witnesses.

After taking off from Caernarfon Airfield, the aircraft was observed heading south by the airfield air/ground operator. Approximately 10 minutes after disappearing from view, the pilot transmitted that he was returning to Caernarfon Airfield as he was unable to penetrate the weather to the south. At 1530 hrs he landed back at Caernarfon Airfield and told ATC that he was now planning to return to Shobdon via the northern coast of Wales once the aircraft had been refuelled. The aircraft was refuelled to full tanks and prepared for departure. After ATC had passed the airfield information, the air/ground operator also added that he had received a weather update on their planned route from a recently departed aircraft. He reported that the Menai Straits were negotiable beneath the cloud until reaching Bangor where the cloudbase became 3,000 ft with unlimited visibility. At 1605 hrs, G-BHAC took off from Runway 26, turned right and tracked approximately 070°M, climbing to 1,800 ft amsl. The radar head situated at St Annes near

Blackpool recorded the aircraft's track until 1612 hrs and this is shown in Figure 1. At 1611 hrs, G-BHAC called RAF Valley ATC to request a Flight Information Service (FIS). The controller offered the pilot a FIS and passed the Holyhead regional pressure setting of 1009 mb. The pilot replied 'QNH 1019, G-BHAC IS A CESSNA 152 ROUTING CAERNARFON SHOBDON VIA COLWYN BAY CURRENTLY TO THE EAST OF CAERNARFON HEADING 190° AT 1,800 FT VFR'. The controller corrected the inaccurately readback QNH and this was acknowledged by the pilot. Nothing more was heard from the aircraft.

Approximately five minutes later, a fell runner near Bethesda heard an aircraft flying close to her but was unable to see it due to the low cloud base. Initially, the engine sounded normal and then it seemed to rise in pitch for a couple of seconds before she heard a bang and then silence. She assumed the aircraft had impacted the mountainside and ran to the nearest telephone to alert the rescue services. At 1745 hrs, a Police Air Support Unit helicopter located the aircraft's wreckage and the pilot was flown to hospital by an RAF rescue helicopter. The passenger was fatally injured in the impact.

Meteorology

An aftercast was obtained from the Met Office which stated that at 1200 hrs on the day of the accident, a moist south-westerly flow covered the British Isles with a slow-moving frontal band covering Ireland and the south-west approaches. It was estimated that in the vicinity of the accident area, the wind at 2,000 ft agl was from 330° at 15 kt and that there was a broken strato-cumulus cloud base at 1,700 ft amsl which was likely to be more extensive over high ground due to the onshore wind. The surface visibility was estimated to be 15 to 20 km. The meteorological report from RAF Valley (20 miles west of the accident site) at 1550 hrs

stated a surface visibility of better than 10 km and a broken cloudbase at 1,700 ft agl.

The Met Office also issued a Form 215 'Forecast Weather Below 10,000 ft' chart at 0930 hrs which provided guidance as to the conditions in Wales during the period 1400 to 2300 hrs. The pilot would have had the opportunity to study this chart whilst at Shobdon and Caernarfon Airfields. This chart forecast that visibility would generally be 15 km with widespread haze reducing this to 7 km. Occasionally the visibility could be expected to reduce to 3,000 m in mist and/or light drizzle on sea coasts with isolated sea and hill fog. The chart also forecast that there would be a broken strato-cumulus cloudbase between 1,500 and 2,000 ft amsl with occasionally a broken stratus cloudbase between 200 and 700 ft amsl. The TAF for RAF Valley issued at 1337 hrs and covering the period 1500-2400 hrs, forecast visibility in excess of 10 km and small amounts of cloud with a base at 2,000 ft amsl.

The fell runner witness was at an altitude of approximately 1,700 ft amsl when she heard the aircraft. She reported that the cloudbase was approximately 2,000 ft and that she could just see the other side of the Bethesda valley from her position (approximately 4 km). She also stated that the cloudbase had dropped significantly over the preceding two hours and there was very little wind.

Reports from other aircraft in the area suggest a cloudbase in the Menai Straits of approximately 1,000 ft amsl with 15 km visibility below the cloud. One aircraft flying over the Menai Straits reported that the mountains of Snowdonia were obscured by low cloud.

Pathology

The post mortem examination of the passenger revealed that he died due to aspiration of his stomach contents into his airways. The aviation pathologist's report states that:

"he had sustained a number of injuries in the crash but none of these would have been necessarily fatal, and indeed the pilot survived having sustained injuries of similar severity...No additional or alternative safety equipment would have been likely to make any difference to this unfortunate event".

Impact conditions

The aircraft had struck gently rising ground at a point approximately 1,970 ft above sea level, close to the local summit of the hillside, on a track of approximately 070°M. The distribution of ground impact features and the pattern of deformation suffered by the aircraft during the initial stages of the impact were consistent with it having been in substantially level flight, banked approximately 10° to the left and pitched slightly nose up relative to its flight path, which for all practical purposes was horizontal at the instant of impact.

During the main impact, the forward momentum of the mainplanes caused both to be moved forward in-plane and to swing downwards in an arc about the restraints offered by the lower ends of the wing struts, until the roof section of the cabin and both wings lay just above the level of the engine cowl and instrument coaming. Associated deformations of the cabin side structure, aided by concurrent forward and upwards swinging of the empennage and rear fuselage (also due to the aircraft's forward momentum), caused the rear part of the cabin, including the aft portion of the door apertures, to fold top-first towards the instrument

panel. Additionally, the left wing rear spar attachment fittings failed in overload as a result of inertial in-plane loading of the mainplanes. Each of these structural deformations was indicative of a substantial impact velocity in the horizontal plane, consistent with the aircraft having been in substantially normal level flight at the time of impact.

Examination of the wreckage

A detailed inspection of the wreckage was carried out *in situ*. The fuel valve was selected ON. The fuel feed pipe from the left wing tank was broken between the inboard rib and the centre section, due to the in-plane rotational movement forward of the wing relative to the fuselage after the rear spar connection had failed. Both fuel tanks were cut open to permit access to their interiors: the right tank, which lay at a slightly higher level than the left, was empty; the left tank contained a small quantity of fuel, to the level of the outlet pipe. It was apparent that fuel had drained from the left tank directly via the fractured fuel pipe, and that the right tank had drained through the same fracture via the interconnecting pipework. The residue of fuel in the left tank was clean, free of visible water contamination, and its colour and odour were consistent with AVGAS.

The carburettor casing had fractured through the float chamber during the impact, and was empty of fuel. The gascolator housing, which lay in the wreckage at a higher level than the fractured carburettor bowl, was also empty. The gascolator bowl and its strainer, and the mesh fuel strainer at the float chamber inlet, were clean.

As found, the throttle plate was almost in the closed position and the throttle knob and its associated push-rod in the cockpit had been bent during the impact whilst at a partial throttle position. However, the throttle spindle

lever at the carburettor was damaged in the impact. Its position, at the lowest point on the engine, was such that it would have been driven towards the throttle-closed end of its travel. It therefore could have potentially back-driven the operating cable and the throttle knob in the cockpit towards the throttle-closed position during the earliest stages of the impact sequence, thus pre-empting the impact damage to the push-rod. As a consequence, the setting of the throttle at the time of impact could not be ascertained. The mixture control lever at the carburettor and its associated control knob in the cockpit were both at the fully rich setting at impact. The hot air control knob in the cockpit was set to COLD at impact, and this setting was confirmed by the position of the valve plate within the hot air box at the carburettor inlet, which was also in the COLD position.

The alternator exhibited evidence of rotational scoring, indicating that the engine was running at impact. Significant impact damage to the propeller blades comprised heavy leading edge deformation and chordwise scoring of the tip region of one blade; circumferential scoring was also present in the tip region of the opposing blade. Overall, the propeller damage was consistent with the engine having been operating at a high power setting at impact.

Both of the wing flap slave cables, which run spanwise to the left trailing edge flap's actuating crank, and both of the aileron control cables in the wing were fractured in overload. This occurred as a result of being stretched by the in-plane displacement of the left wing, following fracture of its rear spar attachment in the impact. The elevator and rudder control cables had been cut by the emergency services just aft of the cockpit, to allow removal of the complete aft fuselage and tail so as to give clearance for the extraction of the surviving occupant. Otherwise, the elevator and rudder cable circuits, and

the elevator control circuit components located under the cockpit floor and comprising the push-pull rod and bellcrank and its connection to the lower end of the control column, were intact and connected. All control surfaces and their control system connections were intact; except for impact deformation of the rudder horn, all moved freely and without restriction on their hinges. The elevator trim tab was set to a neutral position.

Apart from the flap slave cable fractures and some impact bending of the left flap operating rod, the flap control system was intact and free of damage. The flap selector switch in the cockpit was in the flaps up position, but was potentially subject to post-impact disturbance and displayed no damage from which its position at impact could be ascertained. However, the electrical screw-jack flap actuator assembly and the right flap surface, to which it was still connected, were in the fully retracted position at impact.

All the evidence from the crash site suggests that G-BHAC was serviceable and flying essentially normally in level flight when it struck rising ground on a heading of approximately 070°M, banked approximately 10° to the left; possibly after having been pitched up slightly in the seconds before impact.

Discussion

The engineering investigation concluded that the aircraft was serviceable when the accident occurred, so it is likely that the causal factors were of an operational nature.

The pilot's first attempt to fly back to Shobdon would have alerted him to the generally deteriorating weather conditions and a decision was made to return to Caernarfon Airfield. When the pilot was on the ground at Caernarfon, he had the opportunity to study the latest TAFs and METARs as well as the F215

significant weather chart covering his intended route. This information suggested a cloudbase of 1,500 to 2,000 ft amsl which is below the height of much of the high ground in Snowdonia. However, a routing via the Menai Straits and Colwyn Bay would seem to have been feasible given these forecasts. The pilot would also have been aware from a recent airborne report that the Menai Straits were negotiable beneath the cloud and the weather conditions beyond Bangor were significantly better. This is likely to have encouraged an attempt to fly the 'northerly' route back to Shobdon, particularly as the pilot had already considered it a viable option should the direct route back be unsuitable.

After getting airborne the aircraft took up a track which diverged immediately from the stated routing towards the Menai Straits. The track followed was a direct line towards Colwyn Bay, which was also the routing transmitted to ATC at RAF Valley. The pilot's chart had a line drawn from Colwyn Bay to Caernarfon Airfield and the track followed back was coincident with this. The accident site was situated within one mile of this drawn line and its elevation (1,970 ft amsl) is only slightly higher than the height the pilot stated he was flying at (1,800 ft amsl) to ATC. The pilot, having no memory recall of this flight, was not in a position to say why this particular route was followed at a height below the minimum safe altitude into an area of cloud or low visibility. However, given his transmission to ATC that he was routing Caernarfon to Colwyn Bay, the line on his chart reflecting this routing and the radar recording showing that the flight actually proceeded along this route, it does appear that this route was the pilot's intention.

Conclusion

Although, due to the injuries sustained in the accident, the pilot has no recollection of the events surrounding

the accident flight, it would appear that the aircraft was serviceable when it struck the ground and that it was proceeding along the pilot's intended route. His unfamiliarity with the area and the deteriorating weather conditions may well have disguised the danger that the rising terrain presented and led to this controlled flight into terrain. An early climb to MSA, which was accurately marked on the pilot's flight log or an accurately flown track over the Menai Straits, would almost certainly have prevented this tragic accident.

The CAA General Aviation Safety Sense leaflet 23 entitled '*Pilots: It's Your Decision*' states the following;

'Probably the single most important factor in General Aviation flight safety is the decision of a pilot to begin, or to continue with a flight, in unsuitable weather conditions. As you might expect, weather was a major factor in fatal accidents: over 80% of Controlled Flight Into Terrain accidents happened when the pilot either continues flying in adverse weather, or did not appreciate the actual effects of the weather conditions....Remember that weather does not stay constant, it doesn't always do what the forecast predicts, and it can deteriorate very fast. Respect the weather and the implications for flight safety.'