

Aircraft type and registration: Piper PA 38—112 Tomahawk G-BGKX (light single engined fixed wing aircraft)

Year of Manufacture: 1978

Date and time (GMT): 2 April 1985 at 1727 hrs

Location: Jackson's Bay beach, Barry Island, South Wales

Type of flight: Training

Persons on board: Crew — 1 Passengers — None

Injuries: Crew — 1 (serious) Passengers — None

Nature of damage: Aircraft destroyed

Commander's Licence: Student Pilot

Commander's Age: 17 years

Commander's total flying experience: 13 hours and 50 minutes, all on type and of which 1 hour and 25 minutes were solo flight

Information Source: AIB Field Investigation.

The aircraft was on a local training flight in the Cardiff Airport circuit area. It was flown by a student pilot, on his third solo flight as part of an approved course of instruction towards gaining a Private Pilot's Licence. Immediately prior to this flight, the student had flown for 30 minutes with a qualified flying instructor on a dual instruction flight which covered circuits, landings, and a pre-solo check. The instructor reported that the student's performance was satisfactory, and the aircraft was therefore landed and taxied to the parking area where the instructor vacated the aircraft with the engine running. He further reported that he briefed the student to continue flying solo circuits for another 30 to 45 minutes, and that when he left the aircraft the fuel gauges were indicating about 5 US gallons per side with one gauge (he could not remember which) indicating slightly higher than the other. The instructor added that he told the student to change tanks if the fuel in one got low.

The student pilot took off on his solo flight at 1646 hrs and remained within the Cardiff Airport circuit area. The weather at the time was fine, with a light southerly wind, visibility of 20 kilometres and no significant low cloud. After he had been airborne for about 40 minutes, and when the aircraft was in a climb back up to circuit height, the engine suddenly stopped. The pilot immediately lowered the nose of the aircraft and closed and re-opened the throttle. The engine re-started momentarily, then coughed and stopped again. The pilot transmitted an emergency radio message to Cardiff Airport Air Traffic Control (ATC) stating that he had engine trouble. In response to a question from the ATC controller concerning the nature of his emergency and intentions, the pilot replied that he was over Barry docks and making a forced landing on the beach by the holiday camp. No further radio transmissions were received from the aircraft, and the ATC controller immediately alerted the emergency services.

At about the time that the pilot transmitted his emergency message to ATC, the aircraft was observed, by another pilot flying in the Cardiff circuit, to descend suddenly. The next eye-witness reports are of the aircraft observed to be in a descent, at a very low altitude and apparently making no noise, approaching the open car park area of the holiday camp on the south of Barry Island. The car park is sited on a considerable down slope towards the cliff tops, which lie about 23 metres vertically above the beach. The cliff side edges of the car park are bounded by a 2½ metres high iron fence. The aircraft first struck the ground in the car park about 5 metres from, and heading directly towards, the iron fence. It penetrated the fence, which considerably reduced its forward speed, before descending almost vertically down the side of the cliff face and finally came to rest inverted amongst rocks and sand. Eye-witnesses released the pilot from the wreckage and he was transferred to hospital. The aircraft was destroyed. The witnesses reported that, immediately after the accident, a significant quantity of fuel was evident in the vicinity of the wreckage.

Initial examination revealed that both the aircraft's fuel tanks had been ruptured in the impact and were empty. Only a small quantity of fuel (27 ml) was found in the fuel system, however little significance could be attached to this, as it is possible that the lines had been drained either during the aircraft break up or after it had come to rest inverted on the beach. The electric fuel pump was found selected 'ON', and the fuel cock was selected to the right side wing tank. An examination of the engine revealed that it was free to rotate and that its internal mechanisms

were intact. There was no evidence of any malfunction or failure in either the fuel or ignition systems which could explain an engine stoppage. Some chafing damage to the insulation of the wire from the magneto switch to the starter solenoid was found, and this damage had exposed the conductor at a position about 40 centimetres from the switch itself. However, as there was no evidence of any electrical shorting, this was not considered to be relevant to the engine stoppage.

In the Piper PA 38-112 aircraft, the fuel is stored in two 16 US gallons capacity fuel tanks, one in each wing. One US gallon is declared to be unusable in each tank, resulting in a total usable fuel quantity of 30 US gallons. The usable fuel only is indicated on two gauges situated near the top of a central throttle quadrant. The gauges are calibrated at 5 US gallon intervals, showing 15, 10, 5 and 0, with a red warning mark immediately beneath the zero indication. A fuel tank selector control is located on the throttle quadrant between the two fuel gauges. It has three positions, 'OFF', 'LEFT', and 'RIGHT', and is situated on the quadrant so that when 'LEFT' or 'RIGHT' is selected the control selector itself is also pointing towards the fuel gauge relating to the particular tank from which fuel is being used. There is no facility for feeding from both tanks simultaneously, and no common balancing line between the tanks. The aircraft's Operating Handbook contains details of fuel consumption on cross-country flights, but there are no figures relating to fuel consumption on training flights when the aircraft might remain in an aerodrome circuit area. However, the general consensus amongst operators is that the fuel consumed during circuit training flights is typically 6 US gallons per hour.

G-BGKX was last re-fuelled to capacity at about 1530 hrs on 1 April 1985, and was not flown again that day. On 2 April 1985, prior to the commencement of the accident flight, the aircraft had completed a total of 3 hours and 30 minutes flying time, all within the Cardiff Airport circuit and had not been further re-fuelled. Thus at this time the aircraft should have used an estimated 21 US gallons of fuel, resulting in 9 US gallons of usable fuel remaining in the tanks. This estimation is confirmed by the flying instructor's recollection that when he vacated the aircraft, with the engine running, the fuel gauges were indicating about 5 US gallons per side, with one gauge slightly higher than the other. The student pilot reported after the accident that when he took off the fuel was selected from the right side tank and that he did not alter this selection throughout the flight. The total flight time from take-off until engine stoppage was 42 minutes, giving an estimated consumption of 4.2 gallons.

It was the flying school's practice, generally, to have the training aircraft refuelled to full tanks at the end of each day's flying. The aircraft would then usually be able to operate throughout the following day without the need to refuel. It was also general practice to fly the first training detail of the day with the left or right fuel tank selected throughout the flight, and thereafter to fly training details with the tank containing the greater quantity of fuel at the start of the sortie, remaining selected for most of the sortie. Consequently, during circuit training details, airborne fuel tank changes may well have been uncommon. However, the flying school's ground training programmes contained detailed instruction on the layout and management of the fuel system, and on dual instruction flights the importance of monitoring the fuel system was emphasised. It is also relevant that, on circuit flying, a check on the quantity and disposition of the fuel was a requirement in the downwind checks on every circuit.