

No: 7/90

Ref: EW/C1155

Category: 1c

Aircraft Type

and Registration: Cessna 210, PH-EYE

No & Type of Engines: 1 Continental IO-520 L-3A piston engine

Year of Manufacture: 1977

Date and Time (UTC): 5 April 1990 at about 0851 hrs

Location: Dunbrach, approximately 11 nm northeast of Glasgow Airport

Type of Flight: Private (business)

Persons on Board: Crew - 2 Passengers - None

Injuries: Crew - 2 (fatal) Passengers - N/A

Nature of Damage: Aircraft destroyed

Commander's Licence: Netherlands Private Pilot's Licence (First Class) valid until 1 September 1990

Second Pilot's Licence: Netherlands Private Pilot's Licence (Second Class) valid until 1 September 1990

Commander's Age: 46 years

Second Pilot's Age: 46 years

Commander's Total Flying Experience: About 300 hours

Second Pilot's Total Flying Experience: 295 hours (of which 175 hours were on type)

Information Source: AAIB Field Investigation with the assistance of the Netherlands Aeronautical Inspection Directorate, Accident Investigation Bureau

The aircraft was on a private business flight from Texel airport, in the Netherlands to Glasgow Airport with two pilots on board. After a flight in clear weather across the North Sea, the cloud became progressively thicker and whilst attempting to carry out an ILS approach to runway 23 the aircraft crashed into high ground approximately 11 nautical miles northeast of the airport, and 2.5 nautical miles north of the ILS centreline.

History of the Flight

On the early morning of 5 April 1990 the two pilots arrived at Texel airport to prepare for the planned flight to Glasgow. The aircraft was filled to capacity with fuel, which would have given a flight

endurance of 5 hours and 30 minutes. A weather forecast was obtained by telephone from the Meteorological Service at Amsterdam (Schipol), and the commander is reported to have been satisfied that, although the weather was not at its best, VFR flights to Scotland were possible. He filed a VFR flight plan declaring an intended departure time of 0600 hrs and a route direct to Dogger, direct Newcastle, direct Talla to Glasgow. The expected elapsed flight time was 2 hours and 40 minutes, and the nominated alternate airport was Edinburgh. The flight time and fuel endurance calculations were in accordance with performance data included in the aircraft owner's manual. The flight plan also indicated that the aircraft carried life jackets, but no other survival equipment was on board.

The aircraft took off from Texel at 0608 hrs with the second pilot occupying the left side pilot's seat and the commander seated on the right. It climbed to FL 85 and, under radar surveillance from Amsterdam ATC, set course for Dogger. At 0636 hrs it transferred to London Information who, after positive identification, further transferred it to London Airways North Sea Sector East for a radar advisory service and it was cleared to fly directly to Newcastle at FL 85. The transit of the North Sea appears to have been without incident and there were no further radio messages, other than routine position reports and transfer of surveillance between adjacent sectors until 0843 hrs, when the aircraft first contacted Glasgow Airport Approach Control. PH-EYE was informed that it was identified on radar at a position twenty-six miles southeast of Glasgow, and to expect radar vectoring for an ILS approach to runway 23. The pilot indicated that he understood and further advised that he had received the ATIS information 'Golf'. This broadcast the following weather conditions:- Surface wind 220/17 knots, visibility 18 kilometres in rain, cloud 2 oktas 900 feet, 4 oktas 1700 feet and 6 oktas at 2800 feet. Air temperature plus 05, Dew Point plus 03. There were no warnings of unserviceabilities or unusual circumstances.

PH-EYE was initially cleared to descend to 5000 feet, having changed the altimeter pressure setting to 1009 millibars. The pilot acknowledged the descent clearance but mis-read the pressure setting and read back 1019 millibars. This was queried by the ATC controller and the pilot confirmed that he had re-set the correct the correct pressure setting of 1009 millibars. The aircraft continued its descent and, at 0836 hrs, was further cleared to descend to 3500 feet and advised to turn onto a heading of 345 degrees. The pilot indicated that he understood this clearance and complied with it. At 0841 hrs the Glasgow Approach Radar Controller instructed PH-EYE to turn left onto a heading off 330 degrees, and, one minute later, to turn onto a base leg heading of 315 degrees. The pilot acknowledged these instructions and next reported that he was heading 315 degrees at a height of 3000 feet. Immediately the Glasgow radar controller informed the pilot that he was not cleared to 3000 feet (which was below a safe altitude for the area), and requested that he climb back to 3500 feet. The pilot indicated that he would comply with this instruction, and the radar recording confirms that he did so.

At 0845.32 hrs the RTF tape recording records the pilot of PH-EYE reporting that he was established on the localiser and the controller advised a range of 14 miles from touch down and cleared continued descent on the glide path. At 0846.53 hrs the Glasgow approach controller advised PH-EYE that he appeared to be tracking to the south of the localiser and suggested a heading change to re-establish on the ILS centre-line. There was no immediate reply to this transmission until, at 0847.16 hrs, there was a garbled transmission from PH-EYE when the pilot reported some icing problem, and said that he had

passed 2000 feet. The radar controller, aware that the aircraft was probably well below safety height in an area of high ground, advised that the aircraft should climb and turn right, the long way around but away from the highest peaks in order to re-establish on the ILS centre-line. The pilot appeared to acknowledge the instruction, saying that he was at 1700 feet, and, six seconds later reporting level at 2000 feet. This was the last radio transmission received from PH-EYE. The ATC radar controller made several repeated, but unsuccessful, attempts to regain radio contact with the aircraft and, at 0852 hrs, an emergency situation (Aircraft Missing) was declared and the Diversion and Distress Cell was alerted. The response was immediate and two Search and Rescue helicopters, based at the Royal Air Force Stations at Leuchars and Boulmer, were scrambled and tasked with carrying out a search. A third helicopter, operated by the Strathclyde Police, was also involved in the search.

The search was hampered by the extremely adverse weather conditions, however the aircraft wreckage was located at 1047 hrs. It had crashed into the hill of Dunbrach at a height of 1700 feet above mean sea level, and, immediately after the impact, there had been a fierce fire. Both occupants were killed instantaneously in the initial impact. The accident was non-survivable.

Pilots' Licences and Experience

Details of the two pilots' licences and their flying experience were provided by the Netherlands Aeronautical Inspection Directorate, Accidents Investigation Bureau. The Netherlands regulations concerning the privileges resulting from the issue of a Private Pilot's Licence (PPL) divide the licence into two categories. A PPL (first class) allows the holder to make VFR flights both within the Netherlands and to foreign destinations. A PPL (second class) restricts the holder to making VFR flights within the Netherlands and to certain agreed aerodromes in Belgium and West Germany only. This restriction is annotated on the licence.

The commander held a Netherlands PPL (first class) which was valid until 1 September 1990, with a current medical certificate and radio-operator's licence. His total flying experience could not be accurately established as his personal flying log book has not been found. However records held in the Netherlands show that his total flying experience up to June 1989 was 267 hours of which 45 hours were under instruction. During the previous twelve months he had flown 45 hours with approximately 90 take-offs/landings. He did not possess an Instrument Rating and there is no record of any previous instruction in flight under IFR.

The second pilot held a Netherlands PPL (second class) which was valid until 1 September 1990, with a current medical certificate and radio-operator's licence. His total flying experience was 295 hours of which 56 hours were under instruction, and 24 hours under instruction in flight under IFR. His personal flying log book recorded a total of 175 hours in the Cessna 210. He did not possess an Instrument Rating.

Radio Aids to Navigation

The Cessna 210, PH-EYE was fitted with all the flight instruments and radio-navigation receivers necessary for flight under IFR. The latter included VOR/ILS, ADF, DME, and Transponder. The examination of the wreckage showed that a comprehensive selection of aeronautical maps and airport arrival charts had been carried, although there was no trace of any topographical maps.

Immediately after the accident a flight check of the Glasgow Airport runway 23 ILS was carried out in an aircraft from the CAA Flying Unit, Stansted. The check confirmed that the equipment performed in accordance with the specified standards. All other ATC radios and radio aids to navigation were fully serviceable.

Examination of the wreckage

The aircraft had flown on an estimated track of 250° magnetic into a rocky area of hillside with a local slope of approximately 45° and had come to an immediate halt. Several items of wreckage had subsequently fallen back down the hill. The intense post impact fire had consumed most of the fuselage and tail surfaces, with only the wings and engine surviving in recognizable form. The centre section had burnt but the left wing had remained attached to most of the right wing via the main spar. The remains of the tail were not at first visible although they were later found underneath the wings, which had clearly slid back a short distance during the fire. A few pieces of windscreen perspex had been thrown up the hill from the impact point.

It was apparent that the main force of the impact had been borne by the nose of the aircraft: the engine sump had been flattened against the crankcase and the wings had tended to sweep forwards about the centre section under inertial loads, as could be seen by the distortion of the wing spar. The wings themselves had suffered comparatively light contact with the hillside although the outboard section of the right wing had broken off as a result of striking a sharp edged rocky outcrop. The rock had fragmented and fallen away where it had been struck by parts of the aircraft; thus there was a lack of sharply defined witness marks. However the disposition of the wreckage indicated that the aircraft was in a nominally wings level attitude at the time of the impact. The tail surfaces, being found at a lower level than the wings, suggested a nose high attitude at impact: in fact there was a mark on a nearby rock that could conceivably have been made by the right hand tailplane tip. Furthermore, the presence of windscreen fragments above the point of impact at least precluded a nose down attitude.

The propeller was found some 60ft to the right of the impact point (when viewed along track), such a displacement occurring as a result of significant rotational energy following the failure of the propeller shaft during the impact. The blades had suffered considerable leading edge damage, which, together with chordwise scoring, indicated that a considerable amount of power was being developed by the engine at impact. The tip from one of the blades had broken off and this was later found at the presumed impact point in the heavily disturbed earth under the main wreckage.

No hard evidence was found that gave an indication of the speed of the aircraft at impact. However, a subjective assessment made from the degree of impact damage put the speed in the region of 100kts, ie less than the cruising speed of 150 kts. Thus an overall picture emerged of the aircraft striking the hillside in a climbing attitude, wings level and with the engine developing considerable power.

Following an on-site examination, when it was established that the aircraft had been structurally complete at impact, the wreckage was recovered to the AAIB at Farnborough for a detailed examination.

It was established that the landing gear and flaps were retracted, and that the elevator trim was close to the mid position. The fuel filler caps in the wings were still in position and the fuel cock was found selected to the left wing tank. The heating coil in the pitot head functioned satisfactorily although its associated cockpit switch and electrical circuit were destroyed in the fire and could not be checked. Most of the cockpit instruments, including the navigational instruments, had also been destroyed in the post impact fire. However an altimeter face was recovered with its subscale set at 1009mb, which was the Glasgow QNH.

The two engine driven vacuum pumps (which provided suction to the artificial horizon and the directional gyroscope) were disassembled and found to have suffered no pre-impact failure.

Examination of the engine revealed that four cylinder hold down nuts were missing from the right hand bank of cylinders, two each from the front (no.5) and centre (no.3). In each case they were adjacent nuts from the 8 and 10 o'clock positions on the cylinder flanges. The studs they picked up on were in fact crankcase through bolts which reappeared on the left hand side of the engine in the 8 and 10 o'clock positions of the centre (no.4) and rear (no.2) cylinder flanges. The nuts were still present on these cylinders, although the through bolts had migrated through the crankcase to the extent that the nuts had contacted the innermost fins on the cylinders. It is considered that this condition had existed for some time prior to the accident and clearly would have caused an uneven clamping force on the flanges of the affected cylinders. It is also possible that there would have been a similar loss of clamping on the main bearings, with a consequent reduction in oil pressure. In view of this the engine was subjected to a strip examination, when it was found that all bearings were in good condition, the oil filter was clear and that no cracks had yet become visible on the cylinder flanges. It was therefore concluded that although the loose and missing nuts may have caused problems had the engine continued in service in this state, they would not have affected the power output and hence had no bearing on the cause of the accident. Information provided by the Dutch authorities confirmed that the aircraft had been maintained in accordance with an approved maintenance schedule and that the Certificate of Airworthiness was renewed in February 1990. The engine and airframe had achieved approximately 1477 operating hours. The engine, which would have been due for an overhaul at 1700 hours, had had a shock load inspection in December 1981 following an incident and this would most probably have been the last time the cylinder flange nuts were tightened.

Meteorological information

The initial weather information concerning the forecast landing conditions at Glasgow, that the commander reportedly obtained from the Meteorological Service at Amsterdam (Schipol), indicated generally cloudy conditions with the forecast:-

Valid 0400/1300 hrs - Surface wind 220/12 kts, visibility in excess of 10 km, cloud 2 oktas cumulus 1800 ft and 5 oktas strato-cumulus 3000 feet, temporarily visibility 7000 metres, cloud 5 oktas cumulus 1200 feet. Probability 20% between 0400/0700 hrs visibility 5000 metres, showers of rain or snow, cloud 5 oktas at 800 feet.

An aftercast provided by the Meteorological Office, Bracknell has reported that, at the time of the accident, the synoptic situation was a cold front lying from Malin Head to Islay to Fraserburgh. Visibility was generally 15 kilometers in continuous light rain, reducing considerably in sleet and snow on high ground. Cloud: patches of Stratus base 800 feet, Broken Strato-cumulus base 2000 feet merging with Overcast Layers base 3000 feet tops to 10000 feet. The Zero Degree Isotherm was 2000 feet. The aftercast concludes with the remark that moderate accumulations of ice may well have been picked up with prolonged flight in strato-cumulus near the frontal zone on approach to Glasgow. Prior to descent towards Glasgow the aircraft had cruised for about 2 1/2 hours at FL 85, where the air temperature would have been generally around minus 14 degrees Celsius.