

AAIB Bulletin No: 2/94

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Category: 2.3

Aircraft Type and Registration: Robinson R22 Beta, G-OJPI

No & Type of Engines: 1 Lycoming O-320-B2C piston engine

Year of Manufacture: 1988

Date & Time (UTC): 20 November 1993 at approximately 1610 hrs

Location: 1 mile west of Talybont reservoir, near Brecon, Wales

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - Fatal Passengers - N/A

Nature of Damage: Aircraft destroyed

Commander's Licence: Student Pilot

Commander's Age: 42 years

Commander's Flying Experience: Total - 40 hours
Last 90 days - 40 hours
Last 28 days - 22 hours

Information Source: AAIB Field Investigation

History of the flight

The pilot planned to fly from Bristol Lulsgate Airport to his home in Llandeilo, some 60 nm to the north west on the other side of the Brecon Beacons. The flight took off from Bristol and, when it did not arrive at Llandeilo before darkness fell, emergency action was initiated.

The pilot had passed the General Flying Test for the award of his Private Pilot's Licence (Helicopters) two days previously but, as he was not at that time in possession of his new licence, he was still flying under the sponsorship of his flying instructor. This flight was therefore undertaken as a 'continuation training' navigational exercise.

The general aviation forecast was not specific as to the weather in the area of Brecon, although it did state that there would be mist after 1100 hrs, with cloud on the hills and a freezing level of 1,000 feet. The weather at Bristol was reported as 020°/3 kt, with 3,500 metres visibility below scattered cloud and the instructor, who had flown twice during that morning, considered that both the visibility and cloudbase were well within VMC limits and were better to the north west of Bristol. However,

subsequent to the accident, one witness, who was walking the hills in the area at the time of the accident, reports that there was an unbroken cloud cover across the hill tops at 2,000 feet, reducing visibility in cloud to 80 metres. This would still have allowed the flight to continue in VMC below the cloud provided that the planned route along the valleys was maintained.

The pilot had planned two possible routes to his destination: One following the Usk valley, via the Severn Bridge, Abergavenny, Brecon and Llandoverly; and the other, a poor weather alternative route, round the south coast of Wales. Even though the instructor had previously flown the inland route as a dual exercise with the pilot, he spent nearly an hour discussing it and other relevant matters with him and he was fully confident of the pilot's ability to conduct the flight in the prevailing meteorological conditions. If flown according to the flight plan, either route would have been accomplished in VMC within daylight hours and the instructor was not aware that the pilot intended to deviate from the planned flight.

At 1508 hrs, the helicopter took off with full fuel tanks, giving about 4 hours duration, and proceeded as directed by ATC, not above 2,000 feet on a 'Portishead Departure' to the Severn Bridge. The pilot reported Portishead at 1515 hrs and was told to contact Cardiff ATC, which he did at 1516 hrs informing them of his route via Brecon. He was then told that he would receive a Flight Information Service. At 1526 hrs he informed ATC that he was "JUST NORTH OF THE SEVERN BRIDGE" and was estimating Brecon in 18 minutes. At 1544 hrs, Cardiff ATC asked whether he had reached Brecon and was told that he was "CURRENTLY NORTH OF MERTHYR" and "HEADING OVER SENNYBRIDGE THEN TO LLANDEILO". At this time he was told that radio contact with him might be lost due to terrain and this was the last communication with the aircraft.

Exactly what route the flight followed cannot be determined but it was subsequently possible, by replaying the recordings of the primary radar returns, to track what is believed to be the subject helicopter flying in the area between Talybont reservoir and Llangorse lake, which lie respectively 2 nm south and 2 nm north of his planned route. Radar contact was lost at 1602 hrs in amongst the returns from the surrounding high ground, although, without secondary radar, it cannot be certain that the recorded radar returns are of the subject aircraft. This timing, however, accords with the evidence of one witness, who states that, at 1605 hrs, he watched and heard a light helicopter, fitting the description of the subject aircraft, flying in the area. A few minutes later, between 1605 hrs and 1610 hrs, although this witness had turned his attention elsewhere, he heard the noise suddenly stop, followed by a 'pop' sound. This is believed to have been the time of the accident.

Search and recovery

As a result of the initial notification, four helicopters and four mountain rescue teams (MRTs) were tasked to locate a possible crash site. The search area was extensive and stretched from the last

reported position of the aircraft, north of Merthyr, to Sennybridge and Llandeilo. The ground and the wreckage (as found) were snow covered and the meteorological conditions were not favourable for a search. Nevertheless, having searched every possible area of the Brecon Beacons and beyond, an area of about 600 square miles, the MRTs located the wreckage at 1450 hrs the following day, near Talybont reservoir. Given the hostile nature of both the topography and the weather, the organisation, efforts and success of the civil and military MRTs are commendable.

Post mortem examination

A post mortem examination of the pilot did not reveal any abnormalities which could be considered as contributory to the cause of the accident.

Examination of wreckage

The helicopter had flown into a north facing hillside at about 1,800 feet amsl where, although the slope was locally approximately 30°, the gradient was less steep immediately above and below the impact site. The impact track was 172° magnetic and the extent of disintegration of the helicopter indicated a high impact speed, which was subjectively assessed as being about 70 to 80 kt, a normal cruise speed. The helicopter had come to an immediate halt, with the tail boom whipping round to the right causing the tail rotor to become embedded in the ground. Debris consisting mainly of canopy perspex and door frame fragments were scattered more than 20 metres up the hillside. The disposition of the wreckage suggested that the impact had been almost entirely in a horizontal direction, with little or no vertical component, and with a near level pitch attitude.

A main rotor strike was identified in the ground approximately 2 metres up the hill from the main wreckage. The geometry of the aircraft indicated that the rotor strike must have occurred almost simultaneously with the fuselage impact. The aircraft roll attitude could therefore be estimated from the rotor strike angle, which, from the angle and direction that the turf had been cut, suggested a 25° bank to the left.

One of the main rotor blades had sustained severe damage close to the tip; it was probably this blade that was responsible for the strike in the hillside ahead of the aircraft. The other blade had made a grazing contact with the ground over most of its span, causing it to be bent upwards and against the direction of rotation. It appeared that the main rotors had struck the ground with considerable energy, which in turn indicated a high RPM.

The wreckage was recovered to the AAIB at Farnborough for a more detailed examination. The recovery was hampered by snow that had fallen after the accident, with the result that some of the smaller items of wreckage were not found. Most of one tail rotor blade was not recovered, although

the portion that remained attached to the spindle indicated that it was an overload failure such as could be expected in a violent impact. The amount of perspex fragments recovered was less than the canopy area, although the absence of blood or feathers on the canopy and its frame did not suggest that a birdstrike had occurred prior to impact with the ground.

The flying controls had been severely disrupted, especially under the cabin floor. Nevertheless it was possible to ascertain that there had been no pre-impact disconnect. The collective pitch lever friction control was found jammed in the quadrant that was attached to the lever. The position was at the approximate mid point of the range of travel, which suggested a typical cruise position for the collective lever. The RIGHT TRIM knob (which, when pulled out, operates a biasing system on the lateral cyclic controls such that it counteracts a tendency for the aircraft to roll to the left) was found in the extended position; this would have been the normal selection with the aircraft in the cruise.

Damage to the engine cooling fan included some circumferential scoring, which was indicative of fan, and therefore engine, rotation at impact. Additional confirmation of engine rotation was provided by an index mark on the nut that attached the fan drive flange to the end of the crankshaft. This had slipped, in a rotational sense, relative to a corresponding mark on the fan flange, indicating that the engine crankshaft had continued to rotate momentarily after the fan had been halted by contact with its surrounding cowl. A strip examination of the engine did not disclose any untoward features in any of the internal components. The oil pump was located in the accessory gearbox at the front of the engine, and this had broken open in the impact. Evidence of pump rotation was provided by the rotor vanes having caused circumferential gouges in the internal surfaces of the housing. The oil filter was clear of metal debris. The carburettor heat control knob was found with the shaft bent over at a point which suggested that the knob had been in the extended position (ie HOT) at impact.

Examination of the wreckage revealed no evidence of a technical malfunction that could have contributed to the accident.