

No: 8/91

Ref: EW/C91/3/3

Category: 2c

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

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

Year of Manufacture: 1988

Date & Time (UTC): 10 March 1991 at 1305 hrs

Location: near Halifax, West Yorkshire

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - 1

Injuries: 1 occupant (fatal); 1 occupant (serious)

Nature of Damage: Aircraft destroyed

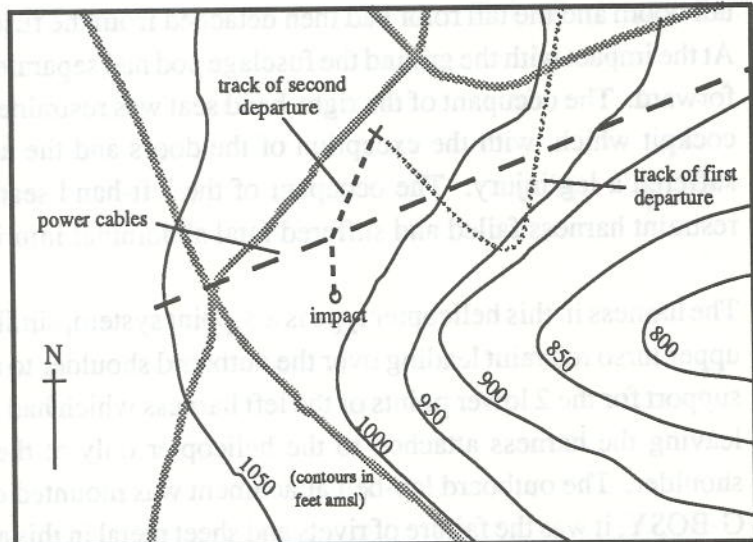
Occupants' Licences: Both Private Pilot's Licence (Helicopters)

Occupants' Ages: (1) 44 years (2) 43 years

Occupants' Flying Experience: (1) 70 hours (all on type)
(2) approx 680 hours (number on type not known)

Information Source: AAIB Field Investigation

The aircraft was operating from a field near the head of a shallow valley with the lower ground to the east. A line of three power cables supported on wooden poles 20 feet high crossed the head of the valley, running from the south-west to lower ground to the north-east. The suggested landing point had been marked with a white cross, approximately 20 metres from a road that bordered the field. The surface wind was 160°/7 kt. The aircraft, carrying two of the owner-pilots, had flown in from its operating base earlier that day and the pilots had reconnoitred the landing site by



overflying it at low level before landing on a heading of 215°. The pilot in the left seat disembarked and the other pilot moved across to the right seat. A passenger then climbed into the left seat and the aircraft took off for a 25 minute air experience flight. After lifting off, the aircraft turned left through approximately 90° and accelerated to climb away over the lower ground to the south-east. This departure path took the aircraft over and well clear of the power cables, which crossed the lower end of the field from which the helicopter was operating.

20 On its return the aircraft again landed on a heading of approximately 215° but was not shut down. The passenger disembarked, followed by the pilot, who walked round the nose and climbed back into the left seat. The other pilot, who had remained on the ground during the previous flight, then climbed into the right seat.

The aircraft took off again but, on this occasion, it left the landing site on a heading of approximately 200°; a track which would have allowed it to accelerate over gently falling ground and then turn left over the valley to head for its operating base. This track was slightly downhill so that, as the aircraft accelerated in level flight, its height above the ground increased only slowly. The track also crossed the power cables which, at this point, were rising gently towards the northern end of the valley. After flying level for some 8 seconds the aircraft was seen to pitch sharply upwards. Immediately afterwards the left forward skid support strut struck the cables and a bright flash was seen. The aircraft pitched down and fell to the ground.

A video film of the final take-off was taken by an observer near the landing site. The film did not show which pilot was handling the cyclic control during the take-off but did show the occupant of the left seat waving his left hand as the aircraft was lifting off. The film showed the aircraft flying level after lift-off and beginning to climb less than a second before impact with the cables.

Examination of the wreckage at the accident site showed that it was indeed the left forward skid support which had contacted the 11kV cables, breaking two of the three. From the pattern of damage to the tail boom and one main rotor blade, it was apparent that the tail boom had been struck by the main rotor and this matched the last clear frame of the video recording, which showed the tail being pitched rapidly into the plane of the main rotor. The distribution of the wreckage showed that the tail boom and the tail rotor had then detached from the fuselage pod before impact with the ground. At the impact with the ground the fuselage pod had separated from the skid landing gear and tumbled forward. The occupant of the right-hand seat was restrained by his harness and remained within the cockpit which, with the exception of the doors and the acrylic transparency, remained intact; he suffered a leg injury. The occupant of the left-hand seat was ejected from the cockpit when his restraint harness failed and suffered fatal abdominal injuries.

The harness in this helicopter type is a 3-point system, similar to that in use in cars, with the diagonal upper torso restraint leading over the outboard shoulder to an inertia reel. In this accident it was the support for the 2 lower points of the left harness which had failed, entirely releasing the lap-belt and leaving the harness attached to the helicopter only at the point behind the occupant's outboard shoulder. The outboard lap-belt attachment was mounted on to the fabricated seat structure and, in G-BOSY, it was the failure of rivets and sheet metal in this area which had released the lap-belt. The inboard attachment was to a tube which also reacted the loads from the friction slide for the collective stick; this tube, together with the 2 small bolts on the other side of the attachment, had failed. There was no evidence of any pre-existing damage in the helicopter which would have contributed to the accident. The engine was later removed and taken to an engine overhaul facility where it was mounted on a test bench equipped with a dynamometer. The engine started easily and was then subjected to a normal test schedule. Without any modification to the engine itself, its carburettor or its ignition, the engine delivered power to within 3% of that acceptable for a newly overhauled unit.