

AAIB Bulletin No: 9/93

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Category: 1c

Aircraft Type and Registration: Avions Pierre Robin DR400/2+2, G-RBIN

No & Type of Engines: 1 Lycoming O-235-H2C piston engine

Year of Manufacture: 1978

Date & Time (UTC): 21 May 1993 at 1138 hrs

Location: M2 Motorway near Rochester Airport, Kent

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - Serious Passengers - N/A
Others - 3 Minor

Nature of Damage: Aircraft destroyed

Commander's Licence: Private Pilot's Licence

Commander's Age: 44 years

Commander's Flying Experience: 151 hours (of which 144 were on type)
Last 90 days - 2 hours
Last 28 days - Nil

Information Source: Aircraft Accident Report Form submitted by the pilot and inquiries and wreckage examination by AAIB

The pilot reported that he intended to fly the aircraft for a number of practice circuits at Rochester Airport. He carried out thorough pre-flight checks, including a fuel system water drain check and a satisfactory engine run-up. The fuel tank was about three-quarters full. The circuits were planned for Runway 20R, a grass surfaced runway with a published take off and landing distance of 827 metres. Immediately beyond the upwind end of the runway the ground drops away steeply into a valley running approximately 160/340°M. The M2 motorway runs along the north east side of the valley, crossing the extended centreline of Runway 20 approximately 120 metres horizontally beyond the upwind end of the runway and 70 feet below its level. The reported wind was 6 kt from 180°M; there was no low cloud and visibility was good.

The pilot flew three touch-and-go circuits, with the fuel mixture control left at full rich and the electric fuel boost pump switched on throughout, in accordance with normal practice for circuit flying, and in each case with the carburettor heat control applied on base leg and pushed back in to cold during the ground run. Following a normal approach and landing on the third circuit, full throttle was applied,

carburettor heat was set to cold, and 15° flap selected and a normal take off was achieved. At around 100 ft agl, approximately over the upwind end of the runway, the engine rpm smoothly reduced to below the normal idle value. The pilot lowered the aircraft's nose, confirmed that all controls were correctly set, and made a Mayday RT call. A Flying Club instructor waiting in an aircraft at the take off hold heard the Mayday, sighted G-RBIN flying level at 50 to 100 ft agl in a gentle descent and advised "Turn right" a number of times over the RT, with the intention of a forced landing in a field at the bottom of the valley, but this was not heard by G-RBIN's pilot. G-RBIN was also sighted by the pilot of an aircraft which had just taken off. It was seen to drop the left wing, turn left and descend in a flat attitude and to arrive on the hard shoulder of the south east bound carriageway of the M2 while travelling approximately north west. The pilot overhead reported motorway traffic as light in both directions. Part of the left wing detached on impact; the right wing contacted a bank adjacent to the hard shoulder but without major damage resulting. A passing coach sustained impact damage, causing breakage of windows and minor injury to three passengers. There was no fire.

The aircraft overhead continued circling and provided information to Rochester AFIS. An air ambulance helicopter based at Rochester Airport was scrambled and arrived at the site shortly after the crash, followed by ground emergency vehicles. The pilot was extracted, having suffered spinal injury. The aircraft sustained severe damage to the forward fuselage and the left wing.

Examination of the aircraft was carried out after recovery to the airport. No evidence was found of any anomaly in the engine controls but these had been considerably disturbed by this stage. Close inspection of the fuel system revealed no signs of blockage or leakage, although the pre-accident setting of the fuel shut-off valve could not be positively established; the possibility of fuel pipe disconnection could not be totally dismissed; and the evidence indicated that a bulb may not have been present in the cockpit fuel low pressure warning light. The electric fuel pump was found to function normally. Magneto timing did not differ significantly from requirements but on bench test the right magneto failed to produce consistent sparks below 500 rpm, compared to a requirement of 200 rpm. Examination indicated an intermittent high resistance in the primary coil, particularly after the coil had been heated. Such a fault could be expected to produce misfiring at high engine rpm.

Engine strip examination showed no evidence of pre-accident malfunction or failure, except in the case of the engine driven fuel pump. This pumps fuel to the carburettor by means of a reciprocating diaphragm operated by an engine driven lever and by springs. A cam in the engine accessory gearbox acts on the lever to drive the diaphragm up and suck fuel into the pumping chamber via a non-return valve; further rotation of the cam allows the diaphragm to be driven downwards under the influence of

a helical compression spring and thus expel fuel from the chamber to the outlet via a second non-return valve. A second helical compression spring acts on the diaphragm end of the lever to preload it downwards. The springs are located in an upper chamber that is open to the interior of the gearbox. Strip examination found that the lever spring had fractured into three parts, and markings suggested that the pump had operated in this condition for a limited period. Specialist inspection confirmed that both spring fractures had resulted from fatigue cracking under the effects of torsional loading. The spring surface had extensive patches of rust, with corrosion pitting in some areas, but it was probable that at least some of this corrosion had occurred

after the accident. Operation of the pump, reassembled with the lever spring absent, on a similar engine on a test bed found no significant difference in fuel pressures and flows compared with operation with a normal pump, throughout the engine operating envelope, with and without backing pump pressure. However, the possibility that the lever or diaphragm had been jammed by parts of the broken spring could not be dismissed, but an operating electric pump should have been capable of supplying the engine in this circumstance.

