No: 10/89 **Ref: EW/C1121** **Category: 2c**

Aircraft Type and Registration:	Hughes 369E (500 Series), G-OABG
No & Type of Engines:	1 Allison 250-C20B turboshaft engine
Year of Manufacture:	1984
Date and Time (UTC):	30 June 1989 at 1836 hrs
Location:	Market Bosworth, Leicestershire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - None Passengers - None
Nature of Damage:	Tail rotor gearbox separated; severe damage to skids.
Commander's Licence:	Private Pilot's Licence (Helicopters)
Commander's Age:	52 years
Commander's Total Flying Experience:	Approximately 600 hours (of which 400 were on type)
Information Source:	AAIB Field Investigation

History of the flight

The aircraft was enroute from Ripley, Derbyshire, to Coventry. Shortly after passing through a heavy rainstorm, when flying level at about 110 kt at 600 feet agl, the occupants experienced moderate vibration accompanied by severe "grinding and groaning noises". The pilot saw a large school playing field ahead and to his left and descended towards it. He flew a left hand circuit of the landing area and made a normal approach to land, using power as required. The aircraft remained fully under control, although the "grinding noise" persisted. The approach was successful and he brought the aircraft to the hover at a height of about 5 feet. After stabilising in the hover for one to two seconds, the aircraft dropped suddenly to the ground. Two of the occupants stated that the aircraft yawed sharply to the right just before it dropped but the ground marks showed that there was no angular movement of the skids as they touched the ground. The pilot later said that he believed he may have sensed the yaw, corrected it and instinctively lowered the collective lever. After the impact, the noise and vibration ceased and the pilot ran the engine for some one to one and a half minutes at idle power before shutting down. The main rotors turned normally during this time.

Examination of wreckage

The helicopter lay on a firm, closely mown surface on a heading of 255 ° M. Both skids had collapsed in a manner suggesting a high rate of descent with little or no forward speed or yaw present at impact. The fuselage underside was just touching the ground, and the attitude of the aircraft was almost level. The tail rotor and half of the tail rotor gearbox had detached and were lying a few metres to the left of the aft end of the tail boom. The remainder of the gearbox, including the input gear, was still attached to the tail boom. The horizontal stabiliser was extensively cracked (apparently by severe vibration) and the small vertical fins attached to the latter had also apparently been shaken loose. There were some indications of tail rotor strikes on the main vertical fin assembly, only one of which could have been caused whilst the tail rotor was rotating on its normal axis. There was also an absence of either tail rotor or tail skid strikes on the ground but the tail skid itself had been struck and propelled by the tail rotor some 54 metres from the impact point.

The tail rotor blades were badly deformed by impact and the metal leading-edge erosion strip was missing from one blade. Despite similar damage to the other blade, the erosion strip had not been displaced. No trace was found of the missing strip.

After careful inspection, it was decided that it would be possible to perform limited ground-running of the helicopter's engine to ascertain the condition of the engine, main transmission and rotor assembly. Accordingly, a limited ground run was performed, during which no abnormalities were observed.

The tail rotor and gearbox assembly was submitted for metallurgical examination. The subsequent report suggested that the erosion strip had detached due to inadequate bond strength at the adhesive to strip interface and noted that there was evidence of disbonding around the periphery of the strip having existed for some time prior to the accident.

Examination of the broken gear case found evidence suggesting that it had failed in a manner not consistent with a single overload. In particular, the fracture face bore signs of progressive failure from two origins occurring over a short period of time associated with a relatively low number of high stress applications.

The Federal Aviation Administration issued Airworthiness Directive number 85-18-02 in September 1985 which became applicable to this machine in March 1987 and which required certain inspections of the erosion strip bonding to be made as laid down in Hughes Service Information Notice EN-19.2. These inspections basically comprised a one-time dye-penetrant and "tap" test of the erosion strip followed thereafter by daily pre-flight visual examinations. The tail rotor blades from G-OABG were those originally fitted to the aircraft at build and had accrued some 2100 hours since that time. The once-off inspection had been accomplished in March 1987 and, although it was not a mandatory requirement, the maintenance organization that carried out the annual check of the aircraft in June 1989 stated that the erosion strip bonding check had been repeated on that check. The owner/pilot has stated that the daily inspections were performed diligently, including that on the day of the accident.