No: **Ref: 2c**

Aircraft type and registration:	Hiller UH-12E-360 G-BBBA	
No & Type of engines:	1 Lycoming VO-540-B2D piston engine	
Year of Manufacture:	1961	
Date and time (UTC):	26 September 1986 at 1500 hrs	
Location:	Driffield, Yorkshire	
Type of flight:	Test Flight	
Persons on board:	Crew — 1	Passengers — 2
Injuries:	Crew — None	Passengers — None
Nature of damage:	Damage to skids, centre section, cabin floor, bubble and rotor blades. Serious damage to the engine	
Commander's Licence:	Airline Transport Pilot's Licence (Helicopters)	
Commander's Age:	43 years	
Commander's Total Flying Experience:	5912 hours rotary wing (of which 2061 were on type)	
Information Source:	Aircraft Accident Report Form submitted by the pilot and AIB examination of the engine	

The accident occurred on the third of a series of flights being conducted for the purpose of tracking the main rotor and with the helicopter ballasted to a high weight. It had been parked tail into wind for ease of access and, owing to the close proximity of some small trees, it was necessary to perform a vertical take-off before a clearing turn could be made to point the aircraft into wind.

A few seconds after lift-off, when at a height of 25—30 feet, a sudden abnormal sound was heard from the rear of the helicopter co-incident with a total loss of engine power and a yaw to the left, which the pilot was unable to arrest with full right pedal. With no significant forward airspeed and insufficient height with which to establish autorotation, the pilot left the collective lever where it was, allowed the helicopter to descend and attempted to cushion the landing by fuly raising the lever. It struck the ground in a slightly nose down attitude, as the tail boom had caught on some branches of a tree, resulting in collapse of the skid landing gear and considerable other damage to the helicopter. There were no injuries, there was no fire and the occupants were able to make their escape past the still rotating main rotor blades, despite these making contact with and severing several tree branches.

Subsequent inspection of the helicopter's engine revealed major damage to the crankcase in the region of cylinders Nos.4 and 6. The engine was removed from the airframe and sent to the AIB facility at Farnborough where a strip examination took place.

This revealed that the No.6 connecting rod had failed at its big-end, the fracture occurring in

the rod side of the bearing approximately 1.0 inches up from the split line. This position was close to the reduced cross section of the cap at the nut counterbore. A secondary failure, in bending, had occurred to the big-end cap bolt on the opposite side of the bearing, the one close to the failure suffering some damage but remaining intact. The fracture exhibited evidence of fatigue over most of its surface, the origin being centered on an area of galling on the bearing shell support face. Close examination revealed several other areas of galling on the same surface, at least one of which were associated with micro cracks.

On this model of engine the big-end bearing caps are clamped to the connecting rods by two bolts, which are installed by measuring their stretched length rather than by direct torque loading of their nuts. Service Instruction No.1307B details the fitting of these bolts, requiring that the installed length should be 2.255/2.256 inches. The free length of these bolts is given as 2.249/2.250 inches.

Measurements were possible of all the cap bolt installed and free lengths, with the exception of the failed and distorted ones in No.6 connecting rod. The installed bolt stretch on rods 1 to 4 lay between .006 and .0075 inches but those for rod No.5 were .0045 and .005 inches. Close examination of No.5 bearing shell support surfaces revealed a similar level of galling was present, on the rod side of the bearing, to that on No.6, although this was generally positioned closer to the split line. Some evidence of fretting was also seen between the bearing shells and big-ends of the remaining connecting rods, although not to the same degree as rods 5 and 6.

A manufacturer's Service Bulletin, No.439, which deals with inspection of connecting rods at overhaul states that "it has been found that the location of galling determines if the rod is or is not likely to fail. Galling marks in the bearing bore are critical except for directly under the I-beam of the rod."

This engine had run for a total of 407.55 hours since overhaul.