

**ACCIDENT**

<b>Aircraft Type and Registration:</b>	Robinson R44 Raven, G-EKKO	
<b>No &amp; Type of Engines:</b>	1 Lycoming O-540-F1B5 piston engine	
<b>Year of Manufacture:</b>	2000	
<b>Date &amp; Time (UTC):</b>	11 March 2007 at 1700 hrs	
<b>Location:</b>	Hollis Farm, Holmgate Road, Tupton, Chesterfield	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 1	Passengers - 1
<b>Injuries:</b>	Crew - None	Passengers - None
<b>Nature of Damage:</b>	Tail rotor drive severed and damage to tail rotor and gearbox	
<b>Commander's Licence:</b>	Private Pilot's Licence	
<b>Commander's Age:</b>	46 years	
<b>Commander's Flying Experience:</b>	2,722 hours (of which 300 were on type) Last 90 days - 37 hours Last 28 days - 16 hours	
<b>Information Source:</b>	AAIB Field Investigation	

**Synopsis**

During the landing manoeuvre, the helicopter suddenly began to vibrate and turn of its own accord. The pilot reacted quickly by landing immediately. The damage was consistent with the tail rotor having been struck.

**History of the flight**

The helicopter was returning to its base having carried out a training exercise at Sandtoft Airfield. The destination was a private landing site at Hollis Farm and the flight was conducted with the instructor acting as both the commander and the handling pilot. The aircraft was brought to a hover and began to manoeuvre towards the landing site. Having turned through 180°, the pilot proceeded to hover-taxi the helicopter when, according to

the pilot's report, it began to "vibrate, shake and judder" and turn of its own accord. The pilot reacted quickly by landing the helicopter immediately and shutting down. Both occupants were uninjured and vacated the aircraft without difficulty. On inspection, the pilot observed that the tail rotor gearbox was missing and the empennage, although in one piece, was almost completely detached.

**Subsequent examination of the site by the AAIB**

The AAIB visited the site some days after the accident. The Hollis Farm landing site is a confined farmyard with a small hangar to the north, one single-storey house to the east and the main farm house to the south. The approach to the farmyard is dependant on the wind direction. On

this occasion the pilot approached from the east into a large sloping field to the south of the farm house. His plan was to transition into the hover, turn back towards the east and hover-taxi to the east above the field and over the farm buildings to land in the yard. The field is level at its western edge and slopes down towards the east. It was following the 180° turn at the top of the field, while hover-taxiing down the slope, that the pilot reported the vibration had occurred.

### **Wreckage examination**

The empennage, including the upper, lower and horizontal stabilisers, was almost detached from the helicopter. Damage to the lower stabiliser was consistent with it having been struck by one of the tail rotor blades whilst they were rotating. The tips of both blades had detached. The rear portion of the tail rotor guard had also separated and was found in several pieces; damage to its tubular construction was consistent with it having been struck from beneath in the area where it attaches to

the lower stabiliser.

The tail rotor had become detached from the associated casting in the rear end of the tail boom. A metallurgical examination showed that none of the four attachment bolts had fractured. Three of the attachment lugs had fractured by overload bending and the fourth by a low-cycle, high-peak, cyclic stress, simple bending fatigue mechanism. It is probable that this fourth lug was the first to separate. It was concluded that all the damage resulted from the tail rotor blades being struck.

### **Discussion**

The helicopter had come to rest at the bottom of the field on an easterly heading; however, the tail rotor debris had been collected before AAIB examination of the site and no ground marks were evident to indicate where the tail had struck. During sloping ground operations, the tail rotor is potentially vulnerable as it is some distance behind the pilot.