

Aircraft Type and Registration: Enstrom 280C Shark, G-IDUP

No & Type of Engines: 1 Lycoming HIO-360-E1AD piston engine

Year of Manufacture: 1979

Date & Time (UTC): 6 May 1993 at 1745 hrs

Location: 2.5 nm south west of Haselmere, Surrey

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - None Passengers - N/A

Nature of Damage: Loss of bolt, nut, split-pin, washers and spacer attaching tail rotor blade pitch link to blade pitch arm

Commander's Licence: Private Pilot's Licence with IMC and Night Ratings

Commander's Age: 53 years

Commander's Flying Experience: 700 hours fixed-wing, 70 hours helicopter (all on type)
Last 90 days - 10 hours
Last 28 days - 4 hours

Information Source: Aircraft Accident Report Form submitted by the pilot together with engineering report produced by the maintenance company and subsequent examination of repaired tail rotor area by AAIB Engineering Inspector

The pilot had collected the aircraft from Goodwood to return it to a farm at Tongham. During the flight, he experienced a sharp lurch and felt a vibration through the rudder pedals. He immediately entered autorotation, descending from 1,400 feet into a field of Barley. Despite his lack of helicopter experience, the pilot landed successfully.

The helicopter was found to have suffered the loss of one of the two tail rotor pitch link to blade pitch arm bolts and associated hardware (i.e. nut, split-pin, washer and spacers). None of these items were recovered, so the reason for the attachment failure could not be established.

The attachment takes the form of a bolt passing through an eye-end bearing assembly on the end of the pitch link and through the operating hole in the blade pitch arm. The bolt is secured by a castellated nut and locked by a split-pin. The eye-end bearing is separated from the pitch arm by a spacer, and the combination of the thickness of the spacer and that of the pitch arm and bearing results in a significant

offset of the loading applied by the pitch link to the bolt. The integrity of the attachment is thus dependent on the tension in the bolt arising from the assembly torque of the nut and bolt.

The maintenance organisation state that they have previously found this particular bolt loose on various Enstrom helicopters. They state that in their opinion, this problem results from the poor initial design of the attachment, the bolt being in single shear and being inadequately supported by the 0.125 inch thickness of the pitch arm. They also consider that the spacer material is unsuitable, suffering rapid crushing and/or wear leading to slackening of the bolt in service and that the use of castellated nuts with split pins can result in fatiguing of the bolt (since frequent overtorquing can occur as this bolt is removed every 50 hours to permit rotation of the feathering bearings during lubrication).

The bolt is the subject of CAA Additional Airworthiness Directive 007-12-83 which in this instance required inspection of this bolt for tightness at 100 hour intervals. The inspection requires that the bolt be replaced if it is possible to freely turn it by hand.

The maintenance organisation point out that the bolt was pre-flight inspected by both the pilot and themselves.

The pilot attributed the success of his landing to regular visits to his training organisation and his instructors insistence that he continued practising autorotations until he achieved an acceptable level.