

BULLETIN ADDENDUM

AAIB File: EW/C92/8/2
Aircraft Type and Registration: Bell 206B JetRanger III, G-OSUE
Date and Time (UTC): 14 August 1992 at 1137 hrs
Location: Near Crowthorne, Berkshire
Type of Investigation: AAIB Field Investigation

SYNOPSIS (AAIB Bulletin 2/93 refers)

AAIB Bulletin 2/93 contained a report on the accident to Bell 206B Jetranger III, G-OSUE, near Crowthorne, Berkshire, on 14 August 1992. The accident was caused by an inflight disconnection of a Thomas coupling in the tail rotor drive shaft, after a nut securing the coupling had become detached. The Bulletin stated that further consideration was being given to the operational aspects of tail rotor failures, with particular reference to the advice given in flight manuals covering loss of tail rotor drive, and that an Addendum would be published covering these aspects and any additional aspects relating to the cause of the drive shaft failure. This Addendum concludes the AAIB investigation into this accident.

Operational aspects

The tail rotor drive disconnect occurred over a densely populated and heavily wooded area. The pilot was able to maintain height, but he had insufficient yaw control to have a major influence on the helicopter's track. However, there was an area adjacent to Broadmoor Hospital which was near this track and which would have appeared more suitable for a safe landing. It is probable that the pilot delayed his descent until he thought that he had a reasonable chance of achieving a landing in this area. Unfortunately, for reasons which could not be positively determined, this did not happen and the final manoeuvre which occurred was commensurate with the pilot having increased power in an attempt to make a late adjustment to the helicopter's flight path.

The AAIB studied the guidance given in the flight manuals of several types of helicopter and discussed the problems associated with a loss of tail rotor thrust with design and flight test personnel from a number of manufacturers. The findings are summarised in the following paragraphs.

Although the effect of the removal of the tail rotor thrust can, to a degree, be predicted theoretically, empirical confirmation is difficult, even in a wind tunnel. It is not an area which can, at present, be explored by flight test. However, the loss of tail rotor thrust is potentially

catastrophic and it is accepted that guidance should be provided in the aircraft flight manual. This may, in detail, be different for each type and any procedure can only be based on the best information available, combined with informed judgement.

The types of failure which may cause the loss of tail rotor thrust and the flight regime in which they occur will vary. The objective of any guidance should be to give an average pilot the best chance both of maintaining control of the helicopter immediately following the failure and of effectively managing the subsequent descent to achieve a successful forced landing.

It was noted that the complexity of the guidance contained in the flight manuals varied. This reflected both the extent to which the performance following a loss of tail rotor thrust could be predicted and the fact that in some cases a straightforward autorotative descent was thought to be the best option. On balance, it was considered that there were no valid grounds for recommending any major departure from the form of the guidance currently provided by manufacturers in their flight manuals.

Technical aspects

The components of the disconnected tail rotor drive shaft have now been examined by the manufacturer's defect investigation specialists. This examination failed to throw any further light upon the cause of the nut separation.

The Bulletin 2/93 report on this accident noted that out of a total of 32 nuts from the tail rotor drive shaft couplings on G-OSUE, 16 had no manufacturer's mark. During discussions with the aircraft's manufacturer it became apparent that prior to 1985 there was no requirement for *Bell Helicopter approved* nuts to be marked with the identification symbol of the nut manufacturer and consequently some, or possibly all, of the 16 unmarked nuts on G-OSUE may have been approved nuts fitted to the aircraft prior to 1985.

Having considered in depth the question of the nut detachment it was felt that the weight of evidence pointed to a relatively rapid separation of the nut due to some form of nut failure, rather than a progressive backing off and ultimate separation by unscrewing. Consequently, the method of locking the nut *per se* was not called into question by this accident.