



MINISTRY OF DEFENCE

Military Aircraft Accident Summary

MILITARY AIRCRAFT ACCIDENT SUMMARY

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AIRCRAFT ACCIDENT TO ROYAL AIR FORCE

WESSEX HC2 XR 524

Date: 12 Aug 1993

Parent Airfield: Royal Air Force Valley

Place of Accident: Llyn Padarn, Gwynedd

Crew: Three

Passengers: Four

Casualties: Crew - 3 Major Injuries
Passengers - 3 Fatal Injuries
1 Major Injury

CIRCUMSTANCES

1. On 12 August 1993, Wessex XR 524 was engaged on a Search and Rescue (SAR) training sortie in North Wales. In addition to the three crew members, the helicopter had four Air Training Corps Cadets on board as passengers on an air experience flight. While the pilot was simulating a planned in-flight autopilot failure, the aircraft suffered a genuine emergency. Loss of drive to the tail rotor rendered the aircraft uncontrollable, and it crashed into Llyn Padarn where it sank rapidly. The crew members and one of the passengers escaped, but sustained major injuries. Unfortunately, none of the remaining passengers managed to escape and all were killed.

CAUSE

2. The Board of Inquiry (BOI) was able to establish quickly that the accident was caused by an overload failure of the No3 tail rotor drive shaft; a complex and protracted technical investigation was,

however, necessary to ascertain the reason for its failure and ensure that all flight safety lessons were learnt. A number of possible causes of the shaft failure such as fatigue, failure of the flight control system and unusually high flight loads were discounted. The Board then looked at possible causes of sudden overloading of the transmission train and was able to discount failure of the gearbox and all components in the tail rotor drive system except the design feature which enables the tail section of the Wessex to be folded back on to itself to reduce the parking area required for the aircraft. The Board therefore considered that failure of this feature was the most likely cause of the shaft failure.

3. The folding system includes a mechanism to break and remake the transmission train between the engine and the tail rotor. This is achieved by means of a disconnect coupling consisting of two toothed flanges which mesh, assisted by spring pressure, when the tail is unfolded. The Board concluded that it was most probable that the flanges of the disconnect coupling failed to mesh completely when the tail section was last unfolded. In-flight simulations of autopilot failure had imposed increased stresses on the tail section resulting in the minimal engagement of the disconnect coupling being lost. The resultant loss of drive to the tail rotor led to a reduction in speed of the rotor relieving the previously imposed stresses on the tail section and allowing the coupling to re-engage. The shock loading of the transmission train was sufficient to cause failure of the drive shaft.

4. The emergency rapidly deprived the pilot of almost all directional control over his aircraft and the Inquiry concluded that his actions were logical, prompt and correct, and that there was nothing else the crew could have done at any stage to avoid or alleviate the inevitable crash. Moreover, the speed at which the aircraft sank prevented any of the crew from attempting to rescue the passengers.

SUBSEQUENT ACTIONS

5. A number of safety recommendations were made. The main follow-

up actions are summarised below:-

- a) The Wessex servicing schedule has been amended to include a visual check for full engagement of the disconnect coupling prior to flight.
- b) Existing training for Wessex pilots to be enhanced to include tail rotor emergency simulator training.
- c) Protective headgear to be provided for all helicopter passengers.
- d) Refine procedure for effective read-across of technical information to helicopter types of all three Services.