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ATSB TRANSPORT SAFETY REPORT
Aviation Occurrence Investigation AO-2011-016
Preliminary

Collision with terrain, VH-HFH Cessnock Aerodrome, New South Wales 4 February 2011

Abstract

On 4 February 2011, a Robinson Helicopter Company R44 Astro helicopter (R44), registered VH-HFH, was conducting circuit operations at Cessnock Aerodrome, New South Wales. On board the helicopter were an instructor, a pilot undergoing a helicopter flight review and a passenger.

Following the completion of a sequence involving the simulated failure of the helicopter's hydraulic-boost system, the instructor assessed that the hydraulic system had actually failed. He elected to reposition the helicopter on the aerodrome to facilitate further examination. Upon becoming airborne, control of the helicopter was lost and it collided with the runway and, shortly after, there was a fire. The pilot managed to exit the helicopter; however, the instructor and passenger were fatally injured.

Examination of the wreckage identified that a bolt securing part of the flight control system had detached. Although the circumstances of the accident are still under investigation, the Australian Transport Safety Bureau has, in the interest of transport safety, issued a Safety Advisory Notice suggesting that operators of hydraulic system-equipped R44 helicopters, and organisations performing inspection, testing, maintenance and repair activities on the flight controls of those helicopters, inspect and confirm the security of the aircraft's hydraulic-boost servos.

The investigation is continuing.

FACTUAL INFORMATION

History of the flight

The information contained in this preliminary report is derived from initial investigation of the occurrence. Readers are cautioned that there is the possibility that new evidence may become available that alters the circumstances as depicted in the report.

At 1115 Eastern Daylight-saving Time[1] on 4 February 2011, a Robinson Helicopter Company R44 Astro helicopter (R44), registered VH-HFH, commenced circuit operations at Cessnock Aerodrome, New South Wales (Figure 1). On board the helicopter were a flight instructor, who was seated in the front left seat; a pilot, who was seated in the front right seat; and a passenger, who was also a qualified pilot and was seated in the right rear seat. The flight was a biennial helicopter flight review (HFR) for the pilot.

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time, as particular events occurred. Eastern Daylight-saving Time is Coordinated Universal Time (UTC) + 11 hours.

Figure 1: Cessnock Aerodrome

Courtesy of Google Maps.

The pilot stated that, following a landing on the grass area to the west of the runway as part of a practice failure of the helicopter's flight control hydraulic-boost system[2] (Figure 1), the hydraulic system could not be re-engaged. The pilot identified the issue to the instructor and handed over control of the helicopter to him. The pilot reported that following a number of unsuccessful attempts to re-engage the system, the instructor assessed that the hydraulic system had failed and elected to reposition the helicopter within the aerodrome to facilitate further examination and maintenance action.

The pilot recalled that, as the helicopter became airborne, the instructor experienced increasing difficulty controlling the aircraft. At 1141, that culminated in the helicopter colliding with the runway in a steep left bank. The pilot reported that shortly after the helicopter came to rest, there was a fire. The pilot was able to exit the helicopter; however, the instructor and passenger were fatally injured.

Pilot information

The instructor and pilot each held Australian Commercial Pilot (Helicopter) Licences that were issued by the Civil Aviation Safety Authority (CASA) in 1983 and 1998 respectively. Both were appropriately endorsed to operate the R44.

The instructor held a CASA Class 1 Aviation Medical Certificate with the requirement to have corrective reading glasses available for use during flight. The pilot held a Class 1 Aviation Medical Certificate without restriction.

The instructor's flying logbook indicated that he had in excess of 11,000 flying hours, including experience in R44 helicopters. The instructor undertook a renewal of his instructor rating on 30 March 2009, which satisfied the requirements of an HFR. The pilot was undergoing the HFR following an 18-month absence from flying and in preparation for commencing employment with the helicopter operator.

Aircraft information

The helicopter, serial number 0505, was manufactured in the United States in 1998. The helicopter was overhauled by the manufacturer at 2,197 airframe hours in 2005, at which time the flight control hydraulic-boost system was installed. Prior to the commencement of flying on the day, the helicopter had accrued 3,643.2 airframe hours.

The aircraft last underwent maintenance at a Civil Aviation Safety Authority-approved maintenance facility on 21 December 2010. That maintenance consisted of a 50-hourly engine inspection. The last 100-hourly maintenance inspection was conducted by the same maintenance organisation at 3,549.6 airframe hours on 15 October 2010. In addition to routine maintenance items, the 100-hourly inspection included the replacement of the front left hydraulic-boost servo due to a hydraulic fluid leak.

Wreckage and impact information

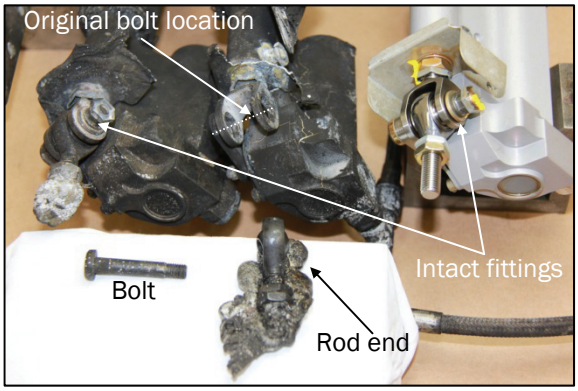
The accident site was located on the runway at Cessnock Aerodrome adjacent to a taxiway intersection (Figure 1). Main rotor contact marks indicated that the helicopter initially contacted the runway while banked to the left at 53° and travelling to the south-west at about 26km/h. The helicopter continued rolling to the left and the fuselage contacted the runway at an angle of about 110°. The helicopter travelled a further 17 m before coming to rest on its left side, orientated north. An intense fire consumed the majority of the helicopter (Figure 2).

2 The hydraulic system was fitted to later model R44s to eliminate cyclic and collective feedback forces from the main rotor. The failure of the system is identified by an increase in control stick forces; however, the controllability of the helicopter remains normal in that case. The system is controlled via a switch mounted on the pilot's cyclic control.

Figure 2: Aircraft wreckage

On-site examination of the wreckage identified that the bolt that retained the lower flight control push-pull tube to the left-front hydraulic-boost servo was missing (Figure 3). The bolt and rod end were subsequently found within the wreckage however; to date, the retaining nuts and associated fixtures have not been located.

Figure 3: Left, right and exemplar hydraulic-boost servos



The helicopter manufacturer advised that a break in the connection of any of the push-pull tubes, whether above or below the hydraulic-boost servos, will lead to the immediate loss of control of the helicopter. The manufacturer's maintenance manual does not permit the removal or fitment of that bolt other than during the repair or overhaul of the hydraulic-boost servo by the manufacturer.

FURTHER INVESTIGATION

The investigation is continuing and will include:

- the technical examination of the helicopter's flight control system, including of its hydraulic-boost servos and associated components
- a review of the helicopter's maintenance history, including of the hydraulic-boost servos
- an examination of a number of operational issues pertaining to the flight
- an examination of survivability issues.

SAFETY ACTION

Australian Transport Safety Bureau

Inspection, testing, maintenance and repair of R44 flight control systems

The ATSB generally proposes corrective or precautionary action in response to a safety occurrence only where it is justifiable on the basis of established or probable facts. Although work remains to be done to establish the facts of this accident fully, the apparent circumstances implicate a possible mechanism or condition that could affect the controllability of R44 helicopters. The Australian Transport Safety Bureau therefore draws attention to the following advisory notice, on the basis of prudence, until such time that the mechanism(s) contributing to the accident involving VH-HFH are fully established and understood.

ATSB safety advisory notice AO-2011-016-SAN-001

The Australian Transport Safety Bureau encourages all operators of hydraulic system-equipped R44 helicopters, and organisations performing inspection, testing, maintenance and repair activities on the flight control systems of those helicopters, to note the circumstances detailed in this preliminary report. It is suggested that those operators and maintenance organisations consider inspecting the security of the hydraulic-boost servos on all hydraulic system-equipped R44 helicopters.