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Collision with terrain, VH-DSD 85 km NW of Julia Creek, Queensland 9 May 2011

Abstract

On 9 May 2011 a Robinson Helicopter Company R22 Beta II helicopter (R22), registered VH-DSD (DSD), was conducting mustering operations about 85 km north-west of Julia Creek, Queensland in conjunction with another R22 helicopter. A third R22 was operating independently about 15 km away. At about 1445 Eastern Standard Time, the pilot of DSD made a radio transmission indicating that a problem had occurred and that he was unable to continue flying.

The other pilots flew to the area and discovered the wreckage of DSD and that the pilot, the sole occupant had been fatally injured.

Examination of the wreckage revealed that a drive belt had broken. Two belt fragments were found about 60 m from the main wreckage.

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 stressing the need for continued vigilance by operators and maintenance organisations during the routine inspection of the R22 helicopter's drive system. The attention of pilots is also drawn to the requirement to operate the helicopter within the flight manual limits; specifically, those related to manifold air pressure.

The investigation is continuing.

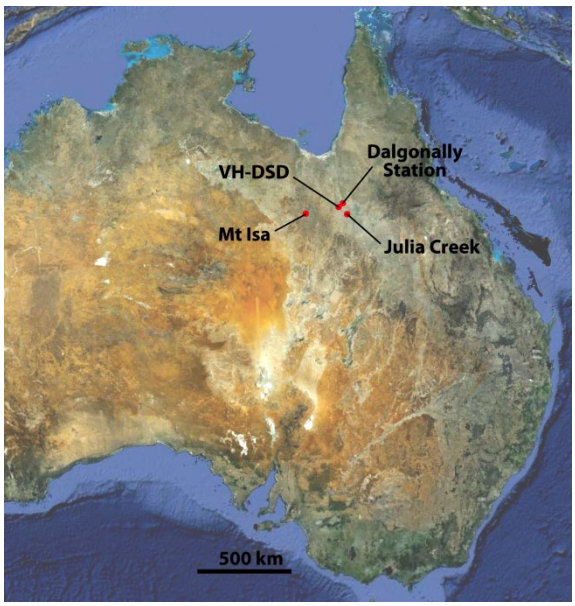
FACTUAL INFORMATION

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.

History of the flight

At about 0700 Eastern Standard Time[1] on 9 May 2011, the pilots of two Robinson Helicopter Company R22 Beta II helicopters took off from the Dalgonally Station homestead, about 85 km north-west of Julia Creek, Queensland.

Figure 1 Location of the accident flight



1 The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time (EST), as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

The pilots flew about 35 km to the south-west of the homestead where they began mustering cattle. The muster continued throughout the morning and early afternoon, with two brief periods on the ground, for refreshment and to refuel. The helicopters' engines and rotors were left running during those periods.

Around 1200, a third pilot began mustering about 15 km to the west on the adjacent property. The three pilots talked with each other via very high frequency (VHF) radio while they worked. It was reported that, at about 1445, the pilot of DSD suddenly broadcast 'I'm going down'. He made no further transmission.

The other pilots flew to the area in which the pilot of DSD had been working, identifying the location by the still-moving cattle. Shortly after, they saw the helicopter on the ground and landed close by.

After approaching on foot, the other pilots determined that the pilot of DSD was deceased. They switched off the helicopter's battery master switch and closed the fuel shutoff valve.

Wreckage and impact information

There was no fire and, although seriously damaged[2], the aircraft was largely intact (Figure 2).

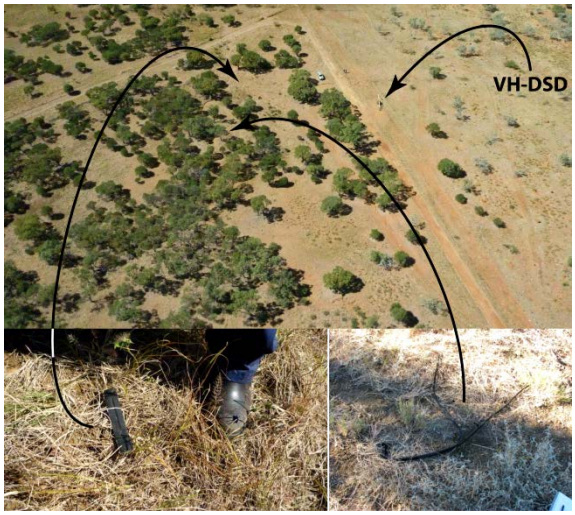
Figure 2: Aircraft wreckage

The tail boom had been severed about 1 m from the tailrotor; however, the tailrotor pitch control and drive train remained intact.

The fuel system was ruptured and fuel was reported to have leaked onto the battery until the fuel shutoff valve was closed. The trailing edge of one main rotor blade was kinked in two places, but the main rotor blades were otherwise undamaged.

Two fragments of the rubber drive belt system that drives the main and tail rotors were found on the ground about 60 m from the main wreckage (Figure 3).

Figure 3: Location of the two belt fragments relative to the main wreckage



Personnel information

The pilot held a Commercial Pilot (Helicopter) Licence and a valid Class 1 Medical Certificate. He was endorsed to fly R22 helicopters and held a current helicopter mustering approval from the Civil Aviation Safety Authority (CASA). The pilot had a total aeronautical experience of about 5,700 hours.

Aircraft information

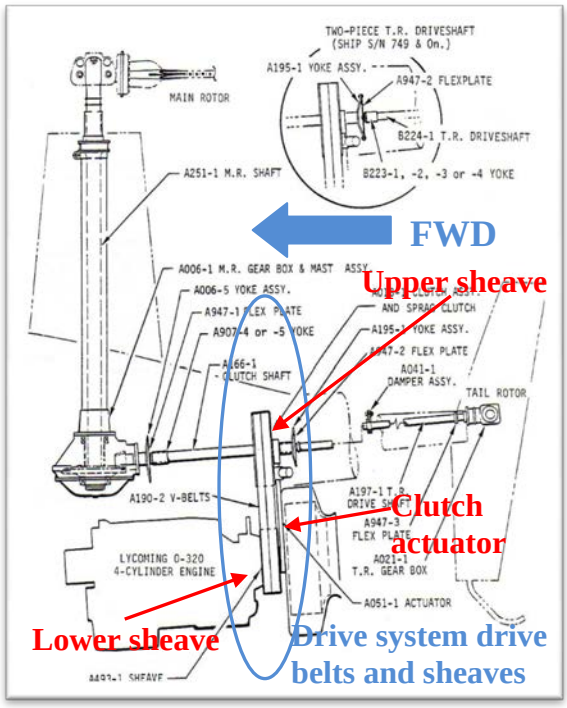
The aircraft was a Robinson Helicopter Company R-22 Beta II that was manufactured in the United States in 1996 and was powered by a Lycoming O-360-J2A four-cylinder engine. The helicopter had a total time in service of about 6,850 hours.

On the R22 helicopter, engine power was transmitted to the rotor system through a drive-belt system that consists of two rubber double V-belts, running on matching multi-grooved sheaves (Figure 4). Both the upper and lower sheaves were constructed of aluminium alloy with a thermally–sprayed, metallised coating applied to improve wear resistance.

2 The *Transport Safety Regulations 2003* definition of 'serious damage' includes the destruction of a transport vehicle.

The upper drive sheave was mounted on the clutch shaft adjacent to a flexible coupling and could be moved relative to the engine-mounted drive sheave by means of an electric clutch actuator. That movement had the effect of varying the tension applied to the belts.

Figure 4: R22 drive belt system



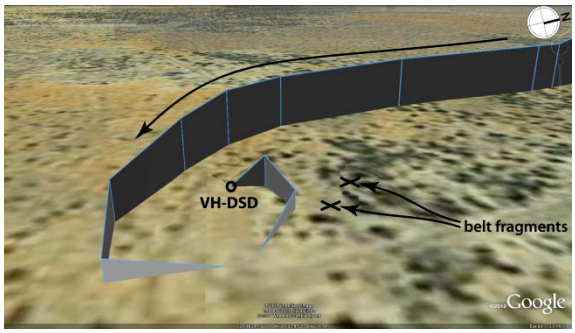
Meteorological information

The weather in the Julia Creek area on 9 May 2011 was reported to have been fine and sunny with very good visibility and stable, southerly winds of about 15 kts. The temperature at Julia Creek at the time of the accident was 25 °C.

Recorded information

A Garmin GPSmap 76CSx handheld Global Positioning System (GPS) unit was on board the helicopter during the accident flight. That unit had been recording GPS positional information throughout the day's flying and the recorded data was downloaded at the Australian Transport Safety Bureau's (ATSB) technical facilities in Canberra. Figure 5 displays the helicopter's final flightpath, derived from that data.

Figure 5: Final flightpath of DSD and the location of the drive belt fragments



Additional information

CASA Airworthiness Bulletin 63-006, Issue 1 titled Issues related to the Robinson Helicopter Corporation (RHC) R22 main rotor drive system

On 14 August 2009, CASA published Airworthiness Bulletin (AWB) 63-006 Issue 1 titled *Issues related to the Robinson Helicopter Corporation (RHC) R22 main rotor drive system*.[3] The purpose of that AWB, which was directed at operators and maintainers of the R22, was to:

- Summarise the results from a number of CASA investigations, including of information in the CASA service difficulty report database.
- Remind maintainers and operators of the need to strictly adhere to the manufacturer's data for the operation and maintenance of the R22.
- Provide guidance in relation to the manufacturer's data on the main rotor drive system in the R22.

The AWB provided an overview of the maintenance- and operational-related factors that were identified by CASA as being associated with a number of main rotor drive belt failures. CASA stressed that operating the helicopter in excess of its maximum gross weight and/or engine horsepower limits, as measured by manifold air pressure (MAP), may result in premature drive belt failure.

3 Available at http://casa.gov.au/wcmswr/_assets/main/airworth/awb/63/006.pdf

CASA concluded by strongly recommending operators and maintainers:

a. Carefully inspect all newly manufactured main rotor drive belts for defects before installation,

b. Consider the importance of the Maintenance and Operational related considerations highlighted in this AWB [AWB 63-006] and disseminate the information throughout their organisations.

Civil Aviation Authority of New Zealand

The May/June 2011 edition of the Civil Aviation Authority of New Zealand's 'Vector' magazine included an article that highlighted the criticality of the drive belts to the R22 drive train. The article, entitled *Two Belts, No Braces* provided an easy-to-read explanation of the drive belt installation in the R22 and highlighted the possibility of drive belt failure in that installation. Of interest to pilots and operators, and similar to the advice provided earlier by CASA in AWB 63-006, the article also stressed the importance of the correct installation and satisfactory testing of the drive belts before commencing operations.

In addition, the Vector article discussed the design of the belts, reinforcing that they were intended to transmit only so much horsepower to the rotors. Any time that horsepower limit was exceeded, such as when carrying excessive weight, a slight debit to belt life can be incurred. The article cautioned that, over time, any reduction in belt life could add up to a premature failure.

The Vector article is available at http://www.caa.govt.nz/Publications/Vector/Vector_2011-3.pdf

Further investigation

The investigation is continuing and will include examination and further analysis of the:

- aircraft components that were recovered from the wreckage, including the engine and drive belts
- aircraft's maintenance history
- pilot's training records
- recorded data
- meteorological information.

SAFETY ACTION

Australian Transport Safety Bureau

Installation, inspection, and maintenance of R22 drive belts

Generally, the Australian Transport Safety Bureau (ATSB) only proposes corrective or precautionary action in response to a safety occurrence on the basis of established facts or circumstances judged to be sufficiently serious to warrant immediate action pending the results of further work. Although further work is required to establish the contributing safety factors in this accident, the circumstances, so far as they are known at the time of this preliminary report, imply a mechanism or condition that could affect the airworthiness of R22 helicopters. The ATSB therefore considers it prudent to draw attention to the following advisory notice until such time as the mechanism and/or conditions contributing to the accident involving DSD are more fully established and understood.

ATSB safety advisory notice AO-2011-060-SAN-001

The Australian Transport Safety Bureau encourages all operators of R22 helicopters, and organisations performing installation, inspection, and maintenance activities on the drive belts of R22 helicopters to note the circumstances detailed in this preliminary report. The ATSB reinforces the need for continued vigilance by operators and maintenance organisations during the routine inspection of the R22 drive system as follows:

- **Drive belts.** Check for defects or damage such as blistering, cracking or delamination.
- **Drive sheaves.** Check for incorrect alignment, poor sheave surface condition and/or uneven groove wear patterns.
- **Clutch actuator.** Check for incorrect tension, such as indicated by rotor engagement during engine start.

Attention is also drawn to the detrimental effect on drive belt life of exceeding engine horsepower limits, as measured by manifold air pressure (MAP). To mitigate that risk, pilots should operate the helicopter within the flight manual limits; specifically, those related to MAP.