Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Report – 200700357

Preliminary

Engine failure – 28 km WSW of Warialda, NSW
2 February 2007
VH-HRT
Bell Helicopter Company 407

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Abstract

On 2 February 2007, at about 1530 hours Eastern Daylight-saving Time, a Bell Helicopter Company model 407 (B407) medical helicopter with a pilot, a crewman, a doctor and a paramedic on board departed Tamworth, NSW enroute to a car accident. At about 1610 hours the pilot broadcast on both the area and common traffic advisory frequency (CTAF) radio frequencies that they were inbound to Warialda at 15 nautical miles south-west and on descent from 6,500 ft above mean sea level. The pilot later reported that soon after the broadcast, the engine chip detector advisory illuminated on the master caution panel. He reported that approximately 5 seconds later, he heard a loud noise and the helicopter developed a severe high frequency vibration with a complete loss of engine power. The pilot then broadcast a distress advisory on the area frequency with position, altitude, passenger information and the problem. During the ensuing auto-rotation emergency landing, the helicopter landed heavily and rolled onto its side. None of the occupants were injured, but the helicopter was destroyed. The investigation is continuing.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the Transport Safety Investigation Act 2003 and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

#About ATSB investigation reports: How investigation reports are organised and definitions of terms used in ATSB reports, such as safety factor, contributing safety factor and safety issue, are provided on the ATSB web site www.atsb.gov.au.

FACTUAL INFORMATION

History of flight

On 2 February 2007, at about 1530 hours Eastern Daylight-saving Time[1], a Bell Helicopter Company model 407 (B407) medical helicopter, with a pilot, a crewman, a doctor and a paramedic on board, departed Tamworth, NSW enroute to a car accident. At about 1610 hours, the pilot broadcast on both the area frequency and common traffic advisory frequency (CTAF) that they were inbound to Warialda at 15 NM south-west and on descent from 6,500 ft above mean sea level (AMSL). The pilot later reported that soon after the broadcast, the engine chip detector advisory illuminated on the master caution panel[2]. He reported that approximately 5 seconds later, he heard a loud noise and the helicopter developed a severe high frequency vibration with a complete loss of engine power. The pilot broadcast a distress advisory on the area frequency with position, altitude, passenger information and the nature of the problem. He then informed all on board that they would have to complete an auto-rotation emergency landing.

Figure 1: Helicopter accident site circled in yellow

The pilot reported that during the approach to land, the helicopter's altitude was high for the approach profile and that he manoeuvred the helicopter to decrease altitude. Upon getting closer to the emergency landing area (figure 1), the pilot

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

2 The engine chip detector advisory was a device, often a permanent magnet, for gathering every chip, usually from lube oil. When a metal chip was collected, the circuit was made continuous and the advisory on the master caution panel illuminated indicating metal contamination internally.

reported that he noticed overhead powerlines in the corner of the landing area and manoeuvred to clear the powerlines. The forward airspeed of the helicopter decreased as a result of this manoeuvring. The helicopter impacted the ground tail first and slid across the ground for about 15 m. The landing gear then collapsed and the helicopter nosed over and rolled onto its right side. The occupants exited the helicopter with no injuries. The helicopter was heavily damaged and was later deemed to be uneconomical to repair. The elevation at the site of the emergency landing was about 1,100 ft AMSL.

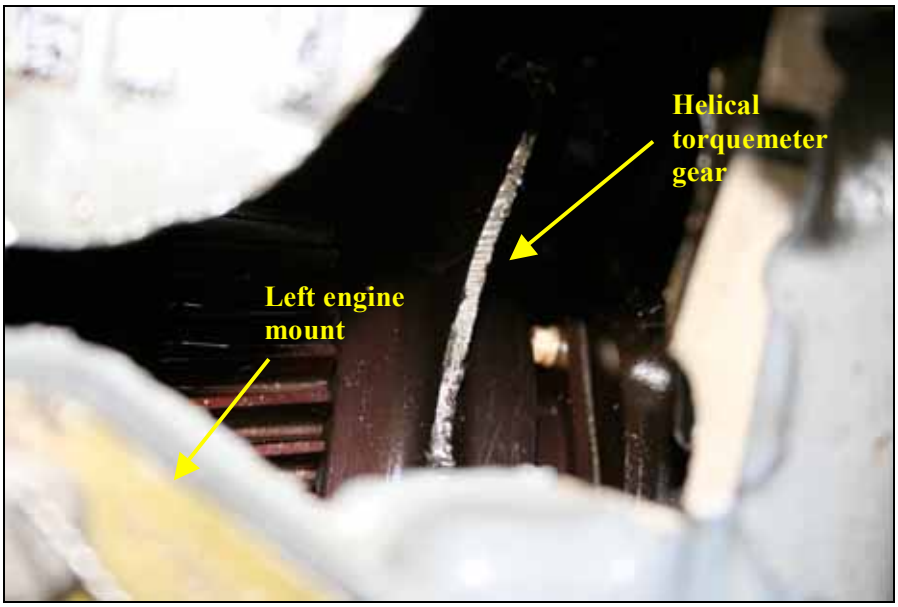
Wreckage examination

The helicopter was recovered to an authorised repair facility for further examination. At the time of the occurrence, the helicopter had completed 3,203.0 hours time since new. The front passenger's windscreen was broken and the landing gear was destroyed. The main rotor blades and the main rotor head assembly were substantially damaged by sudden stoppage. The tail boom and horizontal stabilisers were damaged and the tail section had separated. The tail rotor blades and tail rotor gearbox were also damaged by sudden stoppage (figure 2).

Figure 2: Wreckage examination

The Rolls-Royce Corporation model 250-C47B engine accessory gearbox assembly was damaged. There was a 50 cm diameter hole in the gearbox above the left side engine mounting pad (figure 3).

Figure 3: Engine accessory gearbox cover damage



A section of the separated portion of the gearbox casting was found on the engine deck, along with bearing material. The internal gears of the gearbox were visible and it appeared that the part number 23078713 gearshaft assembly helical torquemeter (helical torquemeter gear) had fractured. The engine and electronic engine control unit were removed from the helicopter and sent to an authorised repair facility for further examination under the supervision of the Australian Transport Safety Bureau.

Preliminary examination of the helical torquemeter gear confirmed the component fractured through the rim and web sections, releasing two similarly sized segments (figure 4). Fracture surface appearances suggested the failure had developed from the radial growth of fatigue cracking from an origin at the root region of a rim gear tooth. Magnetic particle inspection showed evidence of cracking at the roots of several other gear teeth adjacent to the location of the fracture. Evidence of localised gear tooth spalling and uneven surface contact patterns was also observed, suggesting a possible misalignment condition between the helical torquemeter gear and a smaller driving pinion gear.

Figure 4: Helical torquemeter gear examination

Weather information

The pilot reported the weather in the area as: temperature 28 degrees C, wind speed 10 kts (18.5 km/h)[3] from the south-east and no cloud. A routine weather observation for the nearby area for 1500 was:

- temperature 32.9 degrees C
- wind speed 17 km/h from the south-south-east
- relative humidity 28 %
- CAVOK[4]

Pilot informaton

The pilot held a commercial pilot licence (helicopter) and had accrued approximately 9,500 hours total experience, with 410 hours time on type and 56 hours on type in the last 90 days. The pilot reported that his last proficiency check was a base check completed with the operator's chief pilot on 19 January 2007. The check included several auto-rotation emergency landings.

Helicopter weight

The helicopter certificated maximum take-off weight was 2,382 kg. The operator reported that the helicopter departed Tamworth with 850 lbs (386 kg) of fuel with

3 Kilometres per hour.

4 When the following conditions are observed or forecast to occur simultaneously; visibility of 10 km or more, no cloud below 5,000 ft, no cumulonimbus, no significant weather.

an estimated total take-off weight of 2,289.5 kg. The pilot reported that the fuel usage of the helicopter until the time of the occurrence was 200 lbs (91 kg). The estimated total weight of the helicopter at the time of the occurrence was 2,198 kg.

Further investigation

The investigation is continuing and will include examination of:

- the helical torquemeter gear fracture surfaces
- the information downloaded from the electronic engine control unit
- the history of the helical torquemeter gear and the engine accessory gearbox
- the pilot's emergency situation training.