

Robinson R22 Beta, G-CHYL

AAIB Bulletin No: 3/2004	Ref: EW/G2003/08/43	Category: 2.3
Aircraft Type and Registration:	Robinson R22 Beta, G-CHYL	
No & Type of Engines:	1 Lycoming O-320-B2C piston engine	
Year of Manufacture:	1989	
Date & Time (UTC):	11 August 2003 at 1500 hrs	
Location:	Bournemouth Airport, Dorset	
Type of Flight:	Training	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Severe distortion of landing gear tubes and minor distortion of cabin structure	
Commander's Licence:	Commercial Pilot's Licence with Instructor rating	
Commander's Age:	45 years	
Commander's Flying Experience:	758 hours (of which 467 were on type)	
	Last 90 days - 73 hours	
	Last 28 days - 40 hours	
Information Source:	Aircraft Accident Report Form submitted by the commander plus additional enquiries	

History of the flight

The aircraft was being used for a trial lesson and had been operating away from the airport. Before rejoining the circuit, the commander asked the passenger to remove his hands and feet from the controls and he then conducted the pre-landing checks. The commander states that he applied full carburettor heat prior to initiating the descent and that he noticed the passenger taking photographs. The descent was initially from 1,300 feet to the normal helicopter circuit height of 700 feet, at the airfield boundary. The commander kept the aircraft level at 700 feet for about a minute and then, to position for a landing on Runway 08, a further descent was made parallel to the disused Runway 35. The commander stated that the carburettor heat control was selected HOT throughout.

Before descending below 300 feet, as usual, the commander pushed the carburettor heat back to COLD, to be assured of the best engine performance at ground level in the warm (27°C) ambient conditions. The commander recalls that he then heard the low rotor-speed warning horn sound and saw the associated warning light illuminated. He thought these warnings remained on all the way to the ground. He made a slight cyclic 'flare', lowered the collective lever in an attempt to recover rotor speed and opened the twist-grip throttle in an attempt to recover engine speed. In the descent he steered the aircraft away from the active runway and from buildings on his right. The descent rate seemed high and the passenger instinctively grabbed the 'T' bar cyclic control, initiating a flare. The commander shouted at him twice to release the control, which he did, and as the aircraft neared the ground, the commander raised the collective lever in an attempt to cushion the landing. The aircraft landed heavily and bounced to the right but it remained upright as the right skid gear bent. The pilot applied the rotor brake to avoid a rotor strike and as the rotor blades came to rest, he told the

passenger to leave the machine. The commander then secured the cockpit against a possible fire and left. In his report, the commander also commented that the aircraft had yawed to the left in the descent and the aircraft came to rest on the ground some 160° to the left of its initial heading during the final descent.

Analysis

The subsequent examination of the aircraft identified the structural damage from the heavy landing but did not reveal any apparent technical defect. The engine was started and ran smoothly; the only anomaly was that when the engineers first examined the aircraft they found the governor switch in the OFF position. The commander's recollection was that he had selected the governor OFF at the same time as he had turned off the fuel, master switch and magnetos after the accident. Adding to his perception that the engine had stopped in the final part of the descent, he also commented that the rotors had stopped quickly after landing and that, had the engine been running at touchdown, a blade strike or rollover would have been more likely.

The passenger, who was occupying the right-hand seat since this was a trial lesson, broadly confirmed the commander's recollection but, not being familiar with helicopters, was unable to contribute more detail. However, he was able to supply a series of photographs he had taken during the flight and this included one taken during the final descent (Figure 1).



Figure 1

Passenger photograph taken from G-CHYL in descent

This image showed a portion of the instrument panel in the view looking forward onto the airfield. The LOW RPM rotor speed warning light is clearly illuminated, the VSI shows a rate of descent of 400 ft/min and the indicated airspeed is 27 kt. Neither the altimeter nor the dual (rotor and engine)

tachometer needles are visible in the picture. From the aspect of the buildings, the photograph appears to have been taken at a height of 150 to 200 feet. Other photographs showed that the surface wind was southerly at about 10 kt which equated to a 10 kt tailwind component during the 'forced' landing beside Runway 35.

From the evidence in the photograph (low rotor RPM, modest rate of descent and low forward speed) it is unlikely that a simple loss of power was the cause of the accident and the commander was convinced that he had applied carburettor heat properly before the descent.

The commander stated that he lowered the collective lever and opened the throttle when the warning horn sounded. If, however, the collective lever was not lowered sufficiently far or quickly, and the rotor speed decayed further, the helicopter would probably not recover rotor speed above the 'low rotor RPM' level before it arrived at the ground. With a combination of low forward speed and low rotor RPM, it would then be very difficult for the commander to prevent the aircraft from landing heavily.

Other possible explanations for the accident centre around the inadvertent switching off of the governor at some point before the descent but the commander thought that he switched the governor off after landing. With the governor 'off' it would be possible inadvertently to start the descent in a condition of low power and low rotor RPM. Although, irrespective of the governor setting, the mechanical correlator should have increased engine power when the collective lever was raised for touchdown, its effect was unlikely to have been sufficient to prevent a heavy landing, whether or not the engine was operating normally.

A representative from the aircraft manufacturer commented that the conditions shown in the photograph made vortex ring state (or 'settling with power') unlikely as an alternative explanation for the accident. He also noted that the yaw string indicated a relative airflow from the right during the descent and that this would have further added to the power requirement of the helicopter in the descent and thus, potentially, to the rate of that descent.

The most likely explanation for this accident was the low energy state of the helicopter on final approach as shown in Figure 1. Precisely how and why this situation arose could not be determined from the evidence available to the AAIB.