

ACCIDENT

Aircraft Type and Registration:	Schweizer 269C-1, G-CCJE	
No & Type of Engines:	1 Lycoming HIO-360-G1A piston engine	
Year of Manufacture:	2003	
Date & Time (UTC):	18 February 2006 at 1800 hrs	
Location:	Sheffield City Airport	
Type of Flight:	Private	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Aircraft destroyed	
Commander's Licence:	Commercial Pilot's Licence with Flying Instructor Rating	
Commander's Age:	50 years	
Commander's Flying Experience:	3,987 hours (of which 248 were on type) Last 90 days - 101 hours Last 28 days - 34 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot, additional AAIB inquiries and testing of engine	

Synopsis

Following an uneventful flight, the commander was demonstrating an autorotation to a student PPL who had recently purchased a similar type of helicopter. He entered the flare with a relatively high rate of descent, which he was unable to arrest by raising the collective lever. As the helicopter landed, the skids dug in to the relatively soft ground, causing it to roll on to its right side.

Examination of the helicopter, its engine in particular, failed to find any pre-accident defects. The helicopter had been flying close to its maximum permitted weight and, after leaving the helicopter, the commander noted

from the wind sock that the approach had been made with a tailwind component.

History of the flight

The purpose of the flight was to demonstrate the Schweizer 269 to a passenger who had five hours experience as a PPL student on Robinson R22 helicopters, and who had recently purchased the similar Schweizer 269 CBi model.

The takeoff from Sheffield Airport and upper air work in the local area was uneventful and, on their return, the passenger asked the commander for an autorotation

demonstration. It was decided that a practice engine-off landing would be performed back at the airport and, as the wind had been light and variable all day, the commander decided that a power recovery would be the most sensible option. The appropriate checks, which included the engine parameters, were conducted on the approach to Sheffield at around 1,000 ft agl, and a reference point was chosen on the active Runway 28. The entry into autorotation was normal and the aircraft was stabilised, initially at 60 kt. This was subsequently reduced to 50-55 kts in order to reduce the ground speed and to fly closer to the published best speed for autorotation. At 500 ft agl, the engine temperatures and pressures were checked and the descent rate appeared normal. The flare was commenced at about 150 ft with an accompanying opening of the throttle; however, no increase in engine noise was apparent. The flare was progressively 'tightened' but this had little effect and it still appeared to the commander that the engine was not responding. At this point, it became clear that the aircraft was going to strike the ground with a high rate of descent; the commander attempted to cushion this as much as possible by raising the collective lever. The aircraft struck the ground, which had been softened by earlier rain, and the front of the skids dug in, causing the helicopter to tip forward and to the right; it came to rest on its right side. The engine was not running but the commander pulled the fuel shut-off lever and turned off the battery. Both occupants left the aircraft via the shattered canopy and found they had suffered no more than minor cuts and bruises. There was no fire and the emergency services were on the scene almost immediately. After leaving the aircraft the commander observed that the wind sock was indicating the approach had been flown with a tailwind component.

Photographs of the accident site supplied by the airfield operator showed that the main rotor blades were lying

in a 'coned' position, indicating low rotor speed at the time of the ground impact.

Examination of the engine

Although the aircraft was damaged beyond repair, the engine and its accessories had remained intact and hence were assessed as capable of being run. Accordingly, the engine was removed from the airframe, which involved severing the throttle and mixture controls and disconnecting the oil cooler. At this time, the fuel gascolator was found to be clean and the electric fuel boost pump to be functional.

The engine was taken to a Lycoming engine overhaul agent and installed in a test cell, where, apart from removing such accessories that were necessary for mounting it on the test stand, it was run in the 'as found' condition. On starting, some smoke emitted from the exhausts as a result of oil that had accumulated in the cylinder heads as the aircraft lay on its side after the accident. Subsequently, it ran normally throughout the test schedule, which included checking the operation of each magneto. 'Slam' accelerations and decelerations were also conducted, without problems; in particular it was noted that the engine picked-up cleanly during each acceleration. The oil pressure was noted to be slightly low; however, this could have been rectified by adjusting the oil pressure relief valve and was not considered a significant problem. The tests also confirmed that the engine-driven fuel pump was delivering a satisfactory fuel pressure.

The engine had achieved almost 1,100 hours of service and had been installed in the aircraft since new. The overhaul agent commented that the performance parameters were typical for an engine at such a stage in its overhaul life.

Analysis

The pilot reported that the combined weight of himself and passenger, together with an estimated 68 kg of fuel on board, put the all-up-weight (AUW) of the helicopter to within approximately 20 kg of its maximum. Higher AUWs, and hence the increased inertia of any helicopter, result in higher descent rates during autorotation and additional height loss during the flare while recovering to a hover. Some instructors on this type of helicopter have commented that they tend to maintain an airspeed of 60 kt, or more, during autorotation, which represents additional energy that can be used to maintain rotor speed during the flare. Any significant reduction in rotor speed may result in the blades 'over-pitching' as the collective lever is raised at the end of the flare, leading to further rotor speed reduction. In this condition, the available engine power cannot overcome the excessive drag on the blades in order to regain normal rotor speed, leading to the blades coning upwards.

It seems possible that, in this case, the weight of the aircraft and the higher than usual descent rate was compounded by a tailwind component that made judging the manoeuvre more difficult. In addition, the commander had not appreciated the boggy nature of the ground, and this precluded what might otherwise have been a successful run-on landing, albeit with a high rate of descent.

The available evidence does not entirely discount an engine problem during the descent; however, the test cell results did not suggest any such problem. The helicopter's fuel system is simple in design with the fuel tanks being mounted high on the airframe. Thus, even had the electric boost pump failed, the combination of gravity feed and engine-driven pump would have been sufficient to maintain the fuel supply to the engine. Also, as this was a fuel injected engine, the possibility of induction icing was considered remote.