ACCIDENT

Aircraft Type and Registration:	Enstrom 280FX Shark, G-WPKR	
No & Type of Engines:	1 Lycoming HIO-360-F1AD piston engine	
Year of Manufacture:	1986 (Serial no: 2012)	
Date & Time (UTC):	27 July 2019 at 1330 hrs	
Location:	Tongwynlais, Caerphilly	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Lower fuselage, landing skids and tail rotor damaged	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	440 hours (of which 45 were on type) Last 90 days - 16 hours Last 28 days - 7 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

While conducting a steep approach to a private landing site, the helicopter overshot the helipad, descending into an adjacent quarry. After hovering above the bottom of the quarry, the pilot attempted to climb out at full power, but during the climb ran out of power and the low rotor rpm warning activated. The helicopter narrowly managed to clear the lip of the quarry but landed on a fence and some ballast bags, sustaining extensive damage.

History of the flight

During the descent towards a private landing site near Tongwynlais, Caerphilly the pilot contacted Cardiff Radar and the wind was given as 260/10 kt. He approached the landing site from the east for a steep descent onto the helipad, during which the high rotor rpm warning alarm activated. In his attempt to reduce the rotor rpm the pilot over-corrected and the low rotor speed warning alarm then sounded. The pilot reported that he pushed the cyclic forward to increase the rotor speed but in doing so overshot the helipad pad into the neighbouring quarry, where the helicopter descended to approximately 50 ft above quarry floor.

The pilot hovered the helicopter above the quarry floor to recover and then started to climb out at full power but during the climb it became apparent to him that there was insufficient power available to sustain the climb. The helicopter's climb rate reduced and

the low rotor rpm warning sounded. The pilot reported that he was unable to either turn or descend without colliding with the rock face, as the helicopter was close to the side of the quarry.

He continued to apply full power hoping that he could clear the quarry lip and boundary fence, to land on the helipad. As the helicopter came over the lip of the quarry it started to descend and landed on the fence and some bags of ballast. The helicopter came to rest approximately 0.5 m from the quarry edge. Having landed with full power still applied, the engine was over-speeding, so the pilot turned the throttle to idle, disengaged the clutch and turned the fuel off. He was uninjured and was able to exit the helicopter without assistance.

Based on his assessment of the damage sustained by the helicopter, the pilot believes it may have pivoted backwards causing the tail rotor blades to strike the fence and the helicopter to come to rest partly on the fence and partly on the ballast bags (Figure 1).

The pilot subsequently commented that he had misjudged the approach. He considered the approach to be challenging in normal circumstances and particularly so on the day of the accident, because he had not flown G-WPKR for some time as it had been undergoing maintenance. With hindsight, he believes that he should have waited until he could fly G-WPKR with a safety pilot. He also indicated that it might have been preferable to approach the landing site from the north-west as the wind was light and the approach would have been less challenging.

Figure 1

G-WPKR after coming to rest on the lip of the quarry

Discussion

Over-pitching is a phenomenon which occurs when maximum power is achieved from a helicopter's engine and the collective pitch on the main rotor blades continues to be increased. The engine does not have enough power to keep the rotor blades spinning at the required speed, so a reduction in rotor rpm occurs.

Over-pitching can occur following a low rotor rpm situation. As rotor rpm decays, the coning angle of the rotor blades will increase. This causes the rotor disc to become smaller such that the total rotor thrust reduces and the drag on the blades increases. Large blade coning angles prevent the available engine power from increasing the rotor rpm. If the rotor rpm continues to drop it can reach a point where it cannot be restored, even by application of full engine power it; this is known as over-pitching. The reduced rotor rpm and subsequent loss of lift due to reduced airflow over the blades will cause the helicopter to descend when the engine cannot supply the power required.

The recovery actions for over-pitching are to lower the collective lever and simultaneously increase the throttle. Lowering the collective flattens the pitch angle and thereby reduces the drag of the main rotor blades, allowing the engine power to recover and the rotors to spin at full speed. The helicopter will lose height during the recovery.

CAA Safety Sense Leaflet 17 *'Helicopter Airmanship'* emphasises the importance of maintaining rotor rpm at all times together with proficiency at recognising and recovering from low rotor rpm conditions.

Having found himself at the bottom of the quarry, the pilot applied full power to climb out of the quarry and back towards the landing site. With the throttle fully open, he would not have been able to demand any additional power from the engine once he encountered a low rotor rpm situation. Due to his position relative to the quarry wall, the pilot reported that he did not have an option to turn or descend. Unable to execute any of the required recovery actions, it was fortuitous that the helicopter managed to clear the lip of the quarry before it began to descend.

The pilot acknowledged that had he considered aspects such as the challenging nature of the chosen approach to the landing site, the prevailing wind and his recency on type, he may have avoided a situation where it was necessary for the helicopter to climb out of the quarry.

Conclusion

While attempting to recover from overshooting the landing site the helicopter encountered a low rotor rpm situation from which the pilot did not consider it possible to effect the necessary recovery actions. This accident demonstrates the importance of preparation for helicopter operations in to challenging or confined sites. It further highlights the importance of maintaining rotor rpm and proficiency at recognising and recovering from low rotor rpm conditions.