FINAL REPORT

AAIU Report No: 2010-022
State File No: IRL00909108
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In accordance with the provisions of SI 205 of 1997, the Chief Inspector of Air Accidents, on 12 November 2009, appointed Mr. Thomas Moloney as the Investigator-in-Charge to carry out a Field Investigation into this Accident and prepare a Report. The sole purpose of this Investigation is the prevention of aviation Accidents and Incidents. It is not the purpose of the Investigation to apportion blame or liability.

Aircraft Type and Registration:	Robinson R44, EI-MMO (Helicopter)
No. and Type of Engines:	1 x Lycoming O-540-F1B5
Aircraft Serial Number:	1389
Year of Manufacture:	2004
Date and Time (UTC[1]):	31 October 2009 @ 16.15 hrs
Location:	Skinstown, Ballyragget, Co Kilkenny, Ireland
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - Nil Passengers - Nil
Nature of Damage:	Aircraft damaged beyond economic repair
Commander's Licence:	Private Pilot Licence (Helicopter) (PPL(H)) issued by the U.K. Civil Aviation Authority (CAA)
Commander's Details:	Male, aged 65 years
Commander's Flying Experience:	287 hours, of which 96 were on type
Notification Source:	Pilot-in-Command (PIC)
Information Source:	AAIU Pilot Report Form submitted by PIC, AAIU Field Inspection

SYNOPSIS

The privately owned helicopter was on a local flight with two persons on board. On returning to its landing site, as the Pilot attempted to bring the helicopter into a hover just above the site, it dropped suddenly, struck the ground, bounced back into the air, rolled left and yawed rapidly to the right. The two occupants were not injured but the helicopter was substantially damaged. There was no fire. The wind conditions at the time were blustery and changeable and heavy rain commenced almost immediately after the accident.

[1] UTC: Universal Time Co-ordinated. UTC and local time are the same throughout the Report.

NOTIFICATION

The accident occurred on 31 October 2009. However, the AAIU did not receive notification of the accident until 12 November 2009 when a Safety Occurrence Tracking System (SOTS) report was received by fax from the PIC.

1. FACTUAL INFORMATION

1.1 History of the Flight

The helicopter had departed at 15.40 hrs from its usual base, adjacent to the Pilot's residence, on a private local flight. The Pilot, who was the aircraft owner, and one passenger were on board. The Pilot described the flight as a *"short trip to keep his hand in"*. Shortly before 16.15 hrs, the helicopter returned towards its base, completed a circuit of local woodland, and then made an approach to land at its normal landing site, which was in a large field adjacent to the Pilot's residence. The woodland, 27 acres (11 hectares) in area, adjoins the large field.

The Pilot described how he used a windsock, which was located in the southwesterly corner of the field, to make his approach into wind on an approximate heading of 210ºM. He described the weather conditions at the time as being "*blustery and showery*". He also described conditions as being "*turbulent*". He stated that, at a height of about 10 to 15 ft above the ground, he flared the helicopter (pitched the nose upwards) to decelerate to a hover. Just as he approached the hover, the helicopter suddenly dropped and *"slapped off the ground"*. He thought that the initial ground impact was probably at the rear of the left-hand skid. The Pilot stated that the collective lever was up as this occurred. The helicopter bounced up again and he thought it might have rolled 25º to the left. The Pilot could not recall whether the main rotor blades impacted the ground at any stage but he could recall lowering the collective lever. He described how the nose yawed rapidly to the right, and the helicopter ended up settling on its skids, having turned through an angle of more than 90º clock-wise from its final direction of controlled flight.

The Pilot stated that, before the occurrence, all parameters had been normal. He had no problems with the engine or the flight controls and there had been no warning lights or warning horn such as the low rotor speed horn. He had carried out his usual pre-flight checks including the warning lights and horn before the accident flight and there had been no problems. He summarised that, in his opinion, the helicopter had been *"perfect up to the time of impact"*.

The Pilot informed the Investigation that almost immediately after the accident, very heavy rain starting falling. The Pilot described it as falling vertically. The two occupants remained in the helicopter for a short interval, with the Pilot describing their condition as uninjured but *"subdued and amazed"* after their experience. They then exited the helicopter, and made their way the short distance to his residence. When they arrived there, they were saturated from the rain.

1.2 Injuries to Persons

The two occupants were uninjured.

1.3 Damage to Aircraft

The aircraft was damaged beyond economic repair.

1.4 Personnel Information

The Pilot held a valid Joint Aviation Authorities (JAA) Flight Crew Licence (FCL) PPL(H), originally issued in 2006 by the U.K. CAA. He held a Class Two Medical Certificate valid until 9 September 2010. He learned to fly in the U.K. in 2006 and initially held a Robinson R22 rating. He received an R44 rating in January 2008, which was valid until 15 January 2010. He had a total flying time of 287 hrs, of which 96 hrs were on the R44 and the balance on the R22. He had flown 15.4 hrs in the 90 days prior to the accident and 4 hrs in the 28 days prior to the accident.

The passenger also held a rotorcraft PPL, which had been issued in 2009 by the U.S. Federal Aviation Administration (FAA).

1.5 Aircraft Information

The Robinson R44 is a four-seat single main rotor, single-engine helicopter constructed primarily of metal and equipped with skid type landing gear. The main rotor has two all-metal blades, connected to the hub by individual coning hinges. The hub is mounted on the shaft with a teeter hinge located above the coning hinges. One Lycoming O-540 six-cylinder, horizontally opposed, overhead-valve, air-cooled, carburetted engine powers the helicopter. The Pilot informed the Investigation that he had always used Avgas 100LL fuel in the helicopter.

The Irish Aviation Authority (IAA) issued a Certificate of Airworthiness for EI-MMO on 9 January 2008, and an Airworthiness Review Certificate was issued on 28 January 2009 valid until 27 January 2010. The aircraft logbook showed a total flying time of 727.8 hrs on 31 October 2009.

The helicopter was maintained by an Irish EASA[2] Part 145 and Part M approved maintenance organisation. The last Certificate of Release to Service prior to the accident was issued on 7 October 2009 at an aircraft time of 724.5 hrs, following a 50 hr / 6 month inspection. The next scheduled maintenance inspections due were a 100 hr inspection at 745.7 hrs and an annual inspection required on 21 November 2009. Inspection of the logbooks and maintenance records for the aircraft revealed no anomalies.

1.6 Meteorological Information

The Investigation requested an aftercast of the meteorological conditions at the time of the accident from Met Éireann. The salient points of the aftercast are as follows:

A very unstable, southwesterly flow lay across the area. Showery troughs were crossing the country during the period. Some of the showers were thundery in nature. Winds at surface level were from 200ºM at 10 to 12 kts with potential gusts to 25 kts. The temperature was 14ºC and the dew point was 11/12ºC. The QNH was 1016 hPa[3].

[2] EASA: European Aviation Safety Agency
[3] hPa: hectoPascals, a unit of atmospheric pressure

1.7 Wreckage and Impact Information

The Investigation was unable to survey the wreckage of EI-MMO and the accident site for some time after the accident, due to the delay in receipt of accident notification. The Pilot assured the Investigation that the helicopter remained exactly as it had been following the accident.

The helicopter fuselage was resting upright on its skids on a heading of 350ºM (**Photo No. 1**). The entire airframe structure was distorted although the cabin area had remained intact and relatively undamaged. There was significant distortion of the rear left-hand vertical support tubing.

Photo No. 1: Final Position of EI-MMO

Both main rotor blades were fractured close to the hub, although they had not separated. The outer ends of both main rotor blades were resting on the ground, one forward and to the left of the cabin, while the second blade was resting against the left side of the fuselage close to the area where the tail cone is attached to the fuselage. The forward blade did not show evidence of heavy ground impact, but the second main rotor blade had been severely damaged by rotational ground impact towards the area of the blade tip.

The tailcone had been twisted and torn away from the helicopter fuselage almost all the way around its circumference, to the rear of and close to the area where the tailcone is normally attached to the fuselage. Its final position was approximately 60º to the right of its normal alignment. At the rear end of the tailcone, the tail rotor hub was resting on the ground. One of the tail rotor blades had fractured close to its root but had not separated from the assembly. The second tail rotor blade had fractured and separated. Both blades showed evidence of heavy rotational ground impact.

Yellow paint marks were found on the left side of the helicopter, just forward of the area where the tailcone had been torn away from the remainder of the fuselage. However, there were no such marks to the rear of where the tailcone had been torn away. These yellow paint marks matched areas on the upper surfaces of the main rotor blades, which had alternative zones of yellow and white paint.

Two significant rotor blade slash marks were located in the field approximately 3m to the right of the cabin and approximately 1m apart.

The Investigation checked the flight controls for continuity and correct operation. No evidence of pre-impact defects, which might have been a factor in the accident, was identified.

2. ANALYSIS

The Pilot informed the Investigation that he had been bringing the helicopter into a hover, at a height of approximately 10 to 15 ft above the ground, in turbulent and blustery conditions when the helicopter suddenly dropped, made contact with the ground at the rear of the left skid, bounced up and rolled to the left. He stated that there had been no problem with engine power or flight controls and that there had been no warnings such as the low rotor speed horn. The Investigation found no evidence of pre-impact defect or failure, which might have caused the sudden loss of control.

The distortion of the rear left-hand vertical support tubing indicates high vertical impact forces on the rear of the left skid. The evidence also suggests that one of the main rotor blades made heavy rotational contact with the ground and that both tail rotor blades also struck the ground during the accident sequence, causing one tail rotor blade to separate completely from the hub and the second one to fracture near its root. The consequent complete loss of tail rotor authority would have caused the helicopter nose to yaw rapidly to the right, as described by the Pilot. The final heading of the helicopter was approximately 140º to the right of the aircraft heading at it approached the hover.

It seems probable in the circumstances that the blustery and turbulent wind conditions, which were present just before the commencement of a very heavy rain shower, were a major factor in the sudden loss of lift by the helicopter. The Pilot described how the approach to the hover was made into a blustery wind, using visual reference to the windsock. However, he described the heavy rain, which commenced almost immediately after the accident, as falling vertically. This is consistent with a rapid abatement of wind strength at the landing site. The woodland, which adjoins the field containing the landing site, may have caused further disturbance of the airflow around the site.

The high vertical forces, which the helicopter sustained on impact with the ground, suggest that it may have been subjected to a localised downdraught. The minimal height above the ground when the upset occurred meant that the Pilot did not have the time to counteract the upset before the helicopter struck the ground and bounced back up.

3. CONCLUSIONS

(a) Findings

1. The Pilot held a valid U.K. CAA PPL(H) Licence with R44 rating.

2. The helicopter had a valid Certificate of Airworthiness and Airworthiness Review Certificate issued by the IAA.

3. The Pilot was attempting to bring the helicopter to a low-level hover prior to landing at the helicopter's home base.

4. The helicopter suddenly dropped from a height of approximately 10 to 15 ft, struck the ground, probably at the rear of the left skid, and then bounced upwards.

5. The Pilot lost control of the helicopter. One of the main rotor blades struck the ground and both tail rotor blades struck the ground during the accident sequence.

6. Conditions were turbulent and the wind was blustery and changeable. Heavy rain, falling vertically, started almost immediately after the accident.

(b) Probable Cause

Loss of control while approaching a low-level hover, in blustery, changeable wind conditions and turbulence.

(c) Contributory Cause

Insufficient height to affect a recovery.

4. SAFETY RECOMMENDATIONS

This Investigation does not sustain any Safety Recommendations.

- END -