



Federal Public Service
Mobility and Transport
Air Accident Investigation Unit

Air Accident Investigation Unit -(Belgium)
CCN
Rue du Progrès 80 Bte 5
1030 Brussels



Safety Investigation Report

ACCIDENT TO THE ROBINSON R44 II HELICOPTER REGISTERED OO-T** AT EBCF ON 01 OCTOBER 2011

Ref. AAIU-2011-24-EBCF-OO-T**
Issue date: 27 July 2012
Status: Final

FOREWORD.....	3
SYNOPSIS.....	4
1 FACTUAL INFORMATION.....	5
1.1 HISTORY OF FLIGHT	5
1.2 INJURIES PERSONS.....	6
1.3 DAMAGE TO AIRCRAFT	6
1.4 OTHER DAMAGE	7
1.5 PERSONNEL INFORMATION	7
1.6 AIRCRAFT INFORMATION	7
1.7 METEOROLOGICAL CONDITIONS.....	9
1.8 AIDS TO NAVIGATION	9
1.9 COMMUNICATION.	9
1.10 AERODROME INFORMATION	9
1.11 FLIGHT RECORDERS	10
1.12 WRECKAGE AND IMPACT INFORMATION	10
1.13 MEDICAL AND PATHOLOGICAL INFORMATION.	12
1.14 FIRE.....	12
1.15 SURVIVAL ASPECTS	12
1.16 TESTS AND RESEARCH.....	12
1.17 ORGANIZATIONAL AND MANAGEMENT INFORMATION.....	12
1.18 ADDITIONAL INFORMATION	12
1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES	12
2 ANALYSIS.....	13
2.1 PILOT’S EXPERIENCE	13
2.2 DESIGN OF THE AIRFIELD REFUELLING INSTALLATION.....	13
2.3 AIRFIELD PROCEDURE AND USER GUIDANCE FOR REFUELLING	13
3 CONCLUSIONS	14
3.1 FINDINGS.....	14
3.2 CAUSES	14
4 SAFETY RECOMMENDATIONS	15

FOREWORD

This report is a technical document that reflects the views of the investigation team on the circumstances that led to the accident.

In accordance with Annex 13 of the Convention on International Civil Aviation, it is not the purpose of aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the Final Report is the determination of the causes, and define recommendations in order to prevent future accidents and incidents.

In particular, Article 16 of the EU regulation EU 996/2010 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility in the accident.

Unless otherwise indicated, recommendations in this report are addressed to the Regulatory Authorities of the State having responsibility for the matters with which the recommendation is concerned. It is for those Authorities to decide what action is taken.

The investigation was conducted by H. Metillon
The report was verified by L. Blendeman

NOTE:

For the purpose of this report, time will be indicated in UTC, unless otherwise specified.

SYNOPSIS

Date and hour of the accident:	1 st October 2011 at 6:06 UTC
Aircraft:	ROBINSON R44 II
Accident location:	EBCF Cerfontaine Airfield
Aircraft owner:	Building Plastics N.V.
Type of flight:	Private Flight
Persons on board:	One

Abstract:

The pilot intended to fly from a private airfield located in Roeselare to EBMG airfield located near the village of Matagne. Before arriving at EBMG airfield, the pilot intended to make a fuel stop at EBCF Airfield. As planned, the helicopter flew to EBCF airfield, entered the circuit and finally went to the refuelling installation of the airfield. Then the helicopter hovered close to the fuel pump at one meter from the ground when suddenly the helicopter was seen oscillating and moving towards the fuel pump. The main rotor blades violently hit the roof covering the fuel pump causing significant damage to the roof structure and to the helicopter. The airfield commander who was present for the opening of the airfield was slightly injured by the projected debris. The pilot climbed out of the helicopter, shocked but uninjured.

Cause(s):

The cause of the accident is a limited loss of control when hovering within an unsafe distance of obstacles.

Hazard identified during the investigation ¹:

The hover within an unsafe distance of obstacles.

Consequence ²:

Controlled flight into or toward terrain (CFIT).

¹ Hazard – Condition or object with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

² Consequence – Potential outcome(s) of the hazard

1 Factual information

1.1 History of flight

The pilot rented the helicopter for a flight from its home base on the private heliport EBNK to the Matagne ULM airfield (EBMG).

Before arriving at EBMG airfield, the pilot planned to land in EBCF in order to refuel the helicopter.

The helicopter took off from Roeselare at 05:18 UTC and flew straight to EBCF. The pilot contacted EBCF radio shortly before landing and got landing clearance and the usual information; traffic, the active runway was Runway12, etc.

The helicopter entered the circuit around 06:00 UTC and the airfield commander radioed further instructions to guide the pilot to the fuel station.

The pilot was also told that the fuel pump ground wire was a bit short and was advised to land near the fuel pump installation “as best as possible”, taking into account the limited length of the ground wire.

The helicopter flew to the fuel station, and hovered one meter above the concrete platform, in front of the fuel station.

At that moment, the helicopter pitched somewhat rearward, the pilot corrected, and then the helicopter pitched forward, beginning an oscillating movement. Immediately after, the helicopter moved forward, and the main rotor collided with the metallic structure of the fuel shed.

The pilot reacted immediately, putting the collective down, shutting down the propulsion and pulling on the main rotor brake handle.

Despite the pilot’s actions, the main rotor continued to collide several times with the fuel pump installation roof, ejecting debris.

Several pieces hit the tower building, piercing a glass door, dust bins and a concrete wall. Some smaller parts hit a Cessna Caravan parked in the vicinity.

Before the stoppage of the main rotor, the entire tail boom separated from the fuselage due to the significant shocks transmitted through the fuselage.

The airfield commander who was standing around 20 meters from the helicopter was hit in the head by a flying object before he took refuge alongside the door of a building. Fortunately, he was not seriously injured.

According to the airfield commander, the total duration of the accident, from the moment the main rotor blades hit the roof until the rotor came to a complete stop would have been around 30 to 40 seconds.

1.2 Injuries persons

Injuries	Pilot	Passenger	Others	Total
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	1	1
None	1	0	0	1
Total	1	0	0	2

1.3 Damage to aircraft



Figure 1: View of the helicopter and the refuelling installation.

As seen on the above picture the helicopter was severely damaged.

The main rotor blades collided several times with the roof causing the helicopter's skids to violently hit the ground in a rocking movement.

The main rotor blades were destroyed and it is likely that the entire power transmission and the flight controls accessories suffered extensive damage.

The tail structure was submitted to extensive and repeated shock loading when the main rotor hit the roof structure, accompanied by a rocking movement of the skids against the concrete surface. After a short period of time, the tail structure separated from the fuselage before the helicopter finally came to rest on its skids.

As well as the damage located at the tail structure separation, the structure of the fuselage showed a few structural deformations at different places.

1.4 Other damage

The corrugated iron and the roof's steel beams of the fuel pump house were significantly damaged. The concrete surface of the refueling area was also abraded by several impacts of the skids.

Several pieces of debris were projected toward the tower building located around 40 meters further, piercing a glass door, dust bins, and even a concrete wall.

Some smaller parts hit a Cessna Caravan parked in the vicinity causing limited damage to the paint and to the exhaust of the engine.

1.5 Personnel information

Pilot:

Sex:	Male
Age: years old:	26 years old
Nationality:	Belgian
License:	Private Pilot Helicopter license delivered on 20 May 2011, valid up to 20 May 2016. Ratings: R44, valid up to 31 May 2012.
Medical certificate:	Class II, issued on 15 January 2010. Valid up to 13 January 2015.
Pilot's experience:	The student pilot passed the PPL (H) skill test on 16 May 2011 after 82 flight hours of training, including 167 landings. When the accident occurred, the pilot's experience was 103:42 total flight time and 214 landings.

1.6 Aircraft information

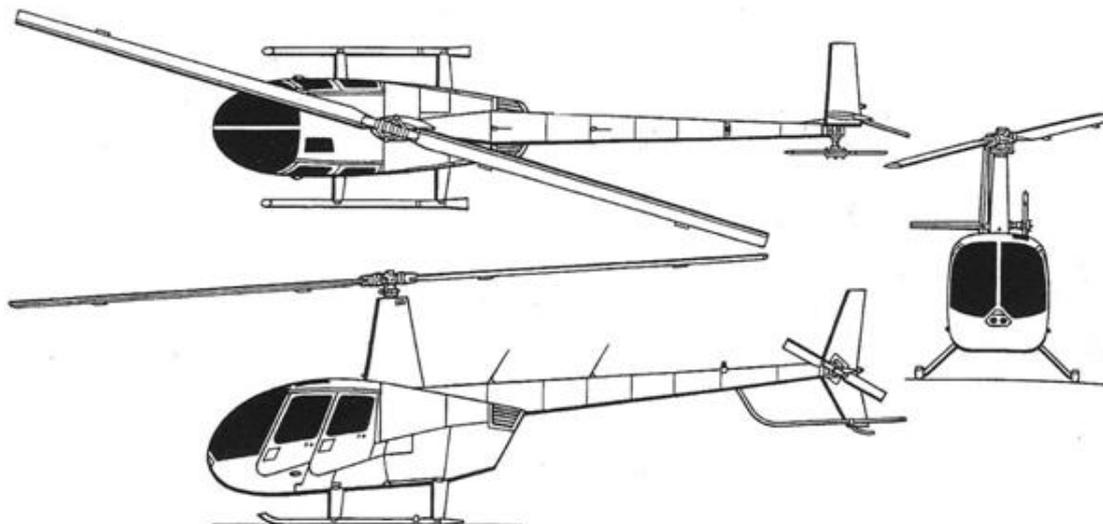
The Robinson R44 is a four-place light helicopter produced by the Robinson Helicopter Company since 1992. It is a single engine helicopter with a semi-

rigid two-bladed main rotor and a two-bladed tail rotor and a skid landing gear. It has an enclosed cabin with two rows of side-by-side seating for a pilot and three passengers.

The Robinson R44 is type certificated by EASA under the reference EASA.IM.R.121, issue 3 dated 21 April 2010.

General characteristics

- **Crew:** one or two pilots
- **Capacity:** four, including pilot
- **Payload:** 900 lb (408 kg)
- **Length:** 21 ft 5 in (9.0 m)
- **Rotor diameters:** 33 ft (10.1 m)
- **Tail rotor diameters:** 4 ft 10 in (1.5 m)
- **Height:** 10 ft 9 in (3.3 m)
- **Empty weight:** 1,450 lb (657.7 kg)
- **Loaded weight:** 2,500 lb (1,134 kg)



Airframe:

Manufacturer: Robinson Helicopter Company
Type: R44 II
Serial number: 11816
Built year: 2007
Registration: OO-T**
Certificate of registration: Number 10157, delivered by BCAA on 17 July 2007
Certificate of Airworthiness: EASA Form 25 issued by BCAA on 27 July 2007.

Airworthiness Review Cert.: EASA Form 15B issued on 19 July 2010,
valid up to 10 July 2012.

Airplane total time: Around 200 Flight Hours.

Ground equipment: Ground handling wheels were on board.

Engine:

Manufacturer: Lycoming

Type: IO-540-AE1A5

Total flight hours: Around 200 Flight Hours

Serial number: L-32021-48A

1.7 Meteorological conditions

Visibility: more than 10 km

Wind: no wind

1.8 Aids to navigation

Not applicable

1.9 Communication.

That morning, an airfield commander was present in order to open the airfield sooner than usually and to give the pilot information through the airfield's radio frequency.

The pilot contacted EBCF radio before entering the circuit and got the landing clearance and the usual information; traffic, the active runway etc ...

The pilot also requested by radio some information concerning the refuelling facilities of the airfield.

1.10 Aerodrome information

The airfield of Cerfontaine EBCF is located N 50°09'10" – E 004°23'14", at 2,7 km south of the city of Cerfontaine (Belgium - Province of Namur).

The elevation is 955 ft (291m) and it is equipped with two parallel 30 m wide grass runways oriented 117° / 297°. The south runway is 675 m long and the other is 798 m long. Maximum strength is 5700 kg.

This operator is "EBCF S.A." and the use of the airfield is subject to prior permission from the operator.

The circuits are left hand for runways 30 and right hand for runways 12, at a height of 945 ft AGL for motorized aircraft and 645 ft AGL for gliders.

The runways 12L/30R (798 long) are recommended for motorized aircraft and runways 12R/30L (675 long) are recommended for gliders (Both 12R and 12L runways request right-hand circuit).

The aerodrome is provided with a Flight Information Service (AFIS) called “Cerfontaine Radio” on the frequency 125.875 MHz (Information only, no ATC).

A refueling installation is available for 100LL Avgas and for Jet Fuel A1. The length of the 100LL fuel pipe was measured as being around 13 meters while the ground cable was around 10,5 meters long.

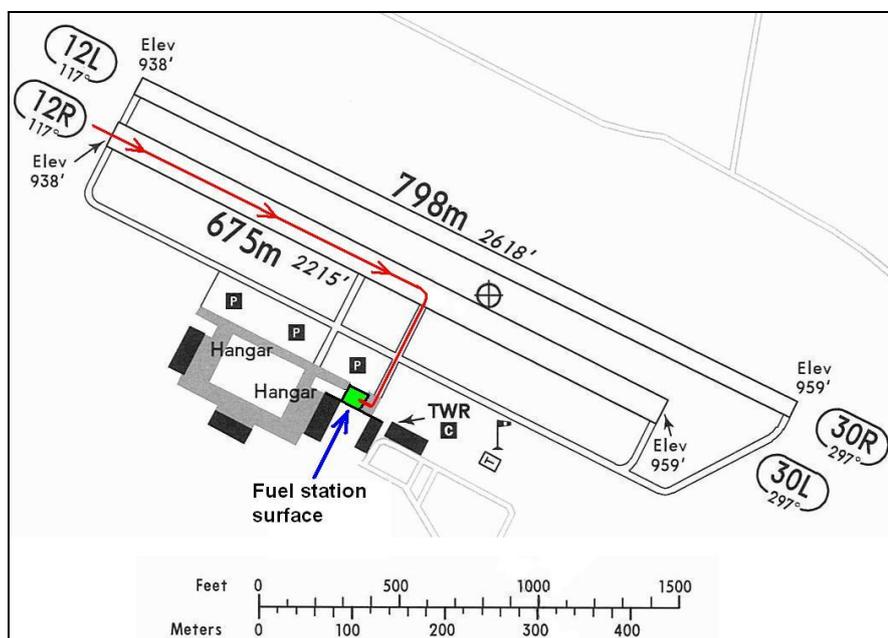


Figure 2: Flight path above EBCF airfield

1.11 Flight recorders

Not applicable

1.12 Wreckage and impact information

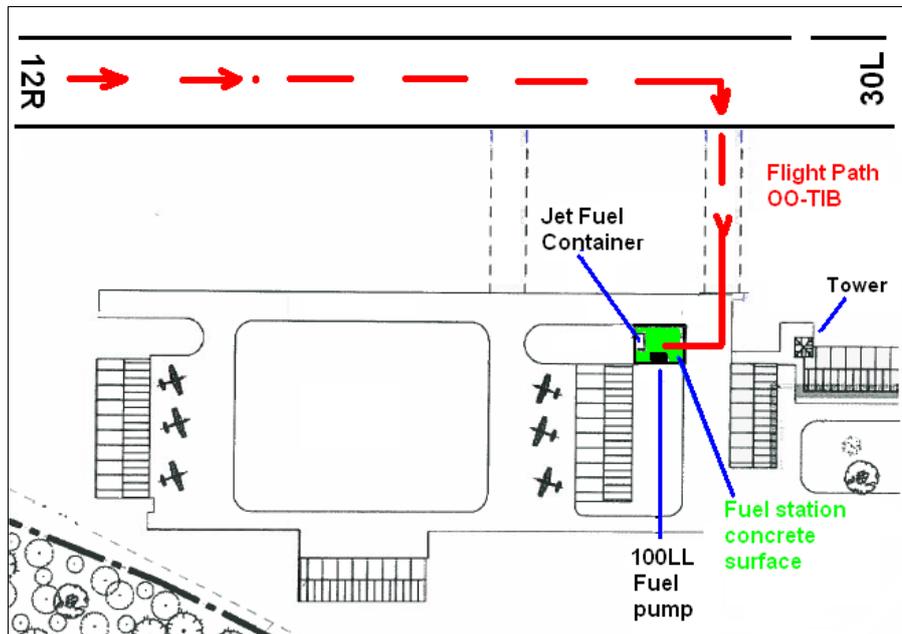


Figure 3: Location of the refuelling installation and flight path.



Figure 4: Pictures of the roof's damage and damage to the concrete wall of the tower.

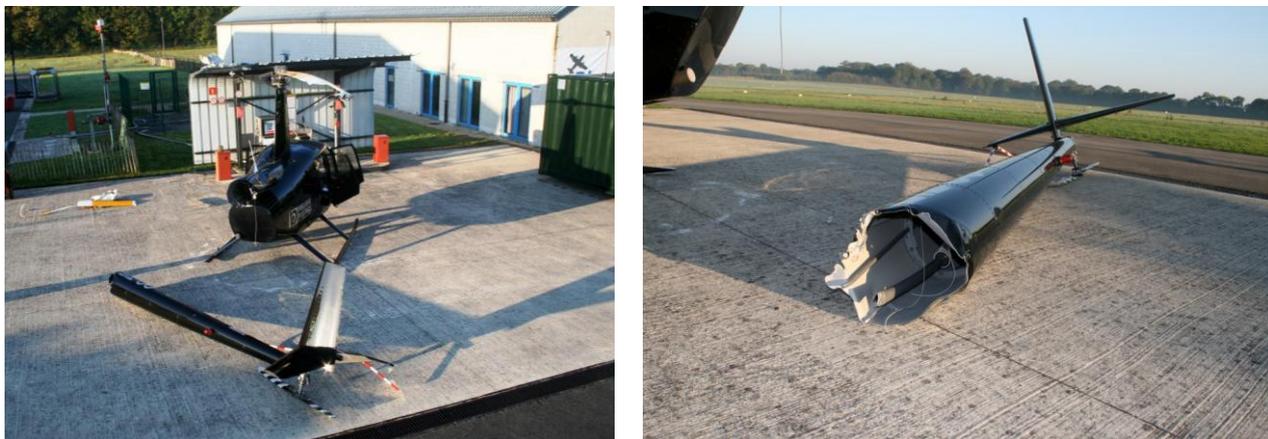


Figure 5: Damage to the helicopter.

As seen on the above pictures (Figure 4), the beam of the roof structure which was hit by the main rotor blades was bent around 45°. The concrete wall of the tower building located around 40 m from the helicopter was pierced, probably by a flying main rotor tip weight.

The helicopter suffered damage on the main rotor blades and the separation of the tail rotor boom. The tail rotor blades were also damaged, but less significantly. Some deformation of the fuselage structure is also visible at several places.

1.13 Medical and pathological information.

The pilot was not injured; however he was shocked by the accident. The airfield commander's head was hit by a flying object. Fortunately, the low density, low weight and low speed of this debris did not cause him to be seriously injured.

1.14 Fire.

There was no fire

1.15 Survival aspects

The crash was survivable to helicopter's occupants provided they were properly strapped by the safety belts.

By contrast, the projection of flying object may have caused serious injuries and even death to people standing within the flying debris distance.

1.16 Tests and research

Not applicable.

1.17 Organizational and management information

Not applicable.

1.18 Additional information

Reportedly, this type of accident is not the first one.

1.19 Useful or effective investigation techniques

Not applicable.

2 Analysis

2.1 Pilot's experience

The pilot experience when the accident occurred was 103:42 total flight time and 214 landings, exclusively performed on Robinson R44 II helicopters.

The pilot flew 21 hours and made 47 landings since he got his PPL (H) license four months and an half before.

It is likely that the pilot had already acquired a certain amount of self confidence while his actual experience was not sufficient to have faced all the situations a senior pilot would have known.

It is likely that the pilot experienced a small instability when he was hovering at 1 meter above the ground, close to the 100LL fuel pump.

2.2 Design of the airfield refuelling installation

To land on the concrete surface of the refuelling area, a helicopter's pilot has to adjust the helicopter hovering position in relation to two obstacles located perpendicularly; the 100LL fuel pump and the Jet A1 fuel container.

The solid Jet fuel container outlines are clearly visible and the distance between the vertical walls of the container and the rotor of the helicopter would be easy to evaluate by the pilot.

By contrast, the 100LL installation is less massive and the pilot would be obliged to evaluate several distances, for example those from the vertical wall of the 100LL fuel pump shelter would be more visible than the horizontal roof.

2.3 Airfield procedure and user guidance for refuelling

When the accident occurred, there was no written procedure available to guide, to warn or to request helicopter's pilots to land at a safe distance from the refuelling installation.

On the other hand, the airfield's commander radioed the pilot instructions to reach the fuel station and recommended him to put the helicopter close to the fuel pump shed, taking into account that the ground cable was a bit short.

3 Conclusions

3.1 Findings

- The helicopter was in airworthy condition.
- The pilot was qualified for the flight but had less experience.
- The pilot was landing near the refuelling installation of EBCF airfield for the first time.
- The design of the refuelling installation involves two obstacles located perpendicularly from each other.
- The safe distance regarding the horizontal roof of the 100LL fuel pump shelter is more difficult to evaluate than other obstacles and could have been underestimated.
- The helicopter was hovering at an unsafe distance from obstacles, close to the fuel pump, when the pilot suffered a limited loss of control.
- The helicopter was carrying ground handling wheels, but it was not intended to use them.

3.2 Causes

The helicopter suffered a limited loss of control when hovering within an unsafe distance of obstacles.

Contributing factors

- The overall experience level of the pilot was low.
- There was no instruction available in the airfield to request helicopter pilots to land at a safe distance from the refuelling station and to move the helicopter manually toward the fuel pump.
- The communication that took place between the pilot and the airfield commander, a.o. stating that the ground wire was short, had certainly influenced the pilot to decide to fly close to the fuel shed.

4 Safety recommendations

The following recommendation was made on 3 October 2011 to the EBCF airfield authority:

Recommendation 2012-H-9 to EBCF airfield authority.

AAIU recommends the EBCF airfield's commanders to request to helicopter's pilots who want to refuel:

- *To land at a safe distance from both the 100LL Avgas fuel pump and the Jet Fuel container.*
- *To be provided with ground handling wheels.*
- *To move the helicopters manually toward the refueling installation.*

The same day, the airfield's authority transferred the above AAIU recommendation to all EBCF airfields commanders and to all helicopter pilots based in EBCF.

Additionally, the airfield standard procedure manual was also revised to incorporate the AAIU (Be) recommendation.

Therefore the above recommendation is considered as being satisfactory complied with.