

FINAL REPORT



ACCIDENT 2021/1985

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FINAL REPORT

ACCIDENT

OCCURRENCE NO – 2021/1985

AIRCRAFT – Helicopter, Robinson R44, SP-CCC

DATE AND PLACE OF OCCURRENCE – 6 July 2021 r., Mikołajki



The Report is a document presenting the position of the State Commission on Aircraft Accidents Investigation concerning circumstances of the air occurrence, its causes and safety recommendations. The Report was drawn up on the basis of information available on the date of its completion.

The investigation may be reopened if new information becomes available or new investigation techniques are applied, which may affect the wording related to the causes, circumstances and safety recommendations contained in the Report.

Investigation into air the occurrence was carried out in accordance with the applicable international, European Union and domestic legal provisions for prevention purposes only. The investigation was carried out without application of the legal evidential procedure, applicable for proceedings of other authorities required to take action in connection with an air occurrence.

The Commission does not apportion blame or liability.

In accordance with Article 5 paragraph 6 of the Regulation (EU) No 996/2010 of the European Parliament and of the Council on the investigation and prevention of accidents and incidents in civil aviation [...] and Article 134 of the Act – Aviation Law, the wording used in this Report may not be considered as an indication of the guilty or responsible for the occurrence. For the above reasons, any use of this Report for any purpose other than air accidents and incidents prevention can lead to wrong conclusions and interpretations.

This Report was drawn up in the Polish language. Other language versions may be drawn up for information purposes only.

WARSAW 2022

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Abbreviations

A/C	Aircraft
ARC	Airworthiness Review Certificate
BEW	Basic Empty Weight
CAMO	Continuing Airworthiness Management Organization
CG	Center of Gravity
CofA	Certificate of Airworthiness
CofR	Certificate of Registration
CRS	Certificate of Release to Service
EC	European Commission
EH	Engine Hours
FH	Flight Hours
FIS	Flight Information Service
HP	Horsepower
IIC	Investigator in Charge
LAPL	Light Aircraft Pilot Licence
LMT	Local Mean Time
M	Month
METAR	Meteorological Aerodrome Report
MTOM	Maximum Take-off Mass
NTSB	National Transportation Safety Board
PDC	Pre-departure Check
PPL(H)	Private Pilot Licence (Helicopter)
PSP	State Fire Service
RPM	Revolutions per minute

SEP(L)	Single Engine Piston (Land)
TBO	Time Between Overhaul
TR	Type Rating
TOW	Take-off Weight
ULC	Civil Aviation Authority of the Republic of Poland
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WBR	Weight and Balance Report

General information

Occurrence reference number	2021/1985			
Type of occurrence	ACCIDENT			
Date of occurrence	6 July 2021 r.			
Place of occurrence	Mikołajki			
Type and model of aircraft	Robinson R44			
Aircraft registration marks	SP-CCC			
Aircraft user/operator	Private user			
Aircraft Commander	PPL(H)			
Number of victims/injuries	Fatal	Serious	Minor	None
	-	3	-	-
Domestic and international authorities informed about the occurrence	ULC, EASA, EC, NTSB			
Investigator-in-Charge	Andrzej Bartosiewicz			
Investigating Authority	State Commission on Aircraft Accidents Investigation (PKBWL)			
Accredited Representatives and their advisers	Accredited representative – NTSB Technical adviser of NTSB: Robinson, Lycoming Technical adviser of PKBWL: EASA			
Document Containing Results	FINAL REPORT			
Safety recommendations	NONE			
Addressees of the recommendations	Not applicable			
Date of completion of the Investigation	TBD			

Synopsis

On 6 July 2021, around 09:30 hrs LMT¹ a pilot of the Robinson R44 (Raven I) helicopter, SP-CCC registration marks, took off from a private property in Mikołajki to perform a recreational flight to the EPUL airfield in Ułęż.

The pilot was a male, holder of PPL(H) and there were two passengers on-board.

The temperature in the helicopter cabin was very high. Shortly after take-off, during acceleration and altitude gain, the pilot wanted to pull the cabin air knob, but by mistake he pulled the mixture control knob, which leaned the mixture and, as a result, the engine shutdown. The pilot immediately realized what had happened and pushed the knob back immediately, but it was too late.

The main rotor RPM began to drop sharply. Light and sound signals alerted the pilot of that fact. The pilot moved the collective downward to switch to auto-rotation flight. During the descent, the helicopter was controllable. Due to the low speed and height (about 40 m AGL), it was not possible to return to the operational RPM of the main rotor.

Just above the water surface, the pilot increased the collective angle of attack of the main rotor blades by raising the collective. Due to too low RPM of the main rotor, he did not manage to fully stop the descent and the helicopter ditched hard in the Tały lake in Mikołajki.

As a result of the collision with water, the pilot lost consciousness, which he regained after choking on water, and then instinctively surfaced. At that time, one of the passengers has already surfaced, and the other one joined her after a while. A private motor boat approached them and they were all taken on-board. A few minutes later, PSP and Police boats arrived and the survivors received first aid.

The pilot and passengers were seriously injured and were taken to hospitals. The helicopter was destroyed and its wreckage came to rest at a depth of over a dozen meters under water. In the afternoon the helicopter was recovered and secured for PKBWL investigation.

The investigation into the occurrence was conducted by the PKBWL Investigation Team in the following composition:

Andrzej Bartosiewicz Investigator-in-Charge;

Mieczysław Wyszogrodzki Team Member;

Krzysztof Błasiak Team Member.

¹ All times in the report are in LMT unless indicated otherwise. On the day of the accident LMT=UTC+2 h

During the Investigation PKBWL determined the following cause of the accident:

Pilot error, resulting in the engine shutdown after take-off.

Contributing factors:

- 1) High ambient temperature as well as inside the cabin.
- 2) Pilot's habits acquired on different helicopter model.
- 3) Time pressure caused by limited availability of airspace.
- 4) Lack of conditions to perform full autorotation (low helicopter height and speed)

Safety recommendations:

PKBWL has not proposed any safety recommendation after completion of the investigation.

1. FACTUAL INFORMATION

1.1. History of the flight

On 6 July 2021, the owner of the Robinson R44 helicopter (SP-CCC registration marks), male, aged 53, holder of PPL(H), planned to perform a recreational light from Mikołajki to the EPUL airfield in Ułęż, with two passengers on board.

Around 7:15 hrs UTC the pilot arrived at the helicopter parking place, placed the luggage in the aircraft, made a pre-flight inspection, and also checked the weather conditions and the availability of the airspace. Knowing that the airspace zones on the planned route would be occupied after 8:00 hrs UTC, the pilot decided to take off as soon as possible.

The pilot showed the passengers their seats in the cockpit, fastened their seatbelts and gave them emergency instructions. One of the passengers took the left front seat (next to the pilot), the other one the right rear seat (behind the pilot).

After taking his seat in the helicopter, the pilot started the engine. The process of starting the powerplant was uneventful. After obtaining the parameters necessary for the flight, the pilot hovered and checked the parameters again, and then made the take-off.

During acceleration and climb, the pilot checked the setting of the radio frequency and transponder code to establish communication with FIS Olsztyn. A moment later, due to very high temperature in the cabin, the pilot wanted to pull the cabin air knob, but by mistake he pulled the mixture control knob², which leaned the mixture and, as a result, caused the engine shutdown.

The pilot immediately realized what had happened and pushed the knob back. However, there was no time to restart the engine in flight, the speed of the main rotor began to drop rapidly. The pilot instinctively lowered the collective as for autorotation.

During autorotation the helicopter remained controllable. Due to low speed and height, the main rotor could not fully recover its RPM. Just above the water surface, the pilot increased the angle of attack of the main rotor blades by raising the collective all the way up, trying to slow down the descent speed. However, the rotor kinetic energy was too low and the helicopter ditched hard in the Tały lake.

As a result of the collision with water, the pilot lost consciousness, which he regained after choking on water, and then instinctively surfaced. Both passengers got out of the helicopter on their own and also surfaced. After a while, a private motor boat approached the survivors and they were taken on board. A few minutes later, the PSP and Police motor boats arrived at the scene.

As a result of the impact (hard ditching), the pilot and passengers were seriously injured, all of them were taken to hospitals for medical treatment.

² Throughout the flight, the mixture control knob should be pressed (mixture maximum rich). According to normal procedures, the helicopter engine is shutdown by pulling the knob

The wreckage of the helicopter rested at the bottom of the lake at a depth of 16 m, from where it was recovered on the same day and secured for the SCAAI and the prosecutor's investigations.

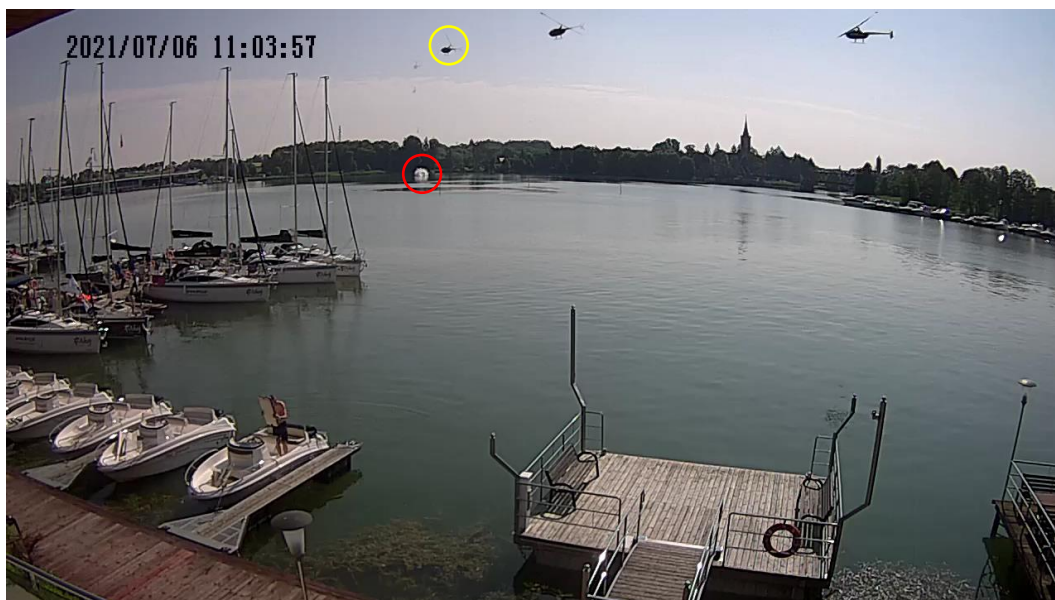


Fig. 1. Robinson R44, SP-CCC – course of the accident (time-lapse photos combined into one image); the yellow circle marks the position of the helicopter when the engine stopped, the red circle marks the place of the collision with water [source: CCTV camera of Gołębiowski Hotel in Mikołajki]³. Note: the recording time in the upper left corner is incorrect.

1.2. Injuries to persons

Table 1.

Injuries	Crew	Passengers	Others	TOTAL
Fatal	0	0	0	0
Serious	1	2	0	3
Minor	0	0	0	0
None	0	0	N/A	0

Persons injured in the accident:

- 1 citizen of Poland (pilot);
- 2 citizens of Ukraine (passengers).

³ Unless otherwise stated, source: PKBWL

1.3. Damage to aircraft

The helicopter was destroyed. All damage to the helicopter resulted from its collision with water. No other visible damage was found, including the engine and drive train, which may have occurred earlier. The main damage is shown in the figures below.



Fig. 2. Robinson R44, SP-CCC – helicopter wreckage after recovery from the lake (visible numerous damage to the structure, including deformed cockpit with broken windshield and bottom skin of the fuselage torn out)



Fig. 3. Robinson R44, SP-CCC – helicopter wreckage after recovery from the lake (visible numerous damage to the structure, including deformed engine compartment and tail boom, tail rotor with gearbox, vertical and horizontal stabilizer, tail rotor cover and tail skid broken)

1.4. Other damage

As a result of the accident, the water in the Tały lake was locally contaminated with fuel and engine oil.

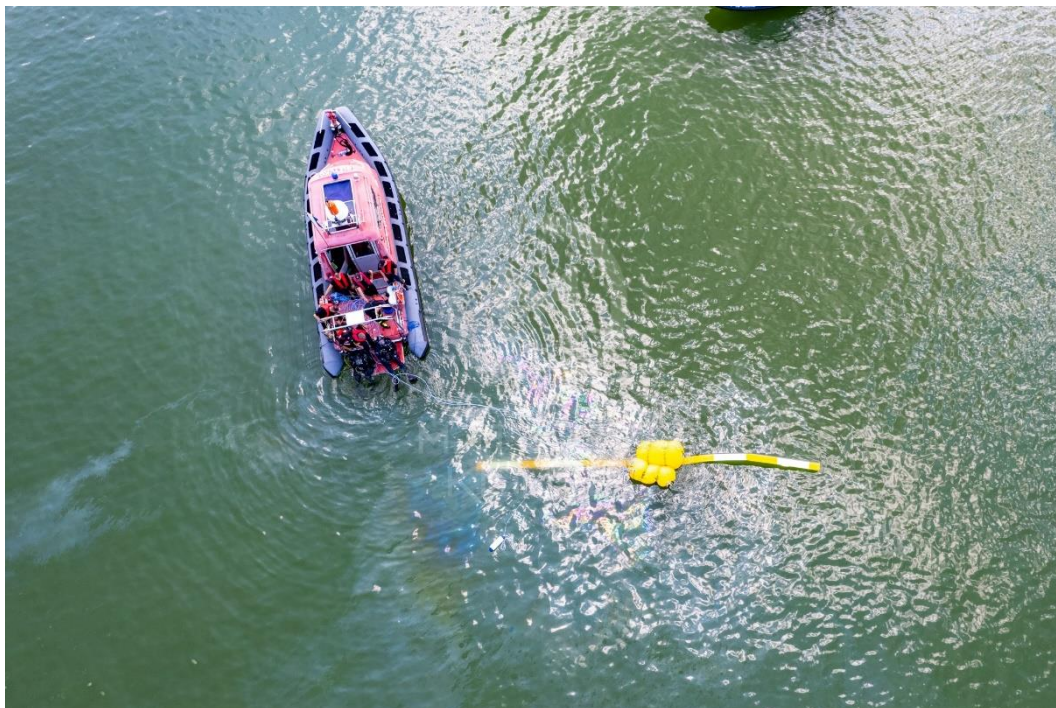


Fig. 4. Accident site – recovery of the Robinson R44, SP-CC helicopter wreckage (stains of fuel and oil are visible on the lake surface) [source: Police]

1.5. Personnel information (pilot data)

Aircraft commander – male, aged 53, holder of PPL(H) issued on 25 November 2014. Ratings for Robinson R44 and night flights.

Aeromedical certificate: Class 1 valid until 21 October 2021, LAPL valid until 6 October 2022.

Extension of the validity of ratings – the last practical test TR R44 (type rating R44) was conducted on 27 January 2020. As a result of the examination, the R44 rating was extended until 31 January 2021. On the day of the accident the pilot TR R44 was not valid.

Flight time on R44 – 1000 FH.

Flight time on R44 over the last 90 days prior to the accident – 30 FH.

Flight time on R44 over the last 30 days prior to the accident – 12 FH.

1.6. Aircraft information

1.6.1. General information

The Robinson R44 is a four-seat classic design, light helicopter, powered by a piston engine with two semi-rigid main rotor blades and a 2-blade tail rotor. The fuselage is made of a welded steel truss covered with aluminium. It is equipped with a fixed landing gear with skids.

Basic data:

- aircraft class – helicopter (H);
- aircraft subcategory – small helicopter (H2);
- purpose and number of seats – general utility and training, pilot +3 passengers;
- registration marks – SP-CCC;
- manufacturer – Robinson Helicopter Company;
- manufacturer designation – R44;
- serial number – 2557;
- aircraft owner – limited liability company;
- aircraft user – private;
- number, manufacturer, engine type and model – 1 x Lycoming O-540-F1B5 (6-cylinder, carburetor, 260 HP);
- engine serial number – L-27789-40E.

Certificate of Registration (CofR) – valid on the day of occurrence:

- register no – 796;
- issue date – 20 December 2018.

Certificate of Airworthiness (CofA) – valid on the day of occurrence:

- issue date – 2 January 2019;
- limitations – without limitations.

Airworthiness Review Certificate (ARC) – valid on the day of occurrence:

- issue date – 31 December 2020;
- valid until – 1 January 2023.

Noise Certificate (NC) – valid on the day of occurrence:

- issue date – 24 September 2018.

Certificate of Insurance (CofI) – valid on the day of occurrence:

- issue date – 26 November 2020;
- validity – from 12 December 2020 until 11 December 2021.

Weight and Balance Report (WBR) – valid on the day of occurrence:

- issue date – 18 August 2018.

1.6.2. Service life data⁴

AIRFRAME:

Manufacture Date	05.09.2018;
TSN	375:38 FH ⁵ ;
Date of the last annual/100 FH check	30.10.2020;
– after TSN	300:40 FH;
– carried out by	CAMO ⁶ .

ENGINE:

Manufacture Date	11 April 2018;
Date of engine installation ⁷	07 May 2000;
TSN	375:38 EH;
TSO	170:59 EH;
Date of the last annual/100 FH check	30 October 2020;
– after TSN	300:40 EH;
– carried out by	CAMO ⁸ .

1.6.3. Aircraft weight and balance

Mass limits:

– Maximum TOM:	1089 kg;
– Minimum TOM:	703 kg;
– Maximum mass per seat (including baggage)	136 kg;
– Maximum under-seat baggage mass	23 kg.

Center of Gravity (CG) – the center of gravity is within the prescribed limits with all doors installed and the pilot mass greater than 68 kg.

Mass:

– BEW ⁹ :	663 kg;
– pilot:	100 kg;
– passenger seated in front:	60 kg;
– passenger seated in the back:	60 kg;

⁴ Data from 11 June 2021

⁵ HH:MM – hours:minutes

⁶ Authorization no PL.145.095

⁷ On 16 April 2020, due to filings, the engine was removed from the helicopter for repair, and after the repair, it was reinstalled on 7 May 2020. The scope of the repair included verification, carbon deposit cleaning, cylinder honing and pistons replacement. The repair was performed in a certified organization, authorization no PL.145.032.

⁸ Authorization no PL.145.095

⁹ Weight expressed in mass units - the sum of the mass of a standard helicopter, the mass of unusable fuel, the mass of operating fluids (when their tanks are fully filled), the mass of engine oil (when the oil tank is full) and the mass of additional equipment.

- fuel (120 l AVGAS 100LL): 86 kg;
- baggage: 10 kg;
- TOTAL 979 kg.

1.7. Meteorological information

On 6 July 2021, in the morning, a neutral point was formed over north-eastern Poland, slowly moving towards the east. Over the western part of the country there was a shallow low-pressure front slowly moving to the north-east, associated with the low pressure system (993 hPa) over Great Britain, moving to the north-east.

The above barometric situation resulted in stable weather conditions over most of Poland. Sunny, cloudless day with little to moderate clouds. In the north-eastern part, mainly in Podlasie region, there was a low risk of showers and storms in the evening hours.

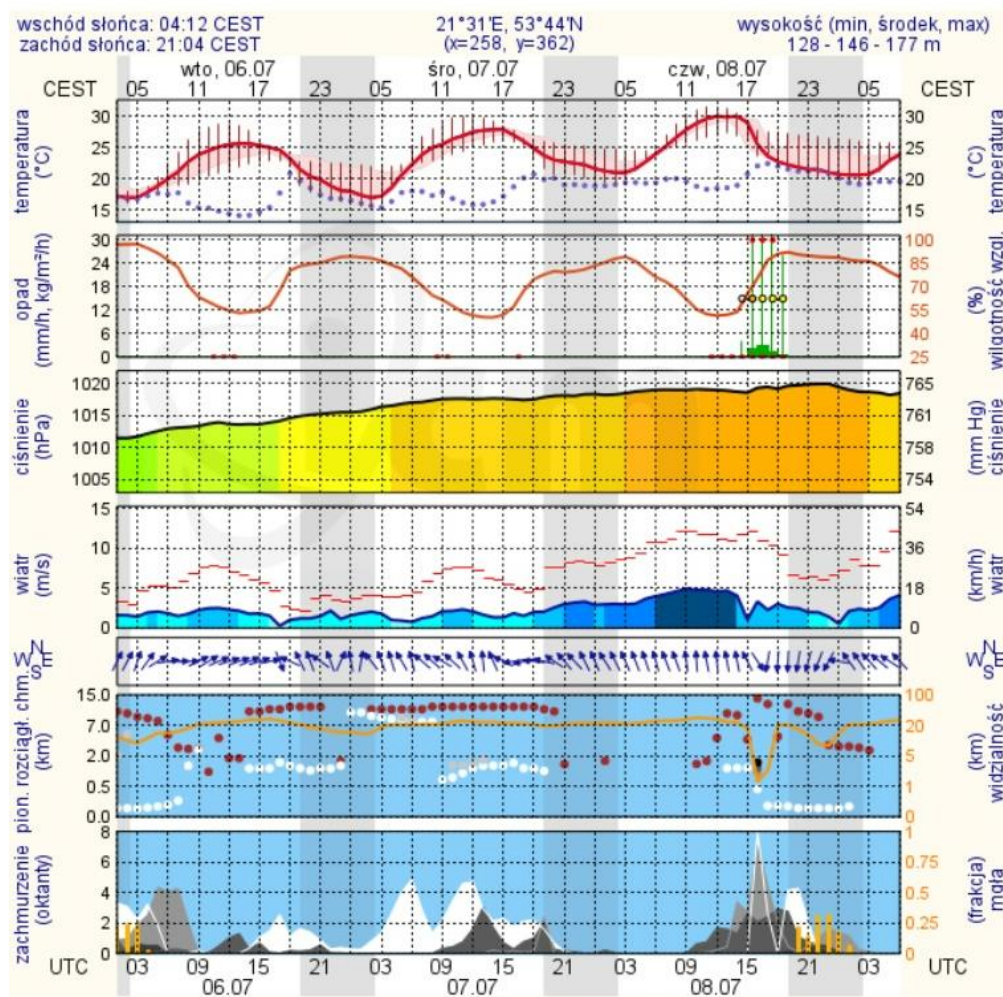


Fig. 5. Meteogram for Mikołajki [source: www.meteo.pl]

Visibility above 10 km was observed near the town of Mikołajki, the surface wind up to 1000 ft – variable up to 5 kt, in the higher parts of the atmosphere up to 3300 ft – from

the west – up to 8 kt. The maximum temperature – 27°C, the pressure – about 1013 hPa and was increasing.

1.8. Aids to navigation

Not used.

1.9. Communications

The pilot did not maintain radio communication.

1.10. Aerodrome information

The take-off was performed from a private property.

1.11. Flight recorders

The accident helicopter was not equipped with flight recorders.

No type of recorder was required under the applicable regulations.

The course of the accident was recorded by CCTV cameras installed at the Gołębiewski hotel in Mikołajki – the time-lapse recording is shown in Fig. 1.

1.12. Wreckage and impact information

During the occurrence, the helicopter ditched hard in the lake. The helicopter collided with the water surface without pitch and roll with a descent rate¹⁰ of approx. 13 m/s and a forward speed of several m/s.

1.13. Medical and pathological information

No information about any physiological or medical factors that could have affected the pilot was found. At the time of the accident the pilot was not under the influence of alcohol. According to the statement he was rested and did not report any medical problems.

During the occurrence, the pilot and passengers suffered serious injuries requiring medical treatment and hospitalization.

1.14. Fire

Fire did not occur.

1.15. Survival aspects

The helicopter was equipped with three-point seatbelts. The seatbelts of the pilot and the passenger sitting next to him were fastened, the seat belt of the passenger sitting in the back was unfastened.

¹⁰ Assessment was made based on CCTV cameras

As a result of the collision, the helicopter cabin and seats were damaged and deformed. The water partially absorbed the impact force.

All persons on board left the helicopter unaided.

After surfacing the survivors were taken aboard a private motor boat.

A few minutes later, motor boats of the Police and PSP arrived at the scene.

First aid was provided to the injured at the accident site.

1.16. Tests and research

On 7 July 2021, a visual inspection/survey was carried out with a particular attention paid to technical condition of the engine.

Engine exterior – no visible damage, no signs of overheating or leaks, the engine shaft rotated without jamming.

Oil, fuel and air filters as well as the carburettor were checked – no visible contamination.

The engine controls were checked – all links, levers and cables moved without jamming.

The condition of the oil and fuel lines was checked – no loosening or leaks were noted.

The condition of electric wires and connections was checked – no concerns.

The drive train was checked – no concerns.

The condition of the fan was checked – no concerns.

The collective and cyclic systems were checked – the systems ensured change in pitch of the helicopter main rotor blades even after the accident.

The control of the tail rotor was checked – the system ensured directional control even after the accident.

An analysis of the video material recorded under water during the recovery of the helicopter wreckage was carried out – the mixture control knob did not have a guard protecting it against accidental pullout.

An analysis of the recording of the CCTV cameras of a nearby hotel was performed – the recording clearly shows the moment of engine shutdown and the course of the occurrence.

The helicopter maintenance documentation was analysed – no concerns.

1.17. Organizational and management information

The helicopter was owned by a limited liability company. The helicopter was used by its owner for private purposes in recreational flights.

1.18. Additional information

Before publication of the Final Report, SCAAI solicited comments from the entities and authorities concerned, including EASA.

JARTON Sp. z o. o. (the owner of the aircraft) – did not submit any comments.

National Transportation Safety Board (the authority that investigates aviation accidents in the USA, representing the state of design and the aircraft manufacturer) – did not submit any comments.

EASA – did not submit any comments.

1.19. Useful or effective Investigation techniques

Standard investigation techniques were applied.

2. ANALYSIS

2.1. Mixture control knob

The mixture control knob should not be moved during flight. The knob has a double protection against accidental pullout (guard/ring and button). Throughout the flight, the knob should be pressed and secured with a guard as shown in Fig. 6-B.



Fig. 6. Mixture control knob: **A** – general view of the knob location in R44 SP-CCC cockpit; **B** – close-up of the pressed knob with a visible guard protecting it against accidental pullout (photo taken inside another helicopter)

In order to lean the fuel-air mixture, the guard must be removed first (it is not attached to anything), then the central button must be pressed which allows the knob to be pulled out.

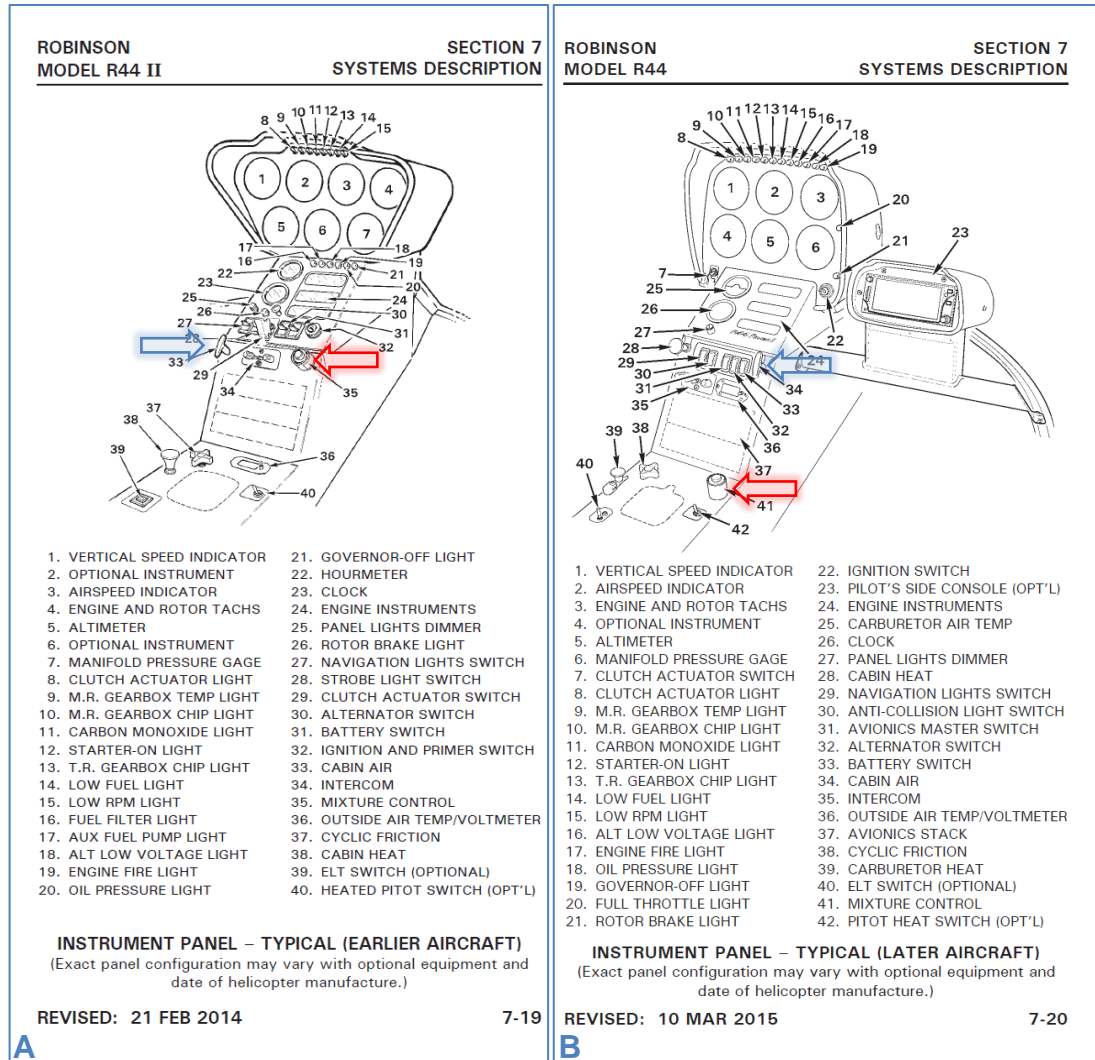


Fig. 7. Robinson R44 panels: **A** –R44 II model (the mixture control knob is marked with red arrow – number 35, the cabin air knob is marked with blue arrow – number 33 – blue arrow); **B** – R44 model (the mixture control knob is marked with red arrow – number 41, the cabin air knob is marked with blue arrow – number 34) [source: Robinson]

The pilot had previously operated two R44 II helicopters, in which the mixture control knob and cabin air knob were located differently than in the accident R44 model (Fig. 7). In R44, the cabin air knob is located in the place where the mixture control knob is located in the R44 II.

During the take-off, the pilot was in a hurry checking the transponder and radio frequency settings. Distraction, time deficit and pilot habits from the helicopters he previously operated played a key role in the accident.

With high temperature inside the cabin, the pilot wanted to turn on the air supply, but mistook the knobs and instead of pulling the cabin air knob, he pulled the mixture control knob, which caused shutdown of the engine.

According to the pilot's statement, before take-off the mixture control knob had the guard to prevent it from being pulled out accidentally.

The inspection of the helicopter before its recovery from the water was recorded on video footage. The recording does not show that the knob had the guard. The guard was also not found in the wreckage of the helicopter after its recovery. Since the guard was not attached to anything, it could have been lost during collision with water or during the recovery operation.

3. CONCLUSIONS

3.1. Findings

- 1) The aircraft airworthiness and maintenance were properly documented.
- 2) The mass and center of gravity were within permissible limits.
- 3) No evidence of any malfunctions or irregularities that could have contributed to the accident was found.
- 4) Prior to collision with water the airframe was intact.
- 5) All visible helicopter damage was caused by high forces created during collision with water.
- 6) Fire did not occur.
- 7) The helicopter engine was mistakenly shut down.
- 8) The pilot did not have a valid license to perform the flight in accordance with applicable regulations.
- 9) The pilot had a valid aero-medical certificate and was rested prior to the flight.
- 10) Haste, distraction and the pilot's habits (got during operating other helicopter models) contributed to the accident.
- 11) The pilot did not maintain radio communication.
- 12) The pilot planned to perform a private, recreational/touristic flight.
- 13) The flight was performed according to VFR in VMC.
- 14) After engine stoppage, the pilot made an immediate and correct decision to initiate autorotation.
- 15) The helicopter was controllable during autorotation.
- 16) There was not enough height to land with autorotation.
- 17) The helicopter was not equipped with flight recorders – no recorder was required under the applicable regulations.
- 18) No evidence/information about any physiological or medical factors that could have influenced the occurrence was found.
- 19) The pilot was not under the influence of alcohol.
- 20) The helicopter was owned by a limited liability company and was used by its owner for private purposes.
- 21) The water partially absorbed the impact forces during the occurrence, which made it possible to survive the accident.

- 22) The pilot and the passenger (seated next to the pilot) had their seatbelts fastened.
- 23) The pilot and both passengers left the wreckage and surfaced.
- 24) The rescue operation was carried out immediately and the survivors were taken aboard private boat.
- 25) First medical aid was provided to the survivors at the accident site.
- 26) As a result of the accident, the pilot and both passengers suffered injuries that required medical treatment and hospitalization.

3.2. Cause of the accident

Pilot error, resulting in the engine shutdown after take-off.

3.3. Contributing factors:

- 1) High ambient temperature as well as inside the cabin.
- 2) Pilot's habits acquired on different helicopter model.
- 3) Time pressure caused by limited availability of airspace.
- 4) Lack of conditions to perform full autorotation (low helicopter height and speed).

4. SAFETY RECOMMENDATIONS

PKBWL has not proposed any safety recommendation after completion of the investigation.

5. ANNEXES

None

THE END

Investigator-in-Charge
Andrzej Bartosiewicz
(digitally signed)