

MINISTRY OF CONSTRUCTION AND TRANSPORT

TRANSPORTATION SAFETY BUREAU

# FINAL REPORT

## (English Language Summary)

Fly-Coop Kft., Schweizer 269C, HA-HBQ Vicinity of Páty, 23 February 2023

Accident 2023-0195-4

This is an English language abstract of the official safety report written in Hungarian. Final Reports are published at www.kbsz.hu.

The sole objective of a safety investigation is to find the causes and circumstances of aviation accidents or incidents and to initiate the necessary safety measures; furthermore, to make recommendations in order to prevent similar cases in the future. It is not the objective of an investigation to apportion blame or liability.

### Introduction

### Synopsis

Occurrence class		Accident
Aircraft	Manufacturer	Schweizer Aircraft Co. USA
	Model	Schweizer 269C
	Registration	HA-HBQ
	Operator	Fly-Coop Kft. Hungary
Occurrence	Date and Time	23 February, 2023, 18:40 LT (1940Z)
	Location	Vicinity of Páty, Hungary 47°30'29.5"N 18°47'37.7"E
Fatalities / Severe Injuries		none
Damage to Aircraft		Substantial

The accident occurred in course of an autorotation drill attempted in the early hours of darkness during a training NVFR cross country flight. The Instructor and Trainee had taken off from Budaörs Airfield (LHBS) in a light helicopter registered as HA-HBQ and completed a few traffic patterns and hovering exercises. They experienced some throttle problems in flight, which were, allegedly, fixed on the spot by the EASA Part 145 approved maintenance organization's mechanic, who made some adjustments on the throttle friction collar. This corrective action remained undocumented. The crew took off again for a night cross country flight and attempted an autorotation drill over a harvested corn field outside Páty, during which the throttle became unresponsive. The Instructor took over the controls and continued the autorotation to an emergency landing. Following touch-down on the soft soil, the pilot accounted for pulling hard on the stick to avoid an imminent nose over, resulting in the helicopter's main rotor blades striking the tail rotor and the tail boom. The main rotor blades knocked the airframe around, which came to a rest on its right side with its nose facing backwards. No personal injury ensued.

The direct cause of the event was established to be the combined effect of a malfunctioning fuel injector due to a missing a cotter pin from a throttle linkage joint, as well as a series of human errors pertaining to deficient flight planning and imprudent decisions regarding the choice of location in the given conditions, to execute an NVFR autorotation drill.

The IC will not propose a safety recommendation.



Figure 1. The helicopter after the emergency landing

### **General information**

All times indicated in this report are in local time (LT). LT at the time of the occurrence: UTC+1 hour.

Geographic locations throughout this document are provided by WGS-84 standard.

Capitalized references used throughout this document (e.g. Captain, Pilot, etc.) denote particular persons concerned in the event investigated.

The format and content of this report is in harmony with Chapter 6 of Annex 13 of Act XLVI of 2007 promulgating the Appendices to the Convention on International Civil Aviation, signed in Chicago on 7 December 1944. Appendix, as well as with the requirements set out in ICAO Doc 9756 Part IV.

### **Reports and Notifications**

The occurrence was reported to TSB's call center at 18:40 on 23 February 2023 by the on-call officer of the Hungarian ATS provider HungaroControl Zrt.

In line with Article 9, Section (2) of Regulation (EU) No 996/2010 of the European Parliament and of the Council, TSB of Hungary notified the following organizations.

- Accident Investigation Authority of the State of Design and Manufacture on 24/02/2023 at 13:110.
- EASA on 24/02/2023 at 13:09.

Neither organization appointed an accredited representative for the investigation.

### **Investigation Committee**

The Head of TSB appointed the following persons in the investigating committee (hereinafter: IC).

Investigator-in-Charge	Mr. Akos Hanczar	investigator
Member	MS. Zsuzsanna Nacsa JD	investigator

### **Overview of the Investigation Process**

Receiving event notification, the on-duty TSB supervisor mandated an immediate dispatch to the site.

Pursuant to Article 5 of REGULATION (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/ECA the TSB is required to initiate an investigation in the following circumstances.

- 1. Every accident or serious incident involving aircraft to which Regulation (EU) 2018/1139 of the European Parliament and of the Council applies shall be the subject of a safety investigation in the Member State in which the accident or serious incident occurred.
- 2. Where an aircraft to which Regulation (EU) 2018/1139 applies and which is registered in a Member State is involved in an accident or a serious incident the location of which cannot be definitely established as being in the territory of any State, a safety investigation shall be conducted by the safety investigation authority of the Member State of registration.
- 3. The extent of safety investigations referred to in paragraphs 1, 2 and 4 and the procedure to be followed in conducting such safety investigations shall be determined by the safety investigation authority, taking into account the consequences of the accident or serious incident and the lessons it expects to draw from such investigations for the improvement of aviation safety.
- 4. Safety investigation authorities may decide to investigate incidents other than those referred to in paragraphs 1 and 2, as well as accidents or serious incidents to other types of aircraft, in accordance with the national legislation of the Member States, when they expect to draw safety lessons from them.
- 5. By way of derogation from paragraphs 1 and 2 of this Article, the responsible safety investigation authority may decide, taking into account the expected lessons to be drawn for the improvement of aviation safety, not to initiate a safety investigation when an accident or serious incident concerns an unmanned aircraft for which a certificate or declaration is not required pursuant to Article 56(1) and (5) of Regulation (EU) 2018/1139, or concerns a manned aircraft with a maximum take-off mass less than or equal to 2 250 kg, and where no person has been fatally or seriously injured.

Based on the findings of the site inspection and with regard to Article 5 (1) of Regulation (EU) No 996/2010 of the European Parliament and of the Council, the head of the TSB decided that an investigation is required and will be launched.

In the course of the investigation the IC has taken the following steps.

- Conducted a site survey including photo documentation of the evidence available and on-board documents.
- Interviewed the instructor and trainee.
- Obtained crew flight documents.
- Sampled the fuel from the fuel tank.
- Seized the aircraft for further investigation.
- Obtained police documentation available.
- Obtained weather data from the Hungarian National Weather Service.
- Obtained radar data and radio exchange recordings of the flight from the ATS provider.
- Obtained radio exchange recordings from the aerodrome service.
- Conducted a supplementary survey of the seized aircraft stored at LHBS (24.02.2024).
- Hosted an additional survey of the seized aircraft stored at LHBS, aimed at providing access for the forensic expert (24.02.2024).
- Examined and analyzed all data available.
- Held a Closing Meeting, as per the Instructor's request, with the participation of the Instructor, the Trainee and two TSB investigators. The IC considered the crew's remarks brought forth and effected modifications in the report. The final conclusions remained unaltered.

### Investigation Principles

# This investigation is being carried out by Transportation Safety Bureau on the basis of the following disciplines.

- Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC,
- Act XCVII of 1995 on aviation,
- Annex 13 identified in the Appendix of Act XLVI. of 2007 on the declaration of the annexes to the Convention on International Civil Aviation signed in Chicago on 7th December 1944,
- Act CLXXXIV of 2005 on the safety investigation of aviation, railway and marine accidents and incidents (referred to as Kbvt. throughout the document),
- NFM (Ministry for National Development) Regulation 70/2015 (XII.1) on safety investigation of aviation accidents and incidents, as well as on detailed investigation for operators,
- In matters not covered by Kbvt., Act CL of 2016 on General Public Administration Procedures prevails.

The competence of the Transportation Safety Bureau of Hungary is based on Government Regulation № 230/2016. (VII.29.) on the assignment of a transportation safety body and on the dissolution of Transportation Safety Bureau with legal succession.

### Pursuant to the aforesaid legislation,

- Transportation Safety Bureau of Hungary shall investigate aviation accidents and serious incidents.
- Transportation Safety Bureau of Hungary may investigate aviation and incidents which
  in its judgment could have led to accidents of more severe consequences in different circumstances.
- Transportation Safety Bureau of Hungary is independent of any person or entity that may have interests in conflict with the objectives of the investigating body.
- In addition to the aforementioned legislation, TSB of Hungary shall conduct safety investigations in line with ICAO Docs 9756 and 6920 Manual of Aircraft Accident Investigation.
- This Report shall not be binding, nor shall an appeal be lodged against it.
- The original of this report was written in Hungarian.

No conflict of interest has been identified between safety investigators appointed to the IC. Investigators assigned to a safety investigation shall not be involved as experts in any other procedure pertaining to the same case and shall refrain from doing so in the future.

The IC shall retain all data and information having come to their knowledge in the course of the safety investigation. Furthermore, the IC shall not be obliged to make such data and information available to other authorities, if their original owner could have legally refused disclosure.

The draft report shall not be published. Pursuant to Article 16 (3) of Regulation (EU) No. 996/2010, the parties concerned and the bodies consulted shall be bound by applicable rules of professional discretion with regard to the content of the consultation until the final report has been issued.

#### Translation

This summary is based on the draft report written in Hungarian. Although efforts have been made to provide a translation as accurate as possible, discrepancies between the versions might occur. In such eventuality, the Hungarian version shall prevail.

### Factual information

### **Flight History**

The Instructor arrived at Budaörs Airfield (LHBS) in the late afternoon, followed shortly by the Trainee who did not participate in the pre-flight inspection of the helicopter. The Trainee described himself as an experienced NVFR pilot on fixed-wing aircraft. He also declared that it was not his, but the commander's duty to preflight the aircraft, this is why he did not do it. In the trainee's opinion he also did not need to prepare for the flight due to his familiarity with the nature of night flying from past fixed wing experiences, and having completed a PPL(H) basic training, therefore the rudiments of flying a helicopter were not going to be any new to him. As a PPL(A) instructor, he did not feel the need to concern himself with "how to fly a traffic pattern," as he put it. The crew took off for the Trainee's very first helicopter NVFR conversion flight at around 18:00 LT.

The planned duration of the flight was 1.5 to 2.5 hours, according to the crew's inconsistent account of the events. The training was to include nighttime traffic patterns, hovering exercises, and NVFR stick-and-rudder drills. The crew started with a single circuit and performed hovering exercises over the airport. Due to some throttle issue they encountered in flight (according to the Trainee, "the RPM would not reduce"), they landed back at the airfield. A mechanic inspected the problem and adjusting the throttle friction collar, he declared the helicopter airworthy once more. No work order, technical log or maintenance log entry was made of the corrective action.

According to regulations, filing a flight plan is a requirement for each NVFR flight leaving the immediate vicinity of the departure aerodrome. The training organization's curriculum imposes a stricter condition, mandating a flight plan to be filed for each NVFR training flight.

Following the mechanic's action that seemed to resolve the throttle issue, the crew announced to the aerodrome service that they were to leave the pattern to conduct some flight exercises near Biatorbágy, some 5 miles east of the aerodrome. The aerodrome serviceman asked whether they had filed a flight plan according to regulations, which they replied to negatively, and went on to make a phone call at 18:15 to file an NVFR flight plan for the training flight. On their way to Biatorbágy they made a low pass over the Budaörs SAR Service Air Base. Arriving at Páty, they attempted an autorotation drill at an altitude of 3,000 feet. This was the Trainee's first encounter of a nighttime condition autorotation at around 2000 feet, descending at approximately 2,000 fpm, the engine did not respond to throttle inputs. The Instructor took over controls, but, according to him, he was also unable to get any RPM; the throttle felt unresponsive. Given the limited time until ground contact, he decided to continue the autorotation and carry out an emergency landing in the crop field below.

According to the Instructor's recollection, he successfully glided down and flared the helicopter. However, after a "not too rough" touchdown, the aircraft started to tilt forward during the ground slide. The rotor blades to hit the tail boom, which knocked the hull around and sent the helicopter in a right spin, ending up on its right side. The aircraft sustained significant damage during the incident, but no personal injuries occurred.

### **Engine Malfunction**

Examinations conducted on the aircraft revealed that the throttle linkage of the engine's fuel injector had a swivel joint missing a cotter pin and washer, and the linkage elements came loose without separating. As a result, the operation of the injector became unreliable due to the resulting excessive play. Consequently, in certain instances, in the first 1/8-1/4 turn of the throttle grip no RPM response was triggered (RPM did not increase) due to the substantial slack. Overcoming a distinct resistance at this point a pilot would be able to rotate the throttle grip beyond this increment, which gave the linkage sufficient input to operate the injector and

the RPM increased. As the linkage also affected the idle mixture regulation, subsequent engine tests during the post-incident examination showed that returning the throttle to idle resulted in an engine stall on multiple occasions.

Furthermore, it cannot be ruled out that the abnormal throttle operation calling for maintenance action after the first takeoff may be attributed to the very same reasons on account of the missing washer and cotter pin.

#### EASA Guidelines for Threat and Error Management in Training Flights

As described in relevant EASA directives<sup>1</sup> for helicopter pilot training, instructors bear substantial responsibility in teaching TEM; part of which is the necessity to provide a safety briefing of at least 15 minutes prior to any flight. As part of the airmanship element of the briefing, time should be spent identifying possible threats and errors associated with the flight. A safety briefing should aim at raising safety awareness and cover the potential risks associated with the task at hand, with details concerning each phase. Explicit strategies should be discussed to avoid these, including planning and developing countermeasures. Potential discussion of accidents and incidents related to the type of the intended flight may also be required. Instructors should develop training scenarios, 'what if' questions or examples that will address the different categories of threats and thereby develop the trainee's ability to detect and respond appropriately to threats.

These guidelines also discuss the aspects and planning requirements associated with landing outside an aerodrome during training flights, which entail the essential assessment of potential and intended landing spots, underlining that prepared autorotation drills require a prior recce of the intended landing spot, including a preceding surface inspection on foot.

### Analysis

The evidence gathered during the investigation, coupled with a thorough examination of the helicopter, was adequate to address the questions surrounding the accident's causes and circumstances. Nevertheless, when it came to the specific details and human aspects of the events leading up to the incident, the IC had no choice but to rely on the crew's account of their actions during the mishap, and based its findings on the crew's statements regarding their actions and the circumstances of the landing.

A technical malfunction that occurred during the training flight in combination with the human factors at play unfolded into an accident according to the following.

#### Human Factors

The lack of proper preparation and crew complacency played a crucial role in the accident. This is evident in the Trainee's perspective, quoted in the introduction, expressing that his experience as a SEP CFI, together with the PPL(A) NVFR hours he had flown, coupled with the 50-hour basic helicopter training he had taken a few years before, would grant him adequate skills and knowledge to tackle the challenges of a helicopter NVFR conversion without any difficulty. He considered this training more of a formality than a valid requirement.

The Instructor's choice of the first flight task also indicates a nonchalant approach to training, not reflecting the training organization's methodology towards a progressive, easy-to-difficult training curriculum. Moreover, there was no preflight briefing, discussion of task objectives and possible hazards, avoidance strategies and assessment of alternative tactics. Crew complacency is further evidenced by initiating an NVFR training flight without a flight plan. Although this would have been otherwise legitimate in the traffic pattern, the ATO training manual explicitly forbids it in training flights. The IC also opines that attempting an autorotation

<sup>&</sup>lt;sup>1</sup> Helicopter Flight Instructors Training Guide, Issue 4, 2022

drill outside the aerodrome in nighttime conditions, especially immediately following a "quick fix" of an apparent throttle issue, does not reflect reasonable risk management on the crew's part.

This flight would be the Trainee's first NVFR conversion flight, which, according to the ATO Training Manual, should have consisted of basic familiarization and fundamental stick-and rudder exercises in the traffic pattern. An autorotation drill would only come after 12 hours of further training of progressively increasing difficulty, including basic instrument proficiency training. Skipping these fundamentals and attempting the most complex and challenging task on the first flight, outside the aerodrome on a field at nighttime, when terrain features and burrow lines can only be made out at the last possible moment, is equivalent of renouncing the last safety barriers to prevent an incident. In these circumstances, losing engine thrust at a critical moment, as it unfortunately happened during this flight, meant that the crew, having consciously abandoned all layers of safety, had no escape route left to avoid an emergency landing.

### **Engine Malfunction**

It was established through subsequent examinations that the abnormal operation of the engine was caused by the previously detailed malfunction of the linkage between the throttle grip and the fuel injector. As throttle linkage operation also had an effect on idle mixture ratio, its failure explains why the engine stalled during a prolonged idle regime and remained unresponsive at a critical moment in the autorotation. For the reason that the engine was decoupled from the main rotor during this time, the pilots, apparently missing the engine RPM needle flatting out, did not realize the engine had stalled until after their attempt to increase RPM to get out off autorotation. At this point, they had no option but to execute an actual emergency landing in nighttime conditions.

#### Elements of the Emergency

The following factors played a role in a flight drill evolving into an emergency ending in an accident.

- The throttle linkage malfunction, compromising the idle mixture ratio during the grip's prolonged idle position, caused the engine to stall in descent, which the crew did not perceive until after the first attempt to increase RPM.
- Night visibility, even with the landing lights on, made it challenging for the crew to distinguish terrain features such as rolling surface or furrow directions in time for final flight path adjustment and a proper flare.
- The soft terrain at the landing site increased friction for the skid out, increasing the risk of a nose-over. Moreover, wobbling over the furrows in a 15-degree angular deviation from the furrow lines compromised skid out stability.
- Towards the end of the skid out the helicopter started to nose over on the uneven, yielding ground surface.
- In an attempt to prevent an imminent nose-over, the Instructor must have pulled the cyclic full back, causing the rotor blades to cut into the tail rotor and the tail boom.
- The main rotor blades knocked out the tail boom and spinned the helicopter around, which came to rest on its right side with its nose pointing backward.

#### Organizational/Maintenance Issues

Although not directly contributory to the accident, it is an organizational performance issue that the "roadside" repairs carried out by the operator's mechanic were not documented on a TFL or a work order by the pilots, and did not appear in the organization's maintenance records.

Operators must consistently strive to maintain and enhance safety throughout their daily operations. According to Regulation (EU) No. 376/2014 of the European Parliament and of the

Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, internal investigations of operational occurrences shall be carried out, entailing risk analysis to identify event causes and potential hazards. If necessary, corrective or preventive measures should be taken to prevent similar occurrences, which also includes the internal dissemination of these measures and staff education about the lessons learned. As far as the IC is aware, there has been no internal investigation or risk analysis at the affected operating organization, and they have not submitted such report to TSB Hungary.

### Conclusions

Based on the above, the event cannot be attributed to a single root cause; the combined effect of human factors and a technical malfunction led to the accident. In this process, questionable human decisions and the cascade effect of these decisions broke down virtually all defenses so fundamental in aviation safety, making a single malfunction that caught the crew off guard result in an accident.

The IC concluded that it was the combined effect of the following factors that let the occurrence unfold into an accident.

- Excessive risk-taking through the conscious abandonment of defenses and safety barriers, combined with inadequate assessment of circumstances, leaving no escape for the crew when a single malfunction occurred unexpectedly.
- Partial detachment in the throttle control linkage due to a missing washer and cotter pin, rendering the throttle control unreliable and causing engine stall in a sustained idle regime by compromising idle mixture ratio.
- Pulling the cyclic control in the final phase of flare in an instinctive attempt to prevent a nose-over on soft ground, which eventually lead to an accident.

Additionally, the IC identified the following indirect causes and contributing factors.

- Insufficient preparation and the lack of proper planning contributed to taking unnecessary risks.
- Disregard for the progression principle in training (attempting an autorotation drill outside the aerodrome at night, as the first task of an NVFR conversion training).
- Complacency from routine and overconfidence, leading to inadequate risk management.
- Disregard for the necessity for prior landing site reconnaissance, including recce on foot, for drills planned outside an aerodrome, especially in case of instruction flights.
- Reduced nighttime visibility, unsuitable for safe autorotation drills outside an aerodrome.
- Instructor's decision to perform an autorotation drill in such circumstances.
- Instructor's decision to proceed with the intended night cross-country flight and autorotation drill even after encountering throttle issues during local NVFR flight.
- Soft, uneven terrain at the landing site.

### Safety Recommendations

With adherence to relevant regulations and principles of reasonable risk assessment, such incidents are avoidable. The Investigation Committee found no circumstances warranting a safety recommendation.

Dated in Budapest, on 9 May 2024.