FINAL REPORT

ACCIDENT 2019/3918

State Commission on Aircraft Accidents Investigation (PKBWL)

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FINAL REPORT

ACCIDENT

EVENT NR –3918/19

AIRCRAFT – Airplane Cessna 172-S, SP-COM

EVENT DATE AND PLACE – 31 August 2019, Kikity landing field (EPKI)

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 2021

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Abbreviations

Abbreviation	Meaning
AFM	Airplane Flight Manual
AGL	Above Ground Level
CCTV	Closed Circuit Television
CPL(A)	Commercial Pilot Licence (Airplanes)
EASA	European Aviation Safety Agency
FI	Flight Instructor
ft	feet
HEMS	Helicopter Emergency Medical Service
KIAS	Knots Indicated Air Speed
kt	knot
LMT	Local Mean Time
MTOW	Maximum Take-Off Weight
PKBWL SCAAI	Państwowa Komisja Badania Wypadków Lotniczych State Commission on Aircraft Accidents Investigation
PPL(A)	Private Pilot Licence (Airplanes)
SEP(L)	Single-engine piston, land
TBD	To be determined
ULC	Civil Aviation Authority (Poland)
UTC	Universal Time, Coordinated
VDL	Distant Vision Limitation
VMC	Visual meteorological conditions
VNL	Near Vision Limitation

General Information

Occurrence reference number:	3918/2019			
Type of occurrence:	ACCIDENT			
Date of occurrence:	31 August 2019			
Place of occurrence:	Kikity landing field (EPKI)			
Type and model of aircraft:	Airplane Cessna 172-S			
Registration marks:	SP-COM			
Aircraft User/Operator:	Aeroklub Warszawski			
Aircraft Commander:	CPL(A)			
Number of the victims /injuries:	Fatal	Serious	Minor	None
	–	*2*	–	–
Domestic and international authorities informed about the occurrence:	ULC, EASA, NTSB			
Investigator-in-Charge:	Krzysztof Miłkowski			
Investigating Authority:	Państwowa Komisja Badania Wypadków Lotniczych State Commission on Aircraft Accidents Investigation			
Accredited Representatives and their advisers:	NOT DESIGNATED			
Investigation Team	K. Miłkowski, K.Błasiak			
Document containing results::	FINAL REPORT			
Safety recommendations:	NONE			
Recommendations addressees:	NOT APPLICABLE			
Investigation completed:	31.05.2021			

Summary

On 31 August 2019 an instructor and a student pilot performed training flights for the PPL(A) on the Kikity landing field (EPKI). In a climb phase, about 80 m AGL, the plane was stalled and entered a spin, which resulted in a collision with the ground. The plane was substantially damaged and both crew members were seriously injured.

The investigation of the occurrence was conducted by the PKBWL Investigation Team composed of:

Krzysztof Miłkowski	Investigator-in-Charge
Krzysztof Błasiak	Team Member

During the investigation PKBWL determined that the cause of the accident was bringing the aircraft to stall after take-off during climb phase.

PKBWL has not proposed any safety recommendations after the investigation.

1. FACTUAL INFORMATION

1.1. History of flight

On 30 August 2019 an instructor pilot and a student pilot hereinafter referred to as instructor and student redeployed the CESSNA-172-S aircraft, registration SP-COM, from Babice (EPBC) aerodrome to Kikity (EPKI) landing field, where training fights for PPL(A) were planned to be continued.

On 31 August 2019, the instructor and the student made several flights in the morning and around 15:00 hrs LMT[1] the crew commenced perfecting exercises including aerodrome traffic circuits, landings and coping with emergency situations, in particular engine failure during landing approach.

Based on the analysis of recordings from CCTV cameras located on the landing field building, it was found that the take-offs took place in direction of 29 and landings in the direction of 11. It was allowable because, according to a weather report, the wind was blowing from alternating directions from 20° to 130° at a speed of 3 kt.

In the fourth flight the instructor intended to demonstrate a climb with the greatest angle of climb. The CCTV recordings show that the climb was much steeper than in the previous flights. After about 22 seconds after the take-off, about 80 m AGL, the plane made a deep roll to the left and at the same time entered a dive. The instructor stopped autorotation and tried to recover from the diving, but due to low height it was not possible, and the plane hit the ground. As a result of the impact, the plane was substantially damaged and both crew members were seriously injured.

1.2. Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	–	–	–
Serious	2	–	–
Minor	–	–	–
None	–	–	–

1.3. Damage to aircraft

As a result of the occurrence, multiple damage and deformations of the aircraft structure occurred. The engine mount and firewall were deformed. The engine was displaced forward and down. In addition, the propeller gearbox housing cracked and multiple joints of the instruments and components were torn out. The upper and lower engine cowlings were torn out of their hooks and deformed. The blades of the two-blade metal propeller were deformed. The nature of the propeller damage indicated that the engine was operating until the plane collided with the ground.

[1] All times in the Report are in LMT=UTC+2h

Particularly significant deformations occurred in the nose part of the fuselage and in the tail part, on the right side behind the cockpit. The cockpit windshield was destroyed, the left door was torn out completely and the right door remained attached to the fuselage only by the lower hinge. The wings and their struts were not destroyed, however, due to the high impact force, their skin was deformed, especially in the area of the left wing tip. The empennage was damaged mainly on the left side of the tailplane.

Continuity of the control system was preserved. As a result of the impact, the landing gear was destroyed. The front landing gear was torn off, the main landing gear legs were deformed, and the left wheel was separated. Numerous elements from the plane were found around the wreck, such as: the left door, structural elements, broken glass, landing gear and airframe parts.

1.4. Other damage

As a result of the accident, the soil at the site was locally contaminated with fuel and extinguishing agents used to protect the wreck against fire.

1.5. Personnel information (crew data)

Instructor: CPL(A) holder, with the following ratings:

- SEP(L), valid until 26.09.2020;
- FI(A), valid until 30.09.2019;
- Flight time – 4247.49 FH;
- Instructor experience – 2364.23 FH;
- Flight time over the last month (as instructor) - 14.03 FH.

Class 1 medical certificate – valid until 09.09.2019, with VDL and VNL limitations.

Student:

- began his practical training on 11 April 2018 and until the accident he completed 122 flights with an instructor during 28 h and 14 min. and 28 solo flights during 05 h and 11 min.
- holder of Class 2/LAPL medical certificate – valid until 06.03.2019, with VNL limitation.
- performed the first solo flight on 1 August 2018, and the last one 13 September 2018. Then he had a break in solo flights, but he flew with instructor until 17 November 2018. Then he had again a break until 17 May 2019. On 17 May he completed 9 flights with an instructor in 2 hours and again had a break until 24 August 2019. After the last break in the training, the student made 9 flights during 4 h and 3 min.

1.6. Aircraft information

Cessna 172 is a four-seat single-engine high wing monoplane. The airplane was designed and equipped for the pilot training.

Type/Model	Cessna 172-S
Manufacturer	Cessna Aircraft Company
Registration marks	SP-COM
SN	172S9140
Engine	Lycoming IO-360-L2A, SN: L-14860-51A, Total Time Since New: 8569.28 h, Time Since Overhaul: 709.10 h, Time To the Next Overhaul: 1290 h, Time to the next maintenance: 16.00 h.
Propeller	McCauley 1A170E, SN: AMC23047, all-metal, two-blade; Total Time: 368 H, Time to Overhaul: 1631.20 h, Time to the next maintenance 16.20 h.
Certificate of Registration	No 4222, issued 20.06.2008
Airworthiness Review Certificate (ARC)	PL.MG.031/11/19 rev.0, issued 31.05.2019 r., valid until 31.05.2020
Certificate of Airworthiness	No 4222, issued 20.06.2008
Total flight time until accident day	6819.9 h
Flight time to the next maintenance	16 h

The airplane civil liability certificate was valid until 15.06.2020.

1.7. Meteorological information

The flight was performed in the daylight, in VMC.

Data for EPSY aerodrome (about 57 km south-east from the occurrence place) at 15:30 hrs: CAVOK, wind direction 70°, variable from 20° to 130°, wind speed 3 kt, temperature 26°C, pressure 1021 hPa. TAF for EPSY: in the afternoon possibility of local CU clouds cover 3-4/8 with base at about 1000 m, visibility over 10 km.

METAR EPSY 311230Z VRB03KT CAVOK 27/15 Q1022=

METAR EPSY 311300Z 05004KT 290V110 CAVOK 26/15 Q1021=

METAR EPSY 311330Z 07003KT 020V130 CAVOK 26/15 Q1021=

METAR EPSY 311400Z 08003KT 030V120 CAVOK 27/15 Q1021=

TAF EPSY 311130Z 3112/3121 05005KT CAVOK

PROB30 TEMPO 3112/3118 SCT030TCU=

Based on the analysis of the weather conditions and the crew's statement, on the accident day the local turbulences occurred due to the local cobditions (rolling terrain) and a large water reservoir situated nearby (Luterskie lake).

1.8. Aids to navigation

Not used

1.9. Communications

The plane was equipped with standard radio and navigation devices. Due to the fact that the flight was performed near the landing field, communication was maintained at its frequency. No personnel was present at the landing field radio station and the correspondence from the aircraft was "blind", i.e., the student maintained communication and the instructor replied.

1.10. Place of occurrence information

The flights were performed on the Kikity landing field, situated north-east of Olsztyn, near Jeziorany village.

Status: Registered landing field: ULC register file: 107

Coordinates: N53°58'58.2" E20°52'36.8"

Radio: Kikity-Radio 119.4

Elevation: 564 ft

RWY: 112/292 (11/29), 850 x 35 m, N53°58'58.2" E20°52'36.8"

Caution: marked grass runway rises from threshold 11 to 29 by 16 m. Landing direction of 11 is recommended.

The landing field general view is shown below – Fig. 1.

Fig. 1. Kikity landing field aerial view [source: airfield owner]

1.11. Flight recorders

The airplane was not equipped with the flight recorders.

1.12. Wreckage and impact information

The plane was stalled during the climb after take-off at approximately 80 m AGL. It rolled on the left wing with its nose down. The instructor stopped the rotation and tried to recover from the diving, but due to the low altitude and time deficit, it was not possible to achieve a level flight at a safe altitude. As a result, the plane collided with the ground with a high angle of attack.

Fig. 2. Place of the first touchdown [source: PKBWL]

The first contact with the ground took place about 400 m from the runway threshold with a deviation to the left from its centre line (Fig. 2). After the first contact the plane bounced and after over a dozen meters, another touchdown occurred. During the first

touchdown, the left main landing gear was damaged, and the left wheel was separated from the landing gear leg, the fuselage structure behind the cockpit was deformed and the windshield was damaged. Elements of the landing gear and parts of the windshield were found several meters from the place where the plane came to rest. After the second touchdown, the plane moved over a dozen meters and, with the left slip, it came to rest several dozen meters from the place of the first touchdown. The nose landing gear was broken, the propeller was damaged, the nose part of the fuselage in the area of engine mount was damaged (Fig. 3).

Fig. 3. The plane after stopping, red arrow shows the separated nose wheel [source: PKBWL]

1.13. Medical and pathological information

As a result of the accident, both crew members were seriously injured. The instructor was taken by HEMS helicopter to the hospital in Olsztyn, while the student was taken to the hospital by ambulance.

1.14. Fire

The fuel system was unsealed during the accident, but the plane did not catch fire. The fire brigade unit arrived and applied extinguishing foam on the wreckage and the spilled fuel to prevent fire.

1.15. Survival aspect

The instructor and the student were wearing their seat belts correctly.

1.16. Tests and research

The investigation team secured the documentation of the aircraft, recordings from CCTV cameras of the landing field, made photographic documentation of the scene and the aircraft wreckage. On the next day additional inspection of the scene and wreckage were carried out and the crew were initially interviewed at the hospital.

1.17. Organizational and management information

The aviation training organization had the required certificate. The training was carried out in accordance with the program approved by the Civil Aviation Authority. In the application for the certificate, the organization indicated Babice (EPBC) aerodrome as the place for conducting aviation training. An alternative aerodrome was Chrcynno (EPNC). The investigated flight was carried out on the Kikity (EPKI) landing field, which was not indicated in the application for the certificate, as well as the organization did not notify the Civil Aviation Authority about the intention to conduct training at this landing field.

The training on the day of the accident was conducted by an instructor who was not entered in the training records as a leading instructor or a supporting instructor.

1.18. Additional information

On 19 January 2021, the pilot-instructor was acquainted with the Draft Final Report and did not comment on its substance.

1.19. Useful or effective investigation techniques

Standard investigation techniques were used.

2. ANALYSIS

On 31 August 2019 at the Kikity landing field, the crew composed of an instructor pilot and a student pilot performed training flights for the PPL(A). On the accident day perfecting flights were planned according to exercises 9 and 10 prior to the student's solo flight. The planned elements were: demonstration of a technique to take-off from a landing site having limited dimensions, performing a climb on parameters that allow to obtain the greatest rate of climb in order to gain the greatest possible altitude at a short distance and then a return to the landing field after a simulated failure of the powerplant.

During the flights the instructor demonstrated a 180° turn after simulated engine failure and landing at the take-off place with a heading opposite to the take-off direction and the student repeated the same maneuvers. In the three consecutive solo flights the student safely performed all elements of the exercise.

In the fourth flight, according to the student's statement, the instructor took control and began a take-off. After the take-off, at a speed below 60 kt, he increased the angle of climb compared to previous flights and continued the climb. During that portion of the flight the warning was activated repeatedly, signaling approaching stall speed.

According to the AFM, this signal is activated about 5 to 10 kt above the stall speed.

According to the student's statement, at a height of about 800 ft, at a speed of about 40 kt, the plane suddenly rolled to the left wing, simultaneously entering a dive.

The instructor stopped the rotation of the plane after about ½ of a spin turn and tried to recover from a dive. The instructor stopped autorotation and tried to recover from the diving, but due to low height it was not possible, and the plane hit the ground.

One day after the occurrence, during the first interview, the instructor stated that he did not remember anything about the accident or what happened after the accident. In his statement made a few days later, he wrote that he did not remember the moment of the accident or the transport to the hospital by a helicopter.

In October 2020, the instructor sent an additional statement to the PKBWL, in which he stated that during the accident flight he had wanted to demonstrate a climb with the speed of Best Angle-of-Climb, which, according to the AFM, is 62 kt for the weight equal to MTOW and the climb was performed at a speed of about 57 kt. He stated that he did not remember the altitude or the speed when the stall occurred.

When analyzing the available CCTV footage, the Commission found that the climb during the accident flight was performed at a much greater climb compared with the previous flights. About 22 sec after lift-off at a height of about 80 m (based on the calculations of the assumed climb rate of the aircraft), the aircraft stalled. In the first phase the plane rolled on the left wing with simultaneous transition to a dive at an angle of approximately 90° (Fig. 4).

Fig. 4. The moment of stalling the plane [source: landing field CCTV camera]

Fig. 5. The plane before the collision with the ground [source: landing field CCTV camera]

After a half of spin turn the rotation was stopped and the plane with a high dive angle was flying to the ground. The CCTV recording shows that during the descent the pitch angle was decreasing (Fig. 5).

The plane hit the ground with considerable force, as evidenced by the mark on the surface, damage to the landing gear and the left main wheel being torn off.

After the first contact with the ground the plane bounced and after over a dozen meters, another touchdown occurred. The second touchdown resulted, among other things, in the breaking of the engine mount and damage to the propeller and the other elements described previously.

After the second touchdown, the plane moved over a dozen meters and stopped with its nose pointing in the direction opposite to the take-off direction. After the plane stopped, the student left the cockpit on his own, and the instructor was recovered by the emergency services who arrived at the scene. The student was transported to the hospital by an ambulance and the instructor was transported by HEMS helicopter.

The Investigation Team found that the flight was performed in the afternoon at temperature of around 26°C. High temperature and topography in the vicinity of the landing field, as well as a large water reservoir and possible Cu clouds created conditions for turbulence, which could have had an impact on the occurrence. The climb was performed at increased angle of attack close to the critical angle, as evidenced, inter alia, by the cyclical activation of the stall warning signal.

According to AFM, the stall speed with the flaps in the 0º position at zero bank angle (take-off configuration) is 48 kt KIAS. According to the instructor's statement, the climb was carried out at a speed of about 57 kt, so only about 9 kt faster than the stall speed. However, according to the pilot’s calculations and opinion, it should have been sufficient, if taking into account that the plane weight was lower than MTOW.

When taking into account the turbulence, it could be assumed, that a rapid increase in the angle of attack could have occurred, and thus a reduction in speed. It should also be taken into account that the plane was in the climb phase and the engine was working at maximum RPM, but due to the time deficit, the instructor did not manage to reduce the engine speed, which could have an impact on the recovery process.

The Airplane Flight Manual (Chapter 5, Remarks) states, that the altitude loss during recovery from stall can achieve 230 ft (about 70 m).

The Investigation Team estimated that at low height of the stall (about 80 m), and taking into account the pilot's response time and the fact that the engine was operating at maximum speed, the crew had no chance to recover from the dive and land safely.

3. CONCLUSIONS

3.1. Commission findings

1) The instructor pilot had a valid license and ratings as well as a valid aero-medical certificate.
2) The instructor pilot had appropriate qualifications and experience in the flights.
3) The instructor pilot and the student pilot had their seat belts fastened.
4) The instructor pilot and the student pilot were not under the influence of alcohol.
5) The instructor pilot conducting the training on the day of the accident was not entered in the student's training record as a leading or supporting instructor.
6) The weather conditions could have had an impact on the occurrence.
7) The aircraft was operative, its airworthiness and maintenance works were properly documented.
8) The airplane take-off weight and center of gravity were within the approved limits.
9) The flights were performed on a landing field which was not reported as an alternative aerodrome for training.

3.2. Cause of the accident

The cause of the accident was stall during climb after take-off.

The factor contributing to the accident:

The weather conditions may have influenced the occurrence.

4. SAFETY RECOMMENDATIONS

The PKBWL has not made any safety recommendations after conclusion of the investigation.

THE END

Investigator-in-Charge

Signature on the original