State Commission on Aircraft Accidents Investigation

FINAL REPORT

2023-0024

OCCURRENCE NUMBER

ACCIDENT

CTOL: Collision with obstacle(s) during take-off and landing

The sole objective of safety investigations is the prevention of future accidents and incidents.

The Commission does not apportion blame or liability. The investigation is independent and separate from any judicial or administrative proceedings.

Any use of the Report for purposes other than prevention of accidents and incidents may lead to wrong conclusions and interpretations.

Private recreational flight.
CH 601, OK-KUA15 .
Kiełczynek (52 4'2,41" N 017 13'28,46" E), 25 May 2023

The Final Report was issued by PKBWL based on information available on the date of its completion.

The Report presents only facts related to circumstances of the occurrence, its causes and safety recommendations.

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

Warsaw, 6 November 2023

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INTRODUCTION

LEGAL GROUNDS

The State Commission on Aircraft Accidents Investigation (PKBWL) is a safety investigation authority referred to in Article 4(1) of Regulation (EU) No 996/2010 of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (Official Journal of the European Union L 295, 12.11.2010, p. 35, as amended)

The Commission conducts safety investigations pursuant to the provisions of the Aviation Law of 3 July 2002 (Journal of Laws No 130 of 2002, item 1112, as amended) and the European Union law on accidents and incidents in civil aviation, taking into account the standards and recommended practices laid down in Annex 13 to the Convention on International Civil Aviation made in Chicago on 7 December 1944 (Journal of Laws of 1959, item 212, as amended).

KEY INFORMATION ON THE OCCURRENCE

Operator (user), flight number or type –Private recreational flight.

Manufacturer, type, model and registration of the aircraft – Zenith Aircraft Company, Zenair CH 601, OK-KUA15.

Place and date of the occurrence – Kiełczynek (52 4'2,41" N 017 13'28,46" E), 25 May 2023

OCCURRENCE REPORT

The PKBWL was notified of the occurrence under a mandatory reporting system by the Police on 28 May 2023.

The occurrence was assigned the reference number – 2023-0024.

Based on initial information, the occurrence was categorised as an accident.

The categorisation was not changed in the course of the investigation.

OCCURRENCE NOTIFICATION

The PKBWL notified the occurrence to:

- the country of registration – the Czech Republic;
- ICAO;
- EASA;
- European Commission;

ORGANISATION OF THE INVESTIGATION

The investigation was conducted by – the PKBWL.

Investigator-in-Charge (IIC) – Roman Kamiński.

Specialist groups – no specialist groups were appointed.

Accredited Representatives (and their advisers) – no country appointed ACCREP.

RECOMMENDATIONS

Unless otherwise specified, the recommendations contained in this Report are addressed to the regulatory authorities of the State concerned. The decision on how to proceed is the responsibility of those authorities. Details are provided in Chapter 4 of this Report.

TIME

Time in the Report is provided as LMT. LMT on the occurrence day = UTC+2.

DATE

Where a date is provided in this Report in a digital format, the respective digits represent DD/MM/YYYY, where DD means day, MM means month, and YYYY means year.

FIGURES AND TABLES

Unless otherwise specified in this Report, the PKBWL is the source.

ABSTRACT

On 25 May 2023, the pilot intended to perform a recreational flight in a Zenair CH 601 in the area of the Kiełczynek airfield. After arriving at the airfield, the pilot pushed the aeroplane from the hangar, carried out a pre-flight inspection and took a seat in the cockpit. The right-hand seat was taken by a passenger. After that, the pilot started the engine, taxied several dozen metres and carried out an engine test, following which he taxied to the end of the RWY. After aligning the aeroplane on the runway centreline, the pilot commenced take off at 19:30 hrs. After covering about 270 m, the aeroplane lifted off from the grass runway but was at the same time banking to the right and left wing alternately. In order to avoid an obstacle on the take-off direction, the pilot made a slight right turn and pulled the control stick slightly towards himself. The aeroplane climbed to approximately 4 m over the RWY but, still banking sideways, made a sudden right turn in the final take-off phase and collided with a building.

The pilot and the passenger got out of the cockpit on their own. The passenger sustained serious injuries and was taken to hospital. The aeroplane was destroyed.

SYMBOLS, ACRONYMS AND ABBREVIATIONS

SYMBOLS

°	degree, e.g. °C (temperature) and 1°
'	minute
”	second

ACRONYMS AND ABBREVIATIONS

ATOM	actual take-off mass
AAII, Czech Republic	Air Accidents Investigation Institute, Czech Republic
C	degrees Celsius
CAVOK	visibility, cloud and weather conditions at the moment of observation are better than the recommended values or conditions (Cloud And Visibility OK)
EW	empty weight
EASA	European Union Aviation Safety Agency
ft	foot/feet
h	hour/hours
hPa	hectopascal
IIC	Investigator-in-Charge
ICAO	International Civil Aviation Organization
FOM	Flight Operating Manual
kg	kilogram(s)
km / h	kilometres per hour
kt	knot / knots
L	litre(s)
MTOM	maximum take-off mass

METAR	meteorological aerodrome report
PPL(A)	Private Pilot Licence (Aeroplanes)
RWY	runway
SEPL	Single Engine Piston Land
Vso	stalling speed in landing configuration
UTC	coordinated universal time

1. FACTUAL INFORMATION

1.1. History of the flight

On 25 May 2023, the pilot (a co-owner of the aeroplane) intended to perform a recreational flight in a Zenair CH 601 in the area of the Kiełczynek airfield. The facts presented below were established on the basis of footage from two CCTV cameras installed on the hangar building, and on the basis of witness accounts.

Figure 1. The accident area – the blue arrow indicates the direction of the flight, while the red circle shows the place where the aeroplane collided with the building.

At around 19:10 hrs, the pilot pushed the aeroplane from the hangar, carried out a pre-flight inspection and took a seat in the cockpit. The right-hand seat was taken by a passenger. At 19:20 hrs, the pilot started the engine, taxied several dozen metres towards RWY 07, carried out an engine test, and taxied to the end

of the RWY. After 8 minutes from the engine start, the pilot aligned the aeroplane on the runway centreline and commenced take-off.

The aeroplane lifted off from the grass runway after about 270 m. Having noticed that he was flying towards a lighting pole located at the greenhouse, the pilot decided to evade it making a right turn and pulling the control stick slightly towards himself. The aeroplane climbed to approximately4 m over the RWY but started banking sideways, first to the right and then to the left, after which it was stalled, turned right suddenly and collided with the roof of a building.

The pilot and the passenger got out of the cockpit on their own, but the passenger could not move due to serious injuries and started calling for help. Several witnesses arrived at the scene immediately. They gave first aid to the victim and took him in a private car to the district hospital in Śrem.

The aeroplane was destroyed as a result of the collision with the building. Due to the wreckage's unstable position on the edge of the roof, it was decided to take it down, which was accomplished with a digger equipped with a special arm. After the remaining fuel had been drained and the batteries removed, the damaged aeroplane was closed in a hangar without reporting the occurrence to the PKBWL or the local Police. The accident was reported to the Police only by the medical personnel of the hospital in Śrem.

1.2 Injuries to persons

Table 1. General summary of the number of injuries

Injuries	Crew	Passengers	Total on board the aircraft	Other
Fatal	0	0	0	
Serious	0	1	1	
Minor	0	0	0	Not applicable
None	1	0	1	Not applicable
TOTAL	1	1	2	

1.3 Damage to aircraft

The aeroplane was destroyed as a result of the accident. All damage to the aeroplane was caused by the collision with the outbuilding. The wreckage is shown in Fig. 2.

Figure 2. The wreckage after being moved to the hangar.

1.4 Other damage

The edge of the outbuilding's roof was damaged.

1.5 Personnel information

Pilot-in-Command.

Pilot: male, aged 40.

Licence: PPL(A).

Ratings endorsed in the licence:

- SEP(L) valid until 31 March 2025;

Total flight time: 80 h.

Type flight time:

- Cessna 152 – 60 h;
- Zenair CH 601 – 20 h

Aeromedical certificate – Class 2, no limitations, expired on 24 April 2023

Rest during the last 48 h – the pilot was provided with an opportunity to rest in home conditions

1.6 Aircraft information

1.1.1. Airworthiness and maintenance

a) General information:

- a two-seater low-wing aircraft of metal construction, manufactured serially in large numbers either as ready-to-use aeroplanes or self-assembly kits;
- manufacturer – Zenith Aircraft Company;
- product designation (model) – Zenair CH 601;
- serial number – 6-6-9484;
- year of manufacture – 2005;
- registration marks – OK – KUA 15;
- owner – a private individual;
- technical approval (Czech: technicky prukaz) – valid on the day of the occurrence.

b) History of the aircraft:

- Time Since New– 1,241 h;
- Time Since Overhaul -– no overhaul carried out;
- flight time since last check (100h maintenance) – 35 h;
- modifications – none;

c) Engine and propeller:

- Engine – Jabiru 3300, manufactured by Jabiru Aircraft Pty. Ltd. (Australia), Ltd. operating time since new: 1,241 h, since last periodic check (100h maintenance): 35 h;
- propeller – SR42, manufactured by Woodcomp, operating time since new: 15 h (installed on 15 November 2022)

d) Fuel:
   - used during the flight – unleaded petrol 95;
   - quantity on board – 80 l;

e) Aircraft load:
   - MTOM-472.5 kg;
   - EW –322 kg;[1]
   - Pilot – 95 kg ;
   - Passenger – 92 kg;
   - Fuel – 59 kg;
   - ATOM – 568 kg (95.5 kg over MTOM).

1.7 Meteorological information

According to METAR for EPPO (located 40 km to the north-west of the occurrence site), the meteorological conditions on 25 May 2023 at 19:30 hrs were as follows:

EPPO 251730Z 31006KT CAVOK 20/08 Q1023

Which means:

- date: 25 May 2023;
- time: 17:30 UTC;
- wind direction 310° ;
- wind speed: 06 kt;
- visibility: over 10,000 m;
- ambient temperature: 20°C;
- Dew point temperature: 08°C;
- pressure QNH 1023 hPa

1.8 Aids to navigation

None were used.

[1] Established on the basis of an aircraft weighing report sent by AAII, Czech Republic.

1.9 Communications

The pilot did not maintain any radio correspondence.

1.10 Aerodrome information

Kiełczynek airfield

Coordinates: 52°04'01.91” N 17°13'28.1” E;

Elevation 220 ft;

RWY: 070/250, 343x20.

Grass runway. Hangars located midway along the runway length to the south. Two characteristic chimneys at the approach to RWY 07.

1.11 Flight recorders

The aeroplane was not equipped with any flight recorders as they are not required by the regulations under which it was certified. The only recording device on board was STRATOMASTER ULTRA HORIZON XL, manufactured by MGL avionics of the Republic of South Africa, installed on the instrument panel. The device can record separate flights including the following data:

- Date of flight;
- Time of take-off;
- Total flight time;
- Maximum speed in flight;
- Maximum altitude in flight;
- Number of powerplant's operating hours.

Unfortunately, despite efforts made, no data from the abovementioned device could be obtained.

1.12 Wreckage and impact information

After take-off, on passing the runway threshold, the aeroplane collided with an outbuilding located on the runway's axis at 90 m from its threshold (Fig. 3). When hitting the building at 3.75 m over the runway, the aeroplane was banked 20º to the right, as a result of which the front section of the fuselage hit the roof surface, the right wing hit the building's wall, and the main impact of the lower fuselage was on the edge of the roof. The left wing, which was above the surface of the roof at the moment of impact, sustained the least damage (Fig. 4).

Figure 3. The place of the aeroplane's impact on the building: the main impact on the edge of the roof (blue circle), the impact of the right wing (black line), the impact of the front fuselage (red arrow).

Figure 4. The view of the damage to the propeller and left wing of the aeroplane.

Figure 5. The damage caused by the aeroplane's impact on the edge of the roof.

1.13 Medical and pathological information

The passenger in the right-hand seat sustained serious injuries as a result of the accident. A surgical procedure was required.

1.14 Fire

No fire broke out.

1.15 Survival aspects

The pilot and passenger wore safety belts.

An inspection of damage to the wreckage and building shows that the edge of the roof made of metal sandwich panels cushioned the force of the impact.

1.16 Tests and research

Traditional investigation techniques were applied.

1.17 Organisational and management information

The flight was performed by a private user.

1.18 Additional information

Before publishing the final report, PKBWL conducted consultations on its draft, asking interested persons and the UZPLN and EASA to submit comments:

a) None of the interested persons submitted any substantive comments;

b) the translated Draft Final Report was submitted to UZPLN (representing the country of registration) and EASA. None of the above institutions submitted any comments to the DFR

1.19 Useful or effective investigation techniques

Standard investigation techniques were applied.

2 ANALYSIS

2.1 General

On 25 May 2023, the pilot planned a recreational flight in the area of the Kiełczynek airfield.

2.2 Flight operations

2.2.1. Crew qualifications

The pilot's qualifications were sufficient to perform the flight.

2.2.2. Operating procedures

According to the FOM, the pilot should control the speed of the aeroplane during take-off and assess whether the lift-off took place where appropriate. According to the FOM, the take-off distance to clear a 15 m obstacle for this aeroplane type is 300 m at MTOM 472,5 kg.

In the flight concerned, the aeroplane reached the height of about 4 m over the RWY after covering 424 m and collided with the building. According to the accounts of witnesses who watched the aeroplane concerned taking off earlier on several occasions, the aeroplane's speed was much lower than during the previous flights. The aeroplane was flying too low, banking sideways.

The longer-than-usual take-off run and the airspeed close to the stall speed (aeroplane banking sideways) indicated a too low available engine power compared to the necessary power for the exceeded MTOW.

The pilot did not decide to abort take-off.

2.2.3. Weather

According to METAR for EPPO, the following temperature values were possible in the area of the occurrence on 25 May 2023 at around 17:30 UTC:

- Ambient temperature 20ºC;
- Dew point temperature 08ºC

The above meteorological data was plotted on a chart (Fig. 6) showing the likelihood of ice formation on aircraft piston engines (yellow lines).

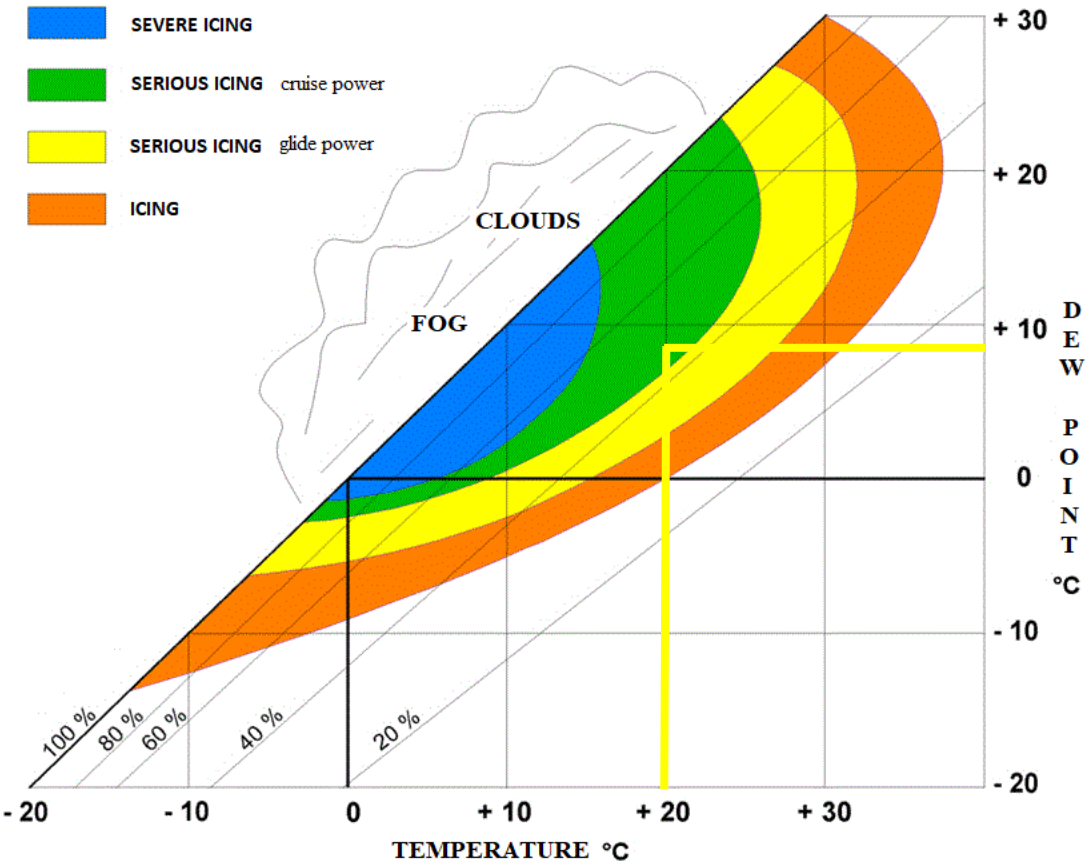

Figure 6. A chart showing the carburettor icing probability [source: the Internet] Internet]

The chart shows clearly that carburettor icing was likely during the occurrence at any stage of the flight.

The engine manufacturer specified two factors that could cause carburettor icing:

1) water content in the fuel (in particular for fuels containing alcohol);
2) high air humidity.

Special risk is posed by carburettor icing conditions occurring in high air humidity, as it leads to reducing the amount of mixture supplied to the cylinders.

It is likely that the meteorological conditions had caused carburettor icing, thus causing a decrease in the engine power and lower thrust generated by the propeller, leading to a longer take-off run.

2.3 Aircraft

2.3.1. Aircraft maintenance

The aircraft was maintained timely and in accordance with regulations.

2.3.2. Mass and balance

Calculations based on the data from the aircraft weighing report show that the maximum take-off mass was exceeded by 95.5 kg.

According to the aircraft weighing report sent by AAII, Czech Republic, the aeroplane's empty mass EW was 322 kg. That value should have been taken into account when calculating the aeroplane's centre of gravity and MTOM. Furthermore, the plate which displays selected performance data and limitations placed on the instrument panel in the cockpit shows EW 298 kg. The plate also shows incorrect values for Vso and minimum pilot weight (in solo flight). The aeroplane was built in 2005 of a self-assembly kit which had been purchased from the Type Certificate holder in the Czech Republic (the CZAW company, no longer in business). The current owners purchased the aeroplane together with the aforementioned plate.

The length of the take-off run was essentially affected by the mass of the aeroplane, as the bigger load caused an increased friction resistance of the wheels on the grass runway surface, thus leading to a longer take-off run and higher stall speed.

2.4 Survivability

The collision of the aeroplane with the edge of the roof made of metal sandwich panels significantly cushioned the force of the impact, thus mitigating the outcomes.

3. CONCLUSIONS

3.1 Findings

3.1.1. The aircraft had a valid technical approval and was maintained in accordance with the regulations.

3.1.2. The maximum take-off mass (MTOM) of the aircraft was exceeded by 95.5 kg.

3.1.3. No evidence of damage to the airframe or system unserviceability before the accident was found.

3.1.4. The aircraft was destroyed by the impact force.

3.1.5. The pilot's aeromedical certificate, Class 2, no limitations, expired on 24 April 2023.

3.1.6. Intensive carburettor icing at any stage of the flight was likely to occur at the site of the occurrence.

3.1.7. The pilot did not abort the take-off despite clear indications of insufficient speed of the aeroplane during the take-off run.

3.2 Causes and contributing factors

3.2.1. Execution of take-off by the pilot in an overloaded aeroplane and with a potentially decreased engine power due to carburettor icing.

3.2.2. The pilot's decision to continue the take-off despite clear symptoms of insufficient engine power.

4 SAFETY RECOMMENDATIONS

None.

5. APPENDICES

None.
