AIR ACCIDENTS INVESTIGATION
INSTITUTE
Beranových 130
199 00 Praha 9 - Letňany

CZ-24-1093

FINAL REPORT

**on the investigation of the causes of
the accident to Cessna P210N registration OM-DKA,
at Bartošovice, 4,7 km SW THR RWY 04 LKMT
on 9. 8. 2024**

Prague
May 2025

Contents

Abbreviations Used

AAII	Air Accidents Investigation Institute
ACC	Area control centre or area control
ADS-B	Automatic dependent surveillance – broadcast
AGL	Above ground level
AMSL	Above mean sea level
ARP	Aerodrome reference point
ATCo	Air Traffic controller
CAVOK	Visibility, cloud and present weather better than prescribed values or conditions
FIR	Flight information region
FIC	Flight information centre
FPL	Filed flight plan
FISO	Flight information service officer
PPL (A)	Private pilot licence
LEBE	The airport Beas de Segura (Spain)
LECN	The general aviation airport Castellón (Spain)
LESB	The general aviation airport Son Bonet (Malorka)
LIDP	The airport Pavullo (Italy)
LJPZ	The international airport Portorož (Slovenia)
LKMT	The international airport Ostrava/Mošnov
LZNI	The general aviation airport Nitra (Slovakia)
RWY	Runway
SEP land	Single engine piston land
THR	Threshold
TMA	Terminal control area
TWR	Aerodrome control tower or aerodrome control
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VNL	Vision limitation
W	West
Non SI units used	
ft	Foot (unit of length 0,3048 m)
h	Hour
min	Minute
inHg	Inch of mercury (jednotka tlaku – 33,8638 hPa)
US gal	Gallon (3,783 l)
l	Litre (1 dm^3)

A) Introduction

Operator:	Legal entity
Aircraft Type:	Cessna Aircraft Company, USA, Cessna P210N
Registration:	OM-DKA
Location of accident:	Bartošovice, 4,7 km THR RWY 04 LKMT
Date and Time:	9. 8. 2024, 06:45 (All times in this report are UTC)

B) Summary

On 9 August 2024, the AAII was notified of an accident of the Cessna P210N aircraft in the vicinity of the village Bartošovice. A foreign pilot was performing a VFR flight according to FPL from Nitra Airport (LZNI) to Borsk Airport (EPBO) in Poland. During the flight in TMA VII Ostrava, at a position of about 14 km W THR RWY 04 LKMT, the pilot sent a distress signal MAYDAY on the frequency and a message that he had an engine failure and was turning towards Mošnov Airport. The pilot decided to try to reach LKMT. He established contact on the TWR Mošnov frequency and reported that he was in a position about 3–4 min W LKMT, at 1,800 ft AMSL and would attempt an emergency landing at Mošnov Airport. ATCo acknowledged the emergency and issued a clearance for landing on RWY 04. At 06:44, approximately 4.8 km from THR RWY 04 LKMT, the pilot announced that he would be landing to terrain as he would not reach the airport.
At 06:45, the pilot landed on a shallow-ploughed field near the village of Bartošovice. After landing with the landing gear and flaps retracted, the aircraft rolled over the nose after about 40 m. The pilot was seriously injured. The aircraft was destroyed.

The cause of the accident was investigated by the AAII commission comprised of:

Investigator-in-charge:	Ing. Stanislav SUCHÝ
Member:	Ing. Lada Ouhrabková

In accordance with established international arrangements, the National Transportation Safety Board (NTSB) in the USA, representing the State of Design and Manufacture, and the Aviation and Maritime Investigation Authority (AMIA) of Slovakia representing the State of Registry and the State of the Operator, appointed an Accredited Representative to the investigation.

The Final Report was issued by:
Air Accidents Investigation Institute
Beranových 130
199 00 Praha 9 - Letňany

On xx. xx 2025

The Final Report comprises:

1 Factual information

1.1 History of the flight

For the following description, the Commission used the pilot's explanation and documentation, the operational and technical documentation of the aircraft, the ATS records obtained, ADS-B flight data, and the results of wreckage examination, engine inspection, and expert examinations.

1.1.1 Circumstances preceding the critical flight

On 31 July 2024, the pilot took over the Cessna P210N aircraft at LKTB after a scheduled 50-hour inspection by the maintenance organisation. He then flew the aircraft to LZNI. From 4 August 2024, the pilot performed a total of 7 international flights with landings at LJPZ, LESB, LECN, LEBE, LIDP and LZNI, where he landed at approximately 15:15 on 7 August 2024. The pilot explained that after landing he had gone to his place of residence in Nitra. The following day, he was in Nitra engaged in his business and administrative activities and had ample rest. The aircraft was parked at the airport until the morning hours of 9 August 2024.

The pilot further stated that on the day of the accident, 9 August 2024, he arrived at LZNI and performed pre-flight preparation of the Cessna P210N aircraft. According to the delivery note, he filled aircraft tanks, including auxiliary tanks, with 196 litres of fuel (total fuel quantity of 120 US gal), added oil and checked the oil quantity with a dipstick. The pilot further stated that the aircraft had been airworthy.

1.1.2 Critical flight

On 9 August 2024, the pilot of Cessna P210N planned to perform a VFR flight according to FPL from Nitra Airport to Borsk Airport in Poland:

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FPL-OMDKA-VG
-P210/L-SDGFY/S
-LZNI0600
-N0142VFR VALPI LKMTS LKMTW REGLI MOFKE PEVUM NASOK
-EPBO0244
-DOF/240809 EET/LKAA0024 EPWW0050 RMK/PILOT
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The pilot stated that he had taken off from LZNI at about 06:00, climbed to 4,000 ft AMSL[1] and had flown as planned along the route to VALPI. He used his iPad, iPhone with the SkyDemon app, and an on-board GPS device for navigation.
At 06:19:59, before the VALPI point and entry into FIR Prague, he announced on the FIC Prague operating frequency that he would proceed at 4,500 ft AMSL according to FPL. FISO Prague confirmed the information and issued an instruction for setting transponder code 1412.

At 06:31:20, about 5 min before the SIERRA point, before entering TMA IV Ostrava, the pilot established contact on the ACC Prague frequency and announced that he would fly over the SIERRA points, then WHISKY and then to the REGLI point at 3,800 ft AMSL at the QNH

1 The flight altitude is rounded off to the nearest 100 ft in the surveillance data processing system

pressure of 1,016 hPa. The flight along the planned route was cleared by ACC Prague and the information about QNH 1,018 hPa was transmitted.

At 06:36:40, after passing over the SIERRA point, the pilot changed course by turning left and proceeded in the course[2] of 130° at 3,800 ft AMSL to the WHISKY point.

In his explanation, the pilot stated that after about another 3–4 min of flight, he suddenly had heard regular metallic bangs accompanied by smoke from the engine compartment. The pilot checked the engine management and monitoring instruments: the fuel feed pressure was at 27 inHg and then dropped to 15 inHg, fuel mixture richness was normal, propeller revolutions were 2,400 rpm, the engine temperature and oil pressure were normal and the temperatures in cylinders as well. The smoke from the engine compartment was brown, but it did not penetrate the cabin or impair the view. The pilot further stated that he had looked around and thought he would try to reach LKMT because the engine still had power. After a few seconds, he found out that the filling pressure had dropped.

At 06:40:53, at a position approximately 14 km W THR RWY 04 LKMT at 3,700 ft AMSL (2,620 ft AGL), the pilot sent a distress signal MAYDAY on the frequency and a message that he had had an engine failure and was turning towards Mošnov Airport. The position of the aircraft is shown in Fig. 1.

Fig. 1 – Position of the OM-DKA aircraft at the time of the MAYDAY distress signal.

The ACC Prague ATCo confirmed receipt of the distress message. He instructed the pilot to proceed on final approach on RWY 04. During a right turn into the course of 090° to LKMT, the pilot descended to approximately 3,300 ft AMSL (2,300 ft AGL relative to terrain) and continued to descend further at GS 110–100 kt. At 06:41:40, the ATCo relayed the QNH information (1,018 hPa) and asked if the pilot needed any further assistance. The pilot responded that he did not require any assistance at that time. He added that he would see if he could make it to the airport. At 06:41:54, the aircraft was in descent at approximately 2,700 ft AMSL (relative to terrain 1,768 ft AGL) and approximately 11.2 km from the THR of RWY 04 LKMT. The ATCo instructed the pilot, if able, to establish contact on the TWR Mošnov frequency. The pilot had the frequency repeated and then confirmed the message in a descent course of about 105° at 2,100 ft AMSL (relative to terrain 1,100 ft AGL).

2 The course corresponds to a vector derived from the ATC recorded surveillance data processing systems. Any so derived courses in the flight description should be considered as approximate

At 06:42:35 (8.6 km W THR RWY 04 LKMT), the pilot announced on TWR Mošnov frequency that he was in a position approximately 3–4 min west of LKMT, at 1,800 ft AMSL (relative to terrain 1,000 ft AGL) and would attempt an emergency landing at Mošnov airport. ATCo acknowledged the distress message and issued a clearance for landing on RWY 04. The position of the aircraft is shown in Fig. 2. The pilot explained that when the engine lost power, he tried to restart it, but the engine no longer responded.

At 06:44:05, the TWR Mošnov ATCo repeated the clearance to land on RWY 04 and at the same time requested the pilot to announce his plan. The pilot had already assessed that he would not reach the airport due to his position and altitude and was looking for an area to land on.

At 06:44:14, at a position approximately 4.8 km from THR RWY 04 LKMT, the pilot announced that he would be landing to terrain as he would not reach the airport. The aircraft was in descent at about 200 ft AGL and descending at GS of 70 kt. The position of the aircraft is shown in Fig. 3.

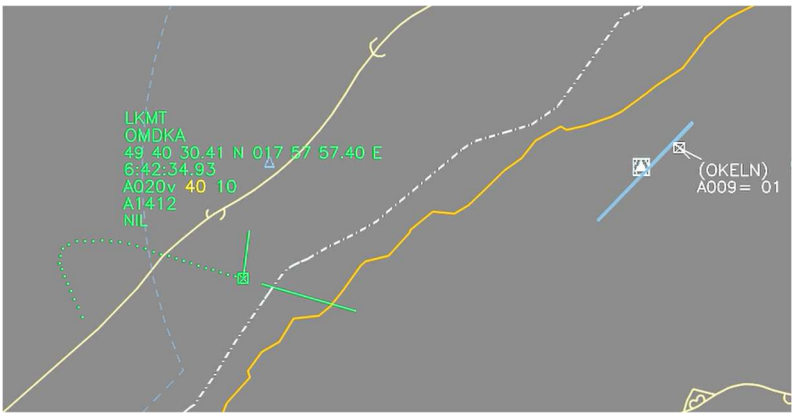

Fig. 2 – Position of the OM-DKA aircraft at the time of establishing communication with TWR Mošnov

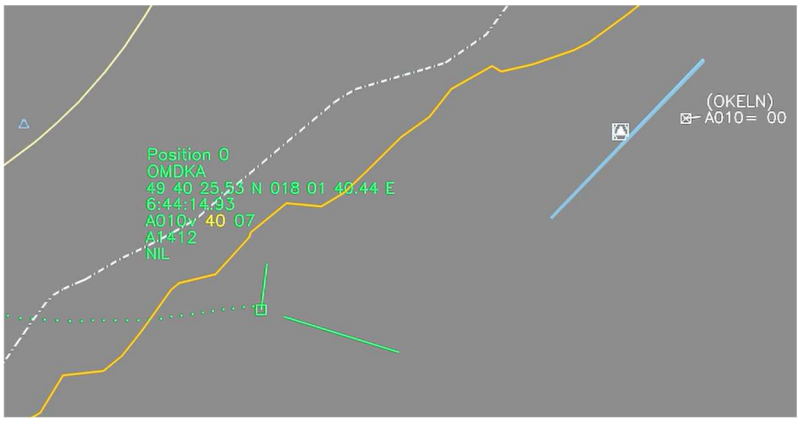

Fig. 3 – Position of the OM-DKA aircraft at the time of sending the message about landing to terrain

The pilot stated that the descent on approach for landing to terrain was first made in the direction of the intended area southwest of the village of Bartošovice. But then he saw trees and power poles in front of him, so he turned right and decided to land on the next field.

Before landing, he retracted the throttle and mixture controls, turned off the magneto and on-board net, and unlocked the cockpit door. He did not turn off the fuel valve.

At 06:45, the pilot landed with the landing gear and flaps retracted on a shallow-ploughed field near the village of Bartošovice. Upon touchdown in the field, the propeller and exhaust hit the ground, and the aircraft rolled over the nose after about 40 m. The position of the accident site relative to LKMT is shown in Fig. 4.

The pilot got out of the inverted aircraft and reported the situation on emergency line 112, where he gave his location. He also reported the incident to the owner of the aircraft and the relevant authority in Slovakia.

Fig. 4 – Location of the accident site of OM-DKA aircraft in relation to LKMT

During the rollover, part of the cargo, a large sports bag, fell out of the passenger cabin.

1.2 Injuries to persons

The pilot was seriously injured. After the arrival of the Integrated Rescue System (IRS) unit at the air accident site, the pilot was transported to the hospital in Nový Jičín for examination and then to the University Hospital in Ostrava. No other persons were injured.

1.3 Damage to the aircraft

The aircraft with registration OM-DKA was destroyed.

1.4 Other damage

Due to the leakage of working fluids at the accident site, the Nový Jičín Environmental Authority and the Odra River Basin Authority were notified. The site of the accident is located on a land belonging to the University of Veterinary Sciences, Brno. The contamination of soil with working fluids from the damaged tanks and engine caused damage, the total extent of which had not been known to the Commission until the Final Report was issued.

1.5 Personnel information

1.5.1 Pilot of the aircraft

1.5.1.1 Personal data

Male, age: 47 years

Nationality: Slovak Republic

Licence: CZ/FCL/PPL(A)

Overview of qualifications and certificates:

- SEP land, valid until 30 September 2025
- NIGHT

Radiotelephony operator's certificate / ICAO language capability: Czech level 6, English level 5, VFR only

Class 2 medical certificate: valid until 12. May 2025, VNL limitation

Limited radio operator licence: valid

1.5.1.2 Flying experience

The pilot received his licence in 2019. He has flown as a pilot of Cessna 172, Diamond DA40 and since 2021 Cessna P210N. His SEP land qualification was last administratively extended on 25 September 2023.

Total flight time as recorded in the pilot's logbook:

All types in total:	262 hrs 43 min
For the last 90 days:	75 hrs 08 min
Cessna P210N:	122 hrs 15 min
Cessna P210N For the last 90 days:	75 hrs 08 min

For data on flights and flight time after the 50-hour aircraft inspection on 31 July 2024 see Table 1.

Table 1 – Overview of flights and flight time performed by the pilot on OM-DKA

Date	Departure	Arrival	Flight time [hrs:min]
31. 7.	LKTB	LZNI	0:55
4. 8.	LZNI	LJPZ	1:55
5. 8.	LJPZ	LESB	4:30
5. 8.	LESB	LECN	1:25
6. 8.	LECN	LEBE	1:35
6. 8.	LEBE	LECN	1:40
7. 8.	LECN	LIDP	4:25
7. 8.	LIDP	LZNI	3:15
9. 8.	LZNI	LN	0:45*
Total	–	–	20:25

* Flight time according to ATS record.

1.5.1.3 Addictive substances test

The pilot was breath tested by the Police of the Czech Republic for the presence of alcohol in his breath with a negative result. In addition, a screening test for the presence of another addictive substance was carried out with a negative result.

1.6 Aircraft information

1.6.1 Basic characteristics

The Cessna P210N type is a six-seat, all-metal, self-supporting, pressurised-cabin upper-wing monoplane equipped with a turbocompressor and a retractable nose type landing gear. The capacity of the tanks was increased by installing additional tanks in the edge curves of both wing halves.

1.6.2 General specifications of the Cessna P210N aircraft, registration OM-DKA

1.6.2.1 Aircraft

Manufacturer:	Cessna Aircraft Company, USA
Year of manufacture:	1979
Serial number:	P21000322
MTOM:	1 814 kg
Total hours flown by the aircraft:	2 293 h 33 min
Liability insurance:	platné
The aircraft was certified for:	Den/Noc, VFR/IFR provoz

1.6.2.2 Power unit

Engine – type:	Continental-TSIO-520-P5B
Year of manufacture:	2005
Serial number:	513946
Total hours flown:	333 hrs 28 min
Propeller – manufacturer:	HARTZEL-MT-Propeller
Type:	PHC-J3YF-1RF/F7663-DB-2Q
Year of manufacture:	1995
Serial number:	FP-2444A
Hours flown after GO in 2011:	202 hrs 28 min

1.6.2.3 Operation and maintenance of the aircraft, registration OM-DKA

Based on a verbal agreement between the owner of the aircraft and the pilot, the pilot operated the aircraft for his own use, with the intention of later purchasing the aircraft.

A check of the maintenance records showed the following:

The inspections and checks of the aircraft, engine and propeller according to the approved maintenance programme PU-P210-DKA-01 and further specified in the accompanying technical documentation of the aircraft manufacturer, or specified in other instructions, were performed by an organisation authorised for maintenance.

According to the minutes of the 200-hour inspection completed on 16 December 2019 with a total flight time of 207 hrs 20 min, cylinder 2 was disassembled, exhaust valve ground, compression pressures assembled and checked after cylinder 2 repair. The authorised maintenance organisation stated that only the seating surface on the exhaust valve was lapped, as it was contaminated by carbon deposits.

The last 200-hour inspection was completed on 26 October 2023 with a total flight time of 2,210 hrs 10 min (engine 249 hrs 35 min) and the aircraft was released into service. The maintenance certificate was valid until 31 October 2024 with 2,310 hrs 10 min flown.

During the last 50-hour inspection completed on 31 July 2024 with a total flight time of 2,273 hrs 38 min (engine 313 hrs 03 min), the authorised maintenance organisation followed the current version of Manual D2058-2-13 regulating the maintenance procedures for the Cesna P210 type, and for engine maintenance also the document “M0” (Continental Standard Practice for Spark Ignited Engines), and for compression checking also its chapter 6 containing the incorporated Service Bulletin SB03-3. The inspection included a Shell 15W50 oil and oil filter change, a visual inspection and a test of the on-board battery.

A representative of the authorised maintenance organisation stated that they also carried out a compression check in addition to the normal 50-hour inspection. Compression pressures were within the required limits. Table 2 provides a summary of the values from the compression pressure measurements performed on individual cylinders at a test pressure of 80 Psi.

Because of the lower compression of cylinder 2 (within the required limit, but lower than the other cylinders), they also performed an additional inspection of the cylinder and the visible parts of the valves and piston crown with a borescope, and found nothing unusual. They also replaced the valve cover gasket on cylinder 2.

Table 2 – Summary of compression pressures in each cylinder during engine maintenance checks

Date	Total hours flown	1	2	3	4	5	6
16. 12. 2019	207:20	60	68	51	57	49	50
18. 10. 2021	213:20	64	72	66	57	56	58
27. 10. 2022	226:15	54	55	63	46	44	48
26. 10. 2023	249:35	44	40	50	44	50	50
31. 07. 2024	313:03	52	45	50	53	55	55

In accordance with the manufacturer’s documentation, the inspection was closed with the proviso that at the next, i.e. 100-hour inspection, the compression check or borescopic check would be performed again.

After the maintenance was completed, the aircraft was released into service.

1.6.2.4 Take-off weight and aircraft balance

No evidence of weight and balance verification prior to flight on 9 August 2024 has been found. The pilot explained that he knew his weight and the weight of the cargo. According to the pilot, the weight and balance before the flight were within normal limits.

Deviations of the actual centre of gravity of the cargo with respect to the location throughout the passenger cabin could not be verified. The Commission therefore only made an indicative calculation of the take-off weight on 9 August 2024 and the determination of the centre-of-gravity position. The detected position was within the approved centre of gravity range envelope for take-off according to the Flight Manual.

Weight of an empty aircraft [3]:	1 239 kg
Pilot's weight:	80 kg
Weight of luggage:	10 kg
Weight of cargo [4]:	92,8 kg
Fuel (120 US gal/454 l):	340 kg
Total:	1 761,8 kg
MTOM:	1 814 kg

1.7 Meteorological information

1.7.1 Weather information at LKMT

The following information about the weather at the time of the event was obtained from the LKMT ATIS:

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GOOD MORNING MOSNOV ATIS
PAPA
AT 0630
ILS APPROACH
RUNWAY IN USE 22
TRL 60
METAR LKMT AT 0630
WIND VARIABLE 1 KNOT
CAVOK
TEMPERATURE 19
DEWPOINT 13
QNH 1018
NOSIG
```

1.8 Aids to navigation

NIL

1.9 Communications

During the flight in FIR Prague, the pilot maintained radio-telephone communication on the operating frequency of the FIC Prague Sector Bohemia East in the 136,175 MHz band. When he entered the TMA Ostrava and the critical situation occurred, the pilot was in contact on the ACC Praha operating frequency in the 119,375 MHz band. In the final phase of the flight, he was in contact with TWR Mošnov on the operating frequency in the 120,805 MHz band. The pilot communicated in Slovak. The recording of the radio correspondence was used for the investigation.

1.10 Airport information

Ostrava/Mošnov Airport is a public international airport. It is located 20 km SW of the Ostrava Main Station. It has a concrete RWY 04/22 with dimensions of 3511 × 63 m. The altitude of the ARP is 842 ft / 257 m. Operating hours are H24 for VFR/IFR operations.

3 According to the weighing protocol of 3 May 2019
4 According to the weighing of the cargo carried out after the accident by the Police of the Czech Republic on 9 August 2024

1.11 Flight recorders and other means of recording

1.11.1 Flight recorders

The aircraft was not equipped with flight recorders as it was not required by regulations. No navigation equipment was installed on board to record flight data.

1.11.2 Mobile phone record

During the critical flight, the pilot had his mobile iPhone with the SkyDemon application with him. He also used an iPad. The AAII Commission has obtained information on air traffic applications from the iPad.

1.11.3 ADS-B record

The Commission used the ADS-B format GNSS position record for the investigation. The record was analysed using ADS-B Exchange and used for investigation.

1.11.4 Recording of Surveillance Situation and Voice Communication

The Commission requested from ANS CR a record of the systems for processing surveillance data. It is not a record of the real situation, but an interpretation of the output system track of the surveillance system, which ensures 100% accuracy of the position data display. A synchronised recording of the surveillance situation and voice communication between ATS stations and the pilot of OM-DKA aircraft during the flight in FIR Prague was used for investigation.

1.12 Wreckage and impact information

1.12.1 Description of site of the accident

The accident occurred in a field located on a gentle slope of the Bartošovice Hill (277 m), about 900 m from the SW edge of the village of Bartošovice and about 100 m from a 22 kV power line. The accident site was approximately 4.8 km away from RWY 04 THR LKMT.

The surface of the harvested field was wet. The nose of the aircraft in the inverted position was pointing in a direction of approximately 300°. The tail section of the aircraft was facing a country lane and partially interfered with the scrubby vegetation along the country lane.

The track of the first ground impact and the beginning of the gouge (2) in Fig. 5 was approximately 45 m from the final position of the nose of the aircraft. The gouge corresponded to the impact of the lower part of the nose of the aircraft at a very slight angle in the landing direction of about 175°. The coordinates of the inverted aircraft were 49°40' 13.8" N and 18°01' 50.1" E, while the altitude was 255 m.

At a distance of about 10.5 m from the beginning of the gouge, a detached part of the exhaust (3) was located on the right, at a distance of 19 m and 5.5 m on the left, there was an impact mark of the edge of the left wing half (4), and a part of a heavily deformed engine piston was found in the gouge, at a distance of 29.5 m and 7.5 m to the left, a fragment of the rib of the left wing tip was found (5) and at a distance of 35.7 m and 10 m to the left, a fragment of the left wingtip arc was found (6).

Fig. 5 – Wreckage of the aircraft at the site of the accident (image from the Czech Police drone)

Fig. 6 – View of the accident site and the gouge in the landing direction (source: PCR)

1.12.2 Inspecting the wreckage

The aircraft was destroyed by the forces of impact to the ground and inversion. The fuselage was broken in the rear part, about 0.5 m before the leading edge of the stabiliser, with a partially torn covering. The landing gear was in the retracted position. The starboard cockpit door was open, the lower part of the nose had a deformed cover and the nose gear shaft door. The three-bladed propeller had one blade bent backwards by about 90° in the middle, the other two blades were bent backwards by about 15°. The propeller cone was deformed. The left engine cover was partially open. The crashed aircraft is shown in Fig. 7.

The cockpit instrumentation and controls were without visible damage. The landing gear selector handle was found in the upper position (retracted). The flap position indicator was in the 0° position (UP). The pitch balance position indicator was in the slightly “nose-heavy” position. The fuel cock was in the “left tank” position. There was a dried trace of reddish-brown paint on the left side of the windshield. On the instrument board cover, there was an iPad tablet in a switched-on state. There were various documents and objects on the ceiling of the cabin (of the inverted aircraft) and in the pockets. A carry-on bag containing aircraft documents and personal belongings has been also found.

The entire passenger cabin was filled with 7 large sports bags. One large sports bag was located outside the aircraft near the left wing half.

Fig. 7 – Condition of Cessna P210N after emergency landing and inversion

In the luggage compartment in the tail section of the fuselage, there was an Emergency Locator Transmitter (ELT) in the ON position, metal steps, first aid kit, tools, two bottles of oil, rubber straps, and various papers.

The right half of the wing was severely deformed, broken in about half of the span with torn covering. The leading edge was deformed, the flap was in the retracted position, the deformed aileron remained attached in the hinges. The fuel tank cap was closed. The left half of the wing had a torn edge in the place of the outer hinge of the aileron and a considerably deformed leading edge about 1.2 m from the end, the slightly deformed flap was retracted, the aileron remained attached in the hinge. The fuel tank cap was closed. Fuel leaked from the damaged tanks and both damaged wing halves, and was later pumped out by the FRS unit and a sample was taken for analysis.

The control cables from the cockpit to the controls were checked and no anomaly was found that would indicate a technical fault that was not caused by a ground impact.

Both magnetos on the Continental-TSIO-520-P5B engine were torn off. The engine nacelle was heavily polluted with dark brown liquid and soil. An irregular oval hole (approx. 80–150 mm) was found pierced on the upper side of the nacelle body in the area of cylinder 2, see Fig. 8. The oil filler hole was closed, the dipstick was inserted. No other significant visual damage to the engine body, cylinder heads, aggregates, fuel and ignition systems was found.

A part of a severely deformed piston was detected under the engine in the engine compartment. A sample of oil was taken through a hole made in the engine nacelle, which was found at the bottom of the nacelle and oil pan after the fuselage was turned to its normal position.

After the aircraft was inspected at the accident site, the wing halves, the rear fuselage section at the fracture point and the stabiliser with elevator were dismantled and separated for transport.

Fig. 8 – Punctured hole in the upper side of the engine

Fig. 9 – Deformed piston parts from the engine

1.13 Medical and pathological information

The seriously injured pilot was taken by ambulance to the hospital in Nový Jičín. He was subsequently transferred to the University Hospital in Ostrava.

1.14 Fire

No fire broke out. The FRS unit intervened at the scene, pumping petrol from the tanks in the wing of the aircraft and securing the aircraft against catching fire.

1.15 Search aspect

After the pilot's emergency report, TWR Mošnov activated the relevant emergency and fire services at the airport. Subsequently, the IRS units arrived at the scene.

1.16 Tests and research

1.16.1 Oil and fuel sample analysis

The fuel and oil samples taken from the Cessna P210N aircraft, registration OM-DKA, were submitted to an accredited testing laboratory for analysis.

The test report shows that the sample of aviation petrol corresponded to AVGAS 100LL. The sample failed the DEF STAN 91-90 ISSUE 5 quality standard for AVGAS aviation petrol due to the presence of minor mechanical impurities. For the other measured parameters, the quality requirements of the AVGAS standard for aviation petrol were met.

The test report shows that the sample of engine oil taken from the Cessna P210N, registration OM-DKA, contained excessive amounts of mechanical impurities, but only part of these impurities were from engine damage that occurred while the aircraft was still in operation. It can be assumed that most of the foreign contaminants (by visual assessment dust, soil, plant debris, and sorbent) entered the oil only as a result of the accident, with the possible source being the environment.

1.16.2 Boreskopic inspection

Borescopic inspection of the damage to the engine Continental TSIO 520 P5B S/N 513946 by an indirect visual method with the help of a videoscope was conducted at the place where the wreckage of the aircraft was stored in Liptovský Mikuláš.

Borescopic inspection of the engine was performed using an Olympus Iplex LX/LT videoscope. The inspection was performed by a Level 2 certified visual inspection specialist. Supervision was carried out by the AAII Commission Chairman. The engine was mounted on the fuselage and for the purpose of inspection of the interior it was accessible from above and from both sides – cylinder heads. A punched hole in the upper part of the engine nacelle between cylinders 1 and 2 was used for inspection. The spark plug on cylinder 1 was then removed and after removing the exhaust valve stem in cylinder 2, the holes were used to inspect the adjacent cylinder area. The following condition was found during the inspection:

Cylinder 1 – The piston was damaged by fractures in several places on the underside around the circumference. There was no significant visual damage.

Cylinder 2 – The piston was completely missing, only the pin and connecting rod remained. The exhaust valve was missing from the cylinder head, the stem of which remained in the guide sleeve, see Fig. 10. The valve stem was removed for subsequent examination of the fracture surface.

Small pieces of metal particles were found in cylinders 3–6, in the internal spaces under the pistons and in the crankshaft area, while the connecting rods and pistons did not show significant damage.

Surveillance images of the interior of the other engine cylinders are shown in the Appendix.

Fig. 10 – Missing exhaust valve head and piston in cylinder 2

1.16.3 Expert opinion of the valve stem fracture surface

After the borescopic inspection, the exhaust valve stem in cylinder 2 was submitted for fractographic analysis of the fracture surface in the laboratory of VZLÚ, a.s. (National Center for Research, Development and Testing in Aerospace), Aviation Division. The fractographic analysis of the fracture surfaces of the selected parts was performed using a line electron

microscope. It has shown that the fracture surface of the delivered part exhibits fatigue failure, see Fig. 11. The fracture surface was nearly perpendicular to the longitudinal axis of the shank without significant shear edges or shank diameter contraction, i.e. the failure occurred without significant plastic deformation that would indicate large deformation stresses on the part in any mode. This was confirmed by the presence of a relatively large number of closed secondary surface micro cracks near the initiation areas of the main or secondary cracks on the valve stem surface.

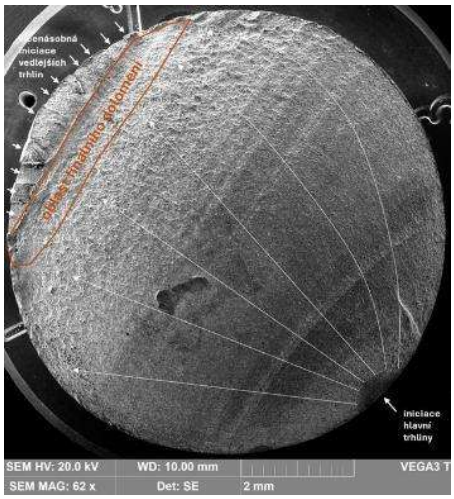


Fig. 11 – Surveillance image of the fracture surface of the broken shank with marked areas of initiation of fatigue failure and directions of propagation of individual cracks

1.17 Organisational and management information

1.17.1 Aircraft operator

The owner and operator of the Cessna P210N aircraft, registration OM-DKA, was a foreign legal entity. The aircraft was operated in a non-commercial aircraft operation under EU rules. The pilot used the aircraft for his activities based on a verbal agreement with the owner.

1.18 Aditional information

1.18.1 Flight characteristics of the Cessna P210N aircraft

The flight manual “Pilot’s Operating Handbook – Cessna 1979 model P210N, REV 9” was found in the cockpit. In section 3 under “Emergency Procedures – Engine Failures”, it gives the recommended procedure for in-flight engine failure and emergency landing with an inoperative engine. The pilot should have adjusted the most favourable glide speed as soon as possible. Efforts should be made to identify the cause of the malfunction when gliding towards a suitable landing area. If time permits, an attempt should be made to restart the engine as indicated in the checklist, see Fig. 12:

ENGINE FAILURE DURING FLIGHT (RESTART PROCEDURES)

1. Airspeed -- 85 KIAS.
2. Auxiliary Fuel Pump -- ON.
3. Fuel Selector Valve -- OPPOSITE TANK (if it contains fuel).
4. Throttle -- HALF OPEN.
5. Auxiliary Fuel Pump -- OFF.

NOTE

If the fuel flow indication immediately drops to zero, signifying an engine-driven fuel pump failure, return the auxiliary fuel pump switch to ON.

6. Mixture -- LEAN from full rich until restart occurs.

NOTE

If propeller is windmilling, engine will restart automatically within a few seconds. If propeller has stopped (possible at low speeds), turn ignition switch to START, advance throttle slowly from idle, and (at higher altitudes) lean the mixture from full rich.

7. Mixture -- ADJUST as required as power is restored.
8. Throttle -- ADJUST power as required.
9. Fuel Selector Valve -- AS DESIRED after fuel flow is stabilized.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 90 KIAS (flaps UP).
2. Seat Belts and Shoulder Harnesses -- SECURE.
3. Mixture -- IDLE CUT-OFF.
4. Fuel Selector Valve -- OFF.
5. Ignition Switch -- OFF.
6. Landing Gear -- DOWN (UP if terrain is rough or soft).
7. Wing Flaps -- AS REQUIRED (30° recommended).
8. Door -- UNLATCH PRIOR TO TOUCHDOWN.
9. Master Switch -- OFF when landing is assured.
10. Touchdown -- SLIGHTLY TAIL LOW.
11. Brakes -- APPLY HEAVILY.

Fig. 12 – Cessna P210N Flight Manual – Checklist

If the engine cannot be restarted, a forced landing must be completed.

The “Amplified Procedures” section provides a chart of the maximum range of the aircraft in descent with an inoperative engine, see Fig. 13.

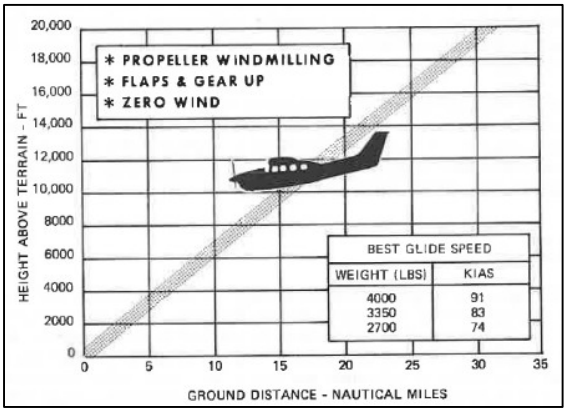


Fig. 13 – Chart of maximum flight range of Cessna P210N in descent with an inoperative engine

The Flight Manual specifies the speed for the best glide performance depending on the actual weight of the aircraft with the landing gear and flaps retracted.

The Commission used the information in the chart to determine the flight range after engine failure. They considered the fuel consumption for take-off and a flight time of about 33 min to determine the weight of the aircraft (about 1,732 kg / 3,820 lb). At this weight, the speed for the best glide was about 90 kt. With the flaps retracted, the aircraft should be able to glide about 1.5 NM per 1,000 ft of altitude. The altitude at the time when the engine failure occurred was approximately 2,620 ft AGL.

At the time when the pilot sent the MAYDAY distress signal and the message that he had an engine failure, the nearest airport was LKMT. The aircraft was located approximately 14 km (7.5 NM) west of the threshold of RWY 04 LKMT. During a right turn to a course of 090°, he smoothly descended to about 3,300 ft AMSL (2,300 ft AGL relative to terrain). From this altitude the aircraft could glide to a distance of about 6.4 km (3.45 NM) with an inoperative engine.

Using the data provided by the surveillance data record and a range of average GS speeds of 110–90 kt, the Commission determined that the aircraft travelled about 7.7 km during the descent in about 2 min 25 s, when it descended to about 1,145 ft AGL. Then the pilot announced that he would land to terrain. He landed without the flaps extended, even though the Flight Manual recommends extending them to 30° when landing with an inoperative engine.

2 Analysis

The accident occurred during an emergency landing with an inoperative engine, and after the nose and propeller touched the ground, a stall moment occurred, and the aircraft was inverted. No device whose data records could be used in analysis of the critical flight phase was present in the aircraft.

2.1 Qualification and health condition of the pilot

The pilot had a valid licence, appropriate qualifications and experience in flying the Cessna P210N, registration mark OM-DKA. He had made 7 flights at foreign airports in the short period before the air accident. In the explanation given, the pilot did not indicate any problems with the execution of flights on the days preceding the air accidentě.

The pilot was not under the influence of alcohol or any other substances prohibited for aviation duty.

2.2 Aircraft

It had a valid airworthiness inspection certificate and valid statutory liability insurance coverage. In the course of the flight during the period after the last inspection on 31 July 2024, the pilot did not record any defect in the aircraft documentation.

The calculation based on the estimated fuel weight at the time of the air accident shows that the aircraft was operated within the prescribed weight and balance at all flight stages.

Based on the wreckage examination, there was no evidence that there was a failure of the controls that would contribute to the occurrence of the air accident.

2.3 Conditions for the flight

Meteorological conditions were in accordance with the prescribed minimums for VFR flights and did not affect the course of the situation after engine failure.

2.4 Critical flight

During the explanation, the pilot stated that from the take-off from LZNI at about 06:00 for about 30 min the flight was uneventful, and all engine mode parameters were normal. The aircraft was flying steady flight at 3,700 ft AMSL at GS 90 kt.

2.4.1 Engine failure

The pilot said his first reaction after hearing the bangs and seeing oil leaking from the engine cowling was to check the instruments. The pilot added that he had initially checked the engine running instruments and the propeller speed, engine temperature and oil pressure were all within normal limits, as were the temperatures on the individual cylinders. As the

engine still had power, the pilot thought he would try to reach LKMT. The Commission concluded, based on the position on the surveillance record, that the aircraft had engine failure at 3,700 ft AMSL. When the pilot noticed that the engine was gradually losing power, he tried to start it, but the engine was no longer responding so he started gliding with an inoperative engine, the landing gear and flaps retracted.

An inspection of the aircraft at the accident site revealed that both parts of the piston from cylinder 2 had penetrated through the punctured hole in the engine nacelle. One part fell out of the aircraft into the gouge probably before the aircraft rolled over. The other part of the piston remained under the engine cover.

The pilot added that as the aircraft descended (to about 1,145 ft above ground level), he realised he could not reach LKMT, notified ATC, and searched for an area to land on.

Several factors could have reduced the performance of the aircraft during the glide after engine failure, such as the failure to maintain the recommended glide speed, aircraft configuration and failure to maintain a stable descent. The Flight Manual does not detail the effect of these variables and only an approximate glide rate can be determined from the resulting surveillance records. Under optimum conditions, at a flight speed of 90 kt and with engine damaged, the aircraft could have flown a distance of about 6.4 km, gliding. He could not have reached LKMT during the descent with an inoperative engine. There was no other airport in the vicinity and the only solution to the situation was an emergency landing to terrain. Upon touchdown in the field, the propeller and exhaust hit the ground, and the aircraft rolled over the nose after about 40 m.

The fractographic analysis of the fractured exhaust valve stem confirmed the fatigue nature of the failure. The failure occurred without significant plastic deformation which would indicate large deformation stresses on the part in any mode.

At some point, the piston in cylinder 2 broke and the piston fragments separated from the engine. Several fractures on the underside around the perimeter of the cylinder 1 piston, additional contact marks, and metal fragments in the engine bay indicated that the failure had a progressive effect on the engine failure. Due to the large extent of deformation of the piston halves, it was not possible to describe the damage process and determine that the breakage was due to the stem breakage and separation of the exhaust valve head.

As noted in 1.6.2.3., during the last 50-hour inspection completed on 31 July 2024, with a total flight time of 2,273 hrs 38 min beyond the normal 50-hour inspection, the maintenance organisation also performed a compression check. Because of the lower compression of cylinder 2 (within the required limit, but lower than the other cylinders), they performed an additional inspection of the cylinder and the visible parts of the valves and piston crown with a borescope, and found nothing unusual.

Between the time of the last compression check, including the borescopic inspection, and the accident, the engine was in operation for 20 hrs 20 min. No records were found to indicate that any other maintenance had been performed on the crashed engine.

3 Conclusions

3.1 Findings

- The pilot had a valid qualification for the flight, was medically fit and had experience in flying the Cessna P210N aircraft, registration mark OM-DKA, including international flights.
- On 9 August 2024, it was his first flight after a day of rest.
- The aircraft had a valid airworthiness certificate, and its maintenance was carried out by a maintenance organisation in accordance with an approved maintenance programme.
- During the last 50-hour inspection, a compression check and borescopic inspection of cylinder 2 and the visible parts of the valves and piston crown were performed, which did not reveal any circumstances that would compromise flight safety.
- After the last inspection, the aircraft flew a total of 20 hrs 20 min, during which the pilot did not notice any malfunction.
- The pilot performed a pre-flight inspection.
- The weight of the aircraft was within the prescribed limits in all phases of flight.
- From take-off, the flight was uneventful for about 30 min and all engine mode parameters were normal.
- The engine failure occurred during steady flight at approximately 3,700 ft AMSL when the aircraft was located approximately 14 km from the THR of RWY 04 LKMT.
- After a turn towards LKMT, the aircraft could have flown a distance of about 6.4 km by gliding due to the altitude above the ground (2,300 ft).
- The only solution to the situation was an emergency landing to terrain.
- During the gliding without an operative engine, the pilot did not extend the flaps.
- After the pilot discovered that he would not reach LKMT, he sent a message about his landing to terrain and searched for a suitable area in the direction of flight.
- In view of the observed obstacles in front of the selected area (trees and power line poles), he decided to turn right and landed on the next field.
- The aircraft landed with the landing gear and flaps retracted on a shallow-ploughed field and, after touching down, rolled over the nose to the inverted position after the propeller blade and the end of the left wing half struck the ground about 40 m later.
- The destruction of the aircraft was caused by the aircraft inversion with the right wing half and keel surface striking the ground.

3.2 The cause

The cause of the air accident was engine failure due to fatigue fracture of the exhaust valve stem in cylinder 2 and piston breakage.

A contributing factor was a forced landing to terrain, during which the aircraft was inverted after the propeller and exhaust hit the ground.

4 Safety Recommendations

The AAII does not issue safety recommendations.

5 Appendices

Appendix 1 - Images of the interior of the engine cylinders.

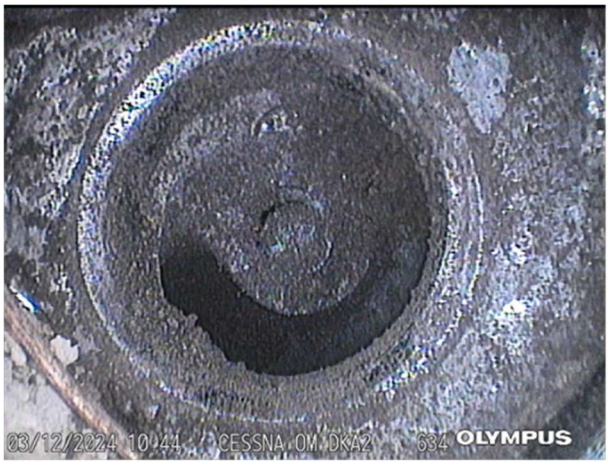
Appendix 1

Images of the interior of the engine cylinders

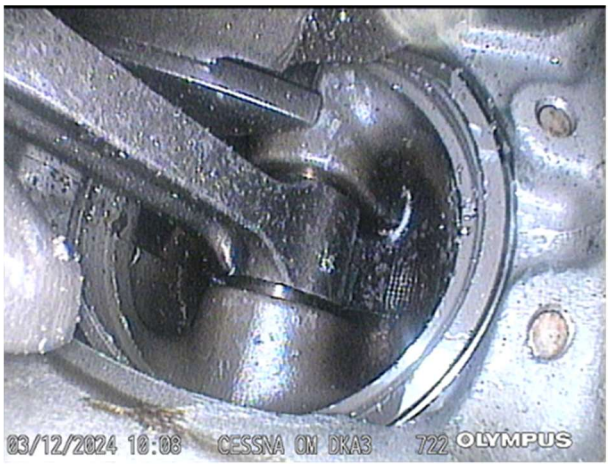
Condition of connecting rod and piston underside in cylinder #1

Detail of condition of connecting rod and fracture on bottom of piston in cylinder #1

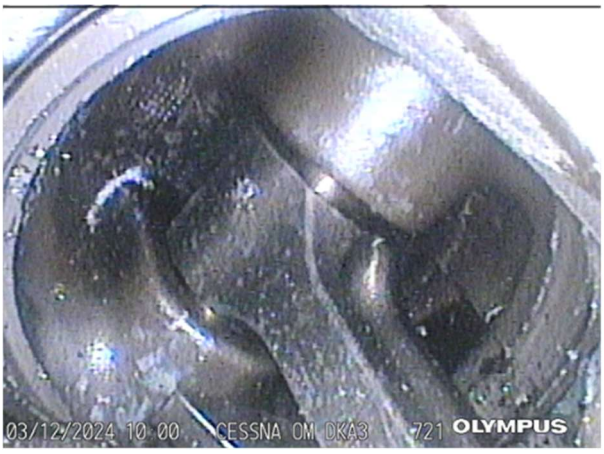
Detailed view of condition of exhaust valve bore in cylinder #2



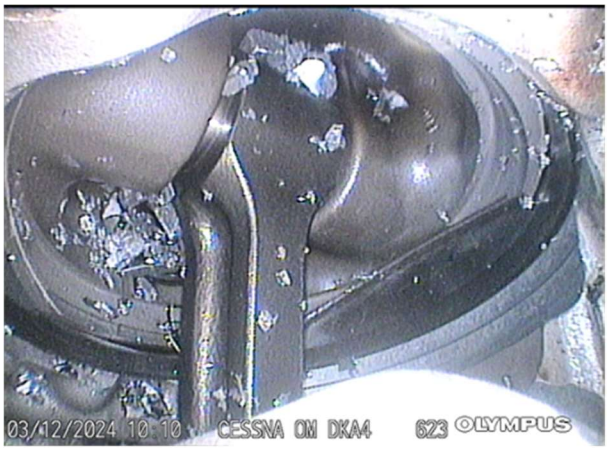
Detailed view of condition of exhaust valve opening in cylinder #2



Detailed view of condition of connecting rod and piston in cylinder #3

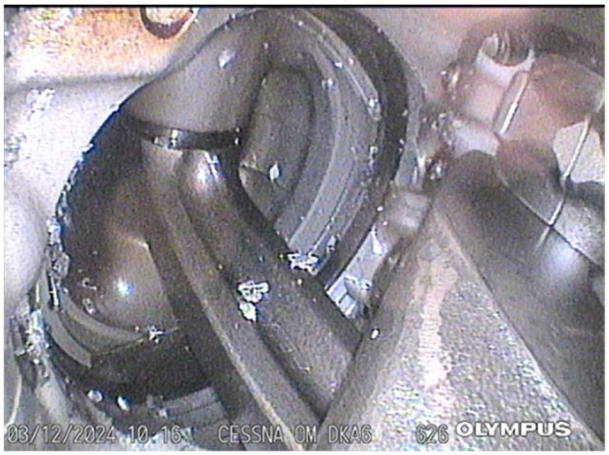


Detailed view of condition of connecting rod and piston at piston pin location in cylinder #3



Detailed view of condition of connecting rod, piston at piston pin location and metal fragments in cylinder #4

View of condition of connecting rod and piston at piston pin location in cylinder #5



View of condition of connecting rod and piston at piston pin location in cylinder #6