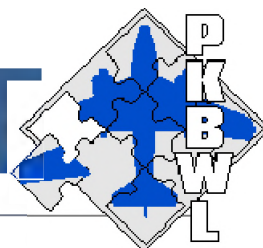


FINAL REPORT



INCIDENT 2021/0289

State Commission on Aircraft Accidents Investigation (PKBWL)

UL. PUŁAWSKA 125, 02-707 WARSZAWA | DUTY PHONE (+48) 500 233 233

FINAL REPORT

INCIDENT

OCCURRENCE NO – 2021/0289

AIRCRAFT – TECNAM P2008-JC, SP-LFD, BOEING 737-800, SP-RKG

DATE AND PLACE OF OCCURRENCE – 14 February 2021, WARSAW
TMA



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 2024

Table of contents

Abbreviations	3
General information	6
Synopsis	7
1. FACTUAL INFORMATION	9
1.1. History of the flight	9
1.2. Injuries to persons	12
1.3. Damage to aircraft	12
1.4. Other damage	12
1.5. Crew data	12
1.6. Aircraft information	13
1.7. Meteorological information	14
1.8. Aids to navigation	15
1.9. Communications	15
1.10. Aerodrome information	15
1.11. Flight recorders	15
1.12. Wreckage and impact information	16
1.13. Medical and pathological information	16
1.14. Fire	16
1.15. Survival aspects	16
1.16. Tests and research	16
1.17. Organizational and management information	16
1.18. Additional information	17
1.19. Useful or effective investigation techniques	17
2. ANALYSIS	18
2.1. Weather conditions on the day of the occurrence	18
2.2. Preparation, supervision and debriefing of the training flight	18
2.3. Performing a training flight in the EPMO aerodrome area	20
2.4. Actions of air traffic control units	21
3. CONCLUSIONS	24
3.1. Findings of the Commission	24
3.2. Cause of the incident	26
4. SAFETY RECOMMENDATIONS	26
5. ATTACHMENTS	26

Abbreviations

Abbreviation	Meaning
ADI	Aerodrome Control Instrument rating
AGL	Above Ground Level
AMSL	Above Mean Sea Level
APP	Approach
ATC	Air Traffic Control, Air Traffic Controller
ATCL	Air Traffic Controller Licence
ATO	Approved Training Organization
ATPL(A)	Airline Transport Pilot Licence (Aeroplane)
BKN	Broken
CAA	Civil Aviation Authority
CAE	Canadian Aviation Electronics
CAE CK	CAE Centre Copenhagen
CPL(A)	Commercial Pilot Licence (Aeroplane)
DME	Distance measuring equipment
DVOR	Doppler VHF Omni-Directional Radio Range
EASA	European Aviation Safety Agency
FAF	Final Approach Fix
FI(A)	Flight Instructor Aeroplane
IAC	Instrument Approach Chart

IMC	Instrument Meteorological Conditions
LFA	Lot Flight Academy
METAR	Meteorological Aerodrome Report
MOL	Coded designator of the airfield EPMO's DVOR/DME
MVA	Minimum Vectoring Altitude
OJT	On-the-Job Training
OJTI	On-the-Job Training Instructor
PANSA	Polish Air Navigation Services Agency
PEGASUS_21	Air traffic management system (Polish Enhanced Generation ATC System for Unified Solutions of 21st Century)
RA	Resolution Advisory
RAD	Aerodrome Radar Control
SATCL	Student Air Traffic Controller Licence
SIA	Safety Investigation Authority
SID	Standard Instrument Departure
TA	Traffic Advisory
TAF	(Terminal) Aerodrome Forecast
TCAS RA	Traffic Alert and Collision Avoidance System Resolution Advisory
TCAS TA	Traffic alert and Collision Avoidance System Traffic Advisory
TMA	Terminal Maneuvering Area
TWR	Aerodrome control tower, aerodrome control or rating endorsement of aerodrome control

ULC	Urząd Lotnictwa Cywilnego – Polish CAA
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Radio Range

General information

Occurrence reference number:	2021/0289			
Type of occurrence:	INCIDENT			
Date of occurrence:	14 February 2021			
Place of occurrence:	WARSAW TMA			
Type and model of aircraft:	1. Airplane, TECNAM P2008-JC 2. Airplane, BOEING 737-800			
Aircraft registration marks:	1. SP-LFD 2. SP-RKG			
Aircraft user/operator:	1. LOT Flight Academy 2. Ryanair Sun			
Aircraft commander:	1. student pilot – without license 2. airline pilot – ATPL(A)			
Number of victims/injuries:	Fatal	Serious	Minor	None
	0	0	0	153
Domestic and international authorities informed about the occurrence:	ULC, EASA, AIB Denmark, TSB Canada			
Investigator-in-Charge:	Grzegorz Pietraszkiewicz			
Investigating Authority:	State Commission on Aircraft Accidents Investigation (PKBWL)			
Accredited Representatives and their advisers:	NOT APPOINTED			
Document containing results:	FINAL REPORT			
Safety recommendations:	NONE			
Addressees of the recommendations:	NOT APPLICABLE			
Date of completion of the investigation:	18 September 2024			

Synopsis

On 14 February 2021, a student-pilot (hereinafter referred to as “student”) was performing a solo VFR training flight from the EPPT aerodrome in a Tecnam P2008-JC airplane, SP-LFD registration marks (hereinafter referred to as “Tecnam”). The exercise involved performing two instrument approaches to EPMO aerodrome, within VMC conditions. After entering the Warsaw TMA, the student performed two non-precision approaches, during which he was radar vectored by EPWA APP ATC. After completing the second approach, the student performed a touch-and-go maneuver and departed to EPPT aerodrome. When issuing the departure instructions, the ATC EPMO TWR trainee (hereinafter referred to as “trainee”) did not give the student the maximum permissible altitude. The Tecnam was followed by a Boeing 737-800 with registration marks SP-RKG (hereinafter referred to as “Boeing”), which departed according to SID LOLSI-2J. Due to the higher speed of Boeing, the distance between the airplanes was decreasing. When climbing, the Tecnam exceeded the altitude of 2,000 ft AMSL and entered the Warsaw TMA without clearance. At that time, the EPWA APP ATC cleared Boeing to fly straight to the SUBIX waypoint. Prior to Boeing right turn, the PEGASUS_21 system generated a warning about dangerous aircraft proximity. At that time, the trainee instructed the student to maintain an altitude of 1,500 ft AMSL or below. After the crews performed the ordered maneuvers, the airplanes began to move away from each other.

The smallest horizontal separation between the airplanes was 1.29 NM when they were in the Warsaw TMA at an altitude of about 2,300 ft AMSL. The required separations (in Class C airspace) were at least 5 NM horizontally and 1000 ft vertically.

The Boeing crew stated that they observed the Tecnam on their TCAS indicator, which disappeared during the climb. The TCAS system did not generate TA or RA messages.

The occurrence was investigated by Grzegorz Pietraszkiewicz, PKBWL Member.

During the investigation, the PKBWL determined the following causes of the incident:

- 1. Probable loss of situational awareness by a student-pilot during approaches to the EPMO aerodrome.**
- 2. OJTI's failure to react to the ATC TWR trainee's error consisting in failure to specify altitude in departure instructions for the Tecnam crew.**

Contributing factors

- 1) Failure to specify altitude in the departure instruction for the Tecnam crew.
- 2) Student's inappropriate allocation of attention during climb after the touch-and-go maneuver.
- 3) Student's solo flight in IMC for which he had not been prepared.
- 4) Performance by the student pilot of the first solo instrument approaches according to VOR with radar vectoring.
- 5) Student's little flying experience.
- 6) Improper assessment of the possible consequences of the ATC TWR trainee's error by the OJTI.

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

1. FACTUAL INFORMATION

1.1. History of the flight

On 14 February 2021, the student performed a solo VFR training flight from the EPPT aerodrome with Tecnam aircraft. The exercise included performing non-precision instrument approaches to the EPMO aerodrome. Field 18 of the filed flight plan included information about 3 planned touch-and-go maneuvers, and the instructor's name was entered as pilot-in-command.

The student flew from the EPNT aerodrome to the Legionowo area, where he made a holding for approach in the Warsaw TMA at about 3000 ft AMSL. Then, EPWA APP ATC vectored the Tecnam landing approach on RWY 26 of EPMO aerodrome according to the VOR MOL¹ indications. After stabilization on the approach path, the student established communication with the EPMO TWR, where the trainee worked under the supervision of the OJT instructor. The trainee cleared the student to execute the touch-and-go and instructed him to climb to 4000 ft AMSL with the RWY heading.

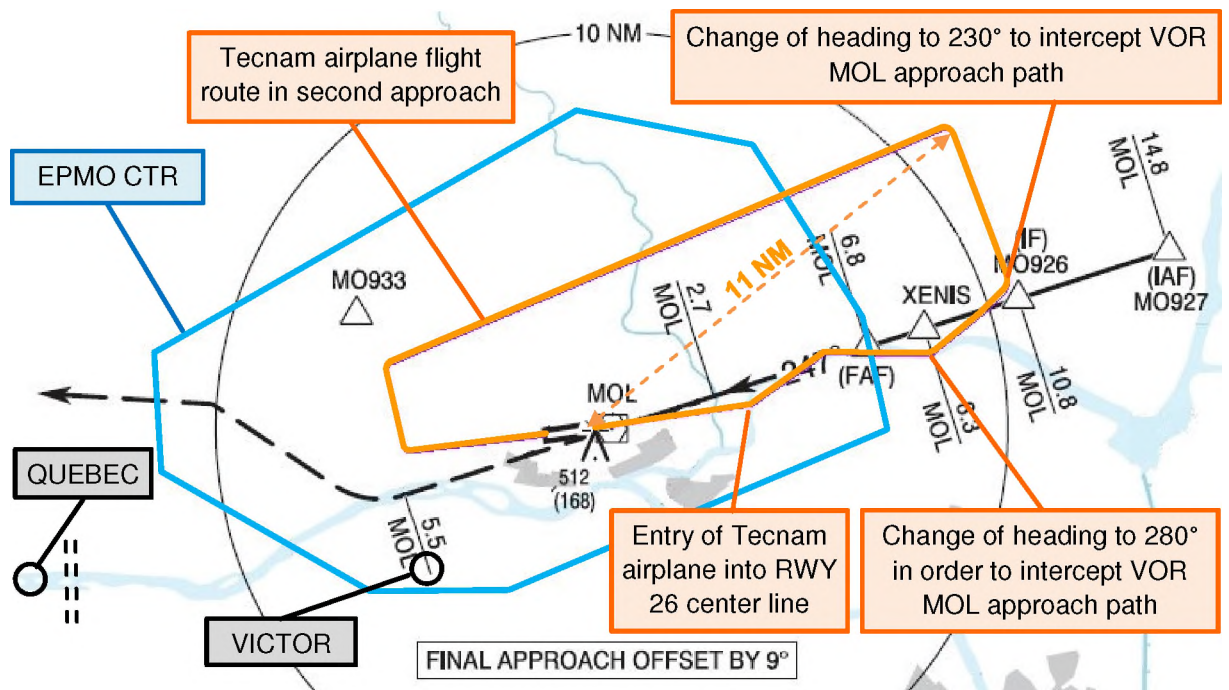


Fig. 1. Sketch of the flight route of SP LFD aircraft during the second landing approach on the EPMO aerodrome [source: PANSa, PKBWL]

After completing a touch-and-go, the student was instructed to establish communications with Warsaw APP when above 1500 ft AMSL. The student established communications with APP ATC and continued the flight with climb to 4000 ft AMSL. When the student was flying with a heading opposite to RWY 26, APP ATC asked him about his intentions. The student replied that he is going to perform a touch-and-go maneuver and then departure to QUEBEC waypoint. APP ATC

¹ DVOR/DME device of EPMO aerodrome.

instructed the student to descend to 3000 ft AMSL. When the Tecnam was at bearing of 51° at a distance of 11 NM from the RWY 26 threshold, APP ATC instructed the student to turn to the heading of 160°. The student was flying with the ordered heading at 2800 ft AMSL instead on of the ordered 3000 ft AMSL.

When the Tecnam was at bearing of 66° at a distance of 11 NM from the RWY 26 threshold, APP ATC instructed the student to make a turn to a heading of 230° for an approach according to VOR to RWY 26 (Figure 2 A). While monitoring the flight of the Tecnam, APP ATC determined that it crossed the approach path and continued the flight with the heading of 230°. When asked by APP ATC, the student replied that he had not intercepted the approach path yet. APP ATC said that according to the radar, the Tecnam was located south of the final approach path and instructed the student to make a turn to a heading of 280° (Figure 2 B), which once again allowed the student to intercept the approach path according to the VOR. At that time, the Tecnam was approximately 8 NM from RWY 26. Approximately 7 NM from RWY 26, the student began a descent. The APP ATC asked the student whether he was stabilized on the approach path. Upon confirmation, the APP ATC instructed the student to establish communication with the EPMO TWR (Figure 2 C).



Fig. 2. Screenshots of PEGASUS_21 system at the APP ATC workplace at the time of:
A - change the heading to 230°,
B - instruction to change heading to 280°,
C - confirmation of stabilisation according to VOR,
[source: PANSAs]

At a distance of 5 NM from RWY 26, the student established communications with the EPMO TWR and received clearance to continue the approach as well as the instruction to report short final. The student made a left turn and, upon reaching RWY 26 centerline, made a right turn and continued the landing approach.

At that time, a Boeing 737-800 was waiting short of RWY 26. The Boeing aircraft was to depart according to SID LOLSI-2J. The student reported distance of 3 NM to RWY 26, as well as his intention to perform a touch-and-go maneuver. The Boeing crew reported readiness for departure but the trainee ordered the crew to wait due to the approaching traffic. The trainee gave the student clearance to perform a touch-and-go maneuver on RWY 26 and ordered departure to QUEBEC waypoint. However, she did not indicate the altitude of departure. The student, when confirming the departure instructions, communicated that he would perform a departure through the VIKTOR and QUEBEC waypoints. The trainee did not react to the student's incorrect acknowledgment of her clearance. At 12:13 hrs, the student executed touch-and-go,

and then the trainee gave the Boeing crew clearance to enter RWY 26 and hold. Then, the trainee instructed the student to perform a departure through the VIKTOR and QUEBEC waypoints, once again without the specification of flight altitude. At 12:14:37 hrs, the trainee instructed the student to leave the RWY centerline. The student acknowledged the instruction. At 12:15:05 hrs, the trainee informed the Boeing crew about traffic (Tecnam was flying southwest at 1500 ft AMSL). At 12:15:22 hrs, the trainee cleared the Boeing crew to take off. The Tecnam was about 0.5 NM southwest of the end of RWY 26. After take-off, the Boeing aircrew established communications with APP ATC. When climbing with the RWY 26 heading, the Boeing approached the preceding Tecnam but their routes diverged. At 12:16:55 hrs, in accordance with the SID LOLSI-2J procedure, at a 1900 ft AMSL on climb, the Boeing crew initiated a left turn. At that time, the Tecnam was at 2000 ft AMSL and entered the Warsaw TMA without establishing communications and without clearance. The angle between the two aircraft routes began to decrease.



Fig. 3. Screenshots of PEGASUS_21 system at the APP ATC workplace during the proximity of Tecnam and Boeing aircraft (aircraft descriptions changed) [source: PANSA]

The APP ATC cleared the Boeing crew to fly direct to the SUBIX waypoint. At the time of giving this clearance, at 12:17:04 hrs, a warning about proximity of the two aircraft appeared on the PEGASUS_21 APP ATC screen.

On the day of the occurrence, the screen of the PEGASUS_21 system at the EPMO TWR, which allows observation of aircraft on the radar situation in the aerodrome area, was not working. The trainee did not observe the proximity, and received information on Tecnam aircraft's entry into Warsaw TMA space from APP EPWA.

At 12:17:10 hrs, the trainee instructed the student to fly at 1500 ft AMSL or below. The trainee acknowledged the instruction and began to descend from 2300 ft AMSL.

At 12:17:21 hrs, the Boeing crew began a right turn to the SUBIX waypoint with continuous climbing.

The execution of the maneuvers caused that both aircraft started moving away from each other. At 12:17:37 hrs, the PEGASUS_21 system terminated indication of the conflict situation. The Tecnam aircraft descended to 1300 ft AMSL and continued the flight to the VIKTOR waypoint, leaving EPMO CTR at 12:20 hrs.

The Boeing crew stated that they observed the Tecnam on their TCAS indicator, which disappeared during the climb. The TCAS system did not generate any TA or RA alerts.

The minimum recorded horizontal distance between the aircraft was 1.29 NM when the aircraft were at an altitude of about 2300 ft AMSL in the Warsaw TMA. Required separations (in Class C airspace) were at least 5 NM horizontally and 1000 ft vertically. The proximity occurred below the designated MVA in Sector 03 of TMA Warsaw, which is 2600 ft AMSL.

1.2. Injuries to persons

None.

1.3. Damage to aircraft

None.

1.4. Other damage

None.

1.5. Crew data

1) Tecnam P2008-JC

a) Flight instructor:

- male, aged 34;
- holder of ATPL(A) with FI(A) rating for CPL(A) training;
- holder of valid medical certificate Class 1;
- total flight time: 2389 FH;
- flight time on the occurrence type: 418 FH;
- instructor flight time: 483 FH.

b) Student-pilot:

- male, aged 26;
- holder of valid medical certificate Class 2;
- total flight time and flight time on the occurrence type: 83:35 FH;
- simulator flight time: 6:30 FH;
- trained in accordance with the integrated program² to the ATPL(A) rating.

² ATP Integrated Training Course – training included in the certificate issued to the ATO CAE CK.

- 2) Boeing B737-800
 - a) Captain:
 - male, aged 38;
 - holder of the ATPL(A);
 - holder of valid medical certificate Class 1;
 - total flight time: 11800 FH;
 - flight time on the occurrence type: 11300 FH.
 - b) First officer:
 - male, aged 35;
 - holder of the ATPL(A);
 - holder of valid medical certificate Class 1;
 - total flight time: 2601 FH;
 - flight time on the occurrence type: 2369 FH.
- 3) EPMO TWR
 - a) OJT instructor:
 - male, aged 42;
 - holder of the ATCL issued first in 2015 with ADI/TWR/RAD ratings for EPMO aerodrome and OJTI;
 - holder of valid medical certificate Class 3.
 - b) ATC trainee:
 - female, aged 28;
 - holder of the SATCL issued in 2016;
 - holder of valid medical certificate Class 3;
 - training on stage 4 (advanced) for ATCL and ADI/TWR ratings for EPMO aerodrome.

1.6. Aircraft information

- 1) The Tecnam P2008-JC is a two-seat single-engine aircraft, equipped with Garmin G3x digital avionics and a ROTAX 912 ULS2 engine. MTOM 630 kg. Cruising speed 99 kt, never-exceed speed 141 kt.



Fig. 3. Tecnam P2008-JC aircraft – demonstration photo [source: Internet, <https://lotflightacademy.pl/flota/>]

- 2) Boeing 737–800 is a twin-engine, narrow-body midrange airliner manufactured by US-based The Boeing Company.



Fig. 4. SP-RKG aircraft in the Ryanair color scheme [source: Internet, <https://www.planespotters.net/photo/1114628/sp-rkg-buzz-boeing-737-8aswl>]

1.7. Meteorological information

TAF issued for EPMO aerodrome at 06:30 hrs (05:30 UTC) on 14 February 2021:

TAF EPMO 140530Z 1406/1506 28012KT 9999 BKN030
PROB40 TEMPO 1409/1421 29015G25KT
BECMG 1422/1501 -SN BKN012
TEMPO 1423/1506 3500 SN BKN006=

In the EPMO aerodrome area, the forecast for the next 24 hours from 07:00 (06:00 UTC) included broken clouds (BKN - 5-7/8) with a cloud ceiling of 3000 ft AGL. Forecast for 10:00-22:00 (09:00 21:00 UTC) included wind gusts of 25 kt with 40% probability. No significant changes in cloud cover or cloud ceiling were forecast during the planned training flight.

METARs from EPMO aerodrome on 14 February 2021 from 11:30 to 12:30 (from 10:30 to 11:30 UTC):

METAR EPMO 141030Z 28015KT 9999 BKN025 M02/M06 Q1033=
METAR EPMO 141100Z 28012KT 9999 BKN025 M02/M05 Q1033=
METAR EPMO 141130Z 27014KT 9999 BKN025 M02/M05 Q1033=

Wind from the direction of 280-270° with a speed of 15-12 kt, was observed on 14 February 2021 during the flight of the Tecnam aircraft in the area of the EPMO aerodrome. Visibility was at least 10 km. General cloud cover - 5-7/8 with a cloud ceiling of 2500 ft AGL. The temperature was -2 °C. The dew point temperature was -6 to -5 °C. QNH pressure: 1033 hPa.

VMC conditions were observed in the EPMO CTR area, which allowed for VFR flights. In the Warsaw TMA, in the vicinity of the EPMO aerodrome, VMC conditions prevailed up to 2500 ft AGL (2844 ft AMSL).

1.8. Aids to navigation

DVOR/DME was installed at EPMO aerodrome.
No comments were made regarding its operability.

1.9. Communications

At the time of the occurrence, the student-pilot of the Tecnam aircraft-maintained radio communication with the EPMO TWR, and the crew of the Boeing maintained radio communication with EPWA APP.

No comments were made regarding the quality of the correspondence.

1.10. Aerodrome information

Warszawa/Modlin Aerodrome (EPMO) is a public aerodrome.



Fig. 5. View of the EPMO aerodrome in August 2020. [source: Google Earth]

Aerodrome coordinates: 52°27'04"N 020°39'07"E.

Aerodrome elevation: 344 ft AMSL.

Aerodrome fire category: CAT 7 ICAO.

RWY: 08/26, 2500x45 m, concrete/asphalt surface.

1.11. Flight recorders

The Tecnam airplane was not equipped with any flight data recorder.

The Boeing airplane was equipped with the following onboard recorders: FDR, CVR, and QAR. Data from the recorders were not used during the investigation of the occurrence.

1.12. Wreckage and impact information

Not applicable.

1.13. Medical and pathological information

None.

1.14. Fire

Fire did not occur.

1.15. Survival aspects

Not applicable.

1.16. Tests and research

The investigation of the occurrence was carried out on the basis of the radar imaging recordings of the PEGASUS_21 system, the recordings of radio correspondence of EPMO TWR and EPWA APP, and the information obtained from the aircraft crews.

1.17. Organizational and management information

1.17.1. Organization training the student pilot

During the preparation of the draft Final Report, the PKBWL received information indicating that:

- a) The organization training the student pilot was ATO CAE CK³, which was certified DK/ATO/005 by the CAA of Denmark.
- b) ATO CAE CK contracted with ATO LFA based in Poland for the course.
- c) ATO LFA conducted the student-pilot training under contract with and under the supervision of ATO CAE CK pursuant to Regulation (EU) No. 290/2012⁴ item "ORA.GEN.205 Commissioned Activities."
- d) The basis of the student-pilot's training at ATO LFA was the training course "Integrated Commercial Pilot Licence with Instrument Rating (Aeroplane)" listed in the annex to certificate DK/ATO/005, approved by the EASA Head FTO of Training Standards.
- e) During student pilot training, the ATO LFA used the "ATP(A) Integrated Course Training Manual LOT OPS, Rev.7.0" approved by the EASA Head FTO of Training Standards on July 1, 2020.

During consultation on the draft Final Report, Canadian Aviation Electronics submitted the concerns outlined in Annex 1.

³ According to the position of the Polish CAA (ULC).

⁴ Regulation (EU) No. 290/2012 of March 30, 2012 amending Regulation (EU) No. 1178/2011 laying down technical requirements and administrative procedures related to civil aviation aircrew in accordance with Regulation (EC) No. 216/2008 of the European Parliament and of the Council.

PKBWL requested ATO CAE CK and ATO LFA to view or provide an excerpt from the agreement between the organizations, which would clearly indicate which organization was responsible for and/or supervised the training of the student pilot.

ATO CAE CK did not respond to an inquiry addressed to it through the Danish SIA.

Polska Akademia Lotnicza sp. z o.o. provided a response indicating that the contract contains information that is a trade secret of ATO LFA as well as of ATO CAE CK.

PKBWL requested the Director of the Aviation Personnel Department of the ULC to appoint a ULC inspector to assist in determining the legal basis for student-pilot training at ATO LFA. The Director did not respond in writing to the request. During the remote conference, PKBWL received information that the training at ATO LFA was conducted under the supervision of the ATO CAE CK, but no document was provided to formulate this position. No assistance was provided to PKBWL.

At the time of the incident, the certificate issued to ATO LFA by the ULC did not include the possibility of integrated training from level “zero” to the ATPL(A) rating.

Therefore, PKBWL could not clearly identify the entity organizing and supervising the training of the student pilot.

1.17.2. Boeing aircraft operator

The Boeing aircraft was performing a scheduled flight as part of the Ryanair Sun airline operations.

1.17.3. Air navigation services provider

Aerodrome control and approach control services for the EPMO aerodrome were provided by the Polish Air Navigation Services Agency.

1.18. Additional information

1.18.1. Consultation on the draft Final Report

On September 14, 2022, the draft Final Report was sent to ATO LFA, Ryanair Sun, ULC, Accident Investigation Board Denmark (ATO CAE Centre Copenhagen), EASA, TSB Canada (Canadian Aviation Electronics - CAE). On September 16, 2022, the draft Final Report was sent to PANSA.

Comments on the draft Final Report were submitted by ATO LFA, CAE and PANSA.

CAE raised the concerns outlined in Appendix 1.

PKBWL took into account the comments of PANSA and partially the comments of ATO LFA and CAE.

1.19. Useful or effective investigation techniques

Standard investigation techniques were applied.

2. ANALYSIS

2.1. Weather conditions on the day of the occurrence

The analysis of METARs from the day of the occurrence (see Section 1.7.) shows that BKN cloud cover (5-7/8) with a cloud ceiling of 2500 ft AGL prevailed in the period of 07:00-13:00 hrs (06:00-12:00 UTC). The elevation of the EPMO aerodrome is 344 ft AMSL, which means that clouds covering more than a half of the sky were observed in the EPMO aerodrome area from an altitude of about 2844 ft AMSL.

The Annex to Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012⁵ specifies the following requirements in the item “SERA.5001 VMC visibility and distance from cloud minima” (Table S5-1):

Altitude band	Airspace class	Flight visibility	Distance from cloud
At and below 900 m (3 000 ft) AMSL, or 300 m (1 000 ft) above terrain, whichever is the higher	C D	5 km	1 500 m horizontally 300 m (1 000 ft) vertically

Accordingly, with the cloud ceiling at an altitude of approximately 2844 ft AMSL, VFR flights in Class C and D controlled airspace in the EPMO aerodrome area was possible up to approximately 1844 ft AMSL.

Weather conditions in the EPMO CTR allowed for the execution of the planned procedural landing approaches in VMC conditions.

2.2. Preparation, supervision and debriefing of the training flight

According to the statement made by ATO LOT Flight Academy, prior to the investigated flight, the student took part in the following exercises related to radio navigation:

- D21 (Basic instrument flying basics);
- F26 (Basic Instrument Flying);
- F40 (Basic instrument flying/navigation with VOR);
- D41 (Basic instrument flying/navigation with VOR);
- F46 (Basic instrument flying/navigation with NDB);
- D47 (Basic instrument flying/navigation with GPS).

The student also performed the P51 (Solo nav) exercise, which included: „*Departure & arrival procedures, ATC liaison, compliance, RT proc*”, and “*Use of navigation aids with stabilized approach concept.*” He got acquainted with the basics of flying and

⁵ Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010.

navigating according to VOR, as well as using the navigation aids in stabilized approach.

Taking the above into consideration, the Commission finds that the student was not prepared for solo flights according to IFR in IMC.

The instructor stated that he supervised the student's preparation to perform the flight. During the preparation, procedures were discussed in detail, as well as scenarios and situations which the student might have faced during the flight. The student was to perform two procedural approaches for landing under VFR.

The instructor approved the flight plan prepared by the student, which incorrectly listed the instructor's name as the aircraft PIC, instead of the student performing a solo flight. The flight plan contained the flight altitude of 2000 ft AMSL, with no changes along the route. The flight plan indicated an intention to make three approaches to landing ending with a go-around.

The weather conditions published in the TAF and METAR messages for EPMO aerodrome allowed the student to perform the planned exercise, but only up to 1844 ft AMSL (see Chapter 2.1.) A proper analysis of weather conditions would have allowed to determine the flight altitude along the route and in the area of EPMO aerodrome so that the aircraft remained in VMC conditions at all times. After preparation for the flight, the student should also know how and under what conditions he could perform the planned landing approaches. The student independently called the EPMO TWR to make flight arrangements. Due to the advanced level of the student's training, the instructor did not supervise that call.

The instructor stated that he supervised the student's flight among others using the www.flightradar24.com website. The imagery shown on this page allows observation of the route and altitude of the flight, but in the event of a need for quick assistance, the instructor did not have the opportunity to do so, as he had no radio communication with the student.

The instructor stated that he supervised the student's flight, among other things, via the website www.FlightRadar24. The imagery provided on that website allows following the route and altitude of the flight, but in the case of a need to provide quick assistance, the instructor did have such option since he did not have radio communication with the student.

Debriefing was conducted after the flight. The student did not inform the instructor about the problems that occurred during the flight, and the instructor did not draw the student's attention to the fundamental errors he had made during the flight.

The analysis of the incident shows that the student performed the flight partially under IMC conditions instead of the entire flight under VMC conditions.

The execution of the flight indicates:

- inadequate analysis of forecast and actual weather conditions along the flight route;
- inadequate preparation of the student to perform the planned exercise.

It should be mentioned that the use of the website in combination with information on atmospheric conditions allowed analysis of the course of the flight and identification of errors made, since knowing the METAR dispatches for EPMO airport, during the discussion of the flight the instructor should note that the student performed part of the flight in the area of this airport at an altitude above 2500 ft AMSL, where IMC conditions occurred.

In that situation, debriefing on the student's solo flight without comments on his performance indicates insufficient supervision of the instructor over the course of the flight.

2.3. Performing a training flight in the EPMO aerodrome area

The student was to perform a solo flight according to VFR, under VMC conditions, and two/three non-precision instrument approaches according to VOR to EPMO aerodrome.

At the time of the flight under the control of EPWA's APP in the PEGASUS_21 system, the Tecnam aircraft was marked as flying under VFR regulations. This means that the student did not report a change in flight rules from VFR to IFR despite performing part of the flight in IMC conditions at an altitude of 4000 ft AMSL. Combined with the performance of part of the flight at an altitude of 2,800 ft AMSL, with a cloud ceiling of about 2,844 ft AMSL, this may indicate the student's strong determination to perform a landing approach, even if it exceeded his skills and the conditions specified in the exercise program.

The student performed an instrument non-precision landing approach with radar vectoring to intercept the path of the VOR/DME system (Figure 1). The purpose of a radar vectoring is to bring an aircraft to a position from which its crew can independently perform a final approach to land according to the VOR system. When executing a vectoring approach, a pilot follows instructions of air traffic control, flying the aircraft according to the on-board instruments.

During the first approach, APP ATC vectored the student's aircraft to a distance of about 8 NM from the touchdown area on RWY 26. The student performed this approach correctly.

During the second approach, APP ATC vectored the student aircraft to a distance of about 10 NM, but the student did not intercept the approach path. When the APP ATC provided a new heading, the interception of the approach path was successful.

While on the approach path, the student reported to the EPMO TWR a distance of 3 NM and received clearance to perform a touch-and-go and was instructed to depart

to the QUEBEC waypoint. EPMO TWR did not provide the flight altitude. The proper response of the student should have been to request the flight altitude, which he had not done.

If the student had assumed that he could climb to the last authorized altitude, i.e., 4000 ft AMSL, he would have to assume to receive instruction to establish communication with EPWA APP, which did not happen. In that situation, the student did not have clearance to climb above 1500 ft AMSL, since above that altitude he was losing separation from Warsaw TMA. The student should have heard the information which the EPMO TWR provided to the Boeing aircrew, namely that the Tecnam aircraft (the student's aircraft) was flying at 1500 ft AMSL. Little flight experience, improper monitoring of radio communication, as well as the execution of approaches with radar vectoring may have disturbed the student's situational awareness at the time of departure, who did not know that he had flown into Warsaw TMA.

At the time of the proximity with the Boeing, the student remained in communication with the EPMO TWR while performing flight without clearance in the Warsaw TMA. He did not notice the air proximity and did not receive information about it from the EPMO TWR.

2.4. Actions of air traffic control units

2.4.1. Actions of EPMO TWR

At the time of the occurrence, a trainee controller was working at the EPMO TWR ATC workplace under the supervision of an OJTI. The trainee was in the advanced (fourth stage) of training, which should demonstrate whether she can work independently even in high density and complex traffic. At that stage of training, the trainee is given a relatively high level of freedom and is allowed to make errors, to see if he/she is able to correct them on his/her own.

During the second instrument approach to RWY 26, the student reported a position of 3 NM from RWY 26, an intention to perform a touch-and-go and a departure to the QUEBEC waypoint. The trainee gave clearance to perform the operations, however, she did not specify the flight altitude in the departure instructions. According to the statement of the OJTI, he noticed the trainee's error regarding the lack of altitude specification. The student, reading back the departure instructions, communicated that he would perform the departure through VIKTOR and QUEBEC waypoints.

The trainee did not correct the student's incorrect readback of the departure instructions. When the Tecnam passed the threshold of RWY 26, the trainee instructed the Boeing flight crew to enter RWY 26 and hold. Following that, at 12:14:08 hrs, the trainee instructed the student to depart via the VIKTOR and QUEBEC waypoints and once again did not specify the flight altitude. The OJTI did not correct those errors.

At 12:14:38 hrs, the trainee instructed the student to leave the centerline of the runway to allow the Boeing aircraft to take off. Flying to the VIKTOR point, the Tecnam airplane was moving away from the runway centerline with an angle of about 30°. The proper action of the EPMO TWR would have been to stop the Tecnam aircraft's climb at an altitude of 1,500 ft AMSL, which would have protected it from approaching the Boeing aircraft. At 12:15:05 hrs, the trainee informed the Boeing airplane crew that the Tecnam airplane was making a southwesterly flight at 1500 ft AMSL in departure. This indicates the apprentice's belief that she had previously given the Tecnam aircraft's altitude information to the apprentice. At 12:15:22 hrs, the trainee gave permission for the Boeing plane to take off.

The Tecnam was climbing and was at an altitude of 1100 ft AMSL about 0.5 NM southwest of the end of RWY 26 at that time. After take-off, the Boeing crew established communications with APP ATC. During the subsequent course of the occurrence, the crews of both aircraft remained in communication with two different air traffic units on different radio frequencies.

On the day of the occurrence, the radar screen at EPMO TWR was not operating, which would have allowed to observe Tecnam above 300 ft AGL and Boeing above 500 ft AGL. In the absence of the above radar imaging, the requirements for OJTI supervision of the trainee's performance became more demanding.

EPWA APP informed EPMO TWR of the Tecnam entry into the Warsaw TMA and the proximity of the aircraft. After receiving that information at 12:17:10 hrs, the trainee instructed the student to maintain the altitude of 1500 ft AMSL or below. The student ceased climbing at the altitude of 2300 ft AMSL and began a descent, and at the altitude of 1300 ft AMSL proceeded to level flight. At 12:20 hrs, the Tecnam left the EPMO CTR.

At the time of the occurrence, the trainee was not fully aware of the location of the Tecnam and did not use the correspondence for emergency situations. She also failed to inform the student about the proximity to another aircraft.

The OJTI was supposed to be a safeguard against the negative consequences of errors made by the trainee. By waiting too long for the trainee correction of her error, the OJTI failed to predict the development of the situation and failed to perform the safety task entrusted to him.

2.4.2. Actions of Warsaw APP

The student made the first landing approach without any problems. After making the first touch-and-go maneuver, while climbing to 4000 ft AMSL⁶, he re-established

⁶ The pilot was instructed to climb to 4000 ft and he followed that instruction. However, he should report to the APP that he cannot perform the flight in IMC. Then, the ATC would be responsible for solving the problem.

communications with EPWA APP ATC. The APP ATC vectored the Tecnam to reach the approach path according to the IAC VOR RWY 26 at a distance of 10 NM from the touchdown area on RWY 26. When Tecnam missed the approach path with a heading of 230°, APP ATC asked the student whether he had intercepted the path. After a negative answer, the APP ATC passed to the student a new heading to intercept the approach path from the other side. In the FAF area, the APP ATC once again asked the student about stabilization on the approach path and after receiving confirmation, instructed him to establish communications with EPMO TWR.

EPMO TWR did not later coordinate the departure the Tecnam with EPWA APP, which for EPWA APP ATC meant that the Tecnam would make further flight out of the Warsaw TMA.

When Boeing crew took off, but prior to the establishment of communications with APP ATC, the ATC made the decision to change its departure route to a straight flight to the SUBIX waypoint. While making this change, APP ATC also moved the Tecnam label, which presented an altitude of 1800 ft AMSL. APP ATC did not notice that fact and paid attention to another of the five aircraft for which he provided radar approach control service.

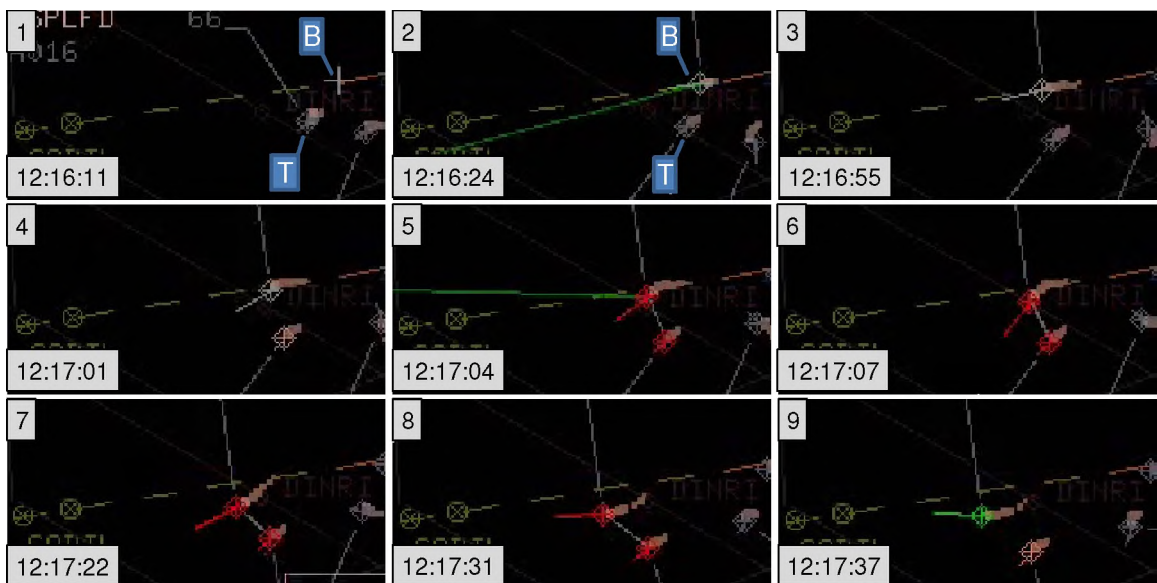


Fig. 6. Course of aircraft proximity, T - Tecnam, B - Boeing [source: PANSA, PKBWL]

At 12:16:54 hrs, the Boeing aircrew established communications with APP ATC. At that time, the Tecnam was on a climb at an altitude of 2,000 ft AMSL and was entering Warsaw TMA without clearance. When APP ATC finished communicating the updated clearance to the Boeing aircrew, they were already executing a left turn in accordance with SID LOLSI-2J. At 12:17:04 hrs, a warning about the dangerous proximity of the two aircraft appeared on the screen. When the Boeing made a right turn and the Tecnam began its descent, the conflict situation ended. The APP ATC did not inform the Boeing crew about the proximity.

The smallest recorded horizontal distance between the involved aircraft was 1.29 NM, when the aircraft were at an altitude of about 2,300 ft AMSL in Warsaw TMA, in Class C airspace. The required separations in this airspace were at least: 5 NM horizontally, 1000 ft vertically. A warning of a possible dangerous proximity was displayed by the PEGASUS_21 system for 33 s.

The proximity of the aircraft occurred above 2000 ft AMSL, which is the limiting altitude between the EPMO CTR and the Warsaw TMA. At the same time, both aircraft were below the MVA, which was 2600 ft AMSL. Radar air traffic control service could have been provided at and above this altitude.

3. CONCLUSIONS

3.1. Findings of the Commission

3.1.1. Training organization of the student-pilot

- a) Due to the lack of cooperation between ATO LFA, CAE CK and ULC, the Commission did not determine the organization training and supervising the training of the student pilot.
- b) The basis of the student pilot's training in the ATO LFA was a program approved by the EASA Head FTO of Training Standards.

3.1.2. Aviation personnel

- a) The instructor pilot had a valid license and a medical certificate.
- b) The student pilot had a valid medical certificate.
- c) The crew of the Boeing aircraft had valid licenses and medical certificates.
- d) The OJTI had a valid license and a medical certificate.
- e) The ATC TWR trainee held a SATCL and a valid medical certificate.

3.1.3. Weather conditions

- a) In the area of EPMO aerodrome there was BKN cloud cover with a cloud ceiling of 2500 ft AGL, which allowed VFR flight up to an altitude of about 1844 ft AMSL.
- b) Forecast and actual atmospheric conditions in the area of EPMO aerodrome did not allow to perform planned instrument approaches in flight according to VFR in VMC conditions.

3.1.4. Flight operations

- a) The student pilot made two instrument non-precision landing approaches with radar vectoring.
- b) During the second landing approach, the student pilot performed a part of the flight in IMC conditions, for which he has not been trained.
- c) Neither the student nor the OJTI responded to the lack of altitude specification in the departure instructions.

- d) While reading back the departure instructions, the student pilot added the VIKTOR waypoint, which was not mentioned in the instructions.
- e) On departure, the Tecnam entered the Warsaw TMA without clearance or establishing communications.
- f) Improper monitoring of the radio frequency of the EPMO TWR and the execution of radar vectoring approaches, with a little aviation experience, may have had negatively influenced the student pilot's situational awareness during departure from the EPMO aerodrome.
- g) The smallest recorded horizontal distance between aircraft was 1.29 NM, at an altitude of about 2300 ft AMSL with required separations of at least: 5 NM horizontally and 1000 ft vertically.

3.1.5. Preparing and debriefing on the student-pilot's flight

- a) The student pilot was theoretically and practically prepared to perform the planned non-precision instrument approaches according to VOR indications.
- b) The student was not prepared for a solo flight in IMC but he performed part of the flight under these conditions.
- c) The student pilot agreed the flight details with the EPMO TWR without the instructor's supervision.
- d) The use of the website, combined with information on weather conditions, allowed to analyze the flight course and identify anomalies.
- e) When discussing the flight, the instructor did not provide comments on the fundamental errors of the student.

3.1.6. Providing aerodrome and approach control services

- a) The TWR ATC trainee provided aerodrome control service under the supervision of the OJTI.
- b) The trainee TWR ATC was at an advanced stage of the operational training.
- c) During the second landing approach of the Tecnam, the trainee TWR ATC provided the student pilot with departure information without altitude specification.
- d) The trainee TWR ATC did not respond to the student pilot's incorrect readback of the departure instructions.
- e) The OJT instructor waited for the trainee correction of her errors, which was in line with the objectives of the stage of her training, but incorrectly predicted the course of the occurrence.
- f) Lack of radar imaging of the aerodrome area in the EPMO TWR made it difficult to follow air traffic.
- g) At the time of the occurrence, EPWA APP ATC was providing radar air traffic control service to five aircraft.
- h) The entry of the Tecnam into the Warsaw TMA was presented on the screen of the PEGASUS_21 system at the EPWA APP ATC workplace.

- i) The air proximity between Boeing and Tecnam aircraft occurred in the Warsaw TMA below the MVA altitude.
- j) When the Boeing reached the MVA altitude, the aircraft routes diverged, which ensured termination of the conflict situation and did not require any action from the APP ATC.

3.2. Cause of the incident

1. Probable loss of situational awareness by a student-pilot during landing approaches to the EPMO aerodrome.
2. OJTI's failure to react to the ATC TWR trainee's error consisting in failure to specify altitude in departure instructions for the Tecnam crew.

Contributing factors

- 1) Failure to specify altitude in the departure instruction for the Tecnam crew.
- 2) Student's inappropriate allocation of attention during climb after the touch-and-go maneuver.
- 3) Student's solo flight in IMC for which he had not been prepared.
- 4) Performance by the student pilot of the first solo instrument approaches according to VOR with radar vectoring.
- 5) Student's little flying experience.
- 6) Improper assessment of the possible consequences of the ATC TWR trainee's error by the OJTI.

4. SAFETY RECOMMENDATIONS

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

5. ATTACHMENTS

Appendix 1 - Canadian Aviation Electronics Statement.

THE END

Investigator-in-Charge

.....
(signature on the Polish original)

CAE Response to State Commission on Aircraft Accidents Investigation (PKBWL) Draft Final Report of INCIDENT 2021/0289

After reviewing the State Commission on Aircraft Accidents Investigation (PKBWL) Draft Final Report of INCIDENT 2021/0289 CAE have identified a few incorrect facts and conclusions that must be corrected.

The training flight in question was not conducted under the approval of the CAE DK/ATO/005 Approved Training Organisation in Europe, but under the approval of a contracted entity in Poland, LOT Flight Academy, which is also confirmed by Captain ... Head of Training at ATO LOT Flight Academy, please see letter enclosed.¹

As such, the event falls under ATO LOT Flight Academy's approval, safety program and oversight.

This makes the following bold underlined parts of the report incorrect:

1.17. Organizational and management information

The organization providing training for the SP-LFD airplane student was **ATO CAE Centre Copenhagen, holder of the DK/ATO/005 certificate issued by the Danish Civil Aviation and Railway Authority**. The training of the student pilot was based on the "Integrated Commercial Pilot Licence with Instrument Rating (Aeroplane)" training course listed in the Appendix to the certificate. On the basis of the Regulation (EU) No. 290/20124, section „ORA.GEN.205 Contracted activities”, CAE Centre Copenhagen signed a contract with ATO LOT Flight Academy, based in Poland, to provide the course. During the training of the student-pilot, ATO LOT Flight Academy used „ATP(A) Integrated Course Training Manual LOT OPS, Rev.7.0” approved by EASA FTO Head of Training Standards on 01 July 2020. **ATO CAE Centre Copenhagen was the authority supervising the training of the student-pilot provided by ATO LFA**

3. CONCLUSIONS 3.1. Findings of the Commission

3.1.1. Training organization of the student-pilot

- a) The ATO providing training for the student pilot was **CAE Centre Copenhagen, which held an ATO certificate issued by the Danish Aviation Authority**.
- b) ATO LOT Flight Academy conducted the student training under an agreement with **and under the supervision of CAE Centre Copenhagen**.
- c) The basis of the student pilot's training in the ATO LFA was a program approved by the EASA Head FTO of Training Standards.

CAE is looking forward to the final corrected Report of INCIDENT 2021/0289

In good cooperation

Signature

CAE Head of Training

¹ Not attached to the mail – PKBWL's annotation.