

FINAL REPORT



ACCIDENT 2021/3056

State Commission on Aircraft Accidents Investigation (PKBWL)

UL. CHAŁUBIŃSKIEGO 4/6, 00-928 WARSZAWA | DUTY PHONE (+48) 500 233 233

FINAL REPORT

ACCIDENT

OCCURRENCE NO – 2021/3056

AIRCRAFT – Airplane, Diamond DA 42, SP-TRL

DATE AND PLACE OF OCCURENCE – 19 August 2021, EPMO



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 2022

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Abbreviations

ATPL(A)	Airline transport pilot license (airplanes)
EASA	European Union Aviation Safety Agency
EPBC	Warszawa-Babice aerodrome
EPMO	Warszawa-Modlin aerodrome
FI(A)	Flight instructor rating (airplanes)
IR(A)	Instrument rating (airplanes)
METAR	Format for reporting weather information
RWY	Runway
SEP(L)	Single-engine piston, land (airplanes)
TR	Type rating
Night VFR	Visual Flight Rules rating for night flights

General Information

Occurrence reference number:	2021/3056			
Type of occurrence:	ACCIDENT			
Date of occurrence:	19 August 2021			
Place of occurrence:	EPMO			
Type and model of aircraft:	Airplane, Diamond DA 42			
Aircraft registration marks:	SP-TRL			
Aircraft user/operator:	Goldwings Flight Academy			
Aircraft Commander:	ATPL(A)			
Number of victims/injuries:	Fatal	Serious	Minor	None
	-	-	-	2
Domestic and international authorities informed about the occurrence:	ULC, EASA, SIA Austria			
Investigator-in-charge:	Krzysztof Miłkowski			
Investigating authority:	State Commission of 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:	29.09.2022			

Synopsis

On 19 August 2021, at 14:22 hrs UTC, the DA 42 airplane crew consisting of the instructor-pilot and student-pilot took off in order to perform training flights as part of MEP(L) training on the route from EPBC to EPMO. The training flights were performed according to the training program approved by the Polish Civil Aviation Authority. As part of the exercise, 9 take-offs and landings were performed uneventfully. After the 9th landing, the crew stopped the plane on the runway and, after a short break, made another take-off. During the climb, at an altitude of approximately 500 ft, the instructor-pilot reduced the power of both engines to idle, simulating a powerplant failure. In order to maintain the airspeed, the crew started descending with the intention of straight-in landing. The descent was performed with a significant nose down pitch, which caused the touchdown at high speed. The airplane was substantially damaged.

The investigation was conducted by:

Krzysztof Miłkowski Investigator-in-charge (PKBWL).

Cause of the occurrence:

- 1) Both engines failure simulated just after take-off in the climb phase, which was inconsistent with the Exercise No 6 of the training program.**
- 2) Insufficient flight altitude during initiation of the powerplant failure simulation during climb phase.**

Contributing factors:

Incorrect estimation of the flight altitude prior to the powerplant failure simulation during climb phase.

PKBWL has not proposed safety recommendations after the investigation.

1. FACTUAL INFORMATION

1.1. History of the flight

On 19 August 2021 at 10:38 hrs UTC a flight plan was filed for the VFR flight with the SP-TRL plane on the route: EPBC DCT EPBCL DCT EPMOY DCT MOL STAY1 / 0200 MOL DCT EPMOY DCT EPBCL DCT EPBC . The plan covered 2h training flights at EPMO. The departure from the EPBC was scheduled for 14:00 hrs UTC but actually took place at 14:22 hrs UTC. After the flight along the EPBCL-MOL route, at 15:05 hrs UTC, the airplane landed at EPMO and took-off again in order to carry out exercise No6 – powerplant failure simulation during aerodrome circuit flights.

As part of the exercise, 9 take-offs and landings were performed uneventfully. After completing the 9th flight, the crew stopped the plane on the runway and, after a short break, took-off again. During the climb, at an altitude of approximately 500 ft¹, the pilot-instructor reduced the power of both engines to idle, simulating the powerplant failure. In order to maintain the airspeed, the flight crew started descending with the intention of straight-in landing². The descent was performed with a significant nose down pitch, which caused the plane touchdown with high speed at around 16:05 hrs UTC. As a result the three-wheel landing gear and both three-blade propellers were destroyed and the fuselage was substantially damaged.



Fig.1. SP-TRL airplane at EMPO after hard landing on RWY26 [source: PKBWL]³

¹ According to the instructor-pilot statement.

² According to the student-pilot statement.

³ Unless otherwise indicated the source is PKBWL.

1.2. Injuries to persons

Injuries	Crew	Passangers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	2	-	-	2

1.3. Damage to aircraft

The plane was substantially damaged. The landing gear of the aircraft was damaged, the main landing gear struts were broken and the wheels detached from their construction. The nose landing gear strut and its wheel were pressed into the nose landing gear well.



Fig.2. SP-TRL airplane at EPPO after the accident



Fig.3. Nose landing gear damaged

As a result of the destruction of the main landing gear, the plane rested on the lower part of the fuselage, which caused the rotating blades to collide with the runway surface. Their wooden structure was destroyed. The lower part of the fuselage was also damaged.



Fig. 4 and 5. SP-TRL aircraft with destroyed propellers blades of both engines.

The wings did not detach from the fuselage, but were slightly damaged in many places. Cracks and delamination of the wings structures occurred especially at their roots.



Fig.6. Damaged airframe in the wing connection area.

In the empennage area the horizontal stabilizer leading edge was damaged.



Fig.7. Damaged empennage

Numerous parts (sleeves, bolts, covering elements), mainly from the damaged nose landing gear and damaged fuselage and wing structures, were found scattered near the wreckage.

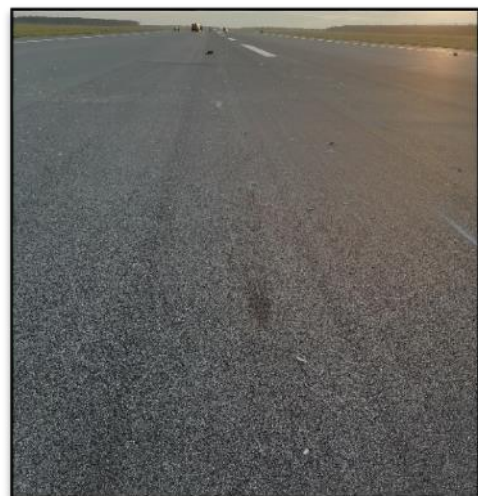


Fig.8 and 9. SP-TRL airplane framgents/elements on the runway

1.4. Other damage

None.

1.5. Personnel information (crew data)

1.5.1. Instructor-pilot

Male, aged 30, ATPL(A) issued on 11.04.2017 with ratings:

- SEP(L) valid until 30.09.2023;

- IR(A) valid until 31.07.2022;
- MEP(L) valid until 31.07.2022;
- TR DHC8/IR valid until 31.03.2022;
- FI(A) valid until 31.10.2023.

Class 1 aero-medical certificate valid until 09.03.2022.

Total Flight time: 4129 FH, including:

- MEP(L) – 231 FH;
- DA 42 – 181 FH;
- FI(A) – 828 FH;

- over the last 90 days:

- FI(A) – 133 h 53 min;
- DA 42 – 83 h 02 min,

- over the last 30 days:

- FI(A) – 59 h 04 min;
- DA 42 – 17 h 27 min,

- over the last 7 days:

- FI(A) - 23 h 29 min;
- DA 42 - 10 h 53 min.

Over the last 48 h prior to the accident the instructor-pilot:

- flew:

- on 17.08.2021 from 14:00 to 14:50 hrs UTC - 1 flight,
- on 18.08.2021 from 10:50 to 18:18 hrs UTC - 3 flights,
- on 19.08.2021 from 07:04 to 16:05 hrs UTC - 11 training flights,

- had breaks:

- on 17/18.08.2021 – 20 h,
- on 18/19.08.2021 – 11 h 46 min

1.5.2. Student-pilot

Male, aged 40, PPL(A) issued on 4.01.2021 with ratings:

- SEP(L) valid until 30.09.2022;
- Night VFR .

Class 1 aero-medical certificate valid until 09.03.2022.

1.6. Aircraft information

DA 42 aircraft, SP-TRL registration marks, was not included in the operator fleet list⁴.

⁴ Maintenance Manual Part B point 1.0.

The Diamond DA 42 is a four-seat, twin-engine, low wing structure with a T-shaped tail. The aircraft is designed mainly for tourism and training purposes. The structure of the Diamond DA 42 airframe is made of composite materials with a wide range of carbon fiber reinforced polymers. This design provides aircraft with an appropriate level of passive safety, in line with the established regulations of the European Aviation Safety Agency (EASA) PART 21, as well as relatively efficient aerodynamics and essentially unlimited airframe life. The cabin accommodates four people in a configuration of two seats in two rows. All persons are seated in individual seats equipped with three-point seat belts. The plane can be controlled from both front seats. A luggage compartment located behind the rear seats is also accessible through the outer door. There are also luggage compartments in the nose of the fuselage. The plane is equipped with a retractable, tricycle landing gear with a nose wheel. Avionics is the Garmin G1000 glass cockpit. There are two large liquid crystal displays on the front dashboard. They display various information about the aircraft as well as navigation data and flight information. Both screens can display identical basic information or be configured for flight data on the left monitor and navigation on the right. The screen can display a "moving map" which makes navigation very easy. The DA 42 plane is also equipped with the sophisticated GFC 700 three-axis autopilot built by Garmin and the GWX 70 weather radar and TAWS anti-collision system.

The DA 42 warns of a stall about of 5-7 kt above before the stall speed and pitches its nose by 5-10 degrees. Its endurance with a standard fuel quantity is up to 13 hours.

The DA 42 can climb 700 ft/min and take-off with one engine operative. The DA 42 is equipped with an anti-icing system and can fly in all weather conditions.

Model DA 42	Twin-Star ⁵
Manufacturer	Diamond Aircraft Industry - Austria
Registration marks	SP-TRL
Serial number	42.201
Date of manufacturing	2006
Aircraft Category	Small aircraft with a MTWO below 3175 kg
Engines	Technify Motors GmbH TAE 125-02-99
Propellers	MT-Propeller MTV-6-A-C-F/CF187-129
Registration certificate issue date	19.07.2019
Airworthiness certificate issue date:	02.09.2008
Maintenance certificate validity date:	18.11.2021
Airworthiness review certificate validity date:	30.06.2022
Total flight time:	2649:54

⁵ Sales designation name.

1.7. Meteorological information

On 9 August 2021, the sunrise was at 03:25 and the sunset at 17:54 hrs UTC. The accident occurred during daytime at 16:05 hrs UTC. The weather conditions for EPMO specified in the METAR at the time of the accident, were as follows:

EPMO191530Z 24011KT 9999 FEW046 21/12 Q1012=

EPMO191600Z 22008KT 190V250 9999 SCT046 21/11 Q1012=

At 15:30 hrs UTC - wind direction was 240° of 11 kt speed, the visibility over 10 km, the cloud cover 1-2/8 with a base of 4600 ft, ambient temperature was 21°C and dew point was 12°C, the atmospheric pressure was 1011 hPa.

At 16:00 hrs UTC - wind direction was 220° of 8 kt speed was recorded and a variable wind blew from 190° - 250°, overall visibility was above 10 km, the sky was 3-4/8 overcast at a base of 4600 ft, the ambient temperature was 21°C and dew point was 12°C, the atmospheric pressure was 1012 hPa.

The weather conditions that prevailed after 16:00 hrs UTC at EPMO did not affect the flight safety except the setting sun which could deteriorate the vision of the crew landing on the RWY26.

1.8. Aids to navigation

Not applicable.

1.9. Communications

The plane was equipped with standard radio navigation equipment. During the flight, the pilots maintained communication with EPMO Tower.

1.10. Aerodrome information

EPMO, Warszawa-Modlin

Status – Controlled Aerodrome

Coordinates – N52°27'04.4" E20°39'06.8"

Radio – EPMO-Tower 123.925,

EPMO-Information 120.325

Elevation – 341 ft

RWY – 081/261 (08/26), 2500x45 m concrete, N52°27'04.4" E20°39'06.8"

1.11. Flight recorders

The airplane was not equipped with flight recorders.

1.12. Wreckage and impact information

On 19 August 2021, during the accident site inspection, PKBWL found that after the collision with the runway surface, the plane moved to a distance of 268 meters from the touchdown place. The damaged parts of airframe, engine and landing gear were scattered along the length of 336 meters. The plane touched down in the middle of the RWY 26 along its centre line and came to rest with a deviation of about 45° from the runway centre line towards the airport terminal (Fig. 10).



Fig. 10 Accident airplane after it came to rest and was left by the crew [source: PKBWL]

The landing gear, propeller blades and the left engine were destroyed during aircraft movement on the RWY 26 surface.

1.13. Medical and pathological information

No evidence of physiological factors affecting the crew and having an impact on occurrence course was found. The crew did not suffer any injuries and left the aircraft unaided.

1.14. Fire

No traces of fire occurring after collision with the runway were found.

1.15. Survival aspects

The instructor-pilot and the student-pilot had their seat belts correctly fastened, which protected them against injuries.

1.16. Tests and research

During the investigation, the technical documentation of SP-TRL was secured, the records from the aerodrome CCTV cameras were secured, the crew and accident witnesses statements were collected. Photographic documentation of the plane and the occurrence site were made and the meteorological conditions were analysed.

1.17. Organizational and management information

The aviation training organization had the required /certificate. The training was based on the program approved by the Polish Civil Aviation Authority.

1.18. Additional information

On 18 August 2021, i.e. on the day preceding the accident, the pilot-instructor performed flights for an air carrier, which ended at 18:18 hrs UTC. On 19 August 2021, i.e. on the day of the accident, the pilot-instructor started his flight duty at 06:00 hrs UTC, which resulted in his rest period shortened to 11 hours 42 minutes instead of the required 12 hours.

1.19. Useful or effective investigation techniques

Standard investigation techniques were applied.

2. ANALYSIS

On 18 August 2021, i.e. on the day preceding the accident, the pilot-instructor performed flights for an air carrier, which ended at 18:18 hrs UTC. On 19 August 2021, i.e. on the day of the accident, the pilot-instructor started his flight duty at 06:00 hrs UTC, which resulted in his rest period shortened to 11 hours 42 minutes instead of the required 12 hours.

The aviation training schedule was based on the 3-hour slots divided into three elements as follow:

- 60 min pre-flight briefing,
- 90 min flight time,
- 30 min debriefing (see extract from Operations Manual below).

ATO - Aviation ATSM	Operations Manual (OM)		Part A
<i>Slot</i>			
<i>Briefing</i>	<i>Flight Time</i>	<i>De-briefing</i>	
<i>60 minutes</i>	<i>90 minutes²</i>	<i>30 minutes</i>	
<i>Ad.¹ The flight time may be extended / shortened depending on the current needs of the exercise being carried out.</i>		<i>Ad.¹ Czas lotu może zostać wydłużony / skrócony w zależności od aktualnych potrzeb realizowanego ćwiczenia</i>	

Fig. 11 Extract from Operations Manual, Part A No. 14.3.

On 19 August 2021, the instructor-pilot had a scheduled flight duty time of 11 hours, divided into 3 slots as follow:

- first - between 06:00 and 09:00,
- second - between 09:00 and 12:00,
- third - between 12:00 and 17:00.

Based on the Operations Manual of the aviation training organisation and the personal flight log of the instructor pilot, it was established that the first series of flights was performed between 06:00 and 09:33:

- briefing between 06:00 and 07:04,
- take-off and landing between 07:04 and 09:03,
- debriefing between 09:03 and 09:33.

The second series of flights was carried out between 09:41 and 13:45:

- briefing between 09:33 and 09:41,
- take-off and landing between 09:41 and 13:45,
- debriefing between 13:45 and 14:15.

The third series of flights started at 14:22 and was interrupted by the accident at 16:05:

- briefing between 14:15 and 14:22,
- take-off at 14:22,
- accident at 16:05.

Only 30 minutes of flight remained to complete the third series of flights – according to the objectives of exercise no 6.

The total flight time of the pilot-instructor in the first and the second slot was 6 hours and 3 minutes.

The flights in the framework of the third slot started at 14:22 and consisted of two flights:

- the first flight was performed between 14:22 and 15:05 hrs as enroute flight EPBC-EPMO and was described in the personal flight log as a *custom lesson*;
- the second flight commenced at 15:05 hrs and was interrupted by the accident at 16:05 hrs – it was described in the instructor's personal flight log as *Exercise 6, Simulating emergencies in aerodrome traffic circuit flights, exercise time 1 hour and 40 minutes*. During the second flight, until the accident occurred, the instructor flew 1 hour and 43 minutes, which means that the total flight time on that day, until the accident was 7 hours and 46 minutes. There were 40 minutes of flight time left to complete Exercise no 6, which means, that the instructor's total planned flight time was 8 hours and 26 minutes.

At 15:05 the instructor began circuit flights according to exercise no 6 to teach the student how to handle engine failure.

The general principles of exercise no 6 of the MEP(L) training program included elements of simulated engine failure in a circuit flight at an altitude of 700-1200 ft (200-300 m) AGL and the implementation of at least one rejected take-off procedure during take-off run by simulating the failure of one engine at a speed less than 50% of V_{mc} . The approximate time of one flight and the number of flights were not defined, but the time of flight with thrust asymmetry was defined as 1 hour 30 minutes.

Place	Altitude	Number of flights	Approximate flight time	Flight time with thrust asymmetry in the exercise
Circuit	200-350 m AGL 700-1200 ft	n	n	01:30

n – result values

Exercise may be carried out in parallel with Exercise 7 after 50% of the flight time has been completed.

Note: in all flights of this exercise, engine failures are simulated by an instructor via closing the throttle of one of the engines or applying the “Zero Thrust Setting” procedure. Prior to simulation initiation the instructor evaluates whether:

- air traffic situation;
- flight characteristics of the aircraft;
- meteorological conditions;
- altitude - ensure safe flight and arrival to an aerodrome with one engine.

Fig. 12 Extract from MEP(L) training program

Exercise no 6 did not contain elements of handling the aircraft with both engines inoperative after take-off during climb and below the altitude of 700 ft.

After the 9th circle with elements of emergency situations the crew completed a full landing on the RWY26. After stopping the plane, the instructor conducted a briefing with the student- concerning another emergency situation, which was an engine failure after take-off with straight-in landing on the runway.

After the briefing, the flight crew took off from RWY26 with a steep climb. At an altitude of approximately 500 ft., the instructor simulated failure of powerplant by reducing the power of both engines. In order to maintain the V_{mca} , the instructor directed the aircraft nose of the plane towards the runway at a significant negative pitch angle. Before touchdown, the instructor tried to change the flight path from descent to horizontal flight but the speed was insufficient, which caused that the plane continued losing altitude and maintaining vertical speed. An impact with the surface of the RWY resulted in the breaking of the main landing gear struts and detachment of the wheels from their structure.

3. CONCLUSIONS

3.1. Findings

- 1) The aircraft was fit for flight, and its airworthiness and maintenance were properly documented.
- 2) No evidence of airframe or system failure prior to the occurrence was found.
- 3) The instructor-pilot had valid license as well as valid aero-medical certificate.
- 4) The instructor-pilot had the proper qualifications and experience in performing training flights.
- 5) The instructor-pilot and the student-pilot had their seatbelts fastened.
- 6) The crew was not under the influence of alcohol.
- 7) The instructor-pilot did not have the minimum break between the flight operations on 18 August 2021 and the accident flight operations on 19 August 2021.
- 8) The instructor started the simulation of an emergency situation at an altitude lower than specified in the general principles of exercise no 6 in the MEP (L) training program.
- 9) The exercise did not include handling engines failure after take-off in climb phase.
- 10) The instructor fatigue could have affected the course of the occurrence.
- 11) Weather conditions did not affect the course of the occurrence.

3.2. Causes of the accident

- 1) **Both engines failure simulated just after take-off in the climb phase, which was inconsistent with the Exercise No 6 of the training program.**
- 2) **Insufficient flight altitude during initiation of the powerplant failure simulation during climb phase.**

3.3. Contributing factors

Incorrect estimation of the flight altitude prior to the powerplant failure simulation during climb phase.

4. SAFETY RECOMMENDATIONS

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

5. ANNEXES

None.

THE END

Investigator-in-Charge

Signature on original

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