FINAL REPORT

ACCIDENT 2020/1766

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 – 2020/1766

AIRCRAFT – Tecnam P2006T, SP-KEY

DATE AND PLACE OF OCCURENCE – 14 July 2020, EPBY

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 2023

Table of contents

Abbreviations

AFM	Aircraft Flight Manual
ATOM	Actual Take-off Mass
ATPL(A)	Airline transport pilot license (airplanes)
EASA	European Union Aviation Safety Agency
EPBY	Bydgoszcz aerodrome
FI(A)	Flight instructor rating (airplanes)
IR(A)	Instrument rating (airplanes)
MEP(L)	Multi-engine piston, land (airplanes)
METAR	Format for reporting weather information
MTOM	Maximum Take-off Mass
PIC	Pilot-In-Command
RWY	Runway
SEP(L)	Single-engine piston, land (airplanes)
TR	Type rating
TWR	Aerodrome control tower or aerodrome control
UTC	Coordinated Universal Time

General Information

Occurrence reference number:	**2020/1766**			
Type of occurrence:	ACCIDENT			
Date of occurrence:	14 July 2020			
Place of occurrence:	EPBY (Bydgoszcz Aerodrome)			
Type and model of aircraft:	Airplane, Tecnam P2006T			
Aircraft registration marks:	SP-KEY			
Aircraft user/operator:	ATO GRAFPROM AVIATION			
Aircraft Commander:	Airplane pilot, ATPL(A)			
Number of victims/injuries:	Fatal	Serious	Minor	None
	2	-	-	-
Domestic and international authorities informed about the occurrence:	ULC, EASA, ANSV (SIA Italy)			
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:	NO			
Addressees of the recommendations:	Not applicable			
Date of completion of the investigation:	26.04.2023			

Synopsis

On 14 July 2020, the crew of the Tecnam P2006T aircraft, SP-KEY registration marks, composed of: flight instructor (ATPL(A), aged 61) and student-pilot (PPL(A), aged 27), took-off at 09:30[1] hrs LMT for the flight to the flight zone as part of MEP(L) training.

Around 10:00 hrs, the crew reported completion of the task in the flight zone and return to EPBY aerodrome. On the final to RWY 08, the crew was cleared to land, however the instructor asked the TWR controller for a touch and go procedure or a low pass over the runway. After receiving clearance for a low pass, the crew continued the flight over RWY 08. After completing the low pass manoeuvre, the crew made a right turn. After a few seconds, the aircraft stalled at low altitude and in the initial phase of the stall, rolled to the right and crashed into the ground.

The aircraft caught fire as a result of the collision. The plane was destroyed and the crew died on the spot.

The investigation was conducted by the PKBWL Investigation Team in the following composition:

Krzysztof Miłkowski	–	Investigator-in-Charge;
Roman Kamiński	–	Team Member.

Cause of the occurrence:
Airplane stall during GO-AROUND procedure.

Contributing factors

1. Performing the GO-AROUND procedure with one engine inoperative and its propeller wind milling.
2. Performing the GO-AROUND procedure with landing gear extended and flaps set to 20º.
3. Little experience of the instructor in conducting MEP(L) training.

PKBWL has not proposed safety recommendations after the investigation.

[1] All Times in the Report are given in LMT, on the day of the accident LMT=UTC+2 h

1. FACTUAL INFORMATION

1.1. History of the flight

On 14 July 2020, the crew of the SP-KEY Tecnam P2006T airplane planned to perform flights in accordance with the MEP(L) training program. Upon arrival on the aerodrome, the crew filed a flight plan and proceeded to prepare the aircraft for flight. As part of the training for the MEP(L), the crew was to perform exercise number 3 - flight in a flight zone with asymmetric thrust, and to practice emergency procedures with one engine inoperative.

The take-off to the zone took place at 09:30 hrs. At around 10:00 hrs the crew reported completion of the task in the flight zone and return flight to the aerodrome. On the downwind leg, the student reported the aircraft position and the intention to land on RWY 08. On the final, the crew received TWR clearance to land on RWY 08.

However, the instructor changed his intention and asked for clearance to make a TOUCH&GO or a low pass. Then he was cleared to make a low pass, which was executed over the RWY 08 in the configuration with the landing gear extended and flaps extended to 20º.

According to the assessment of the TWR controller, the aircraft flew over the runway at high angle of attack, at low speed at a height of several meters. After passing over the end of RWY 08, the aircraft started to turn right with a slight climb. After a few seconds, the aircraft stalled and in the initial phase of the low-altitude stall, rolled to the right and crashed into the ground.

The collision with the ground occurred at 10:08 hrs[2]. About 30 seconds later, smoke appeared and a fire broke out.

As a result of the accident the crew died on the spot and the aircraft was destroyed.

1.2. Injuries to persons

Injuries	Crew	Passengers	Others	Total
Fatal	**2**	**-**	**-**	**2**
Serious	**-**	**-**	**-**	**-**
Minor	**-**	**-**	**-**	**-**
None	**-**	**-**	**-**	**-**

1.3. Damage to aircraft

Due to collision with the ground and fire the airplane was destroyed (Fig. 1).

[2] As recorded by the aerodrome CCTV camera.

Fig. 1. View of the airplane wreckage at the accident site [source: PKBWL]

1.4. Other damage

Due to the unsealing of the fuel tanks and the rescue operation, the grass surface of the aerodrome with an area of approximately 80 m^2 was damaged.

1.5. Personnel information (crew data)

1) Flight instructor:

a) male, aged 61;
b) holder of ATPL(A), with the ratings:
   - SEP(L) (valid until 31 October 2020);
   - MEP(L) (valid until 31 March 2021);
   - IR(A) (valid until 31 October 2021), SE, ME;
   - FI(A) (valid until 31 July 2022), CPL, FI, ME, IR.
c) holder of Class 1 aero-medical certificate (valid until 2 August 2020 with VDL and VNL limitations);
d) total flight time: 10 950 FH, including:
   - MEP(L) – 68:56 FH;
   - Tecnam 2006 – 68:56 FH;
   - FI/ME – 13:19 FH.
e) in the training for the MEP(L) rating with the student-pilot, in the period from 11 July 2020 to the date of the occurrence the instructor performed 19 flights during 4:4 FH, including the accident flight;
f) in the period from May to the date of the accident, the instructor flew 13 hours 19 minutes as an instructor in training for the MEP(L) rating;
g) in the period from 5 to 8 February 2020, the instructor completed the training for the FI/ME rating during 5 hours 32 minutes. On 8 February 2020, the organization issued a certificate of training completion for FI/ME rating with a recommendation to take a flight exam, which was passed by the instructor on 25 February 2020.

2) Student-pilot:

a) female of Italian nationality, aged 27;
b) holder of PPL(A), issued by the Spanish Civil Aviation Authority on 30 May 2018, with rating:
   – SEP(L), valid until 30 June 2022;
c) holder of Class 2 aero-medical certificate, valid until 25 September 2023;
d) total flight time on SEP(L) class aircraft: 115 FH, including 77 FH as PIC;
e) flight time on MEP(L) including the accident flight: 4:04 FH.

1.6. Aircraft information

Tecnam P2006T is a twin-engine, all-metal high-wing monoplane manufactured by Costruzioni Aeronautiche TECNAM in Italy.

It is a four-seat aircraft with fully retractable landing gear and liquid-cooled Rotax engines.

Span - 11.4 m, length - 8.69 m, height - 2.84 m

Mass - 760 kg, MTOM - 1230 kg

Maximum speed - 287 km/h, cruising speed - 250 km/h

Fig. 2. Tecnam P2006T [source: https://www.tecnam.com]

Airframe:

Year of manufacture	Manufacturer	Serial Number	Registration marks	Register number	Register date
2016	**Costruzioni Aeronautiche Tecnam SRL**	**180**	**SP-KEY**	**5185**	**09.01.2019**

Certificate of Airworthiness valid until:	31 May 2021
TSN:	690 FH
Cycles since new:	1516

Date of the last periodic works (100 H): 28 May 2020
after TSN: 668 FH
carried out by: Grafprom Aviation
Subsequent periodic works (50 H): after 29 FH

Rotax 912 S3 Engines

Year of manufacture	Manufacturer	Serial number
2016	**Bombardier-Rotax GmbH**	**LH9563721 RH9563772**

Date of installation on airframe: 21 June 2016
Maximum take-off power: 100 HP
TSN: 690:30 FH
Date of the last periodic works - 100 H 28 May 2020
after TSN: 668 FH
carried out by: Grafprom Aviation
Subsequent periodic works (50 h): after 29 h

MTV-21-A-C-F/CF178-05 Propellers:

Year of manufacture	Manufacturer	Serial number
2016	**MT Propeller**	**LH 160073 RH160075**

Date of installation on airframe: 21 June 2016
TSN: 690 FH
Date of the last periodic works (100 H) 28 May 2020
after TSN: 668 FH
carried out by: Grafprom Aviation
Subsequent periodic works (50 h): after 29 h

Fuel prior to the flight:
fuel: PB95, 140 l;

Mass data:

- empty aircraft: 872 kg
- fuel: 101 kg
- crew: 140 kg
- luggage: 0 kg

Total mass:

- permissible: 1230 kg
- actual: 1113 kg

1.7. Meteorological information

The accident occurred in daytime at 10:08 hrs. The weather conditions at EPBY provided in the METAR at the time of the accident were as follows:

METAR EPBY 140830Z VRB03KT CAVOK 21/11 Q1017

METAR EPBY 140800Z VRB03KT CAVOK 21/11 Q1017[3]

At the time of the occurrence, the weather in the area of the aerodrome was as follows:

Variable wind speed of 3 kt, cloud cover and visibility - CAVOK, temperature 21ºC, dew point temperature 11ºC. The weather conditions had no impact on the course of the occurrence.

1.8. Aids to navigation

The flight was performed under VFR and there was no need to use ground navigation aids.

1.9. Communications

The airplane was equipped with standard radio-navigation equipment. During the flight the crew maintained communication with EPBY TWR.

1.10. Aerodrome information

Bydgoszcz Aerodrome, ICAO code EPBY

Status: Controlled aerodrome

Runway center coordinates: 53°05'48"N 17°58'40"E

Elevation: 236 ft

RWY: 082º/262º (08/26), 2500x60 m concrete surface

The aerodrome is located 3.5 km from the city center to the south-west

Fire protection category: CAT 7 ICAO

Allowed air traffic: IFR/VFR

[3] Times in METAR are given in UTC.

Fig. 3. Approach directions of EPBY aerodrome [source: Google maps]

1.11. Flight recorders

The airplane was not equipped with flight recorders.

1.12. Wreckage and impact information

After making a low pass over the end of the RWY 08 runway, the aircraft commenced a slight climb, which led to an increase in the angle of attack and the aircraft entered an autorotation with a roll to the right wing and nose down pitch. The collision with the ground occurred 490 m from the end of the RWY 08 and 125 m from its centre line. The plane crashed into the ground at an angle of about 90º, as evidenced by flat damage to the wing leading edge (Fig. 4).

Fig. 4. Flat damage on the wing leading edge [source: PKBWL]

After a slight displacement, the wings remained on the crash place. The rear part of the fuselage was bent and moved towards the right wing. The rear part of the fuselage bending to the right caused a partial tearing of the left wing structure. (Fig. 5).

Fig. 5. Torn and deformed part of the letf wing structure [source: PKBWL]

As a result of the collision with the ground, the right wing, and right engine were damaged and the propeller blades were broken (Fig. 6).

The fuel that leaked from the ruptured tank, in contact with hot parts of the engine, initiated a fire.

Fig. 6. Damaged powerplant unit no 1 [source: PKBWL]

Engine No. 2 was not damaged by fire (Fig. 7).

Fig. 7. Damaged engine no 2 [source: PKBWL].

Very steep angle of collision and quick firefighting action limited the damage of the aircraft caused by fire. The fuel tank in the right wing was not damaged and 50 litres of fuel were pumped out of it.

1.13. Medical and pathological information

No evidence was found, indicating physiological factors that could have influenced the actions of the flight crew.

1.14. Fire

The fire broke out after the plane crashed into the ground. The steep angle of impact resulted in fuel spilling over a small area. The fire was started in the area of the running engine No1 and spread to the front part of the fuselage, cockpit and the middle part of the wings.

The aerodrome rescue services arrived at the scene about 3 minutes after the crash and immediately started the rescue and firefighting operation.

1.15. Survival aspects

The instructor and the student-pilot had their seat belts fastened correctly, but due to nature of the impact and fire, they could not survive.

1.16. Tests and research

Airframe and engines

During the inspection of the aircraft wreckage, carried out on 14 July 2020, no damage was detected to the aircraft structure and its systems, which existed prior to the collision and could have contributed to the accident.

However, during the inspection of the cabin wreckage, it was found that the fuel valve of engine no. 2 (right) was in the closed position and was secured with a lever that prevented its displacement (Fig. 8).

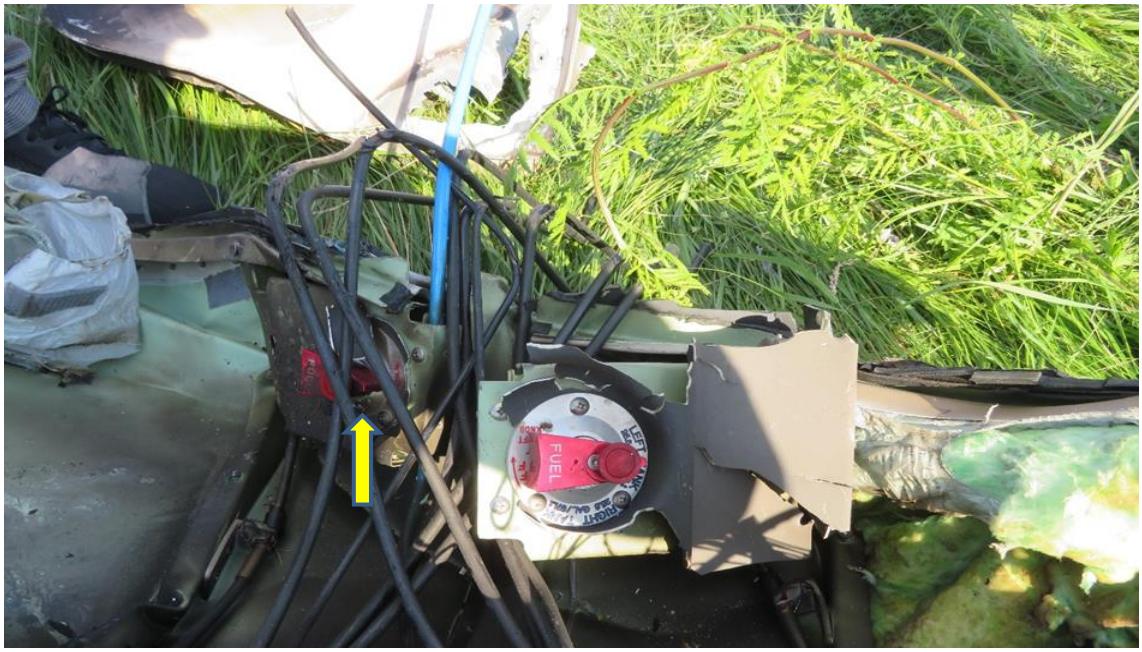

Fig. 8. Engine no 2-fuel valve in closed position [source: PKBWL]

On 8 October 2020, the investigation team re-examined the wreckage of the aircraft and determined that:

- there was no damage to the aircraft control systems that could have prevented its control;
- the landing gear was in the extended position;
- the wing flaps were extended at an angle of 20º (determined on the basis of measuring the length of the extended flaps actuator on the accident aircraft;
- recordings from the aerodrome CCTV cameras show, that the engine No. 1 was running until the collision with the ground. In addition, the investigation team determined (by visual assessment) that the propeller blades of engine no 2 rotated at a speed close to the rotation speed of engine no 1 blades, which indicates that they were not feathered...

1.17. Organizational and management information

The training organization had the required certificate for flight training. The training was based on a program approved by the Polish Civil Aviation Authority.

1.18. Additional information

The MEP(L) training program specifies the minimum number and duration of flights for individual exercises. Notes in chapter 2, item 2.1/2 of the above program specify that: *"The above number of flights and flight times are minimum values. In no progress of the trainee is noticed, the rules described in item 1.10 of the ATO Training Manual should be followed"*.

Exercise no 3, carried out by the crew on the day of the accident, is described as a flight to a flight zone with asymmetric thrust.

The general rules of the flight are as follows:

- flight altitude: 1800-3000 ft AGL;
- time of one flight: 1:00 h;
- number of flights with an instructor: one in a total time of 1:00 h.

The guidelines for exercise number 3 specify the elements to be practiced in flight. They include:

- take-off, arrival to the zone;
- level flight at different speeds;
- shallow and steep turns in level flight and in descent;
- retracting and extending the landing gear;
- engine shutdown and start;
- flight with asymmetric thrust;
- simulated failures in a feathered and wind milling propeller system;
- correct transitions and configuration changes;
- static and dynamic stalls in standard configurations;
- stalling in a turn;
- spirals and slides;
- spin prevention;
- other manoeuvres allowed by the Flight Manual;
- traffic circuit and landing.

The criteria for passing the exercise are as follows:

"The trained pilot should demonstrate that, while maintaining the required flight parameters within the tolerance limits, he/she has the skills to perform the above-mentioned flight elements in a flight zone, is able to efficiently recognize an inoperative engine, and to efficiently follow the procedures specified in the AFM."

1.19. Useful or effective investigation techniques

Standard investigation techniques were applied.

2. ANALYSIS

On 14 July 2020, the crew of the Tecnam P2006T aircraft, SP-KEY registration marks, in the composition of a flight instructor and a student pilot, continued flight training for MEP(L). It was planned to perform exercise no 3 in accordance with the MEP(L) training program.

The crew was cleared to fly in controlled airspace at an altitude of 3000 ft, after taking off from RWY 08 then right to SIERRA, then KILO waypoints. The analysis of the collected materials shows that after take-off at 09:30 hrs, the crew climbed to the zone in accordance with the clearance, reporting the respective waypoints.

The crew reported reaching the KILO waypoint at 09:39 hrs, then, at 09:55 the crew reported the end of the exercise and the flight towards the SIERRA waypoint, which they reported at 10:00 hrs.

After 4 minutes, the crew received instructions to enter the right circuit to RWY 08. At that time, there were two other aircraft on the aerodrome circuit, and their crews were informed about traffic in the aerodrome airspace. At 10:07 hrs the crew reported a turn on base leg to RWY 08 and received instructions to continue the approach and report final.

The flight path of the aircraft from take-off to collision with the ground is graphically presented in Fig. 9.

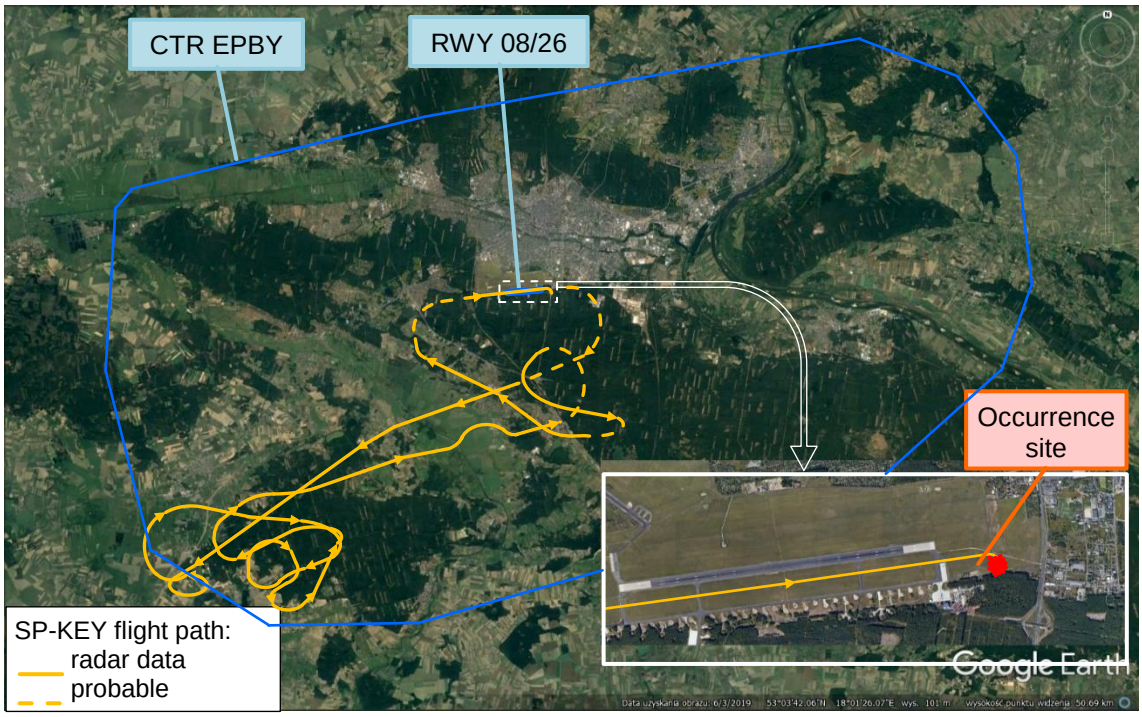

Fig. 9. SP-KEY flight path recreated by radar data [source: PKBWL]

Until that moment, the communication was maintained by the student pilot.

However, it is unclear, why the crew reported termination of the exercise after 25 minutes, if it was planned to last one hour, as described in item 1.18.

The Investigation Team did not establish a reason for premature termination of the exercise. The crew did not report any problems related to the aircraft or other circumstances that could affect the early termination of the task.

The analysis of the footage recorded by the CCTV aerodrome cameras shows that the crew continued the approach to RWY 08. In front of the SP-KEY, on final approach, there was a C-150 aircraft performing the TOUCH&GO procedure, the separation between the aircraft was about 20 seconds.

The video recording shows that the SP-KEY terminated the descent and continued level flight, until the C-150 took off. At the same time, the instructor asked TWR for clearance for a low pass or TOUCH&GO. The airplane was cleared for a low pass and continued approach to RWY 08.

The analysis of the radio communication recording showed 90 seconds after issuing the landing clearance, the TWR controller provided the crew with information about the wind direction and speed. The student did not confirm receipt of this information, and the instructor said *"aaa ..., request low pass and touch and go ... see aircraft"*.

The instructor was known for following the rules of radio communication. However, in this case, the communication was unclear, did not contain the caller's registration marks and there was no recipient of the communication.

In the opinion of PKBWL, the instructor's communication indicates problems with formulation of his message. The other strange factor is, that during the flight communication was maintained by the student, but on the final it was the instructor, who communicated the intention to abort TOUCH&GO.

Witnesses noticed that while flying over the RWY 08, SP-KEY was much higher above the runway threshold than during a normal approach. The aircraft, making a low pass over the runway, was in a landing configuration with the landing gear extended and the flaps extended to about 20º.

The analysis of the recordings, as well as the statements of witnesses and the TWR controller, indicate that the propellers of both engines were rotating, which could suggest that both engines of the aircraft were working. The aircraft performed the low pass several meters over the runway and according to TWR controller and video recordings, the level flight was performed at high angles of attack at low speed. It could be also seen that the plane rolled slightly to the left and right, but those rolls were corrected by the pilots. After passing the end of RWY 08, the airplane was in a level flight for several seconds and then, in a slight climb, started a turn to the right. During the turn, the aircraft stalled and on descent with a significant role to the right, it crashed into the ground (Fig. 10).

A few seconds after the collision, the plane began to burn. Rescue services arrived at the scene after about 3 minutes and undertook rescue and fire-fighting operations.

Fig. 10. Last phase of the SP-KEY flight [source: EPBY CCTV cameras]

PKBWL determined that the right fuel valve was in the "OFF" position and the left one in the "ON" position, indicating that the right engine was out of fuel and not running.

The landing gear was extended and locked, the flaps were extended to about 20º in the "TO" position, the propellers of both engines were in the RPM MAX setting.

The setting of the propellers was determined by comparing the balancing masses under the propeller's spinners. Both masses were at the same angle.

During the inspection of the wreck, it was found that the fire started in the left engine, which was working normally, while the right side of the idle engine was not affected by fire. Due to the action of rescue services, the fire did spread to the whole wreckage. Visual inspection of the right powerplant also shows that the propeller of the right engine was not feathered. The engines throttle controls were set to the maximum RPM, but there is a possibility that the setting may have changed during the impact of the aircraft with the ground.

Based on the analysis of the collected materials, PKBWL concluded that the aircraft approach was made with the right engine inoperative, but the crew did not inform about that fact and did not report any problems during the approach.

After terminating the exercise in the flight zone, the crew reported their intention to land, but that decision was changed on final to RWY 08.

The guidelines for exercise number 3 as described in item 1.18 did not provide for an approach with one engine inoperative, and the methodology of the MEP(L) qualification training did not include that case at that stage of the training. The Commission was not able to establish why the task in the flight zone was terminated after about 25 minutes.

There are no entries in the student's training record that could indicate any problems during her training or would indicate specific elements of the training with which she had difficulties. In the student's training card, each time the instructor wrote comments *"The flight was performed correctly, errors typical for this stage of training"*. The same comments were also included in the training record of his previous student.

Based on this type of records, it is not possible to determine whether there were any problems in the training or which elements caused difficulties for the trained pilots. Interviews with staff of the training center show that the student complained that she was having troubles in landing, she said that: *"the plane is hard to land"*. However, there are no records of such problems in her training record.

The go-around procedure was performed incorrectly. Although in the AFM there is no separate procedure for a go-around with one engine inoperative, there is a procedure for engine failure after take-off. According to the procedure described in the AFM and the procedure used in the ATO, it is possible to safely perform a climb flight with one engine inoperative, but in a clean configuration: landing gear retracted, flaps retracted, propeller of an inoperative engine feathered.

Taking into account the aircraft mass and the weather conditions at the time of the accident, the airplane should have climbed at approximately 190 ft/min rate, which was sufficient to safely perform GO-AROUND procedure.

The implementation of the GO-AROUND procedure with one engine inoperative in the configuration of the aircraft: landing gear extended, flaps in the "TO" setting and wind milling propeller - was virtually impossible.

3. CONCLUSIONS

3.1. Findings

1) The aircraft was fit for flight, and its maintenance and airworthiness were properly documented.
2) No evidence was found related to engine or any other aircraft system failure prior to the accident.
3) During the aircraft impact with the ground, the landing gear was in the extended position and the wing flaps were extended to an angle of 20º.
4) Engine no 2 was shut down by closing the associated fuel valve in the cockpit.
5) Prior to the flight aircraft ATOM was within the limits specified in the AFM A.
6) Engine no 1 was running until the plane crashed into the ground.
7) The propeller of the inoperative engine no 2 was not feathering.
8) The instructor had a valid license and ratings as well as a valid aviation medical certificate.
9) The instructor was qualified to perform training flights.
10) The instructor and the student were wearing seat belts.
11) The instructor and the student were not under the influence of alcohol.
12) Weather conditions had no influence on the occurrence.

3.2. Cause of the accident

Airplane stall during performance of go-around.

3.3. Contributing factors

1) Performing the GO-AROUND procedure with one engine inoperative and its propeller wind milling.
2) Performing the GO-AROUND procedure with landing gear extended and flaps set to 20º.
3) Little experience of the instructor in conducting MEP(L) training.

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