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

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FINAL REPORT

of the State Commission on Aircraft Accidents Investigation

of 31 January 2025

regarding **an aviation accident**

2024-0113

OCCURRENCE NUMBER

Daher Aerospace TB 9 , SP-FNL

9 October 2024, Zborowo airfield (EPZB)

LOC-G: Loss of control – ground

This Report was issued by the State Commissio on Aircraft Accidents Investigation on the basis o information available on the date of its issue.

This Report presents the circumstances of th aviation occurrence concerned, as well as it causes, contributing factors and safet recommendations, if issued.

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1. History of the flight

On 9 October 2024, a pilot holding a PPL(A) planned a flight in a Socata TB9 aeroplane with registration marks SP-FNL on the EPZB-EPKB-EPZB route. He took three passengers on board. The aeroplane had been made available to the pilot by the aircraft owner (a private individual).

On the day before the occurrence, i.e. 8 October 2024, the pilot had checked the weather forecast on the IMGW website. The forecast showed that there would be low cloud ceiling and rainfalls in the morning on the following day. The weather was forecast to improve beginning at 10.30 hrs. The pilot submitted the flight plan for 10.30 hrs.

After arriving at the Zborowo airfield (EPZB), the pilot topped up the aeroplane to 150 l of unleaded 98 petrol. He carried out a pre-flight inspection and calculated the aeroplane's take-off mass taking into account the aeroplane's empty mass of 650 kg.

At 10.40 hrs, after the passengers took their seat in the cabin, the pilot started the engine and lowered the flaps to the take-off position. However, as a low cloud was moving over the airfield, the pilot postponed the take-off until 11.15 hrs. At 11.15 hrs, after the cloud moved out of the airfield area, the pilot started taxiing to RWY 28. It must be noted that the aeroplane's engine had been running on idle (1,200 rpm) all the time since it had been started.

Having taxied to the threshold of RWY 28, the pilot shifted the throttle lever to maximum and, after the engine speed reached maximum, he released the brakes and commenced take-off on a wet grassy surface. The aeroplane was accelerating very slowly and reached 60 kt after passing 650 m. The pilot pulled the control column back but the aeroplane climbed only to 2÷3 m. At that moment, the pilot assessed that he would not fly over a house ahead, and he commenced a 5° left turn. At the same time, intending to fly over the fence, he pulled the control column still further back, causing a sudden increase in the angle of attack and a dynamic stall of the aeroplane (Fig. 1).

Fig. 1 A time-lapse view of the final phase of the flight: 1 - an attempt to fly with a supercritical angle of attack; 2 - the tail hits the ground; 3 - the collision with the first fence and a concrete post; 4 - the collision with the second fence [source: a CCTV camera of the airfield manager]

When just above the ground, the aeroplane hit its tail on the RWY surface, rolled to the right wing and rammed two fences in that configuration, coming to a stop on a clearing some 40 m past the airfield's boundary (Fig. 2).

Fig.2 The aeroplane after it stopped, turned 180º.

No fire occurred. The pilot switched off electrical power supply and switched the main fuel valve to the "closed" position. The pilot and passengers got out of the wreckage on their own. No one sustained any injuries. The occurrence was witnessed by the pilot of an IS-28 motor glider who was getting ready for a flight. Initially, the motor glider pilot intended to be the first to take off, but he changed his mind, and radioed the Socata pilot that he would wait and taxi following the aeroplane. According to the witness statement, when the Socata reached the threshold of RWY 28 its pilot carried out the engine runup, following which he commenced take-off. The aeroplane took exceptionally long to accelerate. In the

witness's opinion, the rotation started at the right place, but the witness noted that the aeroplane had a very high angle of attack on lift-off. The motor glider pilot radioed the Socata pilot immediately "Stop!" and asked "What are you doing?!", but he got no answer. He watched the aeroplane roll to the left wing and stall low above the ground. The witness notified rescue services immediately, following which he went to the occurrence site. The passengers, including a female passenger with a PPL(A), confirmed that the aeroplane had been accelerating slowly, and they assessed that the flight height after lift-off had been 2 to 3 metres maximum. Furthermore, they confirmed that they had been waiting for the weather to improve for around 30 minuted before take-off while the engine was running non-stop.

2. Relevant information

2.1. Damage to aircraft

The following were damaged in the collision with terrain obstacles:

1) The right wing (Fig. 3);
2) The left wing, which came off (Fig. 4);
3) The nose wheel strut;
4) The tail section with empennage (Fig. 5).

Fig. 3 Damage to the leading edge of the right wing.

Fig. 4 The separated left wing.

Fig. 5 Damage to the tail section of the fuselage (the fairing missing and dents in the lower fuselage) [source: PKBWL]

2.2. Aircraft information

The aeroplane had a CofA with an ARC valid until 6 December 2024.

The aforementioned maintenance actions were confirmed in the aircraft's CRS dated 3 September 2024.

Airframe: serial no. 469:

- the latest 2000h / 60 month check and balancing of the aeroplane were carried out on 3 September 2024 with the airframe at 3,789 hours total time since new.

Lycoming O 320 – D2A engine: serial no. L 13929-39A:

- the latest 100h maintenance was carried out on 3 September 2024, with the engine at 1533 h total operating time since new and 75 h operating time since last overhaul.

The aircraft has a Supplemental Type Certificate (STC) No. SE1931CE issued by Petersen, permitting the use of 98 unleaded petrol.

Findings after a post-occurrence inspection of the aeroplane:

1) No pre-flight damage or unserviceabilities were found.
2) The technical condition of the spark plugs did not raise any objections;
3) The uninstalled air filter insert was soaked with water;
4) Based on the measurements of the fuel left in the fuel tanks, it was established that around 50 l of fuel leaked from the fuel system following the aeroplane's collision with the fence;
5) The fuel in the fuel tanks did not contain any pollutions or water;
6) The tyres were inflated properly and in a good technical condition;
7) The throttle and carburettor heating levers moved smoothly and across the full range of travel;
8) The power supply and engine control levers in the cockpit were OFF.

2.3 Mass and longitudinal balance of the aeroplane

The aeroplane's take-off mass and centre of gravity were calculated in accordance with the guidelines provided in the Socata TB-9 Flight Manual. The calculations were based on the data from the aeoplane's weighing report of 3 September 2024.

Load name	Aeroplane mass kg/lbs	Arm from base backwards m/inch	**Moment** kgm/lbs inch
Empty aeroplane	685/1,507	1/39.7	685/59.3
Pilot + passenger	143/315	1.15/45.4	164.45/14.30

Passengers in rear seats	153/337	2.03/80.1	310.59/27
Fuel	108/238	1.07/42.3	115.56/10.06
Luggage:	5/11	2.6/102.3	13/1.2
Total net mass	1,094/2,407	Total moment	1,288.6/111.74

Table 1. The aeroplane's mass and balance data.

The above mass and moment totals were transposed on the chart (Fig. 6).

The aeroplane's loading in the take-off configuration was unacceptable because the intersection of the mass and moment values was beyond the established envelope. The aeroplane's MTOM of 1,060 was exceeded by 34 kg.

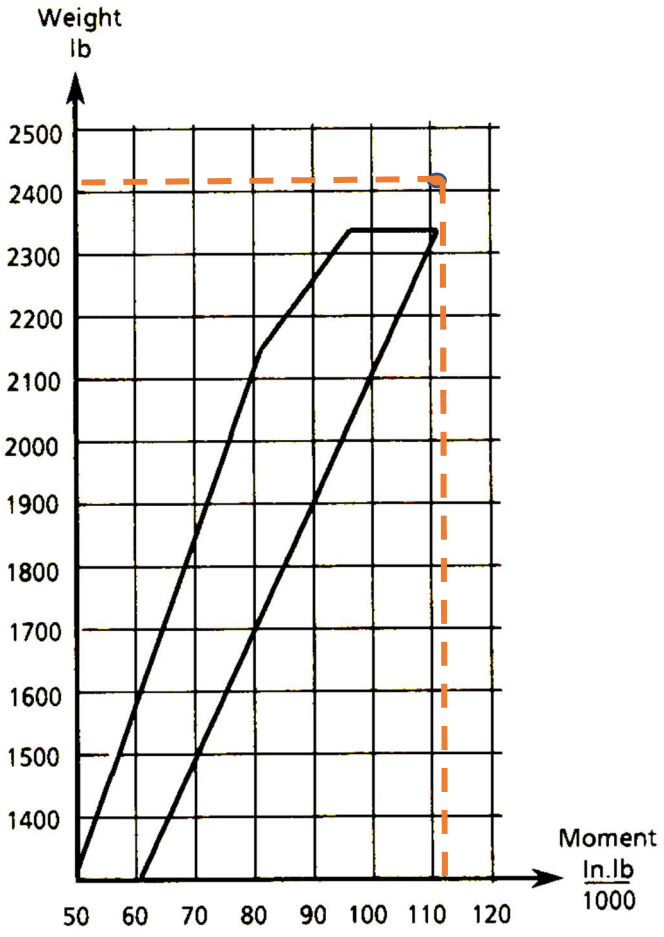

Fig. 6 The aeroplane's mass and total moment envelope (limitations) chart [source: the Socata TB-9 Flight Manual)

2.3. Pilot information

Male, aged 41, holder of a PPL(A) with a SEP(L) rating valid until 30 April 2026, and a Class 2 aero-medical certificate and a LAPL valid until 2 July 2025.

Pilot flight time:

a) total – 129 h;

b) on aeroplanes:

- Tecnam P2008 – 88:54 h;
- Tecnam P2002 – 6:51 h;
- Piper PA-28A – 32:35 h;
- Socata TB-9 – 0:40h.

c) in the last 3 months – 27 h;

d) in the last month – 9 h.

2.4. Meteorological conditions

According to METAR for the EPPO aerodrome, the meteorological conditions on 9 October 2024 at 11.00 hrs (09.00 hrs UTC) were as follows:

METAR EPPO 040900Z AUTO 26008KT RA BKN007 CAVOK 15/14 Q1018=

which means:

- date: 9 October 2024;
- time: 09.00 hrs UTC;
- wind direction: 260°;
- wind speed: 8 kt;
- cloud cover: RA BKN007, rainfall, 5-7/8 of the sky covered by clouds (62,5 – 87,5%), cloud ceiling 700 ft;
- visibility 10 km and more;
- ambient temperature: 15 °C;
- dew point temperature: 14 °C;
- pressure QNH 1018 hPa.

The above data was analysed for a possible icing of the piston engine's float-type carburettor. The meteorological data from the area of the occurrence was plotted on a chart to allow determining the possibility of icing in piston aircraft engines (Fig. 7 – yellow lines).

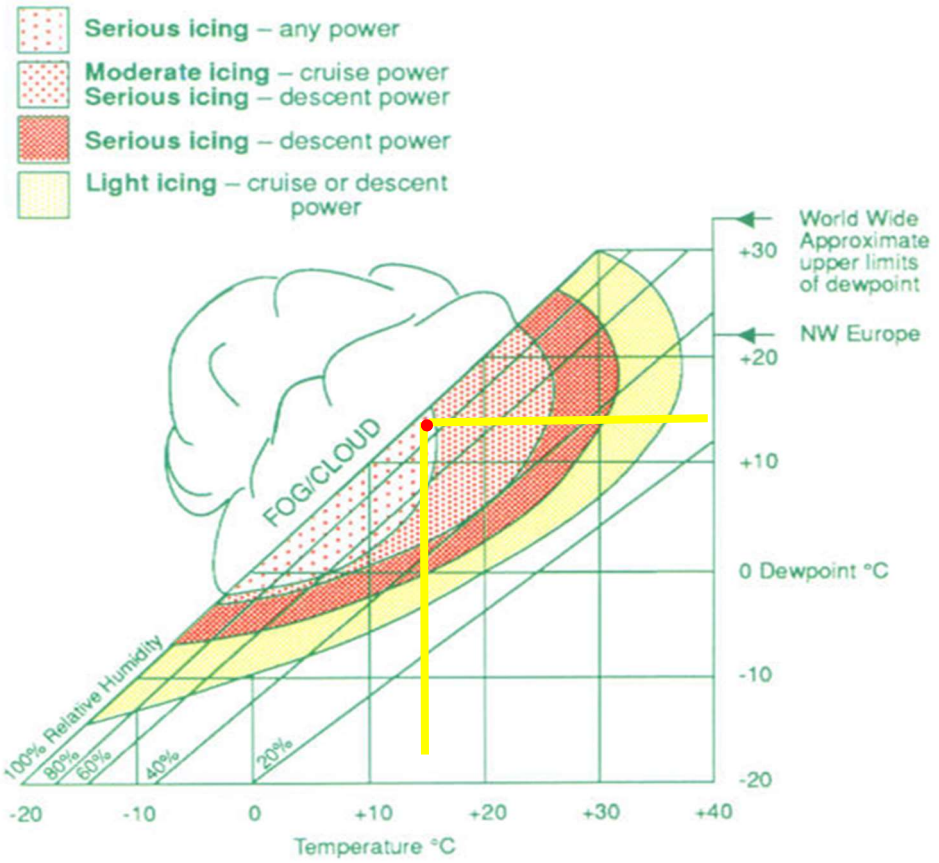

Fig. 7 A chart for determining the possibility of carburettor icing [source: Internet]

The chart shows clearly that at the time of the occurrence carburettor icing was likely at each phase of the flight.

The rate of ice build-up in the engine's inlet system depends mainly on the air humidity and throttle opening, but the longer the engine runs in high humidity conditions and small throttle opening, the faster the process progresses, up until the engine choking. The situation is made worse by the fact that the icing warning signs may be absent at the initial stage.

In the case investigated, the pilot should have checked for carburettor icing before the flight because the engine had been running on idle for around 35 minutes while the pilot was waiting for the weather to improve. Next, the pilot was taxiing on a reduced engine speed for three more minutes. Combined with the high air humidity (93.75%; or even higher, as the airfield is located directly at a lake), the above made for conditions that were very conducive to icing.

Furthermore, filling the aeroplane's fuel tanks with car petrol increased the potential for icing due to higher volatility and water content in the fuel. The fact that the uninstalled water filter insert was soaked with water also shows that the air humidity was high.

Probably, icing of the engine's inlet system led to a reduction in the engine power, which caused the problem with acceleration during take-off, thus extending the take-off run.

2.5. Pilot actions

After preparing the aeroplane for take-off, and after the passengers took their seats in the cabin, the pilot started the engine intending to taxi to RWY. It was only after the engine start that he decided to postpone the take-off until the weather improved. The sudden deterioration of the weather conditions was confirmed by the motor glider pilot, who was also intending to take off at that time but decided to switch off the engine and wait for take-off in his motor glider. Meanwhile, the Socata pilot did not switch off the engine and commenced taxiing to RWY only after 35 minutes.

According to the Flight Manual, the aeroplane's take-off run on a wet grassy surface is extended by 39%. However, the wind on the day of the occurrence could have reduced the take-off run by around 7%. Had the pilot taken the above factors into account, the take-off run to the rotation speed V_R = 59 kt should have ended after 460 m, whereas in fact it reached 650 m, i.e. extended to the point at which the aeroplane should have reached 15 m AGL in those conditions.

Fig. 8 The aeroplane's take-off route: 1 - the start of the take-off run; 2 - lift-off and flight with critical angles of attack (650 m); 3 - turn to the left; 4 - the tail hits the ground; 5 - the collision with the fence; 6 - the place where the left wing came off; 7 - the place where the aeroplane came to a stop [source: PKBWL]

The pilot said that prior to the take-off he had set a possible aborted take-off point. The point was "in line" with the hangar (around 650 m). In fact, the pilot should have aborted the take-off after around 460 m, i.e. almost 200 m earlier. After assessing that the aeroplane might collide with the obstacles ahead, the pilot decided to make a left turn. He stalled the aeroplane by pulling the control column back on himself.

Based on the footage from a camera installed at the airfield, the aeroplane's speed along a 60 m section at the final stage of the flight. The mean airspeed along the said section was 50 kt and was lower than the Socata TB-9 stall speed of 54 kt

The aeroplane's mass and longitudinal balance had a very significant impact on the insufficient increase in the speed during the take-off run, and in consequence on the flight height above ground on critical angles of attack. Performing his

calculations prior to the flight, the pilot took a wrong assumption that the aeroplane empty mass was 650 kg, not the actual 685 kg. As a result, he caused the maximum take-off mass to be exceeded by 34 kg. The centre of gravity moved backwards beyond the envelope, which was conducive to the aeroplane's nose up tendency during take-off. In consequence, the take-off run and attempted climb were performed on too large angles of attack which generated significant movement resistance at the insufficient resultant aerodynamic force.

In his statement, the pilot did not mention whether he had carried out an engine runup, except for the inspection of the spark plugs. The analysis of the recording of the Socata aeroplane's take-off did not confirm that the runup had been carried out. Therefore, the pilot did not check the performance of the carburettor heating system. Carrying out the engine runup was the only chance for detecting carburettor icing and thus avoiding the take-off that followed.

The pilot was not experienced in operating the aeroplane. He performed one familiarisation flight in the Socata TB-9 (40 minutes) on in the EPZB area on 30 September, with two person on board (a much lower take-off mass, the CG close to the neutrum) and the take-off carried out from the opposite direction.

The pilot did not analyse in detail the potential impact of the meteorological conditions on carburettor icing. He was probably not aware that the aeroplane's take-off run on a wet grassy surface would be 39% longer, otherwise he would have decided to abort the take-off at the right point.

2.6 Additional information

Before the publication of the final report, the PKBWL conducted consultations on its draft, requesting comments from interested parties and from BEA and EASA: None of the interested parties or institutions submitted any substantive comments to the FR.

3. Conclusions

3.1. Findings

3.1.1. accordance with applicable regulations.

3.1.2. The pilot held a valid aero-medical certificate.

3.1.3. The aircraft had a valid certificate of airworthiness and was maintained in compliance with regulations.

3.1.4. The permissible take-off mass of the aircraft was exceeded and the aircraft's centre of gravity was in the extreme rear position.

3.1.5. No evidence of pre-accident damage to the airframe or system unserviceabilities were found.

3.1.6. The aircraft was destroyed by the impact forces generated after the collision with ground obstacles.

3.1.7. The fuel that remained in the aircraft's fuel tanks was not polluted.

3.1.8. There was a possibility of carburettor icing at any stage of the flight during the aeroplane's take-off.

3.1.9. The pilot assumed an understated empty The pilot held a licence and qualifications to perform the flight in aeroplane mass when calculating the aircraft's balance.The pilot did not decide to abort the take-off as the take-off run was getting longer.

3.2. Causes and contributing factors

3.2.1. Exceeding the aeroplane's MTOM and take-off with the CG extremely backward.

3.2.2. Probable occurrence of carburettor icing in high air humidity and prolonged engine idling time, which resulted in a decreased engine power leading to the extended length of the take-off run.

3.2.3. Lack of a decision to abort the take-off after reaching the take-off run length prescribed in the FM for take-offs from wet grassy surfaces.

4. Safety recommendations

None.

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