Technical report
IN-011/2022

Incident on 9 March 2022 involving a Tecnam P2006T, registration 5B-CLR, at Lleida-Alguaire Airport (Lleida, Spain)

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GOBIERNO DE ESPAÑA
MINISTERIO DE TRANSPORTES, MOVILIDAD Y AGENDA URBANA
UNDERSECRETARIAT
CIVIL AVIATION ACCIDENT AND INCIDENT INVESTIGATION COMMISSION

Notice

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident and its causes and consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.6 of Regulation (UE) nº 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1 and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

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ABBREVIATIONS

° ‘ “	Sexagesimal degrees, minutes and seconds
°C	Degrees Celsius
AAL	Above aerodrome level
ATO	Approved training organisation
ATPL	Airline transport pilot licence
CBT	Computer-based training
CPL(A)	Commercial pilot license (aircraft)
FI(A)	Flight Instructor (aircraft)
ft	Feet
h	Hours
hPa	Hectopascals
IFR	Instrument flight rules
IR	Instrument rating
kg	Kilograms
km	Kilometres
kt	Knots
L	Left
LEDA	ICAO code for Lleida-Alguaire Airport
m	Metres
MEP	Multi-engine piston rating
METAR	Aviation routine weather report (in aeronautical meteorological code)
Min	Minutes
ICAO	International Civil Aviation Organisation
OEI	One engine inoperative
PBN	Performance-based navigation
PF	Pilot flying
PM	Pilot monitoring
QNH	Altimeter setting to obtain elevation above sea level when on the ground
R	Right
SEP	Single-engine piston rating
SOM	Standard Operating Manual
TAF	Terminal aerodrome forecast
UTC	Coordinated universal time
VFR	Visual flight rules
V_{SSE}	Safe single-engine speed

Technical report

IN-011/2022

Operator	BAA Training
Aircraft:	Tecnam P2006T, registration 5B-CLR (Cyprus)
Date and time of incident:	09 March 2022, 16:35 h[1]
Site of incident:	Lleida-Alguaire Airport (Lleida)
Persons on board:	2 (crew)
Type of flight:	General aviation - Training flight - Dual command
Phase of flight:	Landing
Type of operation:	VFR
Date of approval:	**27 April 2022**

Synopsis

Summary:

On Wednesday, 9 March 2022, the Tecnam P2006T aircraft, registration 5B-CLR, landed at Lérida-Alguaire airport (LEDA) without deploying its landing gear.

An instructor pilot and student pilot were on board the aircraft, both of whom were unharmed.

The aircraft sustained damage to the lower fuselage during the landing without landing gear.

The investigation has determined the cause of the incident was a failure to adhere to procedures, which resulted in the aircraft landing with its landing gear retracted.

The issue of a safety recommendation to the flight school has been deemed necessary.

[1] All times referenced in this report are local time. UTC is 1 hour less.

1. THE FACTS OF THE INCIDENT

1.1. Summary of the incident

On Wednesday, 9 March 2022, the Tecnam P2006T aircraft, registration 5B-CLR, landed at Lérida-Alguaire airport (LEDA) without having deployed its landing gear during a training flight. The aircraft was carrying an instructor pilot and a student pilot.

The incident occurred after they had been flying for approximately 2 hours and 15 minutes, and this was the first flight they had made that day. According to the testimonies they provided to the investigation, neither the instructor pilot nor the student pilot were fatigued and had rested well the night before.

During the first part of the flight, which lasted around 2 hours, they practised instrument approaches at Lleida-Alguaire airport. They then cancelled the instrument flight plan and proceeded to practise VFR circuits. In the first circuit, they performed a standard landing and take-off, on the second, a go-around, and on the third, they simulated a right engine failure on the right downwind leg for runway 13. Normally, an engine failure simulation is started in the second third of the downwind leg, but on this occasion, they started it in the last third of the leg.

After the simulated engine failure[2], the student pilot turned the aircraft to base and carried out the procedure to secure the inoperative engine. Their approach was high and very fast, so the instructor was focused on correcting the student. As a result, according to their statements, they failed to complete the checklist and make sure the light that indicates the landing gear is correctly deployed was illuminated[3].

Moreover, despite the acoustic alarm warning that the landing gear was not deployed sounding continuously from the moment they simulated the engine failure, they delayed the deployment and then forgot about it.

The aircraft landed without landing gear. They became aware that they had not extended the landing gear when the aircraft made contact with the runway. It travelled approximately 200 m along the runway before coming to a stop. Once stopped, they evacuated the aircraft without assistance. Both occupants were unharmed.

The aircraft sustained damage to the underside of its fuselage. At approximately 18:40 h, it was removed from the runway and taxied to the hanger using its own landing gear, which, according to the aircraft operator's testimony, was functioning correctly.

[2] To simulate the right engine failure, the instructor pilot pulled back the right throttle lever to idle.

[3] As indicated during the investigation, the last check on final (three green lights and full forward) is performed at an altitude of 200 ft above the runway.

1.2. Injuries to persons

Injuries	Crew	Passengers	Total in the aircraft	Others
Fatal				
Serious				
Minor				
Unharmed	2		2	
TOTAL	2		2	

1.3. Damage to the aircraft

The aircraft sustained damage to the lower fuselage as a result of landing without having deployed the landing gear.

1.4. Other damage

There was no further damage.

1.5. Information about the personnel

1.5.1. Information about the instructor pilot

The 56-year-old Serbian instructor pilot held a commercial pilot licence -CPL(A)-, first issued on 26 March 2014, with the SEP (land), MEP (land), ME/IR(A)/PBN and SE/IR(A)/PBN ratings, all valid until 30 November 2022. He also held the FI(A) SEP/MEP (land) rating, valid until 31 December 2023.

His Class 1 medical certificate was valid until 11 June 2022.

He had a total experience of more than 13,400 hours.

1.5.2. Information about the student pilot

The 35-year-old Turkish student pilot had a class 1 medical certificate valid until 21 April 2022.

He had 188 h of flight experience and was completing the final stage of the ATPL course, having practised engine failures both in a simulator and in flight. He had made 3 flights with the same instructor, 4 flights previously.

1.6. Information about the aircraft

- Make: Tecnam
- Model: P2006T
- Serial number: 093
- Registration number: 5B-CLR

- Maximum take-off weight: 1,280 Kg
- Number of engines: 2
- Type of engines: ROTAX 912 S3
- Information about the owner and operator: The aircraft is registered with the Cypriot Aircraft Registry in the name of MU Aviation LTD, a Cypriot company that had leased it from the Lithuanian ATO, BAA Training.

The aircraft had an Airworthiness Certificate and an Airworthiness Review Certificate, the latter being valid at the time of the event.

The following photograph shows the aircraft's instrument panel:

Image 1: Instrument panel on board the aircraft

1.6.1. Description of the landing gear position indication system on board the Tecnam P2006T aircraft

The system has a series of indicator lights that tell the pilot what position the landing gear is in:

- 3 green leg position lights. If lit, they indicate that the landing gear is extended and locked.
- 1 red transition light. If lit, it indicates that the landing gear is in the transition phase.
- 1 amber pump light on the annunciator panel, illuminated whenever the pump has a power supply.
- UP/DOWN micro-switches (two for each leg).
- Operation check push button: to check if the red light and the 3 green lights are working correctly.

In addition, an audible warning device sounds when the pilot selects certain throttle, flap and landing gear configurations. It consists of a horn or audible alarm that alerts the pilot when the landing gear position lever is in the UP position, and at least one of the two throttle controls and/or the flaps are set to the IDLE and LAND positions, respectively. The system is also designed to generate an audible warning whenever the flaps are lowered to the landing position, but the gear is not down and locked.

The system's flap-position sensor is activated by a micro-switch located in the upper central part of the cockpit.

1.7. Meteorological information

There were no limiting meteorological conditions for the flight.

1.8. Aids to navigation

N/A.

1.9. Communications

N/A.

1.10. Information about the aerodrome

The aircraft landed at Lleida-Alguaire Airport, whose ICAO code is LEDA. The airport is located 16 km northwest of the city at an elevation of 351 m. It has an asphalt runway designated 13/31, which is 2,500 m long by 61 m wide. At the time of the incident, the aircraft was landing on runway 13.

The airport's operating hours in winter are 07:00 to 17:00 UTC. During its hours of operation, aircraft can communicate with the airport on the approach frequency 127.700 MHz, tower frequency 131.325 MHz and taxiing frequency 121.625 MHz.

1.11. Flight recorders

The aircraft was not equipped with a flight data or cockpit voice recorder because they are not a regulatory requirement for this type of aircraft.

1.12. Aircraft wreckage and impact information

After landing without having extended the landing gear, the aircraft came to rest on the runway, as shown in the photograph:

Image 2: The aircraft immediately after landing without deploying the landing gear

The aircraft was removed from the runway and transferred to a hangar:

Image 3: The aircraft after extending the landing gear

The damage was concentrated on the underside of the fuselage:

Image 4: Condition of the underside of the aircraft's fuselage

1.13. Medical and pathological information

We have found no evidence to suggest the flight crew were affected by any physiological or disabling factors.

1.14. Fire

N/A.

1.15. Survival aspects

The harnesses and restraint systems worked adequately, and the cabin interior maintained its structural integrity.

1.16. Tests and research

1.16.1. Operator's approach procedure before the incident

The approach procedure established by the aircraft operator prior to the incident has been extracted from the Standard Operating Manual (SOM):

Once established on final PF announces: "Landing checklist". The items are completed at different times, so once they are completed is the checklist read, the autopilot can be delayed if used for an IFR approach.

The following items need to be confirmed:

1. LANDING GEAR	**DOWN**
2. PROPELLERS	FULL FORWARD
3. CARB HEAT	OFF
4. FLAPS	SET
5. LANDING LIGHT	ON
6. FUEL PUMPS	ON
7. FUEL SELECTORS	L=L, R=R
8. AUTOPILOT	OFF

Notes:

- *Landing gear position is checked by both PF and PM (FI) for safety.*
- *Propellers must set full forward in case of a go around. If in VFR this will be done on final. If IFR this is to be completed just prior to 1,000 ft AAL*
- *Fuel must set on in case of a go around. If in VFR this will be done on final. If IFR this is to be completed just prior to 1,000 ft AAL.*
- *Carburettor must set off in case of a go around. If in VFR this will be done on final. If IFR this is to be completed just prior to 1,000 ft AAL.*
- *Autopilot must be off for landing and go around, if in VFR minimum hight to be used is 1,000 ft. If IFR in approach mode down to minimums (not lower than 200 ft AAL).*

1.16.2. Operator's approach procedure after the incident

Following the incident, the operator modified the approach and landing checklists. It deleted items from the old landing checklist, which is now as follows:

1. LANDING GEAR	**DOWN (3 green lights)**
2. PROPS	FULL FORWARD
3. CARB HEAT	OFF
4. FLAPS	SET
5. LANDING LIGHT	ON
8. AUTOPILOT	DISCONNECT

And added items to the approach checklist:

3. CARB HEAT	ON IF REQUIRED
6. FUEL PUMPS	ON
7. FUEL SELECTORS	L=L, R=R

In addition, emphasis has been placed on the "Do then Read"[4] principle and checking the status of the landing gear.

[4] The checklist items are implemented from memory, and the checklist is subsequently read out to confirm that the tasks have been carried out correctly.

1.16.3. Engine failure training procedure before the incident

The operator's procedure for engine failure training has been extracted from the Standard Operating Manual (SOM):

Vsse is the minimum speed for intentionally rendering on engine inoperative in flight. This minimum speed provides the margin the manufacturer recommends when intentionally performing engine inoperative manoeuvres during training. Shutting down an engine for training shall not become a habit; for safety purpose, and to optimize training, engine shutdown to perform OEI shall be executed only when necessary and required by Regulations and training syllabus.

During training most engine failures will be simulated, the instructor will hide the throttles from the student and put one of them to idle. The student will then carry out the initial actions, only using the remaining throttle, both propeller levers. Once the student identifies the failed engine the instructor will no longer hide the throttle.

IMPORTANT: During simulated engine failures, the engine feathering and securing procedure is TOUCH DRILLS ONLY this means, no levers or buttons are to be set to the off or feather position, only pointed at and the action said aloud. E.g. "left throttle (while pointing at it) Idle, Left propeller (while pointing at it) feathered, Left ignition switches (while pointing at them) off".

Once the student has simulated feathering the propeller, the instructor will then set "zero thrust zero drag" and inform the student.

If the instructor has not covered the throttle and aircraft reacts as if it were experiencing an actual engine failure, then it could be real and then all actions including engine securing must be completed correctly.

Asymmetric committal height of 200 ft AAL, is used by BAA, below this height no single engine go arounds are to be performed, as the altitude lost while reconfiguring and establishing a climb could be more than available.

1.16.4. Engine failure training procedure after the incident

Following the incident, the operator modified its emergency procedure for an engine failure after take-off with the landing gear up: "*Engine failure after take-off, landing gear up (below 1500 ft AGL)*" by adding a safety note to specify that, during training flights, the simulated engine failure procedure must be practised before reaching the midpoint of the downwind leg of the aerodrome traffic pattern.

This procedure is included in Annexe I to this document.

1.16.5. Measures taken by the flight school after the incident

The flight school carried out an internal analysis of the incident and implemented or is implementing a number of measures to prevent similar events from happening in the future:

- A reminder on the use of checklists has been issued.
- The landing checklist has been reviewed and modified to lighten the workload of student pilots.
- The procedures contained in the SOM have been reviewed and modified to specify that, in the traffic pattern, at 200 ft AAL, an announcement (or "call out") must be made to either continue the approach if the aircraft is stable or to abort it if it is not.
- The cut-off point for performing engine failure simulations in the aerodrome traffic circuit has also been included in the SOM.
- All flight instructors are receiving CBT in fatigue management.
- Standardisation sessions focusing on the use of checklists are being conducted.

In addition, as the student pilot remarked that he was confused with aural alert, since Tecnam P2006T warning for retracted landing gear sounded for him very similar to Cessna 172s stall warning, the flight school recorded and compared these aural warnings and it appeared that they are not very similar.

1.17. Organisational and management information

BAA Training is a training organisation approved (ATO) by the Lithuanian Transport Agency (CAA), in compliance with the applicable European regulations,

1.18. Additional information

N/A.

1.19. Special investigation techniques

N/A

2. ANALYSIS

Several aspects of the incident were analysed, including the possible fatigue and workload of both pilots and the warnings from the landing gear system.

2.1. Analysis of the fatigue and workload of the instructor and student pilot

During the investigation, both pilots stated that they were not fatigued during the flight and had rested well the night before. This was their first flight of the day, and they had been flying for approximately 2 h 15 min when the incident occurred.

During the engine failure simulation, the instructor is supposed to supervise the flight and complete the checklists, which did not happen.

After analysing the event, the flight school decided to modify its procedures to stipulate that engine failure simulations must be practised before reaching the midpoint of the downwind leg in the aerodrome traffic pattern so that student pilots have sufficient time to configure the aircraft correctly. The landing checklist has also been modified as the number of items to be checked was considered excessive.

Given the above, we have concluded that issuing a safety recommendation in this regard is unnecessary.

2.2. Analysis of the landing gear system warnings

The aircraft is equipped with two warnings to alert the flight crew that the landing gear has not deployed correctly:

- A visual warning system in the form of 3 green lights that illuminate when the landing gear has deployed correctly.

  According to the information provided by the instructor pilot during the investigation, they failed to check that the 3 green lights were on before landing because they did not complete the checklist.

- An audible alarm that warns when the landing gear is not deployed.

  This alarm sounded continuously from the moment they simulated the engine failure.

It has been established that none of these warnings were heeded by the crew. The student pilot remarked that he confused it with the stall warning aural alert.

However, as the flight school has taken action to improve the safety of its operation, no safety recommendations are issued in this regard.

3. CONCLUSIONS

3.1. Findings

- The landing gear extension system was functionally operational throughout the event.
- The crew ignored the audible alarm and delayed deploying the landing gear, eventually forgetting to carry out the task entirely because they did not refer to the checklist.
- The crew did not check, by completing the checklist, that the landing gear was correctly deployed.

3.2. Causes/contributing factors

The investigation has determined the cause of the incident was a failure to adhere to procedures, which resulted in the aircraft landing with its landing gear retracted.

4. OPERATIONAL SAFETY RECOMMENDATIONS

A safety recommendation is issued to the flight school as an error has been detected in the Standard Operating Manual (SOM), specifically in the procedure for engine failure training included in section 1.16.3 of this report.

According to this procedure, the trainee will first perform the initial actions and then identify the failed engine, when the correct sequence should be for the trainee to first identify the failed engine and then carry out the initial actions. For this reason:

REC 12/22: It is recommended that the school modify the sequence of actions in the engine failure procedure.

ANNEXE I. ENGINE FAILURE TRAINING PROCEDURE AFTER THE INCIDENT

The procedure established by the operator in the event of an engine failure after take-off is detailed below. Following the incident, the note marked in red was added to the procedure.

6.7. ENGINE FAILURE AFTER TAKE OFF, LANDING GEAR UP (Below 1500 FT AGL)

If the engine failure occurs after takeoff with the landing gear and sufficient climb performance on one engine the takeoff can be continued. The pilot's actions must be carried out according to the take-off and emergency briefing:

Initial action:

- Control: rudder (stop yaw), Ailerons (stop roll) Elevator (maintain blue line speed).
- Power: Propellers full forward, Throttles full forward.
- Drag: confirm landing gear up, flaps up.
- Identify the dead engine: Dead leg, dead engine.

Feathering the engine:

- Throttle: close to verify no change in yaw
- Propeller: feather
- OPERATIVE ENGINE: Propeller max continuous 2265 RPM

Securing, once at a safe height:

- Field: of the dead engine, off
- Ignition: of the dead engine, off
- Fuel pump: off on dead engine, turn on for the live engine
- Fuel selector: of the dead engine, off, manage fuel as required
- Trim: up to 5 degrees towards the live engine

Note:

- If required to shed load Avionics and Cross bus of the dead engine, off
- There is no requirement for the Tecnam P2006T to maintain a climb after an engine failure, in accordance with EASA CS-23. In certain conditions a forced landing might still be required.
- REMINDER: if it is simulated engine failure then securing procedure is touch drills only.

SAFETY NOTE: During training flights in Traffic Pattern, simulated Engine Failure procedure shall be practice until reaching mid downwind position.

Single engine traffic pattern is similar to a normal pattern the differences are:

- Max flaps T/O for landing.
- Landing gear is selected down, when final descent to land is made.
- Rudder trim must be verified neutral on final.
- Use an approach speed of at least blue line in case of a go around.
- Asymmetric committal height of 200ft AAL is used, below this height no go around it to be performed.
- During a go around select full power and maintain blue line speed then, gear up and flaps up straight away, do not wait for a positive rate of climb. The climb might only be achievable after cleaning up the aircraft.