The State of Israel

Ministry of Transport and Road Safety
Aircraft safety Investigation Authority of Israel (AIAI)

Safety Investigation Final Report

Accident File No. 3-25

Complete Engine Power Loss after Takeoff and Execution of a Belly Landing

Date	February 8, 2025
Type of Aircraft	FLY SYNTHESIS TEXAN 3.0 RG
Aircraft Registration	4X-HYX
Occurrence Location	Masada Airfield (LLMZ)

For Safety Purposes only

Israel Air Navigation Law regarding safety investigation and its outcomes

Safety investigation - An investigation of a safety incident to this chapter is a procedure that includes gathering information and analyzing it, drawing conclusions, including determining the causes of the safety incident or the factors that contributed to its occurrence, and providing recommendations related to the matter for the purpose of improving aviation safety, as far as the Aircraft safety Investigation Authority Israel (AIAI) deems it necessary. (IAL, Article 104).

Purpose of a safety investigation - The sole purpose of a safety investigation is the prevention of safety incidents, and its purpose is not to attribute civil, criminal or disciplinary liability to such incidents. (IAL, Article 105).

Duties of the AIAI - The IIC will be in charge of conducting safety investigations according to the provisions of this chapter. In fulfilling his duties, the IIC will act in accordance with the provisions of ICAO Annex 13, insofar as they are applicable in Israel, with the exception of such provisions for which the CAAI informed ICAO, according to the provisions of article 4(b) of the Civil Aviation Authority Law, that Israel operates in a different manner. (IAL, Article 108).

Independence - in carrying out a safety investigation according to this chapter, there is no prejudice against the AIAI manager and his deputy, other than the justice; The provisions of this section shall also apply to an investigator authorized under article 115, subject to the provisions of subsection (c) of said section. (IAL, Article 109).

Publication of the Final Report - The AIAI will publish the final report on its and will also make the report available for public inspection, free of charge, at the Ministry of Transportation and Road Safety, provided that it will not publish the report or part of it and will not make it available for public inspection as stated, if there is any contradiction with the country's security or its foreign relations. (IAL, Article 119).

The recommendations of the AIAI - the CAAI and anyone for whom the AIAI included recommendations in the final report will examine the aforementioned recommendations concerning him, will decide as to their implementation and will notify the AIAI of his reasoned decision in writing; The CAAI will forward his reasoned decision to the minister as well. (IAL, Article 122).

Inadmissibility of the final report - The final report will not be accepted as evidence in a trial, except in an appeal according to article 39, in an administrative petition or in an administrative appeal against decisions according to this law, according to the Law of Courts for Administrative Matters, 2000, and will not be used in a procedure taken by an employer against his employee , and regarding a procedure against a pilot employee according to article 38 - will not be used unless the circumstances stated in article 138(b) are met (IAL, Article 124).

Confidentiality and inadmissibility of safety investigation material - Safety investigation material will not be given and will not be accepted as evidence in a trial and will not be used in a disciplinary procedure, in an administrative procedure or in a procedure taken by an employer against his employee. (IAL, Article 123).

In the morning hours of February 8, 2025, a TEXAN 3.0 RG Light Sport Aircraft (hereinafter: "**the aircraft**"), carrying a private pilot and a passenger, departed Rishon LeZion airfield (hereinafter: "**the home airfield**") to Masada airfield (hereinafter: "**the airfield**") for a cross-country flight.

After an hour-long refreshment break at Masada airfield, the aircraft took off from Runway 19 on its way back to its home airfield. Fifty-six seconds after takeoff, while on a southerly heading, at a horizontal distance of approximately 0.78 statute miles (1.25 kilometers) and an altitude of 265 feet above the line-up and takeoff point[1], the aircraft experienced a complete engine power loss.

The pilot, who was unable to locate a suitable landing area in front of the aircraft, executed a right-hand turn to a northerly heading, trimmed for best glide speed, and maintained a clean configuration by keeping the flaps and landing gear retracted. The pilot successfully returned the aircraft to the airfield and performed a belly landing at the threshold of Runway 01 (hereinafter: "**the occurrence**").

The occurrence was reported to the Director of the Aircraft safety Investigation Authority of Israel (AIAI), who decided to open a safety investigation to examine the circumstances which led to the occurrence.

Picture 1 – **The final aircraft position after the accident**

[1] The altitude as recorded by the Garmin G3X flight instrument system installed in the aircraft.

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Abbreviations	
AD	Airworthiness Directive
AFM	Aircraft Flight Manual
AIAI	Aircraft safety Investigation Authority of Israel
ANR	Air Navigation Regulation
BCAR	British Civil Airworthiness Requirements
DC	Direct Current
ECU	Engine Control Unit
EGT	Exhaust Gas Temperature
EMS	Engine Management System
IAL	Israel Air Law
LSA	Light Sport Aircraft
RPM	Revolutions Per Minute
SEM/EDS	Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy
SB	Service Bulletin
TC	Type Certificate
TCDS	Type Certificate Data Sheet
UTC	Coordinated Universal Time
VMC	Visual Meteorological Conditions

General Notes

- Unless otherwise specified in this report:
    - Times and altitudes are based on data downloaded from the Garmin G3X avionics system which was installed in the aircraft.
    - All times mentioned are in Local Time[2].
- The engine manufacturer BRP-Rotax GmbH & Co KG, is referred to in this report as "Rotax".
- The Aircraft safety Investigative Authority team would like to thank Rotax company for their continued assistance and support in this safety investigation.

Technical Terminology

- **Aircraft Flight Manual (AFM)** - A document, authored by the aircraft manufacturer and approved by the Civil Aviation Authority (CAA), containing information specific to the aircraft **model for which it was written**. The AFM includes operational information, including sections on operating limitations, normal and emergency procedures, weight and balance, performance, aircraft systems descriptions, and more.
- **Service Bulletin (SB**) - A document issued by an aircraft, engine, or component manufacturer to notify owners and operators of modifications, repairs, improvements, or required inspections. While the contents of an SB are not always mandatory, owners and operators are expected to review and address the safety implications detailed therein. An SB titled "Mandatory," "Alert," or "Emergency" indicates a significant safety issue; consequently, the regulator that certified the aircraft, engine, or component may, at its discretion, issue an Airworthiness Directive (AD).
- **Airworthiness Directive (AD)** - A document issued by the regulatory authority to aircraft owners to notify them of an unsafe condition discovered in an aircraft, specifying the required corrective actions and the compliance timeframe. Compliance with an AD **is mandatory** in order to maintain the aircraft's continued airworthiness.
- The term "Vapor Lock" refers to the formation of vapor in the fuel system which disrupts engine operation.

[2] Israel Standard Time (Winter), UTC+2.

1. Factual Information

1.1 History of the flight

In the morning hours of February 8, 2025, several light sport aircraft (LSA) pilots met at the Rison LeZion airfield (LLRS) pilot lounge prior to their planned departure towards Masada airfield (LLMZ) in six separate aircrafts.

A person, who holds a pilot license and has experience flying LSA's and Texan aircraft (hereinafter: “**the passenger**”), also arrived that morning at the pilot lounge. The passenger asked the occurrence pilot (hereinafter: “**the pilot**”) to join him for his planned cross-country flight. The pilot, who had prior acquaintance with the passenger, agreed to the request.

At 10:26, after refueling the aircraft with 42 liters of 95-Octane automotive fuel (MOGAS) from the home airfield fueling station, the pilot taxied the aircraft to runway 36, which was the runway in use at that time.

After about 7 minutes, at 10:33, the airplane took off on its way to the Masada airfield along a route that passes over Jerusalem (see Picture 2). After an uneventful flight**, t**he airplane landed at its destination after about 43 minutes.

Picture 2 – **Actual route from the Rishon LeZion airfield to Masad airfield**

After landing and parking the aircraft in the designated area at the airfield (see Picture 3), the pilot and the passenger joined the other pilots, who arrived that morning with their aircafts from the home airfield to the Masada airfield.

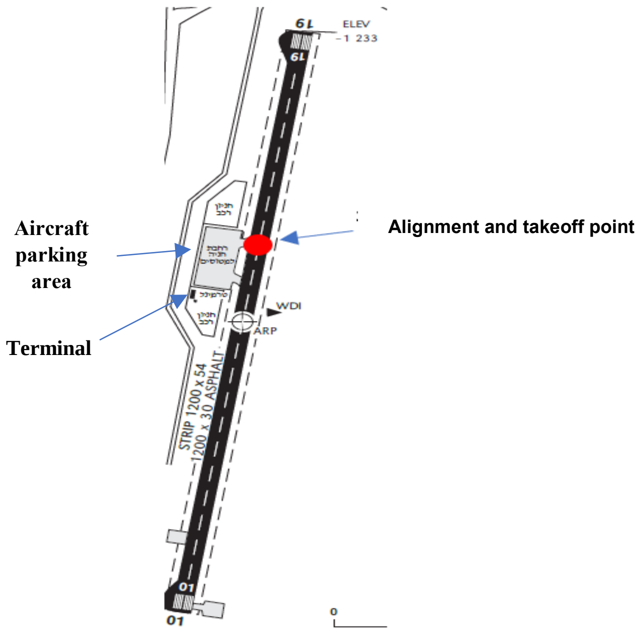
At the end of a refreshment break of about an hour at the pilots' club (the "terminal", see Picture 3), everyone went out to the parking apron and started their preparations for the return flight along a southern route (passing over the city of Arad).

After a brief conversation, the pilot boarded the aircraft and sat, as usual, in the right seat (which was the designated pilot-in-command's seat in that specific aircraft). The passenger followed and sat in the left seat.

At 12:22:41, the pilot started the aircraft engine for the first time after the refreshment break. Since the aircraft canopy had been left open while the aircraft was taxiing on the apron, the passenger's jacket flew out of the aircraft. In order to allow the passenger to exit and retrieve his jacket, the pilot taxied the aircraft back to the initial parking spot where it had been parked earlier. The pilot shut down the aircraft engine after it had been running for 44 seconds.

After an additional 31 seconds, at 12:23:56, while the passenger was walking on the apron to collect his jacket, the pilot started the engine again and taxied several meters to get closer to the passenger. Before the passenger returned to the aircraft, the pilot shut down the aircraft engine a second time after it had been running for 25 seconds.

At 12:24:53, after the passenger returned and sat in the left seat of the aircraft, and after the aircraft remained the last one on the ground (among the group of aircraft that were departing Masada airfield at that time), the pilot started the aircraft engine for the third time, taxied via the taxiway to runway 19, and took off 21 seconds after the third engine start.



Picture 3 - **Alignment and takeoff point at the Masada airfield**

Fifty-six seconds after takeoff power application, at 12:26:10, while on a southerly heading, at a horizontal distance of approximately 0.78 statute miles and at an altitude of 265 feet above the lineup and takeoff point, the aircraft experienced a complete engine power loss.

The pilot, who was unable to locate a suitable landing area in front of the aircraft, executed a right turn to a northerly heading, trimmed for best glide speed, maintained a clean configuration. Prior to touchdown, the pilot attempted to restart the engine, which was unsuccessful. The pilot executed a belly landing at the beginning of runway 01 at Masada airfield. During the landing, the aircraft yawed approximately 90 degrees to the right and came to rest on its belly with the aircraft nose pointing east-southeast. The pilot and passenger exited the aircraft unharmed.

The pilot reported the accident to the AIAI director, who requested a written report and photographs from the accident site.

Concurrently, the pilot requested, on behalf of the airfield operator, the AIAI director's authorization to move the aircraft from the runway as soon as possible, in order to allow the landing of a skydiving aircraft that was operating above the airfield at that time.

After receiving an initial written report and several photographs, the AIAI director authorized the pilot to **move the aircraft**, which was blocking the airfield's one and only runway[3].

Following the AIAI director authorization, the passenger gathered several people who were at the airfield at that time, and they assisted in lifting the aircraft into the air in order to lower the landing gear, which was then extended and lowered. After lowering the landing gear, the pilot and passenger identified damage to the right landing gear leg.

To enable moving the aircraft, the main wheels were secured using a tie-down strap and a ratchet (see Picture 4). Approximately 40 minutes after the accident, and after the pilot and passenger verified that the right landing gear leg remained stable in place, the pilot started the aircraft engine and taxied it to the airfield parking apron. According to the testimonies collected, there was no difficulty starting the aircraft after the accident.

[3] Such authorization to remove the aircraft from the runway was not an authorization to start the aircraft engine.

Picture 4 - **Securing the landing gear using tie-down straps and a ratchet**

After shutting down the aircraft engine, the airfield operator requested the pilot to change the aircraft location on the parking apron to not interfere with other activities taking place at the airfield. To do so, the pilot started the aircraft engine a second time and taxied it to a nearby new parking spot. After the aircraft repositioning, the pilot started the aircraft engine a third time for an additional check that lasted 28 seconds.

1.2 Injuries to persons

Injuries	Crew	Passengers	Notes
Fatal	0	0	-
Serious	0	0	-
Minor	0	0	-
None	1	1	**The event ended without casualties**

1.3 Damage to the aircraft

The aircraft's belly landing caused damage to the aircraft fuselage and a hole was created in its underside. Additionally:

a) Abrasions were caused to the underside of the tail assembly, wheel fairings, and exhaust.

b) The transponder and voice communication (COM) antennas were broken.

c) The right landing gear leg torque link was broken.

d) The nose landing gear tire was damaged and required replacement.

1.4 Other damage

None.

1.5 Personnel Information

1.5.1 Pilot-in-Command

Age: 56 years old.

Pilot licence grade: Private Pilot Licence.

Ratings: Light Sport Aircraft (LSA Group A) rating.

Medical certificate: Valid.

Last proficiency check (LSA Group A): Valid.

Flight experience: Approximately 1,350 flight hours, most of them on LSAs.

1.5.2 Passenger

Age: 74 years old.

Pilot licence grade: Private Pilot License.

Ratings: Light Sport Aircraft (LSA Group A) rating.

Medical certificate: Valid.

Last proficiency check (LSA Group A): Valid.

Flight experience: Approximately 2,500 flight hours on LSAs (most of them on the Texan

aircraft model).

1.6 Aircraft Information

1.6.1 General information

Type: Light Sport Aircraft.

Model: TEXAN 3.0 RG.

Manufacturer: FLY SYNTHESIS Srl (Italy).

Serial number: F2GL1811303F.

Year of manufacture: 2020.

State of registration: Israel.

Nationality and registration marks: 4X-HYX.

Registration certificate: Number 4410, dated 17.11.2022.

Registration basis: Type Certificate (TC) revision no. 13 (August 2022).

Airworthiness certificate validity: Valid until 14.03.2025.

Maximum takeoff weight: 600 kg.

Airframe hours at time of accident: 163.1 hours.

Type and date of last maintenance: Annual inspection on 07.11.2024 (137.5 airframe hours).

1.6.2 Engine

Model: 915iS 3A with turbocharger (Turbocharged Engine).

Manufacturer: BRP Rotax GmbH & Co KG.

Serial number: 9132097.

Year of manufacture: 2018.

Engine hours at time of accident: 162.4 hours.

The aircraft engine is a 4-cylinder, 4-stroke fuel-injected engine equipped with an Engine Management System (EMS), whose function, among others, is to manage the fuel mixture

entering the engine, the operation of the fuel injectors, the generators' activity, and the operation of the spark plugs. The core of the EMS is the Engine Control Unit (ECU), whose function and implications are described further below.

1.6.3 Propeller

Manufacturer: GT Propellers.

Propeller model: GT2VEB GT-2V29 174RFW101SRTC4.

Propeller serial number: 2037.

Pitch type: Variable.

1.6.4 Propeller Blades

Number of blades: 2.

Blade model: V29.

Blade serial numbers: P-192114, P-192115.

Material: Wood-composite.

Year of manufacture: 2019.

1.6.5 Engine Control Unit (ECU)

☒ **General**:

The Engine Control Unit has two designated modules - Lane A and Lane B. Under normal conditions, normal engine operation and when both modules are active (switches in the ON position), full redundancy is maintained in the control, regulation, and monitoring of engine operation. In the event of a full or partial failure in one of the modules, the ECU sensors, automatically selects the module that will control engine operation.

☒ **Ignition:**

The 915iS engine has an electronic signal, received from two independent sensors, that controls the ignition and its timing. The electronic signal is managed by the ECU.

☒ **Fuel injection:**

The engine is equipped with an electric fuel injection system controlled by the ECU, which enables the creation of an optimal fuel mixture according to the engine load and environmental conditions. In determining the amount of mixture entering the cylinder, various parameters are considered, including the throttle lever position (ECO or POWER Mode), manifold pressure, engine RPM, air (intake) temperature, and atmospheric pressure.

[4] The Propeller model listed in the CAAI aircraft registration system is GT2VEG GT-2V11 174R. The propeller model listed is different than the one found installed on the aircraft.

1.6.6 Fuel System

☒ **Fuel type:**

In addition to aviation fuel (100LL), 95-Octane unleaded automotive fuel may be used.

☒ **Fuel tanks:**

A tank with a capacity of 67 liters in each wing[5]. Each tank has a vent line and fuel lines that lead the fuel through the fuel selector and two types of filters (coarse and fine) to the engine.

☒ **Fuel tank selector:**

The fuel tank selector has three positions - R (right tank), L (left tank), OFF (closed). The fuel selector position determines from which tank fuel will be drawn to the engine. To switch between the three positions, the fuel selector must be lifted and rotated to reach the desired position.

From the data collected by the investigation team, it appears that prior to the flight, the pilot refueled only the left fuel tank, and throughout the accident flight, the fuel tank selector was and remained on the left fuel tank.

Picture 5 - **Fuel tank selector position as found after the accident**

☒ **Fuel pumps:**

The aircraft has two electric pumps (primary and backup). These pumps were replaced, as required, in 2022 as part of a (mandatory) service bulletin issued by the engine manufacturer.

The electric fuel pumps (installed in series on the fuel supply line to the engine) are operated by two switches located adjacent to each other on the central console in the cockpit. For each fuel pump separately - in the ON position the pump operates and in the OFF position the pump is off.

When both fuel pumps are off, fuel is not pumped and is not supplied to the engine.

[5] According to the AFM, 2 liters in each fuel tank are unusable.

According to the pilot, both fuel pump switches at the time of the accident were in the ON position.

Picture 6 – **Location of the fuel pump switches on the aircraft center console**

1.6.7 Electrical system

☒ **General:**

The Texan aircraft has a 12-14 volt DC electrical system, consisting of a fuse box, regulator, two generators, and a battery, whose main purpose is to supply power to the Engine Management System (EMS) and to the instruments in the cockpit.

☒ **Fuse box:**

A unit that determines, according to the engine state, which electrical source feeds the Engine Management System (EMS) and whether the source is an external power source (aircraft battery) or one of the generators.

For engine starting (normal engine start or an engine start in emergency situation), an external power source (aircraft battery) is required to operate the Engine Management System (EMS). However, after the engine has been started and the RPM has reached the required level, generator B comes into operation and supplies voltage to the system. After the engine has exceeded a defined RPM threshold for a specified period of time (~2400 RPM + 8 sec) and has completed a self-test, the ECU automatically changes the aircraft's electrical source to generator A, so that during flight, generator A is the main electrical source supplying voltage to the EMS, while generator B charges the battery and supplies voltage to the cockpit instruments.

☒ **Battery:**

According to the Aircraft Flight Manual (AFM), the Texan aircraft has a 12V, 18Ah sealed lead-acid battery. The battery's functions are to supply voltage:

- To the electric starter, via a spring-loaded switch, for engine starting.
- To the flight instruments, for a short time, when the engine is off.
- For flap operation.

☒ **Backup Battery Switch:**

The aircraft has a "Backup Battery Switch". According to the electrical system logic, when the switch is in the ON position, voltage to the EMS is supplied by the battery only, <u>**regardless of the state of the generators**</u>.

If the switch remains in the ON position, the battery may drain even if the generators are operating.

If the aircraft engine shuts down and the generators are not operating, the switch must be moved to the ON position to enable voltage for restarting the aircraft engine.

It should be noted that according to the AFM, a fully charged battery can allow operation of the electrical consumers (trim, flaps, and backup fuel pump) for 20 minutes.

☒ **Generators:**

The aircraft has two separate and independent generators (generator A and generator B). During flight, generator A supplies voltage to the Engine Management System (it cannot supply voltage to the cockpit instruments) and generator B supplies voltage to the flight instruments and charges the battery. In this state, the voltage in the electrical system is between 13.75 and 14 volts.

<u>Generator A failure (B functioning normally)</u>: In this state, the EMS will switch its electrical source to generator B, but as a result, generator B will not be able to supply voltage to the flight instruments or charge the battery. **When generator B is supplying voltage to the EMS, there will be no impact on engine power or performance.**

<u>Generator B failure (A functioning normally)</u>: In this state, generator A will continue to supply voltage to the EMS, but the flight instruments will not receive voltage from generator A and the battery will not be charged. The ECU does not provide a warning

for this condition. To operate the flight instruments, the pilot will be required to connect the battery using the Backup Battery Switch located in the cockpit.

Failure of both generators: In this state, the engine will stop unless the Engine Management System (EMS) continues to receive voltage from an external electrical source (moving the Backup Battery switch to the ON position).

1.6.8 Additional information

According to the pilot, the aircraft's journey and maintenance logs were lost approximately **seven months** prior to the accident (and have not been completed since). Therefore, their contents were not available for examination by the investigation team.

The pilot noted that at the time of departure for the accident flight, there were no open or known malfunctions in the aircraft.

1.7 Meteorological Information

At the time of the accident, VMC conditions prevailed at Masada airfield.

Wind: Easterly up to 10 knots.

Temperature: 15°C.

Pressure: 1,019 millibars.

1.8 Aids to navigation

Not Relevant.

1.9 Communications

Radio communication at the time of the accident was conducted on the Masada airfield frequency. The pilot announced over the radio an engine failure and reported returning to land at the airfield.

1.10 Masada airfield informaion

- ☒ Location - East of Highway 90, approximately 1.5 km north of the Masada junction.
- ☒ Elevation - minus 1,233 feet (below sea level).
- ☒ Asphalt runway oriented 01/19, 1,200 meters in length and 30 meters in width.

1.11 **Fligh**t recorders

1.11.1 Voice recorders

No voice recorders are installed in the aircraft.

1.11.2 Flight data recorder

Flight data is recorded by the Garmin G3X system (hereinafter: "**the Garmin system**") installed in the aircraft.

1.11.3 Engine data recorder

Engine data is recorded by the Engine Control Unit (ECU).

1.12 Wreckage and impact information

The Texan aircraft performed a belly landing at the beginning of runway 01 at the airfield. Upon touchdown, the aircraft yawed approximately 90 degrees to the right, causing significant damage to the aircraft and its components as detailed in section 1.3 above.

1.13 Medical and Pathological Information

Not Relevant.

1.14 Fire

Not Relevant.

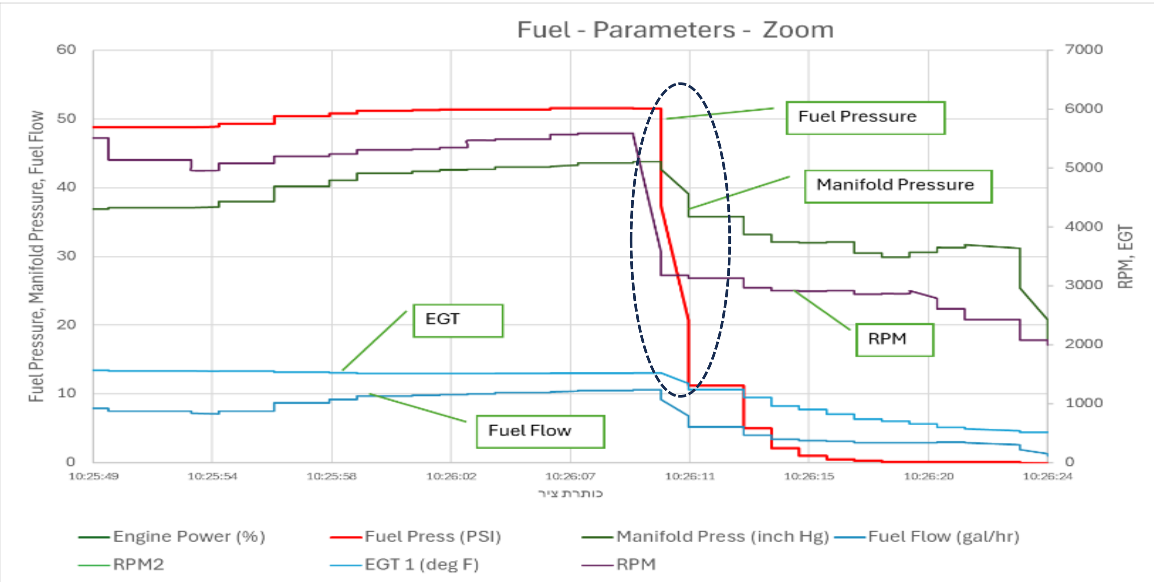
1.15 Survival Aspects

The pilot and passenger exited the aircraft on their own and were unharmed.

1.16 Tests and Research

1.16.1 Flight Data System

Flight data and engine data, as recorded by the Garmin system and the Engine Control Unit data system, were downloaded from the aircraft by the investigation team after the accident. Graph 1 presents selected parameters as recorded by the Garmin system at 10:26 (UTC), at the time of the compete engine power loss in flight.



Graph 1 **- Engine and fuel data at the time of the occurrence**

The data shows a sharp, steep, and nearly simultaneous drop in engine RPM and fuel pressure at the time of the accident.

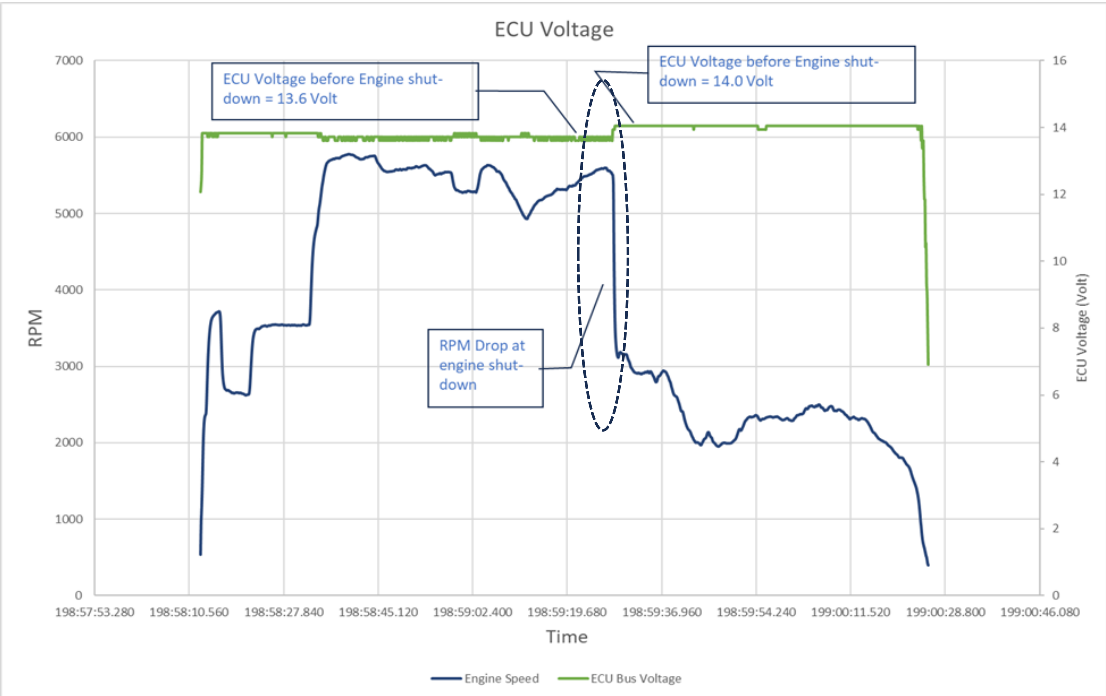
In light of this, in order to identify the root causes of the accident, the investigation team focused on examining the technical aspects, and in the collection and review of data related to the propeller, ignition, electrical, fuel, and engine systems of the Texan aircraft.

1.16.2 Engine Control Unit (ECU) data

Engine Control Unit data downloaded from the aircraft after the accident indicates that:

a) At the time of the accident, the generators were operating as expected in normal flight mode, with generator B charging the battery and generator A serving as the electrical voltage source for the EMS.

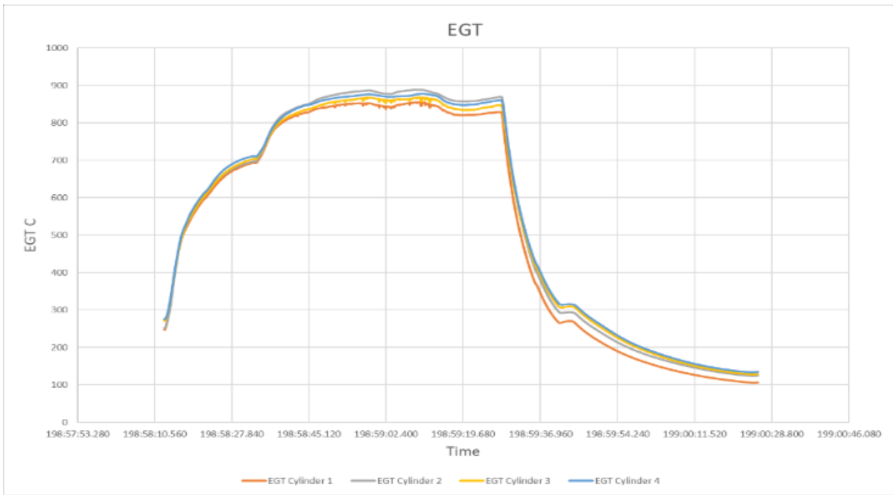
b) The electrical voltage available in the electrical system prior to the accident was approximately 13.6 volts, and at the time of the fuel pressure drop, the available electrical voltage rose to approximately 14.0 volts. This indicates that one or more electrical consumers were disconnected from the system.



Graph 2 - **ECU BUS Voltage**

c) Immediately after the fuel pressure drop:

- The engine changes the amount of air/fuel mixture injected into the engine and the ignition timing in order to try to compensate for the RPM decrease.
- The EGT decrease rate behavior in all four cylinders after the engine shutdown was similar. This indicates **uniform operation** of the cylinders and the absence of fuel combustion in them.



Graph 3 - **EGT Data**

1.16.3 Fuel samples

Fuel samples were taken from the right and left fuel tanks and from the aircraft's fuel filter after the accident and sent for laboratory testing at the Israel Institute for Energy and Environment.

The fuel sample mixture test conducted by the Institute found that:

"The gasoline does not comply with specification requirements for vapor pressure, distillation, and presence of particles."

1.16.4 Fine fuel filter inspection

The fine fuel filter was sent for laboratory testing. SEM/EDS tests consistently revealed particles characteristic of water traces and corrosion in the fuel filter, indicating that there is a high probability that seawater penetrated the fuel tank. Despite the above, the summary report states:

"We are doubtful whether the condition of the filter as received in the laboratory indicates the possibility of blockage of fuel passage toward the engine and the possibility of engine power loss in flight."

1.16.5 Laboratory testing of fuel pumps

The fuel pumps were sent to Rotax company laboratories in Austria for comprehensive functionality tests and to obtain a summary report from the manufacturer of the aircraft involved in the accident.

The tests included two examinations:

- Function test - a functionality test identical to that performed on every new fuel pump leaving the factory.
- Endurance test - a 24-hour test examining the function of each fuel pump separately and both pumps together.

Picture 7 **- Fuel Pumps in Durability Test**

The results of the above tests as summarized by the engine manufacturer:

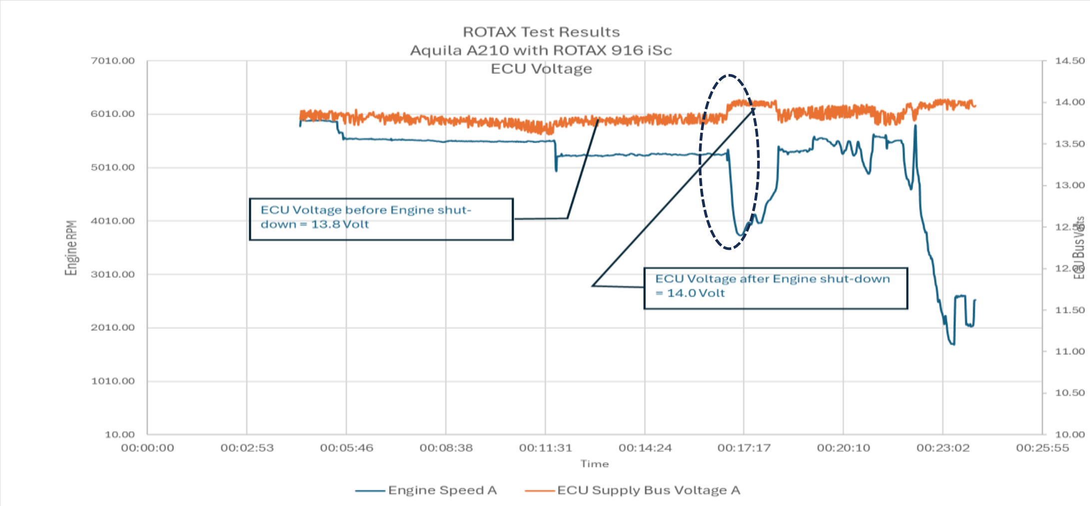
"The tests carried out revealed that the fuel pumps functioned as intended."

That is, in the various laboratory tests, the engine manufacturer found no evidence of failure in the fuel pumps.

1.16.6 Test flight - measurements and documentation

On 21.09.2025, at the request of the CAAI, Rotax company conducted a test flight in which various parameters relating to the electrical system activity during intentional shutdown of fuel pumps in flight were measured and documented. Rotax company used its test aircraft, an Aquila A210 (hereinafter: "**the test aircraft**") equipped with a 916iSc A engine, whose fuel pumps are completely identical to those that were installed in the Texan aircraft involved in the investigated safety occurrence.

The test aircraft took off and climbed to a safety altitude of 3,100 feet AGL. Upon reaching cruise, the test pilot intentionally shut off the (backup) fuel pump. As a result, no change was observed in the ECU BUS voltage. The pilot then shut off the primary fuel pump. **As a result, the test aircraft experienced a complete engine power loss and at the time of the fuel pressure drop caused by the shutdown of both fuel pumps, the ECU BUS voltage rose from 13.8 volts to 14.0 volts.** During the descent, operation of the primary and backup fuel pumps was respectively restored, and the aircraft engine was restarted.



Graph 4 **- ECU data during the test flight**

The voltage measurements taken in the electrical system during the intentional shutdown of the fuel pumps by the test pilot showed an increase in the ECU BUS voltage, the characteristics of which are identical to those that occurred during the engine shutdown of the Texan aircraft involved in the accident (see Graph 2 in section 1.16.2 above).

1.17 Organizational and management information

1.17.1 Civil Aviation Authority of Israel (CAAI)

The Civil Aviation Authority of Israel is the regulator responsible for various aspects relating to civil aviation in the State of Israel. The Authority operates under the Civil Aviation Authority Law (2005), and in accordance with the powers detailed in the Israel Air Navigation Law (2011).

Among its many functions, the Authority is responsible for the issuance of Type Certificates (TC), aircraft registration certificates, and certificate of airworthiness for light sport aircrafts registered in the Israeli Aircraft Registry. The CAAI is the body that supervises the various aspects relating to the design, maintenance, and airworthiness of said aircraft.

1.17.2 BRP Rotax GmbH & Co KG

An Austrian company engaged in the manufacture of engines (two-stroke and four-stroke) for various sectors involved in sports and leisure. Today, the company's engines are widely used in light sport aircraft and unmanned aerial vehicles.

1.17.3 FLY SYNTHESIS Srl

An Italian company that manufactured light sport aircraft, including the Texan aircraft model. The company held a Type Certificate (TC) for this aircraft model issued by the CAAI in 2002 (TCDS revision 0). The company ceased operations in 2024, was sold, and reopened under new ownership.

1.17.4 Gryphen Aircraft Srl

An Italian company that in 2024 purchased the assets of FLY SYNTHESIS Srl, which had closed its doors several months earlier. The company continues its predecessor's work in manufacturing light sport aircraft, including the Texan aircraft model. Since April 2025, Gryphen holds the Type Certificate (TC) from the CAAI for said aircraft model (TCDS revision 15).

1.18 Additional information

The investigation team focused primarily in this safety investigation on examining the circumstances that led to the aircraft engine shutdown after takeoff, which resulted in a belly landing. Nevertheless, the investigation revealed gaps relating to the aircraft documents, operating literature, and checklists compared to the requirements of the manufacturers of the components/systems installed in the aircraft and the design requirements. Therefore, this investigation report expanded the examination and also reviewed said gaps.

1.18.1 Texan aircraft model 3.0 RG Documents

- **Type Certificate**

A Type Certificate (TC) is a certificate issued by a state's civil aviation authority, certifying that an aircraft model, engine, or aviation component meets the required design, airworthiness level, and aviation safety standards.

The TCDS, which is an integral part of the Type Certificate, specifies the conditions and limitations applicable to the approved model.

In May 2002, the Texan aircraft model was issued Type Certificate number IA180 (TCDS Rev 0) by the CAAI. Over the years (up to the writing of this investigation report), 16 changes (hereinafter: "**revisions**") have been approved to the said Type Certificate.

In revision 13 of August 2022, the CAAI approved the TEXAN 3.0 RG model for flight in Israel under the above Type Certificate. Unlike previous models, the TCDS does not specify the AFM or Maintenance Manual revision number (MM/AFM Revisions).

Service Information	TEXAN **3.0 RG** Technical Information (Service Bulletins/Letters), issued by Flysynthesis and approved by CAAI. **Available documents for TEXAN 3.0 RG:** - FM_TEXAN 3.0 RG (last Revision) - MM TEXAN 3.0 RG (last Revision)

Picture 8 **- Section from the TEXAN aircraft TCDS (Update 13)**

- **Aircraft Flight Manual (AFM)**

The Aircraft Flight Manual is a document containing information tailored to the **aircraft model** for which it was written. In accordance with article 67(c)(2) ANR (Aircraft and Parts Documentation Procedures), 1977, the existence of an AFM and compliance with its contents is a condition for meeting the approved design and for obtaining an initial certificate of airworthiness.

The Aircraft Flight Manual for the TEXAN 3.0 RG model was submitted for CAAI approval after the aircraft manufacturer declared that the manual meets the safety and design requirements under which it was approved. Upon completion of a (sample) review of the manual by the CAAI and correspondence with the manufacturer regarding its contents, the CAAI conducted test flights for the model in October 2021. Upon completion of the process, the model was added to the Type Certificate.

☒ **Discrepancies between the AFM and the systems and component installed in the aircraft**

- <u>General:</u>

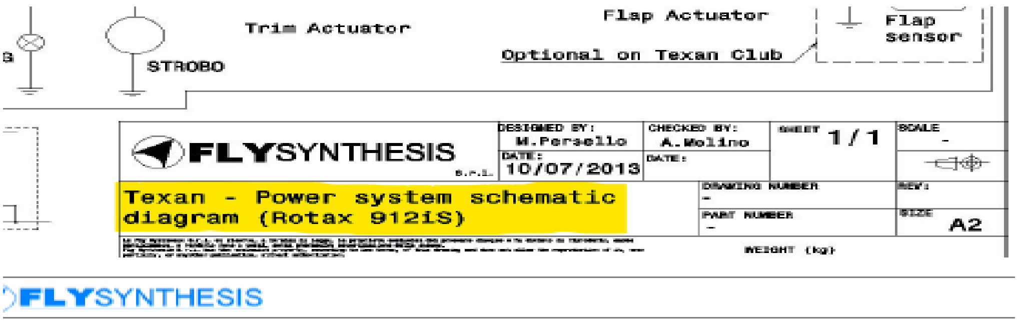
  This chapter reviews discrepancies between the AFM, which is required to contain accurate and reliable information about the aircraft, and the actual aircraft involved in the accident.

- <u>Engine:</u>

  The AFM does not mention that the engine installed in the aircraft is a turbocharged engine, and does not detail the implications derived from this.

- <u>Electrical system - system diagram:</u>

  The electrical system diagram presented in chapter 7.11 of the Aircraft Flight Manual (AFM) is a diagram suitable for an aircraft with a Rotax 912iS engine. The aircraft involved in the accident has a 915iS engine. No electrical system diagram suitable for this engine model was found in the Aircraft Flight Manual.



Picture 9 – **Electrical system diagram from the AFM**

- <u>Electrical system - battery:</u>

  Sections 1.4 and 7.9 of the Aircraft Flight Manual (AFM) state that the aircraft has a 12-volt sealed lead-acid battery. Section 7.11 states that the battery installed in the aircraft is 12 volts, 18 amp-hours.

  Upon inspection of the aircraft after the accident, it was found that the aircraft had a 12-volt, 16 amp-hour sealed lead-tin battery installed, which was also the battery **that was installed in the aircraft when the regulator issued the aircraft its initial airworthiness certificate.**

Picture 10 – **The battery found in the aircraft after the accident**

- <u>Electrical system - Backup Battery switch:</u>

  Although there is a Backup Battery switch in the cockpit, **the AFM does not include an explanation of the switch, its meaning, and its importance**, particularly in the event of a failure in one or more generators. In chapter 7, section 7.11(5) and in chapter 3, section 3.5.2, it is mentioned that:

  "The battery will supply electrical power for alternator short period overload (like landing lights) and for system consumers while the engine is stopped."

  "A fully charged and functional battery should permit the operation of trim, flap and aux electric fuel pump for about 20 minutes."

  No mention was found in the AFM that the Backup Battery switch is required to be moved to the ON position in order for the Engine Management System (EMS) and the various components in the aircraft to receive voltage from the external electrical source (the battery).

  In another scenario, where the Backup Battery switch remains in the ON position during flight (**as currently required in the aircraft's checklist**), the battery will drain during flight. This is due to the electrical system logic that gives priority to the battery over the generators (even if they are operating).

- <u>Variable pitch - Propeller Pitch Control:</u>

  The propeller controller in the aircraft is a FLYBOX PR1-P electric controller. The controller has an automatic mode (CONSTANT SPEED) and a manual mode (MANUAL). Switching between modes is enabled by moving switch 1 (see Picture 11) to the desired position.

  In automatic mode, the **target RPM** in the propeller controller can be changed using switch 2 (INC / DEC). In response, the propeller controller adjusts the blade pitch angle according to the aircraft speed, flight altitude, and RPM and manifold settings determined by the pilot.

  In manual mode, which according to the propeller manufacturer's manual is required during pre-flight checks (on the ground) or malfunction or emergency operation in flight, changing the propeller RPM is enabled using switch 2 (INC / DEC), which allows direct control of the blade pitch angle.

  Switching the switch to manual mode is only possible after pulling the switch outward, past a mechanical barrier, and lowering it.

Picture 11 – **Propeller Governor**

In revision 12 and onwards to the TCDS, the CAAI approved the installation of a GT-Propellers GT2VEB propeller on the Texan model and stated in note 8:

NOTE 8: Automatic pitch control device has been installed in the instrument panel. All the manual operations have been removed.

Approval of the propeller installation as stated is subject to the condition that it can <u>only</u> be operated in automatic mode.

In section 7.14.3 of the Aircraft Flight Manual, it is written that in accordance with an agreement with the CAAI, a propeller controller and GT2VEB variable pitch blades are installed in the aircraft, and that control of the controller shall be automatic only, with all options for manual operation removed:

"As agreed with CAAI, the Fly Box Propeller governor ***can be operated only in automatic mode and all manual operations are removed****…"*

In contradiction to the statement in the Aircraft Flight Manual that all options for manual operation have been removed, it is written further on, that manual mode can be operated when the aircraft is on the ground with its engine off, as part of the pre-flight preparations:

"Only if the engine is not running, operating on the small switch, it is possible to modify the propeller pitch to verify the correct system operation during ***the pre-flight inspections****."*

No requirement was found for checking the propeller controller in the pre-flight preparations detailed in chapter 4.4 of the Aircraft Flight Manual (PRE-FLIGHT INSPECTION).

From the pilot's statements and examination of the aircraft maintenance records, it appears that the manual mode control of the propeller controller was not removed by the aircraft manufacturer, despite the design requirements and what is written in the AFM.

- Variable pitch - cockpit placard:

  A placard was found in the cockpit confirming that the propeller controller can only be used in automatic mode. The investigation team found no mention of this placard in the AFM or in other supporting aircraft literature.

Picture 12 – **Cockpit Signage**

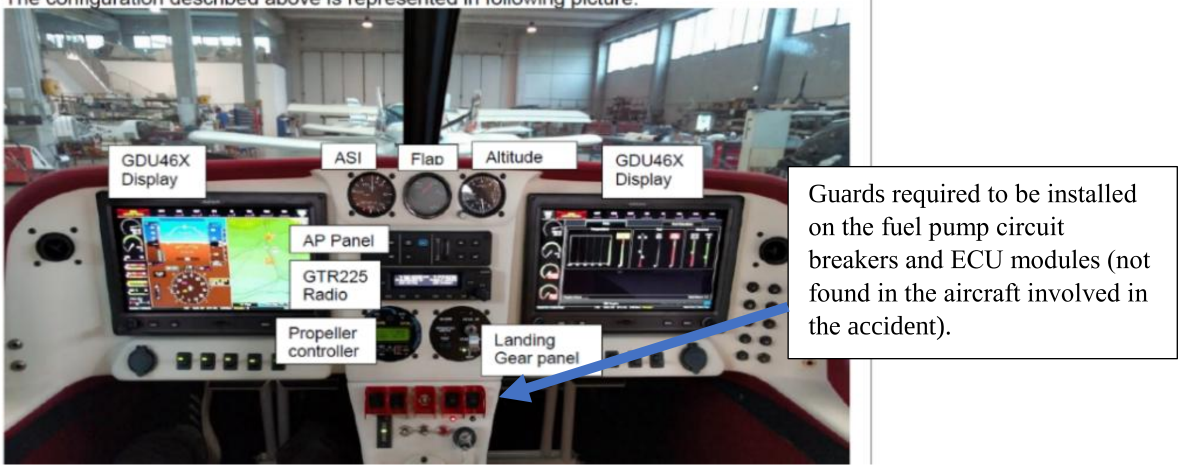
- <u>Avionics and cockpit:</u>

  In section 7.14 of the Aircraft Flight Manual, the avionics configuration in the aircraft is defined as shown in Picture 13:

Configuration 2

- Garmin G3X glass cockpit suite with autopilot panel and integrated transponder
- FlyBox Pr1 Propeller pitch controller and speed limiter
- Garmin GTR225 Radio

The configuration described above is represented in following picture.



Picture 13 – **Required cockpit configuration as presented in the AFM**

Contrary to the image shown in the AFM, the aircraft was found to have only a single GDU46X screen, and the red guards were removed from above the fuel pump switches and the ECU module switches - Lane A and Lane B.

Picture 14 - **The aircraft cockpit**

Due to the fact that no guards were found on the switches as stated and no mention was found in the AFM of the potential hazards in their absence, the AIAI issued an emergency safety recommendation in March 2025 (see Appendix A). In the emergency safety recommendation, the AIAI requested that the CAAI immediately prohibit the operation of Texan aircrafts that have a fuel-injected engine, two electric fuel pumps operated by two switches located adjacent to each other in the cockpit, and that are not protected by appropriate guards.

Note: Following the emergency safety recommendation, the CAAI engaged with the aircraft manufacturer holding the Type Certificate. The manufacturer issued a Mandatory Service Bulletin (Mandatory SB) on 21/07/2025 (see Appendix B), following which, on 07/08/2025, the CAAI issued an Airworthiness Directive (AD) (see Appendix C). This directive requires, among other things, the installation of safety guards for the fuel pump switches, the ECU module switches - Lanes A & B, and the master switch prior to the next flight.

☒ Gaps in AFM checklists

- <u>Missing checks and actions related to the propeller controller:</u>

  The FLYBOX propeller controller manual specifies checks/actions required to be performed by the pilot during five flight phases - before takeoff, during the takeoff roll, climb, cruise, and before landing.

  - Before the take-off:
    - Perform a propeller test as explained in chap. 4.1, "Prop test" function.
    - Check that the min pitch green led is turned on.
    - Check that the target RPM are set to the takeoff value.
  - During the take-off:
    - Check that the engine takes the required RPM.
  - During the climb:
    - Engine RPM and speed checks.
  - During the flight:
    - Set the desired RPM by turning the knob or using the INC/DEC switch.
  - Before landing:
    - Set the target RPM to the takeoff value.

  In the checklists in the Texan aircraft's AFM, no mention was found of the propeller controller checks required before takeoff, and no mention was found of the required increase of the propeller controller target RPM before landing.

- Fuel pump check - gaps between engine manufacturer requirements and the AFM:

  Chapter 4 in the Rotax 915iS engine operating manual deals with engine operation in standard configuration and states that implementation of the procedures is the responsibility of the aircraft manufacturer. Section 4.5 in this chapter describes the checks required to be performed during engine run-up and details the fuel pump check process.

  Section 4.5.1 in chapter 4 (Normal Procedures) of the Aircraft Flight Manual specifies the actions required before starting the aircraft engine and includes, among other things, the process required for checking the fuel pumps.

  That is, there is a discrepancy between the engine manufacturer's requirements and the aircraft model manufacturer's requirements regarding the fuel pump check. While the engine manufacturer states that fuel pump checks are required to be performed while the aircraft engine is running, the aircraft model manufacturer requires the fuel pump check to be performed while the engine is off.

- Backup Battery Switch - ground operation:

  In section 4.5.1 of chapter 4 (Normal Procedures) of the AFM, the actions required before engine start are detailed. The pilot is required to move the Backup Battery switch to the ON position before checking the fuel pumps. At the end of the check, no instruction was found in the checklist to move the switch back to the OFF position, despite the fact that the engine manufacturer states in chapter 4.3 (Engine Start) of the engine operating manual that said switch is required to be in the OFF position upon completion of the start process.

- Backup Battery Switch - emergency operation:

  No mention was found of moving the switch to the ON position in the checklists for abnormal flight situations and emergency situations detailed in chapter 3 of the Aircraft Flight Manual (Emergency Procedures) in general, and for engine failure after takeoff, in particular.

☒ **Additional gaps**

- There is no mention in the AFM that the aircraft has a turbocharger and/or what the operational implications that may arise from this are.
- Use of inconsistent terminology in the AFM:
  a. The AFM mentions the terms alternators and generators interchangeably, when in fact two generators serve as the primary voltage sources in the aircraft.
  b. The secondary fuel pump is referred to in chapter 3.5 as "Aux Electric Fuel Pump" and in chapters 1.4 and 7.9 as "Backup Fuel Pump". No details were found regarding the switch that operates the secondary pump and the difference (if any) between it and the primary pump.
  c. The AFM includes the use of the terms "Fuel Pumps" and "Fuel Pump(s)". The investigation team found no explanation for the difference, if any, in the usage between these two terms.
- In general, in a comparative review conducted by the investigation team between the AFM of the aircraft and the manuals of the Texan Top Class RG 2 aircraft, the Texan Top Class with fuel-injected engine, and the Texan Top Class with carbureted engine, it was found that there are normal and emergency checklists that were copied from an aircraft with a carbureted engine to an aircraft with a fuel-injected engine, and from an aircraft with fixed landing gear to an aircraft with retractable landing gear.

Note: Following the emergency safety recommendation issued by the AIAI approximately one and a half months after the accident (see Appendix A), the CAAI examined and identified gaps in the Aircraft Flight Manuals of Texan models manufactured by FLY SYNTHESIS Srl that have 912iS and 915iS fuel-injected engines. The CAAI began engaging with the new aircraft manufacturer, Gryphen Srl, which currently holds the Type Certificate.

In the Airworthiness Directive (AD) issued by the CAAI on 07/08/2025, numbered AD ISR I-73-2025-07-8 (see Appendix C), the approval of the Aircraft Flight Manuals for aircraft with said engines was revoked, following gaps identified by the CAAI in chapters 7 (fuel system description) and 4 (checklists and procedures relating to the fuel system) in the aircraft model literature. The full details of said AD document are available on the CAAI website.

1.19 Investigation Techniques

For the purpose of this safety investigation:

- ☒ Involved parties and witnesses were interviewed.
- ☒ Information from security cameras located at Masada airfield showing the movements of aircraft in the parking area and action of those involved, was collected and analyzed.
- ☒ Information from the Garmin G3X systems and the Engine Control Unit (ECU) was collected and analyzed by the investigation team and by professional personnel on behalf of the engine manufacturer.
- ☒ Information recorded on the Air Navigation application on the pilot's iPad was downloaded and examined.
- ☒ Components from the aircraft's fuel system were removed and sent for laboratory testing in Israel and abroad.
- ☒ A test flight was conducted by the engine manufacturer for focused examination of a possible failure cause.
- ☒ The aircraft manufacturer, engine manufacturer, and propeller manufacturer literature were reviewed and the compatibility with the actual aircraft was examined.

2. Analysis

2.1 General

This safety investigation dealt primarily with identifying the possible failures in order to understand the circumstances that caused the Texan aircraft engine to shut down shortly after takeoff from Masada airfield:

- **The technical aspect** - In the technical aspect, the components and systems were examined, including the aircraft engine and the ignition, electrical, propeller, and fuel systems. Analysis of the test results is presented at the beginning of this chapter.
- **Aspects related to human factors** – human related aspects that could have led to an engine complete power loss or shutdown were examined.

As part of the investigation, **significant and substantial** issues emerged relating to the design and the Aircraft Flight Manual approved by the Civil Aviation Authority for this aircraft. Reference to these aspects is presented later in the analysis chapter.

2.2 Possible technical aspects that led to a complete engine power loss in flight

2.2.1 Ignition system failure

Analysis of the information from the Engine Control Unit (ECU) indicates that the ECU and the ignition system for which it is responsible operated as required at the time of the accident. The ECU attempted to compensate for the sudden drop in RPM by changing the amount of air/fuel mixture injected into the engine and by changing the ignition timing. Therefore, from said information, no anomaly or failure was found in the aircraft's ignition system, and **it likely did not cause the aircraft complete engine power loss in flight.**

2.2.2 Propeller and blade system failure

The investigation team found no failure in the aircraft's propeller and/or blade system, and **it is likely that this system did not cause the complete engine power loss in flight.**

It should be noted that the investigation team found that the propeller system installed in the aircraft **does not** meet the regulatory requirements detailed in the Type Certificate and the AFM, as the manual control of the propeller controller was not removed, as required.

2.2.3 Complete engine power loss as a result of vapor lock

The atmospheric conditions that prevailed (including the airfield elevation below sea level and the relatively low ambient temperature), the testimonies collected, the fact that the Texan aircraft engine shut down suddenly (and did not "sputter"), and the analysis of the digital information downloaded from the aircraft, indicate **a low probability that vapor lock caused or contributed to the occurrence of the accident.**

2.2.4 Complete engine power loss as a result of manual pitch change in flight

At an early stage, a hypothesis was presented to the investigation team that a manual pitch change from fine to coarse after takeoff, combined with the fact that the takeoff was performed from Masada airfield (which is located below sea level), when atmospheric pressure was higher than standard and throttle position was full (i.e., maximum manifold pressure), created excess pressure in the engine which interfered with the normal (or regular) operation of the pistons.

This hypothesis was examined by the investigation team but was not supported by:

a) The information downloaded from the Engine Control Unit (ECU), as engine pressure limits were maintained by the engine controller at normal values during the demand for full power.

b) Analysis of the aircraft and engine fuel system does not support the claim that fuel pressure would be affected as a result of a change in RPM.

c) The testimonies collected and the fact that the aircraft engine shut down suddenly (and did not "sputter").

d) Analysis of the digital information downloaded from the aircraft, which does not explain how said pitch change led to a sudden fuel pressure drop <u>and to the changes observed in the electrical system indicators at the time of the accident</u>.

Therefore, all of these indicate a low probability that a manual pitch change after takeoff caused or contributed to the occurrence of the accident.

2.2.5 Electrical system failure

Failure in central components of the electrical system (generators, battery, or fuse box) could, under certain circumstances, lead to a sudden cessation of engine operation. Analysis of the information from the aircraft's electrical systems indicates normal operation of the aircraft's central electrical components.

At the time of the accident, generator A was the main electrical source supplying voltage to the EMS, while generator B supplied voltage to the cockpit instruments and charged the battery. The electrical system indicators do not point to abnormal activity of the central components in the electrical system, and therefore **there is a low probability that these caused or contributed to the occurrence of the accident.**

2.2.6 Fuel system failure

☒ **Contamination in the fuel system**

The aircraft engine was started by the pilot <u>three times</u> after the accident occurred, for a cumulative total of several minutes. The fuel that was sampled and sent for laboratory testing from the aircraft <u>was not</u> the fuel that was present in its fuel system at the time of the accident.

This fact made it very difficult for the investigation team to conduct a reliable examination regarding contamination in the fuel system as a possible cause for the aircraft engine shutdown after takeoff.

Nevertheless, fuel samples were taken from the aircraft and sent for laboratory testing. Although the laboratory testing indicated the presence of particles:

a) The results of the fine fuel filter test ruled out the possibility of fuel passage blockage toward the engine.

b) An engine shutdown in flight originating from fuel contamination is usually accompanied by preliminary signs including, among others, vibrations, noises from the engine, and difficulties maintaining a given RPM. The digital information and the testimonies collected indicate a sharp and sudden drop in RPM without any preceding preliminary signs.

In light of this, **there is a low probability that contamination in the fuel system caused the aircraft engine shutdown in flight.**

2.3 Possible human factors aspects that led to a complete engine power loss in flight

2.3.1 Analysis of digital information related to the electrical system

The information downloaded from the aircraft after the accident indicates an increase in ECU BUS voltage at the time of the fuel pressure drop and engine RPM drop. This indicates that one or more electrical consumers were disconnected from the system. In light of the fuel pressure drop, **there is a high probability that the electrical consumer whose operation was stopped was the fuel pump (one or both)**. From the available information:

a) No anomaly or internal technical failure was found in the aircraft's electrical system that could indicate a source that led to the cessation of fuel pump operation.

b) According to the pilot, the takeoff was performed with both fuel pumps operating, but it cannot be determined from the digital information related to the electrical system whether the aircraft took off with both fuel pumps operating or whether the takeoff was performed with only one of the fuel pumps operating.

2.3.2 Analysis of findings from the test flight

Analysis of the electrical system data from the test flight conducted by Rotax company on behalf of the AIAI, in which the test pilot intentionally shut off both fuel pumps during flight, **leading to complete engine power loss (shutdown)**, revealed **identical characteristics** to those observed at the time of the aircraft compete engine power loss on the day of the accident.

The combination of insights from sections 2.3.1 and 2.3.2, describing the cessation of operation of an electrical consumer, together with identical characteristics between the engine shutdown in the test flight and the investigated accident, leads to the conclusion that **human factors** may have contributed to the occurrence of the safety occurrence under investigation.

Human factors were examined at three levels presented below:

- Aircraft design (manufacturer).
- Supervision and control (regulator).
- Operation (pilot).

2.3.3 Cockpit design

Approximately one and a half months after the commencement of the safety investigation, the AIAI issued an emergency safety recommendation regarding the electric pump switches in the cockpit of the TEXAN 3.0 RG model.

The safety recommendation stated that "the type of switches, their location on the central console of the aircraft, their proximity to each other, and the fact that these switches are unprotected, may lead to unintentional shutdown of both fuel pumps simultaneously, which would lead to loss of fuel pressure and engine shutdown during flight."

The cockpit design with respect to the type, location, proximity, and lack of protection guards of the two fuel pump switches by the aircraft manufacturer contributed to the high probability that in this accident, the operation of both fuel pumps was inadvertently stopped.

<u>Note</u>: *This safety recommendation also applies to other Texan aircraft models in which a fuel-injected engine and two electric fuel pumps are installed.*

2.3.4 TEXAN 3.0 RG model AFM

The TEXAN 3.0 RG aircraft model AFM, submitted by the Italian manufacturer FLY SYNTHESIS Srl and approved by the CAAI, was found to be deficient and not faithfully representing the aircraft model in terms of system descriptions (such as: engine, propeller, electrical, fuel, and others) and checklists (normal and emergency), and it does not contain complete and reliable information enabling its safe operation, including that of components and systems installed in it.

In the process of approving the Aircraft Flight Manual for the TEXAN 3.0 RG model, the CAAI relied on said manufacturer's declarations, which stated that the aircraft model meets the required design requirements (BCAR Section S). The CAAI conducted a sample review of the AFM and performed test flights for the model. However, all of these were not sufficient to identify the **substantial and significant** gaps found in the AFM.

2.3.5 Issuance of airworthiness certificate for TEXAN 3.0 RG aircraft

The inspection of the aircraft involved in the accident by a CAAI inspector and the process of issuing the initial airworthiness certificate was conducted at the factory in Italy. This process also relied largely on the manufacturer's declaration regarding the aircraft's compliance with
requirements. The inspector who was present at the inspection and approved the aircraft's airworthiness certificate conducted a sample inspection of the aircraft and its compliance with requirements and literature. In this inspection as well, the gaps between the approved aircraft literature and the components required to be installed on it versus those that were actually installed on the aircraft were not identified (such as a variable pitch propeller that can be manually operated in flight, battery, cockpit placards, etc.).

2.3.6 Operation under time pressure

The aircraft involved in the accident remained last at Masada airfield while the group of aircrafts took off to return to the home airfield. The reason for the delay was the passenger's jacket falling on the airfield parking apron. Said delay caused haste that was evident in the pilot's conduct, both during aircraft operation on the airfield parking apron (three engine starts were performed on the apron) and in the very short time (21 seconds) that elapsed between the last start, taxiing, and takeoff from the nearby taxiway.

This aspect, in the opinion of the investigation team, caused an increased likelihood of erroneous operation of the fuel pump switches in the cockpit before and/or after takeoff from the airfield, which could have led to the aircraft engine shutdown.

2.3.7 Summary of human factors aspects

From the analysis above, in the opinion of the investigation team, **the cause of the complete engine power loss after takeoff stems from the cessation of operation of both fuel pumps after takeoff**, originating from **human factors aspects**, which have several levels including the design level (on the part of the aircraft manufacturer), supervision and control (on the part of the regulator), and finally the operational level.

2.4 Conduct and deviation from regulatory requirements

2.4.1 Operating an aircraft that does not meet regulatory requirements

In this accident, the aircraft was operating while some of its systems did not comply with the approvals granted to it by the regulator, and while the journey and maintenance logs were not present in the aircraft.

2.4.2 Starting the aircraft after the occurrence of the accident

The engine starts after the accident disrupted the safety investigation and made it more difficult for the investigation team to reach more unequivocal conclusions regarding the causes that led to the complete engine power loss after takeoff.

3. Findings and Conclusions

3.1 Findings

3.1.1 The pilot held the licenses and ratings to perform said flight.

3.1.2 At the time of the accident, the aircraft had a valid certificate of airworthiness.

3.1.3 No evidence was found that at the time of departure for the occurrence flight, there were open or known malfunctions in the aircraft; however, this assumption cannot be supported due to the loss of the journey and maintenance logs several months prior to the accident.

3.1.4 Laboratory tests conducted in Israel indicate a low probability that the root cause of the accident originated from a fuel problem or a blockage in the fuel filter.

Alongside this, it should be remembered that the engine of the Texan aircraft involved in the accident was started several times shortly after the safety occurrence, which disrupted evidence collection and may have compromised the reliability of some of said laboratory test results.

3.1.5 Laboratory tests conducted abroad by the engine manufacturer indicated that the fuel pumps were functioning properly and ruled out a technical failure in them as having led to the accident.

3.1.6 Analysis of the digital information rules out technical failures and **<u>greatly reduces</u>** the probability that the root cause of the complete engine power loss in flight originated from a technical problem in the aircraft.

3.1.7 A comparison of the electrical voltage rise in the aircraft's ECU BUS at the time of the investigated accident versus the electrical voltage rise in the ECU BUS during the test flight conducted by the Engine manufacturer (in which the pumps were manually shut off by the test pilot) shows **identical characteristics** to those found in the said accident.

3.1.8 A variable pitch propeller that can be operated in manual mode in flight was installed on the aircraft, **contrary to the approved design for the aircraft model and what is stated in the AFM.**

3.1.9 The AFM is lacking in information and was found not to faithfully represent the aircraft model in terms of system descriptions (such as: propeller, electrical, fuel, and others) and checklists (normal and emergency).

3.1.10 The AFM does not contain complete and reliable information enabling the safe operation of the aircraft, including the components and systems installed in it, and does not reliably represent the aircraft itself.

3.2 Conclusions

3.2.1 The complete engine power loss after takeoff from the airfield was caused, **with high probability**, by fuel starvation originating from **human factors aspects** when the operation of the fuel pumps (one or both) was stopped, leading to a sharp and sudden drop in fuel pressure, leading to fuel starvation and engine stopage, as stated.

3.2.2 Gaps and systemic failures originating from human factors aspects contributed to and led, with high probability, to the possibility of unintentional shutdown of a fuel pump (one or more) in flight, including:

- ✓ Installation of critical switches by the aircraft manufacturer in close proximity to each other and without installation of guards.
- ✓ Approval of the TEXAN 3.0 RG model AFM by the Civil Aviation Authority when the contents of the AFM **do not reliably represent the aircraft model, the aircraft, and the components and systems contained in it.**
- ✓ In the physical inspection process conducted on the aircraft before the issuance of its initial airworthiness certificate, the Civil Aviation Authority did not identify **substantial and significant** gaps between the aircraft model literature and the actual aircraft configuration.

That is, the failures in human factors aspects are manifested at several levels, including the design level (on the part of the aircraft manufacturer), supervision and control (on the part of the regulator), and finally, the operational level.

3.3 Summary

This safety investigation has revealed deep gaps existing between the aircraft model manuals (Type Certificate and AFM) on one hand and the actual aircraft configuration on the other. The investigation raises fundamental and substantial issues relating to, among others:

a) The extent to which the regulator can rely on declarations from LSA aircraft manufacturers within the framework of the approval process for adding an LSA model to an existing Type Certificate.

b) The importance of having **an effective supervision and control system** in place by the regulator, which combines rigor and attention to detail both when reviewing the literature for design approval of a new LSA model and when inspecting the LSA prior to the issuance of an initial certificate of airworthiness.

4. Safety Recommendations

4.1 Emergency safety recommendation issued by the AIAI on 20/03/2025:

Prohibit the operation of Texan aircrafts that have a fuel-injected engine, two electric fuel pumps (in which no mechanical fuel pump is installed) operated by two switches located adjacent to each other in the cockpit and that are not protected by appropriate guards.

Responsible entity: CAAI Director

Recommended completion date: Immidately

> *Note: Following the emergency safety recommendation issued by the AIAI, the CAAI engaged with the new aircraft model Type Certificate holder - Gryphen Srl, and as a result:*
>
> *a. Gryphen Srl issued a MANDATORY SB on 21/07/2025 requiring the immediate installation of the missing guards on the required switches, prior to departure for the next flight.*
>
> *b. The CAAI issued an Airworthiness Directive (AD) on 07/08/2025 following the manufacturer's requirement, as stated.*
>
> *c. Within the framework of the AD, the CAAI revoked the literature for Texan aircraft models manufactured by FLY SYNTHESIS Srl that have 912iS and 915iS fuel-injected engines.*

4.2 **Update the TEXAN 3.0 RG aircraft model AFM and align it, among other things, with the engine manufacturer's requirements, and submit it to the Civil Aviation Authority of Israel for review and re-approval.**

Responsible entity: Gryphen Srl

Recommended completion date: 31.08.2026

4.3 **Revoke the TEXAN 3.0 RG model AFM and subsequently review and re-approve it (if submitted by the aircraft manufacturer Type Certificate holder).**

Responsible entity: CAAI Director

Recommended completion date: within 1 months of AFM submission

> *Note: During the writing of this investigation report, within the framework of the AD issued by the CAAI on 07/08/2025, the Aircraft Flight Manual for the TEXAN 3.0 RG aircraft model was revoked, among other things, pending corrective actions by the aircraft manufacturer.*

4.4 Conduct dedicated inspections on all Texan aircraft registered in Israel and verify the systems and components installed in them match the AFM and engine manufacturer's manual requirements.

Responsible entity: CAAI Director

Recommended completion date: 31.12.2026

4.5 Establish within the AIAI regulatory framework, that in the event of an AIAI safety investigation initiation, a written notice regarding the seizure, detention, prohibition of operation or movement of the occurrence aircraft from its final resting position, shall be conducted under the specific conditions set by the AIAI director.

Note: AIAI is advancing an appropriate arrangement within its regulatory framework and procedures.

Responsible entity: AIAI Director

Recommended completion date: 31.12.2026

Sincerely,

Ofer Vaknin

AIAI Director

Date: 13.04.2026 Ref.: 4000-0098-2026-0000108

Return of items seized during a safety investigation In accordance with Section 114(b)(5)-(7) of the Aviation Law,2011, the Director of the Safety Investigation Authority in Aviation shall return seized items, except for aircraft wreckage, within 45 days of the publication date of the final investigation report. The items shall be returned to the person from whose possession they were seized, or to their owner. Aircraft wreckage shall not be returned except upon request of the aircraft owner and at their expense. A request for their return must be submitted to the Safety Investigation Authority in Aviation no later than 45 days from the publication date of the report.

Appendix A - Emergency Safety Recommendation (Safety Investigation file 3-25)

מדינת ישראל

משרד התחבורה והבטיחות בדרכים
רשות לחקירה בטיחותית בתעופה

כ' באדר תשפ"א
20 במרץ 2025
4000-0098-2025-00000 66

לכבוד:
רשות התעופה האזרחית – מנהל
רשות התעופה האזרחית – מנהל בטיחות
רשות התעופה האזרחית – ראש אגף פיקוח אווירי
רשות התעופה האזרחית – ראש אגף כשירות אווירית

הנדון: המלצת בטיחות דחופה - מפסקי משאבות דלק באווירון זעיר מסוג טקסן

א.נ,

1. הקדמה:

בתאריך 08/02/2025 ביצע אווירון זעיר משקל (אז"מ) מסוג TEXAN 3.0 RG, בעל סימני לאומיות ורישום 4X-HYX, נחיתת גחון במנחת מצדה וזאת, לאחר שמנועו כבה מעט לאחר המראה. הרשות לחקירה בטיחותית בתעופה (להלן: "**הרלב"ת**"), פתחה בחקירה בטיחותית לבדיקת נסיבות האירוע (תיק חקירה 3-25) וזאת בהתאם לאמור בחוק הטיס, תשע"א-2011 (להלן: "**חוק הטיס**").

במסגרת החקירה כאמור ובהתאם לסעיף 122 לחוק הטיס, מבקשת הרלב"ת להמליץ על פעולה מידית מצד רשות התעופה האזרחית (להלן: "**רת"א**").

2. רקע להמלצה הדחופה:

א. למטוס הטקסן מסוג TEXAN 3.0 RG נשוא האירוע, משאבות דלק חשמליות בלבד (לא מותקנות בו משאבת דלק מכאנית). הפסקת שתי משאבות הדלק החשמליות מובילה לכיבוי מנועו של כלי הטיס.

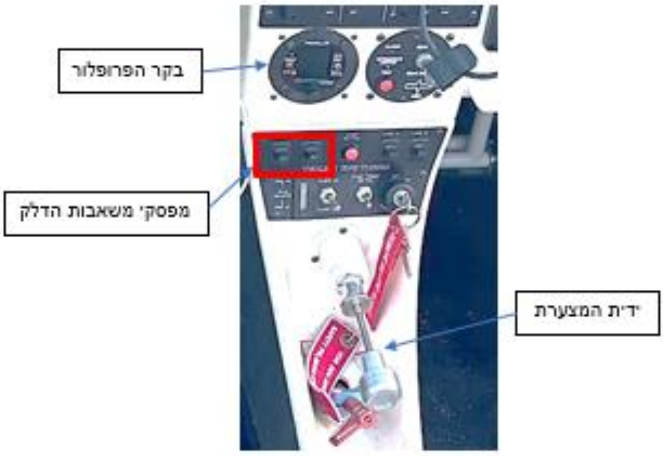
ב. סוג המפסק – בתא הטייס קיימים שני מפסקים בעבור כל אחת ממשאבות הדלק החשמליות, בהתאמה. מפסקי משאבות הדלק הינן מסוג OFF-ON.

תמונה 1 - מפסק OFF-ON

משרד ראשי: נגב 4 קרית תעופה טל': 073-3448159
E.mail: regevg@mot.gov.il
כתובת אתר האינטרנט: https://www.gov.il/he/departments/Units/aiai

הפעלה או כיבוי של כל אחת ממשאבות הדלק מבוצעת על ידי הטייס באמצעות העלאה מעלה או הורדה מטה של כל אחד ממפסקי משאבות הדלק בנפרד. למפסק משרעת תזוזה מוגבלת מעלה-מטה, אשר מקשה להבחין בראיה בשינוי מצבי המפסק והאם המפסק במצב פעיל או כבוי ולפיכך האם משאבות הדלק פועלות או כבויות.

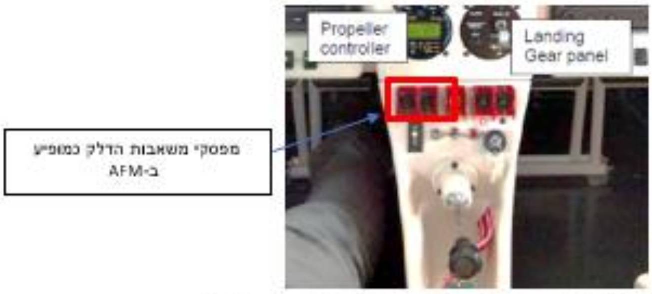
ג. מיקום מפסקי המשאבות בתא הטייס – המשאבות ממקומות בקונסולה המרכזית בין בקר הפרופלור המצוי מעליהן למצערת שמתחת להן (ראה תמונה 2).



תמונה 2 – הקונסולה המרכזית בתא הטייס של מטוס נשוא האירוע

ד. מפסקי משאבות הדלק החשמליות מצויות בצמידות אחת לשנייה (ראה תמונה 2).

ה. בפרק 7.14 שבספר המטוס נשוא האירוע (Aircraft Flight Manual – AFM) מופיעה תמונה של תא הטייס כאשר מפסקי משאבות הדלק החשמליות מוגנים.



תמונה 3 – הקונסולה המרכזית בתא הטייס של מטוס נשוא האירוע

משרד ראשי : נגב 4 קרית תעופה טלי: 073-3448159
E.mail: regevg@mot.gov.il
כתובת אתר האינטרנט: https://www.gov.il/he/departments/Units/aiai

למרות זאת, מפסקי משאבות הדלק החשמליות במטוס נשוא האירוע (ראה תמונה 2), אינם מאובטחים על ידי מגן שימנע הפעלה או הפסקה אקראית של פעילותן.

3. מהות הסכנה:

סוג המפסקים, מיקומם בקונסולה המרכזית של כלי הטיס, קרבתם אחד לשני והעובדה שמפסקים אלו אינם מוגנים, עלולים להביא לכיבוי לא רצוני של שתי משאבות הדלק בו זמנית, דבר שיוביל לאובדן לחץ דלק ולכיבוי מנוע בזמן טיסה.

4. המלצת הבטיחות הדחופה:

לאסור הפעלתם של כלי טיס מסוג טקסן המנויים בסעיף 5 מטה, עד יצירת הגנות שימנעו הפעלה אקראית אפשרית של מפסקי משאבות הדלק החשמליות.

5. כלי הטיס הנכללים בהמלצת הבטיחות הדחופה:

המלצת הבטיחות הדחופה מכוונת לאווירונים זעירים מסוג טקסן אשר להם:

א. מנוע הזרקת דלק.

ב. שתי משאבות דלק חשמליות בלבד (בכלי הטיס לא מותקנת משאבת דלק מכאנית).

ג. הפעלת משאבות הדלק החשמליות בתא הטייס מבוצעת באמצעות:

1) שני מפסקי משאבות הדלק המצויים בצמידות בתא הטייס.

2) המפסקים אינם ממוגנים באמצעות מגן מתאים.

גד רגב

מנהל הרשות לחקירה בטיחותית בתעופה

העתקים:
מר אלעד אהרן – רלב״ת – חוקר מוביל
מר גיל ארנון – רלב״ת – חוקר תאונות כלי טיס
מר בועז גרוסמן – רלב״ת – חוקר תאונות כלי טיס
גב׳ קרן גיא – רלב״ת - מרכזת בכירה חקירות בטיחות
תיק חקירה בטיחותית 3-25

משרד ראשי: נגב 4 קרית תעופה טל׳: 073-3448159
E.mail: regevg@mot.gov.il
כתובת אתר האינטרנט: https://www.gov.il/he/departments/Units/aiai

Appendix B - Mandatory Service Bulletin (SB) 004/25-ULM-LSA

GRYPHEN

Strada provinciale nr. 78 km 12,150
33050 Mortegliano (UD)
Italy

Service Bulletin
N° 004/25-ULM-LSA
July 21, 2025
Page 1 of 3

Information	*Recommendation*	***Mandatory***	**X**

Aircraft affected	*Texan equipped with Rotax 912iS or 915is Engines*
Time of compliance	*Before next flight*
Working place	*Approved maintenance facility/Gryphen facility*

SUBJECT:
Check the safety guards configuration on Texan equipped with Rotax 912iS and 915iS engines.

WARNING:
Non-compliance with these instructions may result in aircraft damage, personal injury or death.

INFORMATION
Mass data:
None.

Necessary tools:
none.

GRYPHEN

Strada provinciale nr. 78 km 12,150
33050 Mortegliano (UD)
Italy

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DESCRIPTION

It has been found that not all the Texan aircraft are equipped with the correct set of safety guards for unintended operation of the switches related to:

- *Master switch*
- *Fuel pumps switches (main and backup)*
- *ECU lanes switches (Lane A and Lane B).*

Figure-1 : example of configuration with safety guards missing

Figure Errore. Nel documento non esiste testo dello stile specificato.2: Example of safety guards correctly installed

Strada Provinciale n 78 -km 12,150- 33050 Mortegliano (Ud) Italy www.gryphen.it

N° 004/25-ULM-LSA

GRYPHEN

Strada provinciale nr. 78 km 12,150
33050 Mortegliano (UD)
Italy

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In aircraft equipped with Rotax 912iS or 915is, the engine is fed using electric fuel pumps only, so it is crucial that at least one of them is functioning. In the case that the pilot switched off both pumps, the engine quits immediately. For this reason, it is necessary to verify that the pumps are correctly guarded in order to prevent unintentional switching off of the pumps. The same check should be performed for the presence of guard switches on lines A and B that control the engine ECU. Also in this case if the pilot switches off both lines, the engine quits immediately. As for the master switch, there are two possible configurations. The first is with master activated by the master key, which does not require protection, the second with the master activated by a switch that requires a safety guard.

REQUIRED ACTIONS.

Verify the presence of the safety guards installed on the aircraft panel.

Visually check the presence of the safety guards on the following switches:
- *Master switch*
- *Lane A switch*
- *Lane B switch*
- *Pump 1 switch*
- *Pump 2 switch*

REQUIRED CORRECTIVE ACTIONS:

If the guards are correctly installed:
NONE

If guards are not properly installed:
Contact Gryphen through the website contact page in order to find identify the corrective action, and to receive all the information to order and install the guards according to aircraft configuration.

If it is found that the safety guards are missing, the corrective actions must be applied before next flight.

End of document

Strada Provinciale n 78 -km 12,150- 33050 Mortegliano (Ud) Italy www.gryphen.it

N° 004/25-ULM-LSA

Appendix C - Airworthiness Directive

CAAI רת"א

לכבוד:
איה תעופה בע"מ-
שחר תעופה-

תאריך: 23/07/2025

<u>הוראת כושר אווירי ISR I-73-2025-07-8</u>

☑ הוראת כושר אווירי המחייבת הבאה מתייחסת **לכלי טיס**/ מנוע / ציוד שחברתכם **<u>מפעילה/ מתחזקת</u>/ משפצת.**

מס' הוראת כושר אווירי (ספרור ישן): 73-2025-7-8

מס' ההוראה: I-ICAA(ISRAEL)-2025-07-08

מתייחסת: SAFETY GUARDS CONFIGURATION ON **<u>TEXAN</u>** EQUIPPED WITH ROTAX 912IS AND 915IS ENGINES.

דגמים

☑ יש לבצע הוראת כושר אווירי זו כמפורט בהוראת הכושר אווירי.
☑ המועד הנקוב בהוראה (וכן מועדים לבדיקות חוזרות, אם ישים).
☑ יש לכלול את הבדיקה המוזכרת בהוראה במערך האחזקה
☑ יש לרשום את ביצוע ההוראה בספר <u>המטוס</u> / מנוע.
☑ יש לדווח על ביצוע ההוראה על גבי הספח.
☐ הערות

☑ רצ"ב צילום ההוראות.

בכבוד רב
קדוש יהודה
מפקח כשירות אווירית
אגף פיקוח ·אווירי

מדינת ישראל משרד התחבורה / רשות התעופה האזרחית
בית גולן / רחוב גולן, ת.ד. 1101 / קרית שדה התעופה 70100 / טל. 03.9774545 / www.caa.gov.il

State of Israel
Ministry of Transport
Civil Aviation Authority

AD ISR I-73-2025-07-8
07 AUG, 2025

AIRWORTHINESS DIRECTIVE

This Airworthiness Directive, issued by the Civil Aviation Authority of Israel in accordance with the Israeli Air Navigation Regulations applies to an aircraft for which our records list as under your registration or you as the registered owner. It affects aviation safety and requires your immediate attention. No person may operate an aircraft to which an Airworthiness Directive applies, except in accordance with that Directive.

APPLIES TO: Texan models (TC IA180) equipped with Rotax 912iS and 915iS engines

SUBJECTS: **AFM Noncompliance & Presence of protection guards on the switches of the electric fuel pumps and the control lines A and B of the ECU of the Rotax 912iS and Rotax 915iS engines equipped Texan aircraft**

REASONS: 1. AFM Noncompliance for Texan models with Rotax 912iS and 915iS engines regarding the description of the fuel system and updating the relevant procedures/manuals.
In examining the data (AFM, AMM) differences were found between the various configurations and the operational documentation.
2. In aircraft equipped with Rotax 912iS or 915iS, the engine is fed using electric fuel pumps only, so it is crucial that at least one of them is functioning. In the case that the pilot switched off both pumps, the engine quits immediately. For this reason, it is necessary to verify that the pumps are correctly guarded in order to prevent unintentional switching off of the pumps. The same check should be performed for the presence of guard switches on lines A and B that control the engine ECU. Also, in this case if the pilot switches off both lines, the engine quits immediately.

ACTIONS: For fuel safety guards configuration correction, accomplish GRYPHEN SB **004/25-ULM-LSA** last revision implementation. In addition, all aircraft AFMs needed to be updated immediately.

COMPLIANCE: Before next flight.

EFECTIVE DATE: 07 AUG, 2025.

FOR FURTHER INFORMATION CONTACT: Mr. Liran Cohen, A/C certification department, CAAI - P.O. Box 1101, 3 Golan Street, Airport City, Israel, 70151, Telephone: 972-3-9774529, E-mail: cohenli@mot.gov.il

State of Israel Ministry of Transport / Civil Aviation Authority
Golan House / Golan St. P.O.B. 1101 / Airport City 70100 / Israel / Tel. +972.3.9774545 / www.caa.gov.il