AIR, MARITIME, AND RAILWAY ACCIDENT
INVESTIGATION NATIONAL BOARD
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SAFETY INVESTIGATION REPORT

ACCIDENT, OCCURRED ON FEBRUARY 4, 2024, INVOLVING PIPER PA-28RT-201, AIRCRAFT REGISTRATION LZ-AOI OPERATED BY PRIVITE OWNER, DURING LANDING AT PANICHAREVO AIRPORT, KYUSTENDIL DISTRICT.

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AAIU-2024-01

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FINAL

Purpose of Report and Responsibility Level

Under Annex 13 of the Chicago Civil Aviation Convention of 07.12.1944, Regulation 996/20.10.2010 of the European Parliament and the Council on the investigation and prevention of accidents and events in Civil Aviation and Ordinance No. 13/27.01.1999 of the Ministry of Transport (last amendment and addition - 22.01.2016) of the Republic of Bulgaria, the investigation of an aviation event aims at identifying the reasons that led to the event to eliminate and exclude these in future **without identifying someone's guilt or liability**.

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01. List of abbreviations

ALT	-	Altitude;
AMRAINB	-	Aircraft, Maritime and Railway Accident Investigation National Bord;
AMM	-	Aircraft Maintenance Manual
ARP	-	Aerodrome reference point;
ATIS	-	Automatic terminal information service;
A/C	-	Aircraft;
BULATSA	-	Bulgarian Air Traffic Services Authority;
CAA	-	Civil Aviation Authority;
FIC	-	Flight Information Centre;
DG CAA	-	Directorate General Civil Aviation Administration;
EASA	-	European Aviation Safety Agency;
FH	-	Flight Hour
FCL	-	Flight Crew Licensing;
ft	-	Foot;
ICAO	-	International Civil Aviation Organization;
KT	-	Knots;
MAG	-	Magnetic course
MSN	-	Manufacturer Serial Number;
MTITC	-	Ministry of transport, information technology and communications;
NTSB	-	National Transportation Safety Board of the USA;
MTOM	-	Maximum Take-Off Mass;
p.	-	page;
FI(A).	-	Flight instructor;
RWY	-	Runway;
LAPL(A)	-	Light aircraft pilot license for aeroplanes;
PPL(A)	-	Private pilot license;
TLB	-	Technical Log Book;
TWY	-	Taxiway;
SEP (Land)	-	Single Engine Piston
VC	-	Vicinity of the aerodrome;
WPT	-	Waypoint;
UTC	-	Universal Coordinated Time;
VC	-	Vicinity of the aerodrome;
WO	-	Work Order;

1. Introduction

Date and time of the aviation event: February 4, 2024, 11:22 h (local time) 09:22 h UTC The difference between local and universal coordinated times is +2 h. All times in the report are given in local time.

Notified: Air, Maritime and Railway Accident Investigation National Board (AMRAINB) and Directorate General "Civil Aviation Administration" (DG CAA) of the Republic of Bulgaria, the European Commission, the European Aviation Safety Agency (EASA) and the National Transportation Safety Board (NTSB) of the USA.

On the grounds of Regulation (EU) No. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and the provisions of Article 9, Para1 of Ordinance No 13 of the Ministry of Transport of the Republic of Bulgaria dated 27.01.1999 on Investigation of Aviation Accidents the occurrence was classified as an accident by the AMRAINB. The materials on the aviation occurrence have been filed in case No 01/2024 in Aviation Transport Unit archives at AMRAINB.

In accordance with the provisions of Article 5, para 4 of Regulation (EU) No. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, Article 142. Para. 2 of the Civil Aviation Act of the Republic of Bulgaria, dated 01.12.1972, and Article 10, para. 1 of Ordinance No. 13 of the Ministry of Transport, dated 27.01.1999, on the Investigation of Aviation Occurrences, and on the grounds of the provisions of Article 6, para 1, point 8 of the Rules of procedure on the activity, structure and organization of the AMRAINB by Order No. RD-08-4, dated February 13, 2024, of the Chairperson of the Management Board, a Commission is appointed for investigation of the accident.

Summary:
On February 04, 2024, at 11:05 local time a small airplane PIPER-PA28RT with registration marks LZ-AOI with one person on board, the pilot –owner, departed Panicharevo airfield for a pleasure flight in the vicinity. During landing at about 11:17 h on Runway 05 with a flat tire on the left main landing gear, it began to veer to the left. The pilot's attempts to keep the aircraft within the runway were unsuccessful. The aircraft left the runway, exited onto the ground when the left main landing gear separated from its attachment assembly and stopped in a grassy area to the left of the runway.
The pilot left the cockpit without injuries, but the airplane sustained significant damage to the airframe and propeller.

Because of the investigation, the Commission considers that the accident is due to the following reason:
Violation of the technology of pre-flight preparation of the airplane by the pilot, which led to taking a flight with an unidentified technical condition of the tire of the left gear, resulting in its burst during the flight and destruction of the left main gear of the aircraft.
The following dominant factors also contributed to the realisation of the aviation accident:
1. The maintenance programme does not specify the works to be performed during the line maintenance.
2. The maintenance programme does not specify the works to be performed by the owner pilot.
3. The presence of asphalt cracking on the runway and grass growth.

2. Factual information

The factual information is based on data collected and analyzed from:

- the inspection of the site was carried out by the investigative team of the AMRAINB.

- the pilot's personal explanations.
- interviews conducted with other people involved and witnesses to the event.
- data from the BULATSA.

2.1.1. Flight number and type, the last point of departure and time, and planned destination point

Flight Number: LZAOI.
Type of flight: Non-Commercial Air Transport – Pleasure flight
Last point of departure: LBPN Panicharevo, Bulgaria.
Take-off time: 11:05 h Local time.
Planned destination point: LBPN Panicharevo, Bulgaria.

2.1.2. Flight preparation and description of the flights

On 04.02.24 around 08:00 after checking METEO forecast for Dupnitsa area, pilot-owner decided to make a pleasure flight with PIPER PA-28RT-201, registration LZ-AOI. At about 09:30 h he arrived at Panicharevo airport, inspected the runway, the taxiways for the presence of potentially dangerous objects and contamination. Around 10:00 h the pilot pulled the aircraft out of the hangar and carries out the pre-flight inspection, starting from the cockpit, manual checked the flying controls of the aircraft for free running, the presence of the required documents on board and carries out a detailed external inspection of the aircraft.

During the inspection he found no faults with the aircraft. He checked the final wind direction and Meteorological conditions, recorded the data for the planned flight in the airport logbook and calculated the mass and balance of the aircraft. Around 10:30 he entered the aircraft and switched on the engine for warm-up, tested the functionality of the magnetos. All indicators are within normal limits. As it is currently windless, selects and taxi to executive start on Runway 23. Lowered the flaps to the takeoff position, engaged the auxiliary fuel pump and started the take-off run. At about 2/3 of the runway's length, it lifted into the air. After climbing to 400 feet above the ground, applied the brakes slightly to stop wheel spin and retracted the landing gear and flaps. The pilot switched off the auxiliary fuel pump and reduced power to 90% to continue the climb to 4000 ft. After that contacted the Sofia Flight Information Centre (Sofia FIC) and reported his intentions to fly into the airfield area. At about 11:10 he began a descent for landing and, seeing that the wind was still light, selected Runway 05 for landing. He turned into the north downwind leg for a left turn approach. After the turn base, he lowered the flaps on first stage and the landing gear.

On the final, the pilot dropped maximum flaps and maintains a normal glide of about 70...75 knots for maximum early touchdown at the beginning of the runway. The approach is calm and uneventful. After touching down on the main gear at the beginning of the runway, the pilot felt the aircraft beginning to veer to the left.

Initially the pilot decided it was from a gust of wind from the south and tried to correct with the vertical rudder and ailerons gradually using their full range, but to no result. The nose wheel was still in the air, and he momentarily considered whether to go around, but gave up when the pilot saw that the nose of the aircraft was now pointing strongly towards the left runway safety strip, and it felt like the aircraft was banked slightly to the left.

The pilot kept applying the right pedal all the way down with the steering wheel in full right yaw when the nose wheel touched the runway but even that could not correct the direction of the aircraft. Tries to reduce speed by using right brake but felt no effect from it. Surprisingly as the airspeed decreased the yaw to the left became greater until finally the aircraft entered the ground part of the safety strip and from there turned perpendicular to the runway as it skidded to a stop in a gully on the ground with the nose to the north banked slightly to the left.

When the aircraft was established, the pilot disconnected the main switch, contact switch and fuel tap, released the belt and left the aircraft. From the side the pilot observed that the left landing gear was detached, and the wing was badly damaged. Checked the left tire and found that it was completely deflated. Then at about 11:17 h, called to report the incident to Sofia FIC and at about 11:20 h informed AMRAINB and started inspection of the entire route from the time of touchdown.

2.1.3. Location of aviation occurrence

The aviation accident was realized on runway 05 at Panicharevo airport, the site of the final stop of the aircraft was with coordinates:
42°16′35,82″N,022°59′26,177″E.
The event was realized during daylight hours.

2.2. Injuries to persons

No injuries

Injuries	*Crew*	*Passengers*	*Total in the aircraft*	*Others*
Fatal	*0*	*0*	*0*	*0*
Serious	*0*	*0*	*0*	*0*
Minor	*0*	*0*	*0*	*0*
None	*1*	*0*	*1*	*Not applicable*
Total	*1*	*0*	*1*	*0*

2.3. Damage to aircraft

During the inspection of the aircraft after the accident, the following damages were found:

- Destroyed left main landing gear (Figures 5, 20, 21, 22, 27 of Appendix 1).
- The skin of the left wing of the aircraft is folded (Figures 5 and 6 in Appendix 1).
- The flap of the left wing of the aircraft is deformed (Figures 5 and 6 of Annex 1).
- One blade of the two-bladed propeller is curved about 90° (Figs 5 and 6 Appendix 1).
- The lower knuckle of the right pilot door is dislodged. There is difficulty in opening the right pilot door (Fig. 18, from Appendix 1).
- Dents and distortions on the cover of the handling pitch steep control of the propeller and on the fuel-air mixture of the aircraft engine (Figures 14, 15, 17 of Appendix).
- Loose rivets on skin of right wing and fuel leak from rivet seams on right wing tank (Fig. 10, from Appendix 1).
- Broken hose to the braking device of the left main landing gear (Fig. 27, from Appendix 1).
- The reservoir with brake fluid is empty.
- Abrasions and destroyed antennas on the lower surface of the aircraft fuselage.
- The braking device on the left main landing gear is partially destroyed and the brake lining is missing.
- Impact damage and deformation of the left side of the left wheel rim (Fig.21 in Annex 1).
- Abraded and flat left main tire (fig. 25, 26, 27 of Appendix 1).
- Deformations on the left-wing trailing edge.
- Corrosion and deteriorated corrosion coating on the longitudinal beam of the left wing (Figure 19, from Appendix 1).

Photographs of the damage in electronic format are attached to the investigation materials.

2.4. Other damages

No other damage.

2.5. Personnel information:

2.5.1. Commander

The 37-year-old pilot in command held a Commercial Pilot License CPL (A) with date 2 August 2018 issued in accordance with Part-FCL (Flight Crew Licensing) for Civil Aviation Aircrew by the Bulgarian civil aviation authority, with the class rating SEP (Land) valid until 31 July 2024 and FI (A) with class LAPL(A), PPL(A) and SEP (Land), valid until 31 July 2025. He had a class 1 medical certificate valid until 14 March 2024. Up until the day of the occurrence he had a total flying experience of about 150 flight hours on this aircraft.

2.6. Aircraft Information

2.6.1. Airworthiness Information

The PIPER PA-28RT-201, registration LZ-AOI, serial number 28R-7918101, was manufactured in 1979 by Piper Aircraft Corp., USA. The aircraft holds Registration Certificate No 2874 issued by the General Directorate of Civil Aviation Administration of the Republic of Bulgaria on 22 January 2020, and in this certificate the aircraft type is recorded PA-28RT-201 Arrow IV. The aircraft has five owners, private individuals. At the time of the event, one of these owners was the pilot.

The aircraft holds Certificate of Airworthiness No 25-0204 issued by DG CAA on January 22, 2020. The aircraft was issued a Certificate of Airworthiness Review with reference No BG-ARC-2874 by an approved technical staff, BG.66. A.00535-10886, on April 11, 2023. This certificate is valid until April 10, 2024, and the aircraft has flown 9335 flight hours at the date of the review. The certificate is valid at the date of the occurrence.
The aircraft has been issued an Aircraft Noise Certificate No 45-0218. The certificate was issued by DG CAA on January 22, 2020. The certificate states the maximum take-off and landing mass of the aircraft as 1247 kg.

From the beginning of the operation until the day of the occurrence, the aircraft had flown 9382:48 h, according to the aircraft logbook records.
The aircraft was equipped with a Lycoming IO-320-C1C6 aircraft piston engine, serial number L-5529-51A. By the time of the event, the engine had completed 49:18 h. The last overhaul to the engine was made to February 2, 2023.

There is no evidence that the engine operation had any contribution to the occurrence of the accident.
The aircraft is equipped with a McCauley B2D34C213 S/N 890926 propeller. By the time of the event, the propeller had 49:18 h run time, after an overhaul carried out in 2022.
There is no evidence that any disturbances in the normal operation of the propeller-engine group were associated with the realization of the accident.

The airworthiness of the aircraft shall be maintained based on a Maintenance Program proposed and approved by the owners of the aircraft in accordance with the requirements of Commission Regulation (EU) No 1321/2014, Annex Vb (Part ML). The program has been developed in English and does not specify the work to be performed during line maintenance and what work is to be performed by the owner pilot. The copy of the program provided by DG CAA does not correspond to the copy provided by the owner pilot. On the day of the event, the pilot, he and the owner pilot perform the servicing at the beginning of the flying day. No faults were found or rectified during the

pre-flight inspection. No records of the maintenance performed at the start of the flight day were made. There are no records of maintenance performed after the pre-event flight on January 31, 2024.

In the annual airworthiness inspections performed, there were no observations related to the need to correct and improve the aircraft maintenance program.

2.6.2. Aircraft characteristics

The PA-28RT-201, ARROW IV aircraft is a single piston-engine airplanes with low-mounted wings and a retractable landing gear, all-metal aircraft characterized by a T-type tail configuration. The aircraft is a four-seater with a 200-horsepower engine.

The maximum take-off mass of the airplane is given in paragraph 2.6.1, 1247 kg, which corresponds to 2750 lb in accordance with the Pilot's Operating Handbook (POH), where 200 lb is given as the maximum baggage allowance. In accordance with the Weight and Balance Report dated April 24 2020, attached to the investigation file, the empty airplane mass (weighted only by the oils and the unusable fuel residue) is 1793,9 lb (813,7 kg). At the time of the flight, only the pilot was on board, who in his explanations indicated that during the pre-flight inspection he had found that the fuel tanks were half full.

In accordance with the aircraft's POH, the amount of fuel used on board the aircraft is 72 US GAL, which corresponds to 272,52 liters, half of this value is 136,26 liters, assuming a specific mass of petrol of 0,75 kg/l, this means that the mass of fuel on board before the start of the flight is 102,2 kg. The pilot weighed 95 kg, according to a discussion with him, and was not carrying any additional luggage on board. Under these conditions, the take-off mass of the aircraft was 1010,9 kg, which was 236,1 kg less than the maximum permissible mass.

The certificate of compliance with the Noise Certificate does not state a maximum landing mass for the aircraft. The airplane is not approved to perform aerobatic maneuvers. The Positive Load Factor (Maximum) is 3,8.

The following are some typical speeds and limitations according to the PA-28RT-201, ARROW IV Pilot's Operating Handbook.

AIRSPEED LIMITATIONS		
VNE	Nevcr Exceed Speed	190 KIAS
VNO	Maximum Cruising Speed	149 KIAS
VA	Design Maneuvenng Speed	121 KIAS
VFE	Maximum Flaps Extended Speed	108 KIAS
VLE	Maximum Landing Gear Extended Speed	130 KIAS

AIRSPEED INDICATOR MARKINGS	
White Arc (Flap Down)	53 - 108 KTS
Green Arc (Normal Operating Range)	58 – 149 KTS
Yellow Arc (Caution Range – Smooth Air Only) .	149 -190KTS
Red Radial Line (Never Exceed)	190 KTS
Final approach speed with flaps extended	75 KIAS
Stalling Speed with Power Off and Full flaps	53 KIAS
Maximum Crosswind Velocity	17 KTS

Paragraph 4.5 of the POH describes the procedures for conducting a pre-flight inspection of an aeroplane on an item-by-item basis and paragraph 4.9 provides details and an explanation of these procedures. The subsection on the right wing, page 4-13, paragraph 5 states:
" ... A thorough landing gear inspection follows. Check the strut for proper extension, which should be 2.5 +/- 0.25 under normal static load. Check tires for cuts, wear and proper inflation. Perform a visual inspection of the brake block and disc. ..."
In the left-wing sub-section, page 4-14, paragraph 1, it is written: "… Check the main landing gear strut for proper stretch, which should be 2.5 +/- 0.25 in under normal static load. Check the tire and brake block and disc…"

In accordance with the inscription on the tires of the aircraft, they have six layers of fabric, and in the presence of tires with fabric under eight layers, no wear of a layer of fabric is allowed.
In chapter three of the aircraft's POH, there is no emergency landing procedure with a flat tire.

2.6.3. Information on the fuel used and its condition.

In the aircraft's logbook, there was no record of refuelling the aircraft, but according to the owner pilot, during the pre-flight inspection, he found that the fuel tanks were half filled with aviation gasoline, which is reflected in paragraph 2.6.2 when determining the take-off aircraft mass. During the inspection, after the event, it was found that the fuel tanks were 1/3 full.
The amount of fuel and its condition have no relation to the realization of the occurrence.

2.7. Meteorological information

There were no weather phenomena that influenced the realization of the event. Detailed information on the meteorological conditions at the time of the event is attached to the investigation file.

2.8. Aids to navigation

Standard navigation equipment of the aircraft.

2.9. Communications

Standard communication equipment of the aircraft. The two-way radio communication between the A/C and FIC was carried out on a frequency of 130.600 MHz.

2.10. Aerodrome information

The flight in which the incident took place was operated from Panicharevo Airport (LBPN), certified for handling flights other than commercial air transport with aircraft with a maximum take-off mass below 5700 kg.
In accordance with the management and operation manual approved on August 2023 by the DG CAA, the airport with:
Aerodrome Location Indicator and Name – LBPN - Panicharevo Airport.
- Designations: RWY 05/23, 50°/230° MAG
- Dimensions of RWY (m) 440/25 m, asphalt concrete.

The control point of the aerodrome (the middle of the flying field) has coordinates N 42°16'34.8" and E 22°59'26.8". The altitude is 1811 ft (552 m).

The dimensions of the runway of the airport allow for an unobstructed take-off and landing of the type of aircraft with which the event was realized.

There are three taxiways:

- TWY A - 25 x 8.7 m., asphalt, satisfactory condition, longitudinal slope - 0.2%, transverse slope - 0.3%.
- TWY B - 41 x 8.5 .m, asphalt, satisfactory condition, longitudinal slope - 0.3%, transverse slope - 0.3%.
- TWY C - 35 x 8.5 m., asphalt, satisfactory condition, longitudinal slope - 0.2%, transverse slope - 0.7%.

The apron measures 32 x 23.5 m. - Asphalt, satisfactory condition, longitudinal slope - 0.6 %, transverse slope -1.3 %.

Declared Distances
-Take off Run Available (TORA) - Runway 05 - 440 m., Runway 23 - 440 m.
-Take off Distance Available (TODA) - Runway 05 - 440 m., Runway 23-440 m.
-Accelerate Stop Distance Available (ASDA) - Runway 05 - 440 m., Runway 23-440 m.
-Landing Distance Available (LDA) - Runway 05 - 440 m., Runway 23 - 440 m.

During the inspection of the runway after the aviation accident, the following discrepancies were found (Figures 1, 2 and 4 of Appendix 1):
The presence of rutted and crumbling areas on the asphalt concrete pavement of the RWY.
Closed joints on the runway, TWY and platform.
Presence of crumbling and pebbled areas on the runway, TWY and the apron.
Worn markings on both runway thresholds, including numbers.

The presence of bumps on the unpaved surfaces of the runway. Brush and spoil to the east of threshold 23 (eastern threshold) within the extent of the runway with no terrain to provide in the presence of a negative slope on the latter section.

Presence of grassed areas on apron east of hangar.

2.11. Flight recorders

Not used on the aircraft type.

2.12. Wreckage and impact information

At 11:10 h the pilot, after completing the flight in the zone of Panicharevo Airport, started the descent for landing at Runway 05. He turned into the northerly windier side for a approach with left turns. After the turn base, he set the flaps to first stage and lowered the landing gear. On the final the pilot she set the flaps in the maximum released position and maintains the glide for maximum early touchdown at about 70...75 kt. The approach is uneventful. The pilot indicates that, by trained habit, he moved his feet so that his heels rested on the floor and his toes rested on the bottom of the vertical rudder pedals, away from the brake cylinders, to avoid the risk of leaning with the brakes applied. After touching down on the main gear, at the start of the runway, the pilot felt the airplane began to veer to the left.

A trace of the aircraft touching down on the runway was found 18 m from the beginning of the runway, the trace is shown in Fig. 3 of Appendix 1. The trace can be likened to the trace of touching the asphalt of the runway with a hard metal object and taking away part of the asphalt, on inspection of the left wheel of the aircraft, which had a scuffed and flat tyre, bruising and deformation of the left side of the left wheel rim were found (Fig. 21 of Appendix 1), which makes it reasonable to assume that at the time of touchdown, the tire on the left main wheel was flat and landing the left main gear

was touching the wheel rim. At 55 m from the beginning of the RWY, traces of the rotation of a metal object on the runway can be seen, fig. 2 of Appendix 1 (probably the left landing gear rim).

After the touchdown, the pilot felt the aircraft started to veer to the left. He attempted to correct the yaw with the vertical rudder and ailerons, gradually using their full motion but to no effect. Whilst the nose wheel was in the air the pilot hesitated to take off, but before passing the throttle stick forward, he saw that the nose of the aeroplane was pointing, towards the left-hand safety strip, and had the feeling that the aeroplane was banked to the left.

This was because the left main gear attachment assembly was destroyed when the aircraft was touching. In Figs. 1 and 2, traces of the aircraft's movement along the runway up to the point of its final stop can be seen, with the trace showing a deviation of about 15° from the centreline and the runway exit 125 m from its beginning. The nose wheel touchdown did not result in a correction of the yaw direction. At the runway exit there are signs of brake fluid leakage and pieces of the left gear assembly have fallen out, shown in Figure 9 and Figure 22 of Appendix 1.

After entering the ground area of the safety strip, the airplane turned perpendicular to the runway and skidded to a stop in a non-major gully with the nose to the northwest on heading 335° as seen in Figures 5, 6, 7, and 8 of Appendix 1. The left main gear is detached from its anchorage and lies under the wing which was deformed. The damage to the airframe resulting from the aircraft touching the bank of the gully is described in paragraph 2.3 of this report.

The airplane's airframe was preserved at final stop, and the resulting damage is described in paragraph 2.3. One blade of the twin-bladed propeller was bent to almost 90°, Figs 5, 6 and 7 of Appendix 1, confirming the pilot's assertion that the engine was running and shut itself down after the propeller had touched down in the gully. The cockpit retained its structural integrity except for the failure of the lower right door hinge, Figure 18 of Appendix 1 and deformation of the handle propeller pitch position housing and fuel air mixture composition, Figures 14, 15 and 17 of Appendix 1. After the final stop of the aircraft, the main power supply was switched off and the fuel tap was closed, the switches being left in the position they were in when the aircraft stopped. The CB LANDING GEAR/LIGHT/5A fuse has blown (as a result of a short circuit caused by the sensor wires breaking when the left strut broke). The gauges are in the position they have when the power is turned off.

Inspection of the aeroplane at the point of final stop indicated no interruption of the aileron, horizontal and vertical rudder control circuits. Fuel was found to be leaking from the rivets of the right-wing tank skin, Figure 10 of Annex 1. There was no visible damage to the engine, Figure 11 of Annex 1. The oil level reading on the level dipstick is above 50%. The brake fluid reservoir was empty, the brake fluid had leaked through the broken hose to the brake assembly of main gear, Fig.27 of Annex1.

After switching off the power supply and closing the fuel tap, the pilot left the aircraft and at 11:17 called the FIC about the event and then informed the AMRAINB.

There was no evidence of fire in the air or on the ground.

2.13. Medical and pathological information

The pilot did not receive any injuries or personal injuries during the occurrence. He is not known to have used the services of medical facilities after the accident. There is no information that physiological factors or loss of capacity affected his performance.

2.14. Fire

The realized event is not related to the fire arising before or after contact of the aircraft with the ground.

2.15. Factors for Survival

At the time of the occurrence, the pilot was wearing seat belts, which he removed before leaving the aircraft. Before leaving the aircraft, he turned off the main switch, the contact switch and the fuel tap.

2.16. Tests and research

For the safety investigation, the following activities were carried out:

1. Inspection of aircraft PIPER PA-28RT-201, registration LZ-AOI, serial number 28R-7918101, at the site of its final stop after the realization of the aviation occurrence.
2. Additional inspection of the aircraft at its storage place after the realization of the event.
3. Discussions with the pilot and individuals concerned with the event.
4. Research and analysis of aircraft technological and operational documentation.
5. Research and analysis of documents related to the registration and airworthiness of the aircraft.
6. Assessment of the aircraft's flight performance.
7. A fractographic examination of the destruction of the attachment at mounting points of the left landing gear to the wing longeron.
8. Logical-probabilistic analysis of possible causes of the aviation event.

A control dismantling and functional test of the brake unit of the left wheel were carried out, during which the absence of blockage and its normal functioning were found.

For Item 1, the results of the inspection of the aircraft at the final stopping point are reflected in paragraphs 2.1.3; 2.2; 2.3; 2.4; 2.6.3 and 2.12.
For Item 2 the results of the inspection of the aircraft at the place of storage are reflected in paragraphs 2.3 and 2.12.
For Item 3 the results of the interviews conducted with the pilot and individuals relevant to the event are reflected in paragraphs 2.1.2, 2.5, 2.6.1, 2.7, 2.12, 2.13, 2.15 and 2.17.
For Item 4 the results of the research and analysis of the operational and technological documentation of the aircraft are reflected in paragraphs 2.6.1, 2.6.2 and 2.6.3.
For Item 5 the research and analysis of documents related to the registration and airworthiness of the aircraft are reflected in paragraphs 2.6.1.
For Item 6 the results of an assessment of the flight and operational characteristics of the aircraft relevant to the realised event are given in paragraph 2.6.2.
For Item 7 the fractographic examination of the destruction of the attachment at mounting points of the left landing gear to the wing longeron, the results are reflected in paragraph 2.17.

A logical-probabilistic analysis of possible causes for the realisation of the occurrence is carried out in Chapter 3 of this report.

2.17. Additional information.

The fractographic examination of the destruction of the attachment at mounting points of the left landing gear to the wing longeron was performed. Destruction of this attachment leads to the collapse of the main gear, the left runway excursion and the damage to the aircraft described in paragraph 2.3. The examination was carried out in the Mechanical Research and Control Laboratory at the Scientific Research Sector of the Technical University of Sofia and is reflected in Protocol №104/3108 of 29.04.2024 attached to the investigation materials.

The equipment used in the examination was a Carl Zeiss Jena metallographic microscope and an Olympus digital camera. The fractography of the fractures has been made. Fig. 1, Annex 2 shows the destroyed support sleeve of the left landing gear, and Fig. 2 to Fig. 8, Annex 2, show photographs of the fractures.
On the presented fractures, in accordance with the statement made by those who carried out the examination, the following was observed:

- The general aspect of the fractures is of a brittle disruption character with an obvious texture of the material from the rupture (Figures 2 and 3 of Annex 2);
- The fatigue cracks have not been identified.
- Observed the presence of ruptures (cracks) localized in the area of the lubrication grooves, which arose during the rupture of the attachment (Figs. 3, 4, 5, 6 and 7 of Annex 2);
- Local areas of plastic deformation in the bearing bore as well as individual undercuts on the fractures were found (Fig. 8 of Annex 2).
- Areas of lubricant (contamination) were found on the surfaces of the fractures (Figs. 6, 7 and 8, from Annex 2).
- In conclusion, the examined fracture is a brittle disruption brittle with an obvious material texture from rupture induced by unacceptable forces (extreme loading), with the likely scheme of unacceptable loading corresponding to general bending and shearing.

3. Analysis

It is evident from the foregoing that the accident associated with the severe damage to the aircraft described in paragraph 2.3 was caused by the landing of the aircraft with a flat tyre and subsequent destruction of the left main gear. With regard to the flat tyre, the pilot-in-command stated that during the pre-flight check of the airplane he had not found any defects in the tyre compression of the airplane, nor had he found any defects which would have prevented the flight from being carried out in terms of the last four paragraphs of paragraph 2.6.2, otherwise he would not have begun the flight until the defects had been rectified.

There are two possibilities:
1.The tyre may have burst on landing with the left pedal brake applied by the pilot.
2.The tyre may have burst on take-off in the acceleration phase and the pilot may not have noticed the burst.

Regarding the first possibility, the instructor-rated pilot stated that he maintained the glide slope for maximum early touchdown at about 70…75 kt during the approach in accordance with the established landing procedures for Runway 05. The pilot indicated that, as a matter of trained habit, he moved his feet so that his heels rested on the floor and his toes rested on the underside of the vertical rudder pedals, away from the brake cylinders, to avoid the risk of touching down with the brakes applied. After touching down on the main gear at the start of the runway, the pilot feels the airplane begin to veer to the left.

The detected track of the landing gear is 18 m from the beginning of the runway as indicated in paragraph 2.12 and can be identified as the track of a hard metal object. Inspection of the left wheel found bruising and deformation to the left side of the left wheel rim, probably caused by impact with a hard, non-deformable surface (the asphalt surface of the runway).

If the tyre has burst as a result of rubbing arising as a result of the tyre contacting the wheel with the braking system applied on the asphalt surface at the point of contact and immediately following, there should be a significant trace of the worn tyre.

The traces on the runway and the deformations on the left wheel indicate that the tire was flat during the left wheel contact and that some of the energy that should have depreciated the tire during contact went to deforming the rim and destroying the asphalt pavement.

After the touchdown, the pilot feels the aircraft begin to veer to the left. He tries to correct the deviation with the vertical rudder and ailerons, gradually using their full deflection, but to no effect. As a result of the impact and subsequent combined bending and shearing loads, the left main gear attachment assembly is destroyed, as confirmed by the TU-Sofia examination described in paragraph 2.17. After destruction of the attachment point of left main gear, the aircraft exits the runway and receives the failures described in paragraphs 2.3 and 2.12.

In the discussion with the pilot, it was found that he could not declare that during the pre-flight inspection of the aircraft he had noticed the tyre tread pattern on to the fabric, and also if there were tread wear (which is unacceptable), if this wear was positioned on the side of the tyre in contact with the ground. In order to detect such tread, wear it is necessary to move the aircraft from its initial stand or have another person observe it at the start of taxiing.

No such action is performed, and the pilot starts to taxi, with the potential for sections of damaged tread pattern on the tires. During taxiing, and more probably during the takeoff run, due to the presence of irregularities on the runway, it is possible that tread rubbing may have resulted in a burst and the tire pressure may drop. If this occurred in the final stage of acceleration prior to the aircraft breaking away it may go unnoticed by the pilot operating the aircraft due to the significant reduction in wheel load due to the increase in lift with increasing speed.

The pilot has no information about the situation with the left tyre and during the landing executes the procedures as they are foreseen for a normal landing, which is accompanied by an unauthorized loading of the left main gear and its subsequent destruction, and all the other consequences associated with the destruction of the aircraft.

Paragraph 6.2, last bullet, states the airplane's POH does not include an emergency procedure for landing with a flat tire.

Considering the foregoing, it can be pointed out that the main cause of the accident was related to an insufficiently thorough and incomplete pre-flight inspection of the aircraft.

The mentioned reason is the result of the fact that in the used maintenance program the section for the line maintenance is not developed, there are no indicated and described the works which are performed by the owner pilot during the maintenance of the aircraft.

4. Conclusion

4.1. Findings

As result of the investigation, the Commission made the following conclusions:

1. The aircraft PIPER PA-28RT-201, MSN 28R-7918101, registration marks LZ-AOI, was manufactured in 1979 by Piper Aircraft Corp., USA.

2. The aircraft holds Certificate of Registration No. 2874 issued by the General Directorate of Civil Aviation Administration of the Republic of Bulgaria on January 22, 2020.

3. The aircraft has five owners, private individuals.

4. During the realized event one of the owners was the pilot.

5. The aircraft holds Certificate of Airworthiness No. 25-0204 issued by DG CAA on January 22, 2020.

6. The aircraft was issued a Certificate of Airworthiness Review with reference number BG-ARC-2874 on April 11, 2023. The validity period of this certificate is 10 April 2024. The certificate is valid on the date of the event.

7. The aircraft has been issued an Aircraft Noise Certificate No. 45-0218. The certificate was issued by DG CAA on January 22, 2020.

8. From the beginning of the operation until the day of the aviation occurrence, the aircraft has flown 9335 h.

9. Maximum take-off and landing mass is 1247 kg.

10. The airworthiness maintenance of the airplane shall be based on a Maintenance Program proposed and approved by the owners of the airplane in accordance with the requirements of Commission Regulation (EU) No 1321/2014, Annex Vb (Part ML).

11. The maintenance program has been developed in English and does not specify the work to be performed during line maintenance and what work is to be performed by the owner pilot.

12. The copy of the Maintenance Program submitted by DG CAA does not match the copy submitted by the owner pilot.

13. On the day of the event, the pilot performs the maintenance at the beginning of the flying day.

14. During the pre-flight inspection no malfunctions were detected and corrected.

15. No record of work performed during line maintenance shall be made in the aircraft documentation.

16. The aircraft is equipped with a Lycoming IO-320-C1C6 aircraft piston engine, serial number L-5529-51A. By the time of the event, the engine had operated at 49:18 h.

17. The last overhaul of the engine was performed as of February 19,2023. There is no evidence that the engine performance had any effect on the occurrence of the accident.

18. A McCauley B2D34C213 S/N 890926 propeller is installed on the aircraft. By the time of the event, the propeller had worked 49:18 h, after the overhaul performed in 2022.

19. As a result of the realized event the propeller was destroyed.

20. At the time of touchdown, the aircraft had a flat left main tire.

21. During touchdown and in the initial section of the landing roll, the attachment at mounting points of the left landing gear to the wing longeron is destroyed.

22. The left main landing gear is destroyed during the landing roll.

23. The aircraft left the runway 05 about 125 m from its beginning.

24. When the aircraft left the runway there were traces of leaking brake fluid and fallen pieces of the attachment of the left main gear.

25. After entering the ground part of the safety strip, the aircraft rotated perpendicular to the runway and skidded to a stop in a small gully with the nose to the northwest on heading 335°.

26. The damage to the airframe resulting from the aircraft touching the bank of the gully is described in paragraph 2.3 of this report.

27. The pilot in command who caused the accident holds a valid European license CPL (A) No BGR.FCL.CPA-00397-10897, issued by DG CAA with date of initial issue 02.08.2018 and valid endorsements at the time of the event for SEP (land) and FI (A).

28. When performing the pre-flight preparation of the aircraft, the pilot in command does not perform the required assessment o of the tires tread pattern.

29. When the pilot in command manipulates the propeller control handles in the landing roll stage, the propeller pitch steep control handle and the aircraft engine fuel-air mixture handle are distorted.

30. After the final stop of the aircraft, the pilot in command switched off the main power supply and closed the fuel tap, released himself from the seat belts and left the aircraft without injury.

31. After leaving the aircraft, the pilot in command calls the FIC about the realized event, and then notifies the AMRAINB.

32. There is no information that physiological factors or incapacitation affected the pilot's ability to work.

33. There is asphalt cracking and grass growth on the runway.

34. There was no evidence of fire in the air or on the ground.

35. The meteorological conditions at the time of the aviation occurrence were of no effect to the accident.

4.2. Causes

Based on the circumstances set out in this report and the analysis of the above, the Commission points to the following as the cause of the accident:

Violation of the technology of pre-flight preparation of the airplane by the pilot, which led to taking a flight with an unidentified technical condition of the tire of the left gear, resulting in its burst during the flight and destruction of the left main gear of the aircraft.
The following dominant factors also contributed to the realisation of the aviation accident:
1. The maintenance programme does not specify the works to be performed during the line maintenance.
2. The maintenance programme does not specify the works to be performed by the owner pilot.
3. The presence of asphalt cracking on the runway and grass growth.

5. Safety Recommendations

Considering the cause of the accident, the Commission recommends the following measures to ensure flight safety:

BG.SIA-2025-01. For subsequent flight operation of the aircraft with which the aviation accident was realized, it is necessary to carry out or overhaul, and the engine control dismantling with subsequent tests.

BG.SIA-2025-02. DG CAA to carry out a more elaborate schedule of inspections of the Maintenance Programs of ELA 2 aircraft registered in the Aircraft Register of the Republic of Bulgaria to determine the availability and sufficiency of the scope of line maintenance.

The Investigation Commission reminds all organizations, to which flight safety recommendations are sent that, on the grounds of Article 18 of Regulation (EU) 996/2010 on Investigation and Prevention of Accidents and Incidents in Civil Aviation and Article 19, paragraph 7 of Ordinance No. 13 on the Investigation of Aviation Accidents are obliged to notify the Air, Maritime and Railway Accidents Investigation National Board in writing of the action taken on the recommendations made.

AIR, MARITIME AND RAILWAY ACCIDENTS INVESTIGATION NATIONAL BOARD

COMMISSION ON INVESTIGATION OF THE ACCIDENT

Sofia January 27, 2025

ANNEX 1

Fig.1

Fig.2

Fig. 3

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

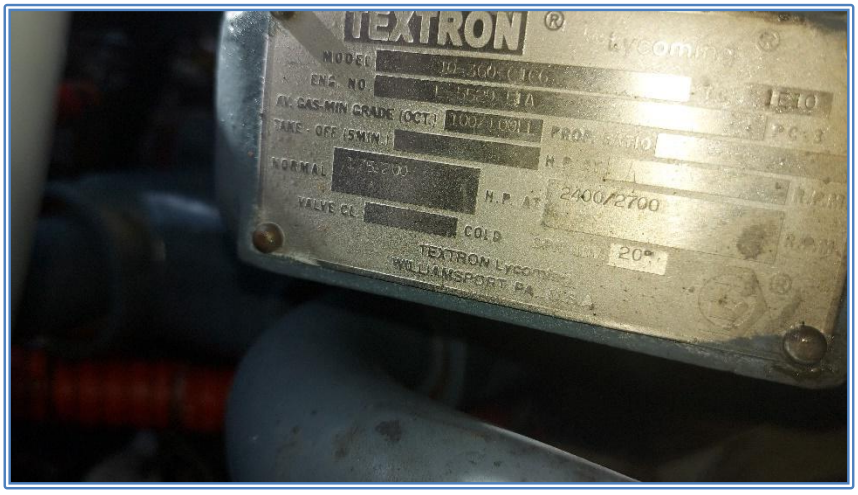

Fig.12.

Fig. 13.

Fig.14.

Fig.15.

Fig. 16.

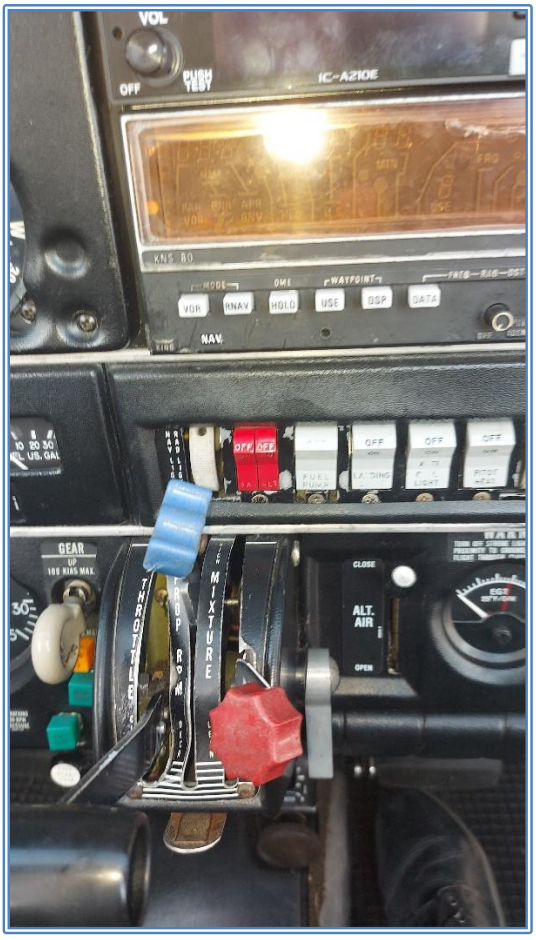

Fig. 17.

Fig. 18.

Fig. 19.

Фиг. 20.

Fig.21.

Fig.22.

Fig. 23.

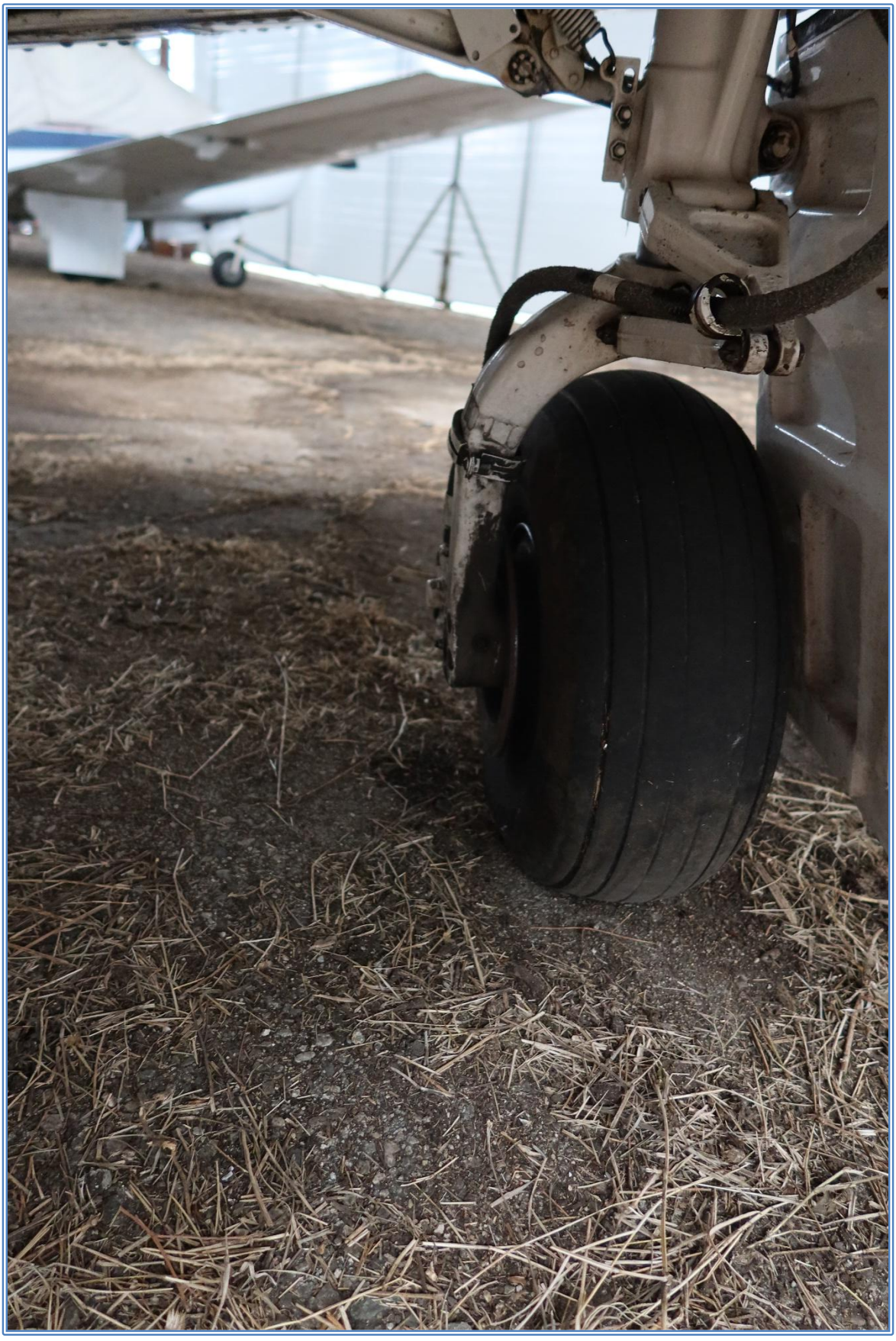

Fig.24.

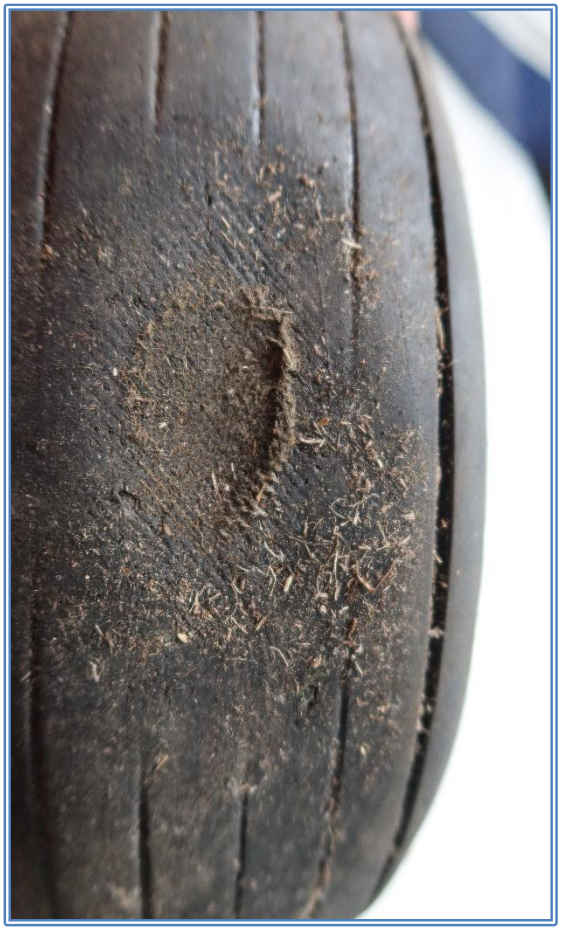

Fig.25.

Fig.26.

Fig. 27.

ANNEX 2

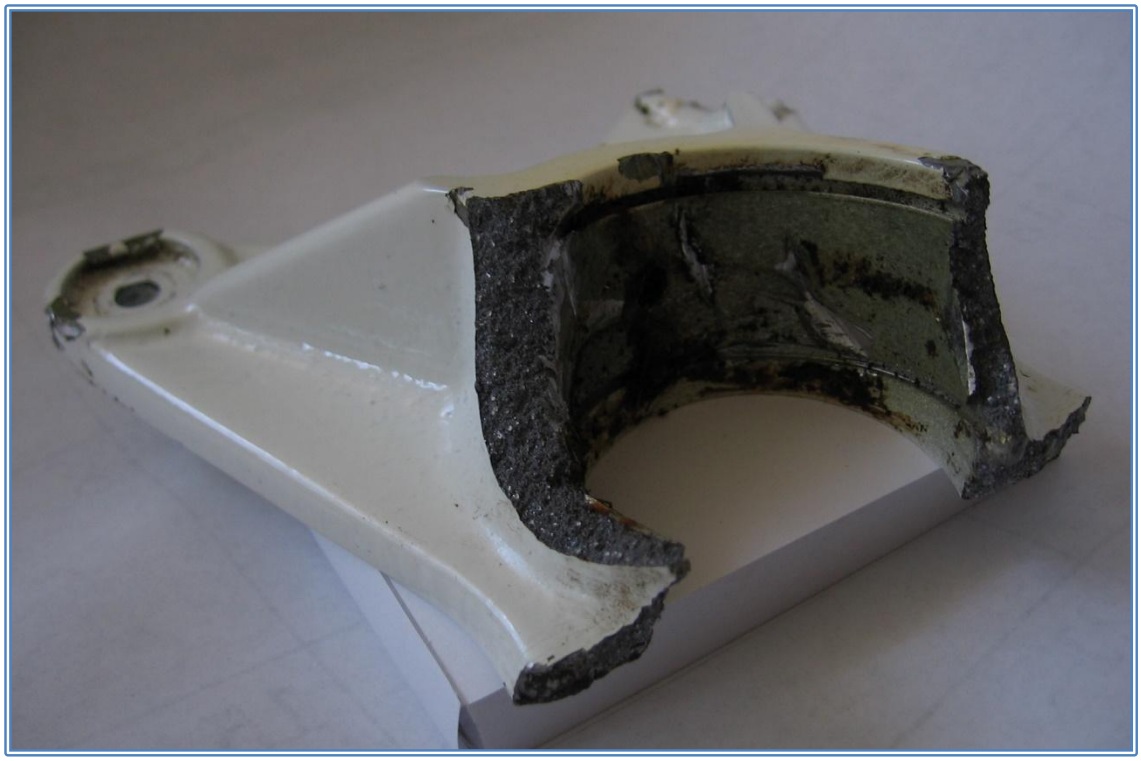

Fig..1 (general view)

Fig.2 (zoom in 4x)

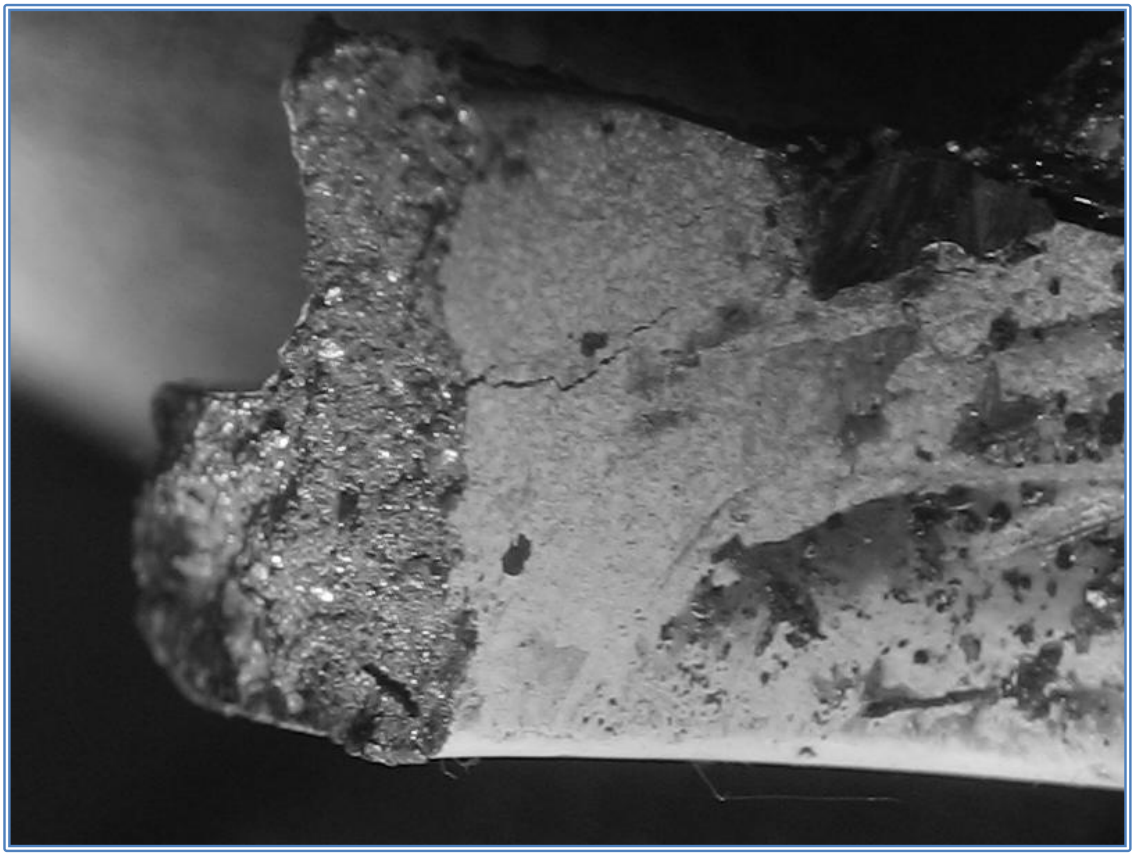

Fig. 3 (zoom in 4x)

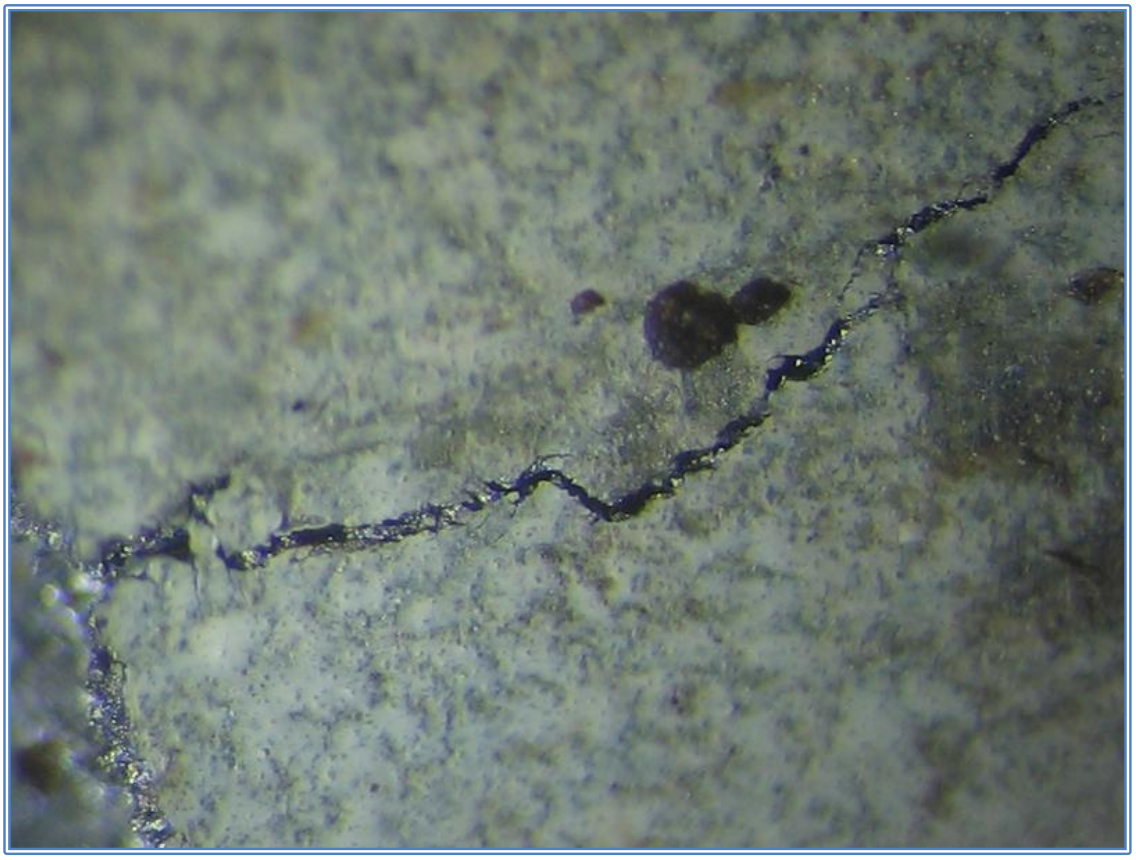

Fig. 4 (zoom in 16x)

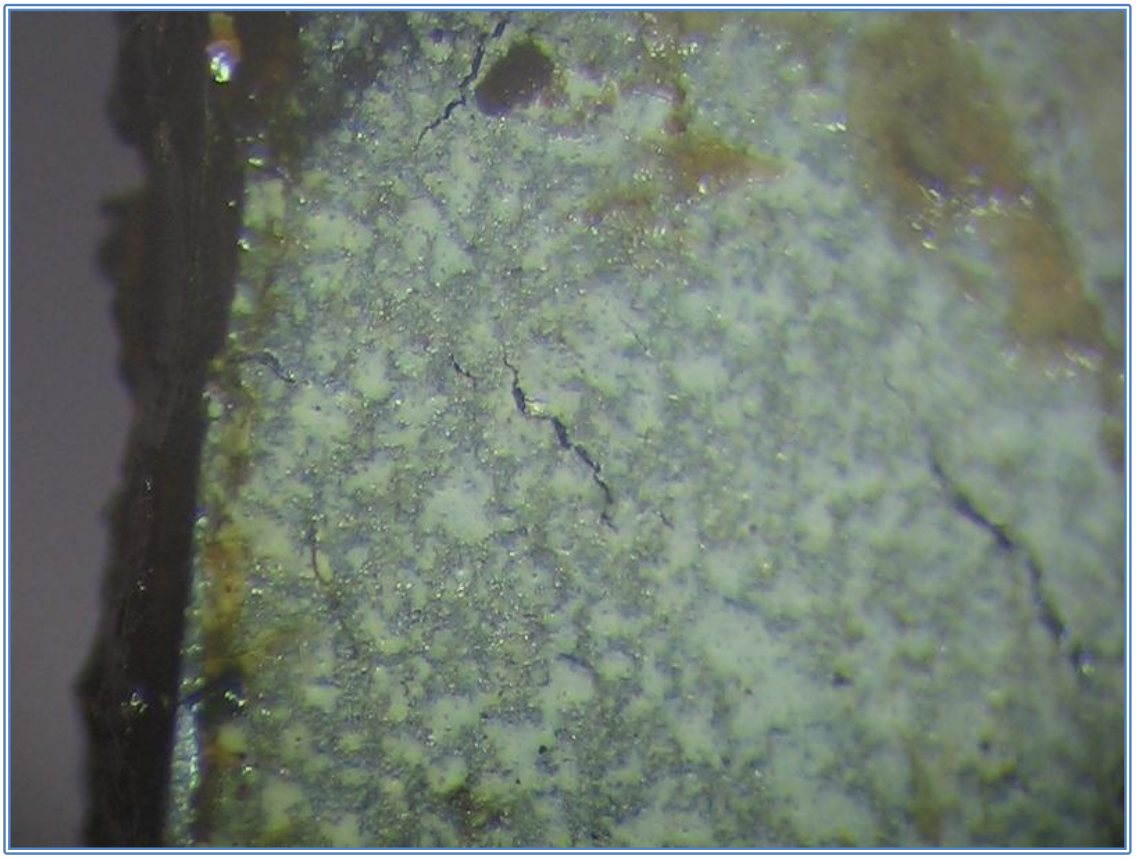

Fig. 5 (zoom in 16x)

Fig. 6 (zoom in 16x)

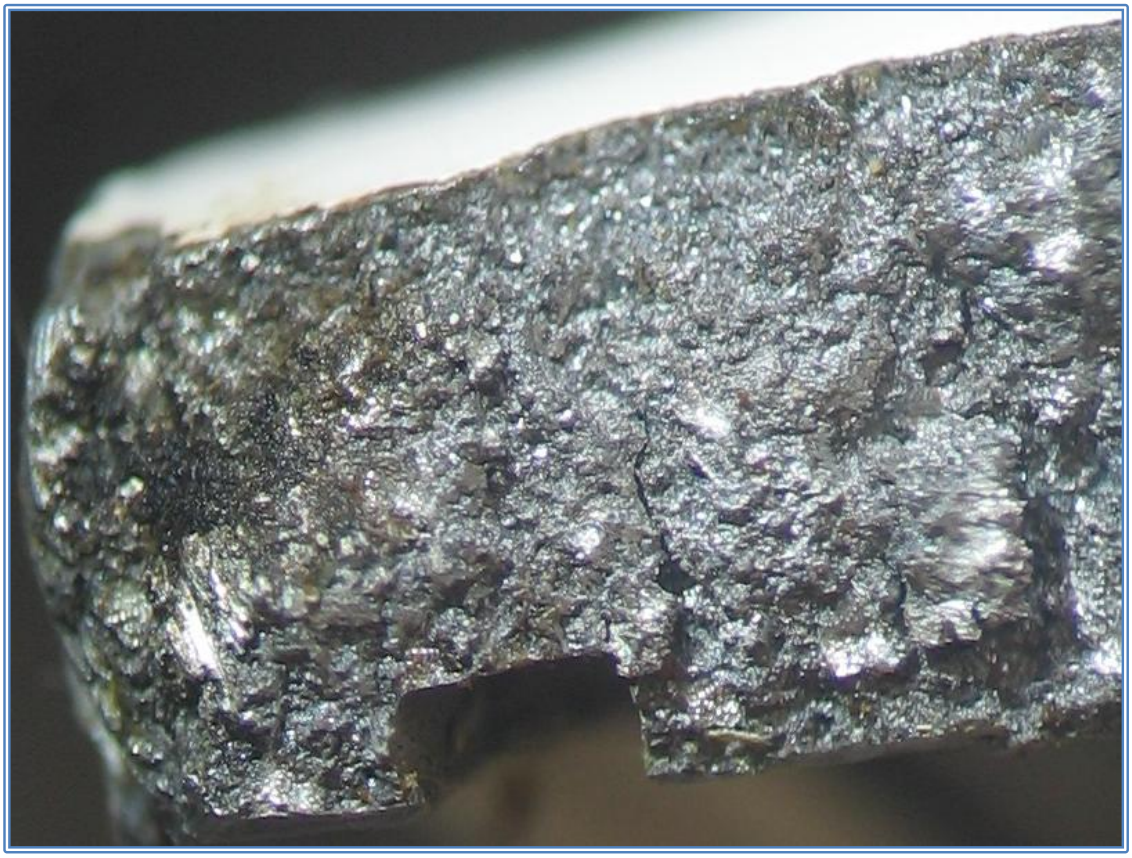

Fig. 7 (zoom in 16x)

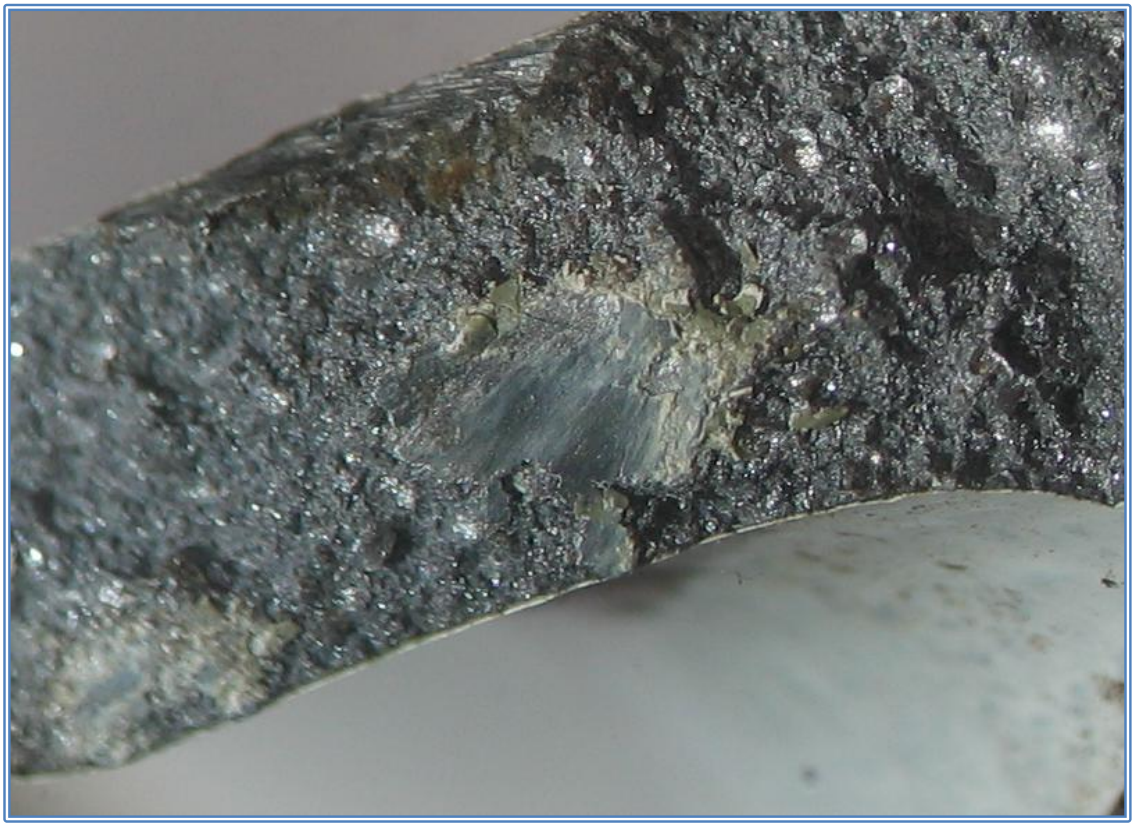

Fig. 8 (zoom in 10x)