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**Unofficial translation**

# FINAL REPORT

## ON THE INVESTIGATION OF A SERIOUS INCIDENT
## Involving aircraft Cessna U206F, registration S5-DOT, at Šentvid pri Stični Airfield, on 11 May 2024

**Republic of Slovenia**

**» 2025 «**

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# INTRODUCTION

The final aircraft serious incident investigation report contains the facts, analysis, causes, and safety recommendations of the serious incident investigation commission based on the circumstances in which the accident occurred.

In accordance with point 3.1 of chapter 3 of Annex 13 to the Convention on International Civil Aviation (13th edition, July 2024), Article 1 of Regulation (EU) no. 996/2010 of the European Parliament and of the Council of 20 October 2010 on investigations and prevention of accidents and incidents in civil aviation (L 295/35), the fourht paragraph of Article 137 of the Aviation Act (Official Gazette of the Republic of Slovenia, No. 81/10 – official consolidated text, 46/16 an 47/19) and According to Article 2 of the Regulation on the Investigation of Air accidents, Serious Incidents and Incidents (Official Gazette of the RS, No. 72/03, 110/05 and 53/19), **the purpose of the final report on the investigation of an serious incident is not to establish guilt or responsibility.**

The final investigation report must undoubtedly benefit aviation safety.

It is important that the final investigation report be used to prevent aviation accidents or incidents. Using the final aircraft accident report for other purposes may lead to misinterpretation.

# 1 SUMMARY

**Date and Time of Occurrence:** 11 May 2024 at 08:25 UTC

**Location of Serious Incident:** Vzletišče Šentvid pri Stični, N 45°56'41" E 14°50'57"

**Type of Flight:** Parachute dropping

**Aircraft Information:**

- **Aircraft Manufacturer:** Cessna Aircraft Company, USA
- **Aircraft Model:** U206F
- **Aircraft Registration:** S5-DOT
- **MTOM:** 1 636 kg

**Owner/Operator:** PARAJET d.o.o., Ljubljana

**Crew and Passengers:**

- **Crew:** pilot (1)
- **Passengers:** 6
- **Total Persons on Board:** 7

**Consequences:**

- **Injuries:**

| | *Crew* | *Passengers* | *Others* |
|---|---|---|---|
| Fatal | / | / | / |
| Serious | / | / | / |
| Minor / None | 0/1 | 0/6 | |

- **Aircraft and Equipment:** Damage to the landing gear, fuselage, wing, and horizontal stabilizer

# 2 FACTUAL INFORMATION

## 2.1 Flight Information

On 11 May 2024, the aircraft Cessna U206F, registration S5-DOT, was engaged in parachute drop operations at Šentvid pri Stični Airfield. During the second flight of the day, a group of six parachutists boarded the aircraft.

While taxiing on the grass surface, the right main landing gear spring strut (hereinafter referred to as the "spring leg") suddenly failed. As a result, the aircraft tilted to the right and the edge of the right wing scraped along the grass surface. Simultaneously, the aircraft tilted backward onto the tail, leading to deformation of the right horizontal stabilizer.

The pilot shut down the engine in accordance with the checklist and instructed the passengers to evacuate the aircraft. None of the occupants, including the pilot, sustained injuries.

**Figure 1: Aircraft position following the failure of the right main gear spring leg**

The aircraft sustained a fracture of the right spring leg, and damage to the lower fuselage, the right wing, and the right horizontal stabilizer.

**Figure 2: Aircraft damage**

## 2.2 Pilot Information

The pilot held the following:

- Commercial Pilot Licence CPL(A), issued on 23 April 2021
- Valid ratings and authorizations: Cessna SET – valid until 31 March 2025, SEP(L) – valid until 31 October2025, IR/SE – valid until 31 March 2025, FI(A) – valid until 28 February 2025
- Valid Class 1/2 LAPL medical certificate with no limitations, valid until 24 January 2025

Total flight time as of the date of the occurrence: 1,850 hours total, of which 1,100 hours on type. Flight time in the last 90 days: 55 hours.

## 2.3 Aircraft Information

The aircraft Cessna U206F (registration S5-DOT) was manufactured in 1973 by the Cessna Aircraft Company. The Cessna U206F is a six-seat, high-wing, single-engine aircraft originally equipped with a piston engine, which was subsequently modified into a turboprop aircraft by installing a Pratt & Whitney PT6A-21 engine, intended for parachute dropping and passenger transport.

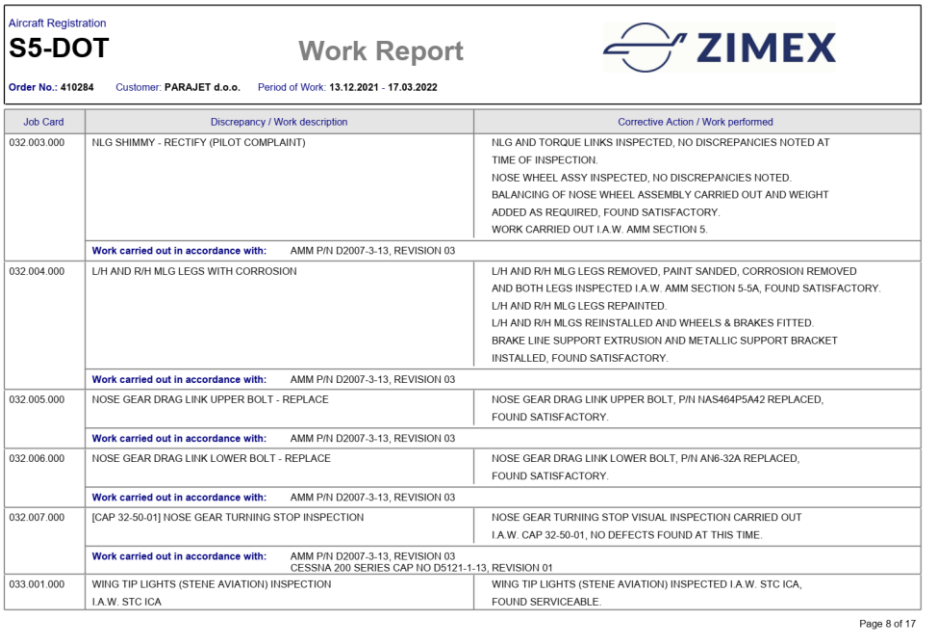
Basic Characteristics:

- **Crew**: 1
- **Length**: 8,6 m
- **Wingspan**: 10,97 m
- **Height**: 2,80 m
- **Wing area**: 16,17 m²
- **Empty weight**: 980 kg
- **MTOM**: 1636 kg
- **Powerplant**: PT&-A21(550 HP)

## 2.4 Aircraft Maintenance Information

The aircraft was entered into the Slovenian aircraft register on 4 April 2019. The investigation commission does not have access to maintenance data prior to that date, including the service history of individual aircraft components. Between 13 December 2021 and 17 March 2022, the aircraft underwent routine maintenance inspection at ZIMEX, an approved maintenance organization in Switzerland. During the inspection, corrosion was identified on both the left and right main landing gear spring legs. According to the maintenance provider, the corrosion was removed and both spring legs were repainted. The work was performed in accordance with the Cessna 206 Maintenance Manual[1].

[1] http://www.aeroelectric.com/Reference_Docs/Cessna/cessna-maintenance-manuals/Cessna_206&T206_1969-1976_MM_D2007-3-13.pdf



Aircraft Registration
**S5-DOT**

**Work Report**

ZIMEX

**Order No.: 410284** Customer: **PARAJET d.o.o.** Period of Work: **13.12.2021 - 17.03.2022**

| Job Card | Discrepancy / Work description | Corrective Action / Work performed |
|---|---|---|
| 032.003.000 | NLG SHIMMY - RECTIFY (PILOT COMPLAINT) | NLG AND TORQUE LINKS INSPECTED, NO DISCREPANCIES NOTED AT TIME OF INSPECTION.<br>NOSE WHEEL ASSY INSPECTED, NO DISCREPANCIES NOTED.<br>BALANCING OF NOSE WHEEL ASSEMBLY CARRIED OUT AND WEIGHT ADDED AS REQUIRED, FOUND SATISFACTORY.<br>WORK CARRIED OUT I.A.W. AMM SECTION 5. |
| | **Work carried out in accordance with:** AMM P/N D2007-3-13, REVISION 03 | |
| 032.004.000 | L/H AND R/H MLG LEGS WITH CORROSION | L/H AND R/H MLG LEGS REMOVED, PAINT SANDED, CORROSION REMOVED AND BOTH LEGS INSPECTED I.A.W. AMM SECTION 5-5A, FOUND SATISFACTORY.<br>L/H AND R/H MLG LEGS REPAINTED.<br>L/H AND R/H MLGS REINSTALLED AND WHEELS & BRAKES FITTED.<br>BRAKE LINE SUPPORT EXTRUSION AND METALLIC SUPPORT BRACKET INSTALLED, FOUND SATISFACTORY. |
| | **Work carried out in accordance with:** AMM P/N D2007-3-13, REVISION 03 | |
| 032.005.000 | NOSE GEAR DRAG LINK UPPER BOLT - REPLACE | NOSE GEAR DRAG LINK UPPER BOLT, P/N NAS464P5A42 REPLACED, FOUND SATISFACTORY. |
| | **Work carried out in accordance with:** AMM P/N D2007-3-13, REVISION 03 | |
| 032.006.000 | NOSE GEAR DRAG LINK LOWER BOLT - REPLACE | NOSE GEAR DRAG LINK LOWER BOLT, P/N AN6-32A REPLACED, FOUND SATISFACTORY. |
| | **Work carried out in accordance with:** AMM P/N D2007-3-13, REVISION 03 | |
| 032.007.000 | [CAP 32-50-01] NOSE GEAR TURNING STOP INSPECTION | NOSE GEAR TURNING STOP VISUAL INSPECTION CARRIED OUT I.A.W. CAP 32-50-01, NO DEFECTS FOUND AT THIS TIME. |
| | **Work carried out in accordance with:** AMM P/N D2007-3-13, REVISION 03<br>CESSNA 200 SERIES CAP NO D5121-1-13, REVISION 01 | |
| 033.001.000 | WING TIP LIGHTS (STENE AVIATION) INSPECTION I.A.W. STC ICA | WING TIP LIGHTS (STENE AVIATION) INSPECTED I.A.W. STC ICA, FOUND SERVICEABLE. |

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**Figure 3: Maintenance report for completed work**

## 2.5 Passenger Number and Weight Information

The necessary data for the calculation of take-off weight and center of gravity (CG) position were obtained by the pilot from the parachute jump supervisor.

## 2.6 Meteorological Information

At the time of the serious incident on 11 May 2024 at 10:25 local time, the following weather conditions prevailed at the airfield:

- Air temperature: approximately 19 °C
- Relative humidity: approximately 45%
- Visibility: more than 10 km
- Light wind from the northeast at an average speed of approximately 5 knots
- Some shallow cumulus clouds with a base around 6,000 ft, and cirrus clouds at high altitude
- No other significant or hazardous weather conditions were present

## 2.7 Navigation Information

N/A

## 2.8 Radio Communications Information

During organized flight operations, radio communication is available via a handheld VHF transceiver on frequency 123.505 MHz.

## 2.9 Aerodrome Information

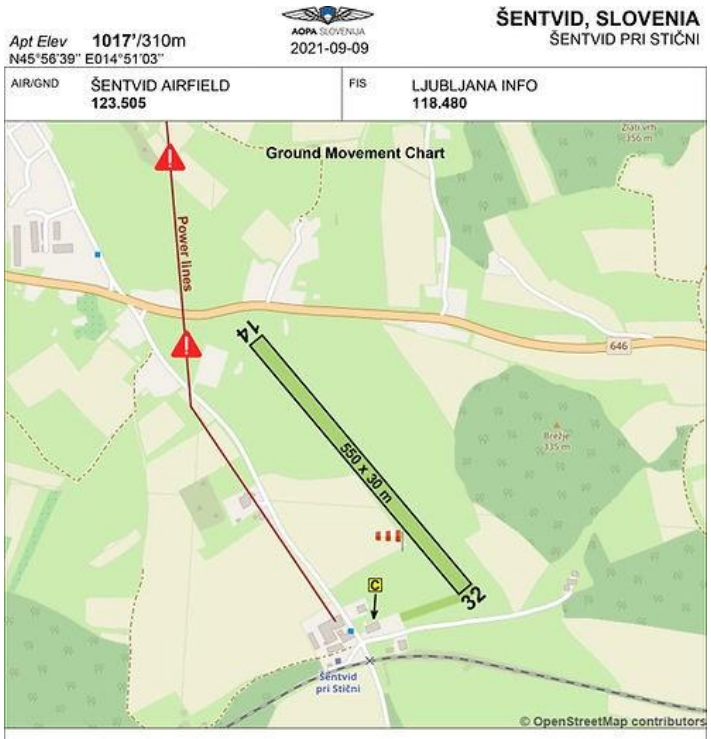
The airfield is located approximately 1,300 meters southeast of the settlement of Šentvid pri Stični.

**Runway Orientation (Magnetic):** 136° / 316°

**Runway Threshold Markings:** 14 / 32

**Runway Dimensions:** 550 m x 30 m

**Strip Dimensions:** 590 m x 30 m




| | | | |
|---|---|---|---|
| **Warnings** | 1. No continuous radio watch. Transmit blind.<br>2. Mind power lines and road before threshold 14.<br>3. Possible turbulence on final 32 behind forest. | | |
| **Remarks** | 1. Often skydiving and glider activity (Wednesdays, Fridays and weekends).<br>2. In case of skydiving activities, two way radio contact is required.<br>3. Only VFR flights allowed. | | |
| **Operator** | Letalski klub Šentvid pri Stični | **Email** | info@lk-sentvid.com |
| **Address** | Šentvid pri Stični 65 | **Internet** | www.lk-sentvid.com |
| **Zip City** | SI-1296 Šentvid pri Stični | **ARO** | +386 4 2040 420 – Ljubljana |
| **Tel** | | **METEO** | +386 4 2804 500 – Ljubljana |
| **Fax** | | | +386 41 548 036 – Airfield (Auto) |
| **Mobile** | +386 40 171 071 | **Fuel/Customs** | N/A |

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**Figure 4: Map of Šentvid pri Stični Airfield**

### 2.10 Operator Information

The aircraft operator is PARAJET d.o.o., based in Ljubljana, a company engaged in aerial transport services.

# 3 ANALYSIS

### 3.1 Flight Preparation

The pilot completed the pre-flight preparation. The take-off weight calculation indicated that the aircraft's weight was below the maximum permitted take-off weight, and the center of gravity was within the prescribed limits (Figure 5).

S5-DOT Sentvid pri Sticni - Sentvid pri Stic... Fuel, Weight and Balance

Fuel

| | | | | | |
|---|---|---|---|---|---|
| Taxi/Takeoff | | 5,0 ltr | Contingency (5%) | | 1,0 ltr |
| Enroute | 10m | 19,6 ltr | Final Reserve | | 0,0 ltr |
| Holding Time | 30m | 56,0 ltr | Minimum | | 84,6 ltr |
| Landing | | 3,0 ltr | **Planned** | **55m** | **110,0 ltr** |

Weight and Balance

| | Weight | Arm (lon) | Mom (lon) |
|---|---|---|---|
| Empty | 986,0 kg | 805,18 | 793907 |
| Fuel (40,0 ltr) | 32,0 kg | 1219,20 | 39014 |
| Pilot + 1 Jumper | 80,0 kg | 914,40 | 73152 |
| 1 Jumper FWD | 160,0 kg | 1270,00 | 203200 |
| 2 jumpers CENTER | 160,0 kg | 1905,00 | 304800 |
| 2 jumpers AFT | 158,0 kg | 2540,00 | 401320 |
| Taxi Fuel (5,0 ltr) | 4,0 kg | -1219,20 | -4877 |
| Final reserve fuel (65,0 ltr) | 52,0 kg | 1219,20 | 63398 |
| **Totals** | **1632,0 kg** | **1148,23** | **1873915** |

Note that where a takeoff weight is displayed in the graph, the taxi/takeoff fuel has been deducted from the startup weight shown in the table.

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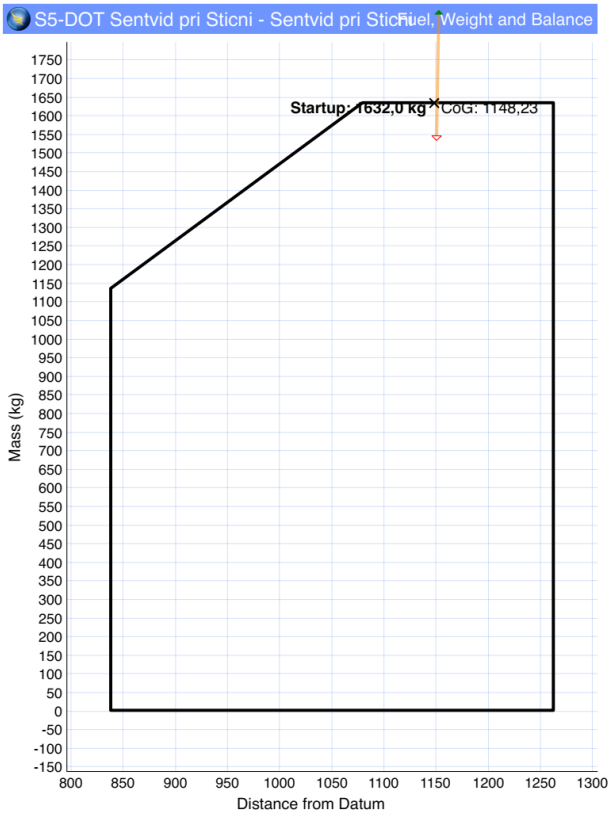


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**Figure 5: Take-off weight calculation and center of gravity determination**

### 3.2 Weather Analysis

Weather conditions had no influence on the serious incident.

### 3.3 Effect of Ground Surface on Landing Gear Fatigue

The airfield is a maintained and regularly mowed grass surface. Drainage pipes and surface channels provide runoff for rainwater. The grass surface is rolled and leveled to ensure suitable operating conditions for aircraft.

Nevertheless, prolonged operations on uneven surfaces can accelerate material fatigue and contribute to structural damage or failure.

### 3.4 Fracture Location of the Sping Leg

The failure occurred at the point where the spring leg enters the fuselage opening (Figure 6). After the failure, part of the leg remained inside the fuselage (Figure 7), while the section connected to the wheel was found lying on the grass (Figure 8).

**Figure 6: Spring leg entry point into the fuselage**

**Figure 7: Section of the leg remaining in the fuselage**

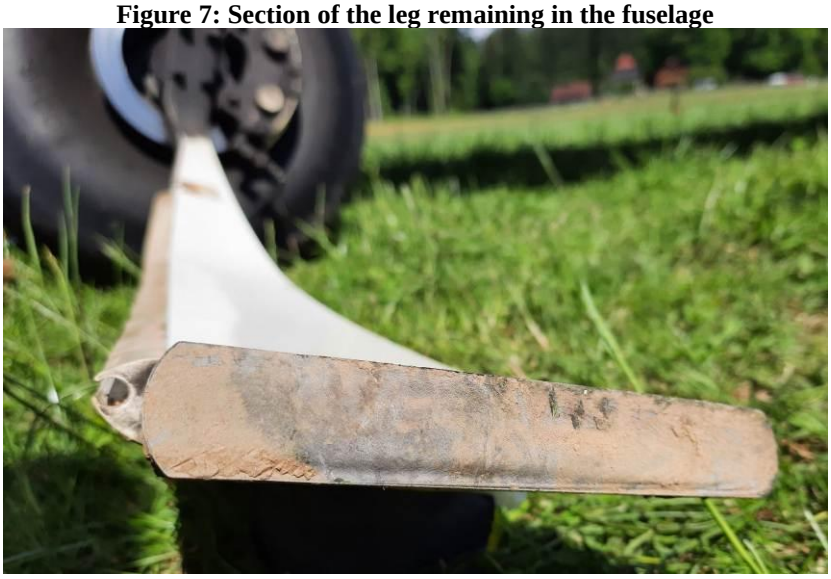

**Figure 8: Detached spring leg section found on the grass**

# 4 INVESTIGATION OF SPRING LEG FAILURE (SUMMARY OF THE ENTIRE EXAMINATION)

The Commission decided to engage the Slovenian National Building and Civil Engineering Institute (ZAG) to assist in determining the cause of the spring leg failure. The Commission has successfully cooperated with ZAG in previous investigations. ZAG has all the resources necessary for such an analysis. Two components of the failed spring leg—outer and inner parts—were delivered to ZAG for examination (Figure 9). The primary objective was to determine whether the spring leg failure was caused by a material defect.

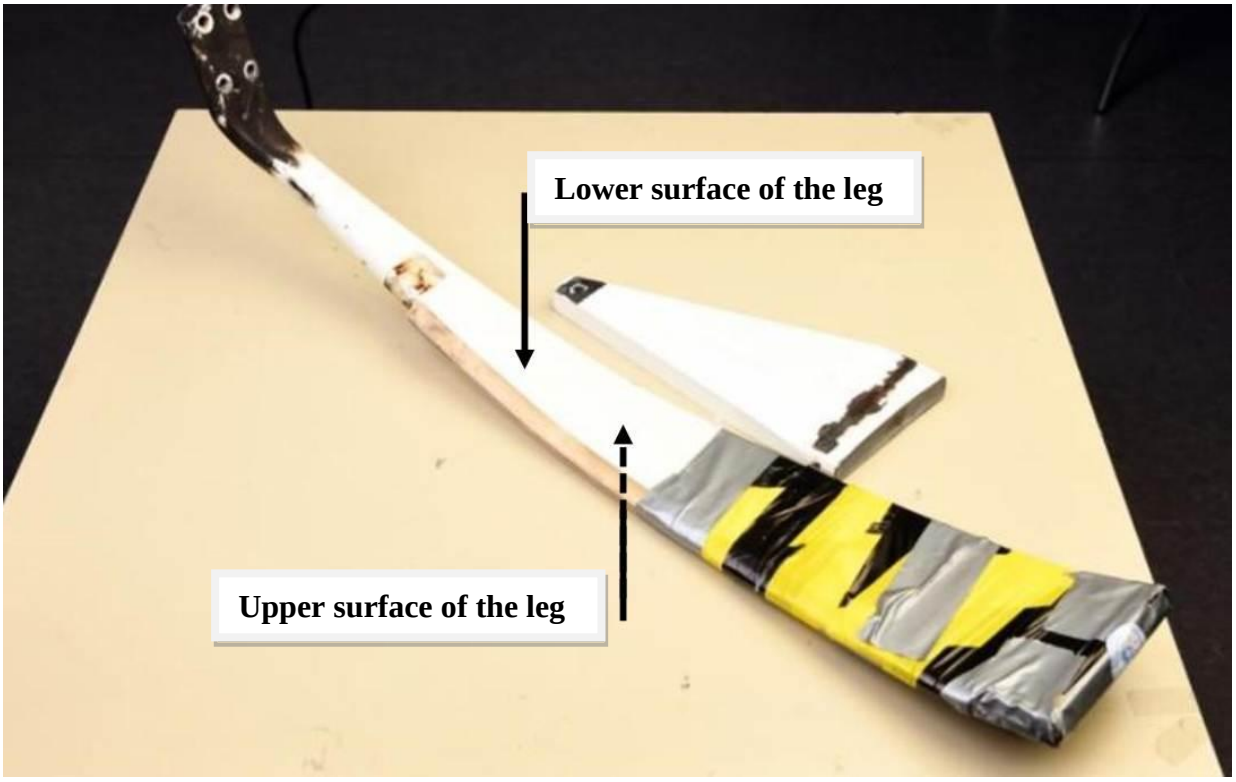


**Figure 9: Spring leg prior to examination at ZAG**

To determine the cause of failure, ZAG carried out the following examinations:

- Visual inspection of the damaged surface
- Chemical analysis (OES)
- Metallographic cross-sectional examination in both longitudinal and transverse directions
- Vickers hardness testing
- Charpy impact toughness testing

## 4.1 Examination Results

### *4.1.1 Visual Examination Results*

The origin of the crack was located on the underside of the spring leg, as shown in Figure 11b (adapted from *Cessna SERVICE MANUAL 1969 thru 1976, MODEL 206 T206 SERIES, Section 5 – Landing Gear and Brakes*). The fracture surface was visually examined to determine the precise initiation point of the crack. The crack began at the location marked with a black rectangle in Figure 10b, and propagated in the directions indicated by the white arrows on the same figure. The origin was a corrosion pit on the lower surface of the spring leg, with

characteristic beach marks ("concentric arcs") visible in the magnified detail in Figure 10c. The size of the initiation area was approximately 5 mm in diameter.

The final fracture occurred suddenly (brittle failure), with fracture paths clearly indicated in Figure 8.

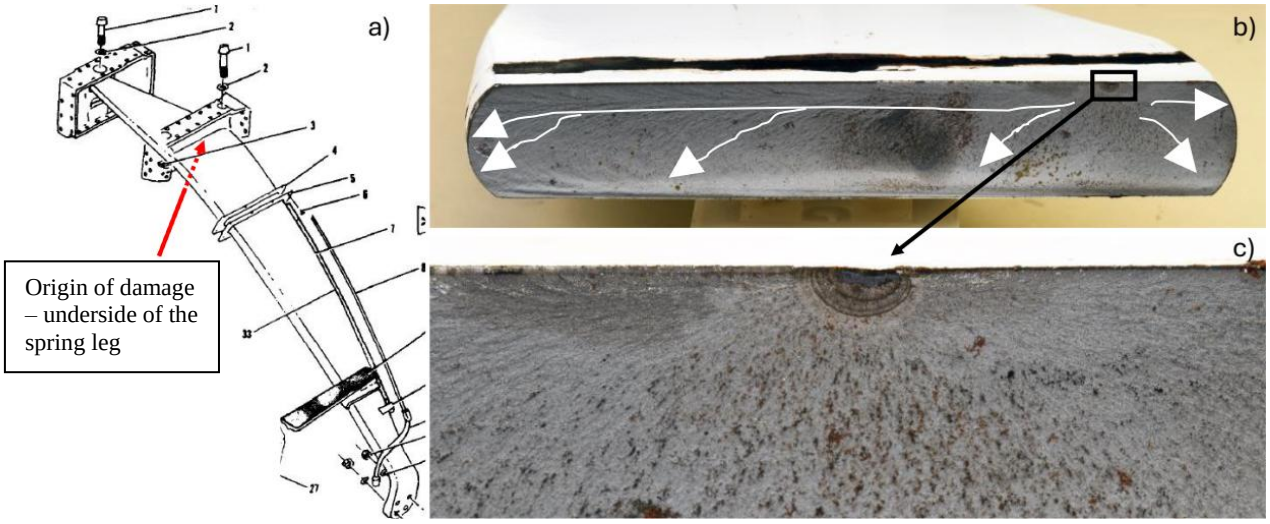


**Figure 10: Crack origin on the underside of the spring leg (a), initiation near surface damage caused by contact with a channel (b), and magnified view of crack initiation zone (c)**

The spring leg's external surfaces were protected with a white anticorrosive coating. In some areas, the coating was missing or flaking, likely due to mechanical abrasion from contact with other elements. Poor adhesion was observed in some areas. After removing the poorly adhered coating, surface corrosion was found underneath (Figure 11). The steel had been ground manually in these areas—grinding marks were visible.

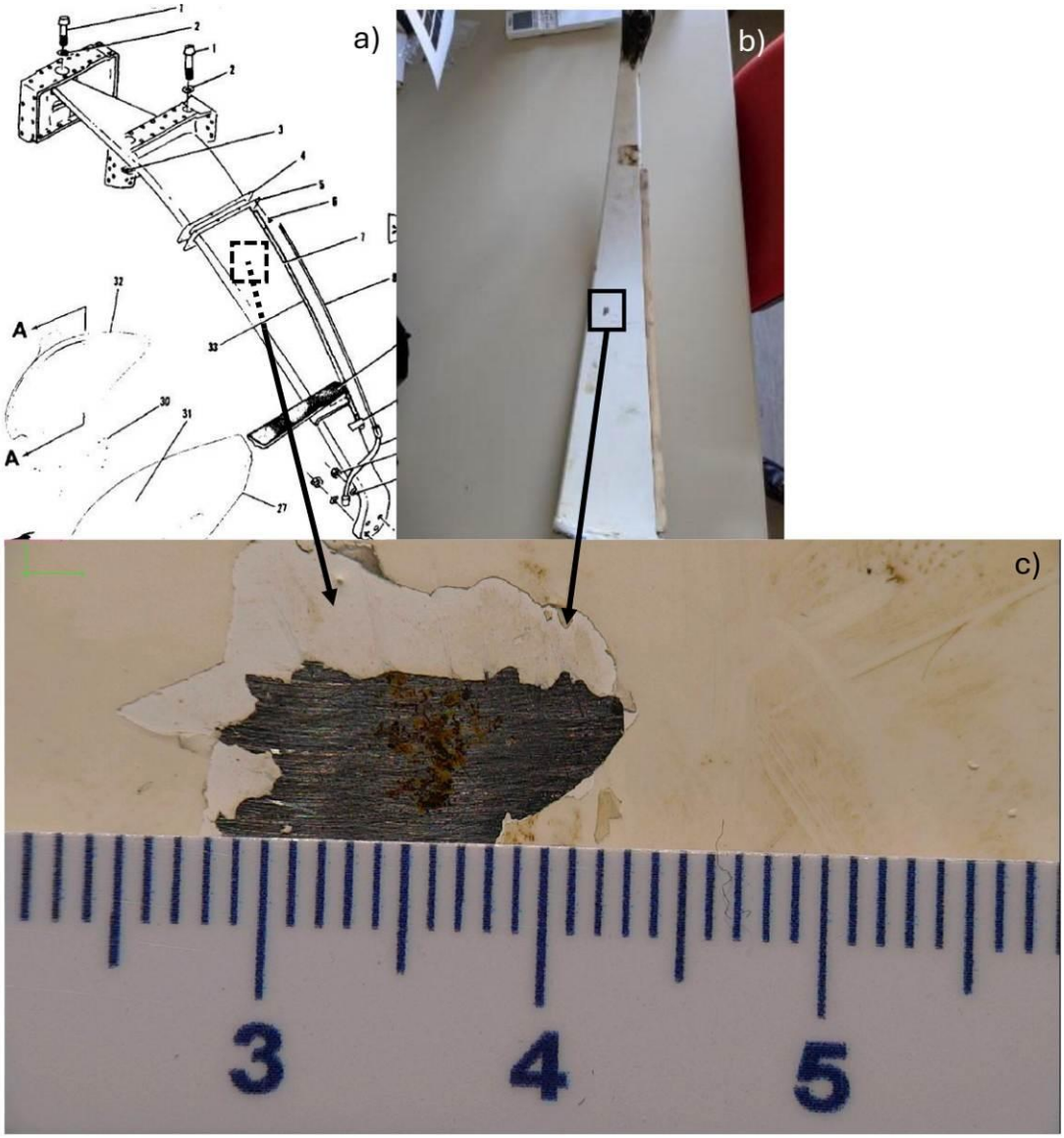


**Figure 11: Corroded surface beneath poorly adhered coating on the underside of the spring leg (a and b – coating damage location, c – corrosion detail)**

### *4.1.2 Chemical Analysis*

The chemical composition was determined using an optical emission spectrometer (OES). The results are shown in Table 1, alongside standard reference values for steel grade AISI 6150 (Steel No. 1.8159 / 51CrV4).

**Table 1: Chemical composition of the tested sample and reference values for AISI 6150 (all values in mass percentages)**

| | % C | % Si | % Mn | % P | % S | % Cr | % V |
|---|---|---|---|---|---|---|---|
| Z/1571/23 | 0.532 | 0.297 | 0.882 | 0.0068 | 0.0126 | 0.937 | 0.143 |
| 1.8159 | 0.47-0.55 | ≤0.4 | 0.7-1.1 | ≤0.025 | ≤0.025 | 0.9-1.2 | 0.1-0.25 |

The composition of the examined sample complies with the standards for this steel type.

### *4.1.3 Metallographic Examination*

The microstructure consisted primarily of fine-grained martensite with traces of retained austenite. Ferrite was found near the surface, indicating surface decarburization of the steel.

### *4.1.4 Vickers Hardness Test*

Vickers hardness was measured in accordance with the SIST EN ISO 6507-1:2023 standard. Results indicate a hardness of approximately 530 HV for the spring leg steel.

### *4.1.5 Charpy Impact Toughness*

Charpy impact tests were performed using an OTTO WOLPERT PW 30/15 K-E ID 3100234 testing machine, in accordance with the SIST EN 148-1:2017 standard.

### *4.1.6 Summary of Findings*

- The chemical composition of the spring leg material conforms to AISI 6150 steel specifications.
- The microstructure is typical for quenched and tempered spring steel, with hardness around 50 HRC.
- The measured impact toughness meets requirements for this type of high-strength steel.
- The measured hardness is high, near the upper limit for steels used in spring applications.

**Coating Characteristics:**

The surface coating consists of four layers with a total thickness of approximately 90 micrometers. The coating was machine-applied. Areas with delaminated coating were identified, mainly due to mechanical abrasion and corrosion.

**Fracture surface characteristics:**

The fracture originated on the underside of the spring leg at position 3 (channel), shown in the left sketch in Figure 9. This area is subject to tensile loading during taxiing, take-off, and landing. The crack was fatigue-induced, with the origin being a corrosion pit approximately 0.3 mm deep and 2 mm long. The fatigue crack propagated to a depth of 2.5 mm and a length of 5 mm, with visible fatigue striations ("beach marks").

### *4.1.7 Analysis Conclusion*

The risk of corrosion-induced failure of spring legs made from this material has been recognized for decades. Regular inspections are defined to prevent most such failures, though not all. According to the *Cessna SERVICE MANUAL 1969 thru 1976, MODEL 206 T206 SERIES, Section 5 – Landing Gear and Brakes* (which was also used during the most recent inspection and maintenance—see Table 1), it is stated that corrosion pits penetrating beyond the shot peened layer (depth between 0.01 and 0.02 inch, i.e., 0.0254 to 0.0508 mm) significantly reduce the component's fatigue life.

In the examined spring leg, the pit at the crack origin was approximately 0.3 mm deep, far exceeding the protective shot peened depth, thus critically compromising the component's integrity.

# 5 CONCLUSIONS

## 5.1 Findings

5.1.1. The pilot held a valid pilot licence and medical certificate on the day of the serious incident.

5.1.2. The aircraft was airworthy on the day of the serious incident and held all valid certificates and approvals.

5.1.3. Weather conditions did not contribute to the occurrence.

5.1.4. The pilot completed the flight preparation and performed the pre-flight inspection.

5.1.5. The aircraft's take-off weight and center of gravity were within the prescribed limits.

5.1.6. The spring steel used in the landing gear met all applicable international standards for this type of material.

5.1.7. The tests conducted by ZAG did not indicate any material defect as the cause of the landing gear failure.

5.1.8. Corrosion was observed on multiple areas of the spring leg.

5.1.9. Corrosion in spring steel weakens the material and can lead to structural failure.

5.1.10. A review of similar events worldwide indicates that landing gear failure due to corrosion is a relatively frequent phenomenon.

5.1.11. The aircraft underwent its last maintenance inspection at an approved organization between 13 December 2021 and 17 March 2022. During that inspection, corrosion was detected on the spring legs and reportedly treated in accordance with the Cessna 206 Maintenance Manual.

### 5.2 Conclusion

#### *5.2.1 Direct cause*

Sudden failure (fracture) of the right spring landing gear leg due to fatigue originating from a pre-existing corrosion pit.

#### *5.2.2 Contributing Factor*

Prolonged and frequent use of the aircraft on uneven grass surfaces, which accelerated material fatigue and contributed to the progression of corrosion-related damage.

## 6 SAFETY RECOMMENDATIONS

**SI-SR005-2025**

Based on the findings of this investigation and similar investigations conducted abroad (e.g., NTSB Aviation Investigation Factual Report No. ANC03IA037, NTSB Recommendations A-01-01 and A-01-02 dated 16 March 2001 concerning the issuance of an Airworthiness Directive, and Airworthiness Bulletin No. 51-006 issued by CASA), it is recommended that the Civil Aviation Authority (CAA) of the Republic of Slovenia inform the following stakeholders**:**

- Aircraft owners
- Maintenance organizations
- CAMO (Continuing Airworthiness Management Organizations)
- CAO (Combined Airworthiness Organizations)

…about the findings of this investigation and relevant findings from similar foreign investigations, with the aim of preventing recurrence of landing gear spring leg failures.

The above stakeholders are advised to:

- **Immediately perform a visual inspection of the landing gear to detect signs of corrosion, cracking, or other defects.**
- **Repeat such inspections every 50 flight hours or during every scheduled aircraft inspection.**
- **If corrosion is detected, determine the extent of the damage and replace all corroded, cracked, or otherwise compromised spring leg components that exceed the manufacturer's specified limits.**
- **For aircraft where damage remains within acceptable manufacturer limits, operators should apply all prescribed preventive measures for corrosion protection of the landing gear.**

**Marko Cvek**

**IIC**