

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

| | | | | | | | |
|--|---|---------------------------------|--------------------------|--------------------------------|----------------------|--------------------------|---|
| | | Reference: | | CA18/2/3/10534 | | | |
| Aircraft Registration | ZS-NDO | Date of Accident | 7 December 2024 | Time of Accident | 0632Z | | |
| Type of Aircraft | Cessna 177RG | | Type of Operation | Private (Part 91) | | | |
| Pilot-in-command Licence Type | Private Pilot Licence (PPL) | | Age | 64 | Licence Valid | Yes | |
| Pilot-in-command Flying Experience | Total Flying Hours | | 1 531.5 | Hours on Type | 274.5 | | |
| Last Point of Departure | Dundee Airfield; KwaZulu-Natal Province | | | | | | |
| Next Point of Intended Landing | Ladysmith Airport (FALY); KwaZulu-Natal Province | | | | | | |
| Damage to Aircraft | Substantial | | | | | | |
| Location of the accident site with reference to easily defined geographical points (GPS readings if possible) | | | | | | | |
| Ladysmith Airport on Runway 11 at GPS 28°34'28.32" South 029°45'00.26" East, at an elevation of 3520 feet (ft) | | | | | | | |
| Meteorological Information | Wind direction: 110°, wind speed: 2 knots, CAVOK, temperature: 25°, Dew point 8°C | | | | | | |
| Number of People On-board | 1+0 | Number of People Injured | 0 | Number of People Killed | 0 | Other (On Ground) | 0 |

Synopsis

On Friday morning, 7 December 2024, a pilot on-board a Cessna 177RG aircraft with registration ZS-NDO took off on a private flight from Dundee Airfield in KwaZulu-Natal province to Ladysmith Airport (FALY) in the same province. Visual meteorological conditions (VMC) by day prevailed at the time of the flight which was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

Upon arrival at FALY, the pilot flew over the airport and joined the left crosswind leg for Runway 11. During the downwind leg, he engaged the landing gear to extend, but the green light which indicate that the landing gear had extended did not illuminate. He then checked the mirror view below the aircraft's wing to visually confirm if the landing gear had extended. The pilot saw that the nose landing gear was down, but the main landing gears were partially extended he retracted the landing gear and extended it again. When he extended the landing gear again, he observed that the main gear had still partially extended whilst the nose gear had fully extended. He the retracted the landing gear once more. Thereafter, he pulled the gear circuit breaker, set the hydraulic control to the gear down position (extended) and manually pumped the emergency gear extension. However, the main gear was still partially extended whilst the nose gear was fully extended. The pilot stated that the emergency gear extension pump became difficult to operate which indicated that the pressure had fully built up; however, the main landing gear still did not fully extend. The pilot then decided to perform a wheels-up (belly) landing.

He contacted the FALY ground crew to assist after landing; thereafter, he followed the gear failure landing procedure and retracted the landing gear. On final approach for belly landing on Runway 11, he shut off the fuel supply and switched off the master switch. The propeller struck the ground as the aircraft landed on its belly; it came to a stop on the runway.

The pilot disembarked from the aircraft; he was met by the ground crew who came to assist. The pilot was not injured during the accident sequence. The aircraft sustained damage to the underbelly and the propeller.

Probable Cause/s and/or Contributory Factors

The main landing gear actuator rod end failed due to fatigue, causing the main undercarriage to partially extend during the landing phase.

Contributory Factors:

Failure to comply with the FAA's recommendation (SAIB: CE14-17).

| | | | |
|----------|--------------|------------------|--------------|
| SRP Date | 10 June 2025 | Publication Date | 13 June 2025 |
|----------|--------------|------------------|--------------|

Occurrence Details

Reference Number : CA18/2/3/10534
Occurrence Category : Category 3
Type of Operation : Private (Part 91)
Name of Operator : Argon Drilling (Pty) Ltd
Aircraft Registration : ZS-NDO
Aircraft Make and Model : Cessna 177RG
Nationality : South African
Place : Runway 11 Ladysmith Airport, KwaZulu-Natal Province
Date and Time : 7 December 2024 at 0632Z
Injuries : None
Damage : Substantial

Purpose of the Investigation

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and not to apportion blame or liability.

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Investigation Process

The Accident and Incident Investigations Division (AIID) of the South African Civil Aviation Authority (SACAA) was notified of the occurrence involving a Cessna C77R aircraft 0632Z which occurred at Ladysmith Airport in Kwa Zulu Natal on 7 December 2024 at 0632Z. The occurrence was classified as an Accident according to the CAR 2011 Part 12 and ICAO STD Annex 13 definitions. Notification was sent to the State of Registry and Operator in accordance with CAR 2011 Part 12 and ICAO Annex 13 Chapter 4. The State did not appoint an accredited representative and advisor. Investigator was not dispatched to the Accident site for this Accident.

Notes:

- 1. Whenever the following words are mentioned in this report, they shall mean the following:
Accident — this investigated accident
Aircraft — the Cessna C77R involved in this accident
Investigation — the investigation into the circumstances of this accident
Pilot — the pilot involved in this accident
Report — this accident report*
- 2. Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows, or lines.*

Disclaimer

This report is produced without prejudice to the rights of the AIID, which are reserved.

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| Abbreviation | Description |
|---------------------|--|
| °C | Degrees Celsius |
| AD | Airworthiness Directive |
| AIID | Accident and Incident Investigations Division |
| AMO | Aircraft Maintenance Organisation |
| AMP | Ampere |
| AMSL | Above Mean Sea Level |
| CRS | Certificate of Release to Service |
| CVR | Cockpit Voice Recorder |
| FAA | Federal Aviation Administration |
| FDR | Flight Data Recorder |
| Ft | Feet |
| GPS | Global Positioning System |
| hPa | Hectopascal |
| Km | Kilometres |
| Kt | Knots |
| M | Metres |
| PSI | Pounds Per Square inch |
| QNH | Barometric Pressure Adjusted to Sea Level. |
| SACAA | South African Civil Aviation Authority |
| SAIB | Special Airworthiness Information Bulletin |
| SI | Supplemental Inspection |
| UTC | Co-ordinated Universal Time |
| VMC | Visual Meteorological Conditions |
| Z | Zulu (Term for Universal Co-ordinated Time – Zero Hours Greenwich) |
| QNH | Barometric Pressure Adjusted to Sea Level. |
| SACAA | South African Civil Aviation Authority |
| SAIB | Special Airworthiness Information Bulletin |
| SI | Supplemental Inspection |
| UTC | Co-ordinated Universal Time |
| VMC | Visual Meteorological Conditions |
| Z | Zulu (Term for Universal Co-ordinated Time – Zero Hours Greenwich) |

1. FACTUAL INFORMATION

1.1. History of Flight

- 1.1.1. On Friday morning, 7 December 2024, a pilot on-board a Cessna 177RG aircraft with registration ZS-NDO took off on a private flight from Dundee Airfield in KwaZulu-Natal province to Ladysmith Airport (FALY) in the same province. Visual meteorological conditions (VMC) by day prevailed at the time of the flight which was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.
- 1.1.2. The flight segment from Dundee Airfield to FALY was uneventful. Upon arrival at FALY, the pilot flew over the airport and joined the left crosswind leg for Runway 11. During the downwind leg while the pilot was performing the before landing downwind checks, he engaged the landing gear to extend, but the green light which indicates that the landing gear was down (extended) did not illuminate on the cockpit panel. The pilot then checked the mirror view below the aircraft's wing to visually confirm if the landing gear had extended the mirror showed that the nose landing gear was extended but the main landing gear was partially extended. The pilot then retracted the landing gear and extended it again (second attempt). He observed (on the mirror view) that the two main landing gears were still partially extended whilst the nose gear was fully extended.
- 1.1.3. The pilot retracted the landing gear once more and it retracted successfully. He pulled the landing gear circuit breaker and set the hydraulic control to the gear down position; thereafter, he manually pumped the emergency gear extension as presented in the aircraft Pilot's Operating Handbook (POH). However, the main landing gears remained partially extended whilst the nose gear was fully extended. The pilot stated that the emergency gear extension pump became difficult to operate which indicated that the pressure was fully built up; however, the main landing gear still did not fully extend.
- 1.1.4. The pilot decided to perform a wheels-up (belly) landing. He contacted the FALY ground crew to request their assistance post-landing. He followed the POH landing gear failure procedure and retracted the landing gear. On final approach for landing on Runway 11, he shut off the fuel supply and switched off the master switch. The aircraft landed on its belly, during which the propeller struck the ground. The aircraft came to a stop on the runway. The pilot disembarked from the aircraft and was met by the ground crew who came to assist. The pilot was not injured during the accident sequence; however, the aircraft sustained damage to the underbelly and the propeller.

1.1.5. The accident occurred during daylight at Ladysmith Airport at Global Positioning System (GPS) co-ordinates determined to be 28°34'28.32" South 029°45'00.26" East, at an elevation of 3520 feet (ft).



Figure 1: The ZS-NDO aircraft post-accident. (Source: Operator)

1.2. Injuries to Persons

| Injuries | Pilot | Crew | Pass. | Total On-board | Other |
|--------------|-------|------|-------|----------------|-------|
| Fatal | - | - | - | - | - |
| Serious | - | - | - | - | - |
| Minor | - | - | - | - | - |
| None | 1 | - | - | 1 | - |
| Total | 1 | - | - | 1 | - |

Note: Other means people on ground.

1.3. Damage to Aircraft

1.3.1. The aircraft sustained substantial damage.

1.4. Other Damage

1.4.1. None.

1.5. Personnel Information

| | | | | | |
|---------------------|-----------------------------|---------------|------|-----|----|
| Nationality | South African | Gender | Male | Age | 64 |
| Licence Type | Private Pilot Licence (PPL) | | | | |
| Licence Valid | Yes | Type Endorsed | Yes | | |
| Ratings | None | | | | |
| Medical Expiry Date | 7 November 2025 | | | | |
| Restrictions | Corrective | | | | |
| Previous Accidents | None | | | | |

Note: Previous accidents refer to past accidents the pilot was involved in, when relevant to this accident.

Flying Experience:

| | |
|----------------------------|----------|
| Total Hours | 1 531.55 |
| Total Past 24 Hours | 0.6 |
| Total Past 7 Days | 3.8 |
| Total Past 90 Days | 15.8 |
| Total on Type Past 90 Days | 6.4 |
| Total on Type | 247.4 |

- 1.5.1. The pilot had a Private Pilot Licence (PPL) that was initially issued by the Regulator on 22 June 2016. The PPL was reissued on 9 November 2024 with an expiry date of 28 February 2027.
- 1.5.2. The pilot had a Class 2 medical certificate that was issued on 25 October 2024 with an expiry date of 7 November 2025.
- 1.5.3. The hours in the table above were recorded in the pilot's logbook, which was last updated on 6 December 2024.
- 1.5.4. The pilot had last flown the aircraft type on 16 November 2024

1.6. Aircraft Information

- 1.6.1. Cessna 177RG (Source: <https://cessna.txtav.com/en/search?find=C77R>)

The Cessna 177RG is an all-metal, two-place, high-wing, single engine airplane equipped with tricycle landing gear and designed for general utility purposes.

The airplane is certified in both the normal and utility category. The aircraft is equipped for day VFR and may be equipped for night VFR and/or IFR operations. The aircraft is powered by a four-cylinder, horizontally opposed, normally aspirated, direct drive, air cooled carburettor-equipped engine. The engine is a Lycoming Model O-360-A1F6D and is rated at

180 hp. Fuel is supplied to the engine from two 25-gallon tanks, one in each wing. Fuel flows by gravity from the two integral tanks through a three-position selector valve. From the selector valve, fuel flows to a reservoir tank and a shutoff valve. Fuel will then flow through the strainer to an engine-driven fuel pump, or an electric fuel pump which parallels the engine-driven pump and is used in the event the fuel pressure drops below 2 pounds per square inch (psi). Fuel capacity can be increased to 61 gallons in total volume with the optional long-range system.

Electrical energy is supplied by a 14-volt, direct-current system powered by an engine-driven, 60-ampere (Amps) alternator and a 12-volt, 33-Amps hour battery.

Airframe:

| | | |
|--|-------------------|------------------|
| Manufacturer/Model | Cessna 177RG | |
| Serial Number | 177RG1260 | |
| Year of Manufacture | 1977 | |
| Total Airframe Hours (At Time of Accident) | 3 082.6 | |
| Last Inspection (Hours & Date) | 3 042.8 | 3 April 2024 |
| Hours Since Last Inspection | 39.8 | |
| CRS Issue Date | 19 April 2024 | |
| C of A (Issue Date & Expiry Date) | 9 December 2010 | 31 December 2024 |
| C of R (Issue Date) (Present Owner) | 2 June 2020 | |
| Type of Fuel Used | Avgas 100LL | |
| Operating Category | Private (Part 91) | |
| Previous Accidents | None | |

Note: Previous accidents refer to past accidents the aircraft was involved in, when relevant to this accident.

Engine:

| | |
|----------------------|-----------------|
| Manufacturer/Model | Lycoming IO-360 |
| Serial Number | IO-360-AIB6D |
| Part Number | L-17635-51A |
| Hours Since New | 2410.10 |
| Hours Since Overhaul | 1560.00 |

Propeller:

| | |
|----------------------|----------------------|
| Manufacturer/Model | Hartzell HC-C3YR-1RF |
| Serial Number | DY7811B |
| Part number | HC- C3YR-1RF |
| Hours Since New | 1 295.4 |
| Hours Since Overhaul | TBO not yet reached |

1.6.2. According to available information, the aircraft was first registered to the present owner on 2 June 2020. The latest Certificate of Release to Service (CRS) was issued on 19 April 2024 with an expiry date of 18 April 2025 or at 3 143.4 airframe hours, whichever occurs first.

1.7. Meteorological Information

1.7.1. The weather information below was obtained from the pilot questionnaire. The weather was recorded at FALY on 7 December 2024 at 0600Z.

| | | | | | |
|----------------|---------|-------------|---------|------------|-------|
| Wind Direction | 020° | Wind Speed | 8kts | Visibility | 10km |
| Temperature | 26°C | Cloud Cover | CAVOK | Cloud Base | Clear |
| Dew Point | Unknown | QNH | Unknown | | |

1.7.2. According to the weather report, the weather was ceiling and visibility okay (CAVOK). When the weather is CAVOK, it means that visibility is good with no significant weather phenomena, and the cloud base is above 5000 ft above mean sea level (AMSL). The absence of significant weather phenomena suggests that the aircraft was not affected by adverse weather conditions that could have impacted the flight

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator. There were no records indicating that the navigational equipment was unserviceable prior to the accident.

1.9. Communication

1.9.1. The aircraft was equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the accident.

1.10. Aerodrome Information

1.10.1. The accident occurred on Runway 11 at FALY, KwaZulu-Natal province.

| | |
|---------------------------|---------------------------------------|
| Aerodrome Name | Ladysmith Airport (FALY) |
| Aerodrome Location | Ladysmith, KwaZulu-Nata Province |
| Aerodrome Status | Licensed |
| Aerodrome GPS coordinates | 28°34'28.32" South 029°45'00.26" East |
| Aerodrome Elevation | 3520 ft |
| Runway Headings | 11/29 |

| | |
|---------------------------|-------------|
| Dimensions of Runway Used | 1200m x 15m |
| Heading of Runway Used | 11 |
| Surface of Runway Used | Tar |
| Approach Facilities | None |
| Radio Frequency | 124.8-MHz |

1.11. Flight Recorders

1.11.1. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor was it required by regulation to be fitted to the aircraft type.

1.12. Wreckage and Impact Information

1.12.1. The aircraft landed on its belly and the propeller struck the ground; it came to a stop on the runway. The underbelly was scrapped, and the propeller blade tips were bent. There was no other damage recorded.



Figure 2: The aircraft on its belly with bent propeller blades after the accident. (Source: Pilot)

1.13. Medical and Pathological Information

1.13.1. None

1.14. Fire

1.14.1. There was no pre- or post-impact fire.

1.15. Survival Aspects

1.15.1. The accident was considered survivable as the aircraft's cabin remained intact. The pilot had used a safety harness during the flight.

1.16. Tests and Research

1.16.1. Description of the Landing Gear System (Source: Cessna 177RG Maintenance Manual)

The retractable tricycle landing gear is extended and retracted by hydraulic actuators, powered by an electrically driven hydraulic power pack. The power assembly is located aft of the rear baggage compartment wall. The mechanically actuated wheel well doors are provided for the nose gear. They are open when the nose gear is down and closed when it is retracted. The nose landing gear has its own hydraulic actuator, retracts rearwards beneath the engine. The main gear legs are mechanically linked and move as one unit; they are actuated by a single hydraulic actuator that is attached to the gear by an eye-shaped rod end. The actuator rod is fully extended when the gear is retracted. The rod retracts and pulls on the main gear attachment to extend the gear until the gear engages a lock in the down position.

An over-centre mechanical linkage provided a positive mechanical up-and-down lock for the nose wheel. The main gear uses a hydraulic sequence valve down locks and hydraulic pressure for positive uplock. The power pack assembly maintains the main gear uplock pressure automatically. When hydraulic pressure drops, the gear can free-fall, but it will not rotate forward into the locked position by gravity alone. The aircraft has an emergency hand pump to provide hydraulic pressure to extend the gear fully.

Two position-indicator lights, mounted to the left of the stabilator trim control wheel, indicate that the gear is either up or down and locked. Both the gear UP (amber) and gear down (green) light are press-to-test types, incorporating dimming shutters for night operation. As an additional reminder that the gear is retracted, a warning horn sounds intermittently whenever the throttle is retarded below approximately 12 inches manifold pressure (master switch on) with the gear up or not down and locked.

1.16.2. The aircraft was recovered to a hangar in Ladysmith Airport after the accident. On 11 December 2024, the aircraft was taken to a workshop in Wonderboom Airport for inspection and testing. According to the aircraft maintenance engineer (AME); the floor cover panel under the rear seats was removed to gain access to the main landing gear actuator. It was found that the threaded rod end on the actuator had failed.

- 1.16.3. The failure of the threaded rod end meant that there was no mechanical connection between the hydraulic system (actuator) and the geared pinion assembly. Whilst the hydraulic system was fully functional, the mechanical connection to the main landing gear was disconnected completely. The nose gear actuator was found functional.
- 1.16.4. An examination of the failed rod end revealed that it had fatigue. There was evidence of a crack which initiated between the last thread cut and the rod end head. The actuator operation (of being extended and retracted) over the years placed cyclic loads on the rod end; the cyclic stresses are known to concentrate in the radius between the last thread cut and the rod end head.
- 1.16.5. Examination of the failed rod end fitting revealed that the rod end with part number S2049M6FG was an old type. The Federal Aviation Administration (FAA), as per their Special Airworthiness Information Bulletin (SAIB) number CE-14-17, had issued a recommendation on 6 May 2014 that the afore-mentioned part be replaced with an improved part number S3469-1. The SAIB was issued in response to several reported incidents in which the rod end body fractured at the lubrication hole on the head of the rod end. However, this type of failure was not applicable in ZS-NDO, even though the part had not been replaced.
- 1.16.6. The Cessna company had also issued the Supplemental Inspection (SI) 32-10-01, dated 2 October 1995, which affected the Cessna 177RG series aircraft with serial numbers from 177RG-0788 to 177RG-1366 (the ZS-NDO's serial number was 177RG-1260). According to the SI 32-10-01, the inspection of the landing gear had a compliance of 6000 hours or 10 years and, thereafter, at every 1000 hours or 3 years. The SI required the actuator, actuator support assembly and rod end bearings to be inspected for cracks and corrosion.



Figure 3: The location of the landing gear actuator under the floor cover panel. (Source: AMO)

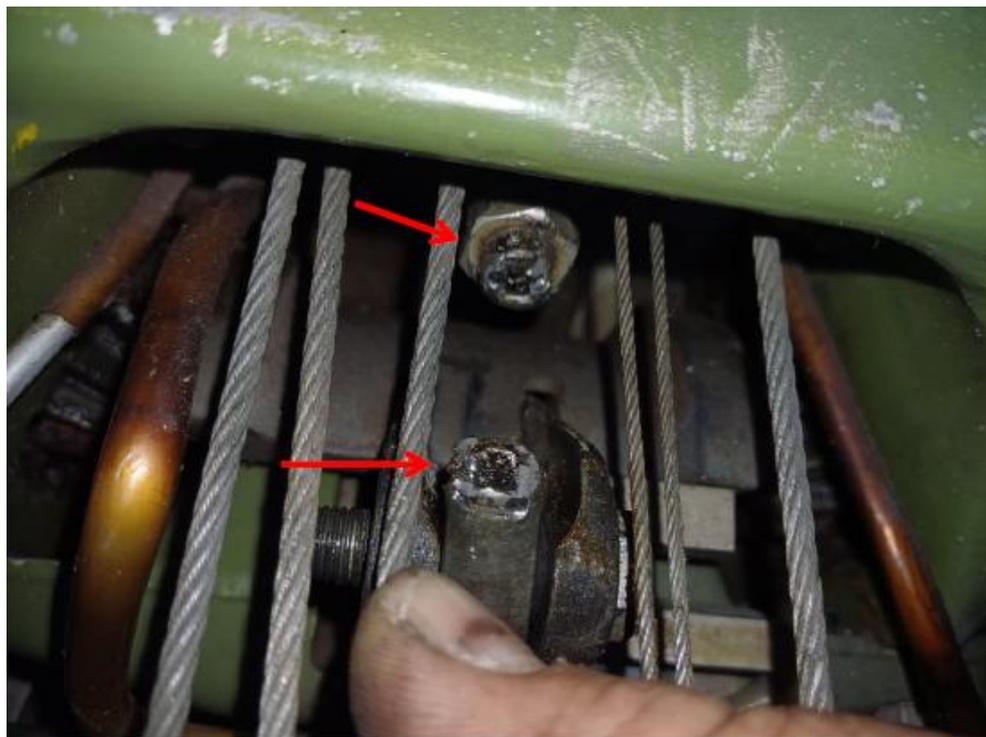


Figure 4: The broken rod end. (Source: AMO)



Figure 5: The broken actuator rod end that was removed from ZS-NDO. (Source: AMO)

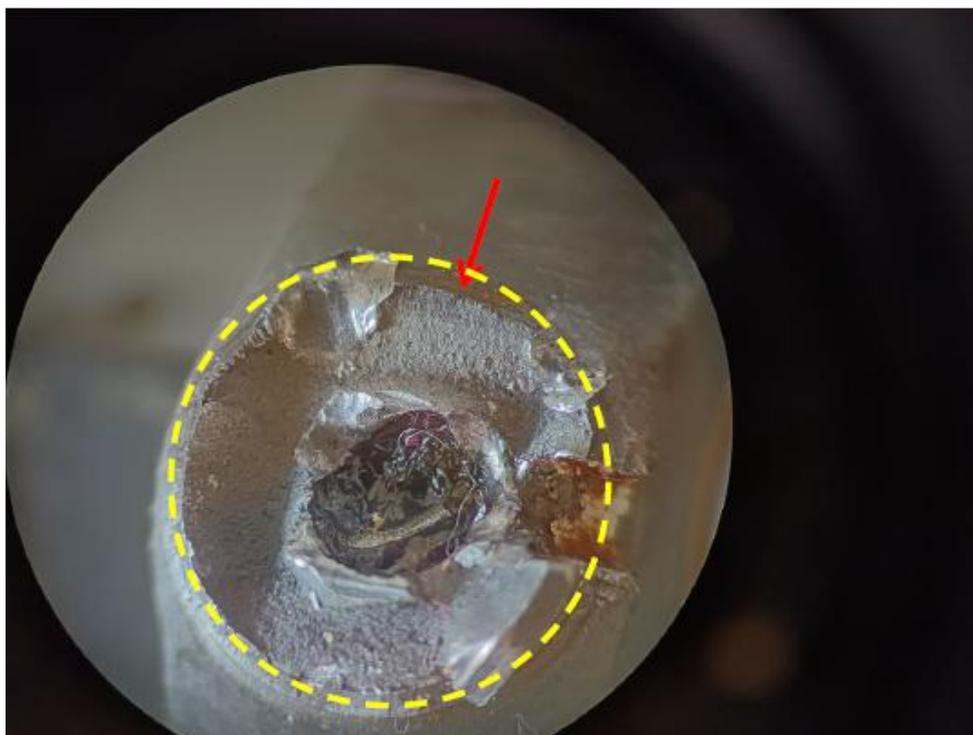


Figure 6: The rod end fracture face. The arrow shows the fatigue fracture initiation point. (Source: AMO)

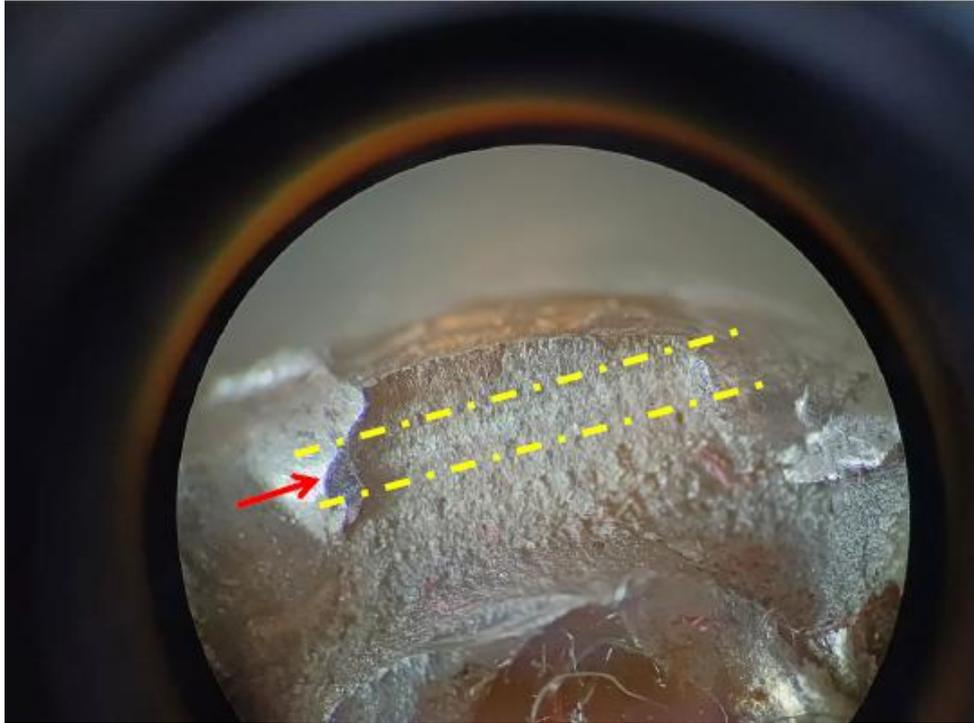


Figure 7: The fatigue fracture striations that formed as the fracture progressed during numerous operation cycles. (Source: AMO)

1.16.7 The FAA Recommendations:

- *Identify main landing gear actuator cracks and if cracks are present, replacement should be done to prevent the possibility of an airplane landing with the MLG not extended and locked down.*
- *Whether or not cracks are found, replace Cessna part numbers S2049-6FG or S2049M6FG with Cessna part number S3469-1 if not previously replaced by S2426-6 as per SE79-37R1.*
- *Comply with Cessna Service Information Letter SE79-37R1 dated 15 December 1980. Additional information is provided in Supplemental Inspection Number 32-10-01, D991-3-13 Temporary Revision Number 7, dated 1 December 2011 in Section 2A-14-03 of the Cessna Aircraft Company Model 177RG Series (1971-1975) Service Manual.*

1.16.8 The aircraft maintenance engineer (AME) stated that the rod end was inspected and found serviceable in 2023; there were no cracks or any other damage found. The SE79-37, issued on 15 December 1980, was complied with as the stronger rod end was installed with part number S2426-6. The AME further stated that the SAIB number CE-14-17, issued by the FAA, recommended that the part be replaced; it was not mandatory. The stronger rod end (part number S2426-6) was installed by the AMO that conducted repairs after the ZS-NDO landing incident which occurred in the past. The AME inspected the part and found no damage on it. The Cessna company issued a Supplemental Inspection Number 32-10-01; this inspection is under 7.A: If the rod end is cracked, replace in accordance with SE79-37 Rev. 1. According to Note 1, Section 2A-14-00, the inspection should be carried out at 6000

hours or 10 years and repeated every 1000 hours or 3 years. The AME had complied with the FAA's recommended inspections.

1.17. Organisational and Management Information

1.17.1. The flight was conducted in accordance with the provisions of Part 91 (Private) of the CAR 2011 as amended.

1.17.2. The aircraft maintenance organisation (AMO) which conducted the last maintenance inspection of the aircraft prior to the accident flight had an AMO Certificate that was issued by the Regulator on 31 August 2024 with an expiry date of 31 August 2025.

1.18. Additional Information

1.18.1. None

1.19. Useful or Effective Investigation Techniques

1.19.1. None.

2. ANALYSIS

2.1. General

From the available evidence, the following analysis was made with respect to this accident. This shall not be read as apportioning blame or liability to any organisation or individual.

2.2. Analysis

2.2.1. The pilot had a Private Pilot Licence (PPL) that was issued on 22 June 2016. The licence was revalidated on 9 November 2024 with an expiry date of 28 February 2027. The pilot was issued a Class II medical certificate on 25 October 2024 with an expiry date of 7 November 2025.

2.2.2. Upon the aircraft's arrival at FALY, the main landing gears failed to extend. The pilot retracted the main landing gears and attempted to extend them manually; however, he was unsuccessful. He opted to conduct a belly landing on Runway 11; the aircraft came to a stop on the runway.

2.2.3. After the accident on 11 December 2024, the aircraft was recovered to the maintenance facility at Wonderboom Airport for a post-accident inspection and testing of the landing gear.

After the AME had removed the cover panel, he found that the threaded rod end on the actuator had failed. This meant that there was no mechanical connection between the hydraulic system actuator and the gear pinion assembly. The hydraulic system was fully functional, but there was no mechanical connection to the main landing gear. The nose gear had its separate actuator and was functional.

- 2.2.4. An examination of the failed rod end revealed that the failure was due to fatigue. Moreover, there was a crack that initiated between the last thread cut and the rod end head. The operation of the actuator (extensions and retractions) placed cyclic loads on the rod end. The cyclic stresses are known to concentrate in the radius between the last thread cut and the rod end head.
- 2.2.5 The failed rod end was the old type, according to the Cessna SAIB number CE-14-17 which was issued on 6 May 2014. It was recommended that the failed rod end be replaced with an improved part (part number: S3469-1). The FAA had issued this SAIB in response to several reported incidents in which the rod end body fractured at the lubrication hole on the head of the rod end. The ZS-NDO's rod end fractured between the last thread cut and the rod end head. The rod end component was the old type that should have been replaced; however, it was not replaced. The AME responsible for the maintenance of ZS-NDO stated that CE-14-17 was not complied with because the FAA made a recommendation for the component to be replaced; it was not mandatory.
- 2.2.6 On 2 October 1995, the Cessna company issued a Supplemental Inspection (SI) number 32-10-01 which affected the Cessna 177RG series with serial numbers from 177RG-0788 to 177RG-1366; ZS-NDO's serial number was 177RG-1260). The SI of the landing gear had a compliance of 6000 hours or 10 years and, thereafter, at every 1000 hours or 3 years. The SI required the actuator, actuator support assembly and rod end bearings to be inspected for cracks and corrosion. The accident aircraft had not reached the 6000 hours and, therefore, was not subjected to this inspection.
- 2.2.7 The prevailing weather at the time of the accident was not a factor.

3. CONCLUSION

3.1. General

From the available evidence, the following findings, causes and contributing factors were made with respect to this accident. These shall not be read as apportioning blame or liability to any organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings** — are statements of all significant conditions, events, or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.
- **Causes** — are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors** — are actions, omissions, events, conditions or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident occurring, or would have mitigated the severity of the consequences of the accident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil, or criminal liability.

3.2. Findings

- 3.2.1. The pilot had a Private Pilot Licence (PPL) that was issued by the Regulator on 22 June 2016 in accordance with Part 61 of the South African CAR 2011. The PPL was revalidated on 9 November 2024 with an expiry date of 7 November 2025.
- 3.2.2. The pilot had a Class 2 medical certificate that was issued on 25 October 2024 with an expiry date of 7 November 2025.
- 3.2.3. The AMO which conducted the last maintenance inspection of the aircraft had an AMO Certificate that was issued by the Regulator on 31 August 2024 with an expiry date of 31 August 2025.
- 3.2.4. The last mandatory periodic inspection (MPI) of the aircraft was conducted on 19 April 2024 at 3 043.4 airframe hours. The aircraft was issued a Certificate of Release to Services (CRS) on 19 April 2024 with an expiry date of 18 April 2025 or at 3 143.4 hours, whichever occurs first.
- 3.2.5. The main landing gear did not extend because the threaded rod end failed, which led to loss of mechanical connection between the hydraulic system actuator and the geared pinion assembly. The hydraulic system was fully functional, but the mechanical connection to the main landing gear was completely lost. The nose gear had its own actuator which was still functional.
- 3.2.6. Examination of the failed rod end revealed that it had failed due to fatigue; moreover, there was a crack which initiated between the last thread cut and the rod end head.
- 3.2.7. The rod end that failed was an old type. It was supposed to have been replaced with an improved part, according to the SAIB CE-14-17 that was issued by the FAA. The AME

stated that he did not comply with this recommendation as it was not compulsory. Furthermore, when he inspected the part in 2023, there was no damage on the rod end.

3.2.8 Clear weather conditions prevailed at the time of the flight.

3.3 Probable Cause/s

3.3.1 The main landing gear actuator rod end failed due to fatigue, causing the main undercarriage to partially extend during the landing phase.

3.4 Contributory Factor/s

3.4.1 Failure to comply with the FAA's recommendation (SAIB: CE14-17).

4 SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2. Safety Recommendation/s

4.2.1. None

5 APPENDICES

5.1. Appendix 1: SAIB number: CE14-17

5.2. Appendix 2: SI number 32-10-01

5.3. Appendix 3: Main landing gear retraction system inspection sheet

This report is issued by:

**Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa**

Appendix 1



FAA
Aviation Safety

SPECIAL AIRWORTHINESS INFORMATION BULLETIN

SUBJ: Landing Gear; Main Landing Gear (MLG) Actuator
This is information only. Recommendations aren't mandatory.

SAIB: CE-14-17
Date: May 6, 2014

Introduction

This Special Airworthiness Information Bulletin is to alert owners, operators, and maintenance technicians of **Cessna Aircraft Company (Cessna) Model 177RG and Reims Model F177RG airplanes** of an airworthiness concern, specifically the need to inspect the MLG actuator rod end bearing to ensure that cracks are not present.

At this time, the airworthiness concern is not an unsafe condition that would warrant airworthiness directive (AD) action under Title 14 of the Code of Federal Regulations (14 CFR) part 39.

Background

In August 2012, a German-registered Cessna Model 177RG airplane made an emergency landing in Spain with the main gear not locked in the down position. No injuries were reported, but the airplane was damaged. The MLG actuator rod end bearing, Cessna part number S2049-6FG or S2049M6FG, had fractured at the location of the lubrication hole.

The FAA conducted an in-depth review of the MLG actuator failures as a result of the German incident. Our investigation found that there are approximately 878 Cessna Model 177RG airplanes listed in the FAA N-number registry ranging in age from 35 to 43 years. The result of our investigation and risk analysis show that infrequent failure of the MLG actuator on these model airplanes could result in damage to the underside of the airplane if the MLG does not extend and lock down. The SDRs reflect that adequate service information is available and being used by owners and operators to properly maintain their airplanes. As an example, several SDR reports mentioned the Cessna Service Information Letter SE79-37R1. However, we feel issuance of this SAIB will serve as notice to those owners, operators, and maintenance technicians who may not be aware of the Cessna service information.

Recommendations

The FAA recommends the following:

1. Identify MLG actuator cracks and if cracks are present, replacement should be done to prevent the possibility of an airplane landing with the MLG not extended and locked down.
2. Whether or not cracks are found replace Cessna part numbers S2049-6FG or S2049M6FG with Cessna part number S3469-1 if not previously replaced by S2426-6 per SE79-37R1.
3. Comply with Cessna Service Information Letter SE79-37R1 dated December 15, 1980. Additional information is provided in Supplemental Inspection Number 32-10-01, D991-3-13 Temporary Revision Number 7, dated December 1, 2011, in Section 2A-14-03 of the Cessna Aircraft Company Model 177RG Series (1971-1975) Service Manual.

1

For Further Information Contact

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For Related Service Information Contact

Cessna Aircraft Company, Customer Support Service, P.O. Box 7706, Wichita, Kansas; telephone: (316) 517-5800; fax: (316) 517-7271.

Appendix 2

CESSNA AIRCRAFT COMPANY
MODEL 177RG SERIES (1976 - 1978)
SERVICE MANUAL

SUPPLEMENTAL INSPECTION NUMBER: 32-10-01

1. **TITLE:**
Main Landing Gear Retraction System Inspection
2. **EFFECTIVITY**
177RG0788 thru 177RG1366, F177RG0139 thru F177RG0177

INSPECTION COMPLIANCE

| | | | | |
|-------------------|----------------|------------|----|------------------------|
| ALL USAGE: | INITIAL | 6000 hours | or | 10 Years (NOTE) |
| | REPEAT | 1000 hours | or | 3 Years (NOTE) |

NOTE: Refer to Note 1, Section 2A-14-00

3. **PURPOSE**
To ensure integrity of main landing gear retraction system.
4. **INSPECTION INSTRUCTIONS**
 - A. Check airplane records to verify that SE79-37 has been incorporated. If not, complete SE79-37 with this inspection.
 - B. Remove seats and carpeting as required to gain access to the plate above the actuator. Refer to the Model 177RG Service Manual.
 - C. Clean areas before inspecting if grime or debris are present.
 - D. Inspect the actuator, the actuator support assembly, and the rod end bearings for cracks and corrosion. Refer to Figure 1.
 - E. Inspect the actuator pins, gears, and sector arm for cracks and wear.
 - F. Inspect the main landing gear pivot fittings for cracks and corrosion.
 - G. Inspect the downlock support assembly for cracks or corrosion.
 - H. Install parts removed for access. Refer to the Model 177RG Service Manual.

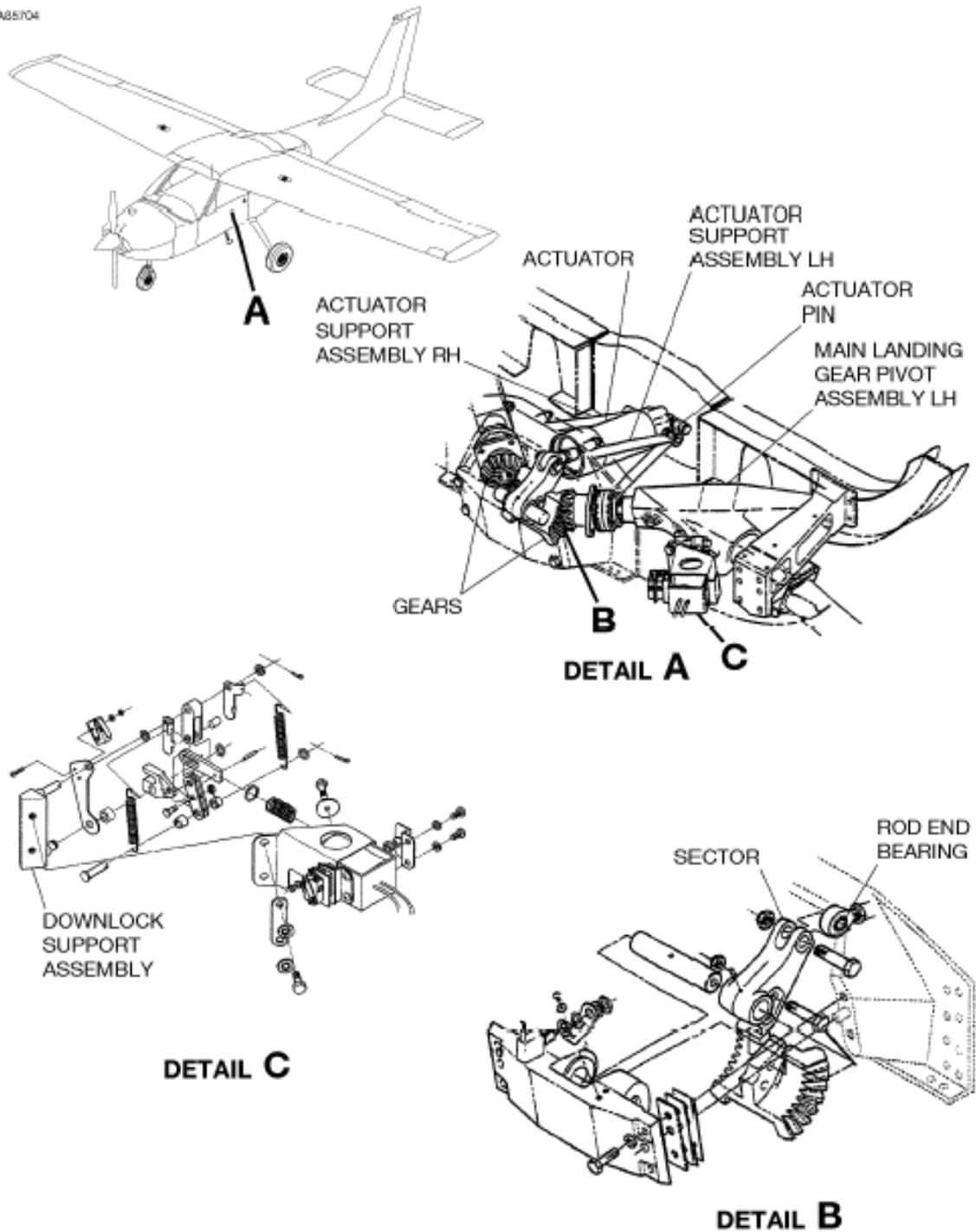
5. **ACCESS AND DETECTABLE CRACK SIZE**

| ACCESS/LOCATION/ZONE | DETECTABLE CRACK SIZE |
|-----------------------------|------------------------------|
| Main Gear Section | Not Allowed |

6. **INSPECTION METHOD**
Visual
7. **REPAIR/MODIFICATION**
 - A. If rod end is cracked, replace in accordance with SE79-37 Rev. 1.
 - B. Replace damaged parts.
8. **COMMENTS**

CESSNA AIRCRAFT COMPANY
MODEL 177RG SERIES (1976 - 1978)
 SERVICE MANUAL

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MAIN LANDING GEAR RETRACTION SYSTEM INSPECTION
 Figure 1 (Sheet 1)

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