AIRCRAFT ACCIDENT SHORT REPORT

CA18/2/3/9873 :The left-side main landing gear wheel axle separated from the gear strut due to failure of the attachment bolts as a result of a hard landing.

Date and time	: 8 March 2020 at 1430Z
Aircraft registration	: ZS-TIO
Aircraft manufacturer and model	: Cessna Aircraft Company, C180
Last point of departure	:Baragwanath Aerodrome (FASY), Gauteng Province
Next point of intended landing	: Baragwanath Aerodrome (FASY), Gauteng Province
Location of accident site with reference to easily defined geographical points (GPS readings if possible)	: FASY S26°52'49" E027°46'38" Elevation 5419ft
Meteorological information	: Surface wind: 5 knots; Temperature: 25°C; Visibility: >10km
Type of operation	: Private
Persons on-board	:1+1
Injuries	: 0
Damage to aircraft	**:** Substantial

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.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (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.***

Disclaimer:

This report is produced without prejudice to the rights of the South African Civil Aviation Authority (SACAA), which are reserve.

1. SYNOPSIS

1.1.1 On 8 March 2020 at approximately 1330Z, the pilot accompanied by a passenger took off from Kitty Hawk Aerodrome (FAKT) on a private flight to Baragwanath Aerodrome (FASY) in Gauteng province. On approach for Runway 13 at FASY, the aircraft's speed was approximately 80 miles per hour (mph)/70 knots (kt), with first notch flaps selected (about 10 degrees). The aircraft landed hard on the runway. This was followed by a severe vibration just before the aircraft's tail wheel touched the runway surface. The aircraft veered off to the right of the runway centreline and onto the grass area. The aircraft's nose subsequently hit the ground and the aircraft came to a stop on the right edge of the runway with the left-wing low and the tail lifted. No injuries were reported by the pilot and the passenger.

1.1.2 The aircraft was substantially damaged during the accident sequence.

1.1.3 The flight was conducted in accordance with visual flight rules (VFR) by day and no flight plan was filed. The flight was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.4 Post-accident examination of the left main gear assembly revealed that the bolts and nuts that secured the axle to the left gear struts had failed.

1.1.5 The investigation revealed that the aircraft landed hard on Runway 13 at FASY, resulting in the failure of the left-side main landing gear axle attachment bolts and nuts, and the subsequent separation of the main wheel and axle assembly from the left main landing gear.

2. FACTUAL INFORMATION

2.1 History of flight

2.1.1 On 8 March 2020 at approximately 1330Z, the pilot accompanied by a passenger took off from Kitty Hawk Aerodrome (FAKT) on a private flight to Baragwanath Aerodrome (FASY) in Gauteng province. On approach for Runway 13 at FASY, the aircraft's speed was approximately 80 miles per hour (mph)/70 knots (kt), with first notch flaps selected (about 10 degrees). The aircraft landed hard on the runway. This was followed by a severe vibration just before the aircraft's tail wheel touched the runway surface. The nose of the aircraft subsequently hit the ground and the aircraft came to a stop on the right edge of the runway with the left-wing low and the tail lifted.

2.1.2 The aircraft sustained damage to the left main landing gear, left wing, propeller, fuselage and the lower engine cowling. No injuries were reported by the pilot and the passenger.

2.1.3 The flight was conducted in accordance with visual flight rules (VFR) by day and in visual meteorological conditions (VMC). The private flight was conducted under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

2.1.4 The aircraft was issued a certificate of registration (CoR) on 30 May 2018. The aircraft had a valid certificate of airworthiness (CoA) that was issued on 20 February 2019 with an expiry date of 28 February 2021.

2.1.5 The last 100-hour Mandatory Periodic Inspection (MPI) was carried out on 15 November 2019 at 7697.45 hours. The aircraft had a total of 7722 airframe hours at the time of the accident and had flown a further 24.55 hours since its last MPI.

2.1.6 The accident occurred during daylight at Global Positioning System (GPS) determined to be S26°20'52.49" E027°46'38.73'' at an elevation of 5419 feet.

Figure 1: The aircraft as it came to rest on the right side of Runway 13 at Baragwanath Aerodrome.

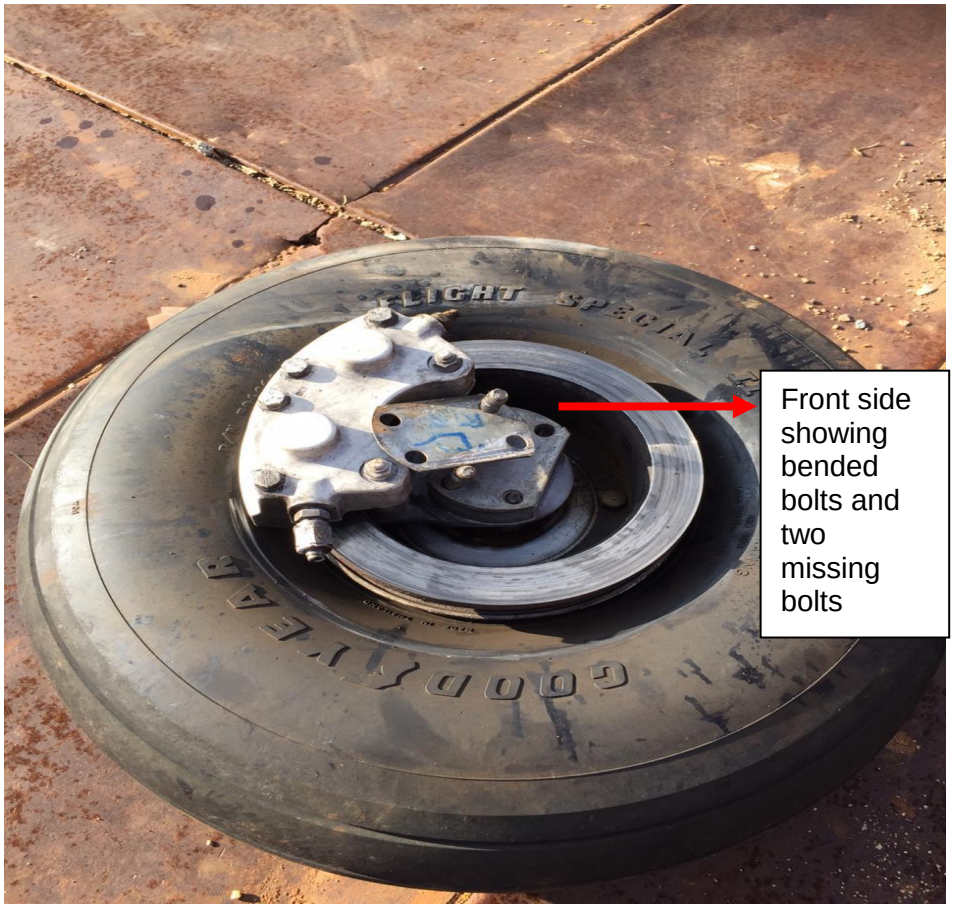

Figure 2: The wheel assembly showing two rear sheared bolts, the missing front top bolt, and the snapped bottom bolt.

2.1.7 After a follow-up with the aircraft maintenance organisation (AMO) and an examination of the separated wheel assembly, the following were observed:

- The wheel assembly was correctly installed to the axle by a castellated nut and secured by a split pin
- The axle was secured to the strut by four bolts and nuts
    - Two nuts and two bolts were still attached to the landing gear strut
    - The third bottom nut broke off (snapped) and its bottom half was still on the wheel assembly
    - The fourth front top bolt was missing
- The two rear bolts were visually inspected and were found sheared and slightly bent. The two attachment bolts were bent aft (backwards), and the fractured surface was consistent with an overstress fracture.

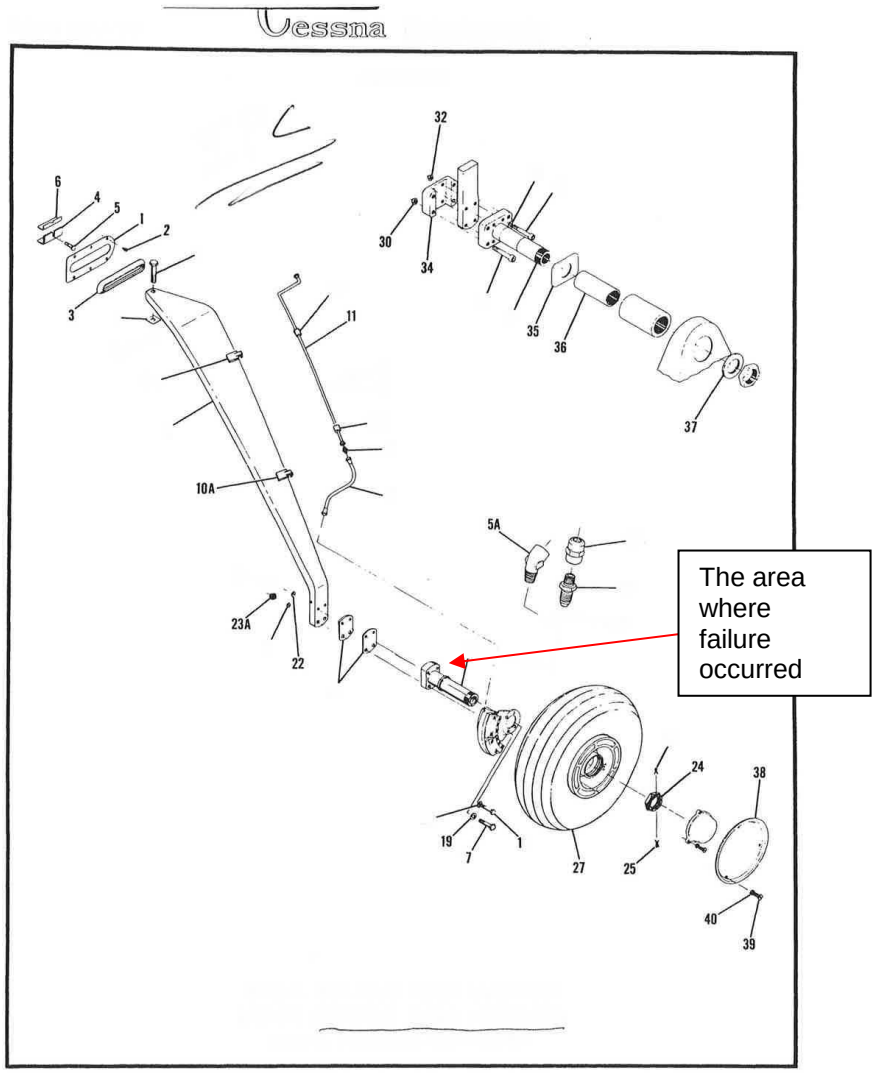

Figure 3: Illustrated parts catalogue of the main gear strut and wheel assembly.

2.1.8 The Cessna Aircraft Service Manual Model 180 *requires the inspection of the main landing gear spring axle attach bolts holes. Initial 4000 hours or 10 years, whichever comes first. Repeat 1000 hours or 3 years, whichever comes first.*

The last inspection was conducted on 15 November 2019 at 7697.45 hours. The aircraft had a total of 7722 airframe hours at the time of the accident.

The Cessna Aircraft Service Manual and Maintenance Task sheet states: *The main landing gear axle assembly for All Models – make sure you visually inspect these areas:*

1) Main gear axle and attach bolts,

2) Wheel halves,

3) Main landing gear spring axle attach bolt holes.

The inspection instruction is as follows:

(1) Inspect all 4 attach bolt holes for any indication of rusting or rust pits.

(2) Inspect the axle for cracks and corrosion. Pay particular attention inspecting the flange radius for cracks. Clean the area before inspecting if grime or debris is present.

NOTE: Corrosion prevention and control program inspection item (baseline interval, refer to Section 2A-30-00 for addition inspection information). Operation 4 Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 36 months. Refer to Section 2A-30-00, Corrosion Prevention and Control Program, for additional information concerning repeat Corrosion Programme Inspection intervals.

The maintenance manual instructs that this inspection is for mild/moderate corrosion environment. It requires inspection of the main landing gear spring and attach fittings for rust or damage to finishing.
NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the bearing. NOTE: Coordinate with tyre change.

3. Findings

3.1 The pilot was issued a Private Pilot Licence (PPL) on 4 June 2015 with an expiry date of 30 June 2020; the aircraft type was endorsed on his licence. The pilot was also issued a Class 2 medical certificate on 18 April 2019 with an expiry date of 30 April 2020.

3.2 The pilot had flown a total of 636.5 hours, of which 23.4 hours were on the aircraft type.

3.3 The Mandatory Periodic Inspection (MPI) was carried out on 15 November 2019 at 7697.45 airframe hours. The aircraft had flown a further 24.55 hours since its last MPI. The aircraft had a total of 7722 airframe hours at the time of the accident.

3.4 The aircraft was operated privately under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

3.5 Weather conditions were fine at the time of the occurrence and were not a contributory factor to the accident.

3.6 The aircraft had a valid certificate of airworthiness (CoA) which was issued on 20 February 2019 with an expiry date of 28 February 2021.

3.7 The aircraft had a certificate of registration (CoR) which was issued on 30 May 2018.

3.8 The Cessna Aircraft Service Manual requires an inspection for corrosion, corrosion pits and cracks. The AMO only visually inspected the components without subjecting them to a non-destructive testing (NDT).

3.9 Post-accident examination of the left main gear assembly revealed that the bolts and nuts that secured the axle to the left gear struts had failed.

3.10 The investigation revealed that the aircraft landed hard on Runway 13 at FASY, resulting in the failure of the left-side main landing gear axle attachment bolts and nuts, and the subsequent separation of the main wheel and axle assembly from the left main landing gear.

4. PROBABLE CAUSE/CONTRIBUTING FACTOR

4.1 The aircraft landed hard on Runway 13 at FASY, resulting in the failure of the left-side main landing gear axle attachment bolts and nuts, and the subsequent separation of the main wheel and axle assembly from the left main landing gear.

5. REFERENCES USED ON THE REPORT

5.1 Pilot questionnaire (form CA 12-03)

5.2 Owner questionnaire (form CA 12-04)

5.3 Aircraft maintenance/Flight folio documents

5.4 Technical report from the Aircraft Maintenance Organisation (AMO)

5.5 Pilot Operating Handbook (POH) of the Cessna C180

5.6 Extracts from the Aircraft Service/Maintenance Manual (AMM)

5.7 Extracts from the Illustrated Parts Catalogue (IPC)

6. SAFETY RECOMMENDATION

6.1 None.

7. ORGANISATION

7.1 None.

8. APPENDICES

8.1 None.

This Report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa