SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-57

LIMITED ACCIDENT INVESTIGATION REPORT

Reference Number	CA18/2/3/10094								
Classification	Accident	**Date**	15 December 2021	**Time**	0926Z				
Type of Operation	Training (Part 141)								
Location									
Place of Departure	Rand Aerodrome (FAGM), Gauteng Province	Place of Intended Landing	Rand Aerodrome (FAGM), Gauteng Province						
Place of Accident	Runway 35 at FAGM, Germiston, Gauteng province.								
GPS Co-ordinates	Latitude	26º14'26.5" S	Longitude	28º08'57.49" E	Elevation	5 476 feet			
Aircraft Information									
Registration	ZS-BRO								
Make/Model	Cessna 310Q (Serial Number: 310Q-0257)								
Damage to Aircraft	Substantial	Total Aircraft Hours	4 554						
Pilot-in-command									
Licence Type	Commercial Pilot Licence (CPL)	Gender	Male	Age	67				
Licence Valid	Yes								
Total Hours on Type	19.3	Total Flying Hours	7900						
People On-board	2 + 0	Injuries	0	Fatalities	0	Other (on ground)	0		

What Happened

On Wednesday morning, 15 December 2021, a flight instructor (FI) and a student pilot (SP) on-board a Cessna 310Q aircraft with registration ZS-BRO departed Rand Aerodrome (FAGM) in Germiston, Gauteng province, on a training flight to the Johannesburg South General Flying area (GFA) with the intention to land back at the same take-off aerodrome. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 141 of the Civil Aviation Regulations (CAR) 2011 as amended.

The FI reported that they conducted a thorough pre-flight and pre-take-off checks with no anomalies found. The aircraft had a fuel endurance of 3 hours (hrs). At approximately 0852Z, the duo took off from FAGM to Johannesburg South GFA. The flight lasted approximately 35 minutes. On their return flight during final approach for landing on Runway 35, they followed the pre-landing checklist and selected the gear lever to the down position. The three green lights illuminated which indicated that all three landing gears were down and locked. The FI further reported that the approach and landing were normal. However, halfway through the landing roll, the left-side of the aircraft started to sink, followed by the left-side propeller blades tips contacting the runway surface. As the aircraft slowed down and veered off to the left of the runway, the left wing tip eventually touched the grass. The

aircraft came to a stop facing the opposite direction from which it had approached, approximately 45 metres (m) from the runway edge. The FI switched off the master, magnetos and the fuel selector valve before he disembarked the aircraft with the SP. According to the FI, there was no evidence of fire or fuel leak after disembarking the aircraft.

The aircraft was substantially damaged. Both occupants were not injured during the accident; they exited the aircraft without any assistance.

Figure 1: The white spot indicates the aircraft's position after it came to a stop.
(Source: Google Earth)

Figure 2: The aircraft at the accident site. (Source: Operator)

What was found:

- During visual inspection of the aircraft at the accident site, the left main landing gear had almost retracted inside the wheel well and both lugs attachments of the drag brace had broken off from the oleo strut; as a result, the aircraft had leaned towards the left-side, sustaining scratches along the bottom of the left wing and propeller tips. The aircraft also sustained substantial damage to the left main landing gear, which collapsed (see Figure 3); the left landing gear bell crank lower lug; and the trunnion upper clevis which fractured (Figures 4 and 5). One of the fractured lugs as well as the clevis were found on the runway (Figures 6 and 7), and the landing gear lever was found inside the cabin in the down and locked position.

Figure 3: The collapsed left main landing gear. (Source: Operator)

Figures 4 and 5: The fractured bell crank lower lug (left) and the upper trunnion clevis (right). (Source: Operator)

Figures 6 and 7: The clevis (left) and a piece of fractured lug (right). (Source: Operator)

- General external visual inspection of the engine was carried out, and it revealed no defects. All three left propeller blades tips were bent backwards and exhibited abrasion marks; an indication that they came into contact with the runway surface several times.

Figure 8: The bent propeller blades. (Source: Operator)

- After the left main landing gear trunnion upper clevis and bell crank lower lug broke, the aircraft sank on its left-side. As a result, the left propeller contacted the ground, leaving several indentations on the runway which spanned approximately 10 metres (m). The propeller strike marks also indicated that the aircraft was likely unstable upon landing as the marks were off the centreline on the left of the runway (see Figure 9).

Figure 9: Propeller marks on the runway.

- The aircraft was recovered the same day to an aircraft maintenance organisation (AMO) hangar where the landing gear system was examined. The following were observed during inspection:

- The ‘D’ doors, which close after the main landing gear retracts, were not damaged during the accident.

- There was no damage to the step (platform) used for accessing the wing-fuselage. The step is mechanically linked to the retraction mechanism for the main landing gear. The collapse of the landing gear whilst the aircraft is in motion would likely damage the step and the ‘D’ doors.

- An examination of the landing gear revealed that the only visible damage to the left main landing gear was the bell crank lug on the lower side brace and the upper trunnion clevis.

- The inspection revealed no damage on the right main landing gear. The landing gear components had adequate lubrication. Due to impact damage, the rigging of the retraction linkage prior to the accident could not be determined.

- The student pilot was issued a Commercial Pilot Licence (CPL) on 17 June 2008. His last validation was conducted on 20 June 2021 with an expiry date of 30 June 2022. A Cessna 310Q rating was endorsed on his licence. His Class 2 medical certificate was issued on 31 July 2021 with an expiry date of 31 July 2022 with no waivers.

- The owner of the aircraft was issued a Certificate of Registration on 3 December 2004. The aircraft was initially issued a Certificate of Airworthiness (C of A) on 21 February 2019 with an expiry date of 28 February 2022.

- According to the latest Certificate of Release to Service (CRS), the aircraft’s last annual inspection was carried out on 19 November 2021, which included an inspection of the landing gear at 4 454 airframe hours. At the time of the accident, the aircraft had 4 554 airframe hours and had accumulated 100 airframe hours since the annual inspection.

- The take-off and the landing weights were found to be within the operation limitations of the aircraft, including the weight of the instructor and the student pilot as occupants.

- A review of the flight folio and defects report revealed no outstanding defects that required rectification relating to the aircraft’s landing gears prior to the accident. The last maintenance was carried out by an approved AMO with a certificate issued on 5 August 2021, with an expiry date of 31 July 2022. The aircraft had no outstanding Service Bulletins (SB) or Service Letters (SL) regarding the landing gear.

- Diagram 1 shows a detailed illustration of the left landing gear in an extended position.
    - Following the accident, the fractured bell crank lower lug and upper trunnion clevis were examined under microscope. The fractured *surface morphology showed no clear indication/s of fatigue (pre-existing fracture/s) which meant that the components failed as a result of exposure to a single overload during landing.*
- It is likely that the clevis was subjected to mechanical shearing due to hard landings, which could have happened over time. However, there were no recorded hard landings in the airframe logbook and the aircraft was not fitted with a G-meter. Therefore, the cause of failure could not be supported with certainty.

- Although the flight instructor reported that the landing was normal with no crosswind, side load or hard landing during the landing roll, it is likely that the aircraft landed hard on the left main gear, inducing overload on the upper trunnion clevis. This resulted in the left main landing gear upper trunnion clevis and bell crank lower lug breaking, followed by the left wing tip and left propeller striking the ground.

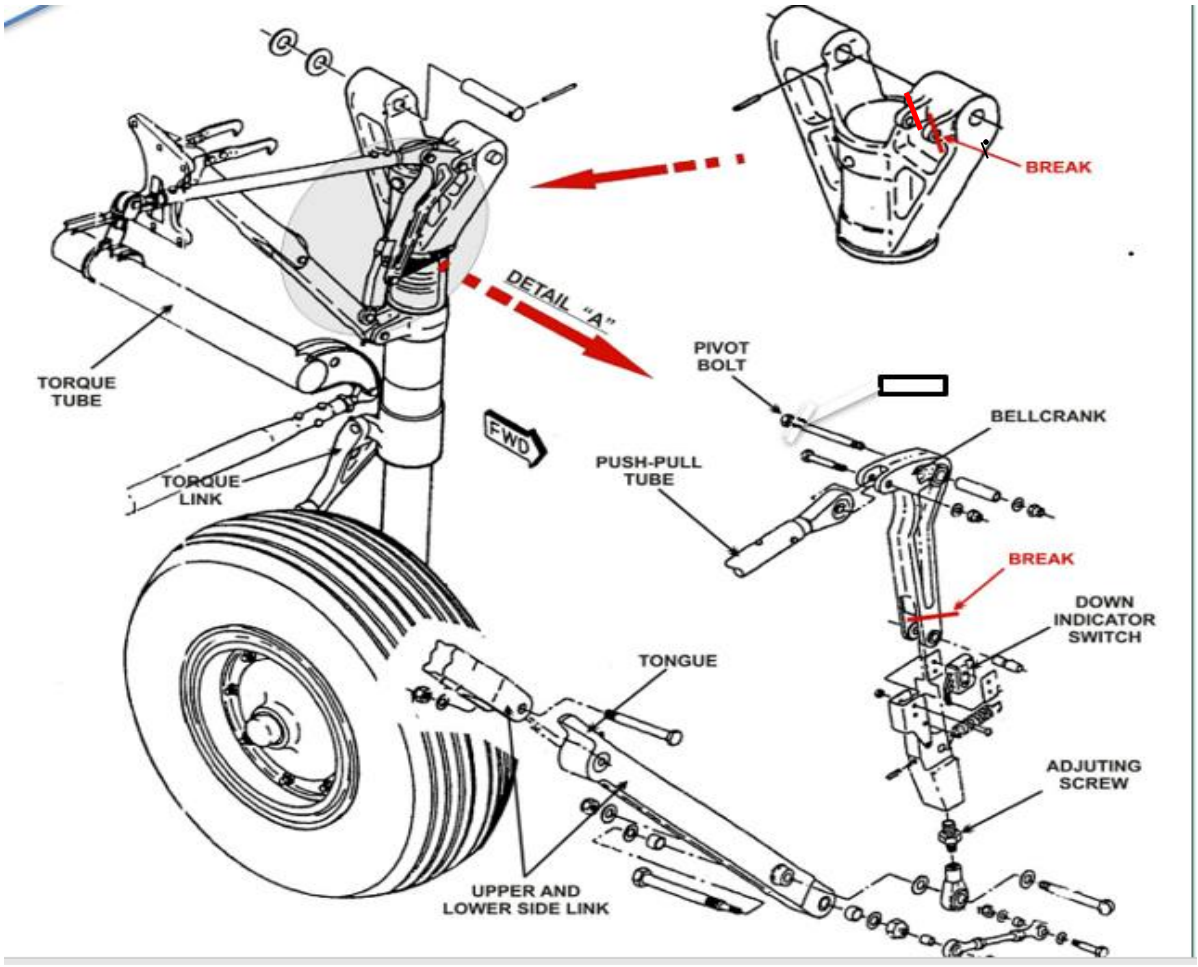

Diagram 1: Schematics of the left gear.

Probable cause:
It is likely that the aircraft was unstable on approach and landed hard, resulting in the left main landing gear collapsing and the aircraft veering off the runway.

Contributory factor:
None.

Safety Action/s

None.

Safety Message
Pilots are to be alert when engaged in the critical phase of flight (take-off and landing) as failure to do so would likely lead to injuries or damage to property.
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****.*
About this Report
Decisions regarding whether to investigate, and the scope of an investigation are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, no investigation has been conducted, and the Accident and Incident Investigations Division (AIID) has relied on the information submitted by the affected person/s and organisation/s to compile this brief report. The report has been compiled using information supplied in the initial notification, as well as follow-up information to bring awareness of potential safety issues to the industry in respect of this occurrence, as well as possible safety action/s that the industry might want to consider in preventing a recurrence of a similar accident. *This report provides an opportunity to share safety message/s in the absence of an investigation.* *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.*
Disclaimer
This report is produced without prejudice to the rights of the AIID, which are reserved.

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