SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10451						
Classification	Accident	**Date**	11 May 2024		**Time**	1540Z	
Type of Operation	Private (Part 94)						
Location							
Place of Departure	Kitty Hawk Airfield (FAKT) Gauteng Province	Place of Intended Landing	Kitty Hawk Airfield (FAKT) Gauteng Province				
Place of Occurrence	Runway 19 FAKT						
GPS Co-ordinates	Latitude	25° 51' 28.58" S	Longitude	28° 26' 58.40" E	Elevation	4580 ft	
Aircraft Information							
Registration	ZU-FIP						
Make; Model; S/N	Aveko VL-3 Flamingo (Serial Number: VL-3-57)						
Damage to Aircraft	Substantial	Total Aircraft Hours	145.9				
Pilot-in-command							
Licence Type	Commercial Pilot Licence (CPL)	Gender	Female	Age	63		
Licence Valid	Yes	Total Hours	1152.36	Total Hours on Type	34.76		
Total Hours 30 Days	3	Total Flying on Type Past 90 Days	18.7				
People On-board	1+0	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0

What Happened

On Saturday afternoon, 11 May 2024, a pilot on-board an Aveko VL-3 aircraft with registration ZU-FIP took off on a local flight from Kitty Hawk Aerodrome (FAKT) in Gauteng province to the general flying area (GFA) and, thereafter, back to FAKT. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that on her return to FAKT, she joined left downwind for Runway 19. She then reduced the speed to 80 knots, extended the landing gear and configured flaps to 15 degrees. The landing gear extended but the landing gear warning lights in the cockpit remained red, which indicated an unsafe landing gear state. The pilot viewed the electronic flight instrument system (EFIS) to verify if the landing gears were extended. She noticed that the nose gear and the left gear were fully extended but the right main gear was partially extended. The pilot retracted the landing gears and, thereafter, extended them again using the normal gear extension but the right main gear did not extend fully. She tried manual release but there was no movement of the main landing gear.

The pilot then declared an emergency, and FAKT prepared for an emergency landing by positioning themselves close to the runway to offer assistance as soon as the aircraft lands. The pilot stated that the downwind leg was extended for the aircraft (ZU-FIP) to allow for other aircraft to land ahead (of ZU-FIP). When on final approach, the aircraft's airspeed was between 53 and 55 knots (kts) with the flaps extended to 55°. The pilot stated that she tightened the safety harness and removed her spectacles to prepare for an emergency landing. She turned off the master switch, ignition and fuel switches before the aircraft touched down. The pilot landed with the nose gear and left main gear extended and, on touch down, the landing gears collapsed. The aircraft skidded on its belly for approximately 60 metres (m) before it veered off to the left side of the runway and came to a stop with the fuselage partially on the runway.

The aircraft's propeller and the under belly were damaged. The pilot was not injured during the accident.

Figure 1: Aerial view of the accident site. The blue arrow shows the direction of landing. (Source: Google Earth)

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

Figure 3: The damaged underbelly.

Figure 4: Landing gear switch.

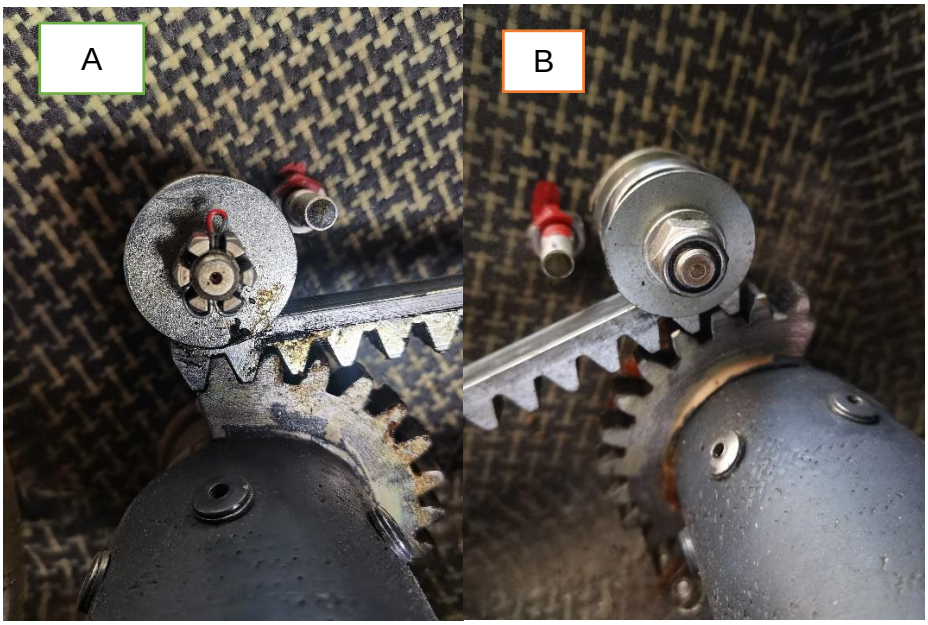

Figure 5: Picture A shows the landing gear track position of the left main landing gear. Picture B shows track position of the right main landing gear.

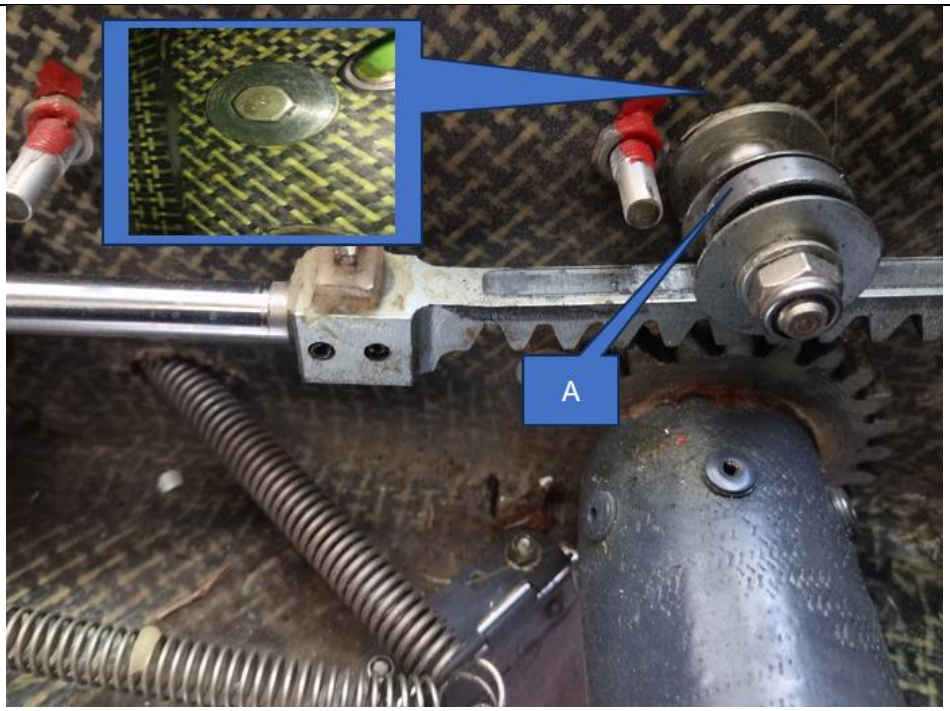

Figure 6: The collapsed bearing (A) which caused the gears to skip tracks when retracting. The inset picture shows damage to the head of the bolt securing the bearing.

Figure 7: Damage to the bearing.

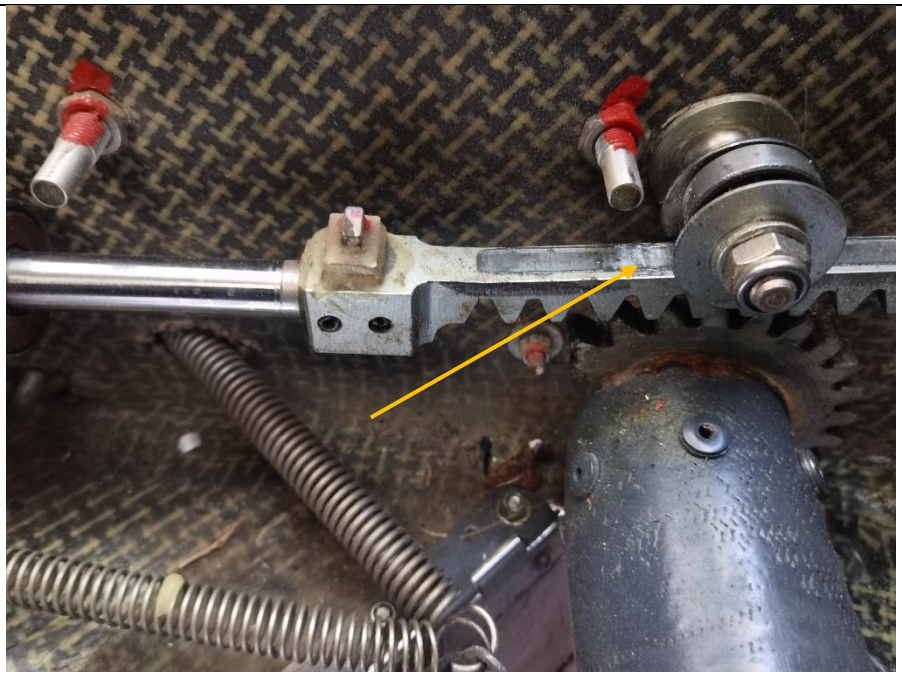

Figure 8: The scarred landing gear track.

1.4	Landing Gear	
1	Check the landing gear for general condition and security.	
2	Inspect the shock absorbing devices for correct fluid levels and pressures.	
3	Check linkages, trusses and other members for condition and security of attachments.	
4	Check retracting and locking mechanisms for condition and	

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Issue no

Aircraft inspection checklist Issue date:

	INSPECTION	Inspected by:
	satisfactory operation.	
5	Check hydraulic lines and retraction jacks for condition and any leakage of fluid.	
6	Check electrical items for condition, chafing of cables and satisfactory operation of motors, switches and indicators.	
7	Check mechanical indicators for condition and satisfactory operation.	
8	Check steering mechanisms for condition and bearings for condition, lubrication and correct adjustment.	
9	Check tyres for condition and creep. Check tyre pressures.	
10	Check brakes for condition correct adjustment and operation.	
11	Check floats, skis or skids for additional security.	

Figure 9: Aircraft maintenance schedule. (Source: Sport Plane Builders)

The investigator inspected the aircraft after it was recovered and found that when the landing gear was extended, the nose and left main gear extended fully and the right main gear extended about 80%. When retracting the gears, the nose and left main gear retracted fully but the right main gear stopped before it entered the wheel well. Upon further investigation, it was discovered that the

bearing (Figure 6) was damaged (possibly due to wear and tear). The damage had caused a gap between the track and gears (Figure 5 b) which then caused the right gear to skip the track on the landing gear strut. This made it impossible for the gear to travel the maximum (entire) length when extended or retracted.

Castle Nut (Source: https://blog.thepipingmart.com/fasteners/castle-nut-vs-lock-nut-whats-the-difference)

A castle nut (Figure 5A) is a fastener which is widely used in the industry. It has an internal threaded hole and its edges are notched like a castle wall. The notched sides allow for the subsequent installation of cotter pins, which lock the nut to ensure it won't come loose during operation.

Lock Nut (Source: https://blog.thepipingmart.com/fasteners/castle-nut-vs-lock-nut-whats-the-difference)

A lock nut (Figure 5B) is a fastener that to secure another nut or bolt. It typically has a round body with threads on the outside and an internally threaded hole at the centre. The main purpose of this specialised nut is to prevent unintentional loosening due to vibration or tampering. Lock nuts come in various shapes, sizes and materials, but all work using a locking mechanism that makes it easier to spin with tools being applied first.

Castle nuts are commonly used in automotive and aviation, as well as in any application that requires securing fasteners with a cotter pin. Lock nuts are widely used in heavy machinery manufacturing, construction and other industries where the force of a machine's moving parts or high vibration may cause regular nuts to come loose. Any use of the nut type will secure. The lock nut will provide resistance to vibrations and excessive tension.

The manufacturer was contacted to request the type of nut with which the bearing on the aircraft should be secured; the manufacturer had responded to the query stating that they had used the type in Figure 5A and that they had only built VL3 (kits) from serial number 100. The manufacturer also stated that they had no responsibility for the airworthiness of the VL3 kits up to serial number 99 and that they had limited access to documentation on how the kits were produced.

Findings

1. The pilot was initially issued a Commercial Pilot Licence (CPL) on 16 March 2010. The licence was reissued on 28 June 2023 with an expiry date of 30 June 2024.

2. The pilot was issued a Class 1 aviation medical certificate on 11 September 2023 with an expiry date of 31 March 2024. The pilot was restricted to wearing corrective lenses when flying an aircraft.

3. The aircraft was issued an Authority to Fly (ATF) on 1 September 2019. The ATF was renewed on 18 September 2023 with an expiry date of 31 October 2024. The aircraft was airworthy when it was dispatched for the flight.

4. The aircraft was issued a Certificate of Release to Service (CRS) on 8 December 2023 with an expiry date of 8 December 2024 or at 241 hours, whichever occurs first. There were no recorded defects prior to the flight.

5. According to flight folio page 017, the aircraft was flown on 8 April 2024, 20 April 2024 and 21 April 2024. The pilot stated that there were no abnormal landings on the mentioned days.

6. The pilot stated that the manual extension system used to extend the landing gears was difficult to operate and the gears did not extend.

7. The bearing had a flat surface and was flown in that condition (Figure 7) for some time. As a result, the bearing could not rotate optimally due to the gaps between the gears on the strut and track (Figure 5 B); therefore, the landing gear could not fully extend.

8. The annual inspection on the aircraft was conducted on 8 December 2023 at 141 hours. The aircraft accrued 4.9 hours since the last annual inspection. The investigation could not determine the time of the landing gear failure; however, the flat surface had developed some time in the past.

9. The investigator tested the manual pump and found it to be operational although this did not extend the landing gear due to some tracks that were skipped (Figure 5B).

10. The damage to the landing gear track was caused by the collapse of the bearing (Figure 8) which made a gap between the track and the strut gears.

11. It is unlikely that the maintenance team would have noticed the anomaly because the Aircraft Maintenance Schedule [figure 9, 1.4 (4)] specifies the inspection of the retraction and locking mechanism, thus, it is probable that it was not properly inspected, or it was missed during the last maintenance.

12. The different nuts (Figure 5 A and B) used to secure the bearing were adequate to keep the bearing in place as the bearing mechanism did not fail.

Probable Cause(s)
It is probable that during the last annual inspection, the right main landing gear bearing was not properly inspected which resulted in the bearing failure and, thus, the landing gear skipped some tracks on the strut and prevented full extension of the right landing gear.
Contributing Factor(s)
Poor maintenance practices.
Safety Action(s)
None.
Safety Message and/or Safety Recommendation/s
It is recommended that the approved persons who maintain aircraft should properly inspect the landing gear extension mechanisms, particularly the bearings, at every annual inspection as prescribed in the maintenance schedule.
About this Report
The decision to conduct a limited investigation is based on factors including whether the cause is known and the evidence supporting the cause is clear, the level of safety benefit likely to be obtained from an investigation and that will determine the scope of an investigation. For this occurrence, a limited 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 limited report. The report has been compiled using information supplied in the initial notification, as well as from follow-up desk top enquiries 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 occurrence. *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
In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011 and ICAO Annex 13, 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.
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This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa