SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED ACCIDENT INVESTIGATION REPORT

Reference Number	CA18/2/3/10086				
Classification	Accident	**Date**	3 December 2021	**Time**	0750Z
Type of Operation	Training Flight (Part 141)				
Location					
Place of Departure	Wonderboom Aerodrome (FAWB)	Place of Intended Landing	Wonderboom Aerodrome (FAWB)		
Place of Accident	FAWB, Runway 11 during the landing roll				
GPS Co-ordinates	Longitude	S 26º 39' 11.73"	Latitude	E 028º 13' 0.11"	Elevation	4095ft
Aircraft Information					
Registration	ZS-MHG				
Model/Make	PA34-200T/ Piper (Serial Number: 34-7770126)				
Damage to Aircraft	Substantial	Total Aircraft Hours	6825.8		
Pilot-in-command					
Licence Type	ATPL	Gender	Male	Age	60
Licence Valid	Yes				
Total Hours on Type	328.8	Total Flying Hours	27335		
People On-board	2+1	Injuries	0	Fatalities	0	Other (on ground)	0
What Happened					

On 3 December 2021 at approximately 0750Z, a Piper PA-34-200T Seneca twin-engine aircraft with registration ZS-MHG was engaged in a training flight. On-board the aircraft were the instructor and two student pilots. Their intention was to conduct multi-reciprocating engine aircraft skills tests. The aircraft took off from Wonderboom Aerodrome (FAWB), Gauteng Province, with the intention to land back at the same 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. No flight plan was filed for this flight.

The flight instructor, who is a designated flight examiner (DFE), was seated on the right seat. The student pilot seated on the left seat was the one being evaluated/tested. The second student pilot was seated in the cabin as an observer. According to the statement from the DFE, they had a normal and stable approach for Runway 11 with all three landing gear lights illuminated (green), indicating that the landing gears were down and locked into position. Approximately 50 metres (m) after touchdown on Runway 11 and during the roll-out, the crew felt the nose section slowly dropping. This was followed by the propeller blades striking the runway surface; thereafter, the aircraft skidded on its nose cone. The aircraft sustained substantial damage to the nose cone and both propeller blade tips were bent. The occupants did not sustain any injuries during the accident sequence; they disembarked the aircraft without assistance.

Post-accident, the aircraft maintenance engineer (AME) who was rated on the aircraft type conducted a visual inspection and found that the nose landing gear actuator bottom rod end had fractured just above the lock nut and jam nut.

Figure 1: Retraction and extension actuator failure on the bottom connecting rod end (left) and the bearing (right).

The aircraft's landing gear system is a fully retractable hydraulic operated tricycle landing gear system. The hydraulic pressure is furnished with an electrically powered pump. The pump is activated by a two-position gear selector switch located to the left of the control quadrant on the instrument panel. The gear selector switch, which has a wheel-shaped knob, must be pulled out before it could be moved to the "UP" or "DOWN" position. When hydraulic pressure is extended in one direction, the gear is retracted; when it is exerted in the other (opposite) direction, the gear is extended. Gear extension or retraction normally takes six to seven seconds.

The nose landing gear actuator bearing is used to set the landing gear position by adjusting the length of the rod end. The rod end bearing's two nuts (lock nut and jam nut) are utilised when attaching a rod end onto a piston rod. However, when the nose landing gear cannot be properly adjusted, it is allowable to use one nut (removing the jam nut), but the maximum length of the exposed threads should be 0.28 inches (approximately seven millimetres). According to the evidence on the failed component, the exposed length was close to the maximum allowable exposure length, based on the number of threads of the exposed part, which was within limits.

According to the aircraft manufacturer, a Service Bulletin (SB) No.1123C was released on 20 May 2013 relating to P34-series aircraft nose landing gear inspection and product improvements. The SB outlined the 'difficulty' reports concerning PA-34 nose landing gear, indicating a need to emphasise and expand upon periodic inspection requirements currently listed in the series maintenance manual in order to avoid the possibility of nose gear failures and inadvertent collapses. Modification on the nose gear has been made to extend their long-term service life. In every 50-, 100-, 500- and 1000-hour service intervals, the actuator mounting brackets must be inspected for cracks, elongation of 250 diameter hole where the retraction link attaches, and for loose mounting brackets.

According to the mandatory periodic inspection (MPI) list of work done, the nose landing gear inspection was carried out and the drag link bolt was replaced during the 100-hour service. The SB 1123C was adhered to by the aircraft maintenance organisation (AMO) that serviced the aircraft. The landing gear actuator failed on the bottom rod end connecting point. The failure is likely to have been caused by retraction and extension forces associated with fatigue which occurred over time during operation. The landing gear inspection requires the following inspection: check oleo strut for proper extension (check for proper fluid level and air pressure as required; check the nose wheel steering control and travel; inspect oleo strut for fluid leaks and scoring; inspect gear strut, attachment, torque links, retraction links and bolts for condition and security. According to

maintenance records, all necessary maintenance required was carried out accordingly. (A similar occurrence with reference AI2018-4 was investigated by Japan Transport Safety Board on a different aircraft type PA46-310P which had the similar nose landing gear configuration. See Figures 2 and 3).

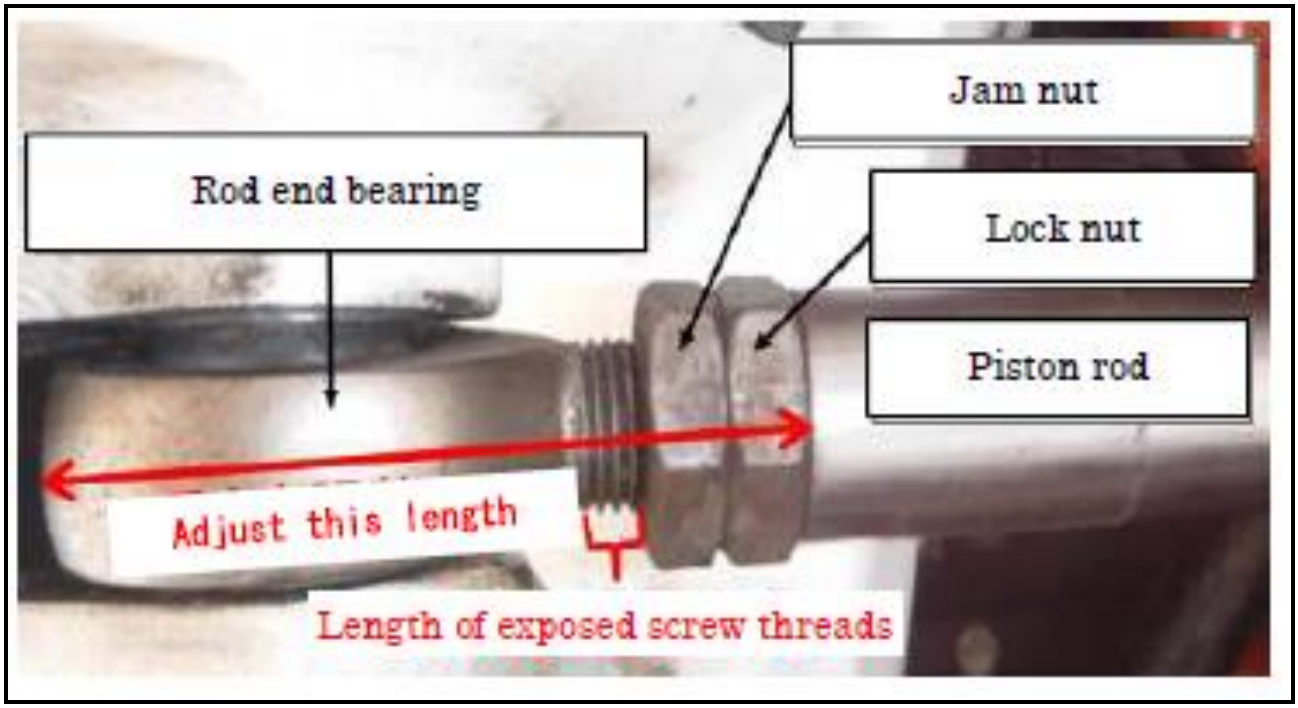

Figure 2: The rod end bearing with jam nut and lock nut attached to a piston rod. (Source: AI2018-4 report)

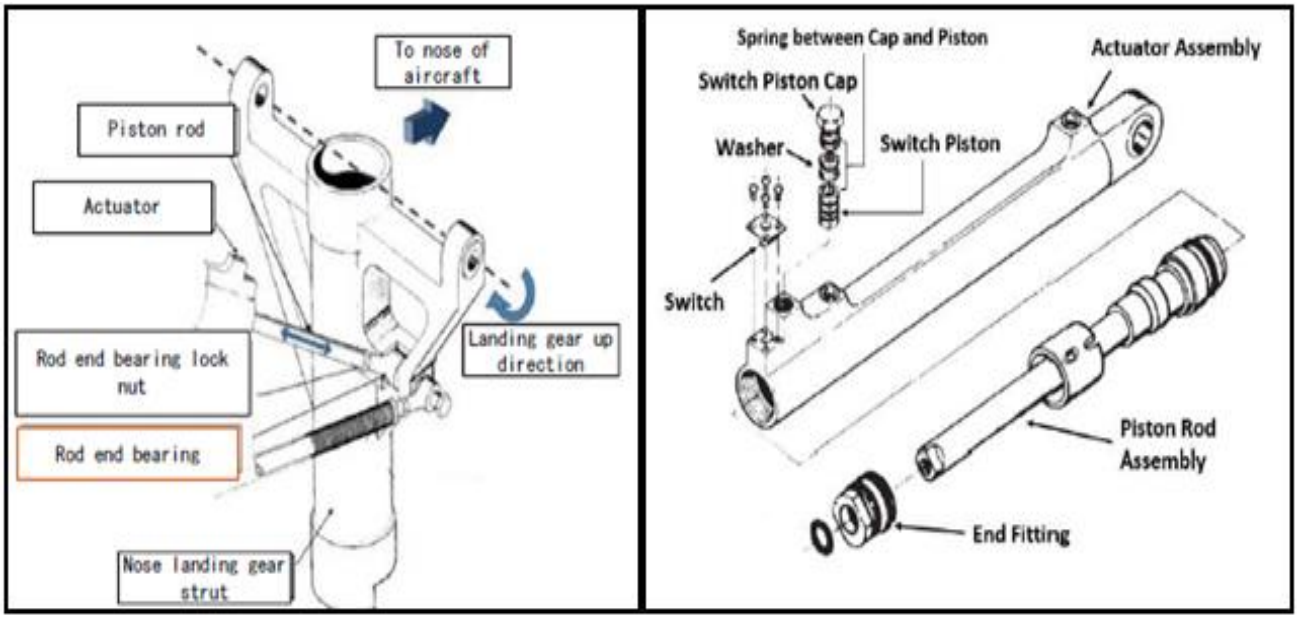

Figure 3: The schemetic of the actuator type and its assembly. (Source: AI2018-4 report)

The aircraft had a valid Certificate of Airworthiness issued by the Regulator (SACAA) on 28 October 2021 with an expiry date of 31 August 2022. The AMO that serviced the aircraft issued the Certificate of Release to Service on 28 October 2021 at 6802.60 airframe hours (HOBBS) and due to lapse at 6902.60 airframe hours or on 28 October 2022, whichever occurs first, unless the aircraft is involved in an accident or becomes unserviceable, in which case the certificate is invalid for the duration of the period. The aircraft's nose actuator failed at approximately 10 hours of flight time following the MPI.

The DFE had an Aircraft Transport Pilot Licence (ATPL) with instructor Grade 1 rating, issued by the Regulator on 18 April 2021 following the currency validation, with an expiry date of 30 June 2022. His Class I medical certificate was issued on 22 November 2021 with an expiry date of 22 November 2022. The aircraft type is endorsed on his licence with approximately 328.8 flying hours on the aircraft type, and a total of 27 335 flying hours on all aircraft types.

The student pilot who was flying the aircraft at the time of the accident had a Private Pilot Licence (PPL) issued by the Regulator on 14 February 2021 with an expiry date of 28 February 2022. His Class 2 medical certificate was issued by the Regulator on 22 December 2017 with an expiry date of 31 December 2022. The student pilot had a total of 10.6 flying hours on the aircraft type.

Probable Cause

The nose landing gear actuator connecting bottom rod end failed during the landing roll and, consequently, the nose landing gear retracted. Failure of the rod end is likely to be attributed to fatigue which occurred over time during operation of the aircraft.

Safety Action/s

None.

Safety Message and/or Safety Recommendation/s

None.

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

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