

**LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL**

<b>Reference Number</b>	CA18/2/3/10359						
<b>Classification</b>	Accident	<b>Date</b>	12 August 2023	<b>Time</b>	1440Z		
<b>Type of Operation</b>	Private (Part 94)						
<b>Location</b>							
Place of Departure	Vereeniging Airfield (FAVV), Gauteng Province		Place of Intended Landing	Vereeniging Airfield (FAVV), Gauteng Province			
Place of Occurrence	On the grass next to Runway 21, Vereeniging Airfield (FAVV)						
GPS Co-ordinates	Latitude	26°33.78'S	Longitude	27°57.68'E	Elevation	4 847ft	
<b>Aircraft Information</b>							
Registration	ZU-AKE						
Make; Model; S/N	Piper Aircraft Corporation; PA 22-150 Tri-pacer (Serial Number: 22-6033)						
Damage to Aircraft	Substantial		Total Aircraft Hours	375.33			
<b>Pilot-in-command</b>							
Licence Type	Airline Transport Pilot Licence (ATPL)		Gender	Male		Age	41
Licence Valid	Yes	Total Hours	7134		Total Hours on Type	29.8	
Total Hours 30 Days	7		Total Flying on Type Past 90 Days	28			
<b>People On-board</b>	1+0	<b>Injuries</b>	0	<b>Fatalities</b>	0	<b>Other (on ground)</b>	0
<b>What Happened</b>							
<p>On Wednesday morning, 12 August 2023 at approximately 1400Z, a pilot on-board a PA-22-150 Tri-pacer with registration ZU-AKE was engaged in circuit-and-landing exercises on Runway 21 at Vereeniging Airfield (FAVV) in Gauteng province when the accident occurred. Visual meteorological conditions (VMC) by day prevailed at the time of the flight. The pilot did not file a flight plan. The flight was conducted under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.</p> <p>The pilot stated that after engaging in several circuit-and-landings on Runway 21, he performed a “wheeler landing” (three-point touch down) and, during the ground roll, he heard a noise which emanated from below the aircraft, followed by the sinking of the right wing. He immediately performed a go-around as he suspected a problem with the gear. He then radioed the owner of the aircraft who was on the ground, alerting him of his predicament. The owner made his way to the runway and the pilot asked him to conduct a visual inspection of the gears whilst he performed a low fly pass over the runway. The owner stated that he could not identify any signs of damage. Thereafter, the pilot conducted another soft landing and, again, the right-side wing sank lower than normal. The pilot stated that he conducted another go-around and landed the aircraft on the grass area next to the</p>							

runway at a speed of 50 miles per hour (mph) (80.5 kilometres per hour). During the landing phase, the right-side landing gear failed, which caused the aircraft to yaw 90° to the right. When the right gear failed, the tail lifted and the fuselage leaned towards the left-side which caused the left-wing tip to contact the ground. The aircraft sustained substantial damage, and the pilot was not injured during the accident sequence.

Post-accident, a visual inspection was conducted and the following damage was recorded: bent propeller, dented spinner, bent engine mounts, dented cowlings, damaged boot cowl, dented firewall, dented exhaust, buckled lift struts, as well as dented left wing, leading edge and left wing tip.



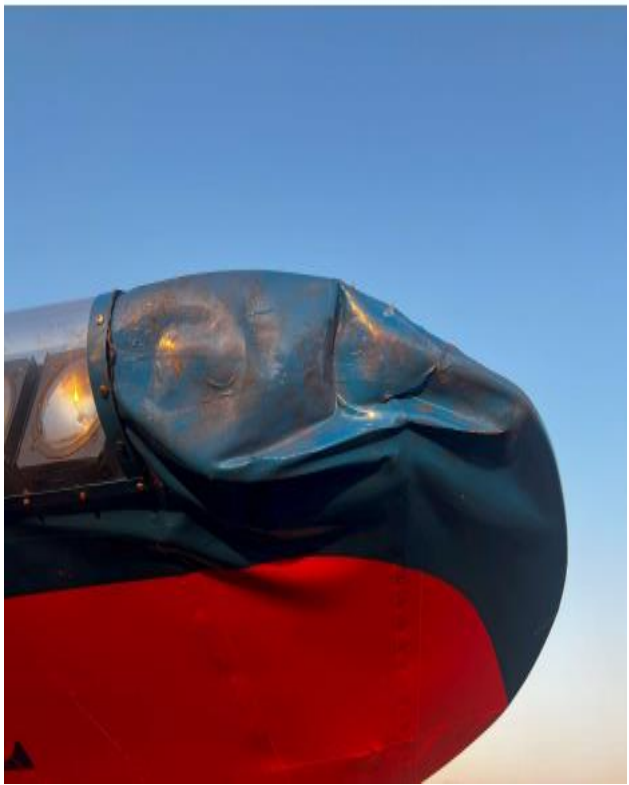
**Figure 1:** The bent propeller blades.



**Figure 2:** Buckled struts.



**Figure 3:** Right-side landing gear with the broken Hydrasorb shock absorbers. In the picture, a rope is tied to prevent the collapse of the landing gear.



**Figure 4:** Dented left wing tip.

The cause of the failure was evident during the visual inspection of the right-side landing gear. The right-side Hydrasorb shock absorbers failed on the mounting boss. A fatigue failure of the mounting boss had an existing crack with extensive evidence of rust, pitting corrosion and dirt (see Figures 5 and 6). It appeared that the Hydrasorb shock absorber had a crack for an extended period prior to the current landing in this accident. Only a small portion of the original diameter of the boss was still intact.

The failure of the bottom mounting boss caused the right-side landing gear to disconnect from the suspension, which caused it to fully collapse when weight was placed on the gear. The left-side main landing gear Hydrasorb shock unit was intact with its external shock cord rings wrapped around its tee flanges. *“The Hydrasorb shock absorbers, in combination with shock chords, absorb and dissipate landing loads within the shock strut assemblies”*. (Source: PA-22 Owner’s Manual)

According to available information, the Hydrasorb shock absorbers were installed in 2010 during the rebuilt of the aircraft. There were no records from the maintenance records indicating that they were inspected as per the Owner’s Manual or manufacturer’s specifications.

Inspection of the Landing Gear (Source: PA-22, Owner's Manual)

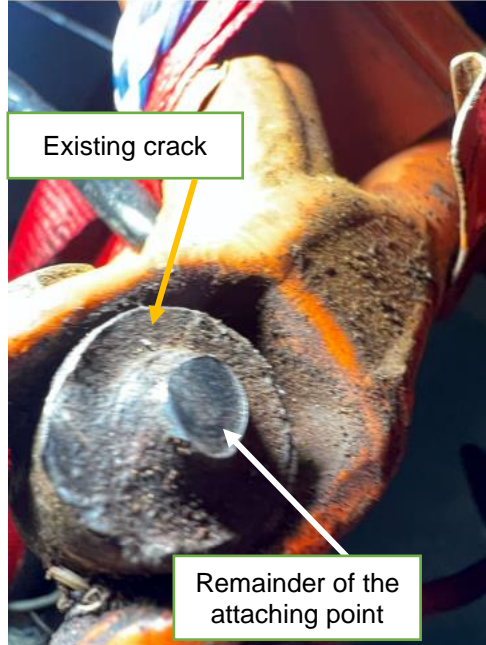
Check shock cords for deterioration and hydraulic unit for operation.

When worn out, this sealed unit must be replaced.

The hydraulic units cannot be repaired and must also be replaced when worn.



**Figure 5:** Mounting boss where it broke off.



**Figure 6:** Sheared off mounting boss where it attaches to the gear leg.



**Figure 7:** New Hydrasorb shock absorber with bottom mounting boss (top right).





**Figure 8:** Example of an assembled Hydrasorb shock absorber with bungies; a circle indicates a failed mounting boss.

According to available information, the aircraft was initially registered as ZS-EBB Tri-Pacer (nose wheel configuration). On 6 January 2005, it was involved in an accident after it experienced engine failure during a climb, which was followed by an unsuccessful landing at Empangeni Airfield (FAEM). The aircraft was destroyed on impact with the ground; no injuries were reported during this accident.

Following this accident, two airframes, namely, ZS-EBB and ZU-AKE Pacer (tail wheel configuration) were merged to create another aircraft. An application for modification was made to convert the aircraft to a tail wheel configuration, and the modification was approved by the Regulator on 23 November 2010. As most parts came from ZU-AKE, the aircraft carried the ZU-AKE Pacer registration.



**Figure 9:** ZS-EBB Tri-Pacer (nose wheel configuration) before modification.



**Figure 10:** ZU-AKE Pacer (tail wheel configuration) after modification.

The information below is an extract from the PA-22-150 Tri-Pacer Pilot’s Operating Handbook (POH)  
*Approach and Landing:*

*The approach technique is as follows: Trim the plane to a 75-80 miles per hour (MPH) glide, after flaps have been lowered at a speed of 95MPH or less. Mixture should be full rich, fuel on proper tank and carburettor heat off unless carburettor conditions prevail. Reduce the speed during the flare out, and touch the ground in a standard three point position approximately at stalling speed (50-60MPH). On the Tri Pacer, the control wheel should be held back far enough to keep the plane in a nose high altitude as long as possible.*

The following weather information was sourced from the pilot questionnaire.

METAR FAVV 121440Z 21005KT CAVOK 23/15 Q1022 NOSIG=

Wind Direction	210	Wind Speed	05kt	Visibility	9999m
Temperature	23°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	15°C	QNH	1022hPa		

It was determined that there had been at least six similar occurrences around the world. Following the investigation of the main landing gear collapse on the Piper aeroplane, the Transportation Safety Board of Canada (TSB) issued a TSB Advisory Letter A10W0092-D1-A1 to Transport Canada Civil Aviation (TCCA).

The Civil Aviation Safety Letter was issued to inform owners and maintainers of PA series aeroplanes of a potential unsafe condition regarding the fatigue failure of the main landing gear Hydrasorb shock absorber assemblies.

During the “wheeler landing” (three-point landing), the right-side fatigued mounting boss broke which led to the failure of the right main landing gear and, subsequently, the left wing tip and the propeller blades contacted the ground.

## **Findings**

### The Pilot

1. The pilot was initially issued an Airline Transport Pilot Licence (ATPL) on 1 April 2011. His last validation was conducted on 24 March 2023 with an expiry date of 31 March 2024. The aircraft was endorsed on the instructor’s licence. A Class 1 medical certificate was issued to the pilot on 25 April 2023 with an expiry date of 30 April 2024.

### The Approved Person

2. The approved person (AP) was initially issued the AP certificate on 10 August 2006. His last validation was conducted on 14 October 2022 with an expiry date of 13 October 2024. The AP had an Approved Person Certificate 2 (APC2): Repair and Maintenance, which includes inspection after repairs, maintenance or modification work as well as carrying out such work. The AP was appropriately certificated to carry out the modifications on the aircraft. Therefore, modifications were not a factor to the cause of this accident.

### The Aircraft

3. The aircraft’s Certificate of Registration (C of R) was issued to the current owner on 4 May 2021. The Authority to Fly (ATF) was initially issued on 17 March 2020. The latest ATF was reissued on 7 August 2023 with an expiry date of 30 June 2024.
4. According to the aircraft ’s latest Certificate of Release to Service (CRS) and logbooks, the last 100-hour annual inspection was certified on 15 May 2023 at 337.08 total airframe hours. The latest CRS had an expiry date of 14 May 2024 or at 437.08 airframe hours, whichever occurs first. At the time of the accident, the aircraft had accumulated 375.33 airframe hours. The aircraft was flown a further 38.25 airframe hours since the last annual inspection.
5. The Hydrasorb shock absorbers had a crack for an extended period prior to the current landing accident. Only a small portion of the original diameter of the boss was still intact.
6. The Hydrasorb shock absorbers are on condition items and should be replaced when worn out.

7. According to the aircraft's airframe and engine logbooks, the aircraft underwent yearly annual inspections and mandatory periodic inspections as required by the manufacturer's specification. The signed out annual inspection prior to the accident was on 23 May 2023, however, over time, metal fatigue on the mounting boss was not detected.
<b>Probable Cause</b>
During a "wheeler landing", the right-side mounting boss broke which led to the failure of the right main landing gear as a result of an undetected fatigue crack on the Hydrasorb shock absorbers bottom mounting boss.
<b>Contributing Factor</b>
Inadequate maintenance inspection on the landing gear system.
<b>Safety Action(s)</b>
None.
<b>Safety Message and/or Safety Recommendation/s</b>
None.
<b>About this Report</b>
<p><i>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.</i></p> <p><i>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.</i></p>
<b>Purpose</b>
<i>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.</i>
<b>Disclaimer</b>
<i>This report is produced without prejudice to the rights of the AIID, which are reserved.</i>

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