SOUTH AFRICAN CIVIL AVIATION AUTHORITY

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

LIMITED OCCURRENCE INVESTIGATION REPORT – FINAL

Reference Number	CA18/2/3/10545								
Classification	Accident		**Date**	18 January 2025		**Time**	1327Z		
Type of Operation	Aviation Recreation (Part 149)								
Location									
Place of Departure	Carletonville Aerodrome (FACR), Gauteng Province		Place of Intended Landing		Carletonville Aerodrome (FACR), Gauteng Province				
Place of Occurrence	On a field approximately 300 metres (m) from the threshold of Runway 31 at Carletonville Aerodrome (FACR)								
GPS Co-ordinates	Latitude	26°22'17.71" S	Longitude	027°21'27.58" E	Elevation	5 044 feet			
Aircraft Information									
Registration	ZS-WXF								
Make; Model; S/N	Atlas Aircraft Corporation, C4M Kudu (Serial Number: 999)								
Damage to Aircraft	Minor		Total Aircraft Hours	4 020.8					
Pilot-in-command									
Licence Type	Commercial Pilot Licence		Gender	Male	Age	29			
Licence Valid	Yes	Total Hours	2 159.0	Total Hours on Type	236.5				
Total Hours Past 30 Days	61.4		Total Hours on Type Past 90 Days	10.5					
People On-board	1 + 0	**Injuries**	0	**Fatalities**	0	**Other (on ground)**	0		

What Happened

On Saturday afternoon, 18 January 2025, a pilot on-board an Atlas C4M Kudu aircraft with registration ZS-WXF was conducting a parachutist-drop flight from Carletonville Aerodrome (FACR) in Gauteng province with the intention to land back at the same aerodrome. The flight was conducted under visual meteorological conditions (VMC) by day. The pilot filed a flight plan to operate at flight level (FL) FL160. The flight was conducted under the provisions of Part 149 of the Civil Aviation Regulations (CAR) 2011 as amended.

The pilot stated that he travelled by road from his residence to Carletonville Aerodrome (FACR) on Friday, 17 January 2025, to conduct parachute-dropping flights on that weekend. He parked the aircraft in a hangar at FACR. A fuel bowser was parked in a separate hangar, also at FACR. Later, he conducted a pre-flight inspection of the aircraft. There was sufficient fuel (Jet A1) on-board for approximately six parachute-drop operations including the reserved fuel. The pilot strained fuel from the wing tanks, which was found to be clean and free of contamination. He then conducted one flight which is referred to as a "sunset drop" and takes place in the late afternoon. This flight was uneventful.

The next morning, 18 January 2025, the pilot and the parachutists continued with the paradrop operation. No fuel was required as there was still sufficient fuel on-board the aircraft. The pilot stated that he conducted three parachute drops and, after landing, he refuelled the aircraft from the bowser. He noted that the fuel flow from the bowser was slow. As there was still some fuel remaining in the aircraft, the pilot asked the bowser operator to conduct fault-finding after he had finished refuelling the aircraft. He then took off for another parachutist-drop flight, whereafter, he landed to find that the problem with the bowser had not been resolved.

He then uplifted a total of 146 litres (L) of fuel in both fuel tanks even though the fuel bowser flow continued to be slow. The pilot suspected that the fuel filters fitted to the bowser were obstructed (clogged) and asked some of the parachute club members to find a new filter as the bowser was the property of the club. The pilot then took off and conducted his fifth parachute-drop flight of the day and landed the aircraft. Thereafter, he uplifted 70L of fuel and flew his sixth parachute-drop flight. After landing, he was informed that a new filter was sourced and installed on the bowser. Thereafter, the pilot uplifted 65L of fuel in the left-wing tank only.

At 1302Z, the pilot took off from Runway 31 with the right-wing fuel tank selected. A team of six parachutists were on-board the aircraft. Once airborne, they climbed to FL160 (16 000 feet), which was approximately 11 000 feet (ft) above ground level (AGL). The pilot then positioned the aircraft overhead the drop zone and all the parachutists jumped out safely and deployed their parachutes. The pilot then descended and moved the throttled back to idle to position the aircraft for landing on Runway 31. He also switched the fuel supply from the right to the left tank during descent. At approximately 5 000ft AGL, he diverted his attention outside the aircraft to look out for canopies (parachutists) and to maintain a safe separation. The pilot positioned the aircraft on the left base leg for Runway 31 and advanced the power lever (throttle) with no response. The pilot then turned on to finals and realised that the engine had stopped (flamed out). He then activated the isolator (ISOL) button which isolated the throttle and, thereafter, pushed the condition lever forward to try and feed fuel directly into the combustion chamber with the intent to restore engine power, but this was to no avail (*the ISOL button isolates the fuel control unit (FCU) and pumps fuel directly into the combustion chamber. In addition to the activated ISOL button, the pilot must also press the Start button. However, contaminated fuel will not ignite, as was the case in this accident)*. The pilot then turned right to avoid colliding with the aerodrome perimeter fence and executed a 3-point landing on a field south-east of the threshold of Runway 31. The aircraft touched down hard and careered through the field for approximately 80m before the right main landing gear strut stopped against an anthill (see Figure 2), which subsequently stopped the aircraft. The tail wheel assembly broke off from the welding lug to the shock strut during the landing roll; the pilot was not injured.

The accident occurred during daylight at Global Positioning System (GPS) co-ordinates determined to be 26°22'17.71" South 027°21'27.58" East, at an elevation of 5 044 feet (ft).

Figure 1: An aerial view of the aircraft, 300m short of the threshold of Runway 31. (Source: Pilot)

Figure 2: The aircraft as it came to a stop against an anthill. (Source: Pilot)

Figure 3: The side view of the aircraft after the accident. (Source: Pilot)

Figure 4: The tail wheel assembly that broke off at the welded lug. (Source: Pilot)

Figure 5: Tail wheel assembly of a similar aircraft. The failure occurred on the welding surface area that is highlighted in yellow.

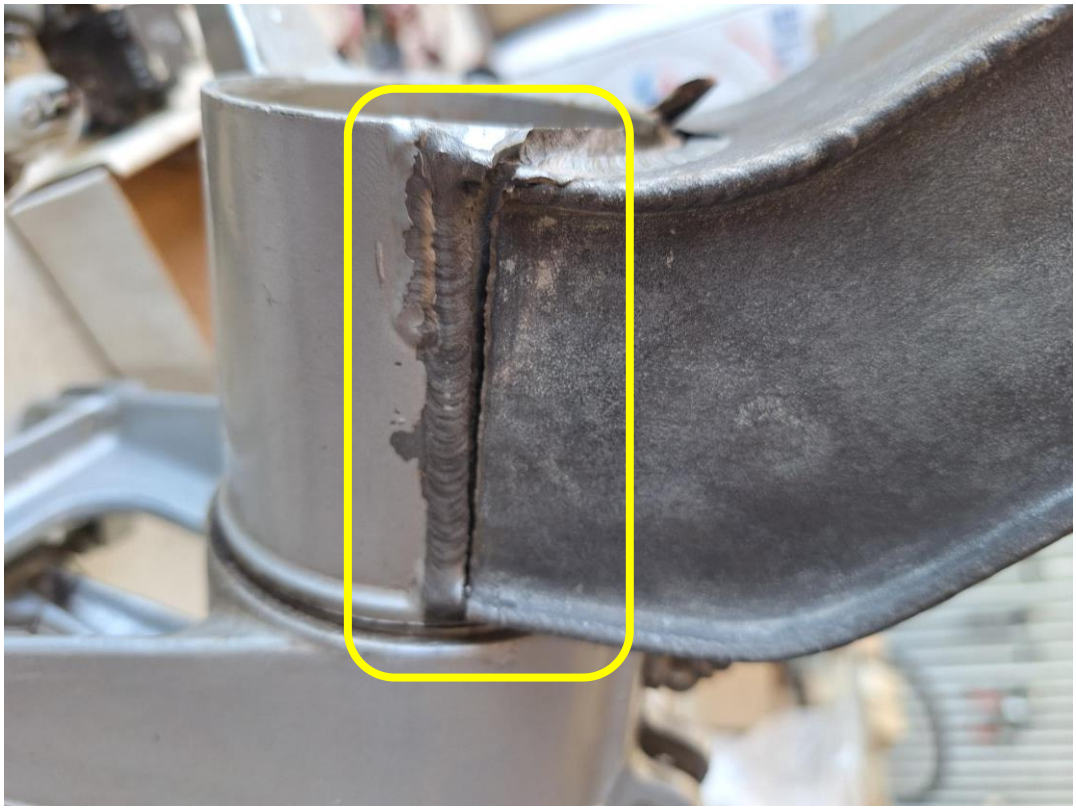

Figure 6: The welded area that failed on the tail wheel assembly.
This is the actual tail wheel assembly that was fitted to the aircraft and failed during the forced landing.

Figure 7: The fuel samples taken a day after the accident.
The red arrows indicate the contamination in the fuel.

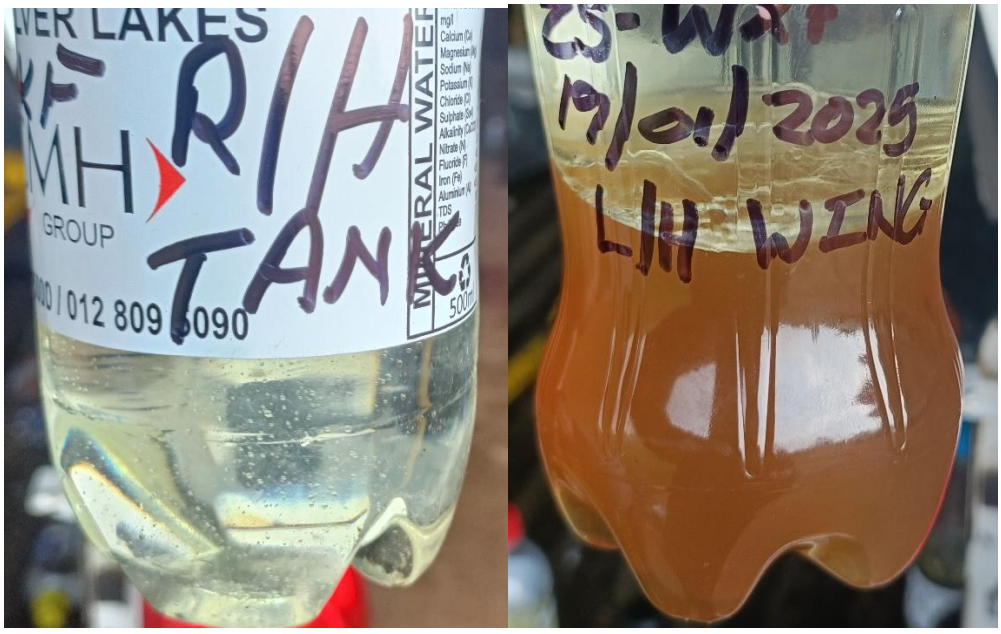

Figure 8: Fuel samples from the right- and left-wing tanks respectively.
The fuel in the right tank was clean but the left tank contained contaminated fuel. (Source: AMO)

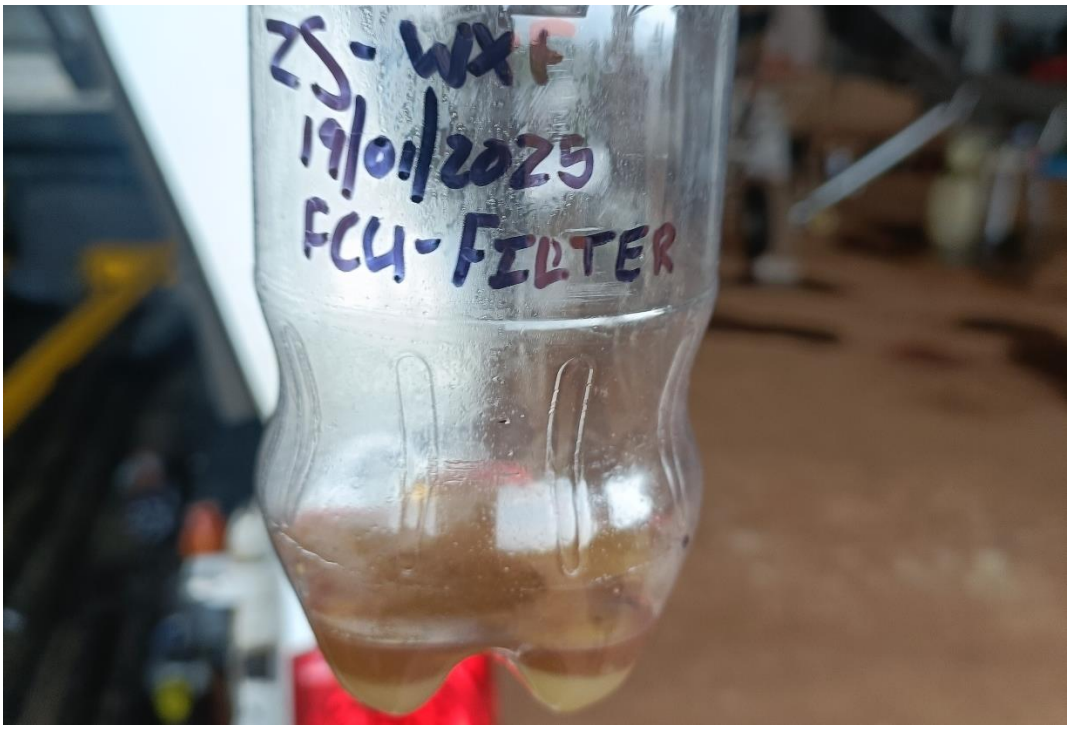

Figure 9: Fuel drained from the fuel control unit (FCU) filter, which was contaminated. (Source: AMO)

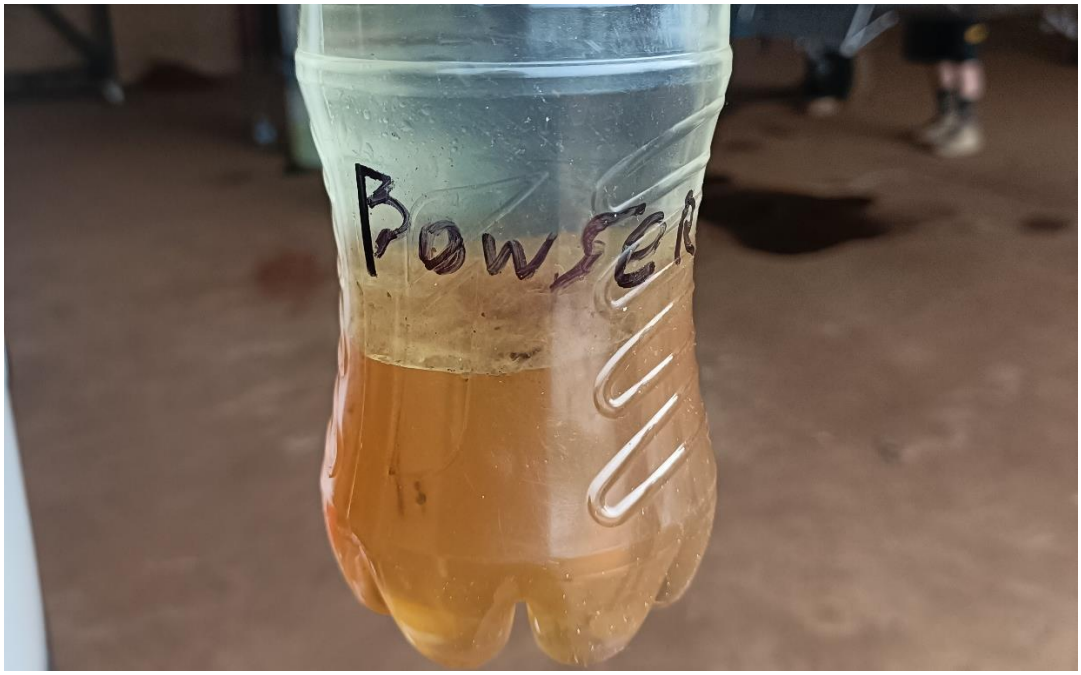

Figure 10: Fuel sample from the bowser, which was contaminated. (Source: AMO)

Fuel Bowser

The bowser is the property of the parachute club and is parked in one of the hangars at FACR. The club provides Jet A1 fuel to the aircraft used for parachute jumping which it purchases from a petroleum service provider in Potchefstroom. Parachute jumping mainly takes place over weekends, weather permitting. The bowser is, therefore, parked for extended periods when there are no flying activities taking place.

Figure 11: The fuel bowser.

The fuel bowser is equipped with two filters to prevent contaminated fuel from entering the aircraft's fuel tanks (see Figure 12). The first filter in the system (number 1) is a water-captor filter. This filter is, however, not equipped with a water trap at the bottom where fuel can be drained for a sample. The second filter (number 2) is located after the pump and is transparent. This filter has a water trap which allows for a fuel sample.

During an inspection of the bowser, the investigating team was advised that they do not take fuel samples from the bowser before refuelling the aircraft.

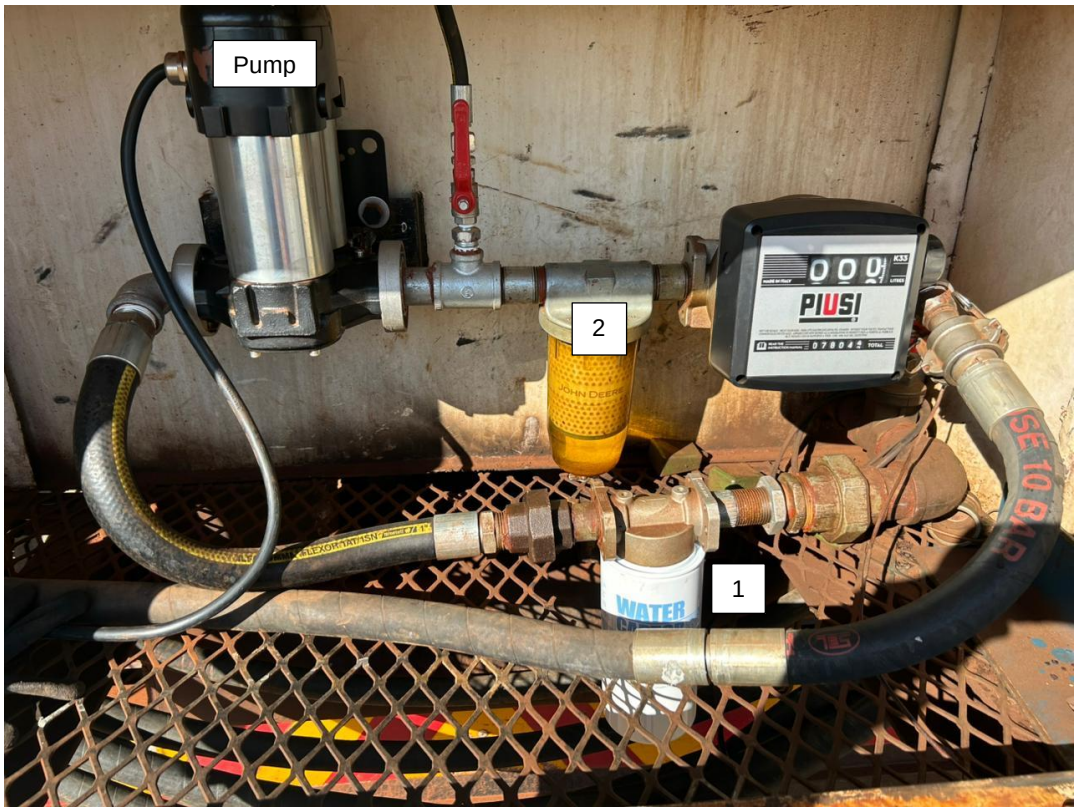

Figure 12: The fuel bowser setup has two filters in the system. Both filters were clogged and, therefore, unable to prevent contaminated fuel from being pumped into the aircraft fuel tanks.

Testing Fuel for Contamination

Water can get into the fuel at any stage of the supply chain. A fuel water detector can be used in jet fuel to detect water that cannot be seen with the naked eye.

Several methods could also be used to ensure fuel is free of contamination (especially water), that is, if the contamination (water) is not visible to the naked eye when a sample is in a transparent container.

Free water in aviation fuel can lead to ice formation, filter blockages and, consequently, engine failure. It can also allow microbial growth in fuel tanks, which can cause fuel spoilage and filter blockage. Acids generated by the microbes can even cause corrosion damage.

Water-detecting capsules (10mm in diameter) are available that can be placed in a syringe which is used to draw approximately 5ml of fuel. If the capsule changes colour, that means there is water in the fuel.

Figure 13: An example of the capsules used to detect water.

There is also water-detecting paste(s). A number of these products are available on the market. The paste is applied to a dipstick or any similar device. The paste will change colour if water is detected in the fuel.

Figure 14: One of the water-detecting products on the market.

(a) (b)

Figure 15: The paste on a dipstick (a). The paste changes colour when water is detected (b).

Technical Report Findings presented by the Aircraft Maintenance Organisation (AMO)

WARBIRD
AIRCRAFT SERVICES CC

22 January 2025

To whom it may concern

On investigation after engine flam out.

A. Only left hand wing fuel tank was refilled before the flight.
B. Pilot noticed the fuel bowser where pumping slowly.
C. Pilot took off on right hand tank and descended on left hand tank.
D. Engine flam out was fuel selection on left hand wing tank.

Conclusion:

A. Suspected fuel or fuel contamination problem.
B. Inspect right hand tank fuel and sample taken. No contamination found.
C. Left hand fuel tank strainer check and fuel contamination found. Left hand fuel tank header tank check, fuel contamination found.
D. Main fuel filter checked and fuel contamination found.
E. Firewall filter checked and fuel contamination found.
F. Fuel control unit filters checked and fuel contamination found.

Flash Fuel system:

A. Left hand tank and main fuel system cleaned.
B. Check system for contamination and no contamination where found after cleaning.
C. Ground Runs carried out and engine operated smoothly.
D. After ground runs, system where check for contamination and no contamination were found.

Pictures:

Please see attached pictures of Left hand wing, first filter, second filter, right hand tank, fuel bowser and fuel control unit.

[redacted]

Warbird Aircraft Services cc

SACAA Approved Person 001 CAR 66.A

WARBIRD AMO 1095

AME 0272013871

Findings

1. Personnel Information

1.1 The pilot had a Commercial Pilot Licence (CPL) that was initially issued by the Regulator (SACAA) on 3 August 2021. The latest reissued CPL had an expiry date of 31 July 2025. The pilot had flown a total of 2 159.0 hours of which 236.5 hours were on the aircraft type.

1.2 The pilot had a Class 1 aviation medical certificate that was issued on 15 January 2024 with an expiry date of 31 January 2025. There was no limitation endorsed on his certificate.

1.3 The pilot had advised the parachute club members to change the filters on the bowser as he had experienced slow fuel flow whilst refuelling; however, no fuel samples were taken from the bowser by the pilot before refuelling was performed.

1.4 The pilot elected to land on a field beyond the aerodrome perimeter fence after the engine had stopped.

2. Aircraft Information

2.1 The last maintenance inspection of the aircraft was certified on 10 October 2024 at 3 976.2 airframe hours. The aircraft had accrued 44.6 hours since the said inspection.

2.2 The aircraft's Certificate of Registration (C of R) was issued to the present owner on 12 November 2021.

2.3 The aircraft had a valid Authority-to-fly (ATF) Certificate that was initially issued by the Regulator (SACAA) on 12 August 2016. The latest ATF Certificate had an expiry date of 31 August 2025.

2.4 The aircraft had a Certificate of Release to Service that was issued on 25 October 2024 with an expiry date of 24 October 2025 or at 4 076.2 airframe hours, whichever comes first.

2.5 The aircraft type was manufactured in 1973 and was one of the only 40 aircraft that were built in this design.

3. Fuel Bowser

3.1 The bowser was the property of the parachute club. There was no documented evidence available of when the filters on the bowser were last replaced. The fuel filters were found clogged and, therefore, unable to prevent contaminated fuel being pumped into the aircraft fuel tanks.

3.2 The bowser was not inspected for contamination prior to refuelling the aircraft.

4. Meteorological Information

4.1 Based on the weather information provided by the pilot, fine weather conditions prevailed at the time of the flight. The weather had no bearing on this accident.

5. Aviation Recreational Organisation

5.1 The Parachute Association of South Africa was issued an Aviation Recreational Organisation Certificate with approval number CAA/ARO/004 by the Regulator (SACAA) on 21 May 2024 with an expiry date of 31 May 2025. The certificate states that the approval is valid as long as the organisation remains in compliance with Part 149 and its Manual of Procedures (MOP).

6. The engine flamed out in-flight as a result of fuel contamination after the aircraft was refuelled from the bowser which was not inspected prior to the aircraft being refuelled.

Probable Cause

The engine flamed out and stopped due to contaminated fuel which led to the pilot conducting a forced landing. The fuel in the aircraft was obtained from the bowser which was not inspected for contamination prior to replenish the aircraft. The tail wheel assembly broke off during the landing roll.

Contributing Factor(s)

1. Failure to obtain a fuel sample from the bowser before refuelling the aircraft.
2. Contaminated fuel was pumped into the aircraft fuel tank from the bowser.

Safety Action(s)

None.

Safety Message and/or Safety Recommendation/s

1. It is recommended that the Executive AIID issue an official letter to the parachute club that owns the fuel bowser to ensure that the bowser and associated equipment are properly maintained. The service provider's actions of neglecting to maintain the bowser properly must be emphasised. The fact that both filters fitted to the bowser were clogged is indicative of an improper maintenance programme or a lack, thereof.

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 desktop inquiries 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.

Disclaimer

This report is issued by:

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