AIRCRAFT SERIOUS INCIDENT REPORT AND EXECUTIVE SUMMARY

			Reference:	CA18/3/2/1426	
Aircraft Registration	ZS-TWF & ZS-CPL	**Date of Incident**	13 August 2023	**Time of Incident**	1510Z
Type of Aircraft	Pilatus PC 12 and Cessna 172		**Type of Operation**	Private (Part 91)	
Pilot-in-command Licence Type	Commercial Pilot Licence (CPL) and Private Pilot Licence (CPL)	**Age**	25 and 27	**Licence Valid**	Yes
Pilot-in-command Flying Experience		**Total Flying Hours**	2 154.5 and 1 49.7	**Hours on Type**	462.7 and 123.2
Last Point of Departure	Welkom Aerodrome (FAWM) and O.R. Tambo International Airport (FAOR)				
Next Point of Intended Landing	Lanseria International Airport (FALA)				
Damage to Aircraft	None				

Location of the incident site with reference to easily defined geographical points (GPS readings if possible)

At 6 000 ft on right downwind Runway 07 at FALA Lanseria International Airport (FALA)

Meteorological Information	Wind velocity: 220° at 11KT; Temperature: 26°C; Dew Point: -09°C; Visibility: ≥10000m; Cloud: CAVOK; QNH: 1023 hPa						
Number of People On-board	1 + 0 and 1 + 1	**Number of People Injured**	0	**Number of People Killed**	0	**Other (On Ground)**	0

Synopsis

On Sunday afternoon, 13 August 2023, a pilot on-board a Pilatus PC12 with callsign GCM566 and registered ZS-TWF was repositioning from O.R. Tambo International Airport (FAOR) to Lanseria International Airport (FALA) in Gauteng province when the serious incident occurred. Meanwhile, a pilot and a passenger on-board a Cessna C172 aircraft with registration ZS-CPL were routing from Welkom Aerodrome (FAWM) in the Free State province to FALA. FALA air traffic control (ATC) cleared ZS-CPL at 5 500 feet (ft) altitude, to join the circuit in early right downwind for Runway 07 (RWY 07) when the serious incident occurred. Both flights were conducted under visual flight rules (VFR) and under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

The ATC officer (ATCO) cleared ZS-TWF inbound at 6 000 ft altitude to join right downwind RWY 07. Thereafter, the ATCO instructed ZS-CPL to conduct a left orbit, as well as advised ZS-TWF of the traffic (ZS-CPL). The ATCO enquired if ZS-TWF had traffic in sight. The ZS-TWF pilot stated that he could only see it on the Traffic Collision Avoidance System (TCAS). Approximately 46 seconds later, ZS-TWF advised the ATCO that the traffic was at 6 000 ft and that he (ZS-TWF) was climbing to 6 500 ft to maintain vertical separation. The ATCO approved ZS-TWF to climb to 6 500 ft and to report final approach. The ATCO instructed ZS-CPL to verify their altitude, to which the pilot responded, “maintaining 5 500 feet”. The ZS-TWF reported final approach and proceeded to land, followed shortly by ZS-CPL.

Probable Cause/s and/or Contributory Factors

Loss of vertical separation due to an instrument error on the transponder that was fitted to the Cessna 172 ZS-CPL aircraft.

SRP Date	13 August 2024	Publication Date	19 August 2024

Occurrence Details

Reference Number	**:** CA18/3/2/1426
Occurrence Category	**:** Serious Incident
Type of Operation	**:** Private (Part 91)
Name of Operator	**:** Flight Services and Skyhawk Aviation (Pty) Ltd
Aircraft Registrations	**:** ZS-TWF and ZS-CPL
Aircraft Make and Model	**:** Pilatus PC12 and Cessna 172
Nationality	**:** South African and Indian
Place	**:** FALA right downwind Runway 07
Date and Time	**:** 13 August 2023 at 1510Z
Injuries	**:** None
Damage	**:** 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.

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.

Investigation Process

The Accident and Incident Investigations Division (AIID) was notified of the occurrence on 13 August 2023 at 1510Z. The occurrence was classified as a serious incident according to the CAR 2011 Part 12 and the International Civil Aviation Organisation (ICAO) STD Annex 13 definitions. The notifications were sent to the State of Registry, Operator, Design and Manufacturer in accordance with the CAR 2011 Part 12 and the ICAO Annex 13 Chapter 4. The states did not appoint an accredited representative and/or advisor. Investigators did not dispatch to the incident site for this serious incident.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Serious Incident — this investigated serious incident
   Aircraft — the Pilatus PC12 and Cessna 172 involved in this serious incident
   Investigation — the investigation into the circumstances of this serious incident
   Pilot — the pilot involved in this serious incident
   Report — this serious incident report

2. *Photos and figures used in this report were taken from different sources and may have been adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows, or lines.*

Disclaimer

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Abbreviation	Description
°C	Degree Celsius
ACCID	Accident
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
AOC	Aircraft Operating Certificate
ATC	Air Traffic Control
ATCI	Air Traffic Control Instructions
ATCO	Air Traffic Control Officer
ATNS	Air Traffic and Navigation Service
ATO	Approved Training Organisation Certificate
C of R	Certificate of Registration
CAA	Civil Aviation Authority
CAR	Civil Aviation Regulations
CAVOK	Ceiling and Visibility OK
CVR	Cockpit Voice Recorder
C of A	Certificate of Airworthiness
E	East
FALA	Lanseria International Airport
FAOR	O.R. Tambo International Airport
FAWM	Welkom Aerodrome
FDR	Flight Data Recorder
Ft	Feet
GCM	Comair Flight Services ICAO code
GPS	Global Positioning System
hPa	Hectopascal
ICAO	International Civil Aviation Organisation
IIC	Investigator-in-charge
INCID	Incident
IOC	Investigator-on-call
KM	Kilometres(s)
kts	Knot(s)
m	Metre
METAR	Meteorological Aerodrome Report
MHz	Megahertz
MPH	Miles per Hour
MPI	Mandatory Periodic Inspection
N/A	Not Applicable
NM	Nautical Mile
Q	Quart(s)
QNH	Query: Nautical Height
RWY	Runway
S	South
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
TCAS	Traffic Collision Avoidance System
UTC	Co-ordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
Z	Zulu (Term for Universal Co-ordinated Time - Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1. On Sunday afternoon, 13 August 2023 at approximately 1310Z, a pilot and a passenger on-board a Cessna 172 aircraft with registration ZS-CPL took off on a cross-country hour building (private) flight from Welkom Aerodrome (FAWM) in the Free State province to Lanseria International Airport (FALA) in Gauteng province. Around 1501Z, another pilot on-board a Pilatus PC12 aircraft with registration ZS-TWF operating under the call sign GCM566 took off on a repositioning flight from O.R. Tambo International Airport (FAOR) to FALA in Gauteng province. Both flights were conducted under visual flight rules (VFR) by day in visual meteorological conditions (VMC) and under the provisions of Part 91 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2. At approximately 15:02:54, ZS-CPL contacted FALA air traffic control (ATC) for inbound clearance south of FALA. The air traffic control officer (ATCO) cleared ZS-CPL inbound at 15:03:23 and instructed him to report early right downwind Runway 07 (RWY 07) at 5 500 feet (ft) altitude, query: nautical height (QNH) 1021. The ZS-CPL pilot read back the clearance and the instructions correctly and entered FALA airspace.

1.1.3. At approximately 15:08:15, the pilot of ZS-TWF contacted FALA ATC and requested joining and landing clearance. The ATCO cleared ZS-TWF inbound for FALA and instructed him to report right downwind RWY 07 at 6 000ft.

1.1.4. At 15:09:35 the ATCO instructed ZS-CPL (the slower aircraft) to commence one orbit to the left and report re-established on right downwind RWY 07 at 5 500ft. The ZS-CPL pilot read back the instructions and commenced the orbit. Thereafter, the ATCO informed ZS-TWF that a Cessna 172 (ZS-CPL) was commencing a left orbit right downwind at 5 500ft and enquired if they had the traffic in sight. The ZS-TWF pilot reported negative but stated that he had it on the Traffic Collision Avoidance System (TCAS). The ATCO instructed ZS-TWF to continue downwind and to report when the Cirrus 22 aircraft (which was ahead of him) was in sight on final approach.

1.1.5. At 15:10:35, ZS-TWF advised the ATCO that he is climbing to 6 500ft as the C172 seems to be at 6 000ft (instead of 5 500ft). The ATCO approved the climb to 6 500ft and requested ZS-TWF to report final approach RWY 07 (ZS-TWF was number two to land, the aircraft in front was on short final approach). The ATCO requested ZS-CPL pilot to confirm their altitude. The ZS-CPL pilot responded that he was maintaining 5 500ft and that he was re-established on right downwind RWY 07. He also stated that he had the traffic (ZS-TWF) in sight.

1.1.6. The ATCO instructed ZS-CPL to follow ZS-TWF and report final approach for RWY 07. (During this time, the Cirrus 22 aircraft had already landed and vacated the active runway). At 15:12:37, ZS-TWF was cleared to land; followed by ZS-CPL.

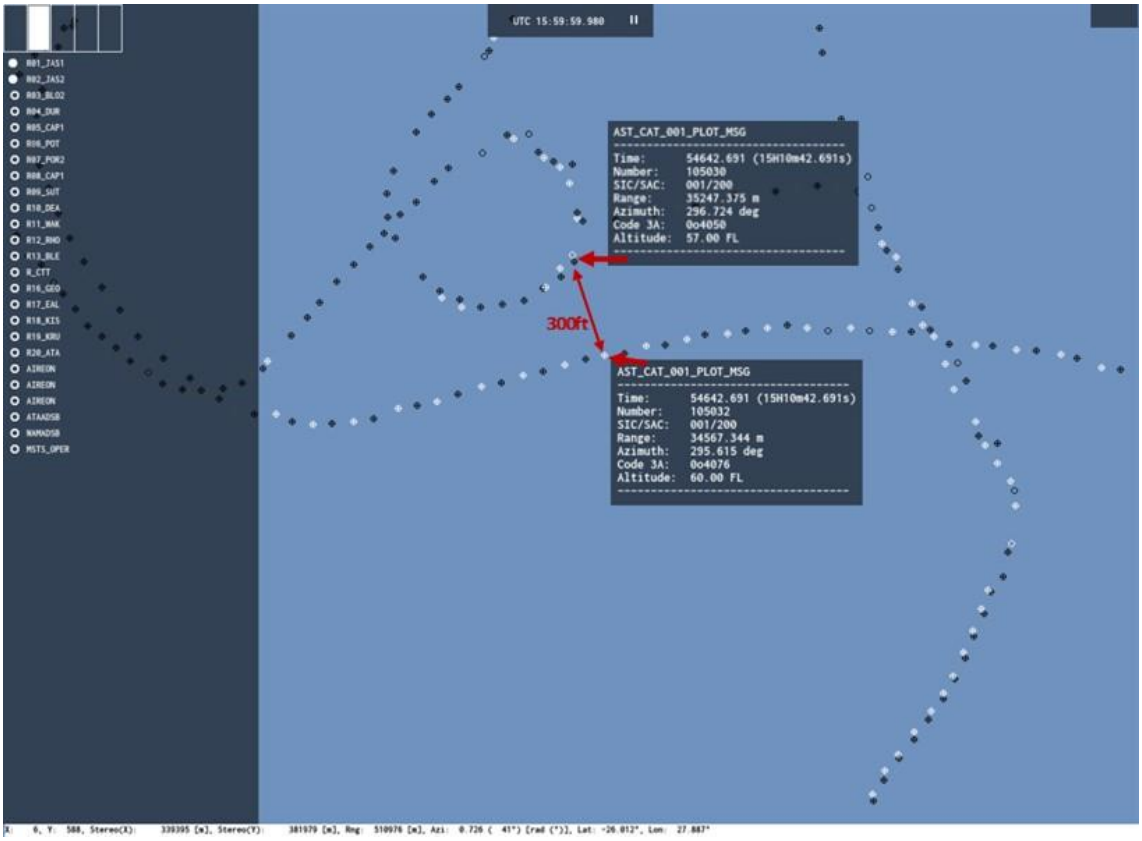

Figure 1: A radar plot of ZS-CPL and ZS-TWF indicating reduced vertical separation of 300ft. (Source: ATNS/TopSky)

1.1.7. The reduced vertical separation serious incident between 5 700ft and 6 000ft occurred on right downwind RWY 07 at FALA.

Figure 2: An overview of FALA. (Source: Google Earth)

1.2. Injuries to Persons

ZS-TWF

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	1	-	-	1	-
Total	**1**	**-**	**-**	**1**	**-**

Note: Other means people on the ground.

ZS-CPL

Injuries	Pilot	Crew	Pass.	Total On-board	Other
Fatal	-	-	-	-	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	1		1	2	-
Total	**1**	**-**	**1**	**2**	**-**

Note: Other means people on the ground.

1.3. Damage to Aircraft

1.3.1. None.

1.4. Other Damage

1.4.1. None.

1.5. Personnel Information

ZS-TWF, Pilatus PC12

Nationality	South African	Gender	Male	Age	25
Licence Type	Commercial Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Instrument and Instructor Grade II Ratings,				
Medical Expiry Date	31 October 2023				
Restrictions	Suitable corrective lenses				
Previous Incidents	None				

Note: Previous incidents refer to past serious incidents the pilot was involved in, when relevant to this incident.

Flying Experience:

Total Hours	2 154.5
Total Past 24 Hours	2.9
Total Past 7 Days	21.3
Total Past 90 Days	95
Total on Type Past 90 Days	85.4
Total on Type	462.7

ZS-CPL, Cessna 172

Nationality	Indian	Gender	Male	Age	27
Licence Type	Private Pilot Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	7 October 2024				
Restrictions	Suitable corrective lenses				
Previous Incidents	None				

Note: Previous incidents refer to past serious incidents the pilot was involved in, when relevant to this incident.

Flying Experience:

Total Hours	149.7
Total Past 24 Hours	0
Total Past 7 Days	11.7
Total Past 90 Days	40.7
Total on Type Past 90 Days	40.7
Total on Type	123.2

Air Traffic Control Officer:

Nationality	South African	Gender	Female	Age	33
Licence Type	Air Traffic Services Licence				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Aerodrome, Approach, Instructor FALA				
Medical Expiry Date	28 February 2024				
Restrictions	None				
Previous Incidents	None				

1.5.1. The ZS-TWF pilot was issued a Commercial Pilot Licence (CPL) on 31 January 2023 with an expiry date of 29 February 2024. His medical certificate was issued on 19 October 2022 with an expiry date of 31 October 2023.

1.5.2. The ZS-CPL pilot was issued a Private Pilot Licence (PPL) on 19 August 2021 with an expiry date of 31 August 2023. His medical certificate was issued on 7 October 2019 with an expiry date of 7 October 2024. The pilot was conducting an hour-building flight (private) to advance to a Commercial Pilot Licence (CPL).

1.5.3. The ATCO was issued an Air Traffic Service Licence (ATSL) on 12 November 2013 with an expiry date of 12 November 2024, with aerodrome, approach and instructor ratings for FALA. Her last proficiency check was conducted on 19 June 2023 with an expiry date of 18 June 2024. Her Class 3 aviation medical certificate was issued on 7 March 2023 with an expiry of 28 February 2024. She signed up for duty at 1345Z on the day of the serious incident.

1.6. Aircraft Information

1.6.1. The Pilatus PC-12 is a low-wing aircraft with a single turboprop engine. The Cessna 172 is a high-wing aircraft with a single-piston engine; it is popularly used for flight training.

ZS-TWF (Pilatus PC12)

Airframe:

Manufacturer/Model	Pilatus / PC12 47E	
Serial Number	MSN 1220	
Year of Manufacture	2017	
Total Airframe Hours (At Time of Serious incident)	4 152.7	
Last Inspection (Date & Hours)	30 May 2023	4 029.2
Hours Since Last MPI	123.5	
CRS Issue Date	30 May 2023	
C of A (Issue Date & Expiry Date)	5 August 2010	31 August 2024
C of R (Issue Date) (Present Owner)	4 September 2017	
Type of Fuel Used	Jet A1	
Operating Category	Private	
Previous Incidents	None	

Note: Previous incidents refer to past serious incidents the pilot was involved in, when relevant to this serious incident.

Engine:

Manufacturer/Model	Pratt & Whitney / PT6A-67P
Serial Number	PCE-RY0226
Part Number	PT6A-67P
Hours Since New	4 154.3
Hours Since Overhaul	709.3

Propeller:

Manufacturer/Model	Hartzell / HC-E4-3D
Serial Number	KX873
Part Number	HC-E4A-3D
Hours Since New	4 029.2
Hours Since Overhaul	709.3

ZS-CPL (Cessna 172)

Airframe:

Manufacturer/Model	Cessna Aircraft Company, C172B	
Serial Number	MSN 1220	
Year of Manufacture	2017	
Total Airframe Hours (At Time of Serious Incident)	10 383.4	
Last Inspection (Date & Hours)	12 August	10 377.7
Hours Since Last MPI	5.7	
CRS Issue Date	12 August 2023	
C of A (Issue Date & Expiry Date)	21 April 2016	30 April 2024
C of R (Issue Date) (Present Owner)	10 May 2022	
Type of Fuel Used	AVGAS	
Operating Category	Private	
Previous Incidents	None	

Note: Previous incidents refer to past serious incidents the pilot was involved in, when relevant to this serious incident.

Engine:

Manufacturer/Model	Lycoming / O-360-A4M
Serial Number	L-35053-36A
Part Number	O-360 A4M
Hours Since New	4761.2
Hours Since Overhaul	559.7

Propeller:

Manufacturer/Model	Sensenich / 76EM8S14-0-60
Serial Number	30922K
Part Number	76EM8514-0-60
Hours Since New	4761.2
Hours Since Overhaul	761.2

1.6.2. There were no reported anomalies with the two aircraft before they were dispatched for their respective flights.

1.7. Meteorological Information

1.7.1 The weather information below was obtained from the Meteorological Aerodrome Report (METAR) that was issued by the South African Weather Service (SAWS), recorded at FALA on 13 August 2023 at 1500Z.

Wind Direction	220°	Wind Speed	11kt	Visibility	10 km
Temperature	26°C	Cloud Cover	CAVOK	Cloud Base	CAVOK
Dew Point	-09°C	QNH	1023hPa		

1.7.2 The weather conditions did not contribute to this serious incident.

1.8. Aids to Navigation

1.8.1 Both aircraft were equipped with standard navigational equipment as approved by the Regulator (SACAA). There were no records on both aircraft which indicated that the navigational system was unserviceable prior to the serious incident. The ZS-TWF was equipped with a TCAS.

1.9. Communication

1.9.1. Both aircraft were equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the serious incident. Both aircraft were in contact with FALA ATC tower on the very high frequency (VHF)124.0-Megahertz (MHz).

1.10. Aerodrome Information

1.10.1. Lanseria International Airport, FALA:

Aerodrome Name	Lanseria International Airport (FALA)
Aerodrome Location	Gauteng Province
Aerodrome Status	Licensed
Aerodrome GPS coordinates	25°56’02.82” South, 027°55’47.81” East
Aerodrome Elevation	4 445 feet
Runway Headings	07 / 25
Dimensions of Runway Used	9 829 x 148 meters
Heading of Runway Used	065 degrees
Surface of Runway Used	Asphalt
Approach Facilities	Very high frequency omnidirectional range (VOR), Runway lighting and instrument landing system (ILS)
Radio Frequency	124.0 MHz

1.11. Flight Recorders

1.11.1. Both aircraft were neither equipped with flight data recorders (FDRs) or cockpit voice recorders (CVRs), nor was it required by the regulation to be fitted to the aircraft types.

1.12. Wreckage and Impact Information

1.12.1. Not applicable.

1.13. Medical and Pathological Information

1.13.1. Not applicable.

1.14. Fire

1.14.1. None.

1.15. Survival Aspects

1.15.1. Not applicable.

1.16. Tests and Research

1.16.1. The transponder of ZS-CPL was taken to an aircraft maintenance organisation (AMO) for examination after the serious incident. An error of approximately 300ft on the transponder was found; subsequently, the transponder was serviced and calibrated.

JOB NO	AIRCRAFT REG	DATE
7184	ZS-CPL	12/09/2023
DESCRIPTION	**PART NO REMOVED**	**SERIAL NO REMOVED**
N/A	N/A	N/A
DESCRIPTION	**PART NO FITTED**	**SERIAL NO FITTED**
N/A	N/A	N/A
WORK DONE		
CALIBRATED MODE-C (300 FT ERROR), TRANSPONDER CHECKS CARRIED OUT AND FOUND SERVICEABLE.		
MANUAL		**REVISION STATUS**
SA-CATS 43-02-10		2011

Figure 3: An extract of the maintenance certificate. (Source: ZS-CPL operator)

1.16.2. The AMO that examined and serviced ZS-CPL transponder was issued an approved maintenance certificate by the Regulator on 5 June 2023 with an expiry date of 30 June 2024.

1.17. Organisational and Management Information

1.17.1. The private flights were conducted under the provisions of Part 91 of the CAR 2011 as amended.

1.17.2. The operator of ZS-TWF had an Aircraft Operating Certificate (AOC) that was issued by the Regulator on 11 April 2023 with an expiry date of 30 April 2024. The aircraft maintenance organisation (AMO) that conducted maintenance on ZS-TWF aircraft had an approved AMO Certificate that was issued by the Regulator on 5 March 2023 with an expiry date of 31 March 2024.

1.17.3. The operator of ZS-CPL had an approved maintenance organisation (AMO) certificate that was issued on 22 July 2023 with an expiry date of 31 July 2024. The aircraft was hired and operated as a hire-and-fly to build hours.

1.18. Additional Information

1.18.1. Transponder and Traffic Avoidance Collision System
(Source: https://www.aviationintegrated.com/blog/what-is-an-aircraft-transponder-and-how-does-it-function/)

What Is an Aircraft Transponder and How Does It Function?

As air travel continues to grow and expand across the globe, so too does the need for advanced technology that ensures safe flights for everyone. One such technology is the aircraft transponder, which plays a crucial role in keeping planes and passengers safe in the skies. In this blog, we will dive into what aircraft transponders are, what they do, and why they are important.

An aircraft transponder is a device that sends out signals to communicate with air traffic control (ATC) radar systems during flight. These signals contain information which helps ATC keep track of an aircraft's location, altitude, and speed. The transponder also receives signals from other aircraft's transponders located around them during flight, helping pilots to avoid potential collisions with one another.

For their operation, aircraft transponders work in conjunction with other technologies like the Traffic Collision and Avoidance System (TCAS), which is commonly found on modern aircraft models. The TCAS uses transponder signals to determine the distance between two aircraft and their relative altitude. If the TCAS detects the chance of a potential collision, it will send an alert to the pilots of both aircraft, instructing them to take action to avoid the hazard.

In addition to the TCAS, aircraft transponders also communicate with various aircraft sensors to help maintain flight safety. In particular, the transponder regularly receives signals from the aircraft's altimeter and airspeed indicator, those of which measure altitude and speed respectively. The transponder relays this information to ATC personnel who use it to track the aircraft's progress and ensure that it is maintaining a safe altitude and speed. At the same time, the ATC will also provide other aircraft with more precise information on location for

further collision avoidance.

In order for individual aircraft to be identified by ATC personnel, aircraft transponders operate by transmitting a unique four-digit code. This code is known as the transponder code, and it is entered by the pilot into the transponder before take-off. If a pilot wishes to send additional altitude information to ATC, the transponder can be set to "Mode C." This allows ATC to more accurately track an aircraft's altitude while also ensuring that surrounding aircraft are well aware of its precise location.

As a more advanced mode of operation, some transponders can also be set to "Mode S," which allows for two-way communication to be established between the transponder of an aircraft and ground-based radar systems. While ensuring increased precision in terms of position and altitude readings, the two-way communication also permits ATC to send messages directly to the cockpit display. As such, this greatly enhances communication and overall safety.

Altogether, aircraft transponders are a critical component of modern air travel, allowing for the accurate tracking of aircraft, communication with other aircraft, and more efficient use of airspace. By working in conjunction with other technologies like TCAS and aircraft sensors, transponders help to ensure the safety of passengers and crew members in the skies. As air travel continues to grow and evolve, we can expect aircraft transponders to remain a key part of the aviation landscape.

1.18.2. Use of Transponders (Source: skybrary.aero/articles/transponder)

Transponder Use in Air Traffic Management (ATM)

Transponders are used in ATM for various purposes, the most notable of them being:

- *Aircraft identification;*
- *Enhancing the controllers' situational awareness;*
- *Development of ATC tools and safety nets (e.g., AMAN, MTCD, STCA, etc.).*

Transponders and ACAS

Airborne Collision Avoidance System (ACAS) operation requires that both aircraft - the interrogator and the target - are equipped with operating transponders. An aircraft equipped with ACAS will receive the following information depending on the type of transponder with which the target aircraft is equipped:

Target aircraft equipped with:	***Interrogator aircraft equipped with ACAS:***
Mode 'A' transponder only	*Will not track the target*
Mode 'A/C' transponder with no altitude reporting	*Below FL 155: Receives Traffic Advisory (TA) only (no altitude or trend arrow will be shown)* *Above FL 155: Will not show the target*
Mode 'C' or 'S' transponder	*Receives TA and vertical Resolution Advisory (RA)*
ACAS	*Receives TA and coordinated vertical RA*

1.19. Useful or Effective Investigation Techniques

1.19.1. None.

2. ANALYSIS

2.1. General

From the available evidence, the following analysis was made with respect to this incident. This shall not be read as apportioning blame or liability to any organisation or individual.

2.2. Analysis

2.2.1. The two pilots and ATCO were adequately licensed and had the correct ratings issued by the Regulator. The ATC system depended on the data received from the aircraft transponder to determine the aircraft's relative altitude.

2.2.2. The available records indicated that both aircraft were maintained in accordance with the regulations and the manufacturers' prescriptions. There were no recorded faults reported for both aircraft before the flights.

2.2.3. The aircraft were maintained by their individual AMO's with appropriate approvals and ratings, and operated within the scopes of their approvals.

2.2.4. The Mode C transponder of ZS-CPL was erroneous as the indication on the aircraft altimeter was 5 500ft whereas the actual height on the transponder indicated 6 000ft; ZS-CPL was detected by the TCAS of ZS-TWF aircraft which prompted the pilot to take evasive action to maintain vertical separation. The two aircraft landed safely. Further tests revealed that the pitot-static check on a mode C transponder had 300ft error to the altimeter and was recalibrated to correct the fault.

2.2.5. The last maintenance of the pitot-static system was conducted and certified on 12 August 2023 in accordance with Part 43.02.10 of the CAR 2011 as amended and operated for approximately 5.7 hours before the serious incident.

3. CONCLUSION

3.1. General

From the available evidence, the following findings, causes and contributing factors were made with respect to this serious incident. These shall not be read as apportioning blame or liability to any organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings —** are statements of all significant conditions, events, or circumstances in this serious incident. The findings are significant steps in this incident sequence, but they are not always causal or indicate deficiencies.
- **Causes —** are actions, omissions, events, conditions, or a combination thereof, which led to this serious incident.
- **Contributing factors —** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the incident occurring, or would have mitigated the severity of the consequences of the incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil, or criminal liability.

3.2. Findings

3.2.1. The pilot of ZS-TWF was issued a Commercial Pilot Licence (CPL) on 31 January 2023 with an expiry date of 29 February 2024. His medical certificate was issued on 19 October 2022 with an expiry date of 31 October 2023.

3.2.2. The pilot of ZS-CPL was issued a Private Pilot Licence (PPL) on 19 August 2021 with an expiry date of 31 August 2023. His medical certificate was issued on 7 October 2019 with an expiry date of 7 October 2024.

3.2.3. The ATCO was issued an Air Traffic Service Licence (ATSL) on 12 November 2013 with an expiry date of 12 November 2024.

3.2.4. The flights were conducted under VFR conditions. The weather conditions of the day did not contribute to this serious incident.

3.2.5. The aircraft maintenance organisation (AMO) that conducted maintenance on ZS-TWF had an AMO Certificate that was issued by the Regulator on 5 March 2023 with an expiry date of 31 March 2024.

3.2.6. The operator of ZS-CPL had an AMO Certificate that was issued on 22 July 2023 with an expiry date of 31 July 2024.

3.2.7. The Mode C transponder of ZS-CPL indicated an erroneous reading of 300ft which led to the pilot of ZS-TWF to take evasive action to maintain vertical separation on downwind RWY 07. The transponder and pitot static system were in operation for approximately 5.7 hours since the last test.

3.2.8. The two aircraft had a vertical separation of 300ft. The required separation is 500ft as stated in SACAA Standards and Procedures Air Traffic Control Instructions Manual Section 2. The loss of separation was caused by the error in the pitot-static system of ZS-CPL which resulted in the transponder reading 300ft less than the actual altitude.

3.3. Probable Cause/s

3.3.1. Loss of vertical separation due to an instrument error on the transponder that was fitted to the Cessna 172 ZS-CPL aircraft.

3.4. Contributory Factor/s

3.4.1. Improper calibration of the transponder.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report. The AIID expects that all safety issues identified by the investigation are addressed by the receiving States and organisations.

4.2. Safety Recommendation/s

4.2.1. None.

5. APPENDICES

5.1. None.

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