

PRELIMINARY ACCIDENT REPORT

Accident and Incident Investigations Division

Accident
- Preliminary Report -
AIID Ref No: CA18/2/3/10249



Figure 1: The Ayres S2R-T15 aircraft, registered ZS-PNC. (Source: Bosveldspotter)

Description:

On 13 January 2023, an Ayres S2R-T15 aircraft with registration ZS-PNC was involved in an accident during a crop-spraying operation at a private farm in Jantjieshoek in Mpumalanga province. Visual meteorological conditions (VMC) by day prevailed at the time of the flight. The pilot stated that the aircraft had been spraying fungicide on the field. During a right turn, the aircraft lost power and the inter-turbine temperature (ITT) decreased. The pilot identified a terrain on which to conduct a forced landing, but the aircraft landed hard on uneven terrain during touchdown and bounced. Subsequently, the main landing gears collapsed, which caused the propeller blades to strike the ground. The pilot was not injured during the accident sequence; however, the aircraft was substantially damaged.

Occurrence Details

Reference Number : CA18/2/3/10249
Occurrence Category : Category 2
Type of Operation : Aerial Work Operations (Part 137)
Name of Operator : Orsmond Aerial Spray (PTY) LTD
Aircraft Make and Model : Ayres S2R-T15
Nationality : South African
Registration Mark : ZS-PNC
Place : Private farm in Jantjieshoek, Mpumalanga province
Date and Time : 13 January 2023, 0950Z
Injuries : None
Damage : Substantial

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) of the South African Civil Aviation Authority (SACAA) was notified of the occurrence involving an Ayres S2R-T15, which occurred at a private farm in Jantjieshoek, Mpumalanga province, on 13 January 2023 at 0950Z. The occurrence was classified as an accident according to the CAR 2011 Part 12 and ICAO STD Annex 13 definitions.

The AIID has appointed an investigator-in-charge to conduct a full investigation. Notifications were sent to the State of Registry, Operator and Manufacturer in accordance with the CAR 2011 Part 12 and ICAO Annex 13 Chapter 4. The State of Manufacturer has appointed an accredited representative and advisor. The AIID will lead the investigation and issue the final report of this accident in accordance with the CAR 2011 Part 12 and ICAO STD Annex 13.

The information contained in this preliminary report is derived from the information gathered during the on-going investigation into the occurrence. Later, an interim or final report may contain altered information in case new evidence is uncovered during the on-going investigation that requires changes to the information depicted in this report.

The AIID reports are made available to the public at:
<https://www.caa.co.za/industry-information/accidents-and-incidents/>

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*

Accident — this investigated accident

Aircraft— the Ayres S2R-T15 involved in this accident

Investigation — the investigation into the circumstances of this accident

Pilot — the pilot involved in this accident

Report — this accident 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
°	Degrees
°C	Degrees Celsius
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AMO	Aircraft Maintenance Organisation
AOC	Air Operator Certificate
CAR	Civil Aviation Regulations
CAVOK	Cloud and Visibility OK
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CPL	Commercial Pilot Licence
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
FDR	Flight Data Recorder
ft	Feet
GPS	Global Positioning System
hPa	Hectopascal
ICAO	International Civil Aviation Organisation
LTD	Limited
m	Metre
METAR	Meteorological Aerodrome Report
MHz	Megahertz
PTY	Proprietary
QNH	Barometric Pressure Adjusted to Sea Level (Query Nautical Height)
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
TBO	Time Between Overhaul
UTC	Co-ordinated Universal Time
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
Z	Zulu (Term for Universal Coordinated Time – Zero Hours Greenwich)

1. FACTUAL INFORMATION

1.1. History of Flight

- 1.1.1 On 13 January 2023, a pilot on-board an Ayres S2R-T15 aircraft with registration ZS-PNC was engaged in a crop-spraying operation on a private farm in Jantjieshoek, Mpumalanga province. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 137 of the Civil Aviation Regulations (CAR) 2011 as amended.
- 1.1.2 The pilot stated that he had been spraying fungicide on the field, and during a turn to the right at approximately 700 feet (ft) above ground level (AGL), the aircraft lost power. This was followed by a decrease in inter-turbine temperature (ITT) and a change in engine sound. The pilot levelled the aircraft and configured it for a forced landing ahead of his flight path. He switched on the igniters and the starter and feathered the propeller blades to increase the gliding distance. The aircraft touched down on uneven terrain. It impacted a fence and, approximately 300 metres (m) after touchdown, it rolled over a ditch and bounced back into the air. Upon touchdown again, the wheel support struts broke off, which caused the main undercarriage to bend and the propeller blades to strike the ground. After the aircraft came to rest, the pilot shut down the engine and disembarked from the aircraft. The pilot was not injured during the accident sequence; however, the aircraft was substantially damaged.
- 1.1.3 The accident occurred during day light at Global Positioning System (GPS) co-ordinates determined to be 27°15'09.1" South 030°07'22.1" East, at an elevation of 6 022ft.



Figure 2: The yellow line shows the flight path of the aircraft when it experienced power loss.
(Source: Google Earth)

1.2. **Injuries to Persons**

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

Note: Other means people on the ground.

1.3. **Damage to Aircraft**

1.3.1. The aircraft sustained damage to the propeller and the main undercarriage.



Figure 3: The aircraft on-site post-accident. (Source: Operator)

1.4. **Other Damage**

1.4.1. None.

1.5. **Personnel Information**

Nationality	South African	Gender	Male	Age	53
Licence Type	Commercial Pilot Licence (CPL) Aeroplane				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night, Instrument, Instructor and Agricultural				
Medical Expiry Date	31 May 2023				
Restrictions	Corrective Lenses and hearing aid				
Previous Accidents	None				

Note: Previous accidents refer to past accidents the pilot was involved in, when relevant to this accident.

Flying Experience:

Total Hours	7762.5
Total Past 24 Hours	4.4
Total Past 7 Days	24.8
Total Past 90 Days	117.0
Total on Type Past 90 Days	99.1
Total on Type	1000.5

- 1.5.1. The pilot was issued a Commercial Pilot Licence (CPL) aeroplane on 9 May 2022 with an expiry date of 30 June 2023. The pilot's hours in the above table are as per the hours submitted by the pilot through the pilot questionnaire and logbook.
- 1.5.2. The pilot was issued a Class 1 medical certificate on 6 May 2022 with an expiry date of 31 May 2023, with a restriction to wear corrective lenses and a hearing aid.
- 1.5.3. The pilot was issued an Ayres S2R aircraft rating on 21 December 2020 to act as a pilot-in-command.

1.6. Aircraft Information

- 1.6.1. *The Ayres/Thrush, formerly the Snow S-2 Aero Commander Ag Commander, and Rockwell Thrush Commander, is an American agricultural aircraft produced by Ayres Corporation and, more recently, by Thrush Aircraft. It is one of the most successful and long-lived agricultural application aircraft types in the world. Typical of agricultural aircraft, it is a single-seat monoplane of conventional taildragger configuration. Originally powered by a radial piston engine, most examples produced since the 1980s have been turboprop-powered. The S-2R-T turboprop powered versions are equipped with Pratt & Whitney Canada PT6A.*
(Source: Thrush Aircraft)

Airframe:

Manufacturer/Model	Ayres Corporation, S2R-T15	
Serial Number	T27-031	
Year of Manufacture	1992	
Total Airframe Hours (At Time of Accident)	6302.9	
Last Inspection (Date & Hours)	7 December 2022	6222.0
Hours Since Last Inspection	80.9	
CRS Issue Date	7 December 2022	
C of A (Issue Date & Expiry Date)	12 May 2022	30 May 2023
C of R (Issue Date) Present Owner	22 April 2005	
Type of Fuel Used	Jet A1	
Operating Category	Part 137	
Previous Accidents	None	

Note: Previous accidents refer to past accidents the aircraft was involved in, when relevant to this accident.

1.6.2 The aircraft was registered under the present owner on 22 April 2005. The Certificate of Airworthiness (C of A) was initially issued on 12 May 2011 with an expiry date of 30 May 2023.

1.6.3 Based on the aircraft's flight folio and airframe logbook, the last mandatory periodic inspection (MPI) was carried out on 7 December 2022 at 6222.0 airframe hours. The aircraft had accumulated an additional 80.9 airframe hours since the last inspection, and no major defects were recorded. The aircraft was reissued a Certificate of Release to Service (CRS) on 7 December 2022 with an expiry date of 6 December 2023 or at 6322.0 airframe hours, whichever occurs first unless the aircraft is involved in an accident or becomes unserviceable.

Engine:

Manufacturer/Model	Pratt & Whitney/ PT6A-34AG
Serial Number	PCE-PH0046
Hours Since New	6399.6
Hours Since Overhaul	2628.6

Propeller:

Manufacturer/Model	Hartzell/ HC-B3TN-3D
Serial Number	BUA32118
Hours Since New	1644.7
Hours Since Overhaul	538.6

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 on 13 January 2023 at 1000Z at Newcastle Airfield (FANC), which is located 25 nautical miles (nm) from the accident site.

FANC 131000Z AUTO 02005KT CAVOK 29/09 Q1022=

Wind Direction	020°	Wind Speed	5 kts	Visibility	9999m
Temperature	29°C	Cloud Cover	CAVOK	Cloud Base	CAVOK
Dew Point	9°C	QNH	1022hPa		

1.8. Aids to Navigation

1.8.1. The aircraft was equipped with standard navigational equipment as approved by the Regulator (SACAA). There were no records indicating that the navigation system was unserviceable prior to the accident.

1.9. Communication

1.9.1. The aircraft was equipped with a standard communication system as approved by the Regulator. There were no recorded defects with the communication system prior to the accident.

1.10. Aerodrome Information

1.10.1. There was no aerodrome within a 10 nautical miles (nm) radius of the accident site.

1.11. Flight Recorders

1.11.1. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor was it required by regulation to be fitted to the aircraft type.

1.12. Wreckage and Impact Information

1.12.1. The aircraft successfully touched down after the forced landing and rolled on an uneven terrain before the propeller blades impacted a perimeter fence, flattening it. The aircraft continued to roll over the fence for a further 300m; it then bounced which caused the main undercarriage to buckle and the propeller blades to strike the ground. The propeller blades dug into the soft ground, causing damage to all three blades. The aircraft came to a stop with the nose facing north.



Figure 4: An aerial photograph of the aircraft's ground roll after the forced landing. (Source: Operator)



Figure 5: The pictures above depict the propeller and main undercarriage damage.
(Source: Operator)

1.13. Medical and Pathological Information

1.13.1. Not applicable.

1.14. Fire

1.14.1. There was no pre- or post-impact fire that erupted during the accident sequence.

1.15. Survival Aspects

1.15.1. The accident was considered survivable as the cabin structure was still intact and the pilot was safely harnessed during the flight.

1.16. Tests and Research

1.16.1. A borescope was conducted on the engine with serial number PCE-PH0046 on 19 January 2023, and the following was uncovered:

The borescope picture display evidence of possible in-service contamination on the suction side of the blade while no visible evidence of heat deterioration that typically manifest at the tip of the blade. Slight burning and cracking [were] observed on small exit duct. Blue discolouration was observed on the (compressor turbine (CT) blades, CT vane

ring and small exit duct. (Source: Aircraft Maintenance Organisation)

The engine has been shipped to the manufacturer for further investigation.

1.17. **Organisational and Management Information**

1.17.1. The flight was conducted under the provisions of Part 137 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2. The operator was issued an Air Operating Certificate (AOC) with an endorsement of Part 137 by the Regulator (SACAA) on 10 November 2022, expiring on 30 November 2023. The operator of the aircraft had a Class G certificate in accordance with the Civil Aviation Regulations.

1.18. **Additional Information**

1.18.1. To be discussed in the final report.

1.19. **Useful or Effective Investigation Techniques**

1.19.1. To be discussed in the final report.

2. **FINDINGS**

2.1. **General**

From the available evidence, the following preliminary findings were made with respect to this Accident. 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 conclusions heading:

- **Findings** — are statements of all significant conditions, events, or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.

2.2. **Findings**

2.2.1. The pilot was issued a Commercial Pilot Licence (CPL) Aeroplane on 9 May 2022 with an expiry date of 30 June 2023. The pilot's Class 1 medical certificate was issued on 2 March 2022 with an expiry date of 31 March 2023, with a restriction to wear corrective lenses and a hearing aid.

2.2.2. The pilot had the agricultural rating and the aircraft type was endorsed on his licence.

- 2.2.3. The flight was conducted under the provisions of Part 137 of the CAR 2011 as amended and under VMC by day. Fine weather conditions prevailed at the time of the flight.
- 2.2.4. The aircraft was originally issued a C of A on 12 May 2011 with an expiry date of 30 May 2023.
- 2.2.5. The Certificate of Registration (C of R) was issued to the present owner on 22 April 2005.
- 2.2.6. The last mandatory periodic inspection (MPI) was carried out on 7 December 2022 at 6222.0 airframe hours. The aircraft had accumulated an additional 80.9 airframe hours in operation since the last inspection, and no major defects were recorded. The aircraft was reissued a Certificate of Release to Service (CRS) on 7 December 2022 with an expiry date of 6 December 2023 or at 6322.0 airframe hours, whichever occurs first unless the aircraft is involved in an accident or becomes unserviceable.
- 2.2.7. The AMO conducted the borescope inspection which revealed evidence of possible in-service contamination on the suction side of the blade, there was no visible evidence of heat deterioration that typically manifest at the tip of the blade. Slight burns and cracks were observed on the small exit duct. Blue discolouration was observed on the compressor turbine (CT) blades, CT vane ring and small exit duct.
- 2.2.8. The engine has been shipped to the manufacturer for further investigation.
- 2.2.9. The aircraft's engine lost power during a right turn and the pilot conducted a forced landing on an uneven terrain.

3. ON-GOING INVESTIGATION

- 3.1. The AIID investigation is on-going and the investigator will be looking into other aspects of this occurrence which may or may not have safety implications.

This report is issued by:

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