AIRCRAFT SERIOUS INCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:		CA18/3/2/1474	
Aircraft Registration	ZU-JHF	**Date of Incident**		5 April 2025		**Time of Incident**	0908Z
Type of Aircraft	Jabiru J430			**Type of Operation**		Private (Part 94)	
Pilot-in-command Licence Type	Private Pilot Licence			**Age**	49	**Licence Valid**	Yes
Pilot-in-command Flying Experience		**Total Flying Hours**		986.3		**Hours on Type**	353.0
Last Point of Departure	Heuningberg Farm, Western Cape Province						
Next Point of Intended Landing	Morningstar Aerodrome, Western Cape Province						
Damage to Aircraft	Minor						
Location of the incident site with reference to easily defined geographical points (GPS readings if possible)							
Ploughed field near Riebeek-Kasteel Town (GPS position: 33°24'55.95" South 018°51'26.79" East)							
Meteorological Information	Surface wind: 045°/10kt; temperature: 25°C; dew point: 10°C; visibility: CAVOK						
Number of People On-board	1+1	**Number of People Injured**	0	**Number of People Killed**	0	**Other (On Ground)**	0

Synopsis

On Saturday morning, 5 April 2025, a pilot and a passenger on-board a Jabiru J430 aircraft with registration ZU-JHF took off on a private flight from Heuningberg Farm in the Western Cape province to Morningstar Aerodrome in the same province. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

The aircraft departed from Heuningberg Farm and climbed to 3000 feet (ft) above ground level (AGL). Approximately 14 minutes into the flight whilst abeam south of Riebeek-Kasteel Town, the engine ran rough and, shortly thereafter, it stopped. The pilot identified a ploughed field on which to conduct a forced landing. He initiated a glide at 65 knots (kts) with a full flap configuration; the aircraft touched down and the pilot brought it to a stop. The aircraft sustained minor damage to the undercarriage during the landing roll on the ploughed field. The aircraft was recovered to an aircraft maintenance organisation (AMO) for further investigation. The pilot indicated that the aircraft had 90 litres of fuel in the tank after the forced landing.

Probable Cause/s and/or Contributory Factors

The pilot executed a forced landing on a ploughed field after engine failure; as a result, the aircraft sustained minor damage. It was found that a hardware failure of the components of the Number 6 cylinder, piston, conrod and inlet valve occurred due to overheating associated with the exceedance of exhaust gas temperature (EGT) limits.

SRP Date	14 October 2025	Publication Date	15 October 2025

Occurrence Details

Reference Number	**:** CA18/3/2/1474
Occurrence Category	**:** Category 2 (Serious Incident)
Type of Operation	**:** Private (Part 94)
Aircraft Make and Model	**:** Jabiru J430
Nationality	**:** South African
Registration	**:** ZU-JHF
Place	**:** Ploughed field near Riebeek-Kasteel, Western Cape Province
Date and Time	**:** 5 April 2025 at 0908Z
Injuries	**:** None
Damage	**:** Minor

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 on 5 April 2024 at 1100Z. 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 investigator did not dispatch to the serious incident site.

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*
   Accident — this investigated serious incident
   Aircraft — the Jabiru J430 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
°	Degrees
°C	Degrees Celsius
AGL	Above Ground Level
AIID	Accident and Incident Investigations Division
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
ARCC	Aeronautical Rescue Coordination Centre
ATF	Authority-to-fly
CAR	Civil Aviation Regulations
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CRS	Certificate of Release to Service
CVR	Cockpit Voice Recorder
EFIS	Electronic Flight Information System
EGT	Exhaust Gas Temperature
EMS	Engine Monitoring System
FACT	Cape Town International Aerodrome
FDR	Flight Data Recorder
ft	Feet
GPS	Global Positioning System
hPa	Hectopascal
kt	Knots
m	Metres
METAR	Meteorological Aerodrome Report
MHz	Megahertz
MPI	Mandatory Periodic Inspection
nm	Nautical Miles
NOSIG	No Significant Change
OEM	Original Equipment Manufacturer
PFD	Primary Flight Display
POH	Pilot’s Operating Handbook
PPL	Private Pilot Licence
QNH	Barometric Pressure Adjusted to Sea Level
SACAA	South African Civil Aviation Authority
SAWS	South African Weather Service
TBO	Time Between Overhaul
UTC	Universal Co-ordinated Time
VHF	Very High Frequency
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 Saturday morning, 5 April 2025, a pilot and a passenger on-board a Jabiru J430 aircraft with registration ZU-JHF took off on a private flight from Heuningberg Farm private airfield in the Western Cape province with the intention to land at Morningstar Aerodrome in the same province. The flight was conducted under visual meteorological conditions (VMC) by day and under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.1.2. The aircraft took off at 0854Z and climbed to a height of 3000 feet (ft) above ground level (AGL). Approximately 14 minutes into the flight whilst flying south of Riebeek-Kasteel Town, the engine ran rough. The pilot immediately turned east towards the closest airfield, which was Craigcor Airfield, and thereafter, broadcasted a MAYDAY on the Cape Town International Aerodrome (FACT) tower frequency 118.10-Megahertz (MHz). The tower personnel informed the Aeronautical Rescue Coordination Centre (ARCC) about the MAYDAY, and they initiated the search and rescue operation.

1.1.3. Meanwhile, the pilot identified a cultivated wheat field on which to conduct a forced landing. He initiated a glide at 65 knots (kts) with a full flap configuration; after the aircraft had touched down, he brought it to a stop. The aircraft sustained minor damage to the undercarriage during landing on an uneven cultivated surface.

1.1.4. The aircraft was recovered to an aircraft maintenance organisation (AMO) for further investigation. The pilot indicated that the aircraft had 90 litres of fuel in the tank after the forced landing.

1.1.5. The accident occurred during daylight on a wheat field approximately 2.6 nautical miles (nm) south of Riebeek-Kasteel Town at Global Positioning System (GPS) co-ordinates determined to be 33°24'55.95" South 018°51'26.79" East, at an elevation of 908 ft.

Figure 1: An overview of the serious incident site. (Source: Google Earth)

1.2 Injuries to Persons

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 The aircraft sustained minor damage to the undercarriage.

1.4 Other Damage

1.4.1 None.

1.5 Personnel Information

1.5.1 Pilot-in-command (PIC)

Nationality	South African	Gender	Male	Age	49
Licence Type	Private Pilot Licence (PPL)				
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	1 June 2025				
Restrictions	None				
Previous Incidents	None				

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

Flying Experience:

Total Hours	986.3
Total Past 24 Hours	1.24
Total Past 7 Days	1.54
Total Past 90 Days	14.5
Total on Type Past 90 Days	14.5
Total on Type	353.0

1.5.2 The pilot had a Private Pilot Licence (PPL) that was initially issued on 5 March 2001. His latest renewed PPL was issued on 19 January 2025 with an expiry date of 31 December 2026.

1.5.3 The pilot had a Class 2 medical certificate that was issued on 1 June 2023 with an expiry date of 1 June 2025 with no restrictions.

1.6 Aircraft Information

Jabiru J430 (Source: https://www.jabiru.co.za/aircraft/)

Jabiru aircraft are used for recreational flying, flight training, rural property management, commuting, surveillance and surveying. Jabiru airframes are manufactured using Fibre Reinforced Plastic (FRP) technologies. It is a system which offers light weight, high structural integrity and clean aerodynamic design.

The Jabiru aircraft is powered by a Jabiru 4-cylinder 4 stroke 2200 cc or a 6-cylinder 3300 cc air cooled engine. This Australian designed and manufactured engine has been developed specifically for use in the Jabiru aircraft and is fitted with dual electronic ignition. The high cruise speed of the Jabiru, low fuel consumption and long endurance make low-cost air touring a viable proposition for both light sport aircraft (LSA) and PPL licensed pilots.

The J430 also has excellent flying characteristics. This aircraft combines the best of both its predecessors – the J400 and J450 flying characteristics with quicker take-off and an impressive climb rate of 1500 ft per minute (at sea level) and landing at slow stall speeds.

Airframe:

Manufacturer/Model	Shadow Lite CC/Jabiru J430	
Serial Number	824	
Year of Manufacture	2012	
Total Airframe Hours (At Time of Serious Incident)	664.9	
Last Inspection (Date & Hours)	629.20	6 June 2024
Airframe Hours Since Last Inspection	35.7	
CRS Issue Date	6 June 2024	
ATF (Issue Date & Expiry Date)	2 July 2024	31 July 2025
C of R (Issue Date) (Present Owner)	12 December 2013	
Operating Category	Part 94	
MTOW	760kg	
Type of Fuel Used	AVGAS 100LL	
Previous Incidents	None	

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

Engine:

Manufacturer/Model	Jabiru A3300
Serial Number	33A2484
Hours Since New	664.9
Hours Since Overhaul	TBO not yet reached

Propeller:

Manufacturer/Model	Sensenich Corvair Ground Adjustable
Serial Number	210443C
Hours Since New	664.9
Hours Since Overhaul	TBO not yet reached

1.6.1 The last annual inspection of the aircraft was conducted and certified on 6 June 2024 at 629.20 airframe hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 6 June 2025 or at 729.20 hours, whichever comes first.

1.6.2 The aircraft had a valid Authority-to-fly (ATF) Certificate that was initially issued by the Regulator (SACAA) on 11 December 2019. The ATF was renewed on 2 July 2024 with an expiry date of 31 July 2025. The aircraft was airworthy when it was dispatched for the flight.

1.6.3 The Certificate of Registration (C of R) was issued to the present owner on 12 December 2013.

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 FACT on 5 April 2025 at 0900Z. The serious incident site was located approximately 37nm from FACT.

FACT 050900Z 21008KT 160V250 CAVOK 26/16 Q1012 NOSIG=

Wind Direction	210°	Wind Speed	8kt	Visibility	9999m
Temperature	26°C	Cloud Cover	CAVOK	Cloud Base	Nil
Dew Point	16°C	QNH	1012hPa		

1.7.2 The weather information entered in the table below was obtained from the pilot via the pilot questionnaire.

Wind Direction	045°	Wind Speed	10kt	Visibility	Clear
Temperature	25°C	Cloud Cover	None	Cloud Base	None
Dew Point	10°C	QNH	Unknown		

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as approved by the Regulator. There were no records indicating that the navigational equipment was unserviceable prior to the flight.

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 flight.

1.10 Aerodrome Information

1.10.1 The serious incident did not occur at an aerodrome.

1.11 Flight Recorders

1.11.1 The aircraft was neither 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 Shortly after the engine had stopped, the pilot identified a cultivated wheat field on which to conduct a forced landing. The field was 2.6nm south of Riebeek-Kasteel Town. The pilot initiated a glide at 65 kts with a full flap configuration; the aircraft touched down and came to a stop.

1.12.2 The aircraft sustained minor damage to the undercarriage due to an uneven terrain.

Figure 2: The aircraft on the cultivated wheat field. (Source: Pilot)

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.

1.15 Survival Aspects

1.15.1 The serious incident was survivable, as the cockpit was not damaged and the pilot executed a safe landing.

1.16 Tests and Research

1.16.1 The engine was removed from the aircraft and was sent to the aircraft manufacturer at George Aerodrome after the serious incident where a teardown inspection was conducted; the AIID investigator was not present during the teardown inspection.

1.16.2 According to a technical report that was made available to the investigator, no external damage was visible on the engine assembly. The engine could not be turned freely by hand, which indicated possible internal damage. To facilitate further examination, the Numbers 2, 4 and 6 cylinder heads were removed.

1.16.3 The removal of the cylinder heads revealed a critical issue with the Number 6 cylinder:

1. The piston from the Number cylinder 6 was missing, and there was debris that had scattered throughout the barrel.
2. The inlet valve head of the Number 6 cylinder was found separated from the valve stem.
3. The connecting rod (Conrod) of the Number 6 cylinder was found bent; the gudgeon pin was still attached.
4. Fragments of the piston and piston rings were located inside the engine, which further contributed to internal damage.

Figure 3: The Number 6 cylinder barrel with an absent piston.

Figure 4: The Number 6 inlet valve head separated from the valve stem.

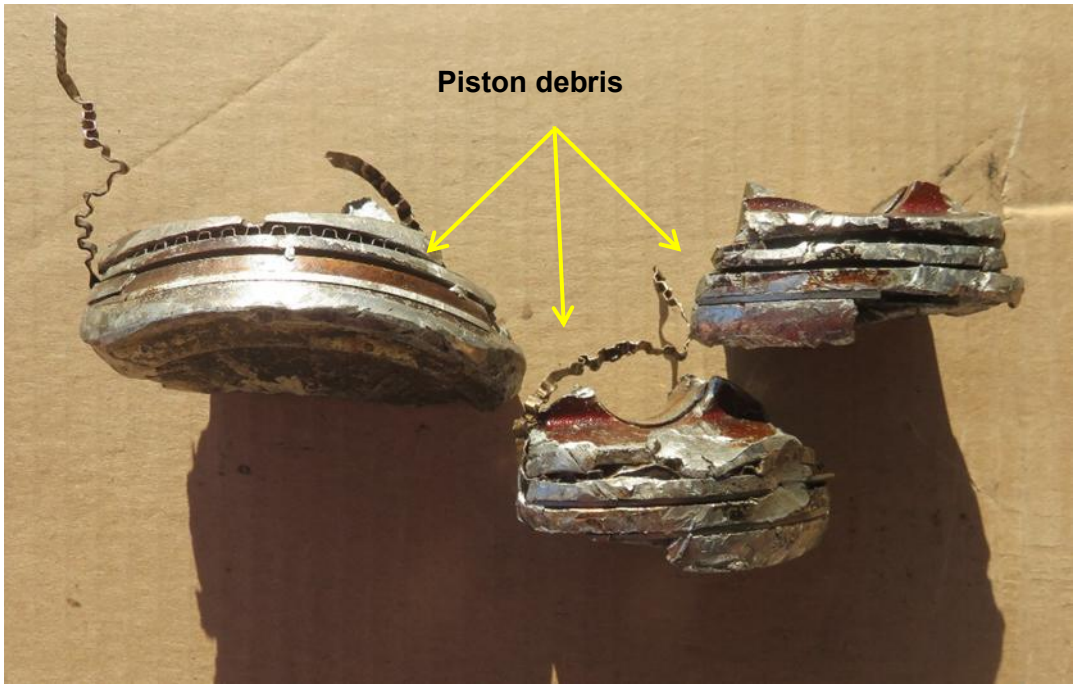


Figure 5: The debris found in the piston (viewed from the side).

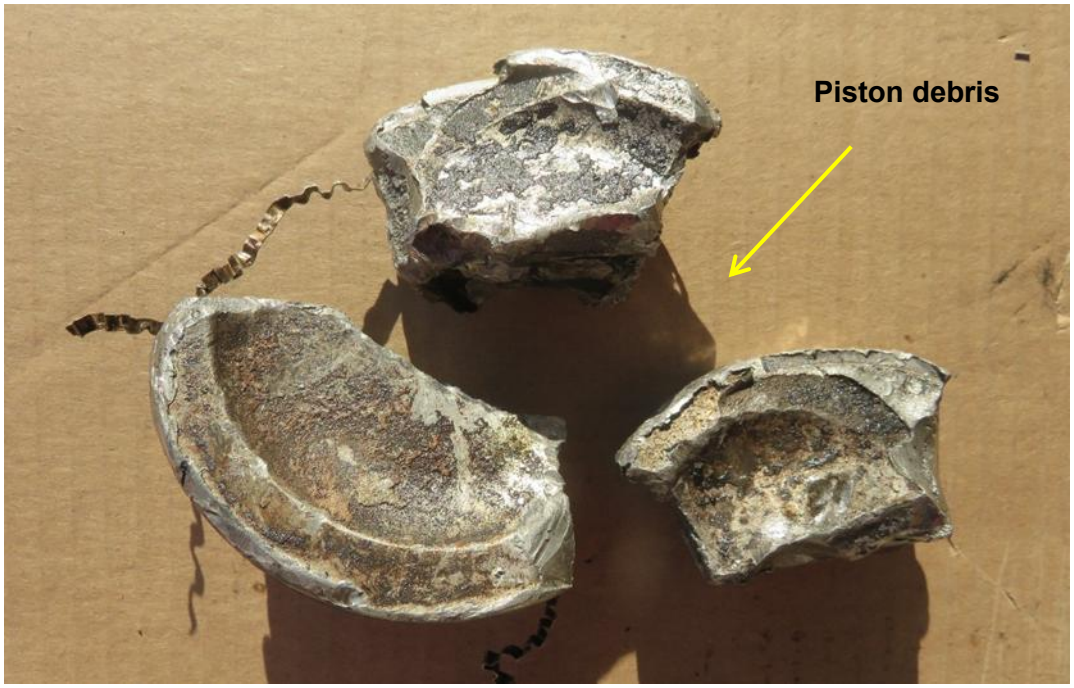


Figure 6: The debris found in the piston (viewed from the top).

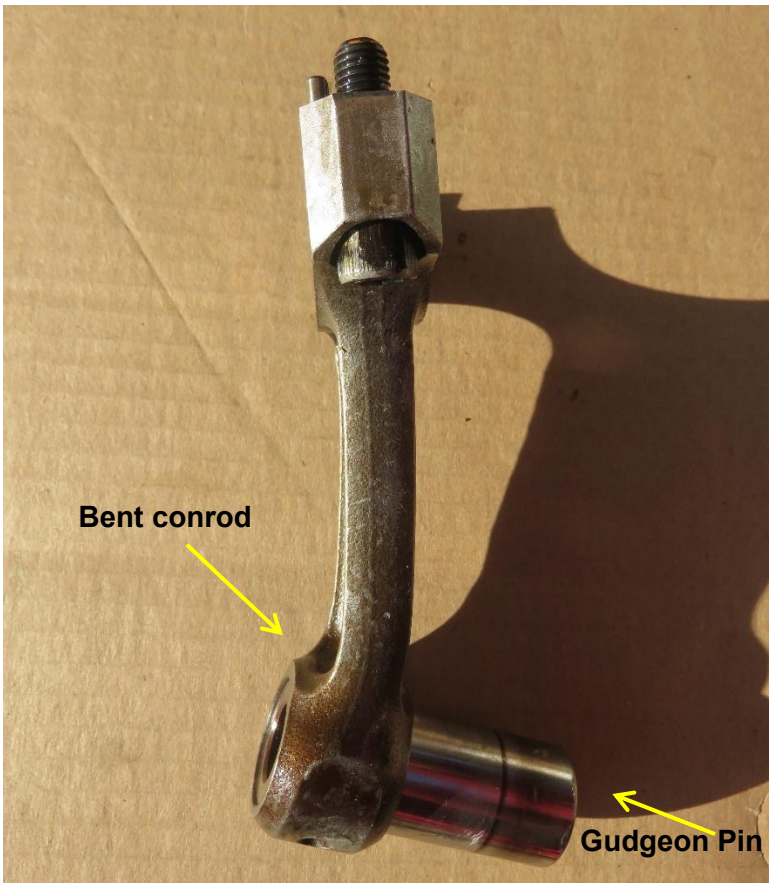


Figure 7: The bent conrod with gudgeon pin still attached.

Figure 8: Score markings inside the Number 6 barrel.

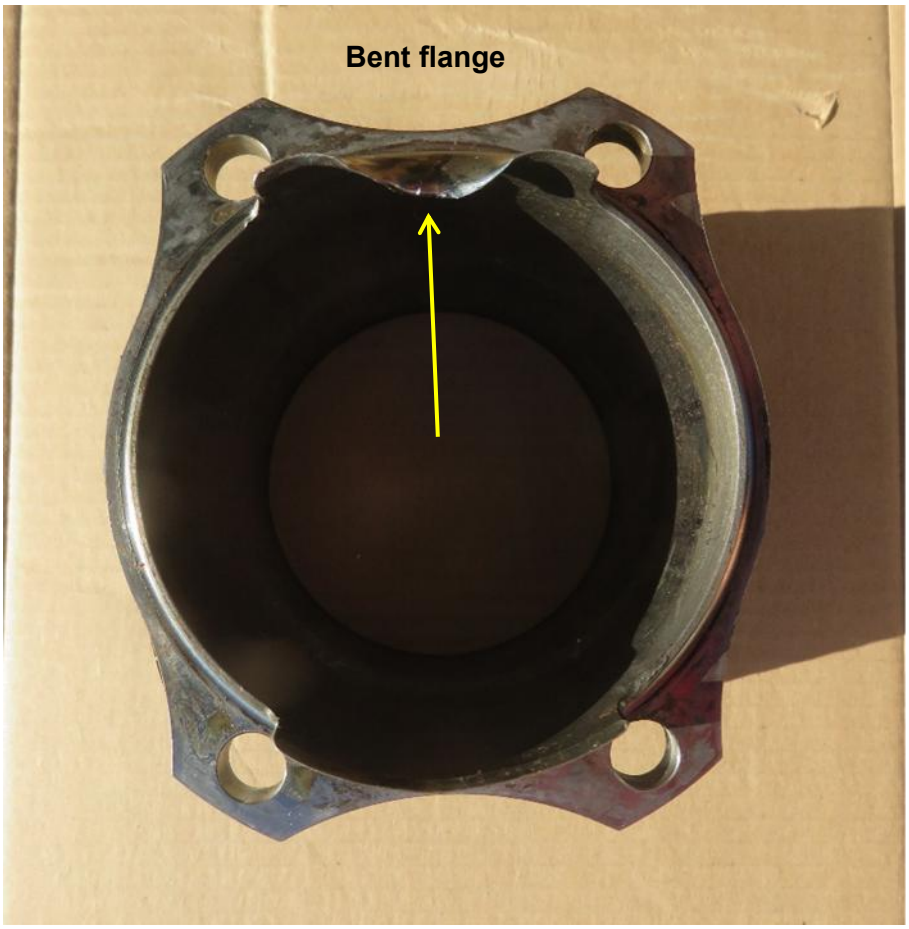


Figure 9: The Number 6 barrel with the flange bent on one end.

Figure 10: The fractured inlet valve head and the bent valve stem.

1.17 Organisational and Management Information

1.17.1 The private flight was conducted under the provisions of Part 94 of the CAR 2011.

1.17.2 The last annual inspection of the aircraft was conducted and certified on 6 June 2024 at 629.20 airframe hours. The aircraft had accrued 35.7 hours since the said inspection.

1.17.3 The Certificate of Release to Service (CRS) was issued on 6 June 2024 with an expiry date of 6 June 2025 or at 729.20 hours, whichever comes first.

1.17.4 The AMO which maintained the aircraft was issued an AMO Certificate by the Regulator (SACAA) on 30 October 2024 with an expiry date of 31 October 2025.

1.18 Additional Information

Following the discovery of internal engine damage, an in-depth examination was conducted by the aircraft maintenance engineer (AME) who reported the following findings:

1.18.1 High Exhaust Gas Temperatures (EGT)

The aircraft owner disclosed that the EGT for the Number 6 cylinder frequently exceeded 800°C, whilst the maximum allowable EGT specified in the Jabiru Engine Maintenance Manual for the Generation 3 engine is 740°C.

1.18.2 Factors that could contribute to piston failure as per the received technical report included:

1. *Overheating which causes the piston material to cease in the barrel. This could be caused by lean mixture in the cylinder.*

2. *Detonation: as the name suggests, is an explosion of the fuel-air mixture inside the cylinder. Under normal operation, each spark plug ignites a point in the fuel/air charge, which then propagates through the cylinder and provides a consistent, regulated burn in a process called deflagration. This extends the time that the burning fuel pushes on the cylinder, providing a gentle power stroke.*

   During detonation, the fuel/air charge (or pockets within the charge) explodes rather than burn smoothly. Because of this explosion, the charge exerts a much higher force on the piston and cylinder, leading to increased noise, vibration and cylinder head temperatures. The violence of detonation also causes a reduction in power. Mild detonation may increase engine wear, though some engines can operate with mild detonation regularly. However, severe detonation can cause engine failure in minutes. Because of the noise that it makes, detonation is called "engine knock" or "pinging" in cars.

   For reference, in a piston engine, deflagration refers to the subsonic combustion of the air-fuel mixture that is initiated by a spark or other ignition source. It is the normal, controlled burning process that drives the piston downwards during the power stroke. Deflagration is characterised by a flame front that propagates at a speed slower than the speed of sound.

3. *Inlet valve breakage in a piston engine can stem from a variety of issues, often involving a collision with the piston, a weak valve spring leading to the valve not closing properly and being struck by the piston.*

4. *Valve Spring Issues*
   Weakened or broken valve springs: Valve springs are crucial for closing the valves. If a spring is weak or broken, the valve may not close fully or quickly enough, increasing the risk of it being hit by the piston.

   Spring fatigue: Excessive heat or erratic spring action can lead to spring fatigue, causing it to lose tension and, potentially, fail to close the valve properly.

   It was found that the rocker arm bushes were severely worn in ZU-JHF.

5. *Piston-related Problems*
   Piston damage: In some cases, the piston itself could be damaged, potentially impacting the valve.

6. Other Factors

Inadequate lubrication: Poor lubrication can cause valves to stick in their guides, preventing them from closing properly and making them vulnerable to piston strikes.

Foreign particles: Small particles entering the valve guide can cause the valve to stick or move improperly, increasing the risk of damage.

Overheating: High temperatures can warp valves, preventing them from sealing properly and, potentially, leading to a burn or breakage.

3.10 Operating Speeds and Limits

3.10.1 Ground Operating Limits

Table 9 – Ground Operating Limitations

	All 2200 Variants	All 3300 Variants	Notes
Idle Speed	900 RPM	800-850	set while engine is hot
Oil Pressure – Idle	Min: 80 kPa (11 psi)	Min: 80 kPa (11 psi)	
	Max: 525 kPa (76 psi)	Max: 525 kPa (76 psi)	All engines
	Optimal: 350 kPa (51 psi)	Optimal: 350 kPa (51 psi)	Hydraulic lifter engines
Oil Temperature	Max. 100°C (212°F)	Max. 100°C (212°F)	
Max. CHT	180°C (356°F)	180°C (356°F)	

Note: If ground temperature limits are reached, shut the engine down or cool it by pointing the aircraft into wind.

3.10.2 In-Flight Operating Limits

Model:	All 2200 Variants	3300L	All Other 3300 Models
Maximum Speed	3300 RPM	3300 RPM	3300 RPM
Maximum Continuous Speed	3300 RPM	2850 RPM	3300 RPM
Oil Pressure – Normal Operations	Min 220 kPa (31 psi)	Min 220 kPa (31 psi)	
	Max: 525 kPa (76 psi) - all engines	Max: 525 kPa (76 psi) - all engines	
	Optimal: 350 kPa (51psi) - hydraulic lifter engines	Optimal: 350 kPa (51 psi) - hydraulic lifter engines	
– Idle	Min 80 kPa (11 psi)	Min 80 kPa (11 psi)	
– Starting & Warm up	Max: 525 kPa (76 psi) - all engines	Max: 525 kPa (76 psi) - all engines	
	Optimal: 350 kPa (51 psi) - hydraulic lifter engines	Optimal: 350 kPa (51 psi) - hydraulic lifter engines	
Oil Temperature:	Min 15°C (59°F) Max. 118°C (244°F)	Min 15°C (59°F) Max. 118°C (244°F)	
Oil Continuous Temperature	80 - 100°C (176° - 212°F)	80 - 100°C (176° - 212°F)	
Fuel pressure to carburettor	5 – 35 kPa (0.75 - 5.0 psi)	5 – 35 kPa (0.75 - 5.0 psi)	
Max. CHT (Climb)	200°C (392°F)	200°C (392°F)	
Max Continuous CHT (Cruise)	180°C (356°F)	180°C (356°F)	
EGT (Mid-Range / Cruise)	600° - 740°C (1112° - 1364°F)	600° - 740°C (1112° - 1364°F)	
EGT (Above 70% Power)	600° - 700°C (1112° - 1292°F)	600° - 700°C (1112° - 1292°F)	

- Time with CHT at between 180°C and 200°C is not to exceed 5 Minutes
- Time with engine speeds above 2850 RPM is not to exceed 10 minutes for 3300L models.
- Read Cylinder Head Temperature – CHT – under the spark plug nearest to the exhaust on the hottest cylinder.
- An EGT gauge is not included as standard equipment on the Jabiru engines, though a system can be supplied as an option.

Note: When testing an engine installation which differs from a typical Jabiru Aircraft installation (even if only by the type of propeller used), the use of EGT sensors on each

cylinder is essential to ensure that all cylinders are receiving correct fuel/air mixture in all modes of operation.

Figure 11: The operating EGT limitations of the engine. (Source: Jabiru Engine Maintenance Manual)

1.18.3 What Happens When the Engine Runs at High EGT Values?

(Source: https://webofproceedings.org.pdf)

Excessive EGT, if prolonged, will damage the piston. This damage can include piston deformation, melting, burning, perforation, cracks, etc., and this damage is cumulative. If there is a slight ablation on the top of the piston, the engine can continue to run without any problem, but next time the EGT is too high, there may be greater damage, and so on, until the failure occurs. Failure is catastrophic for aircraft piston when the piston suffer damage, because the aluminium, than steel or cast iron, has low hardness and melting temperature, the damage of the piston and connecting rod will destroy the engine internal parts made of aluminium or aluminium alloy, it will seriously damage the flight safety, the influence of the minimum is required engine overhaul, this would mean expensive maintenance cost. High levels of EGT can also result in the exhaust manifold and the cylinder head cracks, and the exhaust valve is inoperative. In summary, EGT is a direct product of the combustion process. Understanding how it relates to fuel consumption and engine power for fuel management, aircraft range and endurance, and power plant management is essential for your safety and successful flight operations.

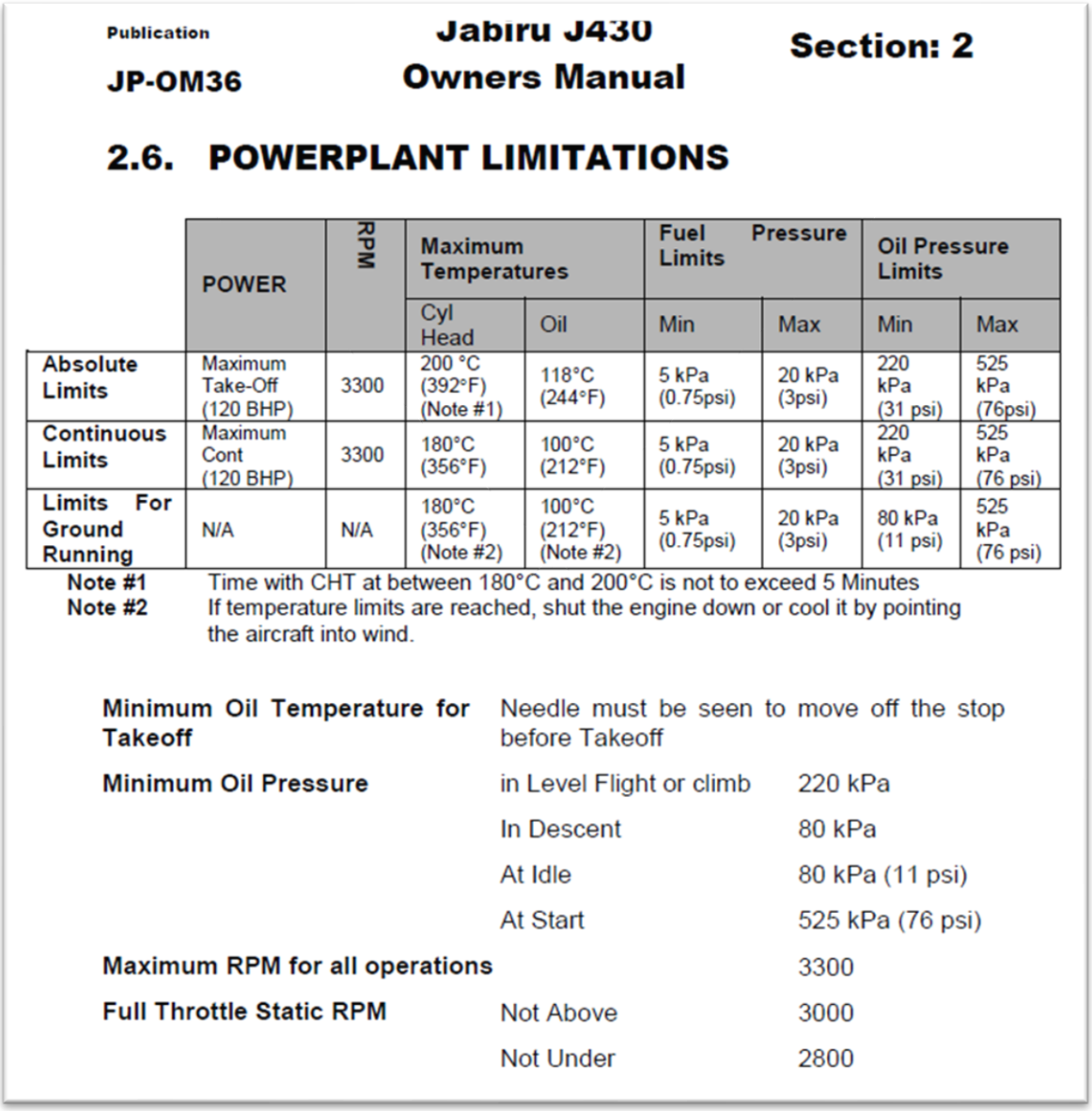
1.18.4 What Material are Jabiru Engine Pistons Made of?

(Source: https://www.jabiru.aero)

Jabiru pistons are made from a high-silicon aluminium alloy, similar to those used in automotive pistons. This alloy is chosen for its balance of properties, including strength, heat resistance and relatively low weight, which are important for aircraft engine applications. Jabiru pistons are fitted with three piston rings, with the top rings typically made of cast iron. These rings seal the combustion chamber and help transfer heat to the cylinder walls.

1.18.5 Powerplant Limitations as per the Jabiru J430 Owner's Manual

The Owner's Manual does not indicate what is the EGT limitation.



Publication: JP-OM36

Jabiru J430 Owners Manual

Section: 2

2.6. POWERPLANT LIMITATIONS

	POWER	RPM	Maximum Temperatures		Fuel Pressure Limits		Oil Pressure Limits	
			Cyl Head	Oil	Min	Max	Min	Max
Absolute Limits	Maximum Take-Off (120 BHP)	3300	200 °C (392°F) (Note #1)	118°C (244°F)	5 kPa (0.75psi)	20 kPa (3psi)	220 kPa (31 psi)	525 kPa (76psi)
Continuous Limits	Maximum Cont (120 BHP)	3300	180°C (356°F)	100°C (212°F)	5 kPa (0.75psi)	20 kPa (3psi)	220 kPa (31 psi)	525 kPa (76 psi)
Limits For Ground Running	N/A	N/A	180°C (356°F) (Note #2)	100°C (212°F) (Note #2)	5 kPa (0.75psi)	20 kPa (3psi)	80 kPa (11 psi)	525 kPa (76 psi)

Note #1 Time with CHT at between 180°C and 200°C is not to exceed 5 Minutes

Note #2 If temperature limits are reached, shut the engine down or cool it by pointing the aircraft into wind.

Minimum Oil Temperature for Takeoff	Needle must be seen to move off the stop before Takeoff	
Minimum Oil Pressure	in Level Flight or climb	220 kPa
	In Descent	80 kPa
	At Idle	80 kPa (11 psi)
	At Start	525 kPa (76 psi)
Maximum RPM for all operations		3300
Full Throttle Static RPM	Not Above	3000
	Not Under	2800

Figure 12: Powerplant limitations of a Jabiru. (Source: Jabiru Owner's Manual)

1.18.6 Cockpit Instrumentation

The aircraft's primary flight display (PFD) was the Dynon FlightDEK-D180, an electronic flight instrument system (EFIS) as shown in Figure 11.

FlightDEK can act as a PFD with synthetic vision, an engine monitoring system (EMS), and a moving map in various customisable screen layouts. If the FlightDEK-D180 has switched to its internal emergency battery due to a power loss in your aircraft, it is advised that you land as soon as possible. The cylinder head temperature (CHT) and EGT limitations are set

up when the unit is installed and display either a green, yellow or red colour depending on the temperature.

The aircraft was also fitted with a few analogue instruments, which included the following:

1. An airspeed indicator
2. Altimeter
3. Vertical speed indicator
4. Engine revolutions per minute (RPM)
5. Battery voltage
6. Engine oil pressure
7. Engine oil temperature

Figure 13: The instrument panel of ZU-JHF. (Source: Original Equipment Manufacturer)

Figure 14: Engine parameters are shown on the right, with the EGT temperature indicated by the yellow arrow.

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 serious incident. This shall not be read as apportioning blame or liability to any organisation or individual.

2.2 Analysis

2.2.1 Pilot

The pilot was engaged in a private flight and was accompanied by a passenger. He had a valid Private Pilot Licence (PPL) that was initially issued on 5 March 2001, with the most recent renewal dated 19 January 2025 and set to expire on 31 December 2026. Additionally, the pilot had a valid Class 2 aviation medical certificate that was issued on 1 June 2023, with validity until 1 June 2025 and with no restrictions. These credentials confirm that the pilot was both medically fit and properly licensed to conduct the flight. The pilot had flown a total of 986.3 hours of which 353.0 hours were on the aircraft type. The pilot broadcasted a *MAYDAY* on the FACT tower frequency after the engine had failed, stating that he would be executing a forced landing.

The pilot exceeded the engine's prescribed limitations by operating it outside its limits. There was no evidence indicating that he took the aircraft to a maintenance facility to address the high EGT indications on the Number 6 cylinder. Due to the absence of proper documented evidence, it is unknown how long the pilot continued to fly the aircraft whilst exceeding the EGT limits. The Owner's Manual of the aircraft under Section 2, Limitations, does not mention the EGT limitations of the engine; however, these limitations are addressed in the Engine Maintenance Manual as referenced in the report. The Dynon FlightDEK D180 EFIS instrument also displayed several engine parameters, including the EGT values for all six cylinders, which the pilot needed to monitor. These EFIS units are calibrated with the minimum and maximum allowable limits for each engine parameter. Once an exceedance occurs, the colour of the display would change from green to amber and then to red to draw the pilot's attention and for him/her to follow the appropriate actions.

2.2.2 Aircraft

At the time of the flight, the aircraft was confirmed airworthy and compliant with the required certifications; an annual inspection was conducted and certified on 6 June 2024 at 629.20 airframe hours. The aircraft had accrued a further 35.7 hours since the last inspection. After

the serious incident, an engine teardown inspection was conducted; it was found that the engine could not be turned by hand.

Post-flight investigations revealed that the engine had suffered internal damage, and that the Number 6 piston was missing from the barrel. Fragmented pieces of the piston, conrod and failed inlet valve were found inside the engine. These mechanical failures significantly compromised the engine operability and safety.

2.2.3 High Exhaust Gas Temperature (EGT)

It was reported that the Number 6 cylinder EGT readings were over 800˚C; the operational limits were between 600°C and 740˚C. Exceedance of the design limitations (high temperatures) contributed to thermal stress and damage within the cylinder. The maintenance manual states that continuous monitoring of the engine parameters within the operating limitations set by the manufacturer is essential to ensure that the engine functions optimally.

The failure of the Number 6 cylinder piston could be attributed to exposure of high EGT temperatures (overheating) which, over an undetermined period, deteriorated the material integrity of the component and caused the piston to cease in the cylinder barrel. There might have been other factors that could have contributed to the failure, which were discussed in the technical report supplied by the manufacturer, and which could have resulted in additional hardware damage and, ultimately, causing the engine to fail.

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 serious 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 serious incident occurring, or would have mitigated the severity of the consequences of the serious

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

Pilot

3.2.1 The pilot had a Private Pilot Licence (PPL) that was initially issued on 5 March 2001 by the Regulator (SACAA). His latest renewed PPL was issued on 19 January 2025 with an expiry date of 31 December 2026.

3.2.2 The pilot had a Class 2 aviation medical certificate that was issued on 1 June 2023 with an expiry date of 1 June 2025 with no restrictions.

Aircraft

3.2.3 The last annual inspection of the aircraft was conducted and certified on 6 June 2024 at 629.20 airframe hours after which a Certificate of Release to Service (CRS) was issued with an expiry date of 6 June 2025 or at 729.20 airframe hours, whichever comes first.

3.2.4 The aircraft had a valid Authority-to-fly (ATF) Certificate that was initially issued by the Regulator on 11 December 2019. It was renewed on 2 July 2024 with an expiry date of 31 July 2025. The aircraft was airworthy when it was dispatched for the flight.

3.2.5 The Certificate of Registration (C of R) was issued to the present owner on 12 December 2013.

Engine

3.2.6 The aircraft was equipped with a Dynon D180 EFIS and EMS display, which provided the pilot with EGT readings for all six cylinders.

3.2.7 The engine had been in operation for 664.9 hours since new.

3.2.8 The piston of the Number 6 cylinder was found to have fractured, the conrod was bent, and the inlet valve failed where the valve head connects to the stem.

3.2.9 The engine was exposed to EGT values of more than 800°C on the Number 6 cylinder which exceeded the manufacturer’s operating limits of between 600°C and 740°C maximum.

3.3 Probable Cause

3.3.1 The pilot executed a forced landing on a ploughed field after engine failure; as a result, the aircraft sustained minor damage. It was found that a hardware failure of the components of the Number 6 cylinder, piston, conrod and inlet valve occurred due to overheating associated with the exceedance of EGT limits.

3.4 Contributory Factor

3.4.1 By exceeding the EGT limitations during flight, the integrity of critical engine components was jeopardised, which resulted in the stoppage and the subsequent failure of the piston, resulting in additional hardware damage that caused the engine to fail.

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 It is recommended that Jabiru Aircraft amend the Owner's Manual of the Jabiru J430 aircraft by adding the EGT limitations as contained in the Engine Maintenance Manual under Section 2, subheading 2.6 Powerplant Limitations.

5. APPENDICES

5.1 None.

This report is issued by:

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