AIRCRAFT INCIDENT SHORT REPORT

CA18/3/2/1241: Forced landing following an engine failure on final approach

Date and time	**:** 12 January 2019 at 1210Z
Aircraft registration	**:** ZS-IIL
Aircraft manufacturer and model	**:** Cessna Textron, C182N
Last Point of departure	**:** Grand Central Aerodrome (FAGC)
Next point of intended landing	**:** Iwamanzi Game Lodge, Koster, North West
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	**:** S25°52'52" E026°59'41", 6nm east of Koster
Meteorological information	**:** FARG METAR: wind: 330°/5kt; temperature 32°C; dew point: 18°C; QNH: 1012 hPa
Type of operation	**:** Private (Part 91)
Persons on board	**:** 1 + 1
Injuries	**:** None
Damage to aircraft	**:** Substantial

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 of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011), this report was compiled in the interests 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:

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1. SYNOPSIS

1.1 On 12 January 2019 at 1016Z, a pilot, accompanied by a passenger, departed Grand Central Aerodrome (FAGC) on a cross-country flight to Iwamanzi Game Lodge, near Koster, in the North West Province. The flight was operated as a private flight under Part 91 and was on a hire-and-fly basis.

1.2 The pilot stated that on final approach at Iwamanzi Aerodrome, the aircraft lost power and he was unable to maintain height. He attempted to correct the loss of power by advancing the power lever, but the engine was unresponsive and stopped operating. He realised that there were telephone lines near the threshold of Runway 33 and he deemed it unsafe to attempt to clear the power lines. He opted to land the aircraft on a field approximately 300 metres (m) short of the threshold of Runway 33.

1.3 During landing, the aircraft sustained damage to the nose gear, lower fuselage, propeller and engine cowling. The two occupants on-board reported no injuries.

1.4 The flight was conducted in visual meteorological conditions (VMC) by day.

1.5 The investigation revealed that the engine stopped on final approach, resulting in a forced landing 300m from the threshold. The cause of engine failure could not be determined.

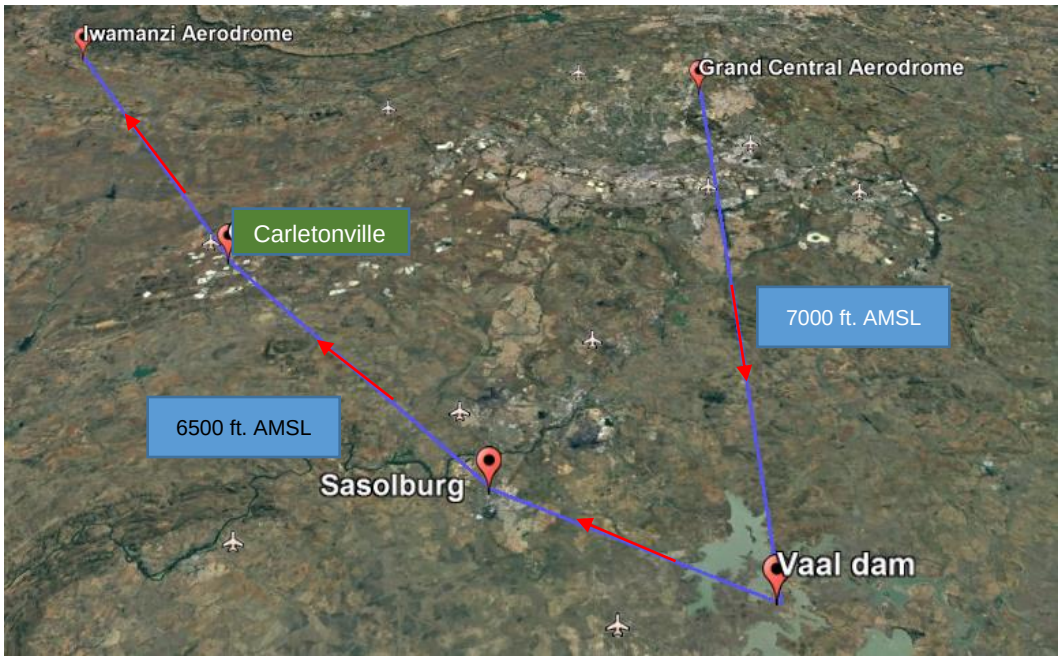

Figure 1: Flight routing from FAGC to Iwamanzi Game Lodge
(Source: Google Earth)

2. FACTUAL INFORMATION

2.1 On 12 January 2019 at 1016Z, a pilot, accompanied by a passenger, departed FAGC on a cross-country flight to Iwamanzi Game Lodge, near Koster, in the North West Province. The flight was conducted as a private flight and was in accordance with Part 91 (General Aviation and Operating Flight Rules) of the South African Civil Aviation Regulations (CAR) of 2011 and on a hire-and-fly basis.

2.2 The flight routed to Iwamanzi Game Lodge via the Vaal Dam, Sasolburg and Carletonville. The aircraft arrived at the aerodrome from a southerly direction and the pilot carried out a runway inspection, taking note of the windsock. The pilot selected Runway 33 for the landing. He carried out a teardrop turn to re-establish the aircraft for final approach to Runway 33.

2.3 The pilot stated that the aircraft lost engine power on final approach and was unable to maintain enough height. The aircraft was approximately 900m from the threshold of Runway 33 and at a height of 500 feet (ft.) above ground level (AGL). The pilot attempted to correct the power and height loss by advancing the power lever, but the engine was unresponsive, and it stopped. The pilot carried out various troubleshooting steps which included confirming the fuel selector was on “both”, the mixture was full rich, the pitch was full fine, both magnetos were “ON” and the throttle at full power.

2.4 When it became evident that the engine would not start, the pilot configured the aircraft for landing. He saw telephone lines near the threshold of Runway 33 and he deemed it unsafe to attempt to clear the lines. He chose to land the aircraft in a field approximately 300m short of threshold of Runway 33.

2.5 The aircraft sustained damage to the nose gear, lower fuselage, propeller and engine cowling; both occupants reported no injuries. A local farmer was the first person on site and assisted the occupants of the aircraft.

2.6 The flight was conducted in VMC by day.

2.7 The location of the forced landing was at Global Positioning System (GPS) coordinates S25°52’52” E026°59’41” at an elevation of 5 110ft above mean sea level (AMSL). The aircraft carried out the forced landing 1 hour 54 minutes after departing FAGC.

2.8 The following tests were carried out by the aircraft maintenance organisation (AMO), which was tasked with recovering the aircraft after the incident, at their facilities at Wonderboom Aerodrome. The tests were carried out in the presence of an Accident and Incident Investigation Division (AIID) investigator.

- Test-running the engine
    - An engine bench test run was carried out to ascertain the condition and operating integrity of the engine. The engine started normally and exhibited normal operating perimeters during the duration of the test.
- Testing the carburettor
    - The carburettor was visually inspected prior to a bench test being carried out. The visual inspection yielded no signs of a potential blockage or failure and the test was successful with the carburettor operating as required.
- Testing the fuel selector valve in the cockpit
    - The selector valve was tested in the “left”, “right” and “both” positions. The selector valve operated normally in all positions.
- Checking the fuel for possible contamination
    - The fuel did not show any evidence of water contamination. No other operator at FAGC had reported possible fuel contamination.
- Inspection of the screens and strainer on the fuel line
    - The screens and strainer on the fuel line were all in good condition and did not show any evidence of blockages.

2.9 The Meteorological Terminal Aviation Routine (METAR) Weather Report for Rustenburg Aerodrome (FARG) (which is the closest aerodrome to the accident site) at the time of the incident was—wind: 330°/5kt; temperature: 32°C; dew point: 18°C; QNH: 1012 hPa. A light risk of carburettor icing was present at the time of the incident.

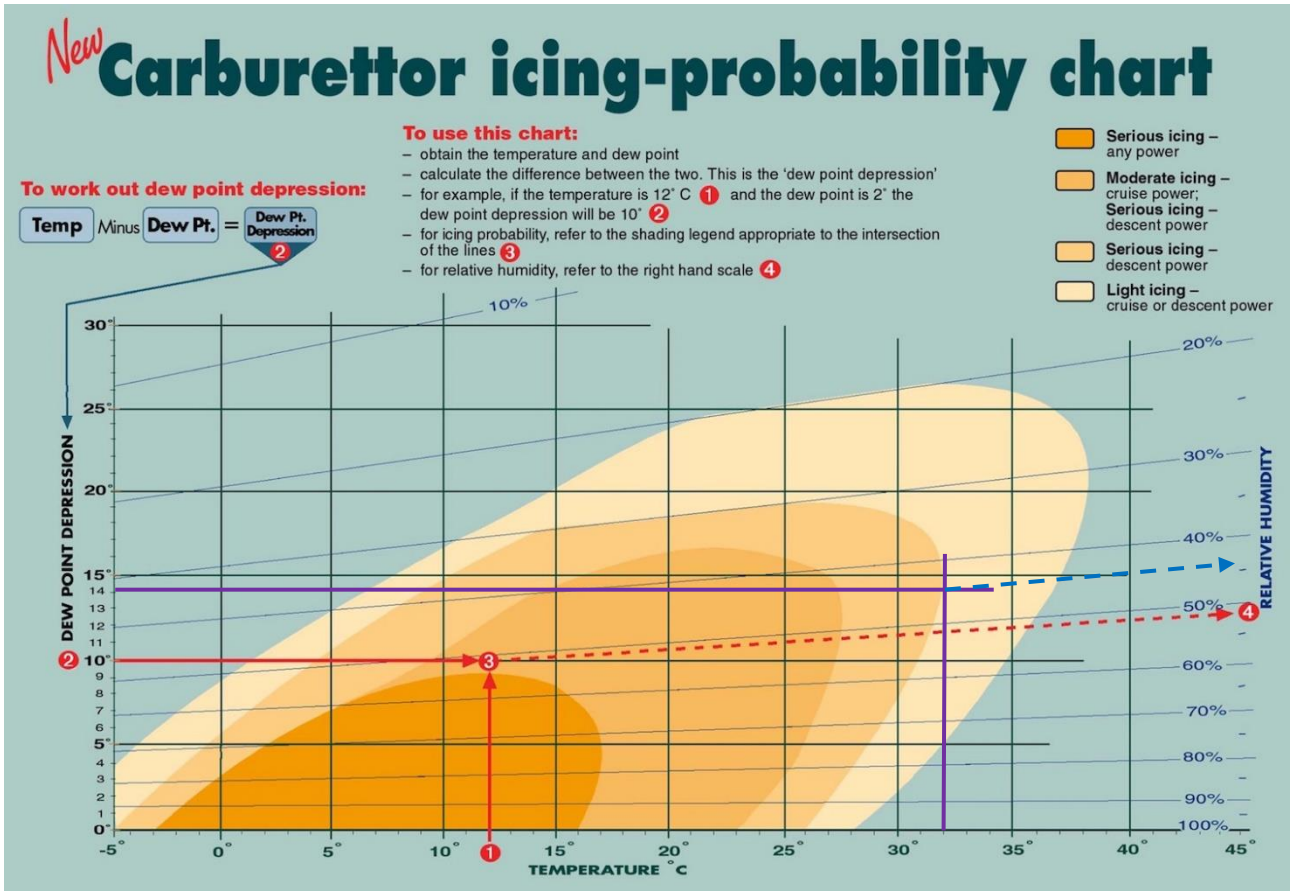

Figure 2: The conditions the aircraft was operating in prior to the shutdown. (Source: Australian Government Civil Aviation Authority)

2.10 The investigation revealed that the engine failed on final approach, resulting in a forced landing 300m from the threshold. The cause of engine failure could not be determined.

Figure 3: Damage to the propeller and cowling
(Source: J de Reuck)

Figure 4: Damage to the nose gear
(Source: J de Reuck)

Figure 5: Location of the accident site
(Source: Google Earth)

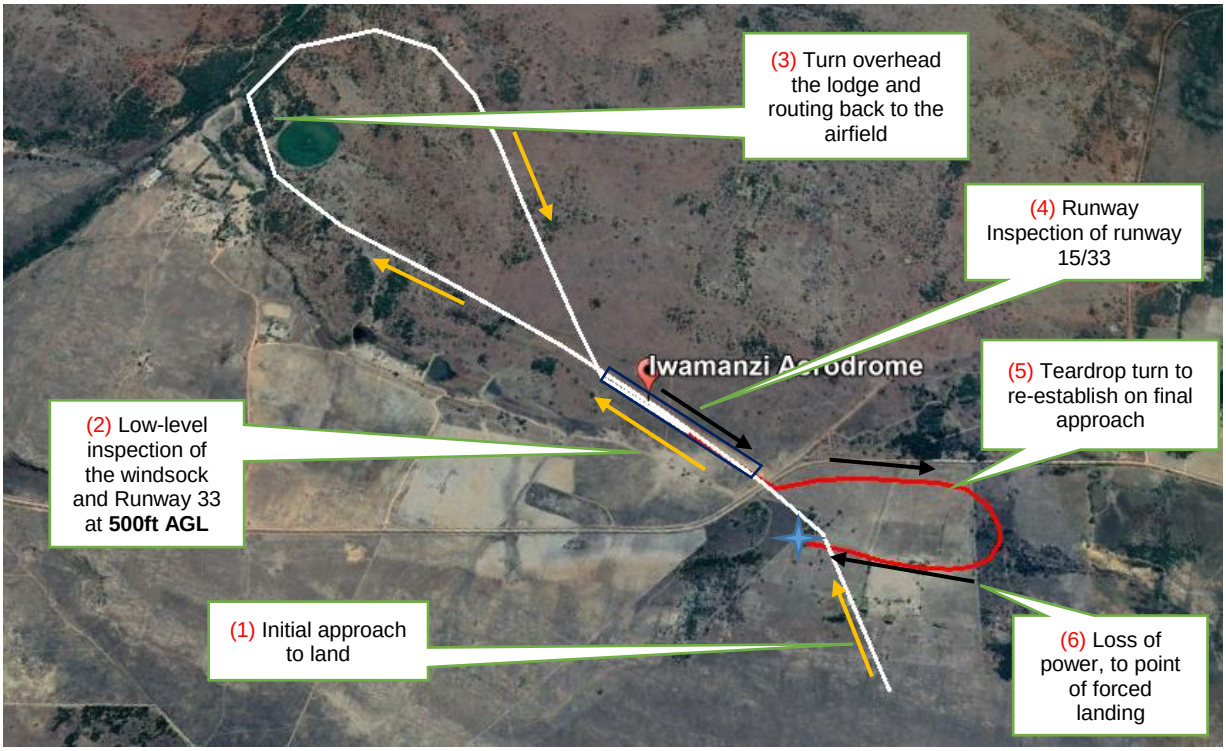

Figure 6: The approach to land was broken up into two sectors. The initial approach (white path and orange arrows) followed by the second runway inspection and final approach to land (red path and black arrows) (Source: Google Earth)

3. FINDINGS

3.1 The pilot

3.1.1 The pilot was issued a foreign licence validation on 10 December 2018, with an expiry date of 9 December 2019. The validation was issued based on his private pilot licence (PPL) issued by the Swiss Authorities. The last competency check for his PPL had been carried out on 9 April 2016 and due to expire on 30 April 2022. The pilot held a single-engine piston (land) class rating.

3.1.2 The pilot had flown a total of 2.9 hours on the C182N and his conversion to the aircraft type had been completed on the day of the incident. The South African air law examination for the licence validation had been completed and passed on 11 January 2019. The pilot's initial skills test for the licence validation had been completed on 11 January 2019. The pilot had complied with all the requirements as stipulated in the South African CAR 2011, 61.01.13(5)(a) and the South African Civil Aviation Technical Standards, 2011(CAT), 61.01.13 to exercise the privileges of the foreign validation issued to the pilot by the South African Civil Aviation Authority (SACAA) (refer to Appendix A). The pilot had a total of 474 flying hours of which 274 hours were of powered fixed wing aircraft and 200 hours were of glider flying.

3.1.3 The pilot held a valid Class 2 aviation medical certificate which had been issued on 11 April 2017 and expiring on 20 April 2019. The medical examination had been conducted in Switzerland. The Class 2 certificate is a minimum requirement for the issue of a PPL and complies with International Civil Aviation Organization (ICAO) aviation medical examination standards and the requirements as stipulated in the South African CAR 2011, 67.00.2 (refer to Appendix B).

3.2 Aircraft

3.2.1 The aircraft was issued with a Certificate of Release to Service (CRS) on 21 June 2018, with an expiry date of 20 June 2019 or at 1 752.85 tachometer hours (whichever occurs first). The last maintenance check carried out was a mandatory periodic inspection (MPI). This check was carried out on 21 June 2018 at 3243.44 airframe hours and included the 50-, 100- and 200-hour inspection tasks. The aircraft had flown a total of 29.85 hours since the last MPI. During this period, no faults regarding the engine were recorded (refer to appendix C).

3.2.2 The aircraft was issued with a Certificate of Airworthiness (CoA) on 16 May 2016, with an expiry date of 31 May 2019.

3.2.3 No faults with any aircraft systems were reported prior to the flight.

3.2.4 Before departing from FAGC, the aircraft had 31 gallons (117.35 litres) of fuel in the left-wing tank and 25 gallons of fuel in the right-wing tank. The aircraft had a total of 56 gallons when it departed FAGC. After the incident, the total quantity of fuel drained during the recovery process was approximately 15 gallons (68 litres) from each tank. The total fuel on-board was 30 gallons of which 26 gallons were usable. Based on the table below, the aircraft would have had enough endurance for a further 2 hours of flight.

Prior to departure from FAGC (Gallons)	56
Duration of flight (Hours)	1.9
Estimated fuel burn per hour (Gallons/hr)	12
Fuel burn for the flight (Gallons)	22.8
Fuel drained during recovery (Gallons)	±30
Usable fuel remaining (Gallons)	±26

3.2.5 Various tests were carried out on the engine and fuel systems and there was no evidence found which could have caused the loss of engine power and the shutdown. The aircraft had enough fuel for the planned duration of the flight.

3.2.6 The engine fitted to the aircraft was a Continental O-470-R. It was last overhauled on 13 June 2001. The time since the last overhaul was 914.69 hours and the time since new was 4182.69 hours.

3.3 Environment

3.3.1 The aerodrome at Iwamanzi Game Lodge is unmanned and unlicensed. The incident occurred approximately 300m from the threshold of Runway 33. The length of the runway is approximately 945m. The runway is a prepared, unpaved surface with a negative slope of 0.01° in the direction of Runway 33. Telephone wires run perpendicular to the threshold of Runway 33, approximately 67m from the threshold.

3.3.2 The METAR for Rustenburg Aerodrome (FARG) at the time of the incident was— wind: 330°/5kt; temperature: 32°C; dew point: 18°C; QNH: 1012 hPa.

3.3.3 The flight was conducted in VMC during daylight.

Figure 7: Nearest weather reporting station (FARG)
(Source: Google Earth)

4. PROBABLE CAUSE

4.1 The engine failed on final approach, resulting in a forced landing 300m from the threshold. The cause of engine failure could not be determined.

5. CONTRIBUTING FACTOR

5.1 None

6. REFERENCES USED IN THE REPORT

6.1 Cessna 182 Pilot's Operating Handbook

6.2 South African Weather Service Report

6.3 South African Civil Aviation Regulations, 2011

6.4 Cessna 182 Service Manual

7. SAFETY RECOMMENDATION

7.1 None.

8. ORGANISATION

8.1 The flight was operated privately under part 91 of the CAR 2011 as amended and on a hire-and-fly basis.

9. TYPE OF SAFETY ACTION

9.1 None.

10. APPENDICES

10.1 Appendix A: Part 61.01.13 of the Civil Aviation Regulations of 2011 (Validation of a foreign pilot licence)

10.2 Appendix B: Part 67.00.2 of the Civil Aviation Regulations of 2011 (Classes of medical certificates)

10.3 Appendix C: Mandatory Periodic Inspection tasks carried out

(2) The Director may approve any other device for a purpose not provided for in sub-regulation (1).

(3) The Director may approve any of the devices, referred to in sub-regulations (1) and (2) on the basis of a similar approval by the regulatory body of a Contracting State.

Recognition, validation and conversion of foreign pilot licences and ratings

61.01.13 (1) The Director may recognise, through temporary validation or permanent conversion, on the conditions prescribed in this Part, pilot licences and ratings issued by an appropriate authority of a Contracting State if the standard of such foreign licence or rating is deemed to be equivalent to, or higher than, the South African licence or rating.

(2) (a) A person who holds a current and valid pilot licence issued by another Contracting State in accordance with ICAO Annex 1 to the Convention, may apply for a validation or conversion of such licence and associated ratings, for use on aircraft registered in South Africa.

(b) A foreign licence or rating shall only be validated or converted provided the minimum experience requirements for the issue of the applicable South African licence or rating have been met.

(3) Where the country of issue is not a Contracting State or does not comply with Annexes 1 and 6 to the Convention, then the foreign licence holder must undergo bridging training to the extent determined by the Director in individual cases and thereafter further assessment of competence to ensure compatibility with the relevant South African licensing standards.

(4) Before the Director validates or converts a foreign licence or rating for a commercial air transport operation or a PPL with Instrument Rating (PPL/IR), he or she must confirm the validity of the foreign licence or rating with the appropriate authority of the issuing Contracting State.

(5) Notwithstanding the provisions of sub-regulations (1) and (2), any applicant for the validation of a foreign licence or rating must undergo the appropriate skills test and –

(a) in the case of validation for use as a private pilot under VFR conditions (PPL/VFR), must –

(i) have attended a tutorial, conducted by at least a Grade III flight instructor at an approved Part 141 ATO on the differences in airspaces and terminology within South Africa;
(ii) have received a briefing on performance planning, taking into account the effect of density altitude; and
(iii) write an Authority approved examination in South African Air Law conducted by an approved Part 141 ATO; or

(b) in the case of validation for use as a private pilot under IFR conditions (PPL/IFR) must –

(i) have attended a tutorial, conducted by at least a Grade II flight instructor at an approved Part 141 ATO on the differences in airspaces and terminology within South Africa;
(ii) have received a briefing on performance planning taking into account the effect of density altitude; and
(iii) pass an examination on South African Air Law and Procedures at an approved Authority Examination Centre; or

(c) in the case of validation for use as a commercial pilot under VFR conditions (CPL/VFR), must have passed an examination in South African Air Law at CPL level at an approved Authority Examination Centre; or

(d) in the case of validation for use as a commercial pilot under IFR conditions (CPL/IFR) or as an airline transport pilot, must have passed an examination in South African Air Law and Procedures at an approved Authority Examination Centre; and

(6)(a) Notwithstanding the provisions of regulation 61.01.14(20), a certificate of validation of a foreign licence for commercial purposes may only be issued for a particular purpose.

(b) The expiry date of such certificate of validation shall coincide with the date of expiry of the medical certificate of the applicant but shall not exceed a period of twelve months.

(c) If the medical certificate expires within the initial 12 month period, then the certificate of validation may be revalidated for a further period not exceeding 12 months from original date of issue of the certificate of validation.

(d) Under exceptional circumstances, the Director may extend the period of validation by one further period of 12 months.

(e) The certificate of validation for a PPL is valid for a period of 60 months from date of successful completion of the applicable skills test.

(f) The privileges of the validation may only be exercised if the holder has a current and valid foreign licence and complies with the recency and maintenance of competency requirements of Subpart 3 of this Part as applicable.

(7) In the case of validated foreign pilots flying South African registered aircraft in a foreign country, a certificate of validation for commercial purposes may be re-issued annually, provided that the operation is flown exclusively outside the borders of South Africa and that any flying carried out in South Africa is for the purpose of a ferry flight for pre- or post-maintenance purposes or for the purpose of a revalidation check.

(8) The purposes for which a certificate of validation may be issued include any or a combination of the following –

(a) to exercise the privileges of a private pilot in a South African registered aircraft;

(b) to ferry a South African registered aircraft from one foreign country to another, or from a foreign country to South Africa;

(c) to conduct demonstration flights in South African registered aircraft;

(d) to conduct familiarisation, difference training or route training of South African flight crew;

(e) to provide its holder with time to complete prescribed bridging training for the conversion of the foreign licence or rating while acting as a flight crew member on a South African registered aircraft during commercial operations; and

(f) in case of a dry- or wet-lease agreement in terms of Part 48.

(9) The privileges of a validated foreign licence may not be exercised for commercial air transport operations, except when issued for the purpose referred to in sub-regulation (7) and paragraphs (e) and (f) of sub-regulation (8), and except by written permission of the Director for the purposes of route training.

(10) A South African licence, issued wholly or in part on the strength of a foreign licence, must indicate the Contracting State that issued the licence upon which the conversion was based.

(11) For the issuing of a South African pilot licence or rating, the Director may not recognise foreign examination credits in isolation; i.e., for a conversion the applicant must be the holder of the appropriate valid licence or rating. If such is not the case, the applicant must pass all the relevant South African examinations.

(12) A foreign licence, if qualifying for the issue of a certificate of validation in terms of these Regulations, or for which a certificate of validation has been issued, may be accepted as the entry requirement for the issue of a higher South African pilot licence.

Validation of a foreign pilot licence and ratings

(13) The application for a certificate of validation of a pilot licence or rating issued by the appropriate authority of a Contracting State should be made to the Director on the appropriate prescribed form.
(14) The Director may validate a pilot licence and ratings issued by an appropriate authority of a Contracting State –

(a) subject to the same restrictions which apply to such foreign pilot licence and ratings;
(b) subject to such conditions and limitations as the Director may deem necessary in the interest of aviation safety;
(c) in accordance with, and subject to, the requirements and conditions as prescribed in these Regulations;
(d) on condition that the privileges may not exceed that of the South African pilot licence or rating.

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APPENDIX B

(2) The Director may designate medical officers to perform in terms of this Part any functions or duties on his or her behalf.

(3) Where appropriate, the reference to the Director in this Part shall be deemed to include medical officers referred to in sub-regulation (2).

Classes of medical certificates

67.00.2 (1) The classes of medical certificates are –

(a) Class 1 –
- (i) airline transport pilot: aeroplane and helicopter;
- (ii) commercial pilot: aeroplane and helicopter;
- (iii) flight test rating;
- (iv) commercial microlight aeroplane pilot;
- (v) gyroplane pilot for commercial purposes;
- (vi) commercial glider pilot;
- (vii) airship pilot for commercial purposes;
- (viii) flight engineer; and
- (ix) powered paraglider pilot for commercial purposes;

(b) Class 2 –
- (i) private pilot: aeroplane and helicopter;
- (ii) student pilot;
- (iii) cabin crew member; and
- (iv) free balloon pilot for commercial purposes.

(c) Class 3 –
- (i) air traffic controller; and

(d) Class 4 –
- (i) microlight aeroplane pilot;
- (ii) glider pilot;
- (iii) gyroplane pilot for non-commercial purposes;
- (iv) airship pilot for non-commercial purposes;
- (v) free balloon pilot for non-commercial purposes;
- (vi) hang-glider pilot;
- (viii) paraglider pilot;
- (viii) powered paraglider pilot for non-commercial purposes; and
- (ix) air traffic service assistant.

(2) A flight crew member who holds a valid Class 1 medical certificate shall be deemed to hold a valid Class 2 medical certificate and a valid Class 4 medical certificate

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APPENDIX C

MODEL 182 & T182 SERIES SERVICE MANUAL

	2-50. INSPECTION TIME LIMITS. (MODEL 182 & T182 AIRPLANES.)	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
J	1 Cowling and Cowl Flaps - Inspect for cracks, dents, and other damage, security of cowl fasteners, and cowl mounted landing lights for attachment. Check cowl flaps for condition, security, and operation.	•				
J	2 Engine - Inspect for evidence of oil and fuel leaks. Wash engine and check for security of accessories.	•				
J	3 Engine Controls and Linkage - Check general condition, freedom of movement through full range. Check for proper travel, security of attachment, and for evidence of wear. Check friction locks for proper operation.	•				E
J	4 Cowl Flap Controls - Check freedom of movement through full travel.	•				
J	5 Ignition Switch and Electrical Harness - Inspect for damage, condition, and security.		•			
J	6 Firewall Structure - Inspect for wrinkles, damage, cracks, sheared rivets, etc. Check cowl shock mounts for condition and security.			•		
J	7 Engine Shock Mounts, Engine Mount Structure, and Ground Straps - Check condition, security, and alignment.			•		
J	8 Induction System - Check security of clamps, tubes, and ducting. Inspect for evidence of leakage.	•				
J	9 Induction Air Filter - Remove and clean. Inspect for damage, and service per paragraph 2-24.		•		F	
J	10 Induction Airbox, Valves, Doors, and Controls - Remove air filter and inspect hinges, doors, seals, and attaching parts for wear and security. Check operation. Clean and inspect air filter and re-oil if flock-coated.		•			
J	11 Alternate Induction Air System - Check for obstructions, operation, and security.	•				
J	12 Alternator - Check brushes, leads, commutator or slip ring for wear.					G
J	13 Alternator, Mounting Bracket, and Electrical Connections - Check condition and security. Check alternator belts for condition and proper adjustment. Refer to Paragraph 16-42 for belt tension.	•				
J	14 Starter, Starter Solenoid, and Electrical Connections - Check for condition of starter brushes, brush leads, and commutator.		•			H
J	15 Oil Cooler - Check for obstructions, leaks, and security of attachment.	•				
J	16 Exhaust System - Inspect for cracks and security. Air leak check exhaust system. Refer to Section 11 and 11A, Paragraphs 11-98 and 11-75A, for inspection procedures.	•				
J	17 Exhaust System (turbocharged engine) - Inspect couplings, seals, clamps, and expansion joints for cracks. Air leak check exhaust system.	•				
J	18 Auxiliary (Electric) Fuel Pump (T182) - Check pump and fittings for condition, operation, security. Remove and clean filter (as applicable).		•			
J	19 Engine-Driven Fuel Pump - Check for evidence of leakage, security of attachment, and general condition.		•			
J	20 Magnetos - Inspection, lubrication, and overhaul procedures.				I	

(Extract from the C182 Service Manual. This extract is for reference only)

	2-50 INSPECTION TIME LIMITS. (MODEL 182 & T182 AIRPLANES.)	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTIONS HOURS	SPECIAL INSPECTIONS YEARS
J	21 Magnetos - Check external condition, security, and electrical leads for condition. Check timing to engine and internal timing if engine timing requires adjustment.		•		J	
J	22 Magnetos - Timing procedures and intervals.				K	
J	23 Ignition Harness and Insulators - Check for proper routing, deterioration, and condition of terminals.		•			
J	24 Spark Plugs - Remove, clean analyze, test, gap, and rotate top plugs-to-bottom and bottom plugs-to-top.		•			
J	25 Cylinder Compression - Perform differential compression test.			•		
J	26 Carburetor - Drain and flush carburetor bowl, clean inlet strainer, and drain plug. Check general condition and security.		•			
J	27 Engine Primer - Check for leakage, operation, and security.		•			
J	28 Hoses, Metal Lines, and Fittings - Inspect for signs of oil and fuel leaks. Check for abrasions, chafing, security, proper routing and support and for evidence of deterioration.	•				L
J	29 Cold and Hot Air Hoses - Check condition, routing, and security.		•			
J	30 Engine Cylinders, Rocker Box Covers, and Pushrod Housings - Check for fin damage, cracks, oil leakage, security of attachment, and general condition.		•			
J	31 Turbocharger (if applicable) a. Inspect turbocharger mounting bracket, ducting, linkage, and attaching parts for general condition, linkage or damage, and security of attachment. b. Check waste gate, actuator, controller, oil and vent lines, overboost relief valve, and compressorhousing for leakage, apparent damage, security of attachment,and evidence of wear. Check waste gate return spring for condition and security.		• •		M	
J	32 Turbocharger (if applicable) a. Remove heat shields and inspect for burned areas, bulges or cracks. Remove tailpipe and ducting - inspect turbine for coking, carbonization, oil deposits, and turbine impellers for damage.			•		
J	33 Engine Baffles and Seals - Check condition and security of attachment	•				
J	34 Engine Oil Change Short Oil Filter (approximately 4 8 inches) a Replace Filter. b. Add recommended grade aviation oil to replace oil lost in existing filter Without Oil Filter - Drain oil sump and oil cooler, inspect and clean screens, and refill with recommended grade aviation oil	•			N	
J	35 Long Oil Filter (approximately 5 8 inches) - Drain oil sump and oil cooler, replace filter element, refill with recommended grade aviation oil.		•		N	

(Extract from the C182 Service Manual. This extract is for reference only)