



AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8656	
Aircraft Registration	ZS-LTJ	Date of Accident	18/05/2009		Time of Accident	1000Z
Type of Aircraft	Cessna 210N		Type of Operation		Private	
Pilot-in-command Licence Type		Commercial	Age	39	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	1 056		Hours on Type	20
Last point of departure		Private runway near Moketsi, Limpopo Province				
Next point of intended landing		Tzaneen Aerodrome (FATZ), Limpopo Province				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Runway 24 Tzaneen Aerodrome (S 23° 49.413' E 030° 19.505;), at an elevation of 1 914 ft						
Meteorological Information		Surface wind 225°M at 5 kts, visibility >10 km, temperature 22°C				
Number of people on board	1 + 0	No. of people injured	0	No. of people killed	0	
Synopsis						
<p>On 18 May 2009, the aircraft was flown on a ferry flight from a private aerodrome near Moketsi to Tzaneen Aerodrome (FATZ).</p> <p>The pilot elected to land on runway 24 at Tzaneen Aerodrome (FATZ). Approximately 800 m after the aircraft touched down, both main landing gear struts collapsed. The aircraft then veered to the right, off the runway, coming to rest approximately 8 m from the runway edge.</p> <p>Following the aircraft recovery, the aircraft was placed on jacks for extension and retraction testing. During the retraction and extension tests, the battery became low on power and it was noted that the battery could not deliver enough power to the electrical hydraulic pump to provide adequate system pressure to lock the main landing gear in the down position.</p> <p>The pilot was not injured during the accident sequence. Minor damage was caused to the aircraft.</p>						
Probable Cause						
Incorrectly adjusted landing gear micro switch						
Contributory Factor						
Low battery voltage						
IARC Date				Release Date		



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Montina Boerdery Partnership
Manufacturer : Cessna Aircraft Company
Model : T210N
Nationality : South African
Registration Marks : ZS-LTJ
Place : Tzaneen Aerodrome (FATZ)
Date : 18 May 2009
Time : 1000Z

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 two hours.

Purpose of the Investigation :

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997), 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 establish legal liability**.*

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

- 1.1.1 On 18 May 2009 at approximately 0815Z, the pilot took off from Rand Aerodrome (FAGM) to a private aerodrome near Moketsi in the Limpopo Province.
- 1.1.2 The pilot stated that when he reached the Zebediela Estates (abeam Lebowakgomo), the electrical low-voltage warning light illuminated. The pilot verified the ammeter, which indicated a negative charge rate. The pilot then immediately switched off all lights in an attempt to preserve battery power.
- 1.1.3 On approach for landing at Moketsi, the low-voltage warning light went out and the ammeter indication was normal. The pilot joined overhead Moketsi and then onto a left downwind for runway 20. Landing gear was selected down, the green landing gear down and lock position indicator light was on, and an uneventful landing was executed.
- 1.1.4 After landing, the pilot recommended to the owner of the aircraft that it would be advisable to ferry the aircraft to an aircraft maintenance organisation (AMO) to investigate the electrical fault that was experienced on the flight from Rand Aerodrome. The owner agreed to the suggestion and asked the pilot to ferry the aircraft to an AMO immediately, as he needed the aircraft the following day for another flight to Rand Aerodrome.

- 1.1.5 The pilot was not able to start the aircraft's engine due to low battery power. An external battery pack was used to start the engine.
- 1.1.6 The pilot then took off and flew to Tzaneen Aerodrome (FATZ). Approximately 5 minutes into the flight, the power supply to the aircraft's radio, GPS and transponder became intermittent, resulting in the components switching off and on intermittently. The pilot then switched off the avionics master switch and pulled the alternator circuit breaker. He then reset the circuit breaker and switched the avionics master switch back on – the operation of the radio, GPS and transponder resumed as per normal.
- 1.1.7 The pilot joined the traffic pattern overhead Tzaneen Aerodrome and flew a left downwind for landing onto runway 24. On downwind, the pilot selected landing gear down. The pilot stated that after selecting the landing gear down he had a green landing gear down and locked indicator light, but the intensity of the light was not as bright as during normal operations. He then confirmed the status of the landing gear by means of the underwing mirror on the right-hand wing. The landing gear appeared to be down and locked.
- 1.1.8 The pilot stated that as he was turning onto final approach for runway 24 at FATZ, the radio, GPS and transponder switched on and off intermittently as they were doing en route. The pilot also recalled that the electrical hydraulic pump was still running at this time and was making an unusual noise; however, the noise stopped. The pilot selected full flaps for landing and the aircraft touched down at a speed of approximately 90 kts.
- 1.1.9 The pilot continued with his landing roll and at a speed of approximately 45-50 kts, but 800 m after touchdown, the pilot experienced a "sloppy" feeling in the tail of the aircraft. The aircraft then veered off the runway. The pilot immediately shut down the engine, closed the fuel selector and retracted the flaps.
- 1.1.10 The aircraft then skidded on the grass clearway next to the runway before coming to a standstill approximately 30 m from the runway edge (Figure 1). The pilot immediately disembarked from the aircraft and when he was outside the aircraft, he realised the nose landing gear was still in the down and locked position but both main landing gear legs had collapsed during the landing sequence.

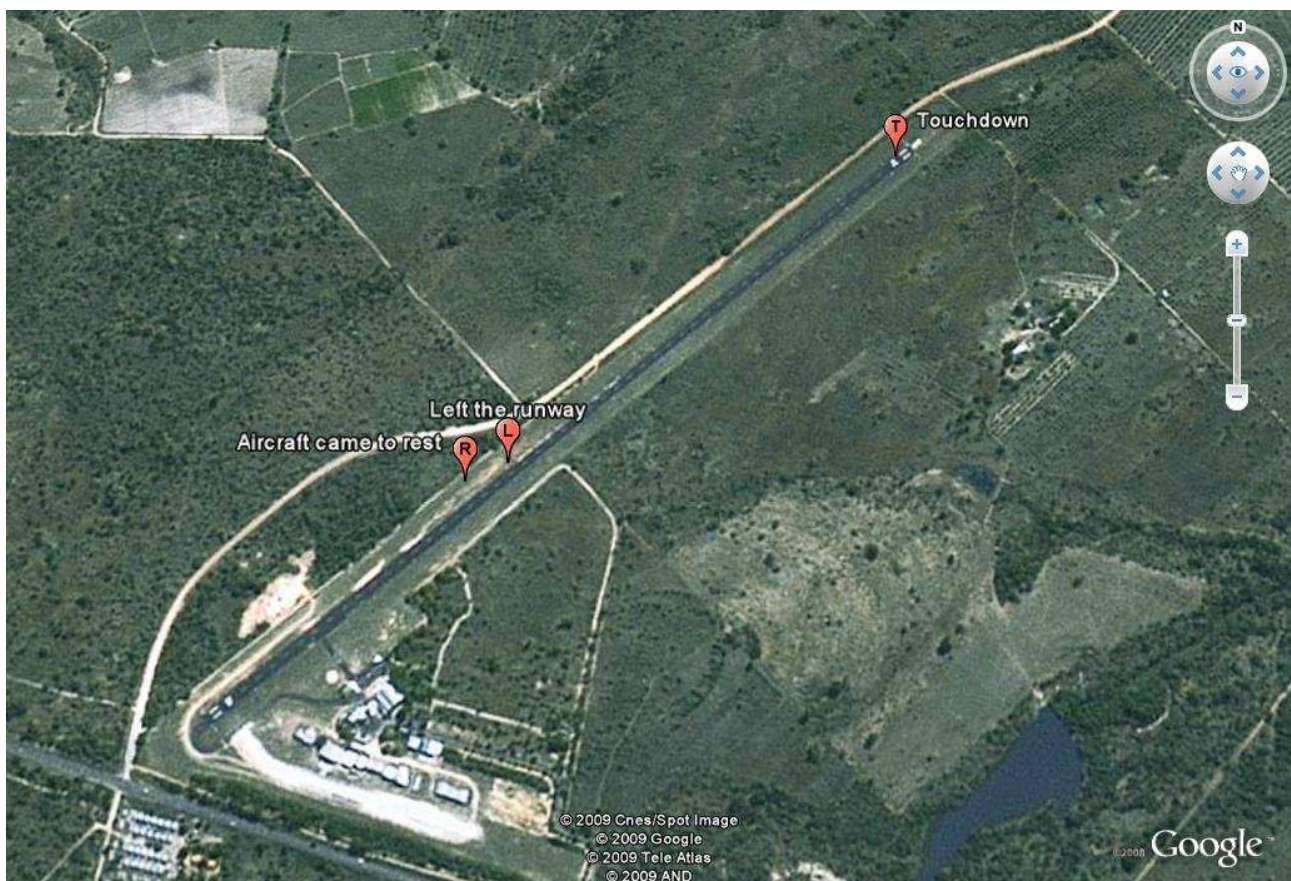


Figure 1: Map of Tzaneen Aerodrome

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

- 1.3.1 Damage was caused to the lower fuselage area and the right-hand horizontal stabiliser (Figure 2 and Figure 3).



Figure 2: Damage to the lower fuselage of the tail section



Figure 3: Damage to the right-hand horizontal stabiliser

1.4 Other Damage

1.4.1 No other damage was caused during the accident sequence.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	39
Licence Number	*****	Licence Type	Commercial		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night rating, Instrument rating				
Medical Expiry Date	31/01/2010				
Restrictions	None				
Previous Accidents	None				

1.5.1 Flying Experience:

Total Hours	1 056
Total Past 90 Days	58.9
Total on Type Past 90 Days	12
Total on Type	20

1.6 Aircraft Information

1.6.1 Airframe:

Type	Cessna 210N	
Serial Number	210-63176	
Manufacturer	Cessna Aircraft Company	
Year of Manufacture	1979	
Total Airframe Hours (At Time of Accident)	2 846.7	
Last MPI (Date & Hours)	29/08/2008	2 767.0
Hours Since Last MPI	79.7	
C of A (Issue Date)	06/06/2006	
C of R (Issue Date) (Present Owner)	12/10/2006	
Operating Categories	Standard	

1.6.2 Engine:

Type	Continental TSIO-520-R
Serial Number	517156
Hours Since New	2 846.7
Hours Since Overhaul	538.7

1.6.3 Propeller:

Type	McCauley D3A34C402
Serial Number	051841
Hours Since New	384.4
Hours Since Overhaul	TBO not yet reached

1.7 Meteorological Information

- 1.7.1 The following meteorological information was obtained from the pilot's questionnaire:

Wind Direction	225°TN	Wind Speed	5 kts	Visibility	10 000 m
Temperature	22 °C	Cloud Cover	Clear sky	Cloud Base	N/a
Dew Point	Unknown				

1.8 Aids to Navigation

- 1.8.1 The aircraft was equipped with standard navigational equipment as per the Minimum Equipment List approved by the regulator. There were no recorded defects to any navigational equipment prior to the flight.

1.9 Communications

- 1.9.1 The aircraft was equipped with two very high frequency (VHF) radios as per the Minimum Equipment List approved by the Regulator. There were no recorded defects to communication equipment prior to the flight. The pilot communicated on frequency 124.8 MHz when entering the circuit at FATZ.

1.10 Aerodrome Information

Aerodrome Location	10 nm east of Tzaneen	
Aerodrome Co-ordinates	S 23°49'24.0" E 030°19'36.0"	
Aerodrome Elevation	1 914 ft	
Runway Designations	06/24	
Runway Dimensions	1 420 m x 20 m	
Runway Used	24	
Runway Surface	Asphalt	
Approach Facilities	Non-directional beacon (NDB)	

1.11 Flight Recorders

- 1.11.1 The aircraft was not fitted with a flight data recorder (FDR) or a cockpit voice recorder (CVR), and neither were required by existing regulations to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

- 1.12.1 The accident site:

The aircraft landed on runway 24 at FATZ and approximately 800 m after touchdown, veered right, off the runway. The aircraft came to rest on the grass

clearway next to the runway, approximately 75 m after the aircraft had veered off the runway surface.

1.13 Medical and Pathological Information

1.13.1 The pilot was not injured during the accident sequence.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was considered survivable as no damage was caused to the structure of the cockpit area and the pilot was wearing a safety harness, which did not fail during the accident sequence.

1.16 Tests and Research

1.16.1 After the accident, the aircraft was recovered and placed on jacks, but no retraction tests could be done immediately as the battery was discharged. After the battery was charged, a number of retraction tests were performed and no abnormalities were found with the landing gear system.

1.16.2 During the retraction and extension tests, the battery became low on power and it was noted that the battery could not deliver enough power to the electrical hydraulic pump to provide adequate system pressure to lock the main landing gear in the down position.

1.16.3 When the same retraction and extension tests were performed using the manual (emergency) hand-pump system, the landing gear operated normally, although the right-hand main landing gear locked just before the left-hand main landing gear.

1.16.4 During the retraction and extension tests with the hand pump, it was found that the left-hand landing gear was not locked yet, but the green light, which should indicate that the landing gear is down and locked, had already illuminated in the cockpit. It was found that the micro-switch on the left-hand main landing gear, which is responsible for the down-and-locked signal to the green indicator light, was missed aligned.

1.17 Organisational and Management Information

1.17.1 The aircraft was privately operated by the owner. The owner was not a pilot and therefore made use of the services of a commercial pilot to fly his aircraft.

1.17.2 The last mandatory inspection on the aircraft was done by an approved maintenance organisation on 29/08/2008, at 2 767 hours. The maintenance organisation was in possession of an approved AMO certificate.

1.18 Additional Information

1.18.1 The aircraft was previously involved in two landing gear-related incidents:

1. On 22/05/2006, while the aircraft was being towed, the nose wheel collapsed when the aircraft was towed through a ditch.
2. On 09/07/2008, the left-hand main landing gear collapsed during landing. This gear collapse was as a result of a hydraulic fluid leak in the system.

1.18.2 The electrical problem experienced on the return flight from Rand Aerodrome, the morning before the accident flight, was not recorded in the aircraft's flight folio.

1.18.3 Evidence also indicates that the aircraft had an electrical problem on 05/03/2009. An approved AMO replaced a voltage regulator on the aircraft following the defect. No evidence could be found in the aircraft's flight folio indicating this problem was reported or rectified. The information only became available following a discussion with the pilot.

1.18.4 According to the CAR, Part 91.03.5, the following points are applicable:

1. The owner or operator of a South African registered aircraft shall ensure that the aircraft carries a flight folio or any other similar document which contains the information as prescribed in Document SA-CATS-OPS 91, at all times.
2. All entries shall be made immediately upon completion of the occurrence to which they refer.

1.18.5 The pilot indicated to the investigator that prior to the flight, during his pre-flight inspection, he did not test the landing gear and horn as stipulated in Section 4, Normal Procedures of the Pilot's Operating Handbook: "Landing Gear Lights and Horn-Press to Test".

1.18.6 System description from Pilot Operating manual

"During a normal cycle, the gear stops full up or locks down, and the position-indicator light (amber for up and green for down) comes on. When the light illuminates, hydraulic pressure will continue to build until a pressure switch turns off the hydraulic pump. The gear is held in the full-up position by hydraulic pressure. If the system pressure drops below minimum, the power pack pressure switch will turn the power pack on and return the pressure to maximum, except when the nose gear safety (squat) switch is open.

A landing gear safety (squat) switch, actuated by the nose gear strut, electrically prevents inadvertent retraction by the electrically driven hydraulic power pack whenever the nose gear strut is compressed by the weight of the airplane. When the nose gear is lifted off the runway during take-off, the squat switch will close, causing the power pack to operate for 1 to 2 seconds, which will return system pressure to maximum in the event pressure has dropped."

The landing gear system is held in the down-and-locked position by means of a mechanical lock. If hydraulic pressure is lost after extension of the landing gear, a spring assembly maintains pressure on the lock to keep it in place.

- 1.18.7 After the accident, the aircraft was flown from Tzaneen Aerodrome (FATZ) to Wonderboom Aerodrome (FAWB) for repairs. During this flight, the electrical system did not charge the battery in flight. At the time this report was completed, the cause of the electrical problem was not yet established.

1.19 Useful or Effective Investigation Techniques

- 1.19.1 None.

2. ANALYSIS

- 2.1 Verification of the pilot-in-command's personal file confirms that he was in possession of a commercial pilot's licence (aeroplane). He was rated on the Cessna 210 and various other aircraft and had an instrument and night flying rating endorsed in his licence. He had a total of 1 056 hours, of which only 20 hours was on the C210 type aircraft. At the time of the accident, the pilot was in possession of a valid medical certificate.
- 2.2 The aircraft's log books were verified and all records indicated that the airframe and engine were properly maintained and all work carried out was properly certified.
- 2.3 could be found in the aircraft's flight folio as to the reason for the replacement.
- 2.4 On 18 May 2009 during a flight before the accident flight, the pilot experienced an electrical problem on a flight from Rand Aerodrome to Moketsi. No evidence could be found in the aircraft's flight log of any electrical defects on this day.
- 2.5 No electrical power was available from the aircraft's battery after the accident when the aircraft was placed on jacks to perform a retraction-and-extension test.
- 2.6 Once the battery was charged, all extension-and-retraction tests were normal and no abnormality was observed during the performance of these tests.
- 2.7 The investigator is of the opinion that the strange noise of the hydraulic pump was as a result of reduced battery power, which prevented the pump from turning (operating) at full capacity.
- 2.8 The investigator is of the opinion that the battery could not produce enough electrical power to the hydraulic pump to provide enough hydraulic power to allow the landing gear to move past the centre point of travel in order to lock in the down-and-locked position. The full flap configuration and the speed during landing produce enough lift to keep the weight off the gear, allowing for the landing roll of 800 m. After 800 m, the speed reduced to approximately 45-50 kts. This speed was not enough to produce the necessary lift to keep the fuselage weight off the wheels and as a result the main landing gear collapsed.
- 2.10 Due to the low speed at the time the landing gear collapsed, only minor damage was caused to the horizontal stabiliser and the underside of the tail section.

- 2.11 The most likely weather conditions at the time and place of the accident as obtained from the pilot questionnaire indicate fine weather with good visibility, and a 5 kt wind in a south-westerly direction.

3. CONCLUSION

3.1 Findings

- 3.1.1 The pilot was correctly licensed, medically fit and qualified to conduct the flight.
- 3.1.2 The aircraft's flight folio was not properly completed and did not reflect previous electrical defects as required by Part 91 of the Civil Aviation Regulations.
- 3.1.3 The maintenance records (aircraft log books) indicated that the aircraft was maintained in accordance with existing regulations and approved procedures.
- 3.1.4 The aircraft's battery could not produce sufficient electrical power after the accident to retract or extend the landing gear.
- 3.1.5 With electrical battery power restored, landing gear retraction and extension tests during the post-accident investigation procedure were faultless.
- 3.1.6 The accident was survivable due to the fact that no damage was caused to the cockpit area and the fact that the safety harness was used by the pilot during the accident.
- 3.1.7 Fine weather conditions that prevailed at the time had no effect on the accident.

3.2 Probable Cause/s

- 3.2.1 Incorrectly adjusted landing gear micro switch

3.3 Contributory Factor

- 3.3.1 Low battery voltage

4. SAFETY RECOMMENDATIONS

- 4.1 None.

5. APPENDICES

- 5.1 None.

Report reviewed and amended by Advisory Safety Panel: 29 September 2009.

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