



## AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	<b>CA18/2/3/8440</b>	
<b>Aircraft Registration</b>	ZS-PWN	<b>Date of Accident</b>	17 February 2008		<b>Time of Accident</b>	1110Z
<b>Type of Aircraft</b>	Cessna U206F		<b>Type of Operation</b>	Domestic charter		
<b>Pilot-in-command Licence Type</b>		Commercial	<b>Age</b>	23	<b>Licence Valid</b>	Yes
<b>Pilot-in-command Flying Experience</b>		Total Flying Hours	729.9		Hours on Type	198.1
<b>Last point of departure</b>		Garonga Safari Camp (private aerodrome)				
<b>Next point of intended landing</b>		Kruger Mpumalanga International Aerodrome (FAKN)				
<b>Location of the accident site with reference to easily defined geographical points (GPS readings if possible)</b>						
Garonga Safari Camp (GPS co-ordinates: S 24° 06.236' E 030° 43.078'), elevation 1 650 ft above mean sea level (AMSL)						
<b>Meteorological Information</b>		Surface wind 190° at 10 kts, temperature 32°C, CAVOK				
<b>Number of people on board</b>	1 + 2	<b>No. of people injured</b>	0 + 1	<b>No. of people killed</b>	0	
<b>Synopsis</b>						
<p>The pilot took off, with two passengers, on a domestic charter flight from Garonga Safari Camp to Kruger Mpumalanga International Aerodrome (FAKN).</p> <p>The passengers arrived and boarded the aircraft, and both passengers occupied the second row of seats behind the pilot. Following the safety briefing, the pilot started the engine and backtracked the aircraft for take-off on runway 18. According to the pilot, as the aircraft rotated, he heard a loud bang from the front of the aircraft as if the nose wheel tyre had burst. Not entirely sure what had happened, he decided to abort the take-off and landed back on the remaining runway surface available. Following touchdown, he applied maximum braking in order to bring the aircraft to a halt before the end of the runway. However, the aircraft started to veer to the left and overran the end of the runway, where after it collided with a tree and several dry tree stumps that were lying in the area.</p> <p>The pilot and one of the passengers, who was seated directly behind him, were not injured in the accident. The second passenger strained her right ankle. She received medical attention at the lodge, following the accident.</p>						
<b>Probable Cause</b>						
<p>Following an aborted take-off, the pilot was unable to bring the aircraft to a stop in the runway distance available, and the aircraft collided with a tree after exiting the runway.</p>						
<b>IARC Date</b>				<b>Release Date</b>		



## AIRCRAFT ACCIDENT REPORT

**Name of Owner** : Flamingo Moon Trading 260 (Pty) Ltd  
**Name of the Operator** : General Airways Charters CC  
**Manufacturer** : Cessna Aircraft Company  
**Model** : U206F  
**Nationality** : South African  
**Registration Marks** : ZS-PWN  
**Place** : Garonga Safari Camp  
**Date** : 17 February 2008  
**Time** : 1110Z

*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 produce without prejudice to the rights of the CAA, which are reserved.*

## **1. FACTUAL INFORMATION**

### **1.1 History of Flight:**

1.1.1 The pilot joined overhead Garonga Safari Camp and followed the unmanned aerodrome procedure prior to landing. The wind was assessed by the pilot to be from the south at about 10 kts. Following an uneventful landing on runway 18 at Garonga, the pilot taxied towards the collecting area where he had to uplift two passengers for a domestic charter flight to Kruger Mpumalanga International Aerodrome (FAKN).

1.1.2 The passengers arrived and boarded the aircraft, and both passengers occupied the second row of seats behind the pilot. The pilot then conducted a safety briefing prior to the flight. Following the safety briefing, the pilot started the engine and backtracked the aircraft for take-off on runway 18. According to the pilot, he turned onto the runway approximately 100 m after the threshold in order to avoid the first section of the runway surface as the area contained a substantial amount of stones. He commenced with the take-off roll and as the aircraft rotated, the pilot heard a loud bang emanating from the front of the aircraft, as if the nose wheel tyre had burst. Not entirely sure what had happened, he decided to abort the take-off and landed back on the remaining runway surface available. According to the pilot's recollection of the event, he landed back past the runway halfway mark, with a flap setting of 10° (take-off flap setting). Following touchdown, he applied maximum braking in order to bring the aircraft to a halt before the end of the runway. However, the aircraft started to veer to the left and overran the end of the runway, colliding with a tree and several dry tree stumps that were lying in the area. Following impact with these obstacles, the nose wheel fork assembly fractured at its attachment to the strut assembly. This caused the propeller to strike the ground and the aircraft came to rest in a nose-down attitude.

1.1.3 The accident occurred in daylight conditions at a geographical position determined to be S 24° 06.236' E 030° 43.078', at an elevation of 1 650 feet above mean sea level AMSL.

1.1.4 The passenger that was seated in the right-hand seat in the second row strained her right ankle in the accident and received medical attention at the lodge following the accident. The pilot and second passenger were not injured in the accident.

## 1.2 Injuries to Persons:

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

### 1.3 Damage to Aircraft:

1.3.1 The aircraft sustained substantial damage when it collided with a tree and several tree stumps that were lying on the ground. The aircraft was fitted with a cargo pod, which was substantially damaged during the impact sequence. The left wing made contact with the ground, the nose gear assembly broke off at the lower end of the oleo strut and the propeller struck the ground.



Figure 1: A view of the left wing



Figure 2: The aircraft in a nose-down attitude following nose landing gear separation

### 1.4 Other Damage:

1.4.1 Apart from minor damage to vegetation around the accident scene, there was no other damage.

### 1.5 Personnel Information:

1.5.1 Pilot-in-command:

Nationality	South African	Gender	Male	Age	23
Licence Type	Commercial				
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instrument				
Medical Expiry Date	31 January 2009				
Restriction/s	Next ECG 2012				
Previous Accidents	None				

\*NOTE: The pilot had flown to Garonga Safari Camp on seven previous occasions prior to the flight in question, with the first flight on 12 November 2007.

Flying Experience:

Total Hours	729.9
Total Past 90 Days	159.7
Total on Type Past 90 Days	159.7
Total on Type	198.1

## 1.6 Aircraft Information:

### 1.6.1 Airframe:

Type	Cessna U206F	
Serial Number	206-02581	
Manufacturer	Cessna Aircraft Company	
Year of Manufacture	1975	
Aircraft Certification Status	Type Certified	
Total Airframe Hours (At Time of Accident)	7 424.2	
Last MPI (Hours & Date)	7 401.0	6 February 2008
Hours Since Last MPI	23.2	
C of A (Issue Date)	20 July 2007	
C of A (Currency Expiry Date)	19 July 2008	
C of R (Issue Date) (Present owner)	24 October 2007	
Operating Categories	Standard	

### 1.6.2 Engine:

Type	Teledyne Continental IO-520F
Serial Number	810173-R
Hours Since New	Unknown according to engine logbook
Hours Since Overhaul	227.0

### 1.6.3 Propeller:

Type	Hartzell PHC-C3YF-1RF
Serial Number	EE 5088-B
Hours since New	1 125.0
Hours since Overhaul	TBO not yet reached

### 1.6.4 Weight and Balance:

Item	Weight (kg)	Arm (inches)	Moment
Aircraft	996	33.0	32 868
Pilot	100	37	3 700
Passengers (2 x 70 kg)	140	70	9 800
Baggage (2 x 30 kg)	60	127	7 620
Fuel (180 l)	130	46.5	6 045
<b>Total take-off weight</b>	<b>1 426</b>	<b>42.1</b>	<b>60 033</b>

The maximum certified take-off weight for the aircraft was not allowed to exceed 1 633kg (3 600 lbs) according to the pilot's operating handbook (POH), Section 1, Pages 1 – 4.

The aircraft was loaded within the Centre of Gravity (CG) envelope of the aircraft at the time of take-off from Garonga Safari Camp.

### 1.6.5 Aircraft Take-off Distance Performance:

The POH, Section 5, Performance includes a take-off distance graph that the pilot can consult to assist him or her with flight planning, and especially the take-off distance required. However, the graph is only applicable to paved, level, dry runway surfaces with an aircraft configured with cowl flaps open and a 20° flap setting.

With reference to the accident in question, the investigator consulted the take-off performance graphs for the ground-roll distance required as well as the distance required to clear a 50 ft obstacle at the end of the runway with safety.

For the purpose of the calculations, the pressure altitude was taken as 2 000 ft, the temperature as 30°C and aircraft at maximum take of weight (MTOW). The actual

pressure altitude at Garonga Safari Camp was 1 650 ft and the temperature was 32 °C.

According to the POH take-off distance table (Figure 5-4 in the manual) the ground roll required was 1 200 ft (365.85 m) and the distance to clear a 50 ft obstacle was 2 430 ft (740.85 m).

Taking into account that a 10 kt headwind prevailed during take-off, the take-off distance table allowed for a 10% decrease in the distance required, reducing this to 666.85 m (see below).

$$1\ 200 \times 10\% = 1\ 200 - 120 = 1\ 080 \text{ ft or } 329.3 \text{ m ground roll}$$

$$2\ 430 \times 10\% = 2\ 430 - 243 = 2\ 187 \text{ ft or } 666.85 \text{ m to clear a 50 ft obstacle}$$

However, a dry grass covered runway surface, requires that the take-off distance be increased by 15%, which increased the distance to clear a 50 ft obstacle to 766.76 m (see below).

$$1\ 080 \times 15\% = 162 + 1\ 080 = 1\ 242 \text{ ft or } 368.66 \text{ m ground roll}$$

$$2\ 187 \times 15\% = 328 + 2\ 187 = 2\ 515 \text{ ft or } 766.76 \text{ m to clear a 50 ft obstacle}$$

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**TAKEOFF DISTANCE**  
**MAXIMUM WEIGHT 3600 LBS**

SECTION 5  
 PERFORMANCE

CONDITIONS:  
 Flaps 20°  
 2850 RPM and Full Throttle Prior to Brake Release  
 Mixture Set at Placard Fuel Flow  
 Cowl Flaps Open  
 Paved, Level, Dry Runway  
 Zero Wind

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	24
2000	23
4000	22
6000	21
8000	20

- NOTES:
1. Maximum performance technique as specified in Section 4.
  2. Where distance value has been deleted, climb performance after lift-off is less than 150 fpm at takeoff speed.
  3. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
  4. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
3600	58	66	S.L.	810	1600	870	1716	935	1845	1000	1985	1076	2135
			1000	885	1755	950	1890	1020	2035	1095	2190	1176	2365
			2000	985	1935	1040	2085	1115	2250	1200	2430	1290	2630
			3000	1080	2140	1140	2310	1225	2500	1320	2710	1415	2945
			4000	1185	2380	1250	2575	1345	2795	1450	3040	1560	3320
			5000	1280	2660	1375	2890	1485	3145	1595	3445	1720	3790
			6000	1410	2985	1520	3270	1635	3580	1765	3950	1900	4390
			7000	1555	3405	1680	3740	1810	4135	1950	4615	---	---
			8000	1720	3925	1860	4380	2005	4890	---	---	---	---

CESSNA  
 MODEL U206F

Figure 5-4. Takeoff Distance (Sheet 1 of 2)

Figure 3: Figure 5-4 in the POH



1.6.6 Stopping Distance:

As the aircraft was already airborne at the time of the pilot’s decision to abort, applying the landing distance information as tabled in the POH, Section 5, Performance (pages 5 – 7) is necessary to obtain an approximation of the distance required to stop. The POH states that for operation on a dry grass runway, the distance should be increased by 40% of the ground-roll figure. If a landing with flaps up is necessary, an allowance of 45% should be applied.

With a pressure altitude of 1 650 ft and a temperature of 32°C, the distance to stop could be as much as 830 ft (253 m). With an additional 45% for the dry grass runway surface, the total distance to stop could be 1 203 ft (366 m).

**LANDING DISTANCE**

**SHORT FIELD**

CONDITIONS:  
Flaps 40°  
Power Off  
Maximum Braking  
Paved, Level, Dry Runway  
Zero Wind

NOTES:  
1. Short field technique as specified in Section 4.  
2. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.  
3. For operation on a dry, grass runway, increase distances by 40% of the “ground roll” figure.  
4. If a landing with flaps up is necessary, increase the approach speed by 11 KIAS and allow for 45% longer distances.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
3600	64	S.L.	695	1340	720	1375	750	1415	775	1450	800	1490
		1000	720	1375	750	1415	775	1450	800	1490	830	1530
		2000	750	1415	775	1455	805	1495	830	1530	860	1575
		3000	775	1455	805	1495	835	1540	865	1580	890	1615
		4000	805	1495	835	1540	865	1580	895	1625	925	1665
		5000	835	1540	870	1585	900	1630	930	1675	960	1715
		6000	870	1590	900	1630	935	1680	965	1725	995	1770
		7000	905	1635	935	1680	970	1730	1000	1775	1035	1825
8000	940	1690	970	1730	1005	1780	1040	1830	1075	1880		

Figure 5-11. Landing Distance

Figure 4: Figure 5-11 in the POH

From the calculations, it would appear that the distance from take-off and to land back and stop the aircraft would be at least 367 m + 366 m = 733 m.

1.7 Meteorological Information:

1.7.1 The following weather information was obtained from the pilot’s questionnaire:



Wind direction	190°	Wind speed	10 kts	Visibility	> 10 km
Temperature	32°C	Cloud cover	Nil	Cloud base	Nil
Dew point	Unknown				

### 1.7.2 Density Altitude:

Pressure Altitude	1 650 ft
Temperature	32°C
<b>Density Altitude</b>	<b>3 500 ft</b>

### 1.7.3 Meteorological Aeronautical Report (METAR)

A METAR was obtained for Hoedspruit/Eastgate Aerodrome (FAHS) for 17 February 2008 at 1100Z, as FAHS is the closest registered aerodrome to Garonga Safari Camp, being 26nm away. The following weather conditions prevailed at FAHS at the time:

Wind	-	110° at 6 kts
Temperature	-	30°C
Dew point	-	13°C

## 1.8 Aids to Navigation:

1.8.1 The aircraft was equipped with standard navigational equipment. It also had a panel-mounted Garmin 100 global positioning system (GPS) onboard, which was utilised by the pilot for navigational purposes.

## 1.9 Communications:

1.9.1 The lodge was located outside of controlled airspace and the pilot broadcast his intentions prior to take-off on the VHF frequency 124.8 MHz.

## 1.10 Aerodrome Information:

Aerodrome Location	Garonga Safari Camp	
Aerodrome Co-ordinates	S 24° 06.236' E 030° 43.078'	
Aerodrome Elevation	1 650 ft	
Aerodrome Status	Unlicensed (private)	
Runway Designations	18/36	
Runway Dimensions	1 100 m x ± 40 m	
Runway Used	Runway 18	
Runway Surface	Grass / Gravel	
Approach Facilities	None	

The runway at Garonga Safari Camp was located on private property, and was neither registered nor licensed with the SACAA. Therefore, the SACAA does not have oversight empowerment over the relevant aerodrome.



**Figure 5:** A view of the runway taken on 18 February 2008 from the threshold of runway 36

## 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 were these required by regulations to be fitted on this aircraft type.

## 1.12 Wreckage and Impact Information:

1.12.1 The aircraft veered to the left and ran off the end of the runway following an aborted take-off, and impacted with a tree approximately 80 m beyond the end of the runway. Following the impact sequence, the left wing tip made contact with the ground and bent upwards approximately 50 cm inwards of the wing tip. Two of the three propeller blades displayed bend marks near the tip area and the nose wheel collapsed as it impacted with several dry tree stumps that were lying in close proximity to the tree into which the aircraft had collided. The cargo pod that was secured to the lower fuselage of the aircraft was also substantially damaged.



**Figure 6:** The aircraft it collided with a tree and the nose wheel collapsed

## 1.13 Medical and Pathological Information:

1.13.1 The pilot was in possession of a valid aviation medical certificate at the time of the accident.

1.13.2 The passenger that was seated on the right in the second row of seats strained her right angle during the impact sequence. No other injuries were reported.

#### **1.14 Fire:**

1.14.1 There was no pre- or post-impact fire.

#### **1.15 Survival Aspects:**

1.15.1 The accident was regarded as survivable. Impact with the tree occurred at a relatively slow forward speed. All three occupants were properly restrained by aircraft-equipped safety harnesses.

1.15.2 The passenger that was seated in the second row of seats on the right-hand side of the aircraft strained her right angle during the impact sequence. No other injuries were reported.

#### **1.16 Tests and Research:**

1.16.1 During the on-site investigation, it was noted that one of the propeller blades, Part no. F8468A-6R, Serial no. K 76896, displayed evidence of blade damage, most probably as a result of impact with a foreign object near the tip of the blade. One blade sustained very little impact damage compared to the other two blades. The damaged surfaces were inspected by a magnifying glass and the damage appeared to be very recent in nature. It was decided to have the damage on the blade evaluated in a laboratory examination.

The investigation report pertaining to the propeller blade in question can be found attached to this report as Annexure C.

#### **1.17 Organisational and Management Information:**

1.17.1 This was a domestic charter flight that was operated by General Airways Charters CC. The operator was in possession of a valid Air Operating Certificate

(AOC), no. N554D, and was approved to operate under Part 135 of the Civil Aviation Regulations of 1997. The operator was also in possession of a valid Air Service Licence.

1.17.2 The AOC was valid until 19 January 2009. (A copy of AOC attached to this report as Annexure A.) The aircraft in question was duly authorised to operate under the AOC. The passengers were issued with tickets for the flight.

1.17.3 The last maintenance that was carried out on the aircraft prior to the accident was certified by aircraft maintenance organisation (AMO) no. 914. The AMO was in possession of a valid AMO Approval Certificate, with an expiry date of 28 February 2008.

## **1.18 Additional Information:**

### **1.18.1 On-site Investigation:**

The investigator in charge (IIC) and co-investigator flew to Garonga Lodge in a Cessna 206. On joining overhead the aerodrome, it was noted that the windsock that was located on the right-hand side of runway 18 was in a dilapidated state and of no use to assist the pilot in assessing the prevailing wind at the time.

During the on-site investigation, the IIC walked a few hundred meters of the runway, which consisted of grass-covered surface. At the time of the accident, it was fairly dry in the area, which had an effect on the condition of the grass on the runway surface. It was noted that the soil surface between the grass consisted of rocks and stones of different sizes.

In an on-site interview with the pilot, he mentioned that he had heard a loud noise (bang) that emanated from the front of the aircraft as he rotated but had no idea what had caused the noise. Although he thought it might have been the nose wheel tyre that had burst, the nose wheel tyre was found to be still inflated. During the subsequent inspection of the aircraft, it was noted that one of the propeller blades, although not damaged in the accident sequence, displayed evidence of damage from the impact of a foreign object near the tip of the blade. The damage was inspected with a magnifying glass and appeared to be very recent in nature and due to impact with a solid object. The source of this damage could not be established with certainty, and neither could the source of the loud noise (bang).

Further evidence indicated that the aircraft veered to the left near the end of runway 18 and collided with a tree approximately 80 m past the end of the runway surface. The collision caused the nose landing gear fork assembly to separate from the oleo strut. The pilot was not able to identify the location on the runway where the aircraft touched down following the decision to abort the take-off, nor was it possible to determine such position due to the nature of the runway surface as well as other wheel markings caused by the manoeuvring of other aircraft that landed and took off from the runway following the accident.

#### 1.18.2 Passenger Statement:

A statement was obtained from a passenger, whose recollection of the accident was different in several aspects to that of the pilot. The information contained below was applicable from the time that the two passengers boarded the aircraft and the pilot conducted his safety briefing until such time that the passenger informed the pilot that he smelt fuel once they had disembarked from the aircraft following the accident.

“He explained the safety issues of the aircraft and proceeded to taxi up the airstrip in a southerly direction.

I was somewhat surprised when the pilot, instead of heading for the end of the landing strip before turning for take-off, stopped the aircraft at approximately halfway along the strip and proceeded to turn the aircraft in such a manner so as to ensure that the aircraft was facing north, that is, facing down a downward gradient in readiness for take-off.

I was concerned, but did not voice my concern, that the pilot, by turning halfway along the landing strip, was not allowing himself and the aircraft sufficient length of landing strip to take off safely with sufficient allowance for emergencies.

It appeared to me that our take-off speed was inadequate and not sufficient to achieve a safe lift-off. This became more evident when a building at the end of the landing strip appeared to become closer and closer without the aircraft having achieved a safe and sufficient speed for take-off.

When the pilot actually commenced lift-off, I realised, a few metres off the ground, that the aircraft had not achieved a sufficient and safe speed and height to fly over



the building.

The pilot obviously also realised that he was about to strike the building and suddenly aborted the take-off. The nose of the plane dropped and struck the ground. The front wheel of the aircraft broke off on impact.

The pilot could not control the aircraft once it struck the ground and we struck a tree. It was fortunate that we struck the tree, as there was a gully behind the tree. The tree prevented the aircraft from diving into the gully.

The pilot immediately left the aircraft without ensuring that my wife and myself were safe or without ensuring that he assisted us in leaving the aircraft. We had to leave the aircraft on our own. I was shocked at the pilot's conduct in exiting the aircraft without attending to his passengers. I assisted my wife off the aircraft and she had difficulty in view of an apparent ankle injury.

When my wife and I had exited the aircraft, I remember smelling aviation fuel and was concerned that the aircraft would catch fire. I approached the pilot to tell him to cut the fuel lines, which he did not do. I had to quickly board the plane in order to remove our luggage, which I was concerned might be damaged or lost if the aircraft caught fire. The pilot never helped me.”

### **1.19 Useful or Effective Investigation Techniques:**

1.19.1 None.

## **2. ANALYSIS**

2.1 Fine weather conditions prevailed at the time, with a southerly wind being reported by the pilot at an estimated strength of approximately 10 kts. Taking the prevailing wind conditions into consideration, the pilot elected runway 18 for landing as well as take-off. The prevailing wind at FAHS, which was located approximately 26 nm south-east of Garonga Safari Camp and as such was the closest licensed aerodrome to Garonga, was 110° at 6 kts.



- 2.2 The pilot was the holder of a valid commercial pilot's licence and had flown to Garonga Safari Camp on seven previous occasions prior to the flight in question, with the first flight being on 12 November 2007. Therefore, he was familiar with the aerodrome. The runway surface consisted of dry grass, which increased the take-off distance required by 15%. According to the take-off distance graph in Section 5 of the POH, the take-off roll required was 368 m and the distance required to clear a 50 ft obstacle was 766 m.
- 2.3 According to the pilot, he used a displaced threshold for take-off by discarding the first 100 m of the available runway length, thereby leaving him with 1 000 m available runway length for take-off, which was well within the take-off distance requirements as calculated utilising the POH. However, the passenger indicated that they commenced the take-off from halfway along the runway in his statement. The investigator cannot agree with this statement, as that would only have left them with an available runway length of 550 m for take-off. The required ground take-off roll according to the POH was 368 m and they could have used even more, whereafter the aircraft become airborne at approximately 70 mph. The distance required to clear a 50 ft obstacle was calculated at approximately 766.76 m. It is doubtful that the pilot would have jeopardised safety to such an extent by only utilising half of the available runway length for the take-off. It should be kept in mind that the aircraft became airborne and that once the pilot had made the decision to land back, he still had in his mind that there was sufficient runway length available to bring the aircraft to a safe stop. According to the POH, landing distance required was calculated at 1 162 feet (354 m). However, this value does not make provision for a 10° flap setting on landing but only provides for a 40° flap setting (full flaps). The absence of additional drag and full flaps at 40° had a direct increase in the landing distance required. The speed on touchdown was most probably also slightly higher than during a normal approach for landing, which could further have increased the landing distance required.
- 2.4 According to available evidence, namely the last five pages of the aircraft flight folio, in which no defects were recorded, the aircraft was serviceable prior to the flight. As the aircraft, rotated the pilot heard a loud noise (bang) emanating from the front of the aircraft. He was not sure what had caused the noise and thought that it might have been the nose wheel tyre that had burst. He then made the decision to land back on the remaining available runway length. However, he was unable to bring the aircraft to a stop on the remaining runway length and impacted with a tree and dried tree stumps. During the post-crash investigation, inspection of the propeller

revealed damage on the propeller that indicated that it might have picked up a hard object, most probably during the take-off run just prior to rotation. This could have been the sound the pilot had perceived to be a burst nose wheel tyre.

- 2.5 Examination of the propeller, and especially one of the blades, displayed evidence of damage by a foreign object that could not have been associated with the nose wheel collapse since the propeller RPM at the time of impact with the tree and tree stumps was at idle, as the pilot had closed the throttle following the aborted take-off. The engine was only switched off once the aircraft came to a halt and the pilot completed his shutdown checks. Foreign matter was detected in one of the indentations on the blade. The indentation markings were inspected on-site by making use of a magnifying glass, and appeared to be very recent in nature. The structure of the sediment type was analysed using a stereo and scanning electron microscope (SEM), and was found to be of a sediment type structure, most probably from a stone or similar sediment type of material.
- 2.6 The nose wheel tyre was inspected during the on-site investigation and did not display any abnormalities that could have cause a noise (bang) as described by the pilot, as it was still inflated. The damage evident on the propeller as well as the foreign matter that was detected in one of the indentations confirmed that the markings on the blade originated following impact with a foreign object (such as a stone), which could have occurred during the take-off run just prior to or on rotation. The pilot then made a split-second decision to land back on the runway length available, not entirely sure of what had caused the noise and the severity thereof.
- 2.7 The pilot was unable to bring the aircraft to a stop on the runway length available and collided with a tree and dry tree stumps in the overrun area. It should be noted that this was an unlicensed aerodrome located on a game lodge, and was surrounded by bush vegetation. The aircraft started to veer slightly to the left as the speed decreased following the aborted take-off, although it really didn't matter which heading the pilot attempted to maintain, once cleared of the runway surface the entire overrun area contained various obstructions/hazards in the form of trees, shrubs and dry tree stumps lying in the area.
- 2.8 The speed of the aircraft had decreased substantially by the time it impacted with the tree, as can be ascertained by the damage sustained by the aircraft. No evidence of any cockpit/cabin deformation was found. It was clear that the nose wheel strut assembly failed following impact with a dry tree stump that it was lying next to, as the aircraft came to rest. The fact that the pilot did not make use of the

entire runway length that was available to him should be regarded as a significant factor in this accident as it might have changed the outcome, with the possibility being that the aircraft could have been brought to a halt prior to impact with the tree. However, the discrepancy between the actual take-off position according to the pilot and that of the passenger is of concern. It still remains the investigator's view that the take-off was not conducted by making use of only half of the available runway length.

### **3. CONCLUSION**

#### a) Findings:

- (i) The pilot was the holder of a valid commercial pilot's licence and had the aircraft type endorsed on his licence.
- (ii) The pilot had flown to Garonga Safari Camp on seven previous occasions prior to the flight in question.
- (iii) The aircraft was maintained in accordance with the approved maintenance schedule.
- (iv) The operator was the holder of a valid Air Operating Certificate, no. N544D, and tickets were issued for the flight.
- (v) No mechanical malfunctions by the aircraft were recorded or reported prior to the accident, which could have contributed to or have caused the occurrence.
- (vi) Weather was not considered to be a factor in this accident, with the wind from the south at 10 kts (headwind).
- (vii) The runway was located on a private game lodge and was unlicensed.
- (viii) The runway surface consisted mainly of grass, which was fairly dry at the time.
- (ix) The take-off run was not commenced from the threshold of runway 18. The pilot opted for a displaced threshold take-off, which was some distance from

the original threshold.

- (x) The runway end safety area had several trees and dry tree stumps that obstructed the clearway, resulting in the subsequent collision.
  - (xi) The aircraft was loaded within the prescribed limitations as stipulated in the POH.
  - (xii) The accident was regarded as survivable.
  - (xiii) Available evidence indicates that the propeller picked up a foreign object, most probably a stone or similar sediment type of material.
- b) Probable Cause/s:
- (i) Following an aborted take-off, the pilot was unable to bring the aircraft to a stop in the runway distance available and the aircraft collided with a tree after exiting the runway.
- c) Contributory Remarks:
- (i) With the pilot not certain as to what has caused the noise (bang) shortly after rotation, he made a decision to abort the take-off and land back on the runway length available.
  - (ii) The take-off run was not commenced from the threshold of runway 18. The pilot opted for a displaced threshold take-off by discarding the first approximately 100 m of the available runway length (actual distance not available).

#### **4. SAFETY RECOMMENDATIONS**

- 4.1 In the interests of aviation safety, it is recommended that the Commissioner for Civil Aviation in collaboration with the Aerodrome Safety Department determine a minimum standard to which all unlicensed aerodromes should adhere to.

- 4.2 It is recommended that the SACAA Aerodrome Safety Department include all unlicensed aerodromes available in their quest to register Category Z aerodromes (registered aerodromes). Charter operators are operating on a regular basis to and from these lodges. The basic requirements as requested by Category Z status aerodromes would be beneficial to the promotion of aviation safety at these locations.

## **5. APPENDICES**

- 5.1 Annexure A (Air Operating Certificate, no. N544D, for General Airways Charters)  
5.2 Annexure B (Copy of information brochure on Garonga Safari Camp Aerodrome)  
5.3 Annexure C (CrashLab Metallurgical Examination Report)

Compiled by:

Report reviewed and amended by Advisory Safety Panel: 25 August 2009.

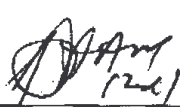
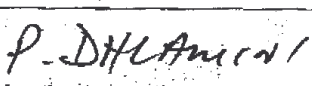
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**ANNEXURE A**



**SOUTH AFRICAN CIVIL AVIATION AUTHORITY  
CIVIL AVIATION REGULATIONS. 1997**

**OPERATING CERTIFICATE PART 135**

File number	CAA/N544D						
Operating certificate number	N544D						
This is to certify that	GENERAL AIRWAYS CHARTER CC						
Trade name	GENAIR						
Of:	P.O. BOX 15634, SINOVILLE, 0129						
Base of Operations:	WONDERBOOM AIRPORT						
To whom (a) Class/Classes	II						
License(s), number(s)	N544D						
	N1 / N2	A3 / A4					
Dated:	09 DECEMBER 1997 / 24 JANUARY 2007						
<p><i>Has been authorized to operate the said air service(s) in accordance with the operations manual approved in terms of regulation 135.04.2(3) of the Civil Aviation Regulations 1997, read together with section 19 (b) of the Air Services Licensing act, 1990 (Act no 115 of 1990) and/or section 20 (1) (b) of the International Air Services act, 1993 (Act no 60 of 1993) and the provisions of the said two Acts relating to the licensing and operation of the relevant air service(s).</i></p>							
<p align="center">THE FOLLOWING AIRCRAFT ONLY ARE AUTHORISED FOR PART 135 OPERATION</p>							
ZS-SMC	ZS-TKB	ZS-OFD	ZS-CWM	ZS-PFG	ZS-PCM	ZS-VAN	ZS-OXV
ZS-LXY	ZS-NOX	ZS-MDU	ZS-PNF	ZS-PWN	ZS-PFS		
<p>Expiry Date 19 JANUARY 2009</p>							
<p>Issued at Midrand on the 22<sup>nd</sup> day of January 2008</p>							
<p>Pp:  Commissioner for Civil Aviation</p>		<p> <b>SENIOR MANAGER</b> FLIGHT OPERATIONS CIVIL AVIATION AUTHORITY</p>					
<p align="center"><i>This certificate was issued without any alteration or erasure.</i></p>							

**ANNEXURE B**



**J III**  
**GARONGA**  
S a f a r i C a m p

**GARONGA SAFARI CAMP AIRSTRIP INFORMATION**

**CO-ORDINATES:** S 24 06. 548'  
E 30 43. 690'

**LENGTH:** 1100m

**ALTITUDE:** 1650ft

**FACING:** NORTH – SOUTH

**DESCRIPTION:**  
GRASS STRIP RUNNING PARALLEL TO A LARGE OPEN AREA.

**OBSTRUCTIONS:**  
SOUTHERN END – LARGE HILL PLUS TREES 50m FROM THE STRIP.

AT THE NORTHERN END ON THE WESTERN SIDE IS A LARGE VERY NICE  
HOUSE – IT'S MINE; PLEASE MISS IT!

**PLEASE COMPLETE INDEMNITY BEFORE USING THE AIRSTRIP AND FAX  
TO GARONGA SAFARI CAMP ON 015 318 7902. THE STRIP IS  
UNREGISTERED.**

THANKS

B.J.SMITH

Reg No. 96406437/07. Director: B.J. Smith (British)  
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Garonga Safari Camp: tel: +27 82 440 3522, Fax: +27 15318 7902, e-mail: safari@garonga.com, website: www.garonga.com

**ANNEXURE C**

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COMPILED FOR: Civil Aviation Authority		DOCUMENT NUMBER MET-002-01-08	
	INVESTIGATION REPORT: PROPELLER DAMAGES CESSNA 401 ZS-PWN	DATE 2008-06-02	ISSUE 1

ITEM: PROPELLER ASSEMBLY, CESSNA 401, ZS-PWN

## 1. INTRODUCTION

1.1. The impact damaged propeller from a Cessna 410, aircraft number ZS-PWN, was submitted to determine the following with regard to the impact damages:

- (a) Possible foreign object type and origin.
- (b) Possible position/time of impact related to the take-off sequence.


1.2. The aircraft was exposed to a gravel runway take-off. Prior to rotating the pilot reported a propeller impact and decided to abort the take-off. The aircraft came to rest against a tree as indicated in Photo 1. The pilot's actions immediately following the perceived propeller impact included the setting of the throttle to 'idle'. No engine cut until impact with tree.



**Photo 1: Accident site (Courtesy SACAA)**

1.2. This report is divided into the following sections:

- |                                |        |
|--------------------------------|--------|
| (a) INTRODUCTION               | Par. 1 |
| (b) APPLICABLE DOCUMENTS       | Par. 2 |
| (c) DEFINITIONS                | Par. 3 |
| (d) INVESTIGATOR               | Par. 4 |
| (e) APPARATUS AND METHODOLOGY  | Par. 5 |
| (f) INVESTIGATION              | Par. 6 |
| (g) DISCUSSION AND CONCLUSIONS | Par. 7 |
| (h) RECOMMENDATIONS            | Par. 8 |
| (i) DECLARATION                | Par. 9 |

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COMPILED FOR: Civil Aviation Authority		DOCUMENT NUMBER MET-002-01-08	
	INVESTIGATION REPORT: PROPELLER DAMAGES CESSNA 401 ZS-PWN	DATE 2008-06-02	ISSUE 1
<p><b>2. APPLICABLE DOCUMENTS</b></p> <p>(a) None.</p> <p><b>3. DEFINITIONS</b></p> <p>(a) OEM Original Equipment Manufacturer  (b) CAA Civil Aviation Authority  (c) SEM Scanning Electron Microscope  (d) EDS Energy Disperse X-ray Analysis System</p> <p><b>4. PERSONNEL</b></p> <p>(a) The investigative member and compiler of this report is Mr C.J.C. Snyman, ID number 6406105057080. Mr Snyman is a qualified Physical Metallurgist (H.N.Dip Metallurgical Engineering, Tech. PTA), Radiation Protection Officer (RPO) registered with the National Nuclear Regulator (NNR) and Aircraft Accident Investigator (SCSI).</p> <p><b>5. APPARATUS AND METHODOLOGY</b></p> <p>(a) The apparatus employed for this investigation are Stereo Microscopes and Digital Camera.</p> <p>(b) The methodology included a visual investigation of supplied parts followed by a Stereoscopic and SEM/EDS investigation.</p> <p><b>6. INVESTIGATION</b></p> <p>6.1. <b>Visual, Stereo-and Scanning Electron Microscope Investigation.</b> The visual inspection revealed impact marks in the tip area (Photo 2, red arrow) as well as previously blended out damage to the leading edge (Photo 2, blue arrow) of the propeller. Closer inspection suggests that the impact damages were induced by a hard object and at a possible high propeller speed (Photo 3, blue arrows). Some foreign matter was detected in one of the indentations (Photo 3, red arrow). These deposits proved to be of a sediment type structure (Photo 4), most probably from stone or similar sediment type of material/s. The EDS results (attached) suggest a typical clay based material.</p>			



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INVESTIGATION REPORT:  
PROPELLER DAMAGES  
CESSNA 401 ZS-PWN

DOCUMENT NUMBER  
MET-002-01-08

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2008-06-02

ISSUE  
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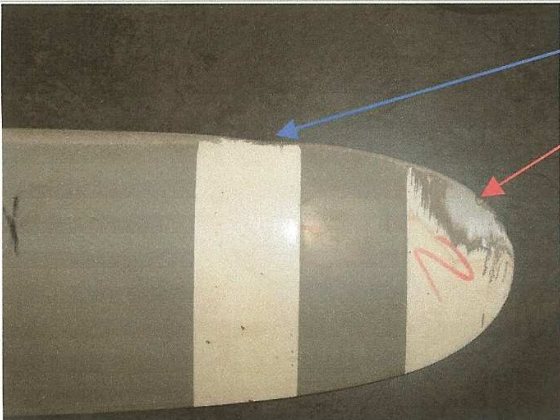


Photo 2: Propeller tip area (digital)

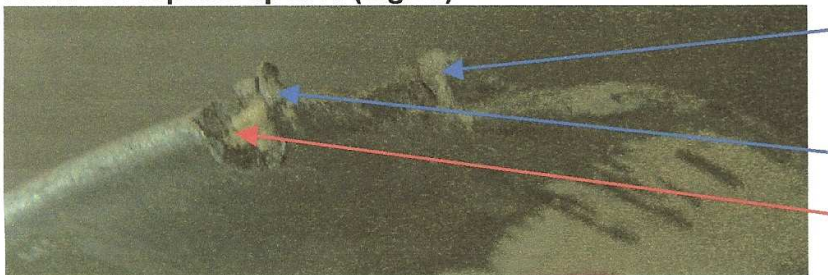


Photo 3: Impact marks, propeller tip area (digital)

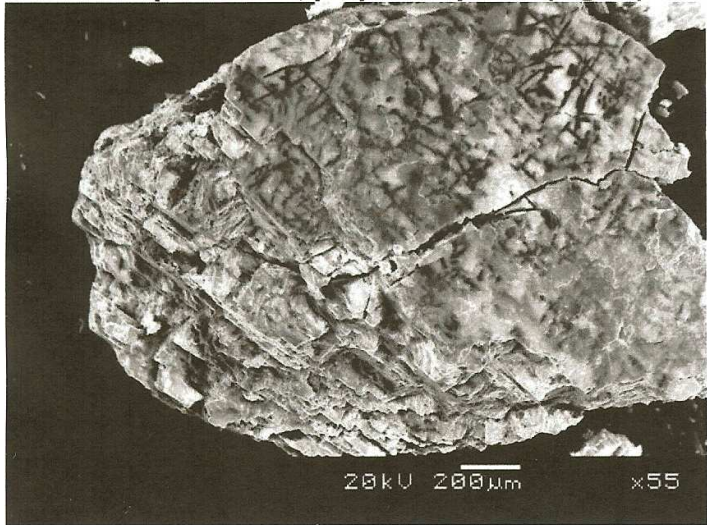


Photo 4: Foreign deposits (x55, SEM)

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**7. DISCUSSION AND CONCLUSIONS**

- Notes:**
- (a) All conclusions are based on the results obtained from the supplied parts only.
  - (b) Only a photo-analysis was completed on the actual accident site as supplied by the SACAA.

7.1. The damages to propellers A and B (Photo 5) suggest a low rpm, low power impact, most probably induced following the nose-wheel collapse. This may be confirmative of the throttle setting on impact with the tree. Propeller C, also the one under investigation, showed no clear bending damages indicating that it was not exposed to a full rotation of the assembly after the nose-wheel collapse.

7.2. Taking this into account as well as the indications of impact damages induced by a hard object under higher propeller speed, it can be derived that the impact damages to propeller C were inflicted prior to the nose-wheel collapse and tree impact.

7.3. Furthermore, if the pilot's report with regard to the position/time of change in throttle setting from full to idle is indeed correct, it can also be derived that the impact damages to propeller C was inflicted during the take-off roll phase.



**8. RECOMMENDATIONS**

8.1. None applicable.