SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-12a

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA/18/2/3/9524	
Aircraft Registration	**ZS-VOL**	**Date of Accident**	4 March 2016		**Time of Accident**	12:53
Type of Aircraft	Cirrus SR22		**Type of Operation**		Private - Part 24	
Pilot-in-command Licence Type	Private Pilot's Licence		**Age**	37	**Licence Valid**	Yes
Pilot-in-command Flying Experience	Total Flying Hours		186,2		Hours on Type	81,7
Last point of departure	Vredendal aerodrome (FAVR), Western Cape					
Next point of intended landing	Driefontein airfield, North West.					
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Next to a railway line close to Driefontein farm at Fochville						
Meteorological Information	Wind: 080˚/5kt; Temperature: 26˚C; Dew point: Unknown; Cloud: Clear skies; Visibility: >10km					
Number of people on board	1 + 3	**No. of people injured**	4	**No. of people killed**	0	

Synopsis

The pilot, accompanied by three passengers, took off on a private flight from Vredendal aerodrome in the Western Cape for Driefontein airfield, an unmanned aerodrome near Fochville in North West. The flight was conducted under VFR conditions. On arrival at Driefontein – his first visit here – the pilot conducted a low-level inspection of the runway, then commenced his approach for runway 21.

According to the pilot, he configured the aircraft appropriately and was expecting a normal landing. It appears, however, that he was caught off guard by the upslope of the runway. During the landing roll, he realised that he was running out of runway and decided to initiate a go-around. This decision came too late and the aircraft failed to get airborne by the time it reached the end of the runway. It continued straight ahead, crashed through the perimeter fence, skidded over a provincial road and came to a halt against a tree.

Probable Cause

Unsuccessful touch and go, due to insufficient remaining runway.

SRP Date	17 January 2017	Release Date	06 February 2017

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** K2014238670 (South Africa) Pty Ltd
Name of Operator	**:** K2014238670 (South Africa) Pty Ltd
Manufacturer	**:** Cirrus Design Corporation
Model	**:** Cirrus SR22
Nationality	**:** South African
Registration Marks	**:** ZS-VOL
Place	**:** Driefontein Farm Airfield at Fochville in North West.
Date	**:** 4 March 2016
Time	**:** 12:53

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

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 The pilot, accompanied by three pasengers, took off on a private flight from Vredendal aerodrome (FAVR) in the Western Cape to Driefontein farm airfield, near Fochville in North West. The flight was conducted under VFR conditions. After take-off, the pilot climbed to 9 500ft and maintained cruising speed of 163kt to Driefontein. The flight was uneventful and after three-and-a-half hours, the aircraft reached its destination.

1.1.2 On arrival at Driefontein farm, his first visit to this unmanned airfield, the pilot conducted a low-level runway inspection. He saw that the runway was clear and the windsock indicated a light, southerly wind. He therefore decided to land on runway 21. He knew that the runway was 1 300m long, a sufficient distance for the landing. He also knew that the runway had an upslope towards the end and prepared for this.

1.1.3 The pilot touched down at 80kt IAS and immediately applied pressure on the brakes. He then realised that he would be unable to bring the aircraft to a halt before the end of the runway, which was just over the top of the slope, so opted to do a go-around. He applied full power and the aircraft accelerated for the short distance to the top of the slope. When he reached the top, however, it was still not airborne, but by then he was committed to the take-off.

1.1.4 The aircraft reached the top of the slope, continued at speed down the other side, and ran off the end of the runway. It had just started to rotate and was about 1m off the ground when it crashed through the perimeter fence and gate 160m distance beyond the end of the runway. The impact with the fence caused structural damage to the aeroplane, which then skidded across a road into an area of long grass. It finally came to a halt against a tree on the edge of an embankment next to the railway line. The aircraft sustained substantial damage during the impact sequence, but the pilot and passengers suffered only minor injuries.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	1	-	3	-
None	-	-	-	-

1.3 Damage to Aircraft

1.3.1 The aircraft sustained substantial damage in the accident.

Figure 1: The wreckage of ZS-VOL.

1.4 Other Damage

1.14.1 Damage was caused to the farm gate, the surface of the road and the security fence of the railway line.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	37
Licence Number	0270479926	Licence Type	Private Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 January 2016				
Restrictions	None				
Previous Accidents	None				

Flying Experience

Total Hours	186,2
Total Past 90 Days	22,3
Total on Type Past 90 Days	22,3
Total on Type	81,7

1.5.1 The pilot's personnel information contained no anomalies.

1.6 Aircraft Information

Airframe

Type	Cirrus SR22	
Serial Number	2181	
Manufacturer	Cirrus Design Corporation	
Date of Manufacture	2006	
Total Airframe Hours (At time of Accident)	819,2	
Last MPI Inspection (Date & Hours)	12 August 2015	615,2
Hours since Last MPI Inspection	204,0	
Certificate of Airworthiness (Issue Date)	Unknown	
C of R (Issue Date) (Present owner)	K2014238670 (South Africa) (Pty) Ltd	
Operating Categories	None	

Engine

Type	Continental IO-550-N
Serial Number	68996H
Hours since New	819,2
Hours since Overhaul	TBO not reached

Propeller

Type	Hartzell PHC-J3YF-1RF/F7694
Serial Number	FP5094B
Hours since New	819,2
Hours since Overhaul	TBO not reached

1.7 Meteorological Information

Wind direction	080˚	Wind speed	5kt	Visibility	Clear >10 km
Temperature	26˚C	Cloud cover	Clear	Cloud base	Clear
Dew point	Unknown				

1.7.1 The above weather conditions were submitted to the SACAA by the pilot, who stated that he had obtained the data from the SA Weather Service website. He landed into the wind and the weather conditions played no part in the accident.

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with navigation and pitot-static systems (primary flight display and multi-function display). The pilot flew the aircraft under VFR conditions by day, so the standard navigation equipment installed was all he required for the flight. The navigation equipment was serviceable and the pilot experienced no problems with it before or during the flight.

1.9 Communications

1.9.1 The accident took place at an unlicensed private aerodrome without communication facilities.

1.10 Aerodrome Information

Aerodrome Location	Driefontein (FADF)	
Aerodrome Co-ordinates	S26˚34’48.5” E027˚26’34.2”	
Aerodrome Elevation	4 780ft	
Runway Designations	03/21	08/26
Runway Dimensions	1 300m x 15m	850m x 15m
Runway Used	21	
Runway Surface	Gravel	
Approach Facilities	None	

1.10.1 The accident took place at an unlicensed, private, civilian aerodrome 6,5 nautical miles south-west of Fochville, North West. The pilot was attempting to land on runway 21 when the accident occurred.

1.11 Flight Recorders

1.11.1 The civil aviation regulations (CAR) do not require that flight recorders be installed in this category of aircraft.

1.12 Wreckage and Impact Information

1.12.1 This was based on an explanation from the pilot. He stated that he had approached from a southerly direction to land on runway 21. The runway sloped upwards for a short distance towards the end.

Figure 2: The upslope of runway 21. The end of the runway is a short distance from the top of the slope

1.12.2 The pilot applied the brakes just after touchdown, realised that there was insufficient stopping distance before the end of the runway, and applied full power to execute a take-off and go-around. However, by the time the aircraft reached the end of the runway just beyond the crest of the slope, it was still not airborne. As the pilot was already committed to the take-off, there was no possibility of aborting it. The aircraft continued with the take-off run downslope, lifting about 1m off the ground. The left wing tip then struck the perimeter fence gate, which was about 1m high, and a substantial section of the wing tip was ripped off.

Figure 3: The left wing tip broke off after striking the gate.

1.12.4 The disabled aeroplane skidded across the 8,5m-wide main road alongside the fence, slid across a small grassy patch, crashed through a railway line security fence, and came to a halt against a small tree at the top of an embankment next to the railway line. The aircraft sustained substantial structural damage.

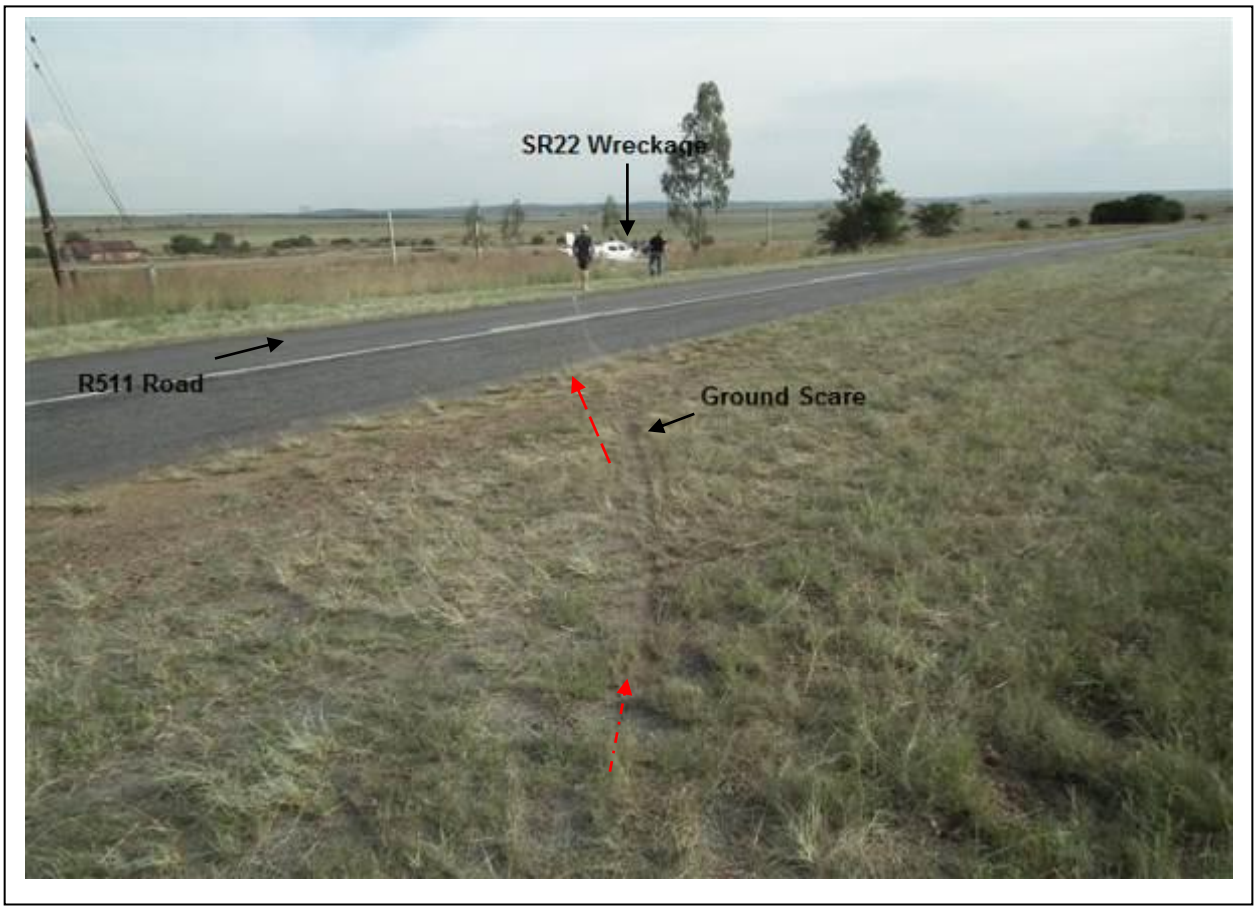

Figure 4: The ground marks produced by ZS-VOL as it skidded to a halt.

Figure 5: An aerial view of the accident scene.

1.12.5 Extensive damage was caused to the nose section, engine compartment, landing gear, propeller and both wings.

Figure 6: The front of the aircraft and the wings were badly damaged.

1.12.6 The aircraft came to a halt close to the Johannesburg-Potchefstroom railway line. Due to the obvious risks involved, the rail service provider installed a temporary repair to the security fence damaged by the aircraft.

Figure 7: The wreckage of the aeroplane, showing its proximity to the steep embankment alongside the Johannesburg-Potchefstroom railway line.

1.13 Medical and Pathological Information

1.13.1 The pilot and passengers sustained minor injuries in the accident. They were taken to a hospital in Potchefstroom for observation, but were not admitted.

1.14 Fire

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

1.15 Survival Aspects

1.15.1 The accident was survivable due to the relatively low impact forces involved. The cabin remained intact.

1.16 Tests and Research

1.16.1 The Cirrus SR22 pilot's operating handbook (POH) details the aircraft's take-off, landing and go-around procedures. According to the POH, the aircraft may be operated on any smooth runway surface.

1.16.2 The following should be considered when calculating landing distances in the Cirrus SR22:

1.16.2.1 Sloped runway:

Increase table distance by 27% of the ground roll distance for each 1% of downslope. Decrease table distance by 9% of the ground roll distance for each 1% upslope. The corrections for runway slope are required to be included. The corrections should be used with caution since published runway slope data are usually the net slope from one end of the runway to the other. Many runways will have portions of their lengths at greater or lesser slopes than the published slope, lengthening or shortening landing ground roll estimated from the table.

1.16.2.2 Landing distance (source: www.flightinstructorguide.com):

Landing Distance

WEIGHT = 3400 LB
Speed over 50 Ft Obstacle = 77 KIAS
Flaps - 100%· Idle · Dry, Level Paved Surface

Headwind: Subtract 10% for each 13 knots headwind.
Tailwind: Add 10% for each 2 knots tailwind up to 10 knots.
Runway Slope: Ref. Factors.

PRESS ALT FT	DISTANCE FT	TEMPERATURE ~ °C 0	10	20	30	40	ISA
SL	Grnd Roll	1082	1121	1161	1200	1240	1141
	Total	2262	2316	2372	2428	2485	2344
1000	Grnd Roll	1122	1163	1204	1245	1286	1175
	Total	2317	2374	2433	2492	2551	2391
2000	Grnd Roll	1163	1206	1248	1291	1334	1210
	Total	2375	2436	2497	2559	2621	2441
3000	Grnd Roll	1207	1251	1295	1339	1384	1247
	Total	2437	2501	2565	2630	2696	2493
4000	Grnd Roll	1252	1298	1344	1390	1436	1285
	Total	2503	2569	2637	2705	2774	2548
5000	Grnd Roll	1300	1348	1395	1443	1490	1324
	Total	2572	2642	2713	2785	2857	2605
6000	Grnd Roll	1350	1399	1449	1498	1547	1365
	Total	2645	2719	2794	2869	2945	2665
7000	Grnd Roll	1402	1453	1504	1556	1607	1408
	Total	2723	2800	2879	2958	3038	2728
8000	Grnd Roll	1456	1509	1563	1616	1669	1452
	Total	2805	2887	2969	3052	3136	2794
9000	Grnd Roll	1513	1569	1624	1679	1735	1497
	Total	2892	2978	3064	3152	3240	2863
10000	Grnd Roll	1573	1630	1688	1746	1803	1545
	Total	2984	3074	3165	3257	3350	2936

Note: Based on the above table, the ground roll required at a pressure altitude of 5 000ft and temperature of 20˚C, is 1 395ft (425m), and total landing distance is 2 713ft (827m).

1.16.3 The following should be considered when calculating take-off distances:

1.16.3.1 Sloped runway:

Increase table distances by 22% of the ground roll distance at sea level, 30% of the ground roll distance at 5 000ft, 43% of the ground roll distance at 10 000ft for each 1% of upslope. The corrections for runway slope are required to be included. The corrections should be used with caution since published runway slope data are usually the net slope from one end of the runway to the other. Many runways will have portions of their lengths at greater or lesser slopes than the published slope, lengthening or shortening take-off ground roll estimated from the table.

1.16.3.2 Take-off distance (source: www.flightinstructorguide.com):

WEIGHT = 2900 LB
Speed at Liftoff = 70 KIAS
Speed over 50 Ft Obstacle = 74 KIAS
Flaps - 50% · Takeoff Pwr · Dry Paved

Headwind: Subtract 10% for each 12 knots headwind.
Tailwind: Add 10% for each 2 knots tailwind up to 10 knots.
Runway Slope: Ref. Factors.
Dry Grass: Add 20% to Ground Roll.
Wet Grass: Add 30% to Ground Roll.

PRESS ALT FT	DISTANCE FT	TEMPERATURE ~ °C 0	10	20	30	40	ISA
SL	Grnd Roll	610	659	710	763	818	684
	50 ft	971	1043	1118	1195	1275	1080
1000	Grnd Roll	673	727	783	841	902	743
	50 ft	1066	1146	1228	1313	1401	1170
2000	Grnd Roll	743	802	864	929	995	809
	50 ft	1173	1260	1351	1444	1541	1269
3000	Grnd Roll	821	887	955	1026	1100	880
	50 ft	1292	1388	1487	1590	1697	1378
4000	Grnd Roll	908	981	1057	1135	1217	959
	50 ft	1424	1530	1639	1753	1871	1498
5000	Grnd Roll	1006	1086	1170	1257	1348	1046
	50 ft	1571	1688	1809	1935	2065	1630
6000	Grnd Roll	1116	1205	1298	1394	1494	1143
	50 ft	1736	1865	1999	2138	2281	1775
7000	Grnd Roll	1238	1337	1440	1547	1659	1249
	50 ft	1920	2063	2211	2365	2523	1936
8000	Grnd Roll	1376	1486	1601	1720	1843	1367
	50 ft	2127	2285	2449	2619	2795	2113
9000	Grnd Roll	1532	1654	1781	1914	2051	1498
	50 ft	2359	2534	2716	2904	3099	2309
10000	Grnd Roll	1707	1843	1985	2132	2285	1643
	50 ft	2619	2814	3016	3225	3441	2527

Note: Based on the above table, the ground roll required at a pressure altitude of 5 000 feet and a temperature of 20˚C is 1 170ft (357m), and total take-off distance is 1 809 feet (551m).

(i) Normal take-off – rotate at Vr (70-73 KIAS with 50% flaps and 80 KIAS with 0% flaps). Ensure positive rate of climb, safe altitude above all obstacles and above 80 KIAS prior to retraction.

(ii) Short-field take-off – set 50% flaps, rotate at Vr (70 KIAS), pitch Vx (78 KIAS) until over obstacle, reduce pitch to regain airspeed, retract flaps to 0%. Ensure positive rate of climb, safe altitude above all obstacles and above 80 KIAS prior to retraction.

1.16.4 The following factors should be considered for a go-around:

At any point in the approach, a go-around may be executed. Smoothly apply maximum power, level the wings and transition to a pitch attitude that will slow/stop descent. After descent has stopped, reduce flaps 50%, pitch for Vy (101 KIAS), and retract flaps to 0%. Ensure positive rate of climb, safe altitude above all obstacles and above 80 KIAS prior to retraction.

1.16.5 The record of accidents and incidents shows that between 2001 and 2014, a total of 147 US-registered Cirrus SR22 aircraft crashed, resulting in 122 fatalities. By 2014, the accident rate was dramatically reduced and attributed to better training, particularly when to deploy the Cirrus Airframe Parachute System (CAPS). . (source: www.wikipedia.org Cirrus SR22). According to the manufacturer's website, the system is installed on Cirrus aircraft to ensure safety in situations where the pilot has lost control of the aircraft in flight.

1.17 Organisational and Management Information

1.17.1 The pilot who flew the aircraft was also the owner and operated it privately.

1.18 Additional Information

1.18.1 According to the pilot, this is the first time he had flown to and landed at Driefontein. While doing his flight planning, he called the owner of the farm to verify the details of the airfield and the condition of the runway.

1.18.2 The accident aircraft, like all Cirrus aeroplanes, was fitted with the CAPS. After the accident, the manufacturer raised a safety concern about the possibility of the CAPS being deployed inadvertently on the ground during the onsite investigation. The manufacturer's representatives were therefore called to disarm and remove the system from the wreckage before the aircraft was transported to Lanseria.

Pulling the CAPS red handle on the cockpit ceiling will deploy a solid-fuel rocket that pulls the parachute from its concealed storage department. It is therefore essential that all individuals who respond to a Cirrus aircraft accident or incident be made aware of this danger.

1.18.3 The pilot stated in his report that runway length was approximately 1 300m and that he landed the aircraft just after the sunflower field. This was about 580m down the runway. He indicated that after reaching the crest of the slope and the end of the runway, the aircraft was still not airborne. The end of the runway is about 160m from crest of the slope hill, and the upslope is about 4,6m in length.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1 The pilot planned to fly the Cirrus SR22 aircraft on a private flight in daylight conditions under visual flight rules. He was to be accompanied by three passengers. According to the pilot's statement, he telephoned the owner of his destination airfield while doing his flight planning. He asked about runway conditions, verified the runway length as being 1 300m, and spoke about the general conditions in and around the airfield that required awareness. It was the first time that the pilot had flown to the airfield and he wanted to ensure that the conditions were safe for landing.

2.2 After the pilot completed the flight planning, he carried out a pre-flight inspection. No anomalies were identified.

2.3 He also carried out a mass and balance calculation, which showed that take-off weight was 3 392lb (1 538,5kg), and thus within the prescribed limits. No anomalies with aircraft performance were therefore expected. Anomalies in this instance would involve take-off distance, angle of climb, rate of climb, ceiling, and range. But based on the take-off distance table, between 659ft (200m) and 1 043ft (320m) of ground run were required for a safe take-off. According to the pilot, the runway used at FAVR was approximately 900m long, which was sufficient. He executed a short-field take-off, rotating at 70 KIAS with flap setting Vfe (50%).

2.4 The pilot levelled off on FL 095 and headed 280˚ straight to Fochville airfield. Based on the POH, the aircraft range is 883NM (1 635km). The pilot reported that his maximum cruise speed was 163 KIAS over a distance of 757NM (1 402km). The difference between the range and distance flown was 126 NM. The pilot had estimated the flight time to be three hours 37 minutes, and 60ℓ of fuel were carried on board. According to the POH, fuel usage is about 12,6ℓ/hour. A total of 44,7ℓ of fuel were used. The flight to Fochville was uneventful.

2.5 Fochville airfield was an underutilised, private airfield. On arrival at the airfield, the pilot flew a low- level runway inspection flight, established from the windsock that there was a light southerly breeze, and opted to land on runway 21. The airfield has two gravel surface runways: 03/21 (1 300m x 15m) and 08/26 (850m x 15m). Runway 21, which is 8,5m wide, has a short upslope about 160m from the end. The pilot was warned by the owner to look out for this feature and should have been well prepared to handle the conditions at the airfield.

2.6 The pilot selected maximum flaps and established approach airspeed of 80 KIAS. Based on the POH, these settings were appropriate for a normal landing.

2.7 It is evident that the pilot had to be particularly careful during the approach due to the up sloping runway. It may lead to an illusion that encourages him to think that the runway continues still on from the terrain before the upslope. The evidence is that despite the potential problem of him experiencing that illusion, he proceeded to touch down just after the sunflower crop, which was about 580m in from the runway threshold. This was only 720m from the end of the runway. Extrapolating from the POH, the required ground roll landing distance was the follows:

2.7.1 At a speed over a 50ft obstacle of 80 KIAS, and at a temperature of 26˚C at 4 780ft, the total ground roll distance required was 2 362 ft (720m). The effect of the upslope shortened this distance by 30% (708ft [216m]), however. So the usable ground roll distance was in fact 1 653ft (504m).

2.8 The pilot indicated that after touching down, he applied the brakes gently to reduce the landing roll speed. But he then realised that he had insufficient stopping distance before reaching the end of the runway 160m from the crest of the slope. He decided to initiate a go-around by applying full power to take-off again. Based on the POH, the required ground roll take-off distance was the following:

2.8.1 The lift-off speed at take-off power, with 50% flap, over a 50ft obstacle is 74 KIAS. At a temperature of 26˚C at 5 000ft, the total required take-off ground roll distance will be 1 170ft (356m), or 1 809ft (551m) to clear a 50ft obstacle). The upslope will shorten the take-off ground roll distance by 30%, ie, 351ft (107m), or 541ft (165m) to clear a 50ft obstacle. This means that the usable ground roll distance was in fact 813ft (248m), or 1 266ft (386m) to clear a 50ft obstacle. If the pilot had already reached the halfway mark (1 181ft [360m] or even slightly further when he decided to do the go-around, he might have taken off safely.

2.9 In support of the above, the pilot indicated that after he had reached the top of the upslope and the end of the runway the aircraft was still not airborne. He was already committed to continue with the take-off, however, and to abort it was not an option. There was nothing else he could do but to follow the contour of the ground surface on the downslope. At this point, more or less, the aircraft was just starting to get airborne and lifted about a metre off the ground. It was at this height when the left wing tip struck the perimeter gate. The aeroplane fell to the ground again and skidded across the road and veld.

2.10 Runway 03/21 contains a safety hazard at each end. On the north-eastern end, there is the wire perimeter fence, road and railway line. On the south-western end, is a sunflower plantation. Neither end has a sufficient overrun safety area in case of an emergency situation. Wildlife on the farm is an added danger. A small private airfield such as this is not part of the regulated civil aviation industry, so any requirement to comply with applicable regulations to improve safety is not mandatory but voluntary for the owner.

2.11 After the aircraft crashed through the perimeter fence, it skidding over a public tar road parallel to the fence, slid across a grassy area and finally came to rest against a small tree on top of a steep embankment alongside the Johannesburg-Potchefstroom railway line. The aeroplane ended up a few metres from the edge of the embankment and the occupants were fortunate that the aircraft did not fall over the edge.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot in command (PIC) held a private pilot's licence (PPL) and the aircraft type rating was endorsed on it. He also had a valid Class 2 medical certificate with no medical restrictions.

3.1.2 The PIC was also the owner of the aircraft. He operated the aircraft privately in the general aviation sector.

3.1.3 A pre-flight inspection was carried out on the aircraft prior to the flight and the pilot was satisfied that the aircraft was serviceable.

3.1.4 The aircraft documents were reviewed in the investigation and it was determined that all were valid and the aeroplane was duly authorised to be operated privately.

3.1.5 The pilot indicated that while preparing for the flight and doing his flight planning, he phoned the owner of Driefontein farm airfield to find out about runway conditions.

3.1.6 During the flight planning phase, the pilot obtained a weather forecast from the South African Weather Service (SAWS) website. This indicated CAVOK conditions.

3.1.7 The pilot, accompanied by three passengers, flew the aircraft from Vredendal aerodrome (FAVR) to Driefontein farm private airfield at Fochville. The flight was uneventful.

3.1.8 The pilot indicated that prior to landing at Driefontein farm airfield; he carried out a low-level runway inspection.

3.1.9 The aircraft approached the airfield from a south-westerly direction to land on Runway 21, which is 1 300m long. The pilot indicated that he touched down just after the field of sunflowers, which meant that he had 720m of runway remaining.

3.1.10 It was calculated from the conditions at the airfield on the day that the required ground roll distance was 1 653ft (504m). A short field landing instead of a normal landing would have brought the aircraft to a halt before the end of the runway.

3.1.11 The take-off ground roll distance was calculated using the same factors as the landing ground roll distance. To take off successfully, the pilot required a ground roll distance of 813ft (248m and a total take-off distance (to clear a 50ft obstacle) of 1 266ft (386m).

3.1.12 The pilot realised during the ground landing roll that that he would not have enough stopping distance before reaching the end of the runway, which just beyond the top of the ridge.

3.1.13 By the time the aircraft reached the end of the runway, it was still not airborne. The pilot was already committed to the take-off and to abort it was not an option. The aircraft continued with the take-off run downslope, finally lifting about 1m off the ground. The left wing tip then struck the perimeter fence gate, which was about 1m high.

3.1.14 The investigation determined that the overrun safety area at each end of runway 03/21 was insufficient. Moreover, hazards existed at both ends. On the north-eastern end were wire perimeter fence, road and railway lines. On the south-western end was a cultivated field.

3.1.15 A CAPS was installed on the aircraft. This can be lethal if deployed inadvertently on the ground, and was therefore disarmed and removed before the investigation got underway.

3.2 Probable Cause/s

3.2.1 Unsuccessful touch and go, due to insufficient remaining runway.

Contributory factors:

3.2.2 Landing too deep on the runway;

3.2.4 The runway's proximity to the perimeter fence, public road and railway line, all of which presented hazardous conditions for a take-off emergency.

4. SAFETY RECOMMENDATIONS

4.1 None.

5. APPENDICES

5.1 None.

…END…