



AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8500	
Aircraft Registration	ZS-SCV	Date of Accident	24 May 2008	Time of Accident	1330Z	
Type of Aircraft	Robinson R44 Raven II		Type of Operation	Private		
Pilot-in-command Licence Type		Private pilot	Age	52	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	1471,6		Hours on Type	71,6
Last point of departure		Pietersburg Civil Aerodrome(FAPI)				
Next point of intended landing		Pietersburg Civil Aerodrome(FAPI)				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Pietersburg Civil Aerodrome S23°55' 54.79" E29°28 ' 22.25"						
Meteorological Information		Surface wind 360/05 knots; temperature 23°C; visibility: CAVOK				
Number of people on board	1 + 3	No. of people injured	4	No. of people killed	0	
Synopsis						
<p>The pilot, with 3 passengers on board, was conducting pleasure rides (flips) near the SAPS hangar on the Annual Polokwane Fly-In day. The helicopter had 40 US gallons of usable fuel prior to take-off (100 LL Avgas).</p> <p>The helicopter came into a hover on a left crosswind near the SAPS hangar and turned into wind for take-off. The helicopter went into transition, approximately 3 metres, the helicopter lost main rotor rpm and the pilot tried to recover by lowering the collective and applying aft cyclic. The tail rotor impacted the ground, which caused the nose to pitch down; the right front skid dug into the ground, helicopter rolled over to the right and caught alight.</p> <p>The investigation determined that the angle at which the helicopter took off was approximately 35 degrees nose down attitude. During the take-off sequence, the power required exceeded the power available, thus coning the blades, which required more power. The helicopter lost main rotor rpm, lost height and the pilot tried to keep level by pulling aft cyclic and raising the collective; then the helicopter impacted the ground with a tail rotor stinger because of excessive flaring. All four occupants sustained injuries and were admitted to hospital.</p>						
Probable Cause						
Helicopter lost main rotor rpm during take-off.						
Contributory factor: Incorrect technique used during take-off.						
IARC Date				Release Date		

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Collective Effort (Pty) Ltd
Manufacturer : Robinson Helicopter Company
Model : Robinson R44 Raven II
Nationality : South African
Registration Marks : ZS-SCV
Place : Polokwane Civil Aerodrome
Date : 24 May 2008
Time : 1330Z

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 (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 Saturday morning, 24 May 2008, ZS-SCV participated in the Annual Polokwane Fly-In day in a private capacity. Shortly before the start of the day's programme, the aircraft departed from the vicinity of the refuelling bay in an easterly direction. The helicopter crossed the apron, hangars and the spectator area at low altitude, after which it turned right and left the airfield. All other aircraft departed in an easterly direction, but did it south of the runway and to the north of the apron, hangars and spectator area.
- 1.1.2 The safety officer who was assigned to assist with the Fly-In operation approached the air traffic controller (ATC) to request the pilot to report to the safety officer on landing. After returning the pilot attempted to resolve the issue with the ATC on the radio. ATC requested the pilot to shut down and report to the safety officer. During the discussion the safety officer expressed his disapproval of the airmanship displayed by the pilot and issued him with a formal warning that any further misconduct would be reported to the regulator.
- 1.1.3 The pilot was conducting helicopter rides with personnel from his office in Polokwane. The pilot had been conducting repeated helicopter rides since the beginning of the show, which started approximately at 09h00Z. At approximately 1320Z he and 3 passengers departed for another helicopter ride. During transition about 3 m, the pilot experienced a decay in main rotor rpm, lowered the collective in an attempt to recover the engine rpm and used aft cyclic. The tail rotor collided with the ground, the helicopter rolled over to its left and caught alight.

- 1.1.4 A video clip was obtained at the accident site, from which it was established that the helicopter did not have an engine failure, as the engine was still running during impact and when it caught fire. The video showed that the angle the pilot took off at was approximately 35 degrees nose down attitude as opposed to the normal take-off.
- 1.1.5 The accident occurred in daylight at a geographical position determined as S23°55' 54.79" E29°28' 22.25" at an elevation of approximately 4231 feet above mean sea level (AMSL).



Fig 1: View of crash site obtained from Google earth

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	2	-
Minor	1	-	1	-
None	-	-	-	-

1.3 Damage to Aircraft

1.3.1 The helicopter was destroyed by post-impact fire.



Figure 2: *Helicopter destroyed by fire*

1.4 Other Damage

1.4.1 A grass area around the wreckage within a diameter of approximately 10 metres was burnt following the accident.



Figure 3: *Burnt area of approximately 10 m diameter*

1.5 Personnel Information

1.5.1

Nationality	South African	Gender	Male	Age	52
Licence number	*****	Licence Type	Private pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 May 2009				
Restrictions	Corrective lenses				
Previous Accidents	None				

1.5.2 Flying Experience

Total Hours	1471.6
Total Past 90 Days	27.1
Total on Type Past 90 Days	12.8
Total on Type	71.6

- 1.5.3 The pilot had a valid class 2 aviation medical certificate at the time of the accident. The medical certificate was to expire on 31 May 2009 and had a medical restriction endorsed stating that the pilot had to wear corrective lenses during flight.

1.6 Aircraft Information

1.6.1 Airframe

Type	Robinson R44 Raven II	
Serial Number	12142	
Manufacturer	Robinson Helicopter Company	
Date of Manufacture	21 September 2007	
Total Airframe Hours (At time of Accident)	17	
Last MPI (Date & Hours)	New	
Hours since Last MPI	New	
C of A (Issue Date)	26 March 2008	
C of R (Issue Date) (Present owner)	13 March 2008	
Operating Categories	Standard	

1.6.2 Engine

Type	Lycoming IO-540-AE1A5
Serial Number	L-32572-48E
Hours since New	17
Hours since Overhaul	New

1.6.3 The helicopter had 40 US gallons of 100 LL Avgas fuel in the tanks prior to the accident.

1.6.4 Weight and balance for helicopter ZS-SCV:

Table showing max take-off for ZS-SCV (Robinson R44 II)

	Weight (lbs)	Arm (inches)	Moment (in.lb)
A/C empty weight	1510	106,5	160815
Pilot & pax (75 kg)+(110 kg)	407	49,5	20146,5
Aft pax. (50kg) + (40 kg)	198	79,5	15741
Baggage (5 kg)	11	44,0	484
Fuel main tank (25 US gal)	150	106	15900
Auxiliary tank(15 US gal)	90	102	9180
Total T/O Weight	2366	93,94	222266,5

The maximum certificated take-off mass for the aircraft as stipulated in the POH (Pilot's Operating Handbook) is 2500 pounds.

The aircraft was within operational limits.

N.B. 1 US gallon is 6 pounds.

1.7 Meteorological Information

1.7.1 The pilot reported the following weather conditions:

Wind direction	360°	Wind speed	5-10 kts	Visibility	CAVOK
Temperature	23 °C	Cloud cover	Clear	Cloud base	Clear
Dew point	N/A				

1.7.2 The weather report obtained from the weather services for Pietersburg International Airport reads as follows:

(METAR FAPP 241100Z 08003KT 9999 SCT035 19/05 Q1022)

Wind direction	080°	Wind speed	03 kts	Visibility	>10 km
Temperature	19 °C	Cloud cover	Clear	Cloud base	Clear
Dew point	05 °C				

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment for this type of helicopter and was serviceable.

1.9 Communications

1.9.1 The aircraft was equipped with standard communicational equipment for this type of helicopter.

1.9.2 The pilot was broadcasting his intentions on 122,7 MHz.

1.10 Aerodrome Information

1.10.1 The helicopter was operating west of runway 08 near the SAPS hangar.

Aerodrome Location	Pietersburg Civil Aerodrome	
Aerodrome Co-ordinates	S23°55' 54.79" E29°28' 22. 25"	
Aerodrome Elevation	4230 feet	
Runway Designations	08/26	
Runway Dimensions	2200x25m	
Runway Used	08	
Runway Surface	Tar	
Approach Facilities	PAPI system 2.96°RWY 08	

1.11 Flight Recorders

1.11.1 The South African Civil Aviation Regulation (CAR) do not require that flight recorders [cockpit voice recorders (CVR) and flight data recorders (FDR)] be installed in this aircraft type. In compliance with the regulation, none of the identified flight recorders were fitted to the aircraft.

1.12 Wreckage and Impact Information

1.12.1 The aircraft impacted the ground west of runway 08 in a geographical position of S23°55' 54.79" E29°28' 22.25".

1.12.2 The tail rotor touched the ground, the helicopter rolled onto its left side and caught alight.

1.12.3 The wreckage remained intact during the impact sequence.

1.13 Medical and Pathological Information

1.13.1 There was no evidence that physiological factors or incapacitation affected the performance of the pilot.

1.14 Fire

1.14.1 After ground impact, the helicopter caught fire and the helicopter was destroyed.

1.14.2 The rescue fire services department responded approximately 2 minutes after the helicopter had crashed to extinguish the fire.

1.15 Survival Aspects

1.15.1 This was considered a survivable accident because of low impact forces sustained by the helicopter, and the pilot and passengers were properly restrained by seatbelts at the time of the accident.

1.15.2 The pilot and the front left passenger sustained minor injuries and the other 2 passengers sustained serious burns from the fire.

1.16 Tests and Research

1.16.1 Not considered necessary.

1.17 Organisational and Management Information

1.17.1 This was a pleasure flight and the pilot was not paid for conducting the helicopter rides.

1.17.2 The aircraft was maintained by an aircraft maintenance organisation (AMO) which was in possession of a valid AMO approval from the CAA at the time the last maintenance was certified on the aircraft prior to the accident.

1.18 Additional Information

- 1.18.1 The graph below shows the curve for the power available and power required. The horsepower available is the power available for the aircraft for a specific day, altitude and temperature. The horsepower required is the power required during normal operations of the aircraft and can be changed by manipulating the flight controls, e.g. raising the collective.

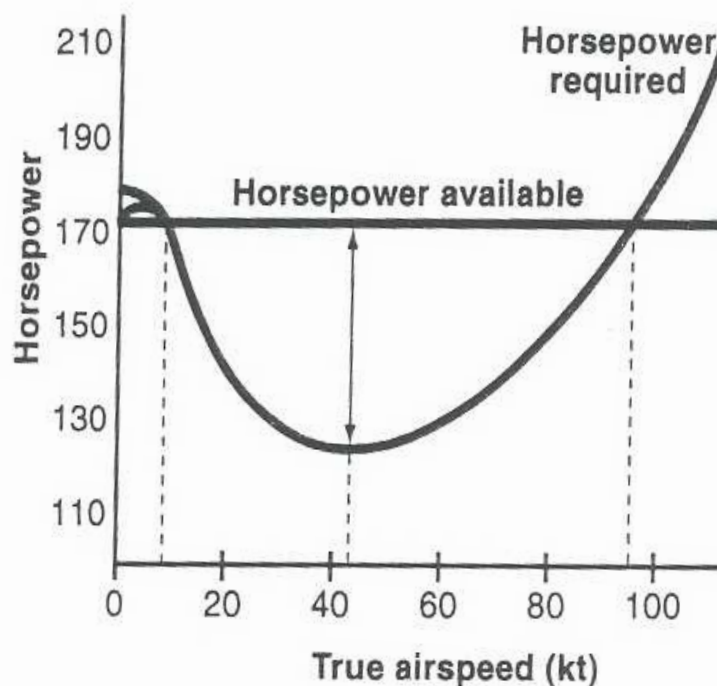


Figure4: Power available vs. power required

- 1.16.2 If the horsepower required exceeds the horsepower available, a descent follows. The immediate reaction would be to pull up the collective to counteract the descent; the main rotor rpm will start to decrease because the power required has exceeded the power available. The correct technique would be to lower the collective and gain more speed or transition.
- 1.16.3 The pilot may use a wrong technique during take-off which can demand more power. Excessive manoeuvring of the aircraft can also result in a power demand. Take-offs are preceded by a hover. Since the power required to hover is more than that required during forward flight, special care is required for operations in high altitude/high gross weight situations where power use is relatively high.

1.19 Useful or Effective Investigation Techniques

1.19.1 Not considered necessary.

2. ANALYSIS

- 2.1 The pilot was correctly licensed and was the holder of a valid medical certificate which had no restrictions.
- 2.2 The aircraft was serviceable prior to the accident and no malfunction or defect was recorded that could have contributed to or caused the accident.
- 2.3 The prevailing weather conditions at the time of the accident were considered not to be a factor in this accident, with the reported surface wind being from the NE at 3 knots.
- 2.4 The pilot was hovering near the SAPS hangar on a left-crosswind and turned into the wind for take-off.
- 2.5 The helicopter went into transition, approximately 3 meters above the ground and experienced a decay in main rotor rpm. The pilot tried to recover the rpm by lowering the collective and applied aft cyclic. The tail rotor touched the ground, the right front skid dug into the ground, main rotor blades struck the tail boom and the helicopter rolled over to the right and caught alight.
- 2.6 Referring to paragraph 1.16.2, if the horsepower required exceeds the horsepower available, a descent follows. The immediate reaction would be to pull up the collective to counteract the descent; the main rotor rpm will then decrease because the power required has exceeded the power available. The correct technique would be to lower the collective and gain more speed or transition.
- 2.7 The pilot may have used a wrong technique during take-off which demanded more power. Excessive manoeuvring of the aircraft could have increased the power demand.
- 2.8 Take-offs are preceded by a hover. Since the power required to hover is more than that required during forward flight, special care is required for operations in high altitude/high gross weight situations where power use is relatively high.
- 2.9 The investigation determined that the angle at which the helicopter took off was approximately 35 degrees nose down attitude. During the take-off sequence, the power required exceeded the power available, thus coning the blades, which required more power. The helicopter lost main rotor rpm, lost height and the pilot tried to keep level by pulling aft cyclic and raising the collective; then the helicopter impacted the ground with the tail rotor stinger because of excessive flaring.

3. CONCLUSION

3.1 Findings

- 3.1.1 The aircraft had a valid Certificate of Airworthiness and a valid certification of registration.
- 3.1.2 There was no evidence that incapacitation or physiological factors had affected the pilot's performance.
- 3.1.3 The maintenance records indicated that the aircraft was maintained in accordance with existing regulations and procedures.
- 3.1.4 A video was obtained at the accident site which revealed that the engine was still running after the helicopter impacted the ground.
- 3.1.5 The aircraft was maintained by an aircraft maintenance organisation (AMO) which was in possession of a valid AMO approval from the CAA at the time the last maintenance was certified on the aircraft prior to the accident.
- 3.1.6 The pilot had a valid pilot's licence and endorsement of the applicable type thereon.
- 3.1.7 The aircraft had 17 airframe hours since new.

3.2 Probable Cause/s

- 3.2.1 Helicopter lost main rotor rpm during take-off.

Contributory factor: Incorrect technique used during take-off.

4. SAFETY RECOMMENDATIONS

- 4.1.1 None

5. APPENDICES

- 5.1.1 None

Report reviewed and amended by the Advisory Safety Panel on 16 March 2010

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