



AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8757	
Aircraft Registration	ZS-HAI	Date of Accident	16 February 2010		Time of Accident	0640Z
Type of Aircraft	Robinson R22 Beta		Type of Operation	Training		
Pilot-in-command Licence Type		Commercial	Age	29	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	2764,7		Hours on Type	62,4
Last point of departure		Rand Aerodrome (FAGM)				
Next point of intended landing		Rand Aerodrome (FAGM)				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Rand Aerodrome (GPS position South 26° 14' 59.7" East 028° 08' 49.9")						
Meteorological Information		Surface wind; 360°/8kts; temperature; 20 °C; visibility; CAVOK.				
Number of people on board	1 + 1	No. of people injured	1 + 0	No. of people killed	0	
Synopsis						
<p>A flight instructor accompanied by a student pilot took off from Rand Aerodrome (FAGM) on visual flight rules (VFR) training. The training included autorotation emergency sequences in all phases of flight. During the autorotation exercise at a height of approximately 500 feet above ground level (AGL) the main rotor rpm decayed. The instructor advised the student to monitor the main rotor rpm and recover from the situation. The student pulled up the collective pitch lever, which caused the main rotor rpm to decay further. Although the instructor managed to lower the collective pitch lever, there was insufficient recovery time and height.</p> <p>The flight instructor sustained minor injuries, the student sustained no injuries.</p> <p>The helicopter sustained substantial damage to the main rotor blades, tail boom and skid gear.</p>						
Probable Cause						
<p>During autorotation, the crew initiated the incorrect recovery technique by allowing the main rotor rpm to decay with insufficient time to recover from the low main rotor rpm.</p>						
IARC Date				Release Date		



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : National Airways Corporation
Manufacturer : Robinson Helicopter Company
Model : R22 Beta
Nationality : South African
Registration Marks : ZS-HAI
Place : Rand Aerodrome
Date : 16 February 2010
Time : 0640Z

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 The instructor accompanied by a student pilot took off from Rand Aerodrome (FAGM) for VFR training. The training included autorotation emergency sequences in all phases of flight. According to the instructor, he demonstrated to the student how to handle an engine failure, autorotation on downwind and the recovery. During the flight, the instructor requested the student to execute autorotation at a height of approximately 500 feet AGL. The wind became strong and the student took a while to start turning into the wind.
- 1.1.2 According to the student pilot, the instructor requested him to execute a downwind autorotation for threshold 11. The student entered into the autorotation and turned the helicopter downwind. The student mentioned that he took a while before turning in order to manage the main rotor rpm. The autorotation descent was a normal approach, but neither of them could control the rate of descent during the recovery and the helicopter crashed to the ground.
- 1.1.3 During the recovery, the student made an abrupt turn to the left and failed to control the rotor rpm and the speed during the autorotation. The instructor advised the student to watch the rotor rpm and to recover by lowering the collective lever. The student pulled up the collective and the instructor immediately lowered the collective to the down position, which levelled the skids. However, there was limited recovery time and the helicopter hit the ground with the left skid and rolled onto its right side.

1.2 Injuries to Persons

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

1.3 Damage to Aircraft

1.3.1 The helicopter sustained substantial damage to the main rotor blades, tail boom and skid.



Photo 1: Wreckage of the aircraft

1.4 Other Damage

1.4.1 None.

1.5 Personnel Information

1.5.1 Flight instructor

Nationality	South African	Gender	Male	Age	29
Licence Number	*****	Licence Type	Commercial		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Instructor				
Medical Expiry Date	30 June 2010				
Restrictions	Hypertension protocol				
Previous Accidents	Yes				

On 23 August 2007 (ZS-RHZ) the pilot was engaged in a training flight and allowed the student pilot to lift off, when the helicopter yawed and the student pilot overcorrected. As a result, the helicopter crashed and rolled over onto its right side.

Flying Experience:

Total Hours	2764,7
Total Past 90 Days	221
Total on Type Past 90 Days	62,4
Total on Type	62,4

1.5.2 Student pilot

Nationality	South African	Gender	Male	Age	46
Licence Number	*****	Licence Type	Student		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	31 August 2010				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	18,4
Total Past 90 Days	18,4
Total on Type Past 90 Days	18,4
Total on Type	18,4

1.5.3 Weight and balance:

	Weight (lbs)	Arm (inches)	Moment (in.lb)
A/C empty weight	883.43	103.6	91523.35
Instructor (105 kg) + Student (90 kg)	429	78.0	33462
Fuel main tank (10 US gal)	58	108.6	6298.8
Auxiliary tank (4 US gal)	23.2	103.8	2408.16
Total T/O Weight	1393.63	95.93	133692.31

The maximum certificated take-off mass for the aircraft as stipulated in the pilot's operating handbook (POH) is 1300 lbs. Therefore, the aircraft was out of the operating limits by 93.63 lbs.

Note: 1 US gallon is 6 pounds.

1.6 Aircraft Information

Airframe:

Type	Robinson R22 Beta	
Serial Number	4274	
Manufacturer	Robinson Helicopter Company	
Year of Manufacture	2008	
Total Airframe Hours (At time of Accident)	689,1	
Last MPI (Date & Hours)	4 November 2008	611,2
Hours since Last MPI	77,9	
C of A (Issue Date)	21 May 2008	
C of R (Issue Date) (Present owner)	15 May 2008	
Operating Categories	Standard	

Engine:

Type	Lycoming O-360-J2A
Serial Number	L-41028-36E
Hours since New	689,1
Hours since Overhaul	TBO not yet reached

1.6 Meteorological Information

- 1.7.1 The following weather information was obtained from the air traffic controller (ATC) at FAGM.

Wind direction	360°	Wind speed	8 kts	Visibility	CAVOK
Temperature	20°	Cloud cover	Scattered	Cloud base	2000 feet
Dew point	Unknown				

- 1.7.2 The following weather information was obtained from the pilot's questionnaire:

Wind direction	360°	Wind speed	11 kts	Visibility	>10 km
Temperature	20°	Cloud cover	2000 feet	Cloud base	Scattered
Dew point	17				

1.8 Aids to Navigation

- 1.8.1 The aircraft was equipped with standard equipment as per manufacturer's design. None was reported unserviceable during the flight or prior to the accident.

1.9 Communications

1.9.1 The aircraft was equipped with standard communications equipment and none was reported unserviceable during the flight or after the accident. The instructor broadcasted his intention to execute autorotation to the air traffic controller on the very high frequency (VHF) 118,7MHz. Listening to the ATC's transcript, the instructor was cleared to execute his intention and to keep a lookout for other traffic. Shortly after the crash the instructor advised the ATC to dispatch the fire brigade. ATC advised the instructor to remain at threshold 11 while he dispatched the fire brigade. There was no further communication between ATC and the helicopter ZS-HAI.

1.10 Aerodrome Information

Aerodrome Location	FAGM (Rand Aerodrome)	
Aerodrome Co-ordinates	S26° 14", 31' E028° 09 04", 88'	
Aerodrome Elevation	5 483 feet	
Runway Designations	11/29	17/35
Runway Dimensions	1660 x 15	1463 x 15
Runway Used	11	
Runway Surface	Asphalt	
Approach Facilities	PAPI, NDB, VOR and ILS	

The helicopter lifted off parallel to runway 11 and crashed in a grass area.

1.11 Flight Recorders

1.11.1 The helicopter was not fitted with a Cockpit Voice Recorder (CVR) or a Flight Data Recorder (FDR) and neither was required by regulations to be fitted to this type of helicopter.

1.12 Wreckage and Impact Information

1.12.1 The flight instructor and the student pilot were executing an autorotation on downwind, and while turning into base leg for final, the helicopter's main rotor rpm decayed. During the recovery from the situation, the student pulled the collective pitch lever, which exacerbated the situation. The left skid struck the ground and the aircraft rolled on its right hand side. The helicopter sustained substantial damage to the main rotor blades, tail boom and skid. During the onsite investigation there were no abnormalities of the controls.



Figure 1: indicate the wreckage of the aircraft

1.13 Medical and Pathological Information

1.13.1 The flight instructor suffered a broken left elbow and a concussion as a result of the crash and he was hospitalised for two days.

1.14 Fire

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

1.15 Survival Aspects

1.15.1 Both occupants were properly restraint by their safety harnesses and due to the low impact force associated with the accident it was considered a survivable accident.

1.15.2 The emergency services responded to the scene immediately after being notified by the ATC.

1.16 Tests and Research

1.16.1 None.

1.17 Organizational and Management Information

1.17.1 This was a training flight. The training school was in a possession of a valid Aviation Training Organisation (ATO) certificate issued on the 02 September 2009 by the South African Civil Aviation Authority (SACAA) with an expiry date of 24 August 2010.

1.17.2 (a) According to the available information from the SACAA, the manual of procedure (MOP) for the ATO does not correspond with the SACAA syllabus. SACAA's syllabus refers to exercise 15 as follows:

- Hover out of ground effect (OGE), vortex ring
- establishing hover OGE
- drift/height/power control
- demonstration of incipient stage of vortex ring, recognition and recovery (from safe altitude)
- loss of tail rotor effectiveness

(b) ATO's training syllabus refers to exercise 15 as follows:

- Flight emergency and introduction to engine off landings
- Recap on the flare and its effects
- Exercise 15 (a): Basic emergencies in the circuit, all warning lights, communications and governor failure
- Exercise 15 (b): Autorotation on final approach to the flare
- Exercise 15 (c): Autorotation in all phases of flight
- Exercise 15 (d): Tail rotor failures

1.17.3 The AMO responsible for the maintenance of the aircraft had a valid AMO approval certificate that was issued on 2 December 2009. The last audit prior to the accident was carried out on 1 November 2008 and on 5 November 2009, and there were no major findings that could have contributed to the accident or maintenance of the aircraft.

1.18 Additional Information

1.18.1 The instructor was sitting on the left and the student on the right.

1.18.2 During simulated engine failures, a rapid decrease in rotor rpm will occur, requiring immediate lowering of collective control to avoid dangerously low rotor rpm.

1.18.3 The following information is obtained from the Rotorcraft flying handbook FAA-H-8083-2 page 11.3

Autorotation with turns.

A turn, or a series of turns, can be made during an autorotation in order to land into wind or avoid obstacles. The turn is usually made early so that the remainder of the autorotation is the same as a straight in autorotation. The most common types are 90° and 180 degrees autorotation. The technique below describes a 180 degrees autorotation.

Technique

Establish the aircraft on downwind at recommended airspeed at 700 feet AGL, parallel to the touchdown area. In a no wind or headwind condition, establish the ground track approximately 200 feet away from the touchdown point. If a strong crosswind exists it will be necessary to move your downwind leg closer or farther out. When abeam the intended touchdown point, reduce collective and then split the needles. Apply proper antitorque pedal and cyclic to maintain proper attitude. Cross check attitude, trim, rotor rpm and airspeed.

After the descent and airspeed is established, roll into a 180 degrees turn. For training you should initially roll into a bank of at least 30 degrees but not more than 40 degrees. Check your airspeed and rotor rpm. Throughout the turn it is important to maintain the proper airspeed and keep the aircraft in trim. Changes in the aircraft's attitude and the angle of bank cause a corresponding change in rotor rpm. Adjust the collective, as necessary in the turn to maintain rotor rpm in the green arc. At the 90 degrees point check the progress of your turn by glancing toward your landing area. Plan the second 90 degrees of turn to roll out on the centreline. If you are too close decrease bank angle if too far out increase the bank angle. Keep the helicopter in trim with anti-torque pedals.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

- 2.1 During the autorotation exercise, the rotor main rpm and speed decayed. The instructor advised the student to monitor the rotor rpm and recover from the situation. The student pulled the collective pitch lever, which caused the rpm to decay. If the collective pitch had been increased to control rpm, it may have had to be lowered on rollout to prevent decay in rpm. The instructor did manage to lower the rpm, but there was limited time for the recovery. It is possible that if there had been a correct handover of controls, the instructor might have succeeded in recovering from the situation.
- 2.2 The aircraft was maintained according to relevant regulations and there were no defects reported prior to or during the accident flight that could have attributed to the accident.
- 2.3 With reference to the weather information given, it is concluded that weather could not have contributed to the accident. It is a safe practice to execute an autorotation exercise and consider the wind.

3. CONCLUSION

3.1 Findings

- 3.1.1 The flight instructor had a valid commercial pilot licence and was properly rated at the time of accident.
- 3.1.2 The instructor pilot had a valid medical certificate with restrictions.
- 3.1.3 The student pilot had a valid student pilot licence and was properly rated at the time of accident.
- 3.1.4 The student pilot had a valid medical certificate with no restrictions.
- 3.1.5 The main rotor rpm decayed during the autorotation.
- 3.1.6 During the recovery from the low rpm the student pilot pulled the collective pitch lever upwards.
- 3.1.7 The instructor had limited time and height to recover from the situation.
- 3.1.8 The helicopter was properly maintained.
- 3.1.9 The helicopter had a valid Certificate of Airworthiness and certificate of registration.
- 3.1.10 According to the available information from the CAA, the MOP of the ATO does not correspond with the syllabus prescribed in the CARs.
- 3.1.11 The on-site investigation revealed no anomalies with the flight controls surfaces and their integrity.

3.2 Probable Cause/s

- 3.2.1 During autorotation the crew initiated the incorrect recovery technique by allowing the main rotor rpm to decay with insufficient time to recover from the low main rotor rpm.

4. SAFETY RECOMMENDATIONS

- 4.1 None.

5. APPENDICES

- 5.1 None.

Report reviewed and amended by the Advisory Safety Panel on 20 July 2010

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