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| <b>AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY</b> |
|---|

|  |  |                              |                          |                             |                         |        |
|--|--|------------------------------|--------------------------|-----------------------------|-------------------------|--------|
|  |  |                              |                          | Reference:                  | CA18/2/3/9272           |        |
| <b>Helicopter Registration</b>   | ZS-RIU   | <b>Date of Accident</b>      | 7 January 2014           |                             | <b>Time of Accident</b> | 1256Z  |
| <b>Type of Aircraft</b>  | AS350 B3 (Helicopter)  |                              | <b>Type of Operation</b> | Training                    |                         |        |
| <b>Pilot-in-command Licence Type</b>   | Airline Pilot Licence  |                              | <b>Age</b>               | 47                          | <b>Licence Valid</b>    | Yes    |
| <b>Pilot-in-command Flying Experience</b>  | Total Flying Hours   |                              |                          | 7 159,6                     | <b>Hours on Type</b>    | 1916.6 |
| <b>Pilot undergoing Proficiency check Licence Type</b>   | Airline Pilot Licence  |                              | <b>Age</b>               | 47                          | <b>Licence Valid</b>    | Yes    |
| <b>Pilot undergoing Proficiency check Experience</b>   | Total Flying Hours   |                              |                          | 4546.8                      | <b>Hours on Type</b>    | 44     |
| <b>Last point of departure</b>   | Kya Sands Randburg (Gauteng)   |                              |                          |                             |                         |        |
| <b>Next point of intended landing</b>  | Grand Central Aerodrome (FAGC, Gauteng)  |                              |                          |                             |                         |        |
| <b>Location of the accident site with reference to easily defined geographical points (GPS readings if possible)</b> |  |                              |                          |                             |                         |        |
| Next to runway 35 at FAGC (GPS position: 25°59'13.4 4" South 028°08'25.97" East)                                     |  |                              |                          |                             |                         |        |
| <b>Meteorological Information</b>  | Temperature: 24 °C, Surface wind: 070°77 kts, Visibility: CAVOK  |                              |                          |                             |                         |        |
| <b>Number of people on board</b>   | 2+2  | <b>No. of people injured</b> | 0                        | <b>No. of people killed</b> | 0                       |        |
| <b>Synopsis</b>  | <p>The pilot departed from Kya Sands with the intention of completing an operational proficiency check with another pilot on board. The pilots were also accompanied by two passengers, seated at the rear of the helicopter.</p> <p>On arrival at FAGC, the instructor pilot cautioned the pilot undergoing the proficiency check that he intended simulating a full authority digital engine control (FADEC) failure. Once the FADEC failure had been initiated by the instructor, the pilot completed the procedures stipulated in the rotor flight manual (RFM). The rotor speed was high on touchdown and the pilot incorrectly attempted to reduce the speed by increasing the collective pitch lever. Due to the high rotor speed and increase in collective pitch, the helicopter became airborne again and climbed to a height of approximately 30 ft above ground level (AGL). With the simulated FADEC failure returned to normal the pilot closed the throttle and the rotor speed reduced rapidly. The helicopter descended towards the ground and touched down hard.</p> <p>The helicopter came to rest in an upright position and sustained substantial damage when the skid gear broke off. None of the occupants sustained any injuries during the impact sequence.</p> |                              |                          |                             |                         |        |
| <b>Probable Cause</b>  |  |                              |                          |                             |                         |        |
| Pilot flying used the incorrect technique to correct for the high main rotor speed following an initial touchdown.   |  |                              |                          |                             |                         |        |
| <b>IARC Date</b>   |  |                              |                          | <b>Release Date</b>         |                         |        |

## AIRCRAFT ACCIDENT REPORT

**Name of Owner** : Chopper Worx (Pty) Ltd  
**Name of Operator** : Chopper Worx (Pty) Ltd  
**Manufacturer** : Eurocopter  
**Model** : AS350 B3  
**Nationality** : South African  
**Registration Marks** : ZS-RIU  
**Place** : Grand Central Aerodrome (FAGC)  
**Date** : 7 January 2014  
**Time** : 1256Z

*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 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 (Instructor) departed from Kya Sands with the intention of completing an operational proficiency check with another pilot on board, who was seated on the right, following a flight briefing. The pilots were also accompanied by two passengers who were seated in the rear seats of the helicopter.
- 1.1.2 On arrival at FAGC the instructor pilot cautioned the pilot undergoing the proficiency check (pilot flying) that he intended simulating a FADEC failure. Once the FADEC failure had been initiated by the instructor, the pilot completed the procedures stipulated in the RFM. The rotor speed was high on touchdown and the pilot incorrectly attempted to reduce the speed by increasing the collective pitch lever.

Due to the high rotor speed and increase in collective pitch, the helicopter became airborne again to a height of approximately 30 ft AGL. The instructor then switched the FADEC switch to its normal position while airborne. The pilot thereafter closed the throttle, which resulted in the rotor speed's decaying rapidly and the helicopter descending towards the ground. The helicopter touched down hard before turning through 90 degrees and coming to rest in an upright position.

1.1.3 The pilots shut down the helicopter and evacuated the helicopter with their passengers. No one sustained any injuries during the impact sequence. The helicopter sustained substantial damage to the tail boom and skid gear, which broke off during impact.

1.1.4 The accident occurred during daylight conditions at 1256Z at a geographical position that was determined to be 25° 59' 13.44" South 28° 08' 25.97" East at an elevation of 5 325 feet above mean sea level.

## 1.2 Injuries to Persons

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

## 1.3 Damage to Aircraft

1.3.1 The helicopter was substantially damaged.

## 1.4 Other Damage

1.4.1 None

## 1.5 Personnel Information

1.5.1 Pilot-in-command (Instructor)

|                     |  |               |                       |     |    |
|---------------------|--|---------------|-----------------------|-----|----|
| Nationality         | South African                            | Gender        | Male                  | Age | 47 |
| Licence Number      | 0270204951                               | Licence Type  | Airline Pilot Licence |     |    |
| Licence valid       | Yes                                      | Type Endorsed | Yes                   |     |    |
| Ratings             | Grade 2 Instructor and Instrument rating |               |                       |     |    |
| Medical Expiry Date | 30 April 2014                            |               |                       |     |    |
| Restrictions        | None                                     |               |                       |     |    |
| Previous Accidents  | None                                     |               |                       |     |    |

Flying Experience :

|                            |         |
|----------------------------|---------|
| Total Hours                | 7 159,6 |
| Total Past 90 Days         | 36,0    |
| Total on Type Past 90 Days | 10,3    |
| Total on Type              | 1 916,6 |

#### 1.5.2 Pilot flying (pilot undergoing proficiency check)

|                     |                                   |               |                       |     |    |
|---------------------|-----------------------------------|---------------|-----------------------|-----|----|
| Nationality         | South African                     | Gender        | Male                  | Age | 47 |
| Licence Number      | 0270213150                        | Licence Type  | Airline Pilot Licence |     |    |
| Licence valid       | Yes                               | Type Endorsed | Yes                   |     |    |
| Ratings             | Night and undersling/winch rating |               |                       |     |    |
| Medical Expiry Date | 31 May 2014                       |               |                       |     |    |
| Restrictions        | None                              |               |                       |     |    |
| Previous Accidents  | None                              |               |                       |     |    |

Flying Experience :

|                            |         |
|----------------------------|---------|
| Total Hours                | 4 546,8 |
| Total Past 90 Days         | 3       |
| Total on Type Past 90 Days | 3       |
| Total on Type              | 44      |

## 1.6 Aircraft Information

- 1.6.1 The powerful, high-performance AS350B3 is designed to carry out missions in the most extreme weather and geographical conditions. The AS350 B3e cockpit is fitted with a dual LCD-screen vehicle and engine multifunction display (VEMD), allowing the pilot to check at one glance the main vehicle and engine parameters, reducing his workload and enhancing safety.



**Figure 1:** The AS350B3 helicopter

### Airframe

|  |                   |         |
|--|-------------------|---------|
| Type                                       | AS-350B3          |         |
| Serial Number                              | 3399              |         |
| Manufacturer                               | Eurocopter        |         |
| Year of Manufacture                        | 2003              |         |
| Total Airframe Hours (At time of Accident) | 3 982,06          |         |
| Last MPI (Date & Hours)                    | 12 November 2013  | 3 957,8 |
| Hours since Last MPI                       | 24,26             |         |
| C of A (Expiry Date)                       | 12 September 2014 |         |
| C of R (Issue Date)                        | 12 November 2013  |         |
| Operating Categories                       | Standard Part 127 |         |

### Engine

|                      |                     |
|----------------------|---------------------|
| Type                 | Arriel 2B-S/N 22199 |
| Serial Number        | 22199               |
| Hours since New      | 3 982,6             |
| Hours since Overhaul | TBO not yet reached |

## Main rotor blade

|                      |                     |
|----------------------|---------------------|
| Type                 | Eurocopter          |
| Serial Number        | M1959               |
| Hours since New      | 3982.06             |
| Hours since Overhaul | TBO not yet reached |

## Tail rotor blade

|                      |                     |
|----------------------|---------------------|
| Type                 | Eurocopter          |
| Serial Number        | MA2053              |
| Hours since New      | 3 982,06            |
| Hours since Overhaul | TBO not yet reached |

## Weight and Balance:

|                      |           |
|----------------------|-----------|
| Basic Empty Weight   | 2 758     |
| Pilot and Passengers | 738       |
| Fuel on board        | 946       |
| Take-off weight      | 4 442 lbs |

Note: The maximum all-up weight for this helicopter is 4 960 lbs. The helicopter was within the take-off weight limitation.

- 1.6.1 The helicopter had 538 litres of fuel on board prior to departure.
- 1.6.2 Following the incident, an examination of the engine was carried out and the engine was found to be free from any pre-impact malfunction or mechanical anomaly.
- 1.6.3 The helicopter was equipped with dual flight controls.

## 1.7 Meteorological Information

- 1.7.1 The meteorological information was obtained from the pilot's questionnaire. The pilot indicated that the weather information had been obtained from the South African Weather Services website.

|                |       |             |         |            |          |
|----------------|-------|-------------|---------|------------|----------|
| Wind direction | 120°  | Wind speed  | 3 kts   | Visibility | 10 km    |
| Temperature    | 22 °C | Cloud cover | 3–4 Oct | Cloud base | 8 000 ft |
| Dew point      | -     |             |         |            |          |

## 1.8 Aids to Navigation

1.8.1 The helicopter was equipped with the minimum visual flight rules navigation equipment required by the regulations. There were no recorded defects on the navigation equipment prior to the flight.

## 1.9 Communications

1.9.1 The helicopter was equipped with standard communication equipment as required by the Regulator. There were no recorded defects on communications equipment prior to the incident.

1.9.2 The pilot (instructor) communicated on the FAGC-designated frequency 122,80 MHz prior to commencing the approach for landing.

## 1.10 Aerodrome Information

1.10.1 FAGC is a SACAA-licensed aerodrome

|                        |                                |  |
|------------------------|--------------------------------|--|
| Aerodrome Location     | FAGC                           |  |
| Aerodrome Co-ordinates | 25°59'13.44" S 028°08'25.97" E |  |
| Aerodrome Elevation    | 5 325 ft                       |  |
| Runway Designations    | 17/35                          |  |
| Runway Dimensions      | 1 724 x 23 m                   |  |
| Runway Used            | Not applicable                 |  |
| Runway Surface         | Asphalt                        |  |
| Approach Facilities    | NDB                            |  |

## 1.11 Flight Recorders

1.11.1 The helicopter was not fitted with a cockpit voice recorder or a flight data recorder and neither was required by regulations to be fitted to this type of helicopter.

## 1.12 Wreckage and Impact Information

1.12.1 The helicopter descended towards the ground, touched down hard and came to rest 80 metres from the initial impact point in an upright position after turning through 90 degrees.

1.12.2 The helicopter came to rest in a northerly direction adjacent to taxiway 35 at FAGC.

1.12.3 The helicopter sustained substantial damage to the tail boom and skid gear, which broke off during the impact sequence.



**Figure 2:** Helicopter as it came to rest

### **1.13 Medical and Pathological Information**

1.13.1 None

### **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 considered survivable due to the landing skids' absorbing most of the energy on impact.

1.15.2 The pilots and passengers were properly restrained by the helicopter-equipped safety harness.

### **1.16 Tests and Research**

1.16.1 None.



## 1.17 Organizational and Management Information

- 1.17.1 The operator was in possession of a valid air operating certificate (AOC) and air operating licence at the time of the incident. The helicopter was duly authorised under the AOC.
- 1.17.2 The helicopter maintenance organisation (AMO) that certified and maintained the helicopter was in possession of a valid AMO approval certificate.

## 1.18 Additional Information

- 1.18.1 According to the operations manual, power-off and emergency procedures training may only be carried out with an instructor during a dual instruction flight.

- 1.18.2 The following information was extracted from the Civil Aviation Regulations 2011:

### ***Inflight testing on passenger and cargo carrying flights:***

91.07.27 *The owner or operator of an helicopter, when passengers or cargo are on board such helicopter, shall ensure that no person -*

- (a) Simulates emergency situations in the helicopter affecting the flight characteristics of such helicopter;*
- (b) conducts flight testing for the initial skills test or renewal of an Instrument rating*
- (c) conducts any flight or skills test other than a route proficiency test;*  
*or*
- (d) conducts any skills test for a class or type rating*

- 1.18.3 Below is the FADEC governor failure training procedure extracted from the Rotor Flight Manual:

### **General**

*This procedure allows training for fail freeze governor failure.  
In case of total failure of the FADEC governor (red "GOV" warning light illuminates and a GONG aural warning sounds), the fuel metering valve is freezed at its current value. This failure is irreversible and the pilot shall land as soon as practicable. The pilot will manually adjust the fuel flow stick to maintain the NR in the green range by using the twist grip on the collective stick.*

### **Failure simulation:**

*Moving the AUTO-MAN selector to MAN produces the same effects as a real failure:*

- The fuel metering valve is freezed*
- The red "GOV" light illuminates and a GONG aural warning sounds.*

**Training Procedure:**

*In steady flight conditions, set the AUTO-MAN selector to MAN.*

*Apply the appropriate emergency procedure (red "GOV" warning light) Section 3.3 page 4 of the RFM.*

*At the end of the training procedure or when needed, reset the AUTO-MAN selector to AUTO (red "GOV" light extinguishes). Reset back the twist grip flight position stop lock then move the twist grip into the flight gate ("TWT GRIP" and amber "GOV" lights extinguish).*

**IMPORTANT:** *It is possible to switch back to the AUTO/MAN selector to the automatic fuel control mode (AUTO mode) at any time and for any NR value.*

| LIGHT | FAILURE   | PILOT ACTION   |
|-------|---|--|
| GOV   | MANU mode engaged<br>or<br>Governing failure : the fuel flow is frozen at the value prior to failure. | <ul style="list-style-type: none"> <li>- Store the flight data.</li> <li>- Unlock the "FLIGHT" notch, the fuel flow can be increased or decreased by turning the twist grip.</li> <li>- Only apply small amplitude adjustments, synchronized with the collective pitch control in order to maintain NR in the green range.</li> <li>- Fly the approach at 40 kt and adjust the fuel flow rate to maintain NR within the upper section of the green range. Slowly reduce the speed if necessary adjust the fuel flow rate slightly on the twist grip to maintain NR within the green range. On final approach, when the collective pitch is increased on reaching the hover, let the NR drop for touchdown. After touchdown, reduce the fuel flow rate before lowering the collective pitch.</li> </ul> <p><b>NOTE :</b> This failure can also result in loss of <math>\Delta N_g</math> and torque parameters on the VEMD. Refer to paragraph 3.3 for compliance with limitations.</p> |
|       | Return from MANU mode to AUTO mode.   | <ul style="list-style-type: none"> <li>- The AUTO/MANU selector can be replaced in the AUTO position irrespective of the NR value. Then return the control to the FLIGHT notch (red and amber GOV and TWT GRP warning lights should be extinguished).</li> </ul>   |

Figure 3: Action required for red governor warning light

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

1.19.1 None.

## **2. ANALYSIS**

2.1 The pilots were licensed in accordance with regulations and had flight experience on the helicopter type. A flight briefing was conducted prior to departure with the intention of completing an operational proficiency flight check. The passengers seated at the rear of the helicopter acted as a load. During simulated emergencies in flight, the carriage of passengers on board a helicopter contravenes the CAA regulations. This was also in contravention with the operator's operations manual. On arrival at FAGC, the instructor pilot communicated with the pilot undergoing the proficiency check that he intended simulating a FADEC failure. Once the FADEC failure was initiated, the pilot undergoing the proficiency check completed the procedures as stipulated in the RFM. During the initial touchdown, the main rotor speed was higher than normal; to remedy this situation the correct action would have been to close the throttle to idle and cancel the simulated FADEC failure. The pilot undergoing the proficiency check increased the collective pitch and due to the high main rotor speed, the helicopter became airborne. The pilot then closed the throttle, which resulted in a rapid decay of rotor main speed and an increased rate of descent. The instructor pilot was unable to assume control and recover the helicopter within the period leading to impact. The pilot undergoing the proficiency check could have fallen out of sequence during the simulated emergency situation due to an increase in workload following the initial touchdown.

## **3. CONCLUSION**

### **3.1 Findings**

- 3.1.1 Both pilots were licensed and qualified for the flight in accordance with existing regulations.
- 3.1.2 The maintenance records indicated that the helicopter was maintained in accordance with existing regulations and approved procedures.
- 3.1.3 The carriage of passengers during a simulated emergency procedure is in contravention with the Civil Aviation Regulations Part 91.07.27.
- 3.1.4 The helicopter landed hard due to incorrect technique used by the pilot flying to correct for the high main rotor speed following an initial touchdown.

### **3.2 Probable Cause/s**

- 3.2.1 Pilot flying used the incorrect technique to correct for the high main rotor speed following an initial touchdown.

### **3.3 Contributory Factor**

- 3.3.1 None.

## **4. SAFETY RECOMMENDATIONS**

- 4.1 None

## **5. APPENDICES**

- 5.1 None.