AIRCRAFT ACCIDENT SHORT REPORT

CA18/2/3/9707: ZS-RBJ, forced landing after take-off following an engine stoppage

Date and time	:	4 May 2018, 1515Z
Occurrence category	:	Accident
Aircraft registration	:	ZS-RBJ
Aircraft manufacturer and model	:	Schweizer Aircraft 269C
Last point of departure	:	Exelsior farm near Bultfontein
Next point of intended landing	:	Exelsior farm near Bultfontein
Location of accident site with reference to easily defined geographical points (GPS readings if possible)	:	28°16'46,3" South 025°52'46,00" East, elevation 4 360 feet
Meteorological information	:	Surface wind: 025°/5kt, Temperature: 22°C, Dew Point: 6°C, Visibility: 10km CAVOK
Type of operation	:	Private (Part 91)
Persons on board	:	1 + 1
Injuries	:	None
Damage to aircraft	:	The helicopter was substantially damaged

All times given in this report is 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 accidents and ***not to establish blame or liability.***

Disclaimer:

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

Figure 1: The Schweizer 269C helicopter prior to the accident (photograph courtesy of Mr H Prinsloo)

1. SYNOPSIS

1.1 The pilot, accompanied by a passenger, took off from a farm in the Bultfontein district in the Free State province. The purpose of the flight was to view game on his farm.

1.2 The engine stopped operating shortly after take-off while they were flying at a height of approximately 100 feet above ground level (AGL). The pilot executed a forced landing, which resulted in the helicopter impacting heavily with the ground and sustaining extensive damage. Neither of the two occupants on board the helicopter sustained any injuries during the accident sequence.

1.3 The investigation determined that the accident was a result of a hard landing following an engine failure after take-off. The cause of engine failure was attributed to fuel contamination.

2. FACTUAL INFORMATION

2.1 History of Flight

2.1.1 On Friday 4 May 2018, the pilot accompanied by a passenger, took off at 1312Z from a farm near Bultfontein on a private flight to view game in the area.

2.1.2 The pilot stated that he had performed his pre-flight inspection prior to the flight and approximately 40 litres (±10 US gallons) of Avgas LL100 was uplifted into the helicopter from a 53 US gallon drum. He then commenced with the startup of the helicopter and performed all the appropriate checks. Once satisfied, he then lifted into hover flight and transitioned into forward flight. As the helicopter ascended through approximately 100 ft AGL, there was a sudden change in the engine noise, where after the engine stopped operating.

2.1.3 The pilot executed a forced landing onto an open flat terrain and the helicopter impacted the ground hard. The helicopter sustained extensive damage during the accident sequence.

2.1.4 The pilot and the passenger did not sustain any injuries during the forced landing.

2.1.5 The accident occurred during daylight conditions at a geographical position that was determined to be 28˚16'46.3" South 025˚52'46.00" East, at an elevation of 4360 ft AMSL.

Figure 2: The helicopter as it came to rest

Figure 3 & 4: Shows the forward and aft damages of the helicopter

2.1.6 The wreckage was recovered to an approved aircraft maintenance organisation where a detailed inspection of the fuel system was conducted, as the engine itself did not display any evidence of a mechanical malfunction. Water was found in the fuel lines when the engine was being disconnected and removed from the airframe. The fuel used by the pilot was purchased in drums and was obtained from different service providers.

Figure 5: The glass container displaying water that was found in the fuel lines of ZS-RBJ.

2.1.6 Fuel System

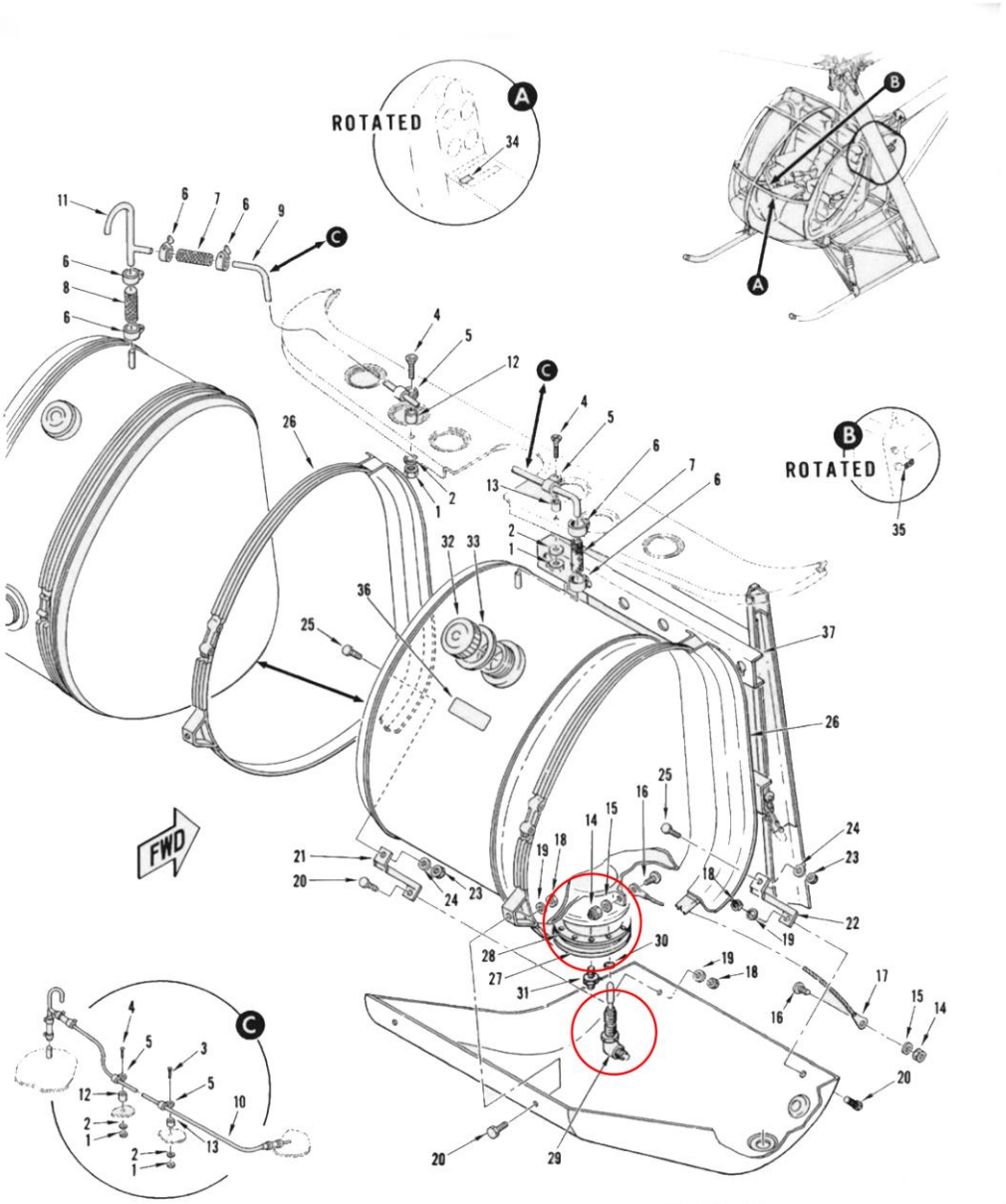

FIGURE AND INDEX NUMBER	PART NUMBER	DESCRIPTION	QTY PER ASSY	MODELS USABLE ON							
				269 A	OPTIONAL ITEM	TH-55A	OPTIONAL ITEM	269 A-1	OPTIONAL ITEM	269 B	OPTIONAL ITEM	269 C	OPTIONAL ITEM
32-26	269A8372	.HANGER ASSY.....	2										
	269A8361-5	.TANK ASSY,FUEL.....	1										
-27	269A8366-5	..SUMP CAP.....	1										
-28	269A8369	..GASKET.....	1										
-29	269A8367-15	..OUTLET AND STRAINER.....	1										
-30	MS29513-14	..PACKING.....	1										
-31	269A8368	..UNION.....	1										
-32	269A4675	..CAP ASSY.....	1										

Figure 6: The fuel system illustration, extracted from the illustrated parts catalogue, highlights the fuel strainer and the sump cap (red circle) which allows for checking the condition of the fuel in the main tank.

2.1.7 The pre-flight instructions in the POH require the inspection of the fuel sump and strainer for any signs of water or contamination (Annexure B – highlighted in red).

2.1.8 The pilot forwarded the photograph as seen in Figure 6 of the fuel drum to the Investigator. This being an off-site investigation by AIID, it could not be established that the contaminated fuel originated from this drum, which was equipped with an external fuel filter, nor was the service provider of the fuel known to the writer, nor was any fuel sample taken from the drum and tested by an approved petroleum laboratory.

Figure 7: The drum mentioned in paragraph 1.4.2 which contained Avgas used to refuel ZS-RBJ
(This photograph was obtained from the pilot / owner of the helicopter)

2.1.9 The emergency procedure for an engine failure – above 7 ft and below 450 ft, which was in the pilot's flight manual, Section 3, can be found attached to this report as Annexure A.

2.1.10 Autorotation is a condition of descending flight where, following engine failure or deliberate disengagement, the rotor blades are driven solely by aerodynamic forces resulting from rate of descent airflow through the rotor. The rate of descent airflow is determined mainly by airspeed.

2.1.11 Manufacturers publish a *Height-Velocity diagram* in the aircraft's Flight Manual (Pilot's Operating Handbook) showing shaded areas that should be avoided as a combination of height and airspeed. These diagrams must be used with discretion

because highly experienced pilots who were mentally prepared for the engine failure carried out flight tests that determined the various combinations. Although a safety factor has been included in most diagrams, pilots need to appreciate that the shaded areas are a guide, at best. Wise pilots add their own safety margin to the height-velocity diagram when computing climbs, descents and general operations.

3. FINDINGS

3.1 The pilot was issued with a private pilot licence on 23 January 2013. He conducted a PPL renewal on the 24 February 2018 with an expiry date of 28 February 2019. He was also issued a medical certificate on 05 March 2018 with an expiry date of 30 March 2019 and his licence was type endorsed.

3.2 The helicopter was privately owned and operated under Part 91 of the CARs, 2011.

3.3 The last maintenance inspection that was carried out on the helicopter prior to the accident flight was certified on 14 September 2017 at 5 755.0 airframe hours.

3.4 The helicopter sustained extensive damage during the impact sequence.

3.5 The helicopter was refuelled out of drums.

3.6 An official weather report was obtained from the South African Weather Service. The meteorological report for that area indicated the weather to be: Surface wind: 025°/5 kts, Temperature: 22°C, Dew Point: 6°C, Visibility: 10 km CAVOK.

2.7 The prevailing weather conditions had no bearing on the accident.

2.8 This was an off-site investigation by AIID. The information used to compile this report was obtained from several sources, which were directly or indirectly involved in the accident.

2.9 Water that was found in the fuel lines of ZS-RBJ when the engine was being disconnected and removed from the airframe.

4. PROBABLE CAUSE

4.1 Unsuccessful forced landing following an engine stoppage after take-off, which was attributed to fuel contamination.

4.2 CONTRIBUTING FACTORS

4.2.1 Improper pre-flight inspection by the pilot. If he had drained the fuel tanks prior to the flight it would have been highly probable that he would have found that water was evident in the fuel.

4.3 SAFETY MESSAGE

4.3.1 The pilots operating from remote locations ensure the fuel supply, whatever the source might be, is clean and meets the requirements to ensure that flight safety is not compromised in any way.

5 ORGANISATION

5.1 This was a private flight, operated under the provisions of Part 91 of the CARs of 2011.

6 REFERENCES USED IN THE REPORT

6.1 Pilot's flight manual – Schweizer Aircraft, Model 269C

6.2 Principles of Helicopter Flight (Second Addition) – WJ Wagtendonk

6.3 Hughes Schweizer 269 Helicopter Illustrated Parts Catalogue

7 SAFETY RECOMMENDATION

None.

Annexure A

Section III

EMERGENCY AND MALFUNCTION PROCEDURES

EMERGENCIES

3-1. ENGINE FAILURE - ALTITUDE ABOVE 450 FEET

- Lower collective pitch.
- Enter normal autorotation.
- Establish a steady glide of 52 knots (60 mph) IAS approximately.
- At an altitude of 50 feet, begin steadily to apply back cyclic stick to decrease forward speed.
- At approximately 10 feet, coordinate collective pitch with forward movement of cyclic stick to level ship and cushion landing. Make ground contact with ship level.
- Avoid rapid lowering of collective pitch or the use of aft cyclic stick during initial ground contact or during ground slide.
- In the event of engine failure at night, do not turn on landing light above 1,000 feet above terrain in order to preserve battery power.

3-2. ENGINE FAILURE - ALTITUDE ABOVE 7 FEET AND BELOW 450 FEET

- Conduct takeoff operation in accordance with the restrictions shown on Height Velocity Diagram (Figure 5-2). In the event of power failure during takeoff, lower the collective pitch (altitude permitting), in order to maintain rotor speed. The amount and duration of collective reduction depends upon the height above the ground at which the engine failure occurs. As the ground is approached, use back cyclic and collective as needed to decrease forward and vertical velocity. Establish a level attitude prior to ground contact.

Annexure B

• Fuel tank sump, for water (30 gallon tank)	DRAIN
• Fuel strainer, for debris or water	DRAIN
• Fuel tank vent	NO OBSTRUCTIONS
• Engine driven fuel pump drain line for security (Service Bulletin B-235)	CHECK
• General engine area for loose wires, fittings or damage	CHECK

CAUTION

IF CRACKING OF CLUSTER FITTINGS IS SUSPECTED, A DYE PENETRANT INSPECTION MUST BE PERFORMED BEFORE FURTHER FLIGHT OPERATIONS.

• Center frame aft cluster fittings for cracks, deformation, or damage	CHECK
• Rear oleo damper extension, strut, and skid	CHECK
• Ground handling wheel (if installed) in up position with quick-release pin installed	CHECK
• Ground handling wheel handle (if installed); quick-release pin installed	CHECK
• Tail rotor control cable	CHECK