SOUTH AFRICAN CIVIL AVIATION AUTHORITY

PRELIMINARY ACCIDENT REPORT

Accident and Incident Investigations Division

Accident
- Preliminary Report -
AIID Ref No: CA18/2/3/9946

Figure 1: A Bell 430 aircraft. (Source: www.netcare.co.za)

Description:

A medical helicopter departed Ultimate Heli heliport in Midrand, Gauteng province, at 0948Z with five occupants on-board (a pilot, a helicopter paramedic, two doctors and a theatre nurse) to collect a patient from Hillcrest Hospital in Pietermaritzburg, KwaZulu-Natal. Approximately 1.5 hours into the flight and cruising at 725 feet above ground level (AGL), the helicopter started to spin uncontrollably before breaking up and losing height rapidly, and finally crashing. A post-impact fire erupted thereafter, which destroyed the helicopter. All five occupants on-board were fatally injured.

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ABBREVIATION	DEFINITION
°C	Degrees Celsius
AGL	Above Ground Level
AMO	Aircraft Maintenance Organisation
AMSL	Above Mean Sea Level
BKN	Broken (3-5 octas)
C of A	Certificate of Airworthiness
CAVOK	Ceiling and Visibility Ok
CVR	Cockpit Voice Recorder
FDR	Flight Data Recorder
FEW	Few (2-3 octas)
ft.	Feet
GPS	Global Positioning System
hPa	Hectopascals
IFR	Instrument Flight Rules
kts	Knots
l	Litre(s)
m	Metre(s)
MHz	Megahertz
mm	Millimetres
Nm	Nautical Mile
OVC	Overcast (8 octas)
POH	Pilot's Operating Handbook
SAWS	South African Weather Service
SCT	Scattered (5-7 octas)
VFR	Visual Flight Rules
VHF	Very High Frequency

DESCRIPTION OF ACCIDENT

Reference Number	**:** CA18/2/3/9946
Name of Owner/Operator	**:** National Airways Corporation (Pty) Ltd
Manufacturer	**:** Bell Corporation
Model	**:** Bell 430
Nationality	**:** South African
Registration Marks	**:** ZT-RRT
Place	**:** Colenso
Date	**:** 21 January 2021
Time	**:** 1135Z

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 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 apportion blame or liability****.*

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.

Investigation Process:

The Accident and Incident Investigations Division (AIID) of the South African Civil Aviation Authority (SACAA) was informed of an aircraft accident involving a Bell 430 helicopter, which occurred at Winterton in KwaZulu-Natal on 21 January 2021. The occurrence was notified to the AIID investigator-on-call at 1601Z. The AIID has appointed an investigator-in-charge with an investigation team. Notifications were sent to the State of Registry/State of Operator, and State of Manufacture/Design, NTSB (Bell and Rolls Royce), respectively. The State of Manufacturer/Design has assigned two accredited representatives to this investigation. The AIID is leading the investigation and will issue the final report.

The information contained in this preliminary report is derived from the factual information gathered during the on-going investigation into the occurrence. Later, an interim report or the final report may contain altered information in case new evidence is uncovered during the on-going investigation that require changes to the information depicted in this report.

The AIID reports are made available to the public at:
http://www.caa.co.za/Pages/Accidents%20and%20Incidents/Aircraft-accident-reports.aspx

Notes:

1. *Whenever the following words are mentioned in this report, they shall mean the following:*

- *Accident – this investigated accident*
- *Aircraft – the Bell 430 involved in this accident*
- *Investigation – the investigation into the circumstances of this accident*
- *Pilot – the pilot involved in this accident*
- *Report – this accident report*

2. *Photos and figures used in this report were obtained from different sources and may be adjusted from the original for the sole purpose of improving clarity of the report. Modifications to images used in this report are limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or the addition of text boxes, arrows or lines.*

Disclaimer:

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

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On Thursday 21 January 2021, a pilot and four passengers (a helicopter paramedic, two doctors and a theatre nurse) on-board a Bell 430 helicopter with registration mark ZT-RRT were on an emergency flight from Ultimate Heli heliport in Midrand, Gauteng province, to Hillcrest Hospital in Pietermaritzburg, KwaZulu-Natal province. The flight was conducted under Visual Flight Rules (VFR) by day and in accordance with (IAW) Part 138 of the Civil Aviation Regulations (CAR) 2011 as amended. The intention of the flight was to expeditiously relocate a patient to another hospital to receive specialised care/procedure which was unavailable at Hillcrest Hospital. The two doctors and a nurse were from Milpark Hospital in Johannesburg, Gauteng province. They were transported to Ultimate Heli heliport by an ambulance, from where they boarded the helicopter. They had with them a total of 12 oxygen bottles, each weighing 6.86kg (total 82.32kg) and each with a capacity of approximately 20 minutes. The oxygen bottles were to be used by the patient whilst in-transit to the destined hospital.

1.1.2 The operator had submitted the following documents to the investigating team for review: weight and balance, weather report, fuel uplift and notice to airmen (Notams) that might have affected the flight. As part of flight planning, the pilot had intended to uplift fuel in Pietermaritzburg whilst the medical staff would be, at that time, preparing the patient to be transported.

1.1.3 Once the passengers had arrived at Ultimate Heli heliport and were ready to depart, the pilot had performed a pre-flight inspection and gave his passengers a safety briefing. According to Ultimate Heli standard operating procedure (SOP), the pilot would have to contact Grand Central Airport (FAGC), which is located 1.4 nautical miles (nm) north-east of the heliport to advise them of their flight requirements, that is, their intended route, persons on-board, fuel endurance and the required height. FAGC would then clear them for their required flight if there was no conflicting traffic; this procedure was adhered to. Once airborne and established on their flight, the pilot would then broadcast his intention on Johannesburg Special Rules South 125.4 megahertz (MHz).

1.1.4 As soon as the helicopter reaches the Johannesburg Special Rules South boundary, the pilot would then change frequency to 123.4MHz and broadcast his position and level to alert other aircraft in the area (airspace); this procedure was also adhered to.

1.1.5 The helicopter was fitted with a Spidertracks device *(a small device that plugs into an aircraft's auxiliary power outlet and is mounted in the cockpit. It provides information such as location, altitude, speed, and direction of the aircraft).* This device allow owners to keep track of their helicopters by receiving updates every 2 minutes. According to the Spidertracks device, the helicopter took off at 0948Z and proceeded in a south-easterly direction, reaching O.R. Tambo International Airport (FAOR) TMA boundary at approximately 1006Z whilst flying at 750 feet (ft) above ground level (AGL). The helicopter was being flown at an average speed of 134 knots per hour and it remained approximately 700ft AGL, as shown on the Spidertracks position 361 in Figure 6.

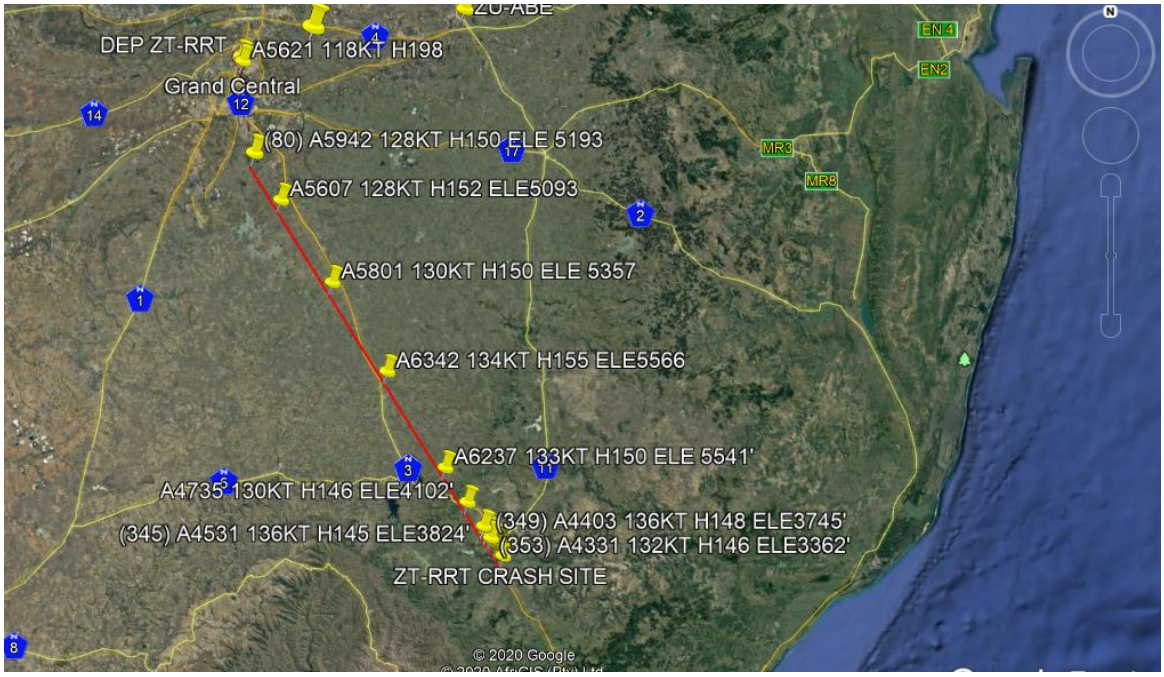


Figure 2: The flight path taken by the ZT-RRT before it crash. (Source. Google Earth)

1.1.6 According to several eye witnesses who were travelling on the N3 Highway as well as a farmer (who was positioned to the west, in relation to the flight path), the helicopter suddenly started to spin around whilst losing height rapidly. The witnesses then saw what looked like helicopter parts breaking off before it crashed and burst into flames 2.45nm from position 361 (see Figure 6). This position is in the south-east of the helicopter's intended route. Debris from the helicopter was scattered along this path. The accident site stretched for approximately half a kilometre from the furthest/first located object of the wreckage. The helicopter was destroyed by post-impact fire and the pilot and four passengers were fatally injured.

1.1.7 The accident occurred during daylight at Global Positioning System (GPS) co-ordinates determined to be S28° 46' 52.66" E29° 40' 28.09" at an elevation of approximately 3301 feet (ft).

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Total On-board	Other on Ground
Fatal	1	-	4	5	-
Serious	-	-	-	-	-
Minor	-	-	-	-	-
None	-	-	-	-	-
Total	1	-	4	5	-

1.3. Damage to Aircraft

1.3.1 The helicopter was destroyed during the accident sequence.

Figure 3: Charred wreckage at the site.

1.4. Other Damage

1.4.1 None.

1.5. **Personnel Information**

Nationality	South African	Gender	Male	Age	40
Licence Number	0270422447	Licence Type	CPL (H)		
Licence Valid	Yes	Type Endorsed	Yes		
Ratings	Night rating, sling load, winching, MEL				
Medical Expiry Date	30 June 2021				
Restrictions	None				
Previous Accidents	Unknown				

Flying Experience:

Total Hours	2680.3
Total Past 90 Days	53.4
Total on Type Past 90 Days	37.8
Total on Type	561.7

1.5.1 The pilot was initially issued a Commercial Pilot Licence (CPL) on 30 October 2009. His last licence validation was on 25 November 2020 with an expiry date of 30 November 2021. The pilot was issued a Class 1 aviation medical certificate on 26 June 2020 with an expiry date of 30 June 2021. The pilot had also completed the following work safety-related certificates:

- A Part 138 flight crew training programme for air ambulance services on 25 June 2020 with an expiry date of 31 June 2021.
- Dangerous Goods Awareness Category 10 programme on 21 October 2019 with an expiry date of 31 October 2021.
- Crew Resource Management (CRM) refresher course on 9 October 2020 with an expiry date of 31 October 2021.
- Annual company proficiency check on 31 July 2020.

1.5.2 The helicopter paramedic, who had a certificate as an Emergency Care Practitioner (ECP), had assisted the pilot before take-off. The ECP had also completed the flight crew training programme for ambulance services on 18 May 2010 with an expiry date of 31 May 2021.

1.6. **Aircraft Information**

Airframe:

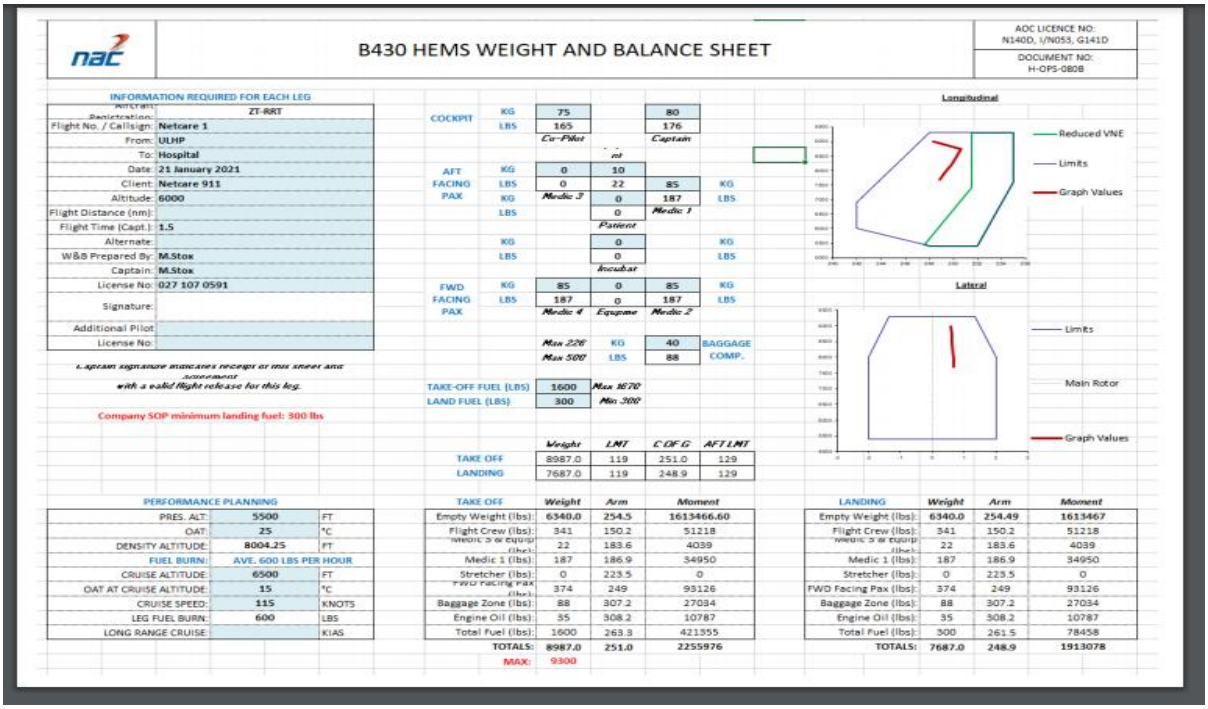
Type	Bell 430	
Serial Number	49126	
Manufacturer	Bell Helicopter Textron	
Date of Manufacture	2005	
Total Airframe Hours (At time of Accident)	7687.7	
Last MPI (Date & Hours)	23 September 2020	7546.6
Hours Since Last MPI	139.6	
C of A (Issue and Expiry Dates)	30 June 2020	30 June 2021
C of R (Issue Date) (Present Owner)	22 November 2019	
Operating Categories	138	

1.6.1 The helicopter (D2-EYS) was operating in Angola and was deregistered on 14 November 2018 prior to it being imported to the Republic of South Africa (RSA). It was then re-registered in RSA on 21 November 2019 with the certificate of registration issued on 22 November 2019. The helicopter was imported in parts (not as a full unit) and was reassembled at National Airways Corporation (NAC), with the Certificate of Airworthiness (C of A) initially issued on 30 June 2020.

1.6.2 On 23 September 2020, the aircraft maintenance organisation (AMO) 1266 had carried out a 150-hour mandatory periodic inspection (MPI) on the helicopter, with the next MPI due on 23 September 2021 or at 7693.7 hours, whichever occurs first.

1.6.3 According to the weight and balance, the helicopter seating arrangement was as follows: the pilot and the helicopter paramedic were seated at the front seats whilst the two doctors and the theatre nurse were seated at the back seats. The 12 full oxygen bottles were strapped down in the luggage compartment. The helicopter had 1600 pounds (lb) of fuel; with a fuel consumption of 600lb per hour. This meant that this flight had fuel endurance of 2 hours and 36 minutes. The maximum take-off weight of the helicopter is 8999lb. The ZT-RRT helicopter take-off weight was 8987lb, which meant that it was 12lb below all-up weight.

1.6.4 The helicopter engines are modular with the gearbox and compressor section overhauled on-condition, and the power section has a limit of 1750 hours (see Appendix 2). The main rotor is a life-limited and on-condition component, whilst the tail rotor is overhauled at 5000 hours.



B430 HEMS WEIGHT AND BALANCE SHEET

AOC LICENCE NO: N140D, I/N053, G141D
DOCUMENT NO: H-OPS-0808

INFORMATION REQUIRED FOR EACH LEG

Aircraft Registration:	ZT-RRT
Flight No. / Callsign:	Netcare 1
From:	ULHP
To:	Hospital
Date:	21 January 2021
Client:	Netcare 911
Altitude:	6000
Flight Distance (nm):	
Flight Time (Capt.):	1.5
Alternate:	
W&B Prepared By:	M.Stox
Captain:	M.Stox
License No:	027 107 0591
Signature:	
Additional Pilot	
License No:	

Captain signature attacates receipt of this sheet and agreement with a valid flight release for this leg.

Company SOP minimum landing fuel: 300 lbs

COCKPIT	KG	75		80	
	LBS	165		176	
		Co-Pilot	or	Captain	
AFT FACING PAX	KG	0	10		
	LBS	0	22	85	KG
	KG	Medic 3	0	187	LBS
	LBS		0	Medic 1	
			Patient		
	KG		0		KG
	LBS		0		LBS
			Incubat		
FWD FACING PAX	KG	85	0	85	KG
	LBS	187	0	187	LBS
		Medic 4	Equipme	Medic 2	
		Max 226	KG	40	BAGGAGE
		Max 500	LBS	88	COMP.
TAKE-OFF FUEL (LBS)		1600	Max 1670		
LAND FUEL (LBS)		300	Min 300		

	Weight	LMT	C OF G	AFT LMT
TAKE OFF	8987.0	119	251.0	129
LANDING	7687.0	119	248.9	129

Longitudinal

Lateral

PERFORMANCE PLANNING

PRES. ALT:	5500	FT
OAT:	25	°C
DENSITY ALTITUDE:	8004.25	FT
FUEL BURN:	AVE. 600 LBS PER HOUR	
CRUISE ALTITUDE:	6500	FT
OAT AT CRUISE ALTITUDE:	15	°C
CRUISE SPEED:	115	KNOTS
LEG FUEL BURN:	600	LBS
LONG RANGE CRUISE:		KIAS

TAKE OFF	Weight	Arm	Moment
Empty Weight (lbs):	6340.0	254.5	1613466.60
Flight Crew (lbs):	341	150.2	51218
Medic 3 & Equip (lbs):	22	183.6	4039
Medic 1 (lbs):	187	186.9	34950
Stretcher (lbs):	0	223.5	0
FWD Facing Pax (lbs):	374	249	93126
Baggage Zone (lbs):	88	307.2	27034
Engine Oil (lbs):	35	308.2	10787
Total Fuel (lbs):	1600	263.9	421355
TOTALS:	8987.0	251.0	2255976
MAX:	9300		

LANDING	Weight	Arm	Moment
Empty Weight (lbs):	6340.0	254.49	1613467
Flight Crew (lbs):	341	150.2	51218
Medic 3 & Equip (lbs):	22	183.6	4039
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Baggage Zone (lbs):	88	307.2	27034
Engine Oil (lbs):	35	308.2	10787
Total Fuel (lbs):	300	261.5	78458
TOTALS:	7687.0	248.9	1913078

Figure 4: The ZT-RRT weight and balance. (Source: Operator)

Engine 1: (Left-side)

Type	Rolls Royce 250-C40B
Serial Number	CAE-844249
Hours Since New	5719
Hours Since Overhaul	Modular

Note: This engine had three previous overhauls done to the power section, and the last one was due at 5205 hours, thus, it should have been 514 hours in operation and 1236 hours to the next overhaul.

Engine 2: (Right-side)

Type	Rolls Royce 250-C40B
Serial Number	CAE-844234
Hours Since New	4760.18
Hours Since Overhaul	Modular

Note: This engine had two previous overhauls done to the power section, and the last one was due at 3500 hours, thus, it should have been 1260.18 hours in operation and 489.82 hours to the next overhaul.

Main Rotor 1: Blue

Type	Composite
Serial Number	A-1959
Hours Since New	8024.5
Hours Since Overhaul	1975.5

Main Rotor 2: Orange

Type	Composite
Serial Number	A-1903
Hours Since New	8024.5
Hours Since Overhaul	1975.5

Main Rotor 3: Red

Type	Composite
Serial Number	A-2188
Hours Since New	8024.5
Hours Since Overhaul	1975.5

Main Rotor 4: Green

Type	Composite
Serial Number	A1773
Hours Since New	8024.5
Hours Since Overhaul	1975.5

Tail Rotor 1:

Type	Composite
Serial Number	A-2031
Hours Since New	2912
Remainder	2087.1

Tail Rotor 2:

Type	Composite
Serial Number	A-2288
Hours Since New	2202.5
Remainder	2797.5

1.7 Meteorological Information

1.7.1 The weather report was supplied by the South African Weather Service (SAWS) on 28 January 2021, with Ladysmith as the closest reporting station, which is 12.45nm north-east of the accident site. The conditions were recorded between 1100Z and 1200Z.

Wind Direction	260°	Wind Speed	04kts	Visibility	9999m
Temperature	29°C	Cloud Cover	Nil	Cloud Base	Nil
Dew Point	18°C	QNH	1020hPa		

1.8. Aids to Navigation

1.8.1 The helicopter was equipped with standard navigational equipment as approved by the Regulator (SACAA) for the aircraft type. There were no recorded defects reported with the navigational equipment prior to the flight.

1.9 Communication

1.9.1 The helicopter was equipped with standard communication equipment as approved by the Regulator for this aircraft type. There were no recorded defects reported with the navigational equipment prior to the flight.

1.10 Aerodrome Information

1.10.1 The accident did not happen at an aerodrome or within 10nm of a nearby aerodrome. The accident occurred 8nm north-east of Winterton, KwaZulu-Natal province, at GPS co-ordinates determined to be S28° 46' 52.66" E29° 40' 28.09" at an elevation of approximately 3301ft.

1.11 Flight Recorders

1.11.1 The helicopter was not fitted with a flight data recorder (FDR) or cockpit voice recorder (CVR) and it was not a requirement according to Civil Aviation Regulations (CAR) 2011, Part 127.05.14 (see Appendix 1).

1.12 Wreckage and Impact Information

1.12.1 The helicopter's last known position from the Spidertracks device is 361 (Figure 6). The helicopter was cruising at 725ft AGL parallel to the N3 Highway in a south-easterly direction, tracking 146°. The witness (farmer) stated that he saw a red and white helicopter spinning around with objects being flung out of the helicopter. The helicopter maintained a south-easterly direction but started to lose height rapidly. The loss of control continued until the helicopter impacted the ground and burst into flames just after flying over the Main Road underpass which crosses the N3 Highway.

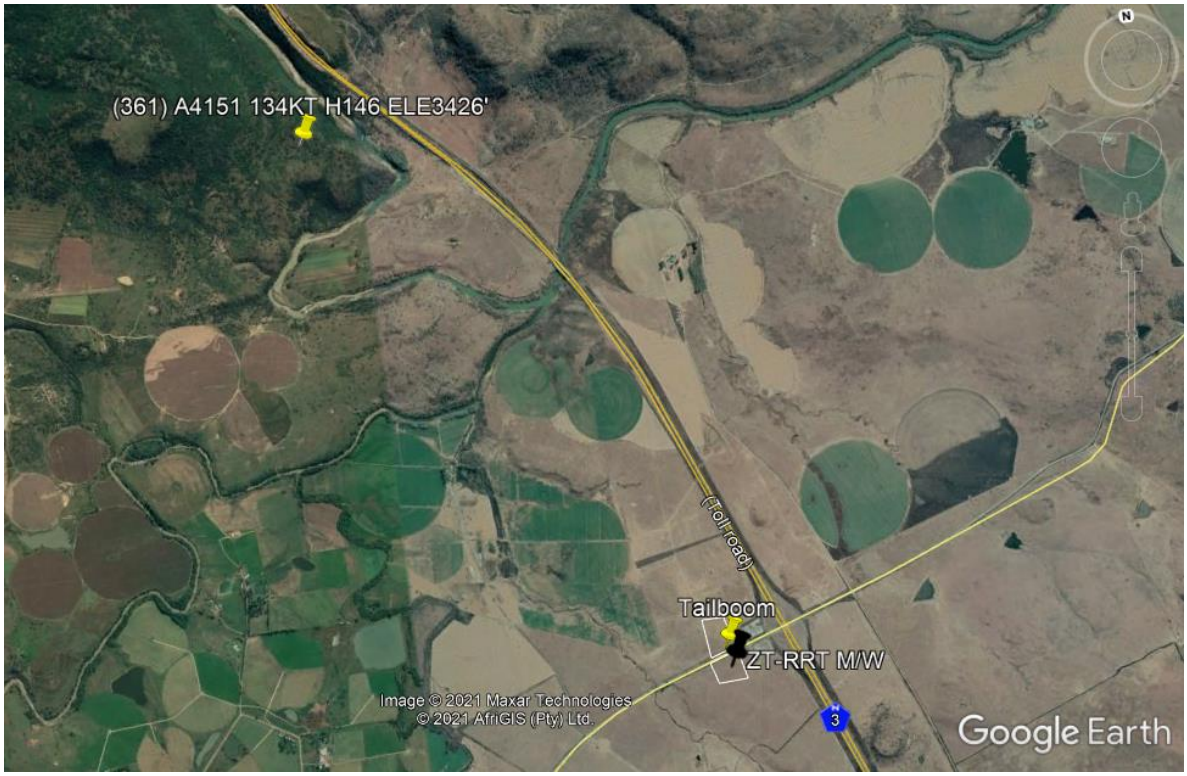

Figure 6: Point 361 is the last downloaded position of the helicopter. It is 2.4nm away from the main wreckage at a height of 725ft AGL. (Source: Google Earth)

1.12.2 The objects that were flung out of the helicopter were some airframe parts that were severed by one or more of the helicopter's main rotor blade(s) whilst spinning out of control, as well as some airframe parts that broke off during the accident sequence. The accident site was divided into two sections; the first section was the tail boom site, and the second section was the main wreckage site. The accident site sections were divided (separated) by the Main Road leading to Winterton, south-west of the N3 Highway.

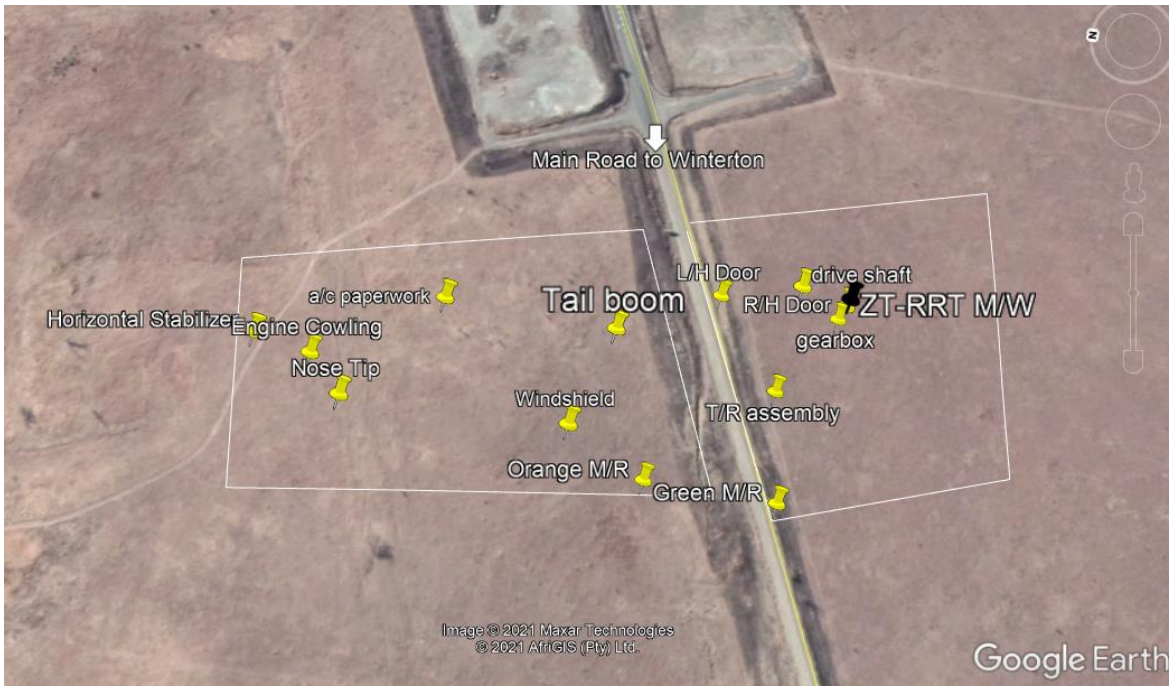

Figure 7: Schematic view of wreckage distribution. (Source: Google Earth)

1.12.3 The Tail boom accident site:

Figures 8, 9, 10, 11: Some helicopter parts that broke off in-flight before impact.

- The horizontal stabiliser, rear engine cowling and the nose cone were some of the airframe parts found furthest along the tail boom site. The investigating team also found helicopter paper work and the flight folio scattered in the tail boom site.
- Debris from the damaged main rotor blade(s), pieces of glass from the helicopter windows, instruments damaged beyond recognition and windshield still attached to the top instrument panel were found west of the tail boom.
- Two pitch link controls (one marked orange and the other blue) were also found closer to the tail boom.

Figure 12: Orange main rotor blade landed 94m from the tail boom.

Figures 13, 14: The root of orange blade separated from the blade before impacting the ground.

- One of the most damaged main rotor blades marked orange was found further west of the tail boom.

Figure 15: The tail boom was located 129.9m from the main wreckage.

1.12.4 The main wreckage accident site:

- The main wreckage was characterised by the remaining parts of the helicopter which had burst into flames after impacting the ground. The left-side fuel tank and gearbox with two blades still attached had broken off the airframe and were not burnt in the fire.
- The green main rotor blade, which is located directly opposite the orange main rotor blade, had also broken off and was found 148m from the main wreckage.
- There were 12 pressurised oxygen bottles, and one of them had exploded when the

helicopter caught fire. The Okhahlamba Fire Department had declared the accident site safe after extinguishing the fire.

- The tail rotor assembly had broken off the tail boom and was located 79.3m from the main wreckage.

Figure 16: The main wreckage post-accident.

Figure 17: The gearbox that was not consumed by fire.

Figure 18: The green main rotor blade.

1.13 Medical and Pathological Information

1.13.1 To be discussed in the final report.

1.14 Fire

1.14.1 Immediately after the helicopter had impacted the ground, it burst into flames and most of the helicopter's airframe parts were burnt beyond recognition. The gearbox with two main rotor blades (blue and red in Figure 17) still attached and the left-side fuel tank had broken off from the aircraft and were not burnt. Local fire services were called to extinguish the flames and they also assisted in locating most of the helicopter parts by marking them with visible flags.

1.15 Survival Aspects

1.15.1 The accident was considered not survivable due to the damage caused to the cockpit and cabin, which resulted in fatal injuries to the occupants.

1.16 Tests and Research

1.16.1 The three dual hydraulic servos that were removed from the gearbox were attached to a hydraulic rig to test their operation and functionality. The left-side servo S/N HR673AB and right-side servo S/N HR619AB were tested on both systems and the piston extended and retracted to its full length of 6 inches. The middle servo S/N HR671AB could only be tested on one system because the other system had damage on the return line; the tested system also extended and retracted the piston to its full length.

1.16.2 The orange main rotor blade, four pitch link control (PLC) and four clevis and their universal bearings were sent for metallurgical testing and analysis.

1.17 Organisational and Management Information

1.17.1 The flight was conducted under Visual Flight Rules (VFR) and under Part 138 of the Civil Aviation Regulations (CAR) 2011 as amended.

1.17.2 The operator was in possession of a valid Air Operating Certificate (AOC) CAA140D under Part 127 with endorsement of Part 138 by the Regulator, which was issued on 1 September 2020 with an expiry date of 31 May 2021.

1.17.3 The AMO 1266 which carried out the last maintenance inspection on this helicopter was issued an AMO approval on 7 September 2020 with an expiry date of 31 May 2021.

1.17.4 The aircraft was modified and fitted with Emergency Medical Services (EMS) equipment in accordance with Air Methods Corporation STC: SR00514DE-D. Another modification was the Articulate Patient Loading System (APLS) with STC: SR00235DE-D.

1.17.5 The aircraft was maintained by AMO 1266 and was released to service on 23 September 2020 after completing a 150-hour MPI at 7546.6 airframe hours. The helicopter had flown a further 137.7 hours before the accident. The next MPI was due on 23 September 2021 or at 7693.7 airframe hours, whichever occurs first.

1.18 Additional Information

1.18.1 To be discussed in the final report.

1.19 Useful or Effective Investigation Techniques

1.19.1 To be discussed in the final report.

2. Findings

2.1. General

From the evidence gathered, the following preliminary findings were made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusions heading:

- **Findings —** are statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.

2.2. **Preliminary findings**

2.2.1 The pilot was initially issued a Commercial Pilot Licence (CPL) on 30 October 2009. His last licence validation was on 25 November 2020 with an expiry date of 30 November 2021. He was issued a Class 1 aviation medical certificate on 26 June 2020 with an expiry date of 30 June 2021.

2.2.2 The aircraft was issued a Certificate of Airworthiness on 30 June 2020 with an expiry date of 30 June 2021. The aircraft was issued a Certificate of Registration on 11 March 2016.

2.2.3 The last MPI (150-h/1-year) was carried out on 23 September 2020 at 7546.6 airframe hours. The aircraft had accumulated an additional 137.7 airframe hours in operation since the last MPI.

2.2.4 The aircraft was issued a Certificate of Release to Service on 23 September 2020 with an expiry date of 23 September 2021 or at 7693.7 airframe hours, whichever occurs first.

2.2.5 The flight was conducted under the provisions of Part 138 of the CAR 2011 as amended. This was a planned emergency flight from Ultimate Heli to Hillcrest Hospital.

2.2.6 The operator was issued an Air Operating Certificate (AOC) number CAA/G140D Part 127 with endorsement of Part 138 by the Regulator on 1 September 2020, with an expiry date of 31 May 2021.

2.2.7 The AMO that carried out the last maintenance inspection on the aircraft was issued an AMO approval certificate on 7 September 2020 with an expiry date of 31 May 2021.

2.2.8 After approximately 1.5 hours in flight and cruising at 725ft AGL, the helicopter started to spin uncontrollably, breaking up in-flight while losing height rapidly. The helicopter impacted the ground and immediately post-impact fire erupted which destroyed the helicopter. All five occupants on-board were fatally injured.

2.2.9 The three dual hydraulic servos that were removed from the gearbox were attached to a hydraulic rig to test their operation and functionality. The first two servos were tested, and the systems and the piston extended and retracted to their full length of 6 inches. The middle servo could only be tested on one system because the other system had damage on the return line; the tested system also extended and retracted the piston to its full length.

2.2.10 The orange main rotor blade, four pitch link control (PLC) and four clevis and their universal bearings were sent for testing and the results would be incorporated in the final report.

2.2.11 The helicopter broke up in-flight and the wreckage was scattered in a 500m radius.

2.2.12 The helicopter was destroyed by impact forces and a post-impact fire, and all occupants on-board were fatally injured.

3. Safety Recommendation

3.1 General

3.1.1 The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report; the AIID expects that all safety issues identified by the investigation are addressed by the receiving states and organisations.

3.2 Safety Recommendation:

3.2.1 None at this stage of the investigation.

4. On-going Investigation

4.1 The AIID investigation is on-going and the investigator/s will be looking into other aspects of this occurrence which may or may not have safety implications.

5. Appendices

4.1 Extract from CAR 2011 Part 127.05.14

4.2 Extract from Rolls Royse M250-C40B Operations and Maintenance Manual

This report is issued by:
Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa

Appendix 1

127.05.14 Flight recorders

(1) For the purposes of this regulation, any reference to—

(a) a specified date upon which an application for the type certification is submitted to a Contracting State means the date an application is made for a new aircraft type, not the date of certification of particular aircraft variants or derivative models; and

(*b*) a specified date upon which an individual certificate of airworthiness is first issued means the first time a certificate of airworthiness is issued for a new individual aircraft serial number that has just come off the assembly line.

(2) No air service operator shall operate in a commercial operation—

(*a*) a helicopter of a MCTOW exceeding 3180 kg for which the individual certificate of airworthiness was first issued on or after 1 January 2016 unless such helicopter is equipped with a Type IVA FDR that complies with the requirements prescribed in Document SA-CATS 127;

(*b*) a helicopter of a MCTOW exceeding 7000 kg, or having a passenger seating configuration of more than 19, for which the individual certificate of airworthiness was first issued on or after 1 January 1989 unless such helicopter is equipped with a Type IV FDR that complies with the requirements prescribed in Document SA-CATS 127;

(*c*) a turbine-engine helicopter of a MCTOW of between 2251 kg and 3180 kg for which the application for type certification was submitted to a Contracting State on or after 1 January 2018 unless if such helicopter is equipped with—

(i) a Type IV A FDR; or

(ii) a class C AIR capable of recording flight path and speed parameters displayed to the pilot; or

(iii) an ADRS capable of recording the essential parameters prescribed in Document SA-CATS 91 that complies with the requirements prescribed in Document SA-CATS 127.

(3) An air service operator shall ensure that the following FDRs are not installed in a helicopter referred to in sub-regulation (2)—

(*a*) engraving metal foil FDR;

(*b*) photographic film FDR;

(*c*) analogue FDR using frequency modulation; and

(*d*) magnetic tape FDR.

(4) A Type IV, Type IVA and Type V FDR shall be capable of retaining the information recorded during at least the last ten hours of its operation.

(5) (*a*) An air service operator shall not operate in a commercial operation a helicopter of a MCTOW exceeding 7000 kg unless such helicopter is equipped with a CVR.

(*b*) For a helicopter not equipped with an FDR, at least the main rotor speed shall be recorded on the CVR.

(6) An air service operator shall ensure that a CVR installed in accordance with this regulation is not a magnetic tape and wire CVR.

(7) A helicopter required to be equipped with a CVR shall be equipped with a CVR capable of retaining the information recorded during the last two hours of its operation.

(8) A helicopter for which an individual certificate of airworthiness is first issued on or after 1 January 2016, which utilize any of the data link communications applications prescribed in Document SA-CATS 127 and is required to carry a CVR, shall be capable of recording on a flight recorder the data link communications messages.

(9) A helicopter which is modified on or after 1 January 2016 to install and utilize any of the data link communications applications prescribed in Document SA-CATS 127 and which is required to carry a CVR shall be capable of recording on a flight recorder the data link communications messages.

Note 1.—Data link communications are currently conducted by either ATN-based or FANS 1/A-equipped helicopter.

Note 2.—A Class B AIR could be a means for recording data link communications applications messages to and from the helicopters where it is not practical or is prohibitively expensive to record those data link communications applications messages on FDR or CVR.

(10) The minimum recording duration on the data link recorder shall be equal to the duration of the CVR.

(11) A data link recording on a data link recorder shall be able to be correlated to the recorded cockpit audio.

Appendix 2

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A. For operators who do not wish to utilize the modular overhaul concept, Rolls-Royce recommends a time between overhaul of 1750 hours for M250-C40B Series engines. However, it is possible that the allowable cycle life limit of certain rotating parts specified in Chapter 05-10-01 through 05-10-05 can be exceeded before the 1750 hour TBO. It is, therefore, the operator's responsibility to ensure that neither the total time limit nor cycle life limit of these parts is exceeded.

B. For operators who wish to utilize modular overhaul, Rolls-Royce recommends time between overhauls as listed in Table 6. However, it is possible that the allowable cycle life limit of certain parts specified in Chapter 05-10-01 through 05-10-05 can be exceeded before the recommended TBO. Therefore, the operator must ensure that neither the total time limit nor cycle life limit of these parts is exceeded.

TABLE 6

Modular Overhaul Components Recommended Time Between Overhauls

Component	Recommended TBO (Hours)
Compressor Assembly	On Condition (1)
Gearbox Assembly	On Condition
Turbine Assembly	1750 (1)

(1) Refer to chapter 05-10-00 for hour and cycle life limits on certain rotating parts. The operator must ensure that no hour or cycle life limit is ever exceeded.

TABLE 7

Accessories Recommended Time Between Overhauls

Component	Recommended TBO (Hours)	Remarks
Fuel Nozzle	2000	
Compressor Bleed Valve	1500	
Hydromechanical Unit (HMU)	2500	
Anti-Ice Solenoid Valve	On Condition	**
Anti-Ice Valve	On Condition	**
Burner Drain Valves	On Condition	**
Exciter	On Condition	**
Igniter	On Condition	**
Igniter Lead	On Condition	**
Outer Combustion Case	On Condition	**
Combustion Liner	On Condition	**
Compressor Discharge Tube	On Condition	**
ECU	On Condition	**