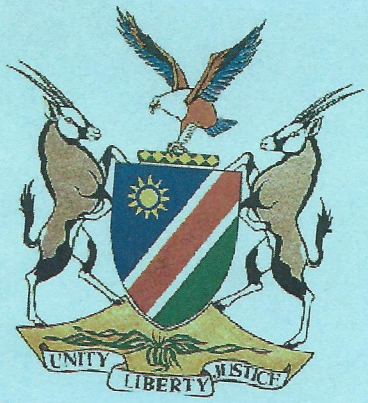

REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

DIRECTORATE OF AIRCRAFT ACCIDENT INVESTIGATION

CIVIL AIRCRAFT ACCIDENT REPORT

ACCID/07242017/01-03

OPERATION	:	INTERNATIONAL FERRY FLIGHT
AIRCRAFT	:	ZS-RNO
LOCATION	:	KOCHENA FARM
DATE	:	24 JULY 2017

REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

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022

AIRCRAFT ACCIDENT INVESTIGATION
Private Bag 12042
Ausspannplatz
Windhoek
NAMIBIA

Enquiries: T.H.Herman

Our Ref: 3/48

Date: 02 May 2017

To : **Honorable Minister: Works and Transport**

From : **Director: Aircraft Accident Investigation**

RE: AIRCRAFT ACCIDENT REPORT

Please find attached the final report on the above subject accident. In accordance with the International Civil Aviation Organization Annex 13 – Aircraft Accident and Incident Investigation – Standard 6.13, final reports shall be published as soon as possible in the interest of accident prevention.

It is recommended that copies of these final reports be made available to the public and other interested parties upon request. Your approval is therefore sought to release the said reports.

Ericksson M. Nengola 02/05/2018
DIRECTOR: AIRCRAFT ACCIDENT INVESTIGATION

TABLE OF CONTENTS

PAGE

FOREWORD

This Report presents the factual information, data analysis, conclusions, and safety recommendations reached during the investigation. The purpose of the investigation was to establish the circumstances surrounding this accident.

In accordance with the provisions of Annex 13 to the Convention on International Civil Aviation Organization, the accident's analysis, conclusions, and safety recommendations contained therein are intended neither to apportion blame nor to single out any individual or group of individuals. The main objective was to identify the systematic deficiencies and draw lessons, from this occurrence, which might help to prevent accidents and/or incidents in the future. To this end, many a time, the reader may be interested in whether or not an issue was a direct cause of the accident (that has already taken place), whereas the investigator is mainly concerned with the prevention of future accidents/incidents.

As a result, usage of this report for any purpose other than (the latter and spirit of Annex 13 and other relevant statutes) prevention of similar occurrences in the future might lead to erroneous interpretations and applications.

ABBREVIATIONS

ACCID	-	Accident
°C	-	Degrees Celsius
C of A	-	Certificate of Airworthiness
C of R	-	Certificate of Registration
CVR	-	Cockpit Voice Recorder
DAAI	-	Directorate of Aircraft Accident Investigation
FDR	-	Flight Data Recorder
ICAO	-	International Civil Aviation Organization
Km	-	Kilometer
MHZ	-	Mega hertz
Nm	-	Nautical miles
S/N	-	Serial Number
UTC	-	Coordinated Universal Time
VFR	-	Visual Flight Rules
AGL	-	Above Ground Level
VMC	-	Visual Metrological Condition
PDS	-	Power line Detection System

Ministry of Works and Transport

ACCID/07242017/01-03

DIRECTORATE OF AIRCRAFT ACCIDENT INVESTIGATIONS
ACCIDENT REPORT – EXECUTIVE SUMMARY

Aircraft Registration	ZS-RNO	**Date of Accident**	24 July 2017	**Time of Accident**	12:20 UTC
Type of Aircraft	MBB-BO-105 HELICOPTER	**Type of Operation**	International Flight		
Pilot-In-Command License Type	Commercial Pilot Helicopter	**Age**	45	**License Valid**	Yes
Pilot-In-Command Flying Experience	Total Flying Hours	4798.3 hours	Hours on Type	350.2 hours	
Last point of departure	Upington Airport (FAUP) South Africa				
Next point of intended landing	Keetmanshoop Airport (FYKT) Namibia				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)					
Kochena Farm, 27°013'10"S 018°53'23"E					
Meteorological Information	Wind: North westerly, Wind speed 15-20 knots: Visibility: >10km, Temperature: 28°C Cloud cover: Nil, Cloud base: N/A, Dew point: Not known				
Number of people on board	2 + 0	No. of people injured	0	No. of fatalities	0

Synopsis

On the 24th July 2017 at 10:42 UTC, a Helicopter MBB-BO-105 type with Registration ZS-RNO, took off from Upington airport, South Africa, on a ferry flight to Luderitz via Keetmanshoop, Namibia. There were two pilots on board. The flight was planned under Visual Flight Rules (VFR) conditions that were prevailing at the time. After one hour and forty minutes (1:40) of flight, the helicopter struck a power line and made an emergency landing at Kochena farm,120 km South East of Keetmanshoop.

The Directorate of Aircraft Accident Investigation that carried out the investigation was informed telephonically about the accident on the 24th of July 2018 by a local operator. South African Civil Aviation Authority (SACAA) appointed a non travelling accredited representative from its Aircraft Accident Investigation Division. The Minister of Works and Transport was responsible for the release of the official final accident report.

Shortly after take-off from Upington, the helicopter climbed to 1500 feet AGL on course to Keetmanshoop. En-route to Keetmanshoop, the first officer handed over the controls to the Pilot - in- Command. According to the Pilot - in - Command they experienced head wind, therefore they descended to low level where they struck the power line at 26 feet AGL. The pilot executed an emergency landing. There were no injuries. The helicopter was substantially damaged.

The weather was fine with good visibility.

The pilot was a holder of a Commercial Pilot Helicopter License and a valid medical certificate without restriction. The helicopter type was endorsed in his license. The MBB-BO- 105 was type accepted in South Africa in 2002.
The last Mandatory Periodic Inspection was carried out on the 28th of March 2017 at 3492.4 airframe hours. The regulatory authority audited the AMO that certified the last MPI on the aircraft prior to the accident, on the 26th of July 2016 and the 2nd of August 2016. It was in possession of a valid Aircraft Maintenance Organization, Approval No. 1087, expiring on the 31st of August 2017. The aircraft had flown a further 33.1 hours since the last MPI. According to available records, all Airworthiness Directives and Service Bulletins were complied with as certified in the MPI, on the 28th of March 2017.
The Annual Inspection (AI) was carried out on the 1st of November 2016 at 3395.50 airframe hours. Both inspections were carried out by Base4 Aerotech AMO # 1087.

Probable cause

Wire Strike

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator:	Base4 Aviation (Pty) LTD.
Manufacturer:	Messerschmidt-Bolkow-Blohm
Model:	1986
Nationality:	South African
Registration Marks:	ZS-RNO
Place:	Kochena farm
Date:	24 July 2017
Time:	12:22 UTC

All times given in this report is Co-ordinated Universal Time (UTC).

Disclaimer:

This report is given without prejudice to the rights of the Directorate of Aircraft Accident Investigations, which are reserved.

Purpose of the Investigation:

In terms of the Aviation Act (act No.6 of 2016) and ICAO Annex 13, 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 establish legal liability****.*

This report contains fact relating to aircraft accidents or incidents which have been determined at the time of issue.
The report may therefore be revised should new and substantive facts be made available to the investigator(s).

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 On the 24th July 2017, at 10:42 UTC, a Helicopter, MBB-BO-105 type with Registration ZS-RNO, took off from Upington airport, South Africa for a ferry flight to Luderitz via Keetmanshoop, Namibia. The nature of the offshore operation was to transport passengers to and from the ship. There were two pilots on board.

1.1.2 Shortly after take-off, the helicopter climbed to 1500 feet AGL on course to Keetmanshoop. The pilot flying was the first officer.

1.1.3 En-route to Keetmanshoop the first officer handed over the control to the Captain.

1.1.4 According to the Captain the helicopter experienced head wind and they descended from 1500 feet AGL through 1000 feet AGL to 500 feet AGL.

1.1.5 The helicopter heading before it struck the power line was ±300°M and the power line run direction North – South with geographic position S 27°00' 31" E 18° 53' 21".

1.1.6 The helicopter further descended to low level and shortly thereafter struck a power line. The Pilot-in-Command executed an emergency landing.

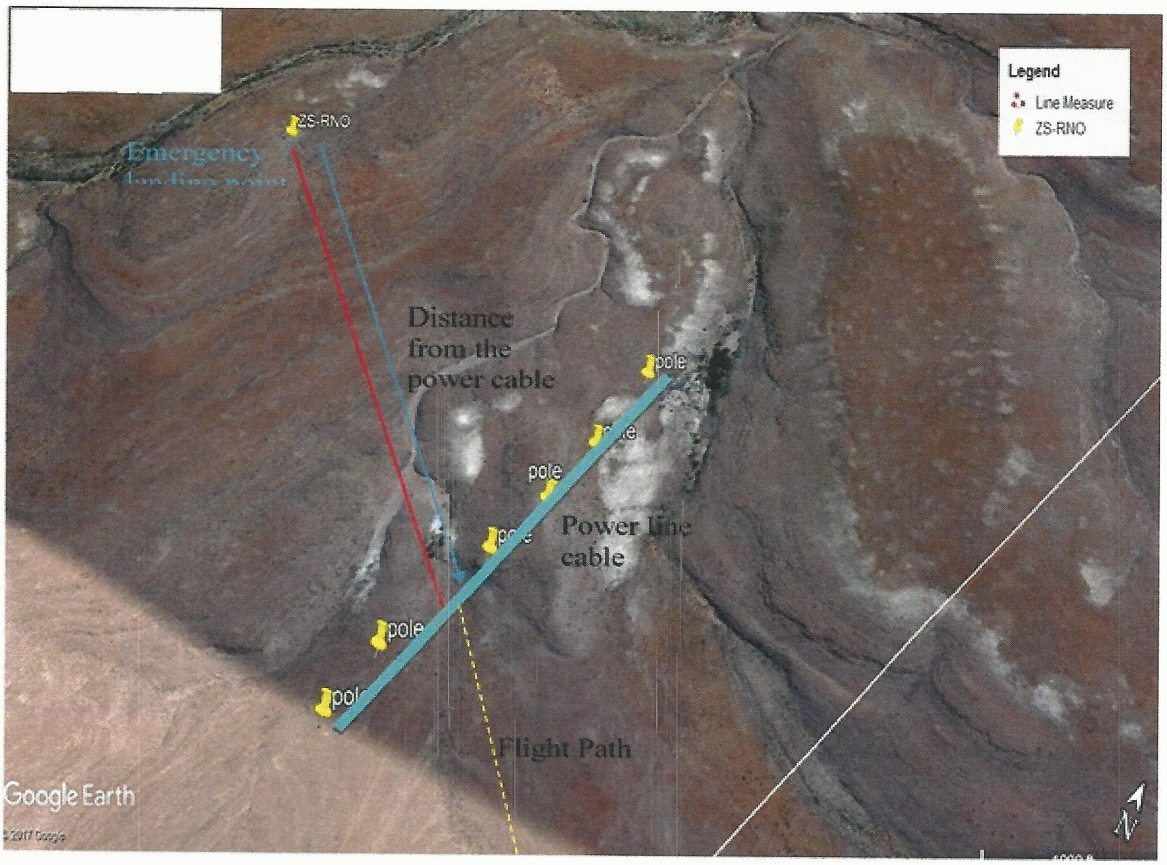

FIGURE 1. Showing the flight path in doted yellow and power line cable in blue.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	2	0	0	0

1.3 Damage to Aircraft

1.3.1 The helicopter was substantially damaged.

FIGURE 1: Nose section and windscreen damaged by the electrical cable.

FIGURE 2: The tail rotor section and blades damaged

FIGURE 3: Photo showing the entangled cable.

1.4 Other Damage

1.4.1 A section of the power line of approximately 1 km was damaged.

1.5 Personnel Information

Nationality		South African			
Licence No	0272297466	Gender	Male	Age	45
Licence valid		Yes	Type Endorsed	Yes	
Ratings		Night flights, Flight instructor grade 2, under sling/winching.			
Medical Expiry Date		30 April 2018			
Restrictions		None			
Previous Accidents		Not known			

Flying Experience:

Total Hours	4798.3 hours
Total Past 90 Days	80.7 hours
Total on Type Past 90 Days	18.7 hours
Total on Type	350.2 hours

1.6 Personnel Information co-pilot

Nationality		South African			
Licence No	0272471582	Gender	Male	Age	20
Licence valid		Yes	Type Endorsed	No	
Ratings		Nile			
Medical Expiry Date		30 September 2017			
Restrictions		None			
Previous Accidents		Not known			

Flying Experience:

Total Hours	331.0 hours
Total Past 90 Days	38.4 hours
Total on Type Past 90 Days	Not rated
Total on Type	Not rated

1.7 Aircraft Information

Airframe:

Type	MBB-BO-105 Helicopter	
Manufacturer	Messerschmidt-Bolkow-Blohm	
Aircraft Serial Number	S-735	
Year of Manufacture	1986	
Total Airframe Hours (At the time of the accident)	3525.5Hrs.	
Last Mandatory Periodic Inspection (Date & Hours)	28 March 2017	3492.4 Hrs
Hours since Last MPI	33.1Hrs.	
C of A (Issue Date)	18 December 2012	
C of A Expiry Date)	17 December 2017	
C of R (Issue Date) (Present owner)	29 July 2002	
Operating Categories	F	

Engine:

Type	Rolls Royce 250 C20B
Engine Serial Number	CAE833736
Hours since New	5506.5
Hours since Overhaul	MODULAR

Engine:

Type	Rolls Royce 250 C20B
Propeller Serial Number	CAE-834486
Hours since New	8485.5
Hours since Overhaul	MODULAR

1.7 Meteorological Information

1.7.1 The following weather information was obtained from the pilot questionnaire.

Wind direction	North Westerly	Wind Speed	15-20 knots	Visibility	>10 KM
Temperature	28°C	Cloud cover	NIL	Cloud base	NIL
Dew point	Not known				

1.8 Aids to Navigation

1.8.1 The helicopter was equipped with standard Navigation Aids applicable for the type.

1.9 Communications.

1.9.1 The pilot was broadcasting on the unmanned frequency of 124.8 MHz

1.10 Aerodrome Information

N/A

1.11 Flight Recorders

1.11.1 The helicopter was not equipped with Flight Data Recorders (FDR) or Cockpit Voice Recorder (CVR). Neither recorder was required by the relevant regulation.

1.12 Wreckage and Impact Information

1.12.1 The site where the accident occurred was flat ground and hilly area with rocks, shrubs and dry grass. The helicopter was in a normal flight configuration with all the flight parameters normal and there was no engine or mechanical defect prior to the accident. The helicopter struck the power line at 26 feet AGL with the nose section first. When the electrical cable was struck, it detached from around 10 poles covering a distance of 1 km, the power line snap on both end and entangled with the helicopter. The helicopter flew a distance of 1.1 km after it struck the power line and made an emergency landing on a flat rocky ground. The entangled power line damaged the aircraft sheet metal structure, front windscreen, the main rotor and tail rotor blades. No parts or components that detached from the helicopter prior or post-accident sequence.

1.12.2 The single phase electrical cable that was struck by the helicopter was 10 millimetre

in diameter. The poles where the power line was erected are 10 meters tall with two (2) meter of the pole buried in the ground. The remaining poles height above ground is 8 metres, which translates to 26 feet above ground. The distance between two poles was 100 meters.

Figure 1. A photo showing where the helicopter landed and the electrical power line entangled around it.

1.13 Medical and Pathological Information

1.13.1 The pilot (Captain) was a holder of a Commercial Pilot Helicopter Licence. His Medical Certificate was valid at the time of accident with no restriction.

1.13.2 There is no evidence that physiological factors or incapacitation may have affected the performance of the pilot because the pilot can account to all the event pre/post the accident.

1.14 Fire

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

1.15 Survival Aspects

1.15.1 There was no Search and Rescue carried out.

1.15.2 This was a survivable accident because the impact forces were not beyond human body tolerance and there was no compression of the cabin compartment.

1.16 Tests and Research.

1.16.1 There was no test carried out.

Research:

"Wire strikes are a serious threat to helicopter safety. Ranked as a leading cause of rotorcraft accidents world-wide, power lines claim on average two (2) helicopters every week. In Namibia, there have been quite a number of such accidents/serious

incidents over the last 10 years one of which resulted in three fatalities and several others resulting in serious injury. Any aircraft operating below 1000 ft is vulnerable to a wire strike-and, since most helicopter missions involve prolonged flight at low altitudes, the risk is particularly high for this segment.

Mitigation strategies include training, awareness and technology, both airborne and on the ground have been identifies to mitigate the risk of wire strike. "At typical flight speeds, wires are almost invisible. If there is one takeaway, wire and obstruction strike accidents are preventable if the pilots and crew understand what the enemy looks like." Unlike other accident categories experience and weather are not typically identified as causal factors in wire strike accidents. In fact 86% of these accidents occur in daytime VMC.

Industry studies have come up with intervention recommendations to mitigate the threat, such as pilot warning devices, wire cutters and improved training. The study concluded that pilot warning devices would have been beneficial in preventing 76% of the accidents, wire cutters would have been 49% effective, and pilot training would have made a difference in 56% of the cases.

Several power line detection systems have been developed in recent years. Safe flight Instruments Corp's power line detection system (PDS) is an example of a relatively low-cost device designed to warn pilots when they near wires that are energized.

In the context of a proactive safety management system (SMS) based on the severity to loss of equipment, harm to the occupants and frequency of these accidents/ serious incident operators would be required to put controls in place to mitigate the risk associated with continued flight operations at low altitudes. The most successful risk mitigation strategies involve employing both soft and safeguards controls."

(A study by Stuart Lau.)

1.17 Organizational and Management Information

1.17.1 The aircraft belonged to Base4 Aviation and was registered in the company Operations Specifications part 127.

1.17.2 Operator:

This was a International ferry flight.

The aircraft had legally entered into Namibian airspace as it had an approved over flight and landing authorization issued by the Namibian Civil Authority on the 17 July 2017. The authorization with number CG17/1245/2017 was valid for the period from 17 July 2017 to 15 August 2017.

1.17.3 Base4 Aviation part 127 Operation Manual page 206 of 255 under Minimum Flight Altitude –VFR clearly stated that "Base4 Aviation helicopter will not be operated at a height below 500 feet by day, except during take-off and landing or where an approved operation dictates".

1.17.4 Certification and Licensing authority:

Both Certificates (C of A and C of R) and the Operating Certificate were valid at the time of the accident.

1.17.5 Maintenance Organizations:

Base4 Aerotech (Pty) LTD with AMO # 1087 carried out Annual Inspection (AI) on

the 1/11/2016 and Mandatory Periodic Inspection (MPI) on the 28/03/2017.

1.18 Additional Information

1.18.1 None

1.19 Useful or Effective Investigation Techniques

1.19.1 None

2 ANALYSIS

2.1.1 On the 24th July 2017, the MBB-BO-105 helicopter type with registration number ZS-RNO, departed Upington airport at around 10:42 UTC for a flight to Keetmanshoop, Namibia with two pilots on board. The flight was intended to proceed to Luderitz where the aircraft will be involved in the offshore operation.

2.1.2 The flight from Upington into Namibia was done by the co- pilot. En-route to Keetmanshoop the Pilot - in - Command (Captain) took over flight control from the co-pilot and commenced the descent.

2.1.3 During the descent the helicopter struck a power line which was way below the authorised minimum height to conduct normal flight.

2.1.4 Although the pilot mentioned that they encountered a head wind, further analysis indicated that even with the mentioned head wind the aircraft could still have flown at a safe height and reach Keetmanshoop.

2.1.5 The reported weather condition at the time leading to the accident did not have any contributions towards this accident.

3 CONCLUSION

3.1 Findings

3.1.1 Both pilots' licences were valid at the time of the accident.

3.1.2 Both pilots' medical certificates were valid.

3.1.3 The aircraft's Airworthiness Certificate(C of A) and Certificate of Registration (C of R) were valid at the time of the accident.

3.1.4 The pilot filed a flight plan with reference number 912 and had an approved over flight, Landing Authorization and a Foreign Operators Permit as required.

3.1.5 The aircraft was on a ferry flight from South Africa to Namibia for offshore operation at Luderitz as per the Foreign Operator Permit.

3.1.6 It is therefore the view of the investigator that the pilot does not uphold operational safety nor follow the laid down safety procedures involved in conducting safe operational flight.

3.1.7 The weather was fine with good visibility at the time of the accident and was not considered a contributing factor to the accident.

3.1.8 The aircraft weight and balance was within limit and was not considered a contributing factor to the accident.

aircraft plus the non-adherence to the company Manual of Operation and the Namibian Civil Aviation Act (Act No 6 of 2016) which gave the minimum height above ground where civilian aircraft should operate in normal flight.

3.1.10 The second crew member who was a co-pilot on the flight was not part of the operation to be carried out in Namibia nor was he rated on the helicopter type.

3.1.11 Looking at the sequence of the way the aircraft descended and struck a power line routed at 26 feet above ground, that is an indication that there were bad airmanship and a violation of company operating procedure which stated that: "Base4 Aviation helicopter should not be operated below 500 feet above ground during the day while in cruise flight".

3.2 Probable Cause/s

3.2.1 Wire strike.

4. SAFETY RECOMMENDATIONS

4.1 None

Compiled by:

.....

T.H.Herman
Investigator-in-Charge

Date: 02/05/2018

Released by:

.....

John Mutorwa, MP
MINISTER: MINISTRY OF WORKS AND TRANSPORT

Date: 12/5/2018

Ministry of Works and Transport
MAY 2018
Office of the Minister