HELICOPTER ACCIDENT REPORT NO. MTC/AIG/01/21

Republic of Botswana

MINISTRY OF TRANSPORT AND COMMUNICATIONS

Directorate of Accident Investigation

Final Report on the fatal accident to Robinson R44 Raven II helicopter, ZS-SBM at Xumabee Game Ranch in the Western Sand Veld, near Sojwe on 5 March 2021

GABORONE: MTC-DAI

Directorate of Accident Investigation

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Directorate of Accident Investigation

DATE: 6 December 2021

REF: MTC/AIG/01/21 (30)

22nd October 2021

Honourable Thulagano M. Segokgo
Minister of Transport and Communications

Sir,

I have the honour to submit the final accident report on the circumstances surrounding a fatal accident to the Robinson R44 Raven II helicopter, ZS-SBM, which occurred at Xumabee Game Ranch in the Western Sand Veld near Sojwe, on the 5th March 2021.

Yours faithfully,

Olefile B. Moakofi
DIRECTOR, ACCIDENTS AND INCIDENTS INVESTIGATION

THE MINISTERIAL NOTE

In accordance with the powers conferred on me by Section 74 of the Civil Aviation Act No. 11 of 2011, I hereby declare the final accident report on the circumstances surrounding the fatal accident involving the Robinson R44 Raven II helicopter, registered ZS-SBM, which occurred at Xumabee Game Ranch in Western Sand Veld near Sojwe, on Friday, the 5th March 2021, to be public.

I therefore call upon members of the public to be circumspect as they go through this report or use it for different research purposes. I urge everyone to pay attention to the foreword in this report. Making aircraft accident reports public is in line with the mandate of the Directorate of Accident Investigation (DAI), which, according to Section 75 of the Act, is to investigate and prevent accidents and incidents. I believe (as indeed is the belief of the aviation fraternity globally) that sharing air accident reports affords those in the aviation industry as well as others, the opportunity to learn and derive lessons from them, with a view to prevent and/or reduce similar recurrences in future. It also serves to demonstrate my Ministry's commitment to the transformational agenda, to remain transparent **in** whatever we do in the best interest of the public.

I trust that all parties concerned will implement the safety recommendations contained therein and that the Civil Aviation Authority of Botswana will make every effort to enforce them. In the same breath, I direct the DAI's management and staff to follow through and monitor the progress made by those concerned in line with the *provisions* of the International Civil Aviation Organization.

Thank you.

Hon. Lefoko M. Moagi

ACTING MINISTER OF TRANSPORT AND COMMUNICATIONS

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FIGURE 1: ***Showing the Wreckage of ZS-SBM***

FOREWORD

This final accident report (on ZS-SBM) presents the factual information, data analysis, conclusions with findings, probable cause(s) and contributory factors as well as safety recommendations made by the Directorate of Accident Investigation duly established by the State of Occurrence (i.e. the Republic of Botswana). The main purpose of this investigation was to establish the circumstances surrounding the accident, with a view to prevent similar recurrences in future.

In fact, Section 75 (1) of the Act states, "The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents and not to apportion liability or blame." Thus, the intent was rather an effort to gather and analyse facts to establish what happened, how it happened, when it happened, where it happened and why it happened, with a view to prevent similar occurrences from happening in future. The aim is to do that in order for all those concerned with aviation safety to derive lessons from this particular occurrence and learn from it as part of accident prevention programme. Most unfortunate is that more often than not, the reader may be more interested as to whether an individual or individuals, an action or actions was or were the probable cause of the occurrence or not and whether anyone was particularly responsible to be held as such. That was not the case in this investigation (or any other air accident/incident investigation for that matter), the main intent of which was to improve upon the aviation safety generally, as a way of promoting travel, trade and tourism in Botswana and beyond.

As a result, therefore, usage of this report (or any part thereof) for any purpose other than that which is consistent with the letter and the spirit of the Act and other relevant instruments and/or international protocols might lead to erroneous interpretations and applications.

ACKNOWLEDGEMENTS: Despite the fact that the official site investigation effectively commenced two days after the occurrence, the Directorate is grateful to the Botswana Police Service. Not only did they assist with the transportation to the occurrence site, but the Crime Scene Investigator (CSI) from Sojwe Police Station did a good job of preserving evidence which greatly helped in this investigation. Similarly, the South African Division of Accidents and Incidents Investigation was extremely helpful and always ready to provide any information as per the Investigator-In-Charge's request.

GLOSSARY OF ABBREVIATIONS

AR: Accredited Representative

ASB: Air Support Branch

ATC: Air Traffic Control

ATO: Aviation Training Organisation

ATS: Air Traffic Services

BR: Botswana Railways

BPS: Botswana Police Service

BTC: Botswana Telecommunications Corporation

BURS: Botswana Unified Revenue Services

CAAB: Civil Aviation Authority of Botswana

CKGR: Central Kgalagadi Game Reserve

CRS: Certificate of Release to Service

CSI: Crime Scene Investigator

DAI: Directorate of Accident Investigation

DIS: Directorate of Intelligence and Security

ELT: Emergency Locator Transmitter

EMS: Emergency Medical Service

ICAO: International Civil Aviation Organization

ICASA: Independent Communications Authority of South Africa

IFR: Instrument Flight Rules

IIC: Investigator-In-Charge

MFED: Ministry of Finance and Economic Development

MOU: Memorandum of Understanding

MTC: Ministry of Transport and Communications

PIC: Pilot-In-Command

POH: Pilot's Operating Handbook

PS: Permanent Secretary

PSA: Public Service Act

SACAA: South African Civil Aviation Authority

SOR: State of Registry

SSKIA: Sir Seretse Khama International Airport

SSR: Secondary Surveillance Radar

UTC: Universal Time Coordinated or Zulu time

SYNOPSIS

Aircraft Accident Report No: MTC/AIG/01/21

Registered Owner:	Finance Asset Aircraft Corporation
Operator:	Mr. Leonard Matenje
Aircraft Type:	Robinson R44
Model:	Raven II
Serial Number:	12099
Nationality:	South Africa
Registration:	ZS-SBM
Place of Accident:	Xumabee Game Ranch
Date and time:	5 March 2021 at 1740Z.

All times in this report are expressed as UTC (i.e. Local time *minus* 2 hours)

SYNOPSIS

The Directorate of Accident Investigation (DAI) was notified of this occurrence in the morning of Saturday, 6 March 2021. A Go-Team left for the site immediately after the notification and the team comprised of O. Moakofi (Investigator-In-Charge) and M. Tlhompho (as the Logistics Member of the Go-Team). The plan was for the Go-Team to drive up to Sojwe and be airlifted from there to the site. Communication with the Air Support crew at the site was difficult and by the time they communicated they were about to reach Gaborone. The Go-Team members therefore proceeded to Sojwe, where they spent a night and were transported to the occurrence site the next morning (i.e. on Sunday, the 7th March 2021). At the time of this occurrence, the helicopter was engaged in a private flight to a private ranch. The Pilot-In-Command of the helicopter was a male, who was also the owner of Xumabee Game Ranch. Aboard the helicopter was also a female passenger, whom it was said was going to the same ranch. After the helicopter entered Xumabee Game Ranch, while approximately a kilometre away from the landing site, it collided with the terrain and crashed. According to some witness reports, it was the first time for the occurrence aircraft to arrive so very late at Xumabee Game Ranch.

A number of findings and some safety recommendations were passed during the course of this investigation.

The Executive Summary

The Robinson R44 helicopter, registered ZS-SBM, belonging to Asset Aircraft Finance Company of South Africa and operated and/or flown by a certain Mr. Leonard Matenje, got involved in a fatal accident on Friday, 5th March 2021 at Xumabee Game Ranch. The helicopter had left Matsieng Airstrip near Rasesa Village on the late afternoon of the same day. The Pilot-In-Command (PIC) and his passenger departed Matsieng Airstrip very late and as a result all the airstrip workers including security officers had knocked off, and therefore the departure flight was not recorded anywhere. Not even the Covid-19 Register was there to show what time did the helicopter occupants arrived at Matsieng Airstrip.

The helicopter was not fitted with an Emergency Locator Transmitter (ELT), which would have triggered off during the crash because the forces characteristic of the crash dynamics. The ELT helps to shorten the time taken to search for a crashed aircraft, which in turn may create an opportunity to afford occupants the necessary aid if they are injured. The PIC had not filed a flight plan with the Air Traffic Services (ATS) at Sir Seretse Khama International Airport (SSKIA) on that day. So, there was no communication with controllers whatsoever. The Secondary Surveillance Radar at SSKIA could not detect the helicopter. This was because the PIC had not switched the transponder on and had not established communication with the controllers at SSKIA, who would have given him squad codes to enable the Radar's detection of the helicopter.

The PIC reported that the flight from Matsieng Airstrip to Xumabee Game Ranch takes on average 45 minutes. He reported that he reached Xumabee Game Ranch at 1850 hrs Botswana Time (BT). One witness reported that his colleague, as soon as he (the colleague) spotted the approaching helicopter from far remarked, "How come the boss is coming so very late today!" The investigation revealed that the helicopter's clock indicated the crash to have taken place around 1940 hrs BT. There was also a trending WhatsApp chat which indicated that the passenger was last seen on WhatsApp at 1904 hrs that evening. The PIC reported that they had a problem of elephants at the farm and that every time before landing he would fly around the fence to check if there are elephants around. He claimed that even on the occurrence night he was flying around to check for elephants.

The preliminary site investigations revealed that the PIC was flying very low, at a tree-top level and that in the process his helicopter's tail rotor collided with the terrain (i.e. one of the trees) and that caused the accident. After collision with terrain, the helicopter glided for approximately 25 metres before contacting the ground and it was ploughing through for approximately another 50 metres before coming to its final rest, where it was facing the direction it had come from. The site indications suggested that during the final crash dynamics, the passenger fell down to the ground prior to the helicopter coming to its final resting place. The PIC reported that after the helicopter came to its resting place, he looked for the passenger, but she was nowhere to be found in the cockpit. He said he then unbuckled and got out of the helicopter and later he found her outside the helicopter. The PIC then decided to leave the passenger to go to a

nearby farm to seek for help. In the meantime, his farm workers had come running to locate the crashed helicopter, but because it was dark in the night, the search took longer. The farm workers were even joined by the Ranch Manager, who was coming from Gaborone by road, together a Vet officer. The Ranch Manager reported that after hearing about the crash, he too followed the workers and he could see their search light from a distance, whereupon he called then over the radio and asked them to come to him. The Ranch Manager then took the satellite phone from the workers and called the PIC. They then continued with the search and finally located the wreckage, where they later saw the passenger who was seriously injured.

After the PIC came back, it was decided that the Ranch Manager must drive the passenger to Sojwe Clinic. The other farm worker was at the back of vehicle accompanying or looking after the passenger. The PIC himself chose to remain behind when the passenger was driven to the clinic in Sojwe. It was reported that the passenger could not make it to Sojwe, but passed on along the way. The investigation questioned some of the PIC's actions or behaviour (commissions and omissions) that night: 1) Wandering away from the scene of the accident at night was not the best decision. An experienced pilot would normally remain by the wreckage and devise means of being discovered quickly by any search team rather than wander away. While staying put he also could have gotten the chance to think of what else to do in order to save the life of the injured passenger. For example, he probably could have called his friend to report the accident much earlier when there was still time. 2) Deciding to remain behind instead of going for medical check that night left a lot to be desired. Besides he going for medical check-up, he was the only one known to the passenger, so common sense would suggest that he would have been the most suited person to accompany her at that time rather than leave her with total strangers, as it were. 3) He had a satellite phone and being a pilot it would be expected of him to have in his check list some emergency numbers which he could have called to come and provide the much needed help instead of having to drive such a long distance in rough and bumpy roads when the passenger was already seriously injured.

Despite the fact that the PIC claimed he was checking for elephants, there was enough evidence to point to the fact that visibility was highly compromised. In other words, it was dark and that could explain why he was flying at tree-top level. The fact that the situation could have been compounded by other factors such disorientation and/or being under influence could not be discounted, especially that some substance was discovered from the accident site. The investigation concluded that the probable cause of this fatal accident was collision with terrain, with a few contributory factors being cited.

SECTION 1: THE FACTUAL INFORMATION

1.1 History of the Flight

1.1.1 In the evening of Friday, 5 March 2021, a Robinson R44 Raven II helicopter belonging to Aircraft Asset Finance Corporation (PTY) LTD, bearing the nationality and registration marks ZS-SBM was engaged in a private flight to the operator's game ranch. Shortly after entering the operator's game ranch, ZS-SBM (the occurrence helicopter) was spotted or heard by some of the game ranch employees. According to reports, the approaching helicopter's lights vanished from sight and there followed an unfamiliar sound which made the employees to suspect a crash. Reportedly, the employees immediately started a search for the helicopter.

1.1.2 According to witness reports, one of the employees who first spotted the approaching helicopter (or saw the lights and/or heard its sound) made a remark as to "How come today the boss is coming so very late?" The other employee, on hearing the remark then went to have a look but was only able to see the helicopter's lights and noticed that it was flying too low. Next, it disappeared from sight and soon they heard the unfamiliar sound and concluded it must have crashed. They then started preparing for the search towards the direction they had seen it (or seen its lights). Asked what time was it when they saw the approaching helicopter, saw its lights or heard its sound, the witness said it was before 1700Z. Asked whether the owner of the game ranch or Pilot-In-Command (PIC) had ever arrived at that time before, the response was that it was the first time ever to see him arriving that very late, adding that the PIC always arrived at the ranch during day time or, at the very latest, in the afternoon, around 1400Z or at the time of driving goats into the kraals (*dipudi di tlhatlhelwa*).

1.1.3 Reportedly, it was not easy to spot the wreckage as it was dark. The Ranch Manager, who was also coming from Gaborone but by road, arrived at around the same time of the accident having just occurred and when the search for the wreckage or victim(s) was still ongoing. He went to assist with the search and could see the search light at some distance from where he was. He then called the searching employees on the radio and told them where he was. After the other employees and the Manager met, the latter took the satellite phone from them and managed to call and talk to the ranch owner or the PIC.

1.1.4 The Ranch Manager was then able to locate the wreckage and he heard a faint voice that sounded like a female's voice. That was when he discovered there was a second person on board the helicopter. The passenger reportedly asked for water and she was given some water. The Manager also reported that he discovered that she was seriously injured. The Manager then left the crash site (with other employees remaining behind) to go and pick the PIC from the adjacent Mmachoama Cattle Ranch.

1.1.5 Some witnesses residing at Matsieng Airstrip (and whose house is not very far from the helipad) reported that they heard the helicopter take-off but did not check exactly what time it was, except estimating it to be between 1600Z and 1630Z. But few minutes later, they heard it returning and thought perhaps the PIC had just gone for a circuit. But they also noticed that after landing, the engine did not cut-off, but was on idle the whole time it was on ground. They further reported that after sometime they heard the helicopter take-off again and after the second take-off it never came back.

1.1.6 The PIC reported that they reached Matsieng Airstrip a few minutes before six local time (or shortly before 1600Z). He stated that he took off and when they were around Dikgonnye Village, he realised that he had forgotten both the satellite phone and radio by the helipad at Matsieng Airstrip. He then returned to the helipad to pick satellite phone and the radio. The PIC stated that he normally takes approximately 45 minutes to fly from Matsieng Airstrip to Xumabee Game Ranch. In a written statement, the PIC stated that on the occurrence day he arrived at 1650Z.

1.1.7 Asked if he had filed the flight plan with the Civil Aviation Authority of Botswana (CAAB), the PIC's response was not affirmative. Asked further as to what was the reason for not doing so, the PIC stated that he had stopped filing the flight plan because of termination once he approaches Boatlaname Village or thereabout.

1.1.8 On being questioned about the final leg of his journey, the PIC stated that they have problems with elephants at the game ranch, so he normally flies low on arriving at the ranch to check for elephants, stating that was what he was doing at the time of this occurrence. He reported that he felt the helicopter swerve a bit and tried to flare it, but he was not sure whether he picked the collective or cyclic in the process. The next he remembered was the rotorcraft being out of control. The PIC reported that after the helicopter had come to a stop, he looked for the passenger but he could not find her inside the cockpit. He then unbuckled and got out of the helicopter. After locating the passenger, he then told her that he was going to look for help from the neighbouring cattle ranch.

1.1.9 Due to some logistical challenges, investigators reached the occurrence site on Sunday, the 7th March 2021. Site investigation revealed that the helicopter was flying low and its tail rotor collided with the terrain, after which it lost control and crashed.

1.2 Injuries to Persons

INJURIES	CREW	PASENGERS	OTHERS
FATAL	0	1	0
SERIOUS	0	0	0
MINOR/NONE	1	0	0

1.3 Damage to Aircraft

The helicopter was severely damaged due to impact forces, but there was no pre or post-impact fire.

1.4 Other Damage

The other damage was limited to the surrounding vegetation (i.e. broken trees and shrubs) as well as the fence being destroyed.

1.5 Personnel Information

1.5.1 Pilot in Command (PIC)

1.5.1.1 Personal information on the PIC was provided by him & the State of Registry.

Nationality	Motswana	Gender	Male	Age	45
Total Hours Flown	590.6	Total Hours on Type	560		

1.5.1.2 The PIC had trained as a pilot at Hover Dynamics at Grand Central in South Africa and obtained his Flying License issued by the South African Civil Aviation Authority (SACAA) in 2014.

1.5.1.3 The PIC had a valid Medical Certificate issued under the auspices of the Civil Aviation Authority of Botswana (CAAB) and this was valid till 24 March 2022 and it had an endorsement of VDL (carry spares) as its limitation.

1.5.1.4 An examination of some of his training records revealed that he had a total of approximately 12 hours of night flying. But there was no record to indicate that he had ever flown solo at night.

1.6 Helicopter Information

1.6.1 Robinson Model R44 System Descriptions

1.6.1.1 The R44 is a four-place, single main rotor, single engine helicopter and equipped with skid-type gear. The main rotor has two all-metal blades mounted to the hub by coning hinges. The hub is itself mounted to the shaft by a teeter hinge. The coning and teeter hinges are self-lubricating. The tail rotor has a two all-metal blades and teetering hub with fixed coning angle.

1.6.1.2 The powerplant is a six cylinder, horizontally opposed, direct drive, air-cooled, fuel injected and normally aspirated. It is of a Lycoming IO-540-AE1A5 model.

It is equipped with a starter, alternator, shielded ignition, two magnetos, muffler, oil cooler and induction air filter.

1.6.1.3 Flight control operation is conventional and comprises both cyclic and collective controls. The engine throttle is correlated to collective inputs through a mechanical linkage. When the collective is raised, the throttle is open and when it is lowered, the throttle is closed. There are these cautions: 1) *At above 4000 feet, throttle-collective correlation and governor are less effective. Therefore, power changes should be slow and smooth.* 2) *At higher settings above 4000 feet, the throttle is frequently wide open, and revolution per minute (RPM) must be controlled with collective.*

1.6.1.4 Left seat pilot controls may be removed and installed by maintenance personnel or pilots as follows: 1) To remove cyclic grip, remove quick-release pin by depressing button and pulling, then pull outward on left grip while supporting cyclic centre post. To re-install removable cyclic grips, follow a reverse procedure. 2) To remove collective, push boot aft to expose locking pins. Depress locking pins and pull forward on stick. To re-install, use a reverse procedure.

1.6.2 The Maintenance History

1.6.2.1 The PIC reported that the occurrence aircraft had been serviced last in November 2020 and that it had an oil change as well as the replacement of its battery.

1.6.2.2 He further reported that it was maintained by the Hover Dynamics in RSA.

1.6.2.3 The investigation was able to get copy of the helicopter's Certificate of Release to Service (CRS) through the help of AR in the State of Registry (SOR). Copy of CRS is attached herein as **Appendix 1**.

1.7 Meteorological Information

1.7.1 According to the PIC, the weather was normal.
1.7.2 However, it was not clear what the exact time of the occurrence was.

1.8 Aids to Navigation

The information received from the SOR indicated that this helicopter was fitted with the Bendix King Transponder.

1.9 Communication

1.9.1 The occurrence rotorcraft was equipped with a King Transmitter VHF radio.

1.9.2 The Radio Station License issued by the Independent Communications Authority of South Africa (ICASA) showed to have expired on 31st March 2019.

1.10 Aerodrome Information

The occurrence took place away from the destination helipad (i.e. approximately 1 km away), so aerodrome information was not relevant to the occurrence. Coordinates for Xumabee Game Ranch were reported to be S22°42,487; E025°29,064.

1.11 Flight Recorders

The helicopter did not have Flight Recorders and was not required to.

1.12 Wreckage and Impact Information

1.12.1 The site investigation revealed that the occurrence aircraft's tail rotor had collided with the terrain (i.e. a tree) while it was flying slightly nose-up. The rotorcraft then spiralled towards the ground but on a somewhat steady dive rather than a sharp vertical descent. From the first point of impact (with the tree) to the first impact with ground, it was a distance of approximately 25 metres. Then after the ground impact, it went ploughing, moving towards the boundary fence. It pulled the fence with it (which action must have further reduced the helicopter's ground speed) and approximately 54 metres length of the fence was affected. The distance covered while moving on the ground to where the wreckage finally rested was approximately 50 metres. The preliminary report is attached as **Appendix 2** to this report.

1.12.2 The main Instrument Panel was found along the skid marks trail at approximately 15 metres upstream of the main wreckage, with reference to the final trajectory. One of the instruments indicated that at the time of losing power (or when it got sheared off the aircraft) the helicopter was descending and banking to the left. Despite the fact that the time of occurrence was reported to be prior to 1700Z, the investigation discovered a mobile screenshot indicating that the passenger was last seen on the WhatsApp at 1704Z. The helicopter's clock was found showing the time captured as 1741Z. The clock's photograph is attached as **Appendix 3** to this report.

1.12.3 The site investigation further revealed that prior to the main wreckage coming to its final resting position, the helicopter hit the root of a shrub with its bottom port (left-hand side) corner and capsized. The helicopter then flew over the shrub and finally landed on its port side and facing the direction it had come from (i.e. having rotated through 180 degrees clockwise). The tailpiece (with fin/rudder and two side flaps/elevators) had been thrown approximately 11 metres straight ahead of the main wreckage, in the direction of the final trajectory. The tail rotor had fallen to the left, at a 45-degree anti-clockwise with

reference to the rotorcraft's final trajectory and 15 metres away from the tailpiece or 14 metres from the main wreckage.

1.12.4 The wreckage showed signs of severe damage to the root of the tail section/boom, with the rest of cabin/fuselage bent, wrinkled and torn. The glass canopy was broken, with the starboard (right-hand side) door not there and only the port door there, but with the glass broken. The seats were found slightly damaged, but both front seat belts were found buckled up. It was also evident that though the aircraft is designed with dual controls, at the time of the site investigation the left-hand side controls seemed to have been disabled or removed (suggesting that the PIC was flying the helicopter from the starboard side and the passenger occupying the port seat). One main rotor blade was sheared off, with wrinkles, bents and tears while the other blade was intact but showing some visible damage. Some of the Wreckage Photographs are attached as **Appendix 4** to this report.

1.13 Medical and Pathological Information

There were no medical or toxicological tests performed on the crew other than the normal post mortem for the passenger.

1.14 Fire

There was no pre or post-impact fire in this occurrence.

1.15 Survival Aspects

1.15.1 The PIC survived the crash, except for minor bruises and scratches. But the passenger sustained serious injuries that led to fatality.

1.15.2 The information obtained from the State of Registry indicated that the helicopter was not fitted with an emergency locator transmitter (ELT) and was not required to.

1.15.3 From the reports available, had it not been for the long drive due (partly) to the bad/rough state of the road, the occurrence might have been survivable.

1.15.4 According the PIC's report, following the crash, only the passenger was sent for medical attention (under care of the Ranch Manager and one employee), while the PIC himself remained behind at Xumabee Game Ranch.

1.15.5 Reportedly, neither the driver (i.e. Ranch Manager) nor the employee who nursed the passenger knew her. They only addressed her as "my sister," as they did not know her name until a day later.

1.16 Tests and Research

1.16.1 The investigation carried out an Internet search to establish the time of sunset on the day of the occurrence (i.e. 05/03/2021).

1.16.2 The search showed sunset times for Gaborone, Francistown, Selebi-Phikwe and Serowe. Since Serowe was the closest to the occurrence site, that was the time deemed applicable and it was 1637Z.

1.16.3 Apart from the above-stated, no other tests or researches were conducted during the investigation.

1.17 Organisational and Management Information

1.17.1 Civil Aviation Authority of Botswana

1.17.1.1 The CAAB is the national safety oversight authority or civil aviation regulatory body. It is therefore the one responsible for setting up safety standards as well as enforcing them upon the aviation industry.

1.17.1.2 The control and/or responsibility of the Botswana's national airspace is vested with the authority and so is the initiation and/or coordination of search and rescue operations in case of a missing or crashed aircraft.

1.17.1.3 As the regulatory body, CAAB is therefore responsible for licensing aerodromes in Botswana. That would include private ones like Matsieng Airstrip and others such as Orapa Airstrip, Limpopo Valley Airfield, etc.

1.17.1.4 This was a private flight conducted under the provisions of Civil Aviation (Aircraft Operations) Regulations of 2012.

1.17.2 Helicopter Owner, PIC and the State of Registry

1.17.2.1 According to the official helicopter documentation, the registered owner of the occurrence helicopter was Aircraft Asset Finance Corporation (PTY) LTD, a South African company. Copy of the certificate of registration is attached as **Appendix 5** to this report.

1.17.2.2 This therefore rendered the PIC as the helicopter's operator. However, he reported that he had bought it, except he had not yet processed its change of ownership as he was still contemplating to acquire a turbine aircraft.

1.17.2.3 By virtue of its registration at the time of the crash, the helicopter therefore did fall under the jurisdiction of the South African Civil Aviation Authority (SACAA), as far as its state of airworthiness was concerned.

1.17.3 Matsieng Airstrip Management

1.17.3.1 The Matsieng Airstrip is situated approximately 30 km north (or north-east) of Sir Seretse Khama International Airport (SSKIA) and it is under private management and ownership (i.e. a local Drilling Company). Matsieng Airstrip is situated near Rasesa Village and it is home to the biggest annual air show in Botswana.

1.17.3.2 Matsieng Airstrip is owned and managed by the De Wet Drilling (PTY) LTD. It is licensed as a Category D, unmanned private aerodrome under License No. B542. There are no service level agreements with any of the aviators who keep their aircraft at Matsieng Airstrip. Those keeping their aircraft in the Matsieng hangars are said to be current pilots and Management relies on their integrity to adhere to the "Rules of the Air" in the conduct of their flying.

1.17.3.3 Regarding security at Matsieng Airstrip, the investigation established that security guards are familiar with the identity of pilots, but there are no records kept for the passengers. The hangar attendant keeps record of aircraft arrivals/departures during working hours on week days. But, since the occurrence aircraft departed after working hours, there was no record reflecting time of departure or name(s) of passenger(s).

1.18 Additional Information

1.18.1 Despite the fact that it was suggested the accident had occurred before or around 1700Z, the PIC only notified his friend (i.e. the key witness) of the occurrence at 2048Z, well over 3.5 hours after the suggested/claimed time of occurrence.

1.18.2 According to the air traffic service (ATS) Log Book, the key witness reported the occurrence (at 2120Z) on behalf of the PIC, and suggested that there were four persons on board the helicopter. The partial telephonic conversation between the key witness and Area Controller is attached as **Appendix 6** to this report.

1.18.3 During the interview, the PIC reported that they had three bottles of Rupert & Rothschild (R & R) red wine and two packs of savannah.

1.18.4 There were different versions of unconfirmed reports according to the media (social and/or otherwise), some of which suggested the following:

1.18.4.1 That the helicopter had flown to Xumabee Game Ranch (where there was a party going on) and landed safely, after which four persons went for a joy ride and were on board at the time of the crash.

1.18.4.2 That the deceased passenger was the one flying the helicopter at the time of this occurrence.

1.18.4.3 That the ELT must have triggered off during the crash to alert relevant authorities of the occurrence.

1.18.4.4 That the Transponder was switched off and as a result, the CAAB Radar was unable to detect the occurrence aircraft.

1.18.5 There was a visible difference between photographs taken on Saturday by the Crime Scene Investigator (CSI) and the ones taken on Sunday at the time of the site investigation. For example, Saturday pictures revealed blood stains over some parts of the wreckage, as well as around the spot where the passenger was found, but all that was not visible on Sunday.

1.18.6 A quick search on the Internet regarding the effects of spatial disorientation revealed the following: Spatial disorientation of an aviator is the inability to determine angle, altitude or speed. It is most critical at night or in poor weather, when there is no visible horizon, since vision is the dominant sense for orientation. The auditory system, vestibular system (within the ear), and proprioceptive system (sensory receptors located in the skin, muscles, tendons and joints) collectively work to co-ordinate movement with balance, and can also create illusory nonvisual sensations, resulting in spatial disorientation in the absence of strong visual cues.

1.18.7 The key witness who reported the occurrence on behalf of the PIC did say that he was reporting so that investigators can go to the site because of insurance issues.

1.18.8 The PIC reported that the helicopter had no mechanical fault prior to the crash.

1.18.9 A whitish substance was reportedly found in one of the two occupants' personal effects.

1.19 Useful or Effective Investigative Techniques

1.19.1 The useful technique applicable in this investigation was that of using the Internet to establish the time for sunset, as well as partial disorientation.

1.19.2 Using the screenshot that revealed the last time the passenger was seen on the WhatsApp was another useful technique for this investigation.

1.19.3 Efforts to get communication transmitted through the passenger's mobile phone were not fruitful, as the service provider only provided the list of times and numbers the phone transmitted to or received from.

SECTION 2: ANALYSIS

2.1 The Aircraft's Airworthy State

2.1.1 According to item 1.18.8 above, the PIC reported that the helicopter did not have any mechanical fault.

2.1.2 The flight from Matsieng Airstrip to entering Xumabee Game Ranch was reported as having been uneventful according to the PIC. According to the CRS, the next maintenance check (or mandatory periodic inspection) was to take place at 390.3 hours or on 14/07/21. The CRS was still valid for over 4 months or over 28 hours, whichever was going to come earlier. Therefore, the probability of the helicopter having crashed as a result of a mechanical fault is very remote or highly unlikely. The same helicopter was reportedly involved in another accident in 2015 while still in RSA, but the two accidents were not deemed to be related. Though the helicopter was under the jurisdiction of RSA as the SOR, it was not clear why it was still kept under that registry while being operated in Botswana and by Motswana for so long. The PIC when asked said it was because he was contemplating purchasing a turbine type, but in another statement he declared that he had leased the helicopter. On the re-examination, the PIC stated that the helicopter was acquired on a lease to own contract.

2.1.3 The aircraft's state of airworthiness or its registry was not deemed to be a factor in this occurrence. But once an aircraft is rightfully purchased by a citizen, it is expected to be properly cleared with BURS and then entered into the civil aircraft register, lest it raises unnecessary concerns/suspicions amongst the relevant authorities.

2.2 ELT's Functionality

2.2.1 At item 1.18.4.3 above, there was a suggestion of the ELT having triggered off during the crash and therefore alerting authorities about the occurrence.

2.2.2 An ELT is a transmittal garget installed in the aircraft as an aid to search and rescue operations. Following an impact, a signal should be transmitted via satellite to a ground-based station in the event that an ELT has triggered off. Such stations serving our region are located at Cape Town; London or Paris. The signal would then provide coordinates of the occurrence site and aircraft information and that helps to shorten the time taken to look for an aircraft involved in a mishap. Having said that, however, the occurrence helicopter was not fitted with an ELT, as per item 1.15.2 above.

2.2.3 The issue about ELT triggering off or not was not a factor in this occurrence, because there was none fitted to start with.

2.3 ATC Radar Detection

2.3.1 At item 1.18.4.4 above, there was a mention of the transponder being switched off and thus rendering the helicopter undetectable by the CAAB Radar.

2.3.2 A transponder is an electronic device installed in the aircraft to communicate with Radar used by the air traffic control (ATC). It is a short form of "transmitter-responder" and it transmits a 4-digits code otherwise called squawk code. These codes allow the aircraft to be identified by ATC and the codes are given by ATC in the order of the clearance granted. The ATC Radar system is of two types: Primary Radar and Secondary Surveillance Radar (SSR). The latter was serviceable at SSKIA at the time of this occurrence, whereas the Primary Radar was temporarily unserviceable. There are two criteria for the transponder to be picked by a Radar; namely, codes must be given by ATC and the aircraft must be flying at a detectable altitude and the occurrence helicopter did not meet any of these criteria on the day of this occurrence. To start with, the PIC was not communicating with ATC, so there is no way he could have obtained the codes. Lastly, he was flying too low to be detected by the Radar.

2.3.3 Whether the transponder had been switched on or off would have had no effect and therefore the issue was not a factor in this occurrence. But, in the interest of safety, the PIC was professionally and morally obligated to communicate with ATC, switch the transponder on and maintain a detectable cruising altitude, especially that he was carrying an innocent passenger on board.

2.4 The Significance of a Flight Plan

2.4.1 Item 1.1.7 above indicated that the PIC had stopped filing flight plans, claiming termination around Boatlaname as the reason.

2.4.2 Any professional pilot who values his/her life, the lives of his/her passengers, the equipment s/he operates or flies and the environment in general would always file a flight without fail. Not only that, s/he would always have an alternate aerodrome and extra fuel endurance. These are some of the basics of flying and they are imperative in the case of the aircraft suddenly developing a mechanical problem while airborne which can happen to anybody at any given time, aviation being what it is. The reason for the flight plan is for one's movements to be known at all times so that in the event of an eventuality help can be offered immediately. Extra fuel and alternate airfield are necessary for purposes of diversion in the account of weather or closure of the destination airfield. Yes, many people may argue that such may not be really applicable for a helicopter, but it would be naïve or short sightedness to think that way as closure of any landing site can be caused by anything. The PIC's claim or excuse to blame it on termination around Boatlaname did not hold any water, because what if technical problems develop between Matsieng Airstrip and Boatlaname (i.e. before the claimed termination)? Also, experience has shown that the majority of pilots who do not file flight plans are always up to something uncalled for, though this does not mean to paint all pilots with the same brush. Aviation security has been a national concern for quite some time in this

country, especially when flights are non-communicated, starting and/or ending into unmanned airstrips.

2.4.3 The fact that the PIC chose not to file a flight plan for this flight did not lead to the crash *per se*. But, had a proper flight plan been filed, a coordinated search and rescue may have been initiated earlier on following the crash, possibly increasing chances for the passenger's life to be saved.

2.5 Was Accident Reporting for Convenience?

2.5.1 Item 1.18.7 above suggested that the reason for reporting this occurrence had more to do with the insurance.

2.5.2 During the interview, the key witness mentioned that the issue of insurance was raised by the PIC. It was highlighted that the PIC reported that he had lost his mobile phone and as such was unable to report to ATC himself. He, therefore, asked the key witness to relay the message about the crash to the authority. Reportedly, it was at that time that he (the PIC) said insurers might ask for reports from both the police and investigators. One therefore gets the impression that if it was not for the insurance purposes, if the helicopter was not substantially damaged and the passenger not seriously injured, the crash could have probably gone unreported.

2.5.3 The actual underlying motive for reporting the occurrence had nothing to do with the crash. But, one would expect all airmen (including the PIC and the key witness) to know that it is their responsibility to report any crash, whether or not the insurance is an issue.

2.6 Number of Souls on Board

2.6.1 Item 1.18.2 above highlighted that ATS Log Book recording reflected four persons on board the helicopter.

2.6.2 The key witness said he received a phone call from the PIC at 2048Z on the night of this occurrence.

2.6.2.1 The key witness then said he called ATC on 391-4407 at 2106Z. But the ATC Log showed that the phone call was received at 2120Z (a disparity of 14 minutes). According to the recording of the telephone call, the key witness, when asked how many people were on board the helicopter stated, "**It seems they were four**." The phrase "It seems" was found to be neither factual nor having any concrete basis. During the interview, the key witness was asked to explain. It turned out that the PIC did not categorically say anything about the number of souls on board. However, the key witness had known the PIC to always fly to his farm with some friends and therefore when asked he subconsciously answered the way he did.

2.6.2.2 The investigation established that the passenger was rushed to a clinic in Sojwe and not Letlhakeng. Again, during the call to ATC, the key witness had

reported that the injured passenger had been transported to Letlhakeng Clinic. When subsequently asked why did he say Letlhakeng Clinic, the key witness did not recall having said Letlhakeng. He did not deny having said it though, but he just could not recall saying that or why he could have said so. These conflicting and/or inconsistent responses by the key witness (like saying to ATC that he was calling from his farm at Dikgonnye that night, while he was actually in Block 10 at the time) raised a lot of questions or suspicions. The key witness was a highly placed officer in a disciplined force and a flying Captain for that matter. Ordinarily, anyone would expect accurate and factual information by someone of his calibre, especially where an issue relating to his flying profession was of concern (or since he could, of necessity, personally relate to the events of that night).

2.6.2.3 From the site investigation, there was no concrete evidence to nullify the fact that there were only two (2) occupants on board the occurrence helicopter at the time of the crash, as reported by the PIC and supplemented by the Ranch Manager (who was amongst the first people to reach the crash site that evening). But, the investigation team only reached the site on the 07/03/21. However, the investigation established that the BPS Captain and his Co-pilot first flew the police helicopter to the site on Saturday (i.e. 06/03/21). They picked three police officers from Sojwe Police Station and that left only one extra seat. That was the seat occupied by the PIC on the return leg from the site to Gaborone on Saturday afternoon. In other words, from the occurrence site back to Sojwe Police Station, the police helicopter was at full capacity, with six (6) souls on board, including the PIC.

2.6.2.4 On the other hand, the vehicle that had driven from Gaborone to Xumabee Game Ranch on the day of occurrence was the one that rushed the passenger to Sojwe Clinic. In it there were only three people i.e. the driver (Ranch Manager), the nurse (Ranch employee) and the patient (the passenger). The same vehicle returned to Gaborone on Sunday morning and it was still carrying two (2) occupants (i.e. Driver/Ranch Manager and the Vet/Mokenti), both of whom had driven from Gaborone to Xumabee Game Ranch on Friday. Therefore, the question is, "If there were four occupants of the occurrence helicopter, how could the other two passengers have travelled back to Gaborone?" In addition to that, the police officers who went to the site on Saturday reported to have seen only the PIC and the rest of ranch employees plus mokenti. The first rescuers to reach the crash site on Friday night reported that they only found the injured passenger, as the PIC had travelled to a nearby cattle farm to ask for assistance.

2.6.2.5 There was one name suggested or mentioned as possibly being amongst the passengers aboard (or one of the four occupants of) the occurrence helicopter. The investigation made efforts to establish if the person whose name was suggested as being on board the occurrence helicopter at the time of the crash was indeed aboard the helicopter. It turned out that he was not on board the aircraft and that he has never been to Xumabee Game Ranch. Actually, according to his statement, on the night of this occurrence, he was travelling somewhere between Gaborone and Maun via Ghanzi for some meeting that was scheduled to take place on Saturday, the 6th March 2021. The investigation

did establish (independently) from two reliable sources that he was at the said meeting. The individual's statement was found to be consistent with items 2.6.2.3 & 2.6.2.4 above.

2.6.3 On the account of item 2.6.2.5 above, as supported by items 2.6.2.3 & 2.6.2.4 previously, the investigation could not nullify the reports that there were only two (2) souls on board the helicopter at the time of the crash. However, it is of vital importance for people, especially professional pilots, reporting accidents to give accurate information to authorities instead of imagining things and stating, "**It seems they were four.**"

2.7 Security of Matsieng Airstrip

2.7.1 According to item 1.17.3.3 above, activities taking place after working hours are unrecorded.

2.7.2 The Management of Matsieng Airstrip stated that those keeping their aircraft in the Matsieng hangars are current pilots and that Management relies on their integrity to adhere to the "Rules of the Air" in the conduct of their flying. This would mean that those current pilots keeping their aircraft in Matsieng hangars and having no integrity may or may not adhere to the "Rules of the Air" in the conduct of their flying. Not only that, but after working hours there is no check or record. Taking into consideration the proximity of this airstrip to the seat of government, it goes without saying that some of the activities here, especially after working hours, may be potentially a threat to the national security. In this occurrence, a current pilot keeping his helicopter in one of the Matsieng hangars came after hours and there was no record to show who he was with, what time did he arrive/depart at/from the airstrip, or what was being carried on board the helicopter. In this particular case, one might suggest (or believe) it was just an innocent Motswana, a ranch-owner, going to his ranch. But, what if it happened to be a team of armed people with ulterior motives and perhaps with an intent to go and blow up some national strategic facilities? Still there would have been no record since it was after hours. Alternatively, it could have been people smuggling illicit drugs and/or precious stones. Rules of the Air recommends one to file a flight plan and therefore in this instance, that was not the case. Therefore, it is not all current pilots keeping their aircraft in the Matsieng hangars that have integrity to adhere to the "Rules of the Air," as was the case on the day of this occurrence.

2.7.3 The fact that the PIC had an easy access to Matsieng Airstrip (including the hangar) after working hours and therefore no recording whatsoever has no direct bearing in this occurrence. However, that alone is potentially a serious national security concern by any standard and something has to be done with immediate effect.

2.8 The Whitish Powder

2.8.1 According to item 1.18.9 above, some whitish powder was discovered from the crash site.

2.8.2 It was reported that some whitish powder was found in one of the two occupants' personal effects (i.e. a handbag). The powder was sent for the laboratory analysis and found to be a substance containing Methcathinone and Caffeine (or what is commonly known as Khat). It was in a small transparent bag. According to the Illicit Traffic in Drugs and Psychotropic Substances Act of 2018, this is a controlled substance in Botswana. Ordinarily, common sense might suggest that it belonged to the passenger as it was found inside one of her personal effects. However, since she was incapacitated and as the PIC was not rushed for the medical attention immediately after the crash, the investigation could not prove who could have placed the small transparent bag with the whitish powder in one of the passenger's personal effects. That it was placed by the passenger herself cannot be ruled out. But with the same token, the possibility of the small transparent bag with the whitish substance having been placed by the PIC (personally or through delegation), especially that he remained behind when the passenger was rushed to the Clinic cannot be discounted either. This could be amongst the activities meant to be accomplished afterwards. The question that crosses one's mind is, "Was the substance taken by the helicopter's occupants (or by one of them) before, and/or during the flight from Matsieng Airstrip?" If so, could that have played a contributory role in the circumstances surrounding this occurrence or not? Well, according to (https://en.wikipedia.ord/wiki/Methcathinone) accessed on 29/06/2021, some of the effects of this substance include:

- Feelings of euphoria;
- Shaking of the limbs;
- Increased blood pressure, risk of stroke or heart attack; and
- Both decreased and increased sexual function and desire.

2.8.3 Whether or not both (or either one of) the helicopters' occupants used the substance before or during the occurrence flight could not be established. Neither could the investigation prove who between the two occupants of the occurrence helicopter placed the small transparent bag with the substance in one of the passenger's personal effects nor could it rule out either one of them having done so.

2.9 Occurrence Site Contaminated

2.9.1 Item 1.18.3 above cited the PIC saying they had some R & R red wine and two packs of savannah on board the helicopter.

2.9.2 There were few pieces of broken bottle(s) at the occurrence site. Though the site investigation commenced late, the investigation had the chance to go through evidence preserved by the CSI the day before and still there was little evidence. On being asked about the beverages, the PIC stated that some were broken and that during clearing of the site guys might have helped themselves with the unbroken ones. Unless the clearing of the site took place prior to commencement of the site investigation on Sunday, 7th March 2021, site investigation showed very few broken pieces of bottles. As a professional pilot, the PIC should have known that nothing taken in or out of the occurrence site (except it is for purposes of saving life) until investigators have arrived and

completed the preliminary investigations. The late arrival of investigators, *notwithstanding,* this clearance of the broken pieces of wine bottles or the possibility of guys helping themselves with the unbroken beverages suggested that the occurrence site had already been tampered with (or contaminated) at the time of site investigation commencement (See also item 1.18.5 above). Tampering with evidence at the occurrence site is an obstruction to the investigation. According to Section 76 of the Act, anybody deemed to obstruct an investigation "is liable to a fine not exceeding Pula 5 Million, or to imprisonment to a term not exceeding 10 years, or to both."

2.9.3 Contamination of the occurrence site did not cause the crash. However, tampering with evidence at the occurrence site following an accident and prior to the commencement of investigation is a very serious obstruction to the investigation and breach of the law, liable to a prescribed fine as aforestated.

2.10 Late Arrival at the Occurrence Site

2.10.1 Item 1.1.9 above indicated that investigation commenced on the 7th March 2021 as a result of logistical challenges.

2.10.2 Several factors contributed to the late arrival of the IIC at the occurrence site.

2.10.2.1 First, there was a late notification of the accident to DAI/IIC. ATC's efforts to notify the IIC on the occurrence night (i.e. 05/03/2021) were unsuccessful. It transpired that the IIC's official phone had been cut off by the service provider. Apparently what had happened was that MTC had sent a list of telephone numbers whose users' contracts had come to an end. Among the numbers to be cancelled was 73-011-583. This was mistakenly taken to be 73-011-582 (i.e. the IIC's) and the latter was therefore cancelled. Hence, on the day of this occurrence it was not working, but BTC restored it on the 10th March 2021 after being told of this, and an apology for the inconvenience caused was rendered.

2.10.2.2 Second, there were post notification logistical challenges as well. Arranging for the trip and getting the necessary transportation to the site was not easy. This was further compounded by the fact that Xumabee Game Ranch was out of the normal network. As a result, using non-satellite phones was a challenge and this explained why communication with the BPS helicopter crew was not possible until very late that Saturday afternoon, when they had already returned from the site. There were other technological/operational design limitations for the said helicopter, which made it impossible to fly at night. Thus, the IIC could only be flown out of Sojwe (where he had arrived by road on Saturday afternoon and spent a night) into the occurrence site on Sunday morning as a result.

2.10.2.3 It would be noted that reaching the occurrence site on time has always been a challenge generally. It is also worth-noting that it is the best international practice for investigators to reach the occurrence site as soon as it is humanly possible. The reason for that is obvious; whenever an accident occurs, there could be several factors involved and some of them (causal or contributory) may well be a temporary evidence (i.e. evidence lasting only for a short period of time before disappearing). To this end, the Permanent Secretary at Ministry

of Finance and Economic Development has advised that MTC should request for authorisation to utilize a Standing Imprest for investigators to avoid such delays, on the realisation that DAI's operations are of emergency nature.

2.10.3 The late arrival of investigators had no bearing in this occurrence. However, concerted efforts must be made to address the logistical challenges experienced during this occurrence or others in the past (which the PS, MFED has effectively addressed now).

2.11 Medical Attention after the Crash

2.11.1 According to item 1.15.4 above, following the crash, only the passenger was sent for medical attention (under care of the Ranch Manager and another employee), while the PIC himself remained behind.

2.11.2 Common sense would suggest that once a vessel (i.e. vehicle, helicopter, etc.) has been involved in an accident, all victims including those with minor injuries would go seek medical attention immediately. One of the reasons for this is because issues of invisible injuries (like internal bleeding) cannot be predicted with any degree of accuracy. So, the best thing is to always go and be checked by the medical experts and let them be the ones declaring you fit.

2.11.2.1 In this instance, the second victim (i.e. the PIC), for reasons best understood by himself, did not go for medical attention immediately following the occurrence. Subsequently, it was said that none of the employees (including even the Ranch Manager) knew the passenger. They were even addressing her simply as "my sister," because they did not know her name (See item 1.15.5 above). The PIC was the only person at the Ranch who knew her and likewise the only person known by the passenger. With such background as this and irrespective of what was the actual relationship between the *duo*, in all fairness, even if the PIC felt fine physically so as not to need medical attention immediately, he was the most suited person to accompany the passenger and nurse/comfort her. That would have been the honourable thing to do, *the golden rule*! For the PIC to have decided to remain behind on that fateful night leaves everybody wondering and guessing.

2.11.2.2 While members of the general public may have various interpretations of their own for this action or lack thereof by the PIC, from the point of view of investigation, an intent to remove crucial evidence (directly or indirectly, by delegation) that might have further aided the investigation cannot be ruled out.

2.11.2.3 Asked if there was first aid kit in the helicopter, the PIC's response was affirmative. Asked if it was ever used in aid of the injured passenger, the answer was negative. The reason cited for not using the first aid kit was that there was no visible bleeding or injury or situation prompting its application. That said, the investigation came across evidence captured by the Sojwe CSI which showed stains of blood around where the passenger was found. In addition, witnesses reported that the passenger had a broken thigh, which would suggest a visible injury. Even if the need for applying first aid that night could be ruled out, the need for basic first aid by pilots is a necessity because one can never know

when an accident would take place and passengers (or fellow crewmembers) be injured.

2.11.3 Rushing to seek medical attention was a post-event and therefore did not have any bearing in this occurrence. However, the fact that the PIC chose neither to accompany the passenger (and comfort her on the way to the clinic as the only person she knew that night) nor to go seek medical attention himself suggests there was another mission to be accomplished at the site/Ranch.

2.12 Preservation of Human Life

2.12.1 Item 1.15.4 above indicated attempts by the PIC to save the passenger's life.

2.12.2 Even though the PIC chose to remain behind, he made some efforts for the passenger to be rushed for medical attention, but was that enough and/or timely? Could he had done better? These are the questions in the minds of many people. He had a satellite phone and therefore communication was not much of a problem. Aviation being what it is, you would expect all pilots to have emergency numbers (i.e. 991, 992, 993, 995, or 997) as part of their checklists to immediately call for assistance instead of driving the already seriously injured passengers in long and bumpy roads at night. The fact that the PIC had not filed the flight plan obviously meant the window of opportunity for an official search and rescue was lost, as he was not in communication with the ATS. So, what other option(s) was(were) there for him?

2.12.2.1 **Option 1:** Perhaps the nearest emergency unit (or ambulance) could have been arranged on the account of the gravity of the situation. The advantage with such an arrangement, if it was explored, is that even though it could have taken time for help to arrive, 1) the passenger would have rested in one place and injuries not aggravated. 2) the emergency unit could have administered professional first aid at the site, possibly with portable oxygen bottles and only move her after stabilising or even wait for the next day's flight. Admit, one may say that the feasible aid (say from the Okavango Air Rescue in Maun) could have taken a longer time to reach the site. While that is true, the difference is that the emergency ambulance would have been carrying able-bodied professionals who are trained for emergency situations. So, the ambulance would have travelled relatively faster as compared to a vehicle, which was travelling very slow for fear of further injuring the passenger already in pains. In addition to that, the vehicle that carried the passenger to Sojwe was driven by someone who was already fatigued by having driven from Gaborone to the farm and going on a search for the crashed helicopter shortly after his arrival at Xumabee Game Ranch. Not only was he physically fatigued, but the events of that evening alone were enough to render him emotionally affected. The ambulance would have, most likely, been manned by a fresh crew/shift that had probably only started duty at 1600Z or so that evening. While a proper expert opinion (by aid of post mortem interpretation) could determine otherwise, this only serves to suggest one possible option that could have been explored. It is, by no means, a claim to say with certainty that had this been done, the passenger could have made it, but it would have been viewed as an effort

made, an *extra mile taken* by the PIC! The investigation did check with EMS at Mahalapye Referral Hospital, Ghoghaa Diamond Mine and Okavango Air Rescue, as to how could they have assisted had they been contacted for help on the occurrence night. The Mahalapye EMS indicated that they do not have a 4 x 4 ambulance, so the sandy roads, among others, could have posed a challenge. Okavango Air Rescue submitted that since it was at night they could have either flown their PC-12 aircraft to the nearest landing strip, provided the airstrip would be lit even if it was by using vehicles' lights. Alternatively, they would have sent a 4 x 4 ambulance from the nearest sister company with which they have a service level agreement. Ghaghoo Diamond Mine site office at Lephepe did refer the investigation to head office in Gaborone, but efforts to reach the head office were not successful.

2.12.2.2 **Option 2:** It is worth-noting that some people would think the police helicopter could have been another option. The investigation examined this as a possible option but it was ultimately ruled out as an option. Reasons for ruling this out as an option were as follows: 1) Police helicopters are not approved for night flying generally. They may fly at night in the case of extreme emergencies but even then it'll be mostly around places with ample illumination such as cities or major towns. 2) Furthermore, it was explained that the clientele of Air Support Branch (i.e. the BPS section responsible for air operations) is mainly police stations around the country. In other words, the Air Support Branch (ASB) would get involved when requested by some police station to provide air support. This, therefore, eliminates **Option 2**, as the PIC could not have called BPS for any assistance.

2.12.2.3 The other point which compounded issues here was for the PIC to wander away from the occurrence site immediately following the crash. This is something crewmembers should avoid at all cost. It is very easy for pilots to lose their own lives (due to wild beasts, getting lost, dehydration, etc.) simply because they left the scene of the accident, even though ultimately help did arrive at the crash site.

2.12.2.4 Firstly, immediately after a crash, one's mind is somewhat unstable and the capacity to make sound decisions is adversely affected and so is one's judgement being somehow impaired. So, leaving the site (at night, for that matter) was a recipe for further complications of the situation. This is one of the reasons why it is necessary for pilots to learn survival skills, as they may need to apply them at any given time in their career. In fact, the PIC did say that as he was walking to the nearby farm to seek assistance, he was worried about the passenger's safety as he could hear the sounding of jackals in the vicinity.

2.12.2.5 Secondly, by the sound of it, it took the PIC a long while to reach the nearby farm. Now, that was the time he could have used to call the emergency numbers, if he had them as part of his checklist. Alternatively, he could have called the key witness (right from the crash site) and ask him to relay the message about the crash to relevant authorities. Chances are, had he done so instead of leaving the crash site, the key witness (being a highly experienced Captain himself) could have suggested what else to do in order to preserve the

passenger's life, because that would have been long before she was rushed to Sojwe Clinic. But as it were, the key witness was himself inhibited because by the time he finally got the news of the crash, the injured passenger was already on the way to Sojwe.

2.12.2.6 That said, the time lost by the PIC going to a nearby farm and back was the most invaluable time that should have been ideally devoted towards saving the life of a seriously injured passenger. Preservation of a human life is normally the primary focus (or preoccupation) of any surviving crewmember (especially the PIC). It is the reason why the PIC is always the last to walk away from the crashed aircraft, after making sure that all his/her passengers have been safely evacuated.

2.12.3 Preservation of human life was an after event/process and therefore had nothing to do with the causation of this occurrence. However, the post-crash management of the situation (or the moral conduct by the PIC after the crash) was found wanting or questionable.

2.13 Time of the Occurrence

2.13.1 Items 1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.7.2, 1.12.2, 1.16.2, 1.18.1, 1.19.1 & 1.19.2 above, have something to do with the issue regarding the exact time of the occurrence.

2.13.2 The actual time of this occurrence was very crucial to the investigation, but it was not coming out clear. The very first remark suggested it was a very late arrival. Some said it was before 1700Z, the PIC's written statement indicated arrival at the Xumabee to be 1650Z. However, the helicopter's clock showed it stopped at 1741Z.

2.13.2.1 First, there was a remark by someone wondering as to how come the boss came so very late on that particular night. That in itself could have been translated to be some kind of a *premonition* by some students of William Shakespeare. Even though one witness submitted that the occurrence was before 1700Z (or before 7 pm Botswana time), the remark alone said volumes. It was an indication that the helicopter arrived very late on the day of the occurrence and that would explain why the PIC flew so low, at tree-top level. Pilots do not, under normal circumstances, choose to deliberately fly at tree-top level. This can happen when visibility is compromised, or the PIC is under some form of influence or being somewhat disoriented. The PIC himself reported that he and the passenger had reached Matsieng Airstrip a few minutes before 1600Z, but did not elaborate as to what exactly was a few minutes.

2.13.2.2 Second, at Matsieng they had to move/push the helicopter from the hangar to the helipad before he could start the engine. The PIC also had to load the luggage (i.e. the passenger's bag and beverages). He also had to perform some mandatory pre-flight checks, as he could not just take a helicopter that had been parked for days and fly away. All this must have taken some time. They initially took off and flew up to Dikgonnye whereby the PIC then realised he had forgotten both the satellite phone and emergency radio by the helipad at Matsieng Airstrip. The helicopter returned to its departure point for the PIC to pick the forgotten items. That meant additional time as well. After all, the PIC was not communicating with the Tower at SSKIA, so whatever time he could give could not be positively verified, which is why it is imperative for all crewmembers to always invariably establish communication with ATC prior to being airborne. It was after hours, so there was no security guard at Matsieng Airstrip to say, what time it was when they finally took-off. Not even the Covid-19 register that was to be kept was there to assist in this investigation.

2.13.2.3 Third, though it was reported that the accident took place before 1700Z, the investigation got some evidence showing that the passenger was last seen on WhatsApp at 1704Z. This would mean the helicopter was still airborne. Not only that, but also that she was on WhatsApp at a time and place where there was network, quite some time before arriving at Xumabee Game Ranch, the helicopter's final destination. Therefore, through the aid of the mobile phone technology, there was evidence that this particular accident occurred sometime after 1704Z, contrary to what was being reported. The PIC said that the trip from Matsieng Airstrip to the Xumabee Game Ranch takes 45 minutes on average. The POH stated the maximum cruise speed for the occurrence aircraft as 110 knots (i.e. 204 km/h).

2.13.2.4 Fourth, it was noted that sunset was at 1637Z on the day of occurrence. The helicopter's clock showed the stoppage time to be 1741Z. This would make the actual time of crash to be at least an hour after sunset. This is consistent with the reports that employees could not easily locate the wreckage because it was dark. This was further confirmed by the witness who said he could see fellow employees' search light at a distance. It all points to the fact that the crash took place when the visibility was greatly compromised and this was compounded by the fact that it was the PIC's first time to fly to his Ranch that very late. His training records revealed that he had accrued approximately 12 hours of night flying, but they were all dual with no solo flight recorded. Not only that, but flying at night around the Gauteng Province cannot compare with flying at night in the Western Sand Veld. At Gauteng one has the advantage of street lights (together with moving vehicles' lights) and at Western Sand Veld features were different and if it was the first time for the PIC to be flying in the area at night, the possibility of spatial disorientation cannot be ruled out.

2.13.2.5 Fifth, if the crash had occurred as early as before 1700Z, one wonders why then did it take the PIC so very long to call the key witness who was to report the crash (i.e. at 2048Z, almost 4 hours later) in order for him (the key witness) to report the accident to the relevant authorities. Unless the PIC was busy trying to make sure the occurrence site is cleared, it leaves question marks as to why he did not immediately call the key witness so that he (the key witness) could report the accident expeditiously. Regulation 10 (1) of the Civil Aviation (Aircraft Accident and Incident Investigation) Regulations, 2012 states the following: Any person who becomes aware of an accident or serious incident that occurs –

(a) in or over Botswana; or
(b) outside Botswana which involves a Botswana registered aircraft or an aircraft operated by a Botswana operator, shall as soon as is practicable after he or she becomes aware of the accident or serious incident, notify by indicating the place where the accident has occurred, to any of the following persons by the quickest means of communication available –

(i) the Director,
(ii) the nearest air traffic service or airport authority,
(iii) the police,
(iv) military personnel, or
(v) the nearest local government authority. Indeed, the PIC notified (iii) above, but was not as expeditiously as it is called for by the said Regulation.

2.13.2.6 Last, the PIC did say that the average time taken to fly from Matsieng Airstrip to Xumabee Game Ranch on the occurrence helicopter is 45 minutes. It should be noted that an average time is a variable dependent upon the speed of aircraft *vis-à-vis* that of wind and wind direction (i.e. head wind will increase the time, while tail wind will shorten it). Therefore, one could take 45 minutes as an average duration from Matsieng Airstrip to Xumabee Game Ranch and the time of occurrence based on the helicopter's clock (as 1740Z). The 45 minutes being a variable dependent on other factors, one could argue that the flight time was increased by (say) extra 10 minutes (making it 55 minutes' duration). That would suggest the final take-off time from Matsieng Airstrip to have been approximately 1645Z. However, if on that particular day, the flight time was exactly 45 minutes, then the final take-off time from Matsieng Airstrip would have been approximately 1655Z.

2.13.3 The time of this occurrence had a lot more to do with the accident causation. The seriously compromised visibility having contributed to spatial disorientation is also a high probability that cannot be ruled out.

2.14 Passenger Last on WhatsApp

2.14.1 According to item 1.12.2 above, the passenger was last seen on WhatsApp at 1704Z.

2.14.2 Following this occurrence, one of the news circulating or trending was a screenshot indicating that the passenger was last seen on WhatsApp at 1704Z on the day of occurrence. The screenshot was said to have been shared by one local artist. The investigation made a number of efforts to invite the particular artist for an interview, but this could not take place. At one stage someone told him that investigators had been trying to contact him and he said that he ignored the messages thinking it was a prang or people pretending to be doing something official. What also caught the investigator's eye in the trending screenshot was the comment, reportedly by one of the passenger's fans. The comment went something like, "***Golo something is fishy. Helicopter crashed at 19:00 Sasa was last seen at 19:04.***" So, even the passenger's fans were (or at least one of them was) able to piece things together and see that something was not adding up, to be told that the helicopter crashed before 1700Z and yet the passenger aboard the same helicopter was on WhatsApp at 1704Z. Some would say, "It did not need a Rocket Scientist to see that the helicopter crashed after 1700Z or after 1704Z." It was rather unfortunate that the investigators' efforts to meet with the artist in question through an interview were futile, as that could have hopefully assisted the investigation somewhat. On the part of the artist, that could have been seen as one way of paying the last respect to a fellow artist. In fact, his initial reaction would be fully understood, when he thought it was perhaps just people pretending to be doing something official. But an associate (plus the IIC on a telephone conversation) confirmed this to be an official investigation. So, for him to still have not responded positively and cooperate was rather unfortunate.

2.14.3 Despite the difficulties to interview the artist in question, the observation by one of the passenger's fans was very valid. The time of the passenger's last presence in the WhatsApp therefore nullified all the stories told/claimed by witnesses regarding the actual time of this occurrence.

2.15 Collision with the Terrain

2.15.1 Item 1.1.9 above stated that the occurrence aircraft was flying low when the tail rotor collided with terrain.

2.15.2 The PIC reported that by the time he reached the ranch, it was about dusk. In a written statement he said it was at 1650Z. He further reported that they have a problem of elephants and that normally before he lands, he flies along the fence to check for elephants. He further stated that even on the day of this

occurrence he was checking for elephants. Now, common sense would suggest that normally an experienced pilot would descend a bit to check for elephants, but certainly not to a tree-top level flying. Flying at that very low altitude would suggest that he was either unsure of his actions (under influence perhaps) or it was too dark for him to see elephants from a slightly higher altitude and therefore he had to descend even more and in the process collide with the terrain. If it was not dark and he had clear visibility, elephants are so large, he did not need to descend that very low to check for them. It could also mean that elephants were not an issue, but the effects of something else (i.e. substance influence and/or spatial disorientation, as per item 1.18.6 above) were already setting in, without him noticing. But, the bottom line is that visibility was already compromised and that (plus other possibilities) is what led to flying at a tree-top level and to collision with the terrain.

2.15.3 Collision with the terrain was the causal factor in this occurrence. Since it was the first time for the PIC to fly into his Ranch that very late, he was unable to manage the situation or even recover from it.

SECTION 3: CONCLUSIONS

3.1 Findings

3.1.1 According to the Certificate of Registration, the aircraft belonged to Aircraft Asset Finance Corporation (PTY) LTD, but the PIC stated that he had acquired it through a lease to own contract arrangement.

3.1.2 The investigation established (through the help of AR) that nobody had ever approached SACAA regarding change of ownership for the occurrence aircraft.

3.1.3 The aircraft had a valid Certificate of Airworthiness issued by SACAR.

3.1.4 The occurrence aircraft had a valid CRS and it was valid until 14/07/2021 or 390.3 hours.

3.1.5 The aircraft had an expired (i.e. Expiry Date 31/03/2019) Radio Station License issued by the Independent Communications Authority of South Africa (ICASA).

3.1.6 The PIC had a valid Crew License issued by SACAR, and a valid Medical Certificate issued by CAAB.

3.1.7 While it was reported to be the first time for the PIC to fly into Xumabee Game Ranch so very late, the training records from the ATO (i.e. Hover Dynamics) did not show that he had ever flown solo at night.

3.1.8 Despite the fact that the key witness who reported the accident to ATC stated that it seemed there were four (4) occupants in the helicopter, the PIC reported that they were only two (2) and investigation found no concrete evident to nullify the PIC's report in that regard.

3.1.9 The investigation established that the PIC flew the occurrence aircraft from the starboard seat and that the port side controls had been removed, therefore ruling out the possibility (or claims) of the passenger having been flying the rotorcraft at the time of this occurrence.

3.1.10 The investigation found insufficient evidence at the occurrence site confirming the report by the PIC that some beverages (like R & R wines, two packs of savannah, etc.) were part of the luggage, which could suggest they were consumed along the way or they had been removed from the scene after the occurrence and prior to the arrival of investigators on 07/03/2021.

3.1.11 There was no record of the pilot or his passenger at Matsieng Airstrip or any record to show what was the time of departure and this was because after working hours, when security guards have knocked off, there is no way of recording such.

3.1.12 The PIC reported that he did not file any flight plan with the ATC at SSKIA and cited the issue of termination around Boatlaname as his reason. So, ATC did

not know about the flight till the key witness phoned to report the accident at 2106Z according to the witness or at 2120Z according to the ATC records.

3.1.13 Though the PIC claimed that he was checking for elephants when they crashed, the investigation established that the crash took place when visibility was inadequate or very much compromised.

3.1.14 The helicopter was flying at tree-top level, at the time when the PIC was probably under substance influence or subjected to spatial disorientation, without noticing, and ended up having the helicopter's tail rotor colliding with terrain, leading it to the crash.

3.1.15 The PIC's decision to depart from the crash site was deemed very risky and as having robbed him of the opportunity to inform the key witness on time, as the key witness could have probably assisted with more expert advice, on how best to try and preserve the passenger's life, being such a highly experienced flying Captain himself.

3.2 The Probable Cause(s)

3.2.1 The probable cause of this occurrence was the helicopter's tail rotor colliding with terrain and leading to the helicopter's crash.

3.3 Contributory Factors

3.3.1 Flying low (i.e. at tree-top level) in a compromised visibility due to inadequate natural lighting (i.e. approximately 1 hour after sunset), with the possibility of spatial disorientation and/or substance influence.

3.3.2 The PIC's first late arrival at the Ranch, compounded by the fact that during training at Hover Dynamics, according to documentation all his night flying was dual flying (and nothing solo), whereas he was also aided by the cosmopolitan street lighting and other sources of light as compared to Western Sand Veld.

3.3.3 The fact that the PIC departed Matsieng Airstrip rather late in the afternoon of the day of the occurrence flight (i.e. Friday, 5th March 2021).

SECTION 4: SAFETY RECOMMENDATIONS

4.1 CAAB, in conjunction with the relevant security organs like BPS, DIS, etc., must come up with a requirement that all licensed aerodromes in Botswana must pass the security vetting (including having a proper security programme as a minimum) in order to be licensed. This requirement shall take place with immediate effect.

4.2 CAAB must ensure that all pilots flying within the Botswana airspace, particularly when carrying innocent passengers, must file flight plans (including requests for search and rescue, alternative aerodrome and adequate fuel endurance, in case of diversion). They must also switch on their transponders and take all the necessary steps to enable/facilitate the Radar detection.

4.3 CAAB must ensure that all pilots, especially helicopter ones, flying within the Botswana airspace, provided they are not engaged in the national security or emergency assignments, must avoid flying in a compromised situational awareness or less visibility conditions such as reaching their destinations after sunset (or departing before sunrise) or flying during bad weather conditions (when it is dark).

4.4 CAAB must require that all civilian pilots who attain their pilot licenses abroad and who intend to fly within the Botswana airspace at night are IFR-rated, over and above being only night-rated.

4.5 CAAB, in close liaison with BURS, must put a mechanism in place to ensure that foreign-registered aircraft in Botswana do not overstay without proper import clearance and/or entry into the national civil aircraft register.

4.6 CAAB must consider making it mandatory for all ATOs to include basic first aid lessons and survival skills in their syllabus and have them as endorsements in the crew licenses, as these are necessary in one's flying career.

4.7 PS, MTC must approach PS, MFED, with a view to review (or defer) certain aspects of the financial instructions (i.e. T116 & T117A) in order to accommodate emergencies (i.e. instant departure of investigators to the accident site before crucial evidence is lost).

4.8 MTC/DAI must draft MOUs for consideration by the relevant organisations (i.e. BPS/ASB, CAAB, Air Botswana, BR) with further proposals for expediting the arrival of investigators at scenes of accidents in order for Botswana to meet its national and international obligations in future.

The above report was compiled by the following:

O. B. Moakofi/IIC

P. V. Mngqibisa/Team Member

SECTION 5: APPENDICES

APPENDIX 1: COPY OF THE CERTIFICATE OF RELEASE TO SERVICE

INSPECTION REMINDER

Registration	25-SBM
MPI Date	14/07/2021
	330.3
	340.3
	14/07/2021

Hover Dynamics Maintenance

HOVER DYNAMICS MAINTENANCE cc

PO Box 155
Halfway House

AMO 237

Hangar M
Grand Central Airport

Certificate of Release to Service

Nº 1289

Nationality and Registration Marks: 25-SBM

Aircraft Type: Robinson R44 Raven II Serial No: 12091

I hereby certify that I am satisfied that the above mentioned aircraft and all its equipment are in every way serviceable for flight and that all maintenance has been carried out in accordance with the Civil Aviation Regulations, 2011, and its Approved Maintenance Schedule.

This Certificate lapses at a total of 390.3 hours of flight time or on 14/07/2021 (date), whichever occurs first, unless the aircraft is involved in an accident or becomes unserviceable, in which case the Certificate is invalid for the duration of the period.

Signed: [signature] Licence No: W J BREITENBACH

Date: 15/07/2020 Time: 12:30

APPENDIX 2: THE PRELIMINARY REPORT

Republic of Botswana — Form No.: AIG-DAI/004/2

<table>
<tr><td>Authority/Unit</td><td colspan="5">Directorate of Accident Investigation (DAI), Ministry of Transport & Communications (MTC), BOTSWANA</td></tr>
<tr><td colspan="6">PRELIMINARY REPORT</td></tr>
<tr><td colspan="4"></td><td>Reference:</td><td>MTC/AIG/01/21</td></tr>
<tr><td>Aircraft Registration</td><td>ZS-SBM</td><td>Date of Accident</td><td>5 March 2021</td><td>Time of Incident</td><td>1740Z</td></tr>
<tr><td>Type of Aircraft</td><td colspan="2">Robinson R44 Raven II</td><td>Type of Operation</td><td colspan="2">Private Flight</td></tr>
<tr><td>Pilot-in-command Licence Type</td><td>PPL Helicopter</td><td>Age</td><td>45</td><td>Licence Valid</td><td>24/03/22</td></tr>
<tr><td>Pilot-in-command Flying Experience</td><td>Total Flying Hours</td><td colspan="2">598.5</td><td>Hours on Type</td><td>560</td></tr>
<tr><td>Last point of departure</td><td colspan="5">Matsieng Airstrip</td></tr>
<tr><td>Next point of intended landing</td><td colspan="5">Xumabee Game Ranch</td></tr>
<tr><td colspan="6">Location of the incident site with reference to easily defined geographical points (GPS coordinates, if possible)</td></tr>
<tr><td colspan="6">Inside the adjacent farm</td></tr>
<tr><td>Meteorological Information</td><td colspan="5">Fine</td></tr>
<tr><td>No. of people on board</td><td>2</td><td>No. of people injured</td><td>2</td><td>No. of people killed</td><td>1</td></tr>
</table>

Narration	ALL TIMES IN UTC (i.e. Botswana Local Time minus 2 hours)

1. THE NARRATION

1.1 In the evening of Friday, 5 March 2021, a South African registered helicopter, Robinson R44, Raven II belonging to Aircraft Asset Finance Corporation, bearing registration ZS-SBM, was involved in a fatal accident. According to reports, on the day of occurrence, the Pilot-In-Command (PIC) who had taken-off from the Matsieng Airstrip in Rasesa experienced some problems after entering Xumabee Game Ranch in the Western Sandveld. The PIC in his report stated that on board the helicopter there were two (2) occupants (i.e. himself and the passenger).

1.2 The PIC's report indicated that he took-off a few minutes after 1600Z from Matsieng Airstrip and that the flight to the Ranch is 45 minutes on average. The Pilot Operating Handbook (POH) states that the recommended maximum cruise speed for the R44 is 110 knots, which is approximately 204 km/h. The PIC further stated that he initially took-off and that somewhere around Dikgonnye he realised that he had forgotten the radio and a satellite phone. They then returned to the helipad at Matsieng to pick them. Both the PIC and other witness reports indicated that the accident occurred around 1700Z. The PIC only managed to report the accident at around 2000Z, which would make it three (3) hours after the time the accident is alleged to have occurred. The PIC reportedly called another pilot in Gaborone through a satellite phone and it was this pilot who informed the Air Traffic Services (ATS) at Sir Seretse Khama International Airport (SSKIA) about the accident. The recording in ATS Log Book was made at 2120Z and it captured that the caller or reporter said there were four (4) persons on board the aircraft.

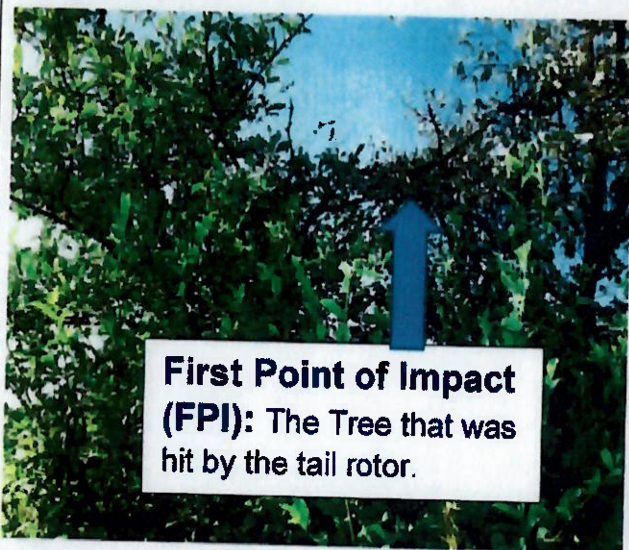
1.3 According to reports, it took a while before the wreckage and/or victims were located by the search team (i.e. employees from Xumabee Game Ranch). It was reported that the passenger had sustained serious injuries and was rushed to Sojwe for medical attention, but was confirmed dead on arrival at Sojwe Clinic and the arrival time was approximately 2300Z. The PIC had also sustained some minor injuries, but he did not go for medical attention on the night of the accident.

1.4 The preliminary site investigation revealed that the helicopter's tail rotor made first contact with a tree, apparently when the aircraft was flying in a slightly nose-up configuration. From then on, it went into a steady dive for approximately 25 metres before hitting the ground. It then moved along the ground and pulled the main boundary fence separating Xumabee Game Ranch from the adjacent Cattle Ranch, where the wreckage was found. The helicopter moved on ground for approximately 50 metres before coming to its final resting position. The main Instrument Panel and some structural components including the door frame were found along the skid marks trail at approximately 15 metres upstream of the main wreckage. One of the instruments (the Horizon) showed that at the time of losing power (or when it sheared off the aircraft) the helicopter was in a left bank and descending configuration. Unconfirmed reports indicated that the passenger had called some friend at 1704Z. According to screenshot sourced through the Accredited Representative in the State of Registry as well as photographs taken by the Sojwe Police officer, the aircraft's clock showed the time of accident to be 1740Z.

1.5 The site investigation further revealed that prior to the main wreckage coming to its final resting position, the helicopter hit the root of a shrub with its port (left-hand side) corner and capsized. The helicopter then landed over and to the left of the shrub lying on its port side and facing the direction it had come from (having rotated through 180 degrees clockwise). The tail piece (with fin/rudder and two side flaps/elevators) had been thrown approximately 11 metres straight ahead of the main wreckage, with tail rotor having fallen to the left, at a 45-degree

clockwise position with reference to the aircraft's final trajectory and 15 metres away from the tail piece or 14 metres from the main wreckage. One main rotor blade was sheared off, with wrinkles, bents and tears while the other blade was intact but showing some visible damage. The main rotor mast was torn into two pieces. There were signs of more severe damage to the root of the tail section/boom, with the rest of cabin/fuselage bent, wrinkled and torn. Most of the glass canopy was broken, with the starboard (right-hand side) door not there and only the port door present, but with broken glass. The seats were found slightly damaged, but both front seat belts were found to be still buckled up. It was also evident that though the aircraft is designed with dual controls, at the time of site investigation the left-hand side controls had been disabled or removed (indicating that the PIC had been flying the helicopter from the right-hand seat, when the passenger was occupying the left front seat).

1.6 The investigation (through interviews) revealed that no flight plan had been filed with the Air Traffic Services (ATS) at Sir Seretse Khama International Airport (SSKIA). The investigation interviews also revealed that the Xumabee search team had to use a search light, as it was dark. The Google search by the investigation showed sunset on the day of the accident (i.e. 05/03/21) around the Serowe area to have taken place at 1637Z. The documentary inspection revealed that though the PIC had a valid license, his license did not have night rating endorsed in it. Regarding the helicopter's ownership, it was reported that the PIC had bought it but the actual change of ownership had not yet been finalised.

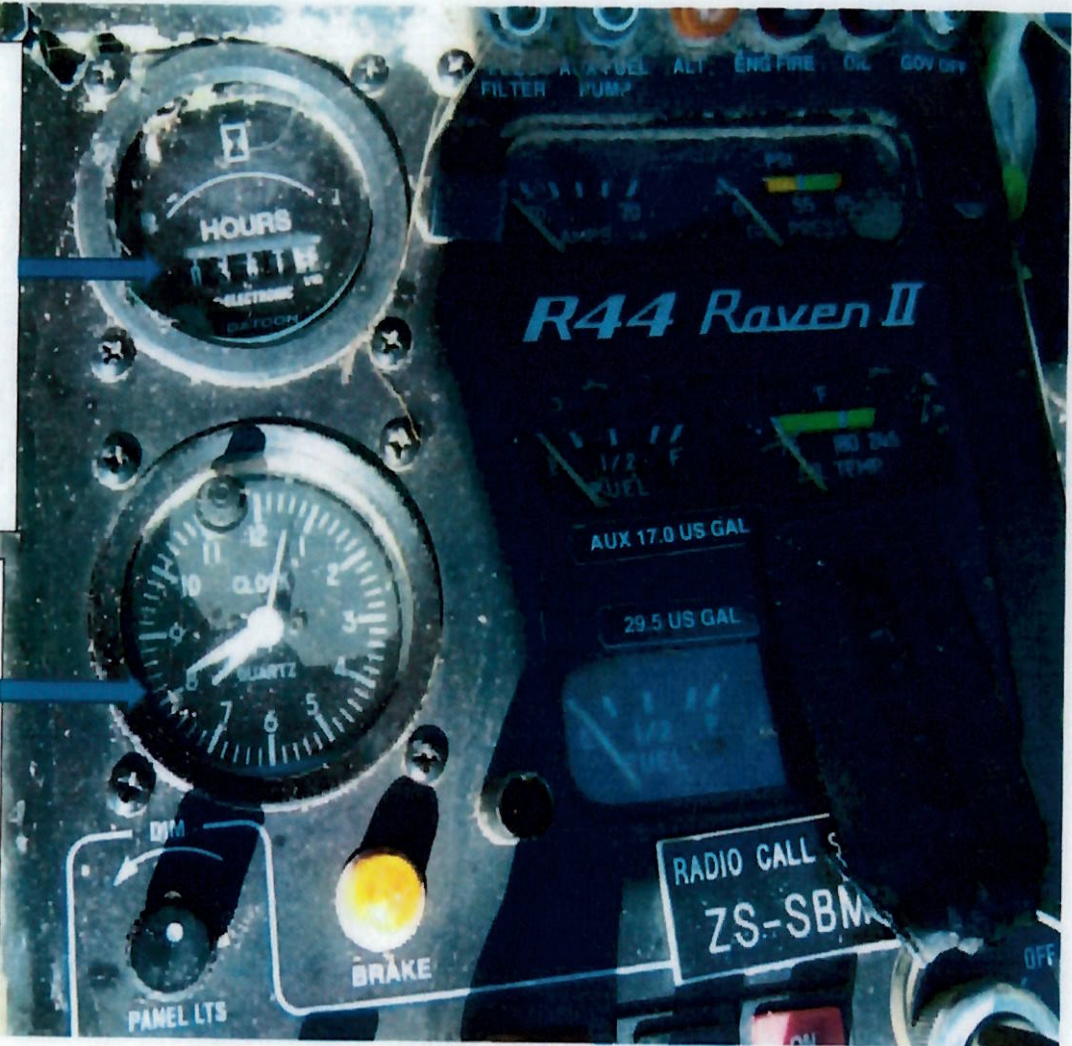


Interim Safety Recommendations

1. It is strongly recommended that all pilots must always file flight plans with the nearest ATS facility, as that might speed up the initiation of search and/or rescue operations at the time of need.
2. It is recommended that all pilots not having night ratings or operating helicopters not certified for night flying must always ensure that they reach and land at their destinations well before sunset, for purposes of full visibility.

Compiled by the IIC: O. B. Moakofi	**Release Date:** 16 March 2021

APPENDIX 3: PICTURE OF THE HELICOPTER'S CLOCK



The Hob's Meter showing the aircraft time as 361.7 hours, meaning the aircraft still had 28.6 hours before its next maintenance check.

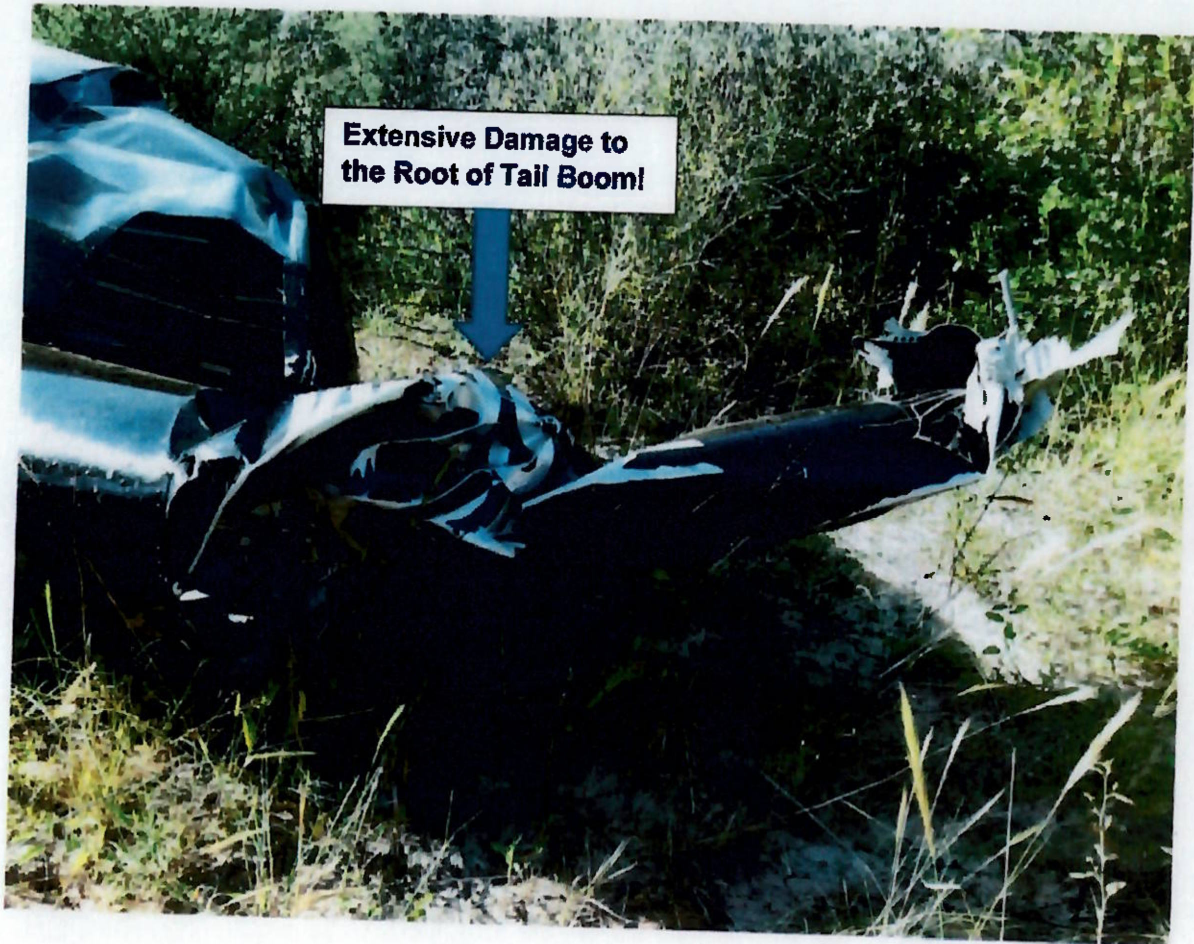
The Helicopter's Clock recording the loss of power as 1741Z, suggesting the crash time to be 1740Z or thereabout!

APPENDIX 4: WRECKAGE PHOTOGRAPHS

First Point of Impact
between the tree and
tail rotor!

The main wreckage lying on its port side, with under surface facing south and the helicopter facing eastwards, the same direction it had come from!

Closer view of the same picture above, showing extensive damage by the root of tail boom.

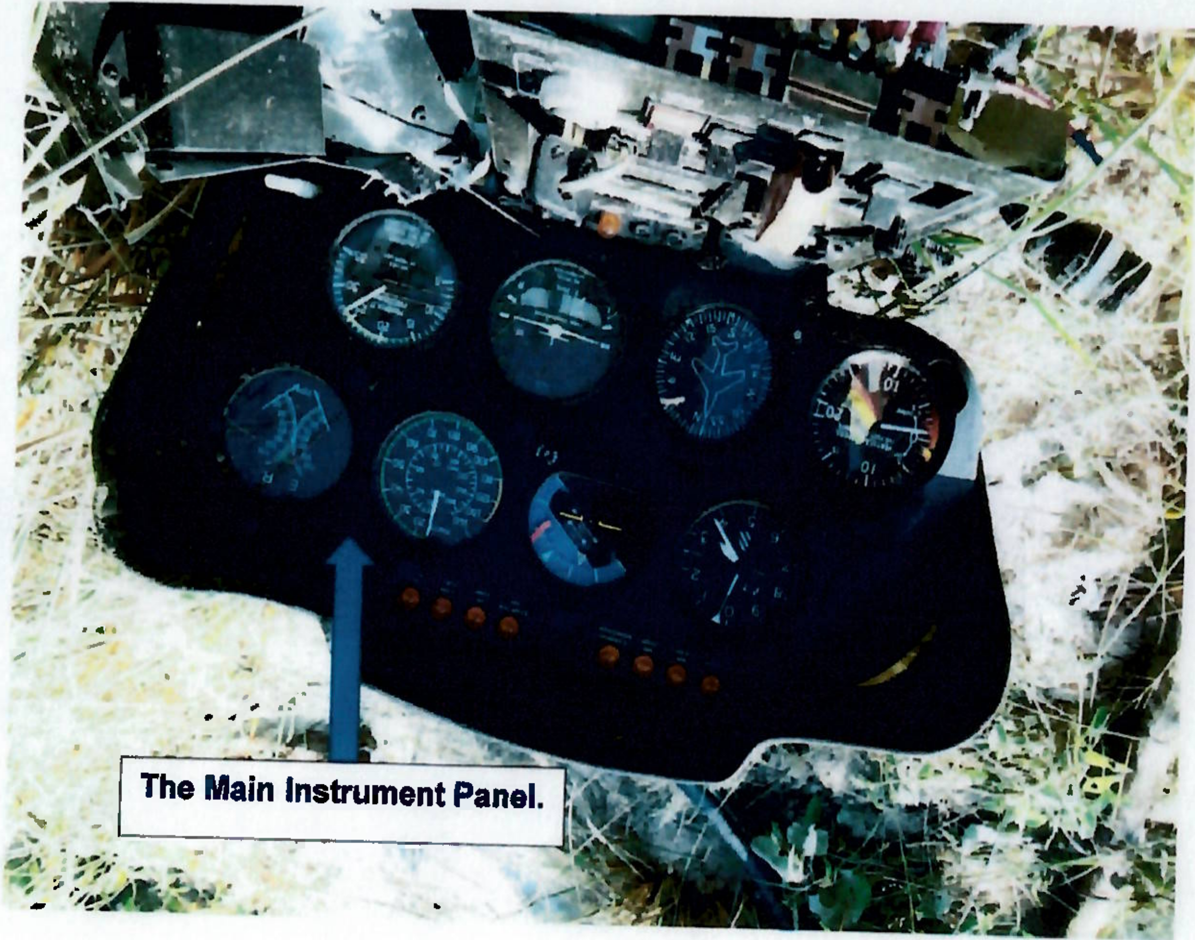

Extensive Damage to
the Root of Tail Boom!

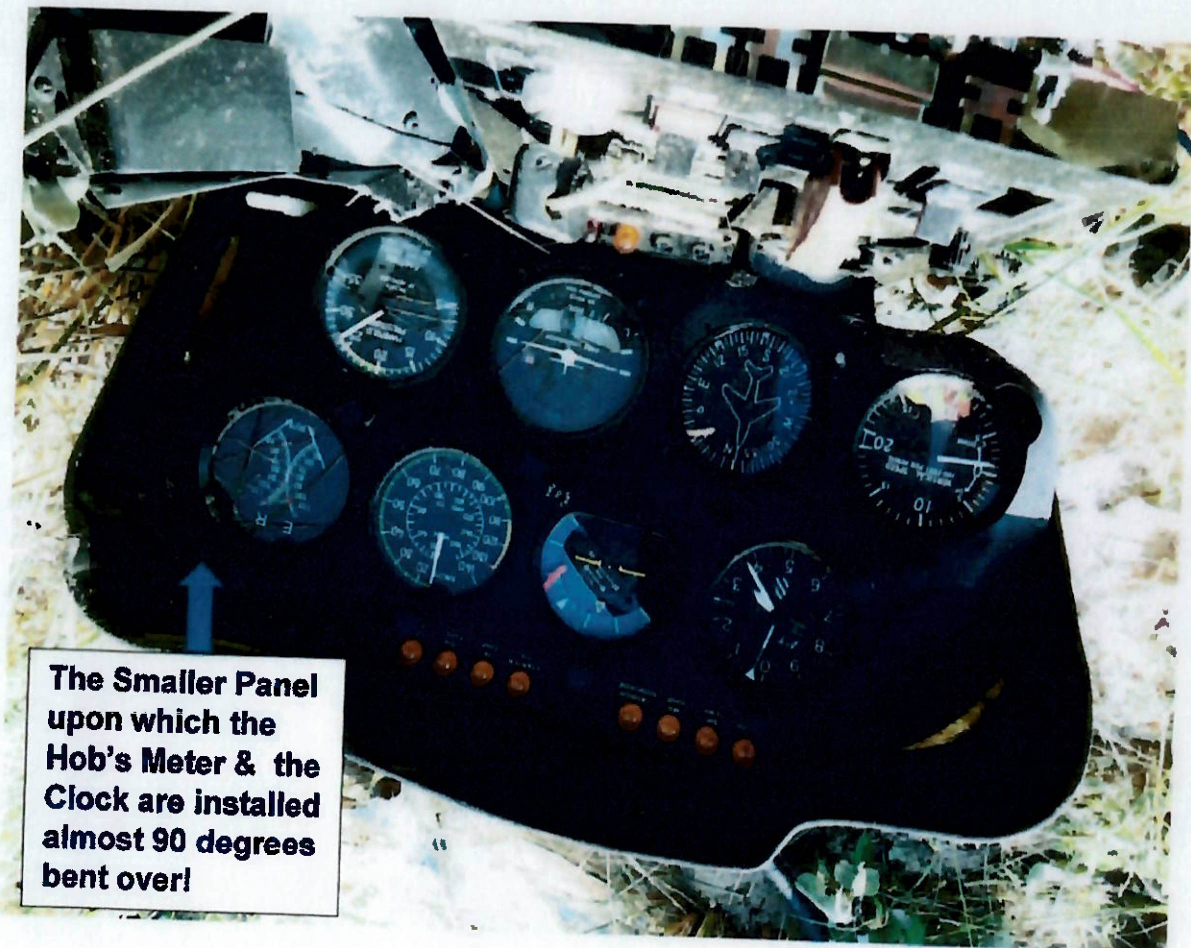
The PIC's Seatbelt was found buckled up
The Passenger's Seatbelt was found buckled up
10/03/2021 10:05

Close-Up of the Main Wreckage!

The Tail Piece of the Helicopter.

The Helicopter's Tail Rotor!


The Main Instrument Panel.


The Smaller Panel upon which the Hob's Meter & the Clock are installed almost 90 degrees bent over!

APPENDIX 5: COPY OF THE CERTIFICATE OF REGISTRATION

SOUTH AFRICAN CIVIL AVIATION AUTHORITY — **CAR47B**
REPUBLIC OF SOUTH AFRICA

CERTIFICATE OF REGISTRATION — **CERTIFICATE NUMBER : 38-ZS-SBM-2**

1 Nationality and registration marks	2 Manufacturer and manufacturer's designation of aircraft ROBINSON HELICOPTER COMPANY	3 Aircraft serial number
ZS-SBM	R44 II	12099

4 Name of owner **AIRCRAFT ASSET FINANCE CORPORATION**

5 Address of owner **(PTY) LTD**
PO BOX 1768
MORNINGSIDE
2057

6 It is hereby certified that the aircraft described above has been duly entered on the South African Civil Aircraft Register in accordance with the Convention on International Civil Aviation dated 7 December 1944 and with the Civil Aviation Regulations, 2011, as amended.

7 *NO ENDORSEMENTS*

Date of issue: **2016/05/25**

31150

FOR DIRECTOR OF CIVIL AVIATION

APPENDIX 6: Telephone Transcription Between the Key Witness (Caller) and Area Controller (Receiver)

Phone Ringing!!!

Receiver: Gaborone

Caller: Hullo Gaborone, Hullo!

Receiver: Ee rra

Caller: Keapproach?

Receiver: Ke Area

Caller: Ke Area?

Receiver: Ee rra!

Caller: Bona, ke repota crash mo

Receiver: Rra?

Caller: Ke repota crash!

Receiver: Crash?

Caller: Hmm!

Receiver: O erepota olekae?

Caller: No, kemo, nna kegore ke..., nna ke Alpha Siera 8-1-9

Receiver: 8-1-9, ee rra!

Caller: Ee, but nna gakeatheogela, kefa famong hela, keha dikgonnye

Receiver: Dikgonnye

Caller: Ee nna keha dikgonnye

Receiver: Ee rra!

Caller: You know what happened, there is this guy wa ZS-SBM, gake itse gore a wamotshwara ....

Receiver: ZS-SBM?

Caller: Ee ZS-SBM, onna ko Matsieng!

Receiver: Omho!

Caller: So, ona le famo kako ke side ya CKGR kakwa

Receiver: Mho!

Caller: Ee nna keitse famo yagwe ha eteng, but I'm the one who is on standby like now

Receiver: Okay!

Caller: So, he just called me ka a Satellite phone

Receiver: Ehe!

Caller: Gore o crashitse

Receiver: Bosigo jaana?

Caller: Over!

Receiver: O crashitse leng, bosigo or just now?

Caller: Ene ele, I think......... kgantelenyana goragore one asakgone gontshwara,

Receiver: Ehe!

Caller: Gone mo famomg yagagwe

Receiver: Okay, ke type mang?

Caller: Rra?

Receiver: Ke type mang kana?

Caller: Ke Robinson 44

Receiver: Romeo Alpha?

Caller: Robinson 44, ZS-SBM

Receiver: Oh!

Caller: So, eh seaneng asempolella kegore, goraagore pax e one keyone elebegang a robegile, but bakgonne gomo tsaya kakoloi bamoisitse sepateleng goragore etlabo ele boLetlhakeng mme goragore otla referiwa

Receiver: Ehe oko Letlhakeng gone ana?

Caller: Ene elegore baya side ya Letlhakeng, leha Sojwe

Receiver: Ehe o crasheditse fela mo famomg ya gagwe

Caller: Mo famong yagagwe ee

Receiver: Okay!

Caller: Ee

Receiver: Ee rra!

Caller: Jaanong goragore, intension, kopo yagagwe, akere because of the Insurance issues, so,

gaelegore eya ko boarding ele report e official, such that gongwe e folowe ehm, the investigation, retlise diinvestigators, akeitse gore e lonchiwa yang from your side

gaentse jalo

Receiver: Ehe!

Caller: For the investigators

Receiver: So ene, ene balekae?

Caller: It seems they were four!

Receiver: They were four? And they are all alive?

Caller: They are all alive, only ene oalebegang a robegile maoto!

Receiver: The pilot kene arobegileng maoto?

Caller: No, the pilot ke ene aneng aletsa, ene osiame!

Receiver: Oh, one of the passengers . . .