



**REPUBLIC OF KENYA**

**MINISTRY OF ROADS AND TRANSPORT**

**STATE DEPARTMENT FOR TRANSPORT**

**AIRCRAFT ACCIDENT INVESTIGATION**

DRAFT FINAL REPORT ON AIRCRAFT ACCIDENT TO  
CESSNA 208B REGISTRATION 5Y-JKN AT MARSABIT HILL  
ON 20 MARCH 2021

## SUMMARY OF THE ACCIDENT

OPERATOR/OWNER	:	Aeronav Air Services Ltd
AIRCRAFT TYPE/ MANUFACTURER	:	C208/Cessna (Textron)
YEAR OF MANUFACTURE	:	1998
AIRCRAFT REGISTRATION	:	5Y-JKN
AIRCRAFT SERIAL NUMBER	:	208B-0688
DATE OF REGISTRATION	:	17 July 2012
NUMBER AND TYPE OF ENGINE	:	One-PT6A-114A
ENGINE SERIAL NUMBER	:	PCE-PC2350
DATE OF OCCURRENCE	:	20 March 2021
TIME OF OCCURRENCE	:	10:00am (0700Z)
LOCATION OF OCCURRENCE	:	Marsabit Hill
TYPE OF FLIGHT	:	Commercial
PHASE OF FLIGHT	:	Approach
PERSONS ONBOARD	:	2
INJURIES	:	Fatal
NATURE OF DAMAGE	:	Destroyed
CATEGORY OF OCCURRENCE	:	Accident
PIC'S FLYING EXPERIENCE	:	ATPL/4235.5hours

*All times given in this report is Coordinated Universal Time (UTC), with East African Local Time in Parenthesis*

## **OBJECTIVE**

This report contains factual information which has been determined up to the time of publication. The information in this report is published to inform the aviation industry and the public of the general circumstances of the accident.

This investigation has been carried out in accordance with The Kenya Civil Aviation (Aircraft Accident and Incident Investigation) Regulations, 2018 and Annex 13 to the ICAO Convention on International Civil Aviation.

The sole objective of the investigation of an accident or incident under these Regulations shall be the prevention of accidents and incidents. It shall not be the purpose of such an investigation to apportion blame or liability.

## **Investigation Process**

The accident involving the C208B type of aircraft, registration 5Y-JKN was notified to the Aircraft Accident Investigation Department (AAID), State Department for Transport (SDT) of the Ministry of Transport, Infrastructure, Housing, Urban development, and Public Works through a phone call by Aeronav Air Services Ltd.

Under the provisions of Annex 13 to the Convention on International Civil Aviation, Kenya civil aviation act, and regulations, a team of AAID investigators was sent to the accident site on 21 March 2021 for initial onsite investigation and witness interviews.

After the initial on-site investigation phase, the occurrence was classified as an ‘Accident’ owing to the extent of injuries to the occupants and nature of damage to the Aircraft.

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## **LIST OF ABBREVIATIONS/GLOSSARY OF TERMS**

AAID	-	Air Accident Investigation Department
AC	-	Alto cumulus Cloud
AGL	-	Above Ground level
AMSL	-	Above Mean Sea Level
AOC	-	Air Operation Certificate
ATC	-	Air Traffic Services
ATPL	-	Airline Transport Pilot License
CPL	-	Commercial Pilot License
CPL	-	Commercial Pilot License
EGWS	-	Enhanced Ground Proximity Warning System
HKMB	-	Marsabit Airstrip
HKNW	-	Nairobi Wilson
IAS	-	Indicated airspeed
ICAO	-	International Civil Aviation Organization
KCAA	-	Kenya Civil Aviation Authority
VIP	-	Very Important Persons

## **SYNOPSIS**

The report describes the accident to C208B type of aircraft, registration 5Y-JKN with two crew on onboard that occurred at Marsabit Hill on 20<sup>th</sup> March 2021 in which the aircraft crashed killing two crew onboard.

The aircraft with 2200lbs fuel onboard was chartered to ferry Marsabit County Officials to a peace keeping mission at Illeret 156 nautical miles North West of Marsabit town. Preliminary information revealed that the aircraft departed Wilson Airport at 08.20am (0520Z) and arrived within the vicinity of Marsabit town at around 10.00a.m (0700Z). It collided with Kofia Mbaya Hill - Marsabit terrain while attempting to approach Marsabit airstrip. The aircraft first impacted the terrain with its nose-wheel and the main landing gears leaving parts of the fuselage and iron box with its content kept in the lower baggage compartment on the sport. It then ballooned and missed a house before it flipped upside down and impacted the ground and came to rest facing opposite direction. It left a trail of aircraft parts along its path before it came to rest. The nose-wheel and its assembly separated and fell off and was found next to the house 110m from its first point of impact. There was no fire after impact but all the occupants received fatal injuries

# 1. FACTUAL INFORMATION

## 1.1 History of the Flight



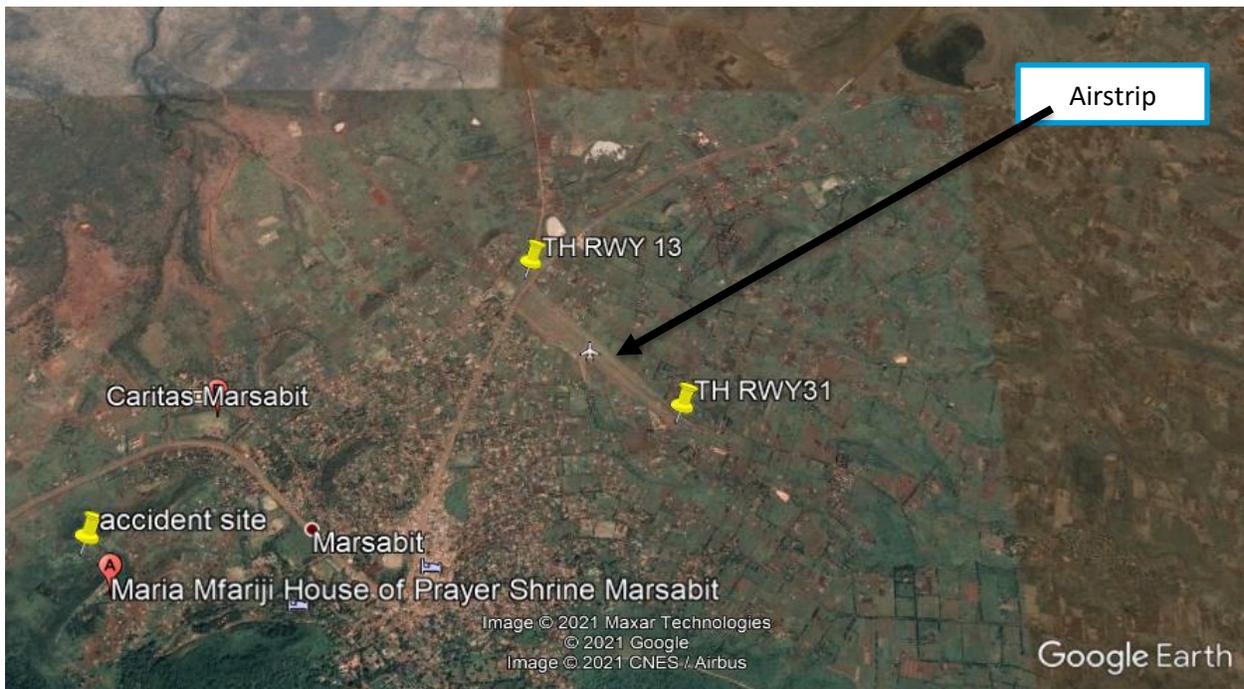
**Figure 1:** Photograph of the accident aircraft at the accident site

On 20<sup>h</sup> March 2021, the Air Accident Investigation unit at the Ministry of Transport, Infrastructure and Urban Development was notified of an accident involving a Cessna208B type of aircraft, registration 5Y-JKN operated by Aeronav Air Services Ltd at Marsabit Hill (Karantina). The aircraft departed Wilson Airport (HKNW) with a total of 2200lbs fuel on board on charter flight to ferry Marsabit County Officials to a peace keeping mission at Illeret 156 nautical miles North West of Marsabit town. Preliminary information revealed that the aircraft departed Wilson Airport at 08.20am (0520Z) and arrived within the vicinity of Marsabit town at 10.00am (0700Z). It collided with Marsabit Hill terrain while attempting to approach Marsabit airstrip 1.6 nautical miles from threshold runway 13. The aircraft first impacted the terrain with its nose-wheel and the

main landing gears leaving parts of the fuselage and iron box with its content kept in the lower baggage compartment on the spot. It then ballooned and missed a house before it flipped upside down and impacted the ground and came to rest facing opposite direction. It left a trail of aircraft parts along its path before it came to rest. The nose-wheel and its assembly separated and fell off and was found next to the house 110m from its first point of impact. There was no fire after impact but all the occupants received fatal injuries. Information obtained by eyewitness indicated that the accident occurred in poor visibility due to heavy presence of thick fog.

On 10 April 2006, a twin engine turboprop Kenyan military aircraft Y-12 carrying 14 VIP passengers crashed on the same spot in poor visibility while attempting to land at Marsabit airstrip. The aircraft caught fire on impact and all the 14 passengers received fatal injuries.

According to the information obtained from Flying Doctor's airfield information, booklet, it indicates that caution to pilots Marsabit has high ground, watch-out in low weather and use Segel airstrip as alternate. There are also aerial masts and wind turbines as well on top of the hills.



**Figure 2:** Google earth map showing the position of the accident and the airstrip

## 1.2 Injuries to Persons

**Table 1:** Injury chart

<b>Injuries</b>	<b>Crew</b>	<b>Passenger</b>	<b>Others</b>	<b>Total</b>
<b>Fatal</b>	2	0		0
<b>Serious</b>	0	0		0
<b>Minor/none</b>	0	0		0
<b>Total</b>	2	0		2

## 1.3 Damage to Aircraft

The aircraft was destroyed

## 1.4 Other Damages

Fuel spillage and damage to trees

## 1.5 Personnel Information

### 1.5.1. Captain

The Captain of the flight was 30 years old, he held a valid medical class one certificate with no limitations and an Airline Transport Pilot License (ATPL) valid until 19<sup>th</sup> May 2021. He was rated on Piper34, Cessna 208B and Let 410 aeroplanes. He had a total of 4235.2 hours with 2329.6 hours on C208.

**Training.** Information obtained from the company indicated that the captain was last trained on the use of EGPWS on 27<sup>th</sup> May 2016. The following was used for his training assessment.

- i) Little or no mastery. Cannot demonstrate mastery even with instructions
- ii) Partial mastery of target. Demonstrate partial mastery/understanding or can perform portions of the target with assistance

- iii) Meets expectation of the target
- iv) Advance well above expectations

The result on his overall assessment was tabulated as indicated in Table 2 below.

**Table 2:** Captain Skill test training results

Skill tests	Remarks
Application of procedures.	Meets expectations
Communication	Meets expectation
Aircraft flight path management control	Meets expectation
Aircraft flight path management automation	Aircraft flight path management automation
Problem solving and decision making	Meets expectation
Situational awareness.	Meets expectation
Workload management	Meets expectation
Knowledge of flight planning and aircraft performance	. Excellent
Terrain, traffic, runway incursion	Well briefed
Ground proximity warning systems alerts	Meets expectations

There was no report on any other training on the captain on the use of EGPWS since 2016.

**Crew briefing.** Information obtained from the operator suggested that the crew were supplied with weather briefing at the destination aerodrome.

### 1.5.2 First Officer

The first Officer was 24 years old, held a valid medical certificate with no limitation and had a commercial pilot license valid until 21<sup>st</sup> February 2022. He held ratings for Cessna 150, Piper34 and Cessna 208B aeroplanes. He had a total of 104.15 hours on Cessna 208B and a total of 344.1 hours.

There was no report obtained from the company on training of the first officer on the use of EGPWS.

### 1.6 Aircraft Information



**Figure 3:** Photograph of the accident aircraft before the accident

The accident aircraft registration 5Y-JKN, C208B type was constructed by Textron (Cessna) Co. in 1998. Aeronav purchased the aircraft in 2012 and was issued with a valid certificate of registration on 17<sup>th</sup> July 2012. Its certificate of airworthiness was issued on 7<sup>th</sup> February, 2021 expiring on 6<sup>th</sup> February 2022.

It is a single-engine turboprop with 1 or 2 crew compliment. It had a seating capacity of 12 passengers plus the two crew. It had 1 Engine Pratt & Whitney PT6A-114A turboprop, constructed on 13<sup>th</sup> December, 2019 construction number PCE-PC2350 and had 291 hours since new. The airframe had a total of 17.1 hours since renewal of certificate of airworthiness and a total of 16343.8 hours since new. It had three propeller blades McCAULEY 3GFR34 C703, construction number 902400 with a total of 505 hours since major overhaul.

The last certificate of release to service dated 4<sup>th</sup> March 2021 indicated it was due for routine maintenance on 1<sup>st</sup> June 2021 or after 16442.8 airframe hours. The aircraft logbook did not indicate any significant maintenance carried out since last major maintenance.

## **1.7. Meteorological Information.**

### **1.7.1 Background Information**

Long rains start in this area from mid-March until July every year. Marsabit hills are characterized by creation of their own weather marked by thick fog and rain showers during this period.

On 10<sup>th</sup> April, 2006 a Kenya Air force Y12 aircraft crashed on the same spot in thick fog killing 14 people on board.

### **1.7.2 Forecast Weather**

The weather information obtained from the station indicated that it was expected to be strong winds above 25knots North West of Marsabit with few scattered AC clouds at the top highest between 6000' to 15000' clouds and at the lowest base between 1200' and 3000'above ground level. Surface visibility over 10km unless in fog, rain showers or thunderstorms.

### **1.7.3 Actual Weather at the time of the Accident**

The weather information obtained from the station indicated as follows:

## 1.8 Aids to Navigation

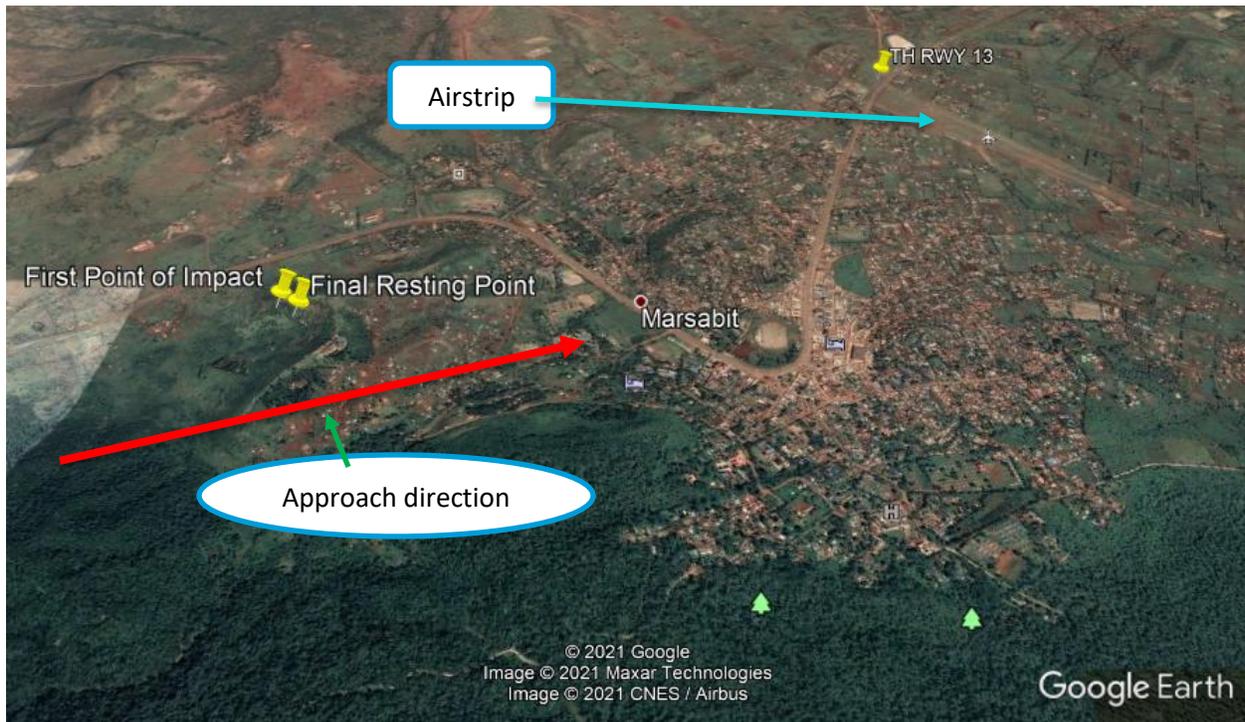
There were no ground navigational aid at Marsabit Airstrip but the aircraft was equipped with ATC transponder 066-1062-0C S/N 17670, GPS Germin Aera 550 and EGPWS

## 1.9 Communication

It had onboard radio equipment make Bendix/King Model KX 165 AND Bendix/King Model KHF 950 approved by Communication Authority of Kenya valid until Jun 2021.

## 1.10 Aerodrome Information

Marsabit is unmanned government airstrip with runway orientation of 13/31, positioned at GPWS coordinates N 02°20'49.5" E 037°59'03.2" with an elevation of 1339.9m, measuring length 1km, width 20m located 1km off Marsabit town. It is a gravel covered surface runway. It is surrounded by hills within Marsabit town.



**Figure 4;** Google earth map showing the airstrip and the location of the accident

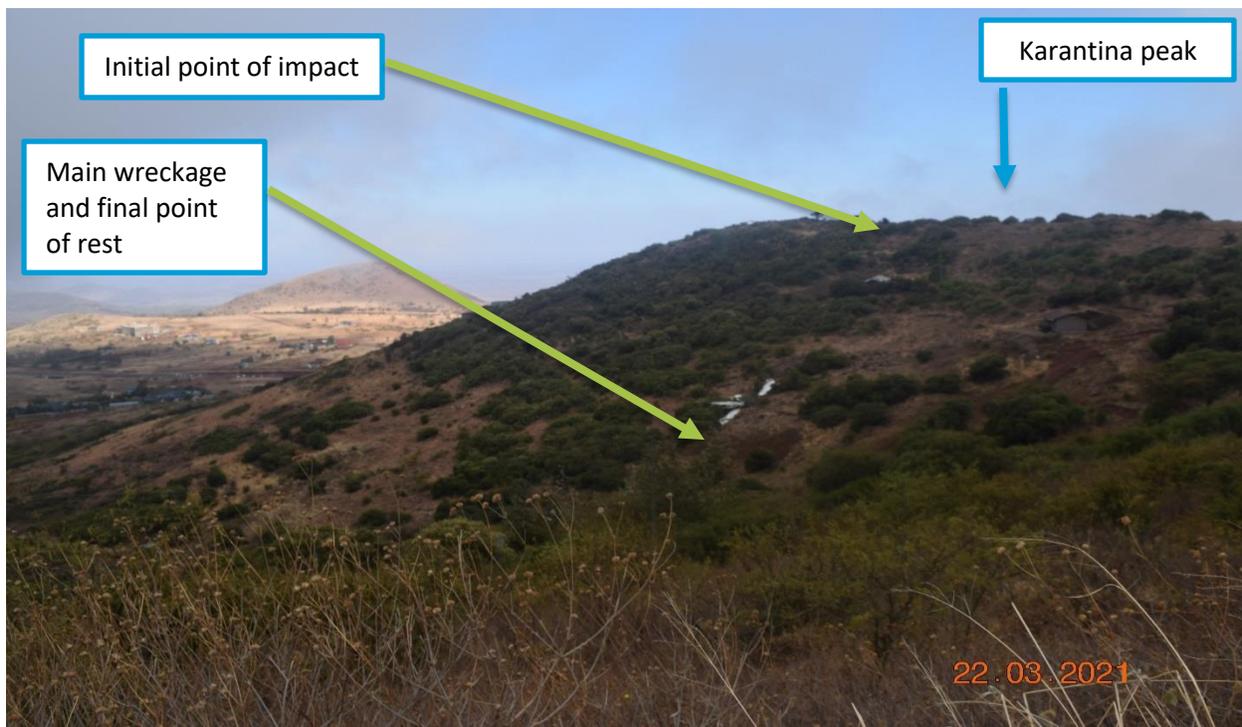


**Figure 5:** Photograph showing fog around Marsabit around 10.00am near the location of the accident.

### **1.11. Flight Recorders**

The aircraft was not equipped with flight recorders nor was it required to be fitted by KCAA regulations

## 1.12. Wreckage and Impact Information



**Figure 6:** Photograph showing the general wreckage distribution after impact



**Figure 7:** Photograph showing the aircraft nose-wheel that separated after impact



**Figure 8:** Photograph showing family house within the vicinity of the accident.



**Figure 9:** Photograph showing the wreckage of the accident aircraft



**Figure 10:** Photograph showing the level of fog after it starts to clear

The aircraft impacted the hill top with its nose wheel and landing gear after which the nose wheel collapsed and separated. The fuselage also contacted the ground and some parts peeled-off. An iron box containing aircraft oil lubricants, mechanic rags, locking wire and water was found at the first point of impact. A bag containing personal effects for the first officer was also found at the first point of impact. The right wing broke off and separated from the main fuselage but remained near the main wreckage (7m) away. The propeller and its assembly separated and was not accounted for except a single piece of the propeller blade was collected along the path. The nose wheel landing gear was found next to a house along the wreckage flight path.

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

The report is yet to be notified

### **1.14 Fire**

There was no post fire after impact

### **1.15. Survival Aspects**

The accident was not survivable due to high impact forces, however two men who noticed the accident raised the alarm and arrived at the accident site within 2 minutes but were unable to remove the crew because the aircraft was inverted and they were trapped within the cabin until the arrival of the security officers

### **1.16. Tests and Research.**

Not applicable

### **1.17. Organization and management information**

#### **1.17.1. Aeronav Ltd**

Aeronav Air Services Ltd is a local charter air operator based at Wilson airport Kenya that operates non-scheduled passenger and cargo air charter services. It has a fleet of C172, C206, PA34, B58, and C208. It had a valid air operation certificate (AOC) issued on 30<sup>th</sup> July 2020 expiring on 29<sup>th</sup> July 2021.

#### **1.17.2 KCAA**

Regarding KCAA Legal Notice No. 165 aircraft operations regulation 26, the aircraft was equipped with EGPWS as required. KCAA had also provided provision of meteorological services, as per KCAA Legal Notice No. 166, all weather information services were made available at the departure aerodrome in this case Wilson airport. There is even a weather station office located at Marsabit which is within the vicinity of the aerodrome.

### **1.18. Additional Information**

Not applicable

### **1.19 useful or effective investigation techniques**

Not applicable

## **2. ANALYSIS**

**2.1. Injuries to persons onboard.** Both crew experienced fatal injuries

**2.2. Damage to aircraft.** The aircraft was destroyed

2.3. **Crew experience.** Both crew had valid commercial pilot license.

2.4. **EGWS training.** The captain had received training regarding the use EGPWS about four years ago.

2.5. **Certificate of airworthiness.** The aircraft had a valid certificate of airworthiness and there was no record in the aircraft log book regarding any defect on maintenance since last major repair.

2.6. **EGPWS.** The investigation is yet to establish whether the EGPWS gave pilot warning on terrain just before impact with to the ground.

2.7. **Weather.** it was evident that Marsabit hills and its environs is characterized with creation of its own weather marked by rapid formation thick fog and sometimes rain showers between 0840am to around 12.25pm. This weather phenomenon clears fully after 12.230pm.

The actual weather on that day was clear up to 0840 LT hills visible with visibility of more than 7 km, light winds and zero cloud cover. After 0840LT there was fast generating thick fog encompassing the entire family of hills reducing the visibility to less than 200 meters. During this period of thick fog, now and again gaps of improved, forward visibility occurred but they were closing almost as soon as they formed. This was evident from the photographs taken on 23 March at around the same time (See figure 5). With this type of weather it is very difficult for VFR flight to be conducted to Marsbit airstrip considering the type weather formation.

### **3.0. CONCLUSION**

#### **3.1. Findings**

3.1.1. The crew had valid license for the operation of aircraft.

3.1.2. The aircraft had valid certificate of airworthiness

3.1.3. There was poor forward visibility due to heavy presence of fog during approach to Marsabit airstrip.

#### **3.2. Probable cause of the accident.**

The probable cause of the accident was continued descend into terrain without forward visibility in thick fog. The following was the contributing factors.

- i. Location of the airstrip which is surrounded by high hills

- ii. Inadequate flight planning and crew resource management

### **3.0 SAFETY RECOMMENDATION**

Due to the terrain and natural weather formation around Marsabit hills, AAID recommends crew sensitization and enhanced Local Marsabit weather communication to inbound traffic.

**Martyn Lunani**

**CHIEF INVESTIGATOR OF Accidents**

**May 2023**