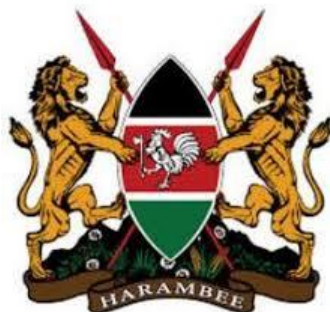


# REPUBLIC OF KENYA



MINISTRY OF ROADS AND TRANSPORT  
STATE DEPARTMENT FOR TRANSPORT  
**AIRCRAFT ACCIDENT INVESTIGATION DEPARTMENT**

INVESTIGATION REPORT No. **01/01/2021**

INVESTIGATION REPORT OF AN OCCURRENCE INVOLVING AN  
CESSNA 172M, REGISTRATION 5Y-NNJ ON 03 JANUARY 2021  
AT WILSON AIRPORT IN NAIROBI

## AIRCRAFT ACCIDENT INVESTIGATION

OPERATOR	:	Ninety Nines Flying School
AIRCRAFT TYPE	:	Cessna 172 M
MANUFACTURER	:	Textron Aviation Inc.
YEAR OF MANUFACTURE	:	1976
AIRCRAFT REGISTRATION	:	5Y-NNJ
AIRCRAFT SERIAL NUMBER	:	172-65726
DATE OF REGISTRATION	:	02 August 2018
NUMBER AND TYPE OF ENGINE	:	One, Lycoming 0-320-E2D
DATE OF OCCURRENCE	:	03 January 2021
LAST POINT OF DEPARTURE	:	Wilson Airport, Nairobi
POINT OF INTENDED LANDING	:	Wilson Airport, Nairobi
TIME OF OCCURRENCE	:	0856 (1156)
LOCATION OF OCCURRENCE	:	Wilson Airport, Nairobi
TYPE OF FLIGHT	:	Training
NUMBER OF PERSONS ON BOARD	:	01
INJURIES	:	None
NATURE OF DAMAGE	:	Minor
CLASS OF OCCURRENCE	:	Serious Incident
PILOT IN COMMAND	:	PPL holder
PIC FLYING EXPERIENCE	:	88.4 hours

*All times given in this report is Coordinated Universal time (UTC), with East African local time in parenthesis*

## **OBJECTIVE**

This report contains 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.

The information contained in this report is derived from the data collected during the investigation of the occurrence.

## **INVESTIGATION PROCESS**

The occurrence involved a Cessna 17M aircraft registration 5Y-NNJ, and was notified to the Aircraft Accident Investigation Department (AAID), State Department for Transport (SDT), Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works through a phone call by Wilson Airport Air Traffic Control.

AAID investigator on standby duty was deployed to the site for initial onsite investigation and witness interviews.

After the initial on-site investigation phase, the occurrence was classified as a “serious Incident” owing to minor damage to the Aircraft. No injuries were reported.

In accordance with ICAO Annex 13 protocols, AAID notified National Transportation Safety Board (NTSB) of United States of America as the aircraft accident investigation authority of the state of manufacture and design of the aircraft and engine respectively.

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## LIST OF ABBREVIATIONS/GLOSSARY OF TERMS

AAID	-	Aircraft Accident Investigation Department
AMO	-	Approved Maintenance Organization
CPL	-	Commercial Pilots' License
ELT	-	Emergency Locator Beacon
KCAA	-	Kenya Civil Aviation Authority
METAR	-	Meteorological Terminal Aviation Routine Weather Report
NM	-	Nautical miles
PPL	-	Private Pilots' License
TSN	-	Time since New
VFR	-	Visual Flight Rules

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



## **SYNOPSIS**

On 03 January 2021, a serious incident occurred at Wilson airport involving a Cessna C172M aircraft registration 5Y-NNJ operated by a PPL holder pilot of Ninety Nine Flying School upon landing. The flight was uneventful until touch-down on Runway 07 when the aircraft bounced and lifted into the air again. Upon its second touch-down, the nose wheel of the incident aircraft hit the ground heavily. The aircraft moved forward and stopped on the runway in a nose down position. The Student climbed out uninjured. The propeller and nose landing gear of the aircraft were substantially damaged. There was no fuel leakage or fire.

The probable cause of the serious incident was identified as:

After a bounced landing, the bailed landing procedures, where go-around should be executed, were not performed. Upon its second touch-down, the aircraft had a hard nose landing, which resulted in the stoppage of the rotation of propeller after the blades contacted the ground (i.e. propeller strike), the collapse of the nose landing gear and the subsequent damage to the aircraft.

# 1. FACTUAL INFORMATION

## 1.1. History of Flight

On 03 January 2021 at about 0856 (1156), a Cessna C172M aircraft registration 5Y-NNJ performing a VFR training flight crashed on landing at Wilson airport's runway 07. On board was a PPL holder performing solo circuits training in pursuit of his CPL.

Prior to this flight, the CPL student together with a flight instructor had performed five touch and go training flights. The flight instructor eventually released the CPL student execute three solo touch and go flights. On the maiden solo flight the student took off from Wilson airport's runway 07 and coming in to land on the same runway. Upon flaring to land the aircraft bounced twice, settled on the ground, broke the nose landing gear fork and dragged on the runway for about 210 m before coming to a stop before taxiway B.

The uninjured pilot exited the aircraft unaided and the Airport Rescue and firefighting services (ARFFS) arrived immediately at the occurrence site. The disabled aircraft was eventually towed away from the runway to its approved maintenance organization's (AMO) hangar.

There was no pre or post occurrence fire.



**FIGURE No. 1** – A photo of the aircraft in a nose down position on Runway 07.

## 1.2. Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	0	0	0
Serious	0	0	0
Minor/None	1	0	

## 1.3. Damage to Aircraft

The nose wheel assembly and wheel fork were found detached from the nose landing gear. There was grinding damage on the broken nose gear strut. Both propeller blades exhibited impact damage and the blade tips were bent rearwards. The engine remained intact and secured to the aircraft structure.

Post occurrence visual examination of the aircraft revealed no deficiencies prior to the incident.

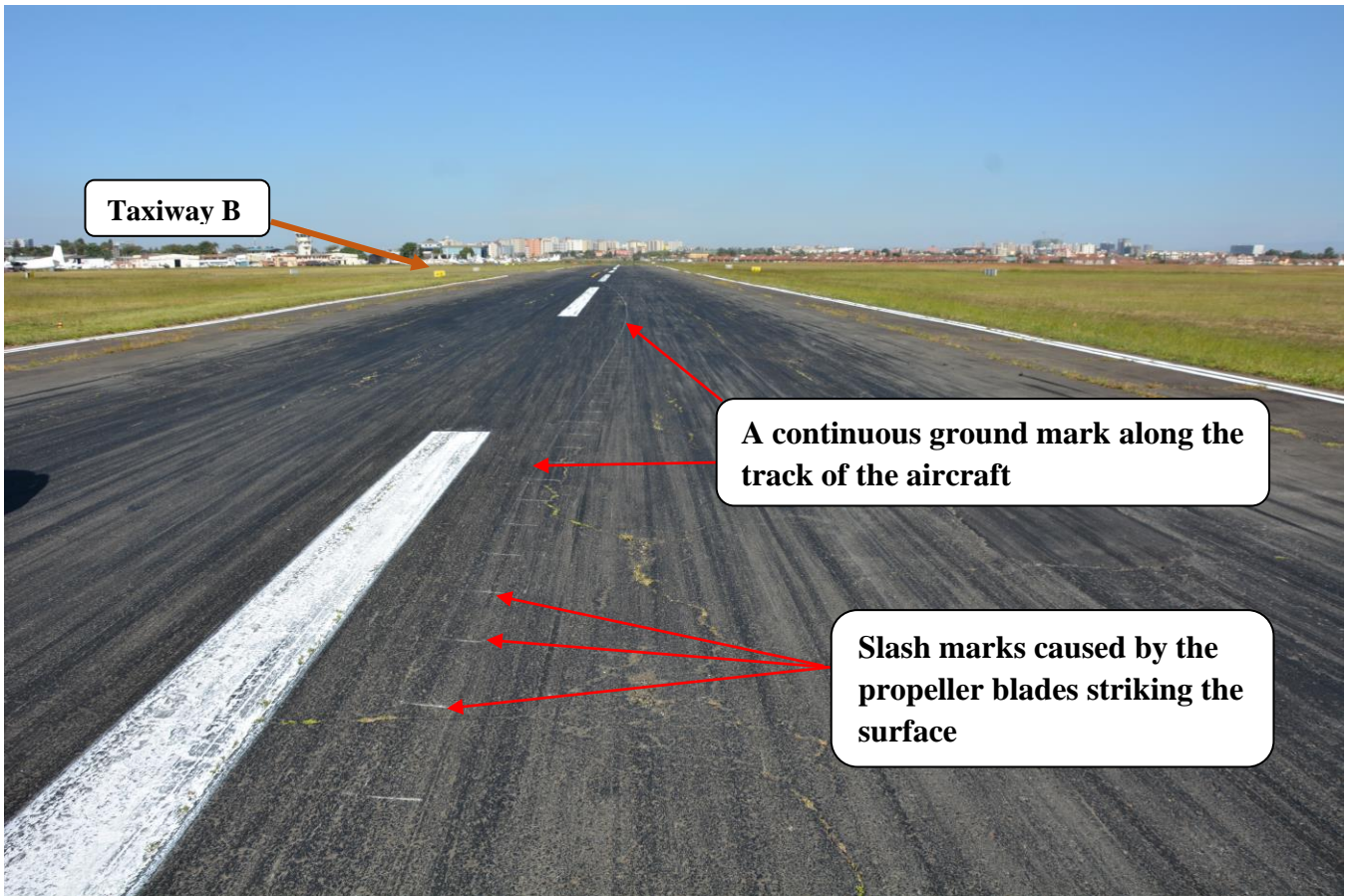


*FIGURE No. 2 and 3 – Photos depicting extent of damage to the propeller and nose landing gear wheel.*



*FIGURE No. 4 and 5 – Photo depicting damage of nose landing gear and propeller.*

#### 1.4. Other damage



*FIGURE No. 6 – Ground marks*

The broken nose gear strut left an impact point and a continuous ground mark along the track of the aircraft on the runway pavement surface. Slash marks caused by the propeller blades striking the surface were also found. The distance between most of the marks was 30cm.

## 1.5. Personnel Information

### 1.5.1 The Pilot

The PPL holder was the only person on board the aircraft during the incident. He was a student pilot at Ninety Nines flying school at Wilson airport undergoing his CPL (A) training. He held a PPL issued on 20 November 2020 and a Class 2 Medical Certificate with no limitations/restrictions, valid until 24 March 2021 in accordance with the current Kenya Civil Aviation Authority (KCAA) personnel licensing requirements.

<b>Pilot license</b>	PPL
<b>Medical expiry date</b>	24 March 2021
<b>Total flying hours</b>	88.4
<b>Hours, last 30 days</b>	4.6
<b>Hours, last 07 days</b>	2.2
<b>Hours, last 24 hours</b>	1.2

### 1.5.2 The instructor

At the time of the incident, the Instructor held a KCAA airline transport pilot's license valid until 10 May 2021 with a class one medical certificate and Fokker F27 rating. He had a total of 2,300 flying hours. He also held a Flying Instructor (FI) rating, valid until 29 January 2021, which entitled him to exercise the privileges of a flight instructors rating on all aircraft in group 1 of his license (Cessna 172 and Piper PA 34). The most recent FI renewal test was conducted by KCAA on 14 January 2020.

Availed records indicated that he had conducted training flights with the pilot on the day of the occurrence, the previous day, 6 December 2020, 5 December 2020, 20 November 2020, 9 November and 4 November 2020 respectively. He had 7.7 hours of dual flight with the Student in the seven flights. The instructor indicated that the pilot needed more practice on approach and landing procedures. These remarks were echoed by one of the pilot's instructor during the pilot's PPL training who insisted on the need for the pilot to watch out for speeds on approach and correct and also to maintain constant approach profile.

## 1.6. Aircraft Information

The occurrence aircraft was a Cessna C172M aircraft, serial number 172-65726. It was a high wing, single engine aircraft, with a tricycle landing gear configuration and a steerable nose wheel. It was powered by a Lycoming O-320-E2D, 150 HP at 2700 RPM four-cylinder, horizontally opposed, reciprocating engine.

<b>Manufacturer</b>	Textron Aviation Inc.
<b>Type and model</b>	Cessna C172M
<b>Serial number</b>	172-65726
<b>Nationality / Registration Mark</b>	Kenyan, 5Y-NNJ
<b>Name of Operator</b>	Ninety Nines Flying School
<b>Certificate of Registration</b>	02 August 2018
<b>Validity of Certificate of Airworthiness</b>	24 September 2021
<b>Total airframe time</b>	11,669.4 hours
<b>Engine type (no.)</b>	Lycoming 0-320-E2D (1No.)
<b>Propeller (no.)</b>	McCauley propeller (1No.)
<b>Fuel type used</b>	AVGAS

### **1.6.2 Maintenance Records**

At the time of the incident, the aircraft had a valid Certificate of Airworthiness in the Commercial Air Transport (Passengers) Category issued by KCAA on 25 September 2020, with validity period until 24 September 2021. A review of the aircraft records indicated that the aircraft had no outstanding defects prior to the incident flight. The aircraft was certified, equipped, and maintained in accordance with existing KCAA regulations and approved procedures. The most recent scheduled maintenance check 1 was conducted on 15 December 2020. The check was performed by Solid Horizon Ltd, a Wilson airport based KCAA Approved Maintenance Organization (AMO). At the time of the incident, the aircraft and engine had flown a total of 11,669.4 and 1,755.5 since new.

### **1.6.3 Mass and Balance**

Not considered a factor.

## **1.7. Meteorological Information**

Meteorological Information obtained from the Meteorological department of Kenya indicated that there was no significant weather reported near Wilson airport at the time of the incident. Visibility was more than 10KM with scattered clouds and easterly winds of 6 knots. The weather at Wilson airport and its environs was suitable for a VFR flight.

## **1.8. Aids to Navigation**

Not applicable. The accident flight was operated under VFR, during which the aircraft was required to remain clear of cloud and in sight of the surface.

## **1.9. Communications**

The aircraft was equipped with a two way Very High Frequency (“VHF”) radio. The pilot made standard radio calls for reporting his positions to Wilson control tower during the incident flight. After the aircraft was disabled on the runway the pilot alerted the control tower. The tower notified ARFFS who responded shortly. Runway 07 was closed and traffic was moved to runway 14.

Communication was not considered a factor in this occurrence.

## **1.10. Aerodrome Information**

Wilson airport is located at latitude 01° 19' 18.19" S and longitude 036° 48' 53.40" E at an elevation of 5,546 feet AMSL. It is a medium-sized airport situated about 5km south of Nairobi Central Business District. It serves both domestic and international traffic and has two asphalt runways:

- RWY 07/25 measures 4,800 feet (1,463m) long by 79 ft (24m) wide;
- RWY 14/32 measures 5,118 feet (1,560m) long by 75 ft (22m) wide.

The Airport has eight taxiways namely A, B, C, E, H, J, K, L, and M.

It is also used for training flights. The aerodrome has a manned Air Traffic Control (ATC).

## **1.11. Flight Recorders**

Not applicable. Flight recorders are not required by KCAA regulations for this category of aircraft.

## **1.12. Wreckage and Impact Information**

The main body of the aircraft remained intact, except that the nose wheel assembly and nose wheel fork were detached and found on the runway. An impact point was located on Runway 07. Right after the impact point, a gouge mark was found while the remaining ground mark was a scratch mark continuing to the final position of the aircraft. Propeller blades slash marks were found along the track of the aircraft. Most of the spaces between the slash marks measured 30cm. The aircraft moved forward for approximately 210 m and finally stopped slightly the left of the runway centerline. No tire mark was found.

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

The pilot was not on prescribed drugs. No tests were conducted to check if his performance was affected by fatigue, alcohol, drugs and/or medication at the time of the incident.

## **1.14. Fire**

There was no inflight or post impact fire. No fuel leakage was found.

## **1.15. Survival Aspects**

The occurrence was survivable. The pilot survived uninjured and exited the aircraft unaided. The seats and harness were all intact and showed no sign of damage.

The ELT was not activated.

## **1.16. Tests and Research**

Inspection of the fractured surfaces indicated that there was no pre-existing failure on the nose wheel fork and the failure was due to overload.





*FIGURE No. 7 – Broken nose gear fork*

## **1.17. Organizational and Management Information**

### **1.17.1. Ninety Nine Flying School**

Aircraft Owner/Operator: Ninety Nines Flying School

Address: Nairobi, Kenya

Ninety Nines Flying school is an ATO that operates at Wilson airport conducting training flights in fixed-wing aircraft. The school has its own Safety Management System to promote safety culture and identify areas for improvement.

## **1.18. Additional Information**

Availed records indicated that the instructor had conducted training flights with the pilot on the day of the occurrence, the previous day, 6 December 2020, 5 December 2020, 20 November 2020, 9 November and 4 November 2020 respectively. He had 7.7 hours of dual flight with the Student in the seven flights. The instructor indicated that the pilot needed more practice on approach and landing procedures. These remarks were echoed by one of the pilot's instructor during the pilot's PPL training who insisted on the

need for the pilot to watch out for speeds on approach and correct and also to maintain constant approach profile.

As confirmed by the instructor, the pilot had been taught the balked landing procedures (i.e. an immediate go-around following a bounced landing) during training. As revealed in the Student's training records, go-around manoeuvres, stabilized approaches had been practiced and during the pre-solo assessment flight preceding the incident solo flight.

### **1.19. Useful and Effective Investigative Techniques**

Not applicable.

## **2. ANALYSIS**

### **2.1 General**

#### **2.1.1**

The weather conditions at the time of incident were within the limits for operations under VFR and considered suitable for the Student to conduct his solo circuit flight.

#### **2.1.2**

Pre-flight checks were conducted prior to the pre-solo flight assessment and the incident flight. No anomalies were reported.

### **2.2 Licensing Aspects**

#### **2.2.1**

The Student was entitled to act as pilot-in-command of the accident solo flight with his valid PPL. The Instructor was properly licensed and suitably qualified to authorize the incident solo flight.

### **2.3 Engineering Aspects**

#### **2.3.1**

The aircraft had a valid Certificate of Airworthiness at the time of the incident, and no anomalies were found in the maintenance history.

#### **2.3.2**

The aircraft had no outstanding defects and was serviceable for the incident flight.

## **2.4 Analysis of the Accident Flight**

### **2.4.1**

#### **The Landing Flare and Bounced Landing**

##### **2.4.1.1**

A bounced landing can be caused by an improper flare and/or an incorrect landing airspeed. The Student recalled that the final approach was stable with correct airspeed upon touch-down. If the airspeed upon touch-down was correct, the bounced landing was probably caused by an improper flare, where the flaring action was too late (“late flaring”) or too flat (“under flaring”), that resulted in the bounced landing upon touch-down.

##### **2.4.1.2**

The bailed landing procedures following a bounced landing involves an immediate go-around. As confirmed by the Instructor, the Student had demonstrated such procedures to a satisfactory standard before he was authorized for his solo flight. As revealed in the Student’s training records and confirmed by the Instructor, go-around manoeuvres were conducted during the pre-solo assessment flight preceding the incident solo flight. During the interview, the Student reported that he had been taught to execute a go-around following a bounced landing during his PPL training, however, it all happened so fast that he did not execute the go-around.

#### **2.4.2 Second Touch-down**

##### **2.4.2.1**

Following the bounce and upon the second touch-down, the Student realized that the aircraft had a hard nose landing.

#### **2.4.3 Collapse of the Nose Landing Gear**

##### **2.4.3.1**

Inspection of the fracture surfaces of the nose wheel fork were consistent. There was no pre-existing failure, and the fracture of the nose wheel fork was due to overload. Examination of the detached nose wheel assembly revealed a cut exhibited on the nose tire and a rubber transfer mark on the nose wheel assembly. The cut and transfer mark indicated that the aircraft had experienced a hard nose landing, in which the tire was compressed and/or folded over and made contact with the nose wheel assembly.

##### **2.4.3.2**

The ground marks were consistent with the damage to the aircraft. The first slash mark was located near the runway centerline marking. Slash marks were consistent with the propeller striking the runway surface. From examination of the propeller blades, the backward bending indicated forward aircraft speed, whereas bending of more than one blade indicated that the engine was still running at the time of impact.

#### **2.4.3.3**

Near the slash marks, an impact point was found on the runway centerline.

#### **2.4.3.4**

From examining the aircraft damage and ground marks aforesaid, it was determined that the aircraft had a hard nose landing upon the second touch-down, resulting in the collapse of the nose landing gear.

### **2.4.4**

#### **Aircraft Movement**

#### **2.4.4.1**

- The track of the aircraft could be traced by a ground mark continuing from the impact point to the final stop position. The first segment of the ground mark was a gouge mark while the remaining was a scratch mark. The gouge mark revealed that the broken nose gear was pressing on the runway surface. The gouge mark was subsequently lightened to scratch mark, showing that a reduction in force exerted by the nose gear on the surface, partially shared by the main landing gears.

#### **2.4.4.2**

No tire mark was found, an indication that the pilot did not apply any rudder or brake. The aircraft moved forward for approximately 210 m and finally stopped near taxiway B.

## **2.5 Pilot Action**

### **2.5.1**

Despite the Student pilot had been trained to execute go-around manoeuvres during training, the startle factor when encountering an actual bailed landing situation, especially if the involved Student did not have much flying experience, could possibly contribute to any delay, deviation or lapse from executing the required procedures.

### **3. CONCLUSIONS**

#### **3.1 Findings**

3.1.1 The weather conditions at the time of accident were within the limits for operations under VFR and considered suitable for the pilot to conduct his solo circuit flight.

3.1.2 The aircraft had a valid Certificate of Airworthiness and was maintained and certified in accordance with the regulatory requirements.

3.1.3 The aircraft had no outstanding defects and was serviceable for the incident flight.

3.1.4 The aircraft was operating within its weight and centre of gravity limits.

3.1.5 The pilot held a valid KCAA Class 2 Medical Certificate which entitled him to act as the pilot-in-command of the accident solo flight.

3.1.6 The Instructor was properly licenced and suitably qualified to authorize the solo flight.

3.1.7 In the pre-solo flight assessment, the pilot was checked by the Instructor and was considered suitable for undergoing his solo circuit flight. As revealed in the Student's training records and confirmed by the Instructor, go-around manoeuvres had also been conducted in the pre-solo assessment flight.

3.1.8 The solo flight was uneventful until touch-down in the first circuit, when the aircraft bounced and lifted into the air again.

3.1.9 The bailed landing procedures, where go-around should be immediately executed after a bounced landing, were not performed.

3.1.10 Upon the second touch-down, the aircraft had a hard nose landing, which resulted in the propeller strike, detachment of the nose landing gear wheel assembly, fork and subsequent damage to the aircraft.

3.1.11 The detachment of the nose landing gear wheel assembly and fork was due to overload during the hard nose landing.

3.1.12 The aircraft stopped on the runway in a nose down position.

## **3.2 Probable causes**

The probable cause of the occurrence was the pilot's failure to follow balked landing procedures following a bounced landing resulting in propeller strike, detachment of the nose landing gear wheel assembly, fork and subsequent damage to the aircraft.

## **3.3 Contributing Factors**

3.3.1 Given the pilot's limited flying experience, the startle factor when encountering an actual balked landing situation could possibly contribute to any delay, deviation or lapse from the required procedures.

## **4. SAFETY RECOMMENDATIONS**

- **4.1 Recommendation**

It is recommended that Ninety nines flying school to review and enhance its safety management systems and training programme to improve its student pilots' readiness to execute emergency manoeuvres, and to properly record training on emergency manoeuvres in the pilots' training files.

**Martyn Lunani**

**CHIEF INVESTIGATOR OF ACCIDENTS**

**May 2023**