REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

DIRECTORATE OF AIRCRAFT ACCIDENT INVESTIGATION

CIVIL AIRCRAFT ACCIDENT REPORT

ACCID/083022/01-03

OPERATION	**:**	**CHARTER**
AIRCRAFT REGISTRATION	**:**	**V5-LMK**
LOCATION	**:**	**IMPALILA ISLAND, NAMIBIA**
DATE	**:**	**30 AUGUST 2022**

REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

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Enquiries: Thomas H.Herman **Our Ref: 3/48** **Date: 11 May 2023**

To : **Minister of Works and Transport**
Deputy Minister of Works and Transport
ED: Ministry of Works and Transport

From : **Director: Aircraft Accident and Incident Investigation**

RE: CIVIL AIRCRAFT ACCIDENT REPORT

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

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

Magnus Abraham
DIRECTOR: AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION

MINISTRY OF WORKS & TRANSPORT
Office of the Minister
2023 -05- 11
Private Bag [illegible] Windhoek
REPUBLIC OF NAMIBIA

Foreword

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

In accordance with the provisions of Annex 13 to the Convention on International Civil Aviation Organization and the Namibian Civil Aviation Act (Act No 06 of 2016), the accident's analysis, conclusions, and safety recommendations contained therein are intended neither to apportion blame or liability nor to single out any individual or group of individuals. The main objective was to identify the systematic deficiencies and draw lessons, from the occurrence, which might help to prevent accidents and incidents in the future. To this end, many a time, the reader may be interested in whether or not an issue was a direct cause of the accident (that has already taken place), whereas the investigator is mainly concerned with the prevention of future accidents/incidents.

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

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ABBREVIATIONS

AHRS	-	Attitude and Heading Reference System
AMO	-	Aircraft Maintenance Organization
AOC	-	Air Operator Certificate
ATC	-	Air Traffic Control
AGL	-	Above Ground Level
°C	-	Degrees Celsius
CAR	-	Civil Aviation Regulations
CAVOK	-	Ceiling and Visibility OK
CG	-	Centre of Gravity
CPL	-	Commercial Pilot License
CVR	-	Cockpit Voice Recorder
DAAII	-	Directorate of Aircraft Accident and Incident Investigation
FDR	-	Flight Data Recorder
FIR	-	Flight Information Region
ft	-	feet
GPS	-	Global Positioning System
lbs	-	Pounds
ICAO	-	International Civil Aviation Organization
IFR	-	Instrument Flight Rules
IIC	-	Investigator-in-charge
LOC	-	Loss of Control
KCAS	-	Knots Calibrated Airspeed
KIAS	-	Knots Indicated Airspeed
kts	-	Knots
m	-	Meters
METAR	-	Meteorological Aerodrome Report
MHz	-	Megahertz
MPI	-	Mandatory Periodic Inspection
MTOW	-	Maximum Take- Off Weight
NAMCARs	-	Namibian Civil Aviation Regulations

NCAA	-	Namibia Civil Aviation Authority
nm	-	Nautical Miles
NPFFSI	-	Namibian Police Force Forensic Science Institute
POH	-	Pilot's Operating Handbook
PIC	-	Pilot-in-command
QNH	-	Query Nautical Height (Barometric Pressure Adjusted to Sea Level)
RWY	-	Runway
THR	-	Threshold
TMA	-	Terminal Area
UTC	-	Universal Time Co-ordinated
VFR	-	Visual Flight Rules

REPUBLIC OF NAMIBIA

MINISTRY OF WORKS AND TRANSPORT

Directorate of Aircraft Accident and Incident Investigations

Accident Reference: ACCID 083022/01-03

Aircraft Accident Investigation Final Report

CESSNA 210N V5-LMK

RELEASE DATE:

Aircraft Accident Report

DESCRIPTION OF OCCURRENCE: Cessna210N accident

Reference number	: ACCID 083022-01-03
Name of the owner	: Nature Wings
Operator	: Scenic Air (Proprietary) Limited
Type of operation	: Charter
Manufacturer	: Textron Aviation (Cessna Aircraft Company)
Model	: C210N
Nationality	: Namibian
Registration marking	: V5-LMK
Place	: Impalila Island Airstrip (FYII), Zambezi Region, Namibia
Date	: 30 August 2022
Time	: 10H23 UTC

Ministry of Works and Transport

ACCID/083022/01-03

DIRECTORATE OF AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION
ACCIDENT REPORT – EXECUTIVE SUMMARY

Aircraft Registration	V5-LMK	**Date of Accident**	30th Aug 2022	**Time of Accident**	10:23 UTC
Type of Aircraft	CESSNA 210N		**Type of Operation**	Charter	
Pilot- In - command License Type	CPL 027511456 (NCAA Validation 0285)	**Age**	21	**License Valid**	valid
Pilot-In-command Flying Experience	Total Flying Hours	310.2		**Hours on Type**	82.1
Last point of departure	Impalila Airstrip (FYII)- Zambezi Region				
Next point of intended landing	Eros airport (FYWE) via Rundu (FYRU)				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)					
GPS 17° 46' 30.9"S 25° 11' 36.9" E					
Meteorological Information	Wind Direction: 100°, Wind speed: 08 kts, Visibility: >10km, Temperature: 31° C Dew point -01°C, QNH 1020HPA				
Number of people on board	1+4	**No. of people injured**	0	**No. of people killed**	5

Synopsis

On the 30th of August 2022, On Tuesday morning, a Cessna C210 aircraft with registration V5-LMK departed from Windhoek Eros (FYWE) to Impalila Island (FYII) at 05H55 UTC with only the pilot on board. The aircraft had a flight endurance of seven hours and 30 minutes of fuel on board. The intention was to pick up 4 passengers from FYII to FYWE via Rundu airport (FYRU). FYRU was a technical stop to fuel. The aircraft landed on the FYII airstrip in an easterly direction on Runway 10 at 09H43 UTC.

The passengers were already waiting for the aircraft at the airstrip and witnessed the approach and landing. The landing was not stable because the aircraft ballooned before it came to a stop and switched off at the end of the RWY 10.

The driver then drove the four passengers to the aircraft for boarding. When they arrived at the aircraft the driver opened the door and greeted the pilot. The driver helped the pilot to load the luggage into the aircraft and after the pilot realized that the luggage was too heavy she offloaded two big bags and phoned the operator to make arrangements for the bags to be picked up. The aircraft departed from the Airstrip from Runway 10 and abeam threshold 28 turned to the left and crashed in the Zambezi river. All occupants in aircraft were fatally injured and the aircraft was destroyed.

The Directorate of Aircraft Accident and Incident Investigation (DAAII) was informed of the accident on the 30th of August 2022 at 11:15 UTC of a Cessna 210N that crashed in Zambezi River. DAAII appointed an Investigator- in-charge and a Co-investigator to lead the investigation and issue the final report. The investigators commenced with the investigation immediately.

The state of the aircraft manufacture was notified of the accident.

The Minister of Works and Transport was responsible for the release of the official final accident report.

Unless otherwise indicated, recommendations in this report are addressed to the Regulatory Authority of the state havingresponsibility for the matters with which the recommendation is concerned.

All times used in the report is Coordinated Universal Time (UTC), which is local time minus 2 hours.

Probable Cause: The aircraft stall shortly after an early left turn abeam threshold 28

Contributing factor(s): Early aircraft left turn maneuver.
Aircraft over the weight limit.
Aircraft retracting flaps below the recommended flaps retraction speed.

AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator	: Nature Wings
Manufacture	: Textron aviation (Cessna Aircraft Company)
Model	: Cessna 210N
Nationality	: Namibian
Registration	: V5 - LMK
Location	: Zambezi river GPS: 17°46'30.9" S 25°11'36.9" E
Date	: 30th August 2022, Time: 10:23 UTC

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

Disclaimer:

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

Purpose of the Investigations:

In terms of the Namibia Civil Aviation Act (Act No. 6 of 2016) and ICAO Annex 13, this report was compiled in the interest of the promotion of aviation safety and the reduction of risk of aviation accidents or incidents and **not to apportion blame or legal liability.**

This report contains facts relating to aircraft accidents or incidents that have been determined at the time of issue. The report may therefore be revised should new and substantive facts are made available to the investigators.

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1. On Tuesday morning, 30 August 2022, a Cessna C210 aircraft with registration V5-LMK departed from Windhoek Eros (FYWE) to Impalila Island (FYII) at 05H55 UTC with only the pilot on board. The aircraft had fuel endurance of seven hours and 30 minutes on board. The purpose of the flight was to pick up 4 passengers from FYII to FYWE via Rundu (FYRU). FYRU was a technical stop to upload fuel. The flight was uneventful and the aircraft entered the Gaborone Flight Information Region (FIR) at 07H38 UTC. The pilot made contact with Kasane (FBKE) Air Traffic Control (ATC) when the aircraft entered the Terminal Area (TMA) of FBKE at 09H01 UTC. The FBKE ATC guided the pilot through the TMA and the aircraft landed on the FYII airstrip at 09H43 UTC.

1.1.2. The passengers were already waiting at the airstrip and observed the approach and landing. The aircraft landed in an easterly direction on Runway (RWY) 10. On landing the aircraft ballooned and finally came to a full stop at the end of RWY 10 (Threshold 28). After the aircraft came to a stop and switched off, the passengers were driven to the aircraft for boarding. When they arrived at the aircraft the driver opened the aircraft door and spoke to the pilot, thereafter loading of luggage and the boarding commenced.

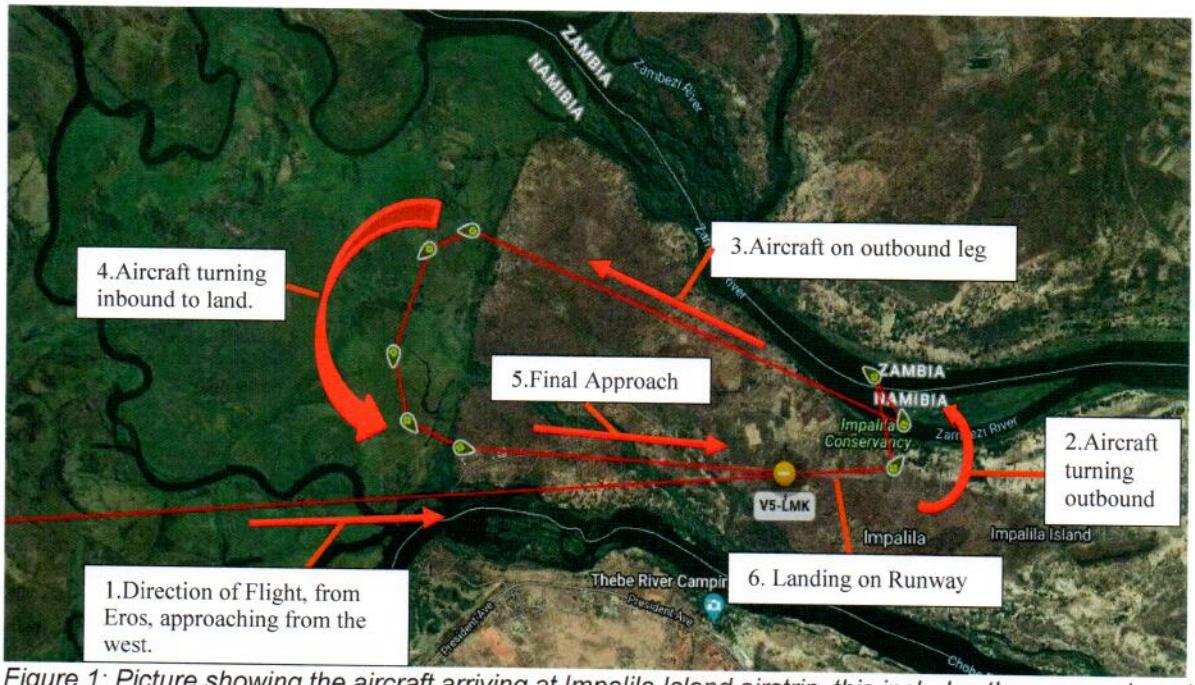


Figure 1: Picture showing the aircraft arriving at Impalila Island airstrip, this includes the approach and landing (Sequence from 1 to 6). The Aircraft did one circuit before landing. (source: spider track fitted in the aircraft by Aircraft AMO)

1.1.3. The pilot, assisted by the driver started loading the luggage into the aircraft. The pilot realized that the bags were too many and too heavy, she then decided to offload 2 big bags. The pilot then called the operator to make arrangements for the two bags to be picked up. The pilot highlighted to the operator why the bags had to be offloaded, she informed the operator that the bags were too heavy, because the tail of the aircraft was almost touching the ground. The pilot was then instructed by the Operator to hand the bags over to the driver to take it back to the lodge where the passengers stayed.

1.1.4. The pilot requested the driver to move the vehicle closer to the aircraft so that she can use it as a ladder to inspect the fuel tanks and to do other pre-flight checks. After the pre-flight checks were completed the pilot informed the driver that they are good to go. The driver assured the pilot that he would wait until they are safely airborne. The adult male passenger sat next to the pilot on the right front seat, two passengers sat in the second (middle) row. The adult female passenger was sitting directly behind the adult male passenger whilst the last passenger was seated in the last row on the left. All passengers had their seat belts fastened. The pilot then started the aircraft and backtracked from THR 28 to THR 10 to depart RWY 10 in an easterly direction.

1.1.5. The pilot made radio contact with Kasane ATC and informed them that the aircraft was lined up on the RWY and will be departing soon from RWY 10 to FYRU. Kasane ATC acknowledged and requested the flight level, fuel and the number of people on board, which the pilot provided. The ATC provided the pilot with the surface conditions (wind direction, speed and air pressure) and then instructed the pilot to report when airborne. The pilot then commenced with the take-off. After rolling for some distance, she commenced with the lift-off and made contact with Kasane ATC again to informed them that the aircraft was airborne. Kasane ATC then wanted to know whether the aircraft will be routing via "Caprivi Strip", on which the pilot answered "yes". Kasane ATC then instructed the pilot to broadcast on the unmanned frequency 124,8MHz, but the pilot never acknowledged the instruction (Kasane ATC made several calls thereafter to the aircraft, but there was no reply). After take-off, the pilot made an early left turn. The aircraft inclined sharply and veered off to the left; thereafter it rolled further to the left. The left wing was pointing 90 degrees downwards and clipped a tree next to the river, thereafter the aircraft crashed into the river, where the right wing

impacted the water first followed by the nose section of the aircraft. The impact caused the engine and propeller to break free from the fuselage. The aircraft came to a stop in an upright position facing South, with the tail section protruding out of the water.

1.1.6. Another eyewitness who was standing close to where the aircraft crashed said he heard the aircraft departing from behind the tree line (he could not see the RWY from where he was standing, because of the trees blocking his view). Shortly thereafter he saw the aircraft appearing from behind the tree line retracting the landing gear. According to eyewitness shortly after the landing gear were retracted the aircraft turned to the left. The bank angle to the left increased until the left wing tip clipped a tree next to the river and crashed.

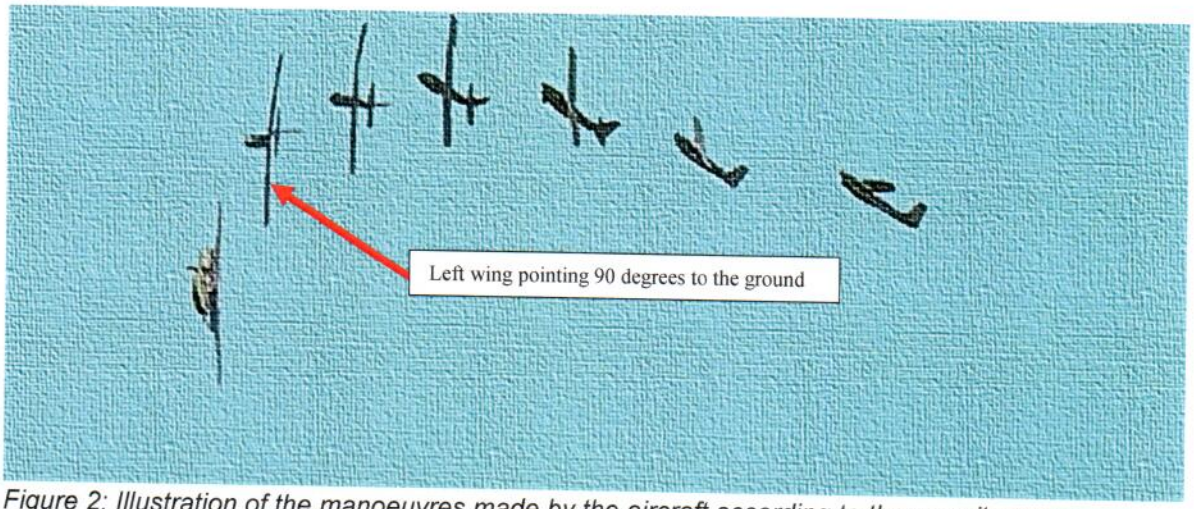


Figure 2: Illustration of the manoeuvres made by the aircraft according to the eyewitnesses.

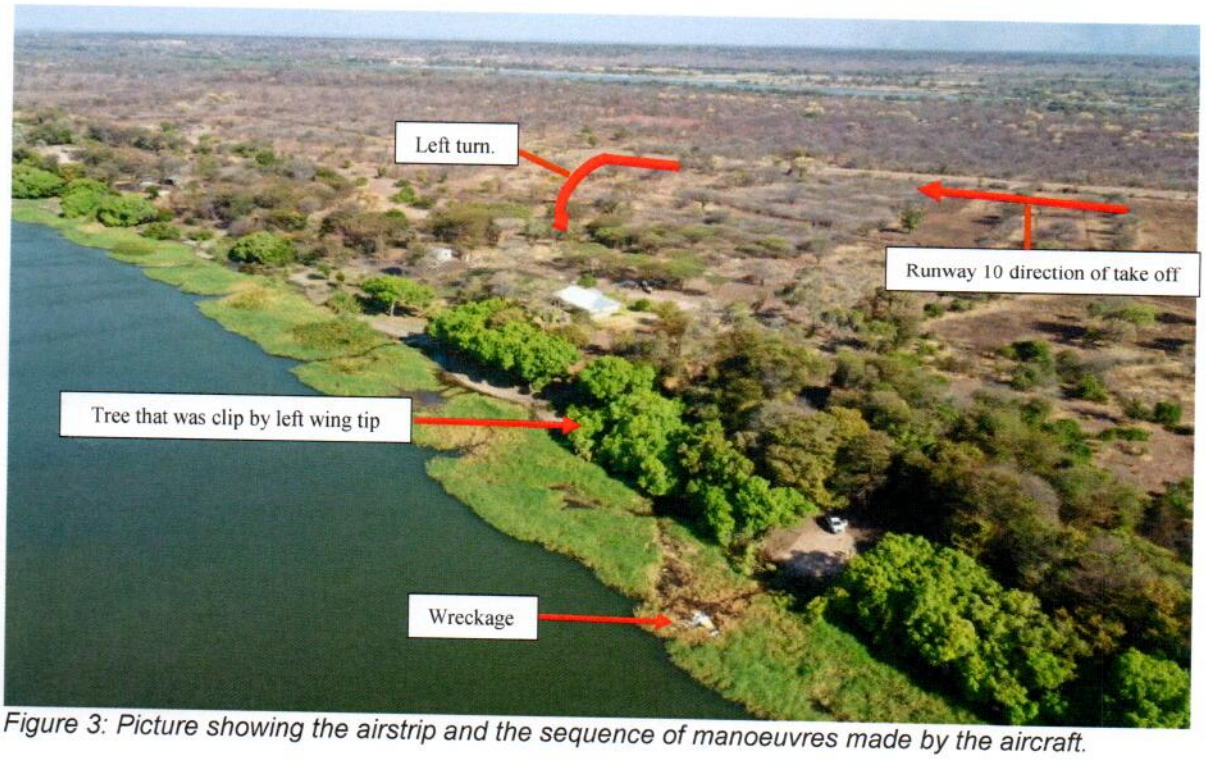


Figure 3: Picture showing the airstrip and the sequence of manoeuvres made by the aircraft.

1.1.7. The driver and a lady that was at the airstrip rushed to the scene, joined by the other eyewitness. They called the navy, the clinic and the Police of the Island to assist. They tried to get to the aircraft wreckage, but it proved to be very difficult because of the leaking fuel and vegetation.

1.1.8. At the crash site it was also very difficult to get to the wreckage as there was no boat available at the time. A boat was sourced from one of the eyewitnesses who stayed close to the crash site and it was used to get to the wreckage. The rescue was done by cutting a hole on top of the aircraft between the wings to gain access to the cabin. When access to the cabin was established all occupants were found strapped in their safety harnesses and the safety harnesses had to be cut to free the occupants from the wreckage. The pilot and the four passengers were found fatally injured. After the bodies were removed from the wreckage, they were transported to a mortuary in Katima Mulilo town.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	01	-	04	-
Serious	-	-	-	-
Minor	-	-	-	-

1.3 Damage to Aircraft

1.3.1 The aircraft was destroyed.

Figure 4: Wreckage after recovery from the river.

1.4 Other Damage

1.4.1 There was no other damage.

1.5 Personnel Information

1.5.1 Pilot-In-Command

The pilot was a holder of a commercial pilot license issued by SACAA on the 04/10/2021. Her medical certificate number 630271 issued by SACAA on the 02/09/2021with an expiry of the 30/09/2022 was valid at the time of the accident.

Nationality		South African			
Licence No	02750011456	Gender	Female	Age	21
Licence valid		Valid	Type Endorsed	yes	
Type Ratings		C172, P28A, P28R, SLG2 and C210			
Medical Expiry Date		30/09/2022			
Restrictions		None			
Previous Accidents		Unknown			

Flying Experience

Total Hours	310.2
Total Past 90 Days	80.6
Total on Type Past 90 Days	80.6
Total on Type	82.1

1.6 Aircraft Information

1.6.1. Aircraft description (sourced from aircraft service manual under General description & POH)

The Cessna 210N is a single-engine, high wing monoplane of all metal, semimonocoque construction. Wings are full cantilever, with sealed sections forming fuel bays. The fully-retractable tricycle landing gear consists of tubular spring-steel main gear struts and a steerable nose gear with an air-hydraulic fluid shock strut. The six place seating arrangement is of conventional, forward facing type. Powering the model 210 series is a Continental, horizontal-opposed, air cooled, six-cylinder, fuel injected engine driving all mental, constant-speed propeller. The stalling speed for this aircraft is 69 kts at maximum all up weight in the most forward CG configuration, with flaps fully retracted and 0°angel of bank the aircraft will stall if flown slower than this speed. With full flaps, the stall speed is 57 kts at maximum all up weight, at 0°angle of bank.

Stall speeds as per Pilot Operation Handbook (POH)

Performance – Specifications

Stall Speed (KCAS)

Flaps Up, power off .....65 Knots

Flaps Down, power off .....56 Knots

Limitations

White Arc KIAS Value or Range – 57 - 115

Full flaps operating range. Lower limit is maximum weight Vso in landing configuration. Upper limit is maximum speed permissible with flaps extended.

Green Arc` KIAS Value or Range – 69 - 165

Normal operating range. Lower limit is maximum weight Vs at most forward C.G with flaps retracted. Upper limit is maximum structural cruising speed.

Stall Speeds

Conditions:

Power off

Gear up or down

KIAS

Most rearward center of gravity:

Weight 3800lbs	Flaps Deflection				Angel of Bank
		0°	30°	45°	60°
	Up	65	70	77	92
	10°	64	69	76	91
	30°	52	56	60	74

Most forward center of gravity:

Weight 3800lbs	Flaps Deflection				Angel of Bank
		0°	30°	45°	60°
	Up	69	74	82	98
	10°	69	74	82	98
	30°	57	62	69	82

Normal Procedures

Speeds for Normal operations

Takeoff:

Normal climb out .....80 – 90 KIAS

Short field takeoff, flaps 10°, Speed at 50 feet .....74 KIAS

GROSS WEIGHT INTERNAL - 3800 LBS. / 1723.6 KGS.

Airframe:

Type	Cessna 210N
Serial No.	21064656
Manufacture	Cessna
Year of Manufacture	1982
Total Airframe Hours (At time of Accident)	12055.2
Last MPI (Date & Hours)	14 July 2022, airframe hours 12017.8
Hours since Last MPI	32.3 hours
C of A (Issue Date)	17 February 2022
C of R (Issue Date) Present owner	15 July 2005
Type of fuel used	Avgas
Operating Categories	Standard A,B,C,D,E,F

Engine:

Type	Continental I0520L13B
Serial No.	1031201
Hours since New	1148.6

Propeller:

Type	Hartzell
Part no	HC-J3YF-1RF/F8068-2
S/N	L11331,L11339,L11340
Hours since new	1232.6
Hours since overhaul	137.3

1.6.2. The last Maintenance inspection that was carried out on the aircraft was the Mandatory Periodic Inspection (MPI). The inspection was certified on the 14th of July 2022 at 12017.8 airframe hours. The aircraft had flown 37.4 hours since the last inspection was carried out.

1.6.3. **Weight and Balance**

1.6.3.1. According to the data below on the weight and balance chart and graph the aircraft took off from Impalila airstrip with 75 lbs more than the aircraft maximum take-off weight.

1.6.3.2. The operational flight plan log was recovered from the wreckage by the investigators. In the operational flight plan log the pilot recorded the following before take-off from Impalila Airstrip:

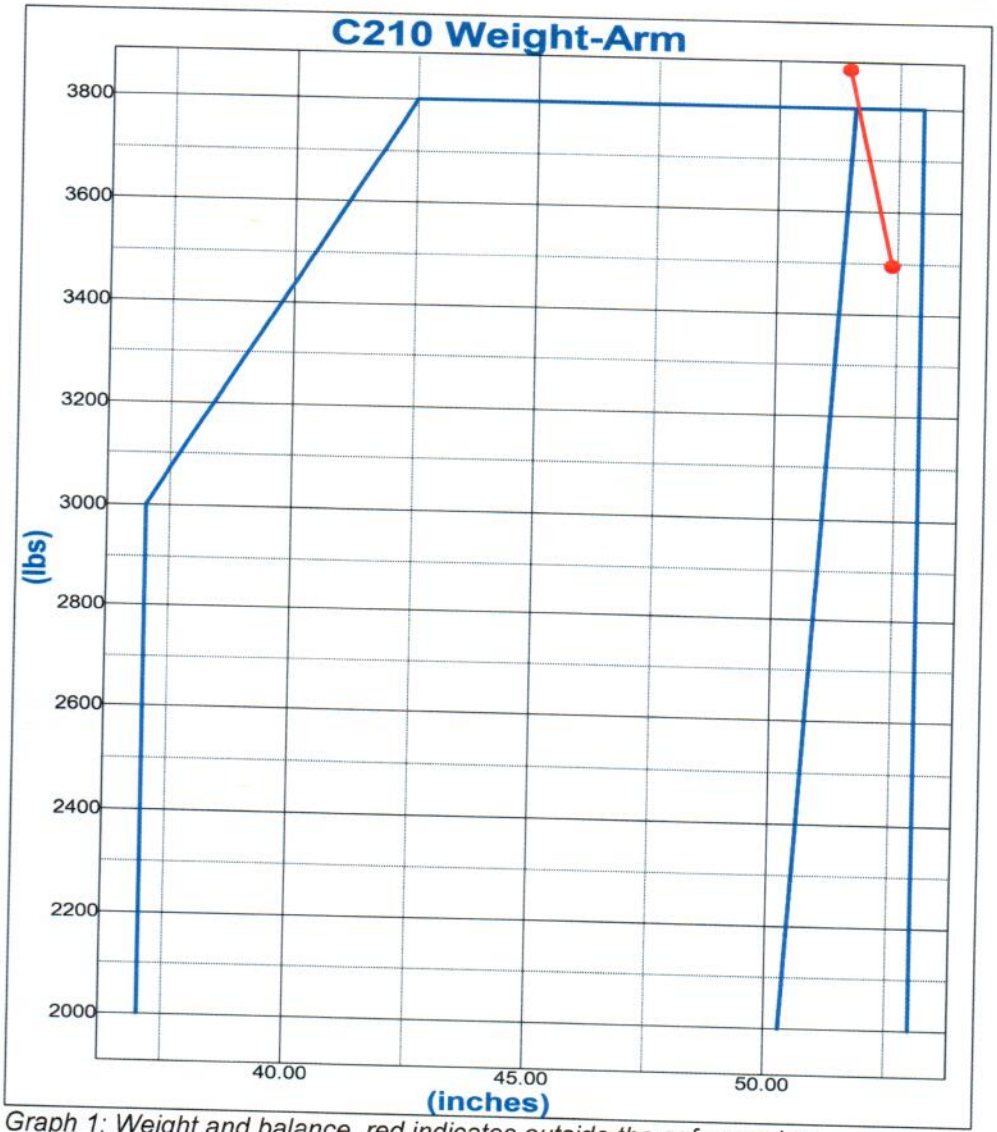
80 liters of fuel on the left tank, 100 liters' in the right tank and 30 liters each in the left and right wing tip tank totaling to 240 liters of fuel on board.

AIRCRAFT LOADING					
Item	Quantity	Unit Weight (lbs.)	Total Weight (lbs.)	Arm (inches)	Moment (lbs.-inches/1000)
Aircraft empty weight	1	2420	2420	43	104
Pilot	1	187	187	37	6.9
Front seat passenger (R)	1	206	206	37	7.6
Middle seat passenger (L)	1	165	165	71	11.7
Middle seat passenger (R)	1	164	164	71	11.6
Rear seat passenger (L)	1	153	153	101	15.5
Rear seat passenger (R)	0	0	0	101	0
Bag w Well	1	88	88	117	10.3
Main Hold	1	97	97	138	13.4
Accessories	1	15	15	138	2.1
TOTAL Empty weight (No Fuel)			**3 495.0**	**52.4**	**183.1**
Fuel	240 (liters)	1.6	380	42.9	16.3
Total weight before starting up			**3 875.0**	**51.5**	**199.0**

The aircraft's maximum take-off weight (MTOW) is 3 800 pounds (lbs), according to the Pilot's Operating Handbook (POH).

Note: *The weight of the pilot and passengers were obtained during the Post-Mortem examination. The weight of the baggage was done after all the bags were recovered from the wreckage in the river and properly dried. The amount of fuel on board the aircraft before take-off was obtained from the operational flight plan log.*

FUEL CALCULATIONS		
Unusable:	3.8 (liters)	
Taxi:	5 (liters)	
Flying:		
Trip:	02 hours 12 min	110 (liters)
Approach and Landing:	00 hours 06 min	5.0 (liters)
Contingency (5%):	00 hours 07 min	5.7 (liters)
Alternate:	00 hours 19 min	16.2 (liters)
Final Reserve:	00 hours 45 min	37.8 (liters)
Extra:	01 hours 07 min	56.5 (liters)
TOTAL USABLE:	04 hours 36 min	236 (liters)



Graph 1: Weight and balance, red indicates outside the safe envelop.

1.7. Meteorological Information

Weather report (METAR) was obtained from Kasane (Botswana).

Wind direction	100°	Wind speed	08 kts	Visibility	good
Temperature	31°C	Cloud cover	clear	Cloud base	N/A
Dew point	-01°C	Air Pressure	QNH 1020 Hpa		

1.8. Aids to Navigation

1.8.1. There were no navigation aids at the Airstrip where the accident occurred nor was it required by the relevant Regulations.

1.9. Communications.

1.9.1. The aircraft was equipped with standard communication equipment as approved by the Regulator for the type. There were no communication problems prior to the crash, because the pilot had clear communication with Kasane Air Traffic Control.

1.10. Aerodrome Information

1.10.1. The aerodrome utilized for the accident flight is a single gravel runway. The runway designators are 10/28 located on Impalila Island.

1.10.2. The runway length is1300 meters and 30 meters wide, the runway is hard gravel with an even surface. A windsock is located in the middle, South of the runway.

1.10.3. The residents of the island also use the runway as a road.

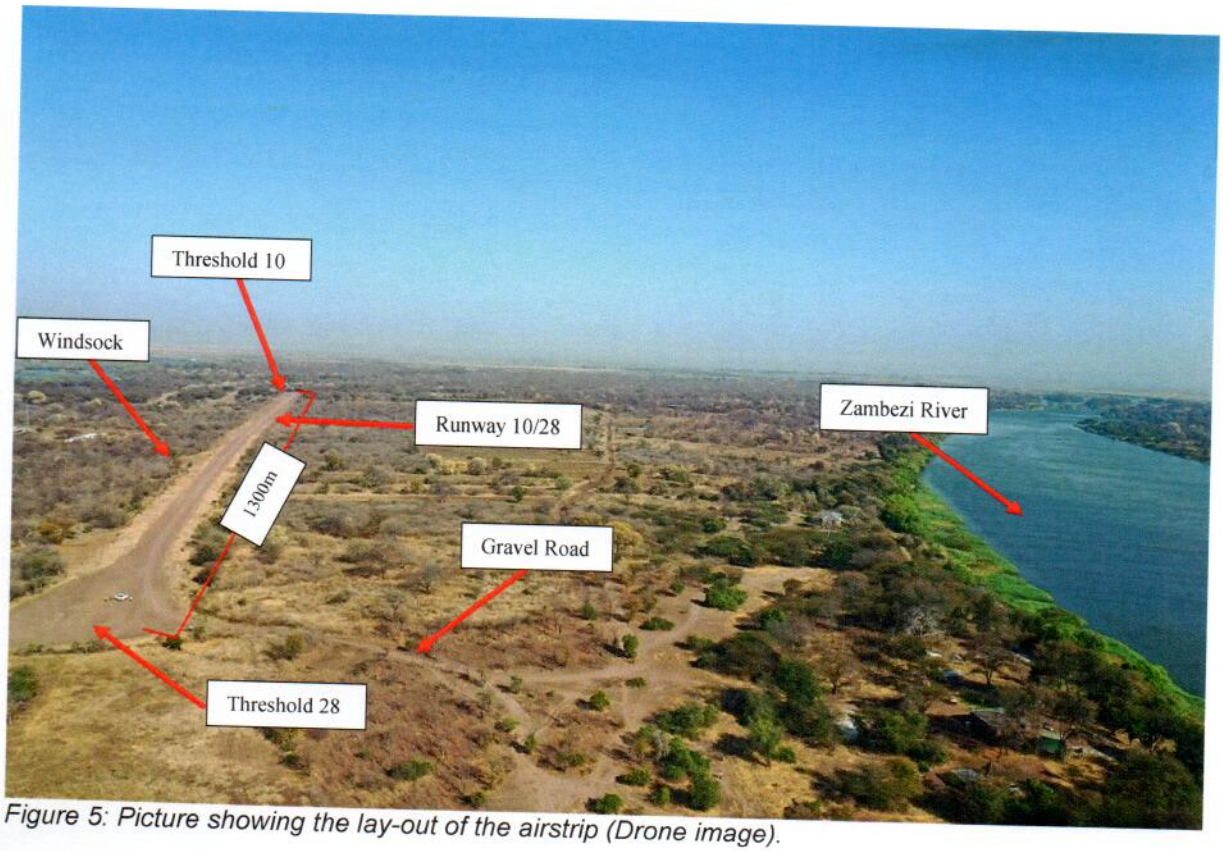


Figure 5: Picture showing the lay-out of the airstrip (Drone image).

Aerodrome Location	Impalila Island
Aerodrome GPS coordinates	17°46'30.9" S 25°11'36.9" E
Aerodrome Elevation	3058ft
Runway Designators	10/28
Runway Dimensions	1300×30
Runway used	10
Runway surface	Gravel
Aids to navigation	None

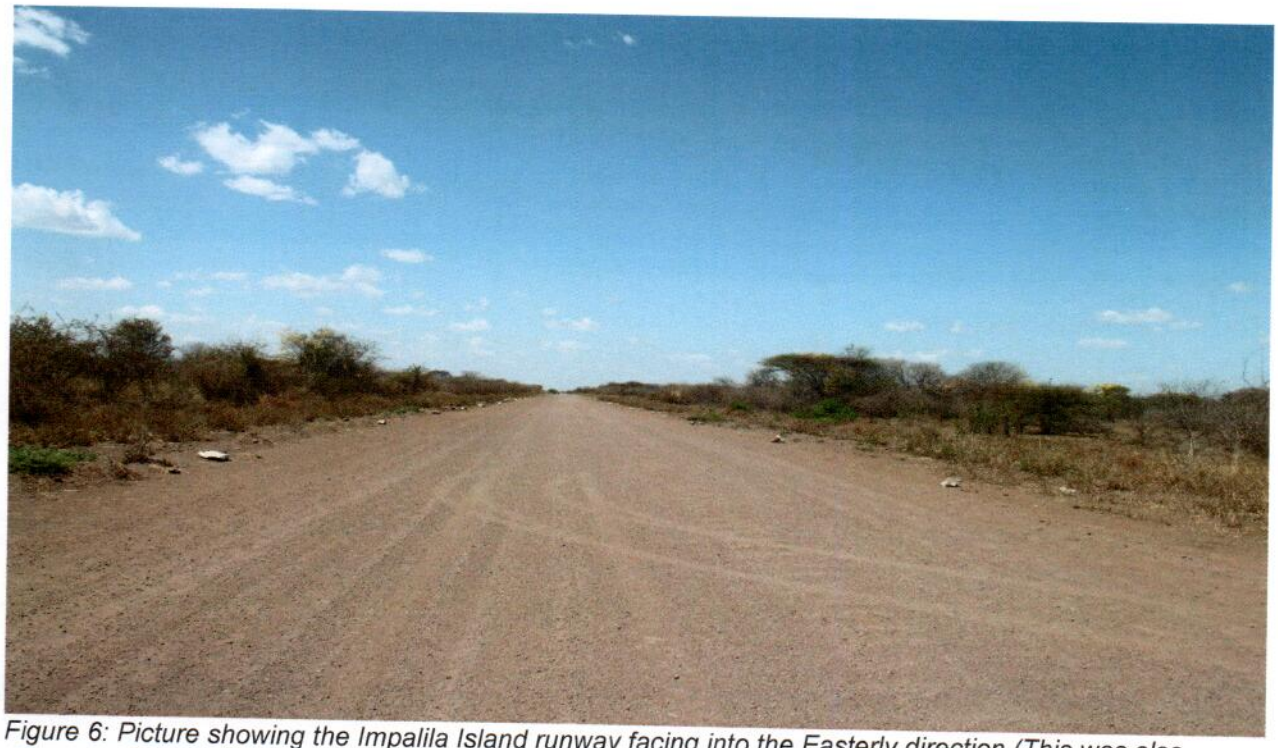


Figure 6: Picture showing the Impalila Island runway facing into the Easterly direction (This was also the take-off direction of the accident flight).

1.11. Flight Recorders

1.11.1. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR) nor was it required by the relevant aviation regulations.

1.11.2. However, the aircraft was equipped with a Spider Track Device. The spider track device enables real-time flight tracking via satellite with automated collection and wireless transfer of AHRS data, it enables powerful post-flight operational and safety reporting.

1.11.3. The data from the spider track that was installed in the aircraft shows the time, altitude, heading and maneuverer that the aircraft performed from start up to the last point when the aircraft turned to the left abeam THR 28. These points are labelled 1-5, see Figure 7.

1.11.4. The point of note from the data is point number 5, at this point the aircraft speed was 61kts ground speed at an elevation of 212 feet AGL. An early left turn manoeuvre abeam THR 28 was made from runway track 93 degrees to a 51 degrees' track.

Aircraft	Track	Point	DateTime(UTC)	DateTime(Local)	Latitude	Latitude(d	Latitude(m	Latitude(s	Latitude(d	Longitude	Longitude(	Longitude(	Longitude(	Longitude(	Altitude(ft	Speed(kno	Bearing	PointType	Description
V5-LMK	3E+27	1	30/08/2022 10:13	30/08/2022 12:13	17Â° 46' 3	17	46	32.08	-17.7756	25Â° 11' 3	25	11	39.11	25.1942	3045	0	0	NORMAL	
V5-LMK	3E+27	2	30/08/2022 10:15	30/08/2022 12:15	17Â° 46' 3	17	46	31.99	-17.7756	25Â° 11' 3	25	11	37.7	25.19381	3048	10	270	NORMAL	
V5-LMK	3E+27	3	30/08/2022 10:21	30/08/2022 12:21	17Â° 46' 3	17	46	30.32	-17.7751	25Â° 10' 5	25	10	51.39	25.18094	3022	11	94	NORMAL	
V5-LMK	3E+27	4	30/08/2022 10:22	30/08/2022 12:22	17Â° 46' 3	17	46	30.93	-17.7753	25Â° 11' 4	25	11	4.58	25.18461	3029	60	93	SPEED_UP	Speed Up
V5-LMK	3E+27	5	30/08/2022 10:22	30/08/2022 12:22	17Â° 46' 3	17	46	30.89	-17.7752	25Â° 11' 3	25	11	36.92	25.19359	3242	61	51	NORMAL	

Figure 7: Insert showing the spider track data for the accident flight. Note: Numbers 1-5, showing speed, heading and elevation at the different positions. (source: spider track fitted in the aircraft by the Aircraft AMO).

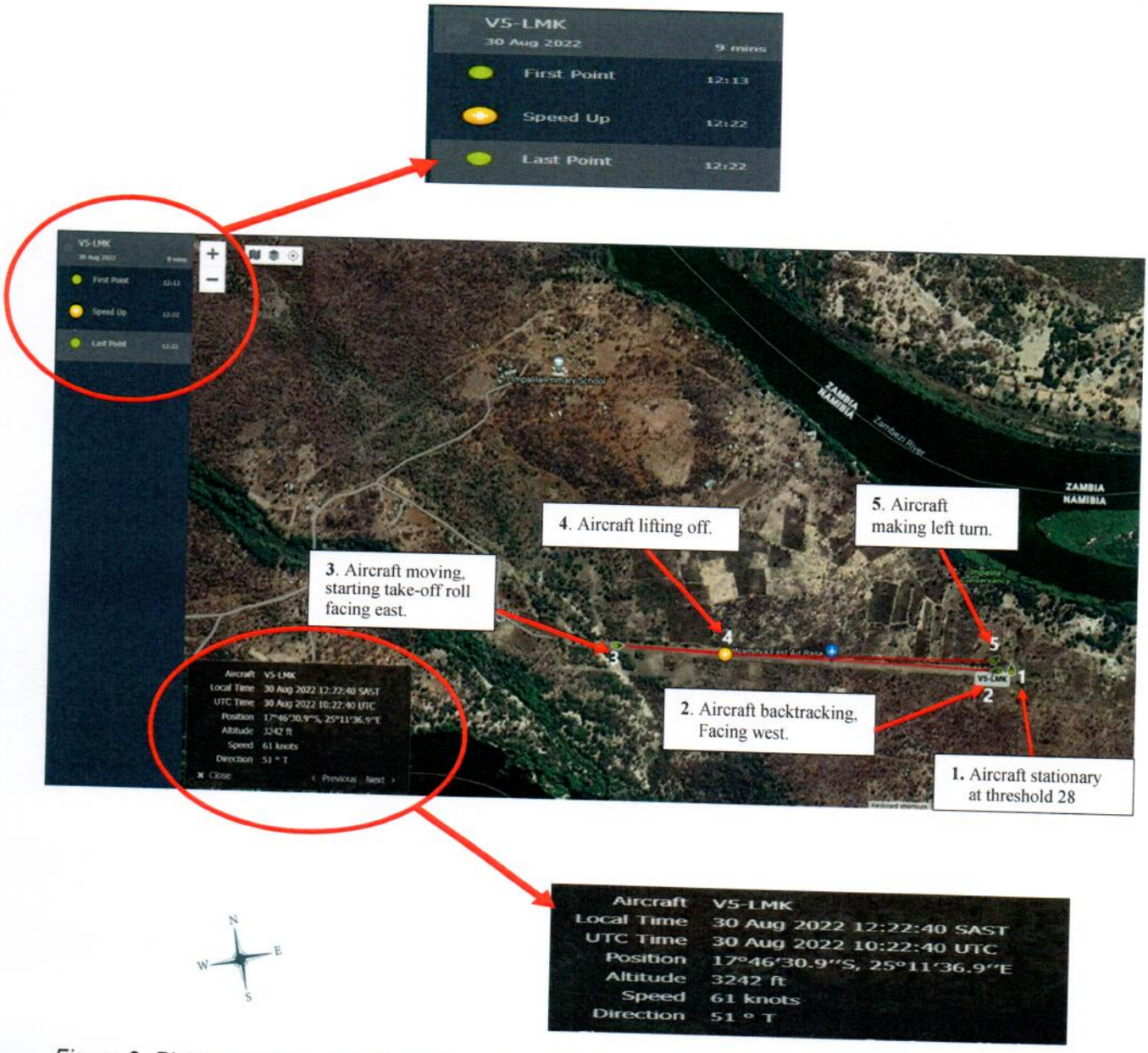


Figure 8: Picture showing data from the spider track pertaining to the accident flight (source: spider track fitted in the aircraft by the Aircraft AMO).

1.12. Wreckage distribution and Impact Information

After take-off from runway 10, the aircraft made an early left turn, thereafter the left wing clipped a tree next to the river and crashed a few seconds later into the Zambezi River. The right-wing tip fuel tank was found at the beginning at the first point of impact. The engine was found under water in the impact trail, about 15 meters away from the main wreckage. The main wreckage was found around 40 meters away from the impact point facing into a southerly direction. The nose section was totally destroyed and the instrument panel was just attached to the fuselage by cables. The main aircraft fuselage was destroyed; the tail section bend towards the right side of the aircraft.

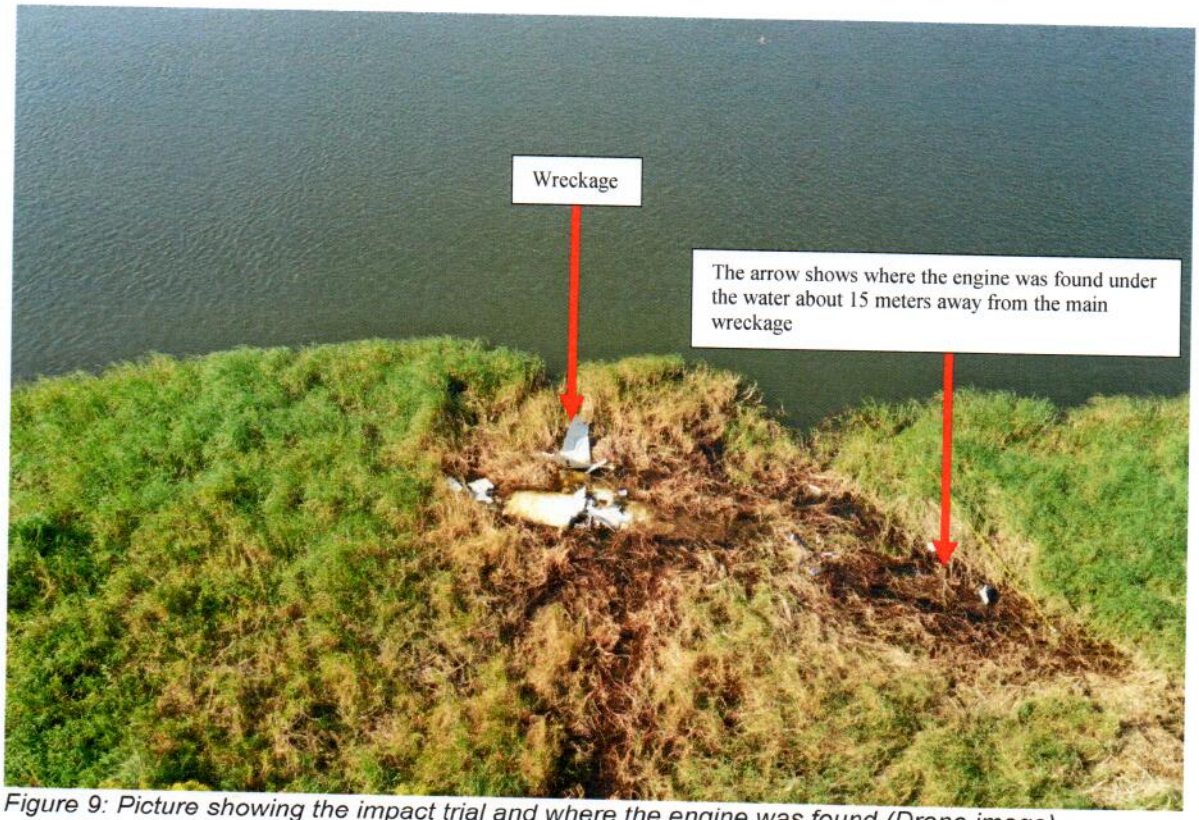


Figure 9: Picture showing the impact trial and where the engine was found (Drone image).

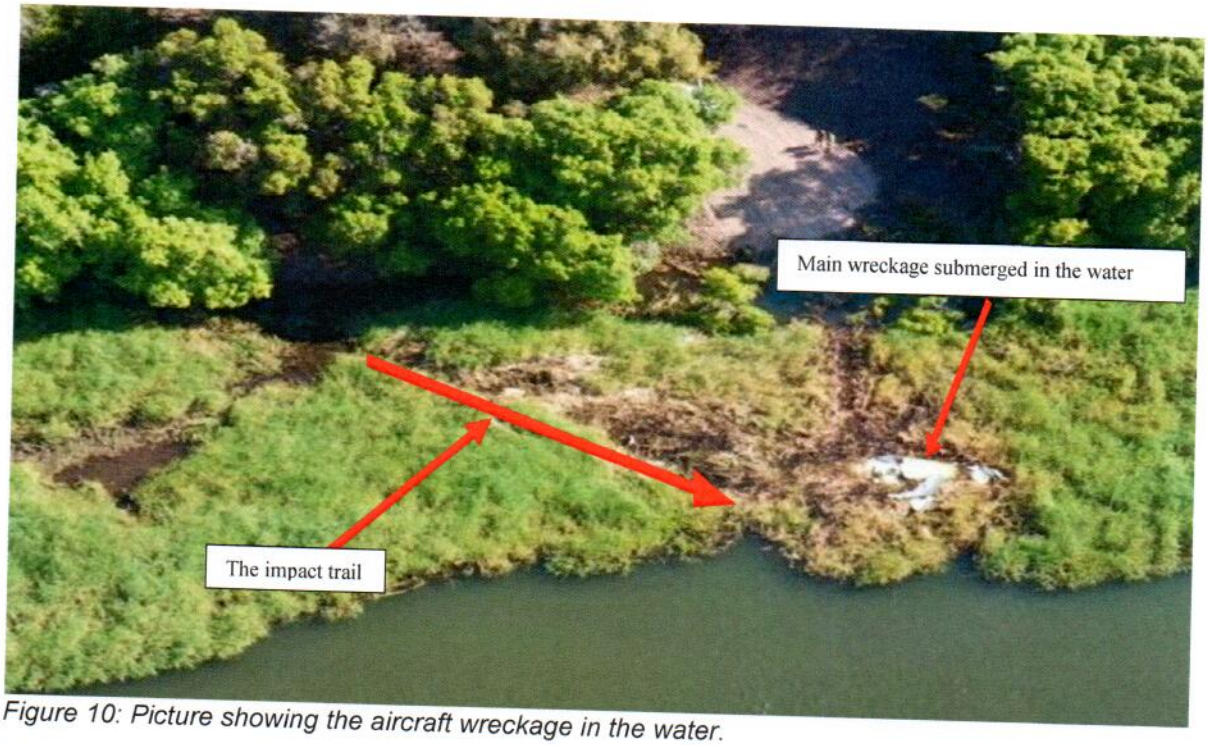


Figure 10: Picture showing the aircraft wreckage in the water.

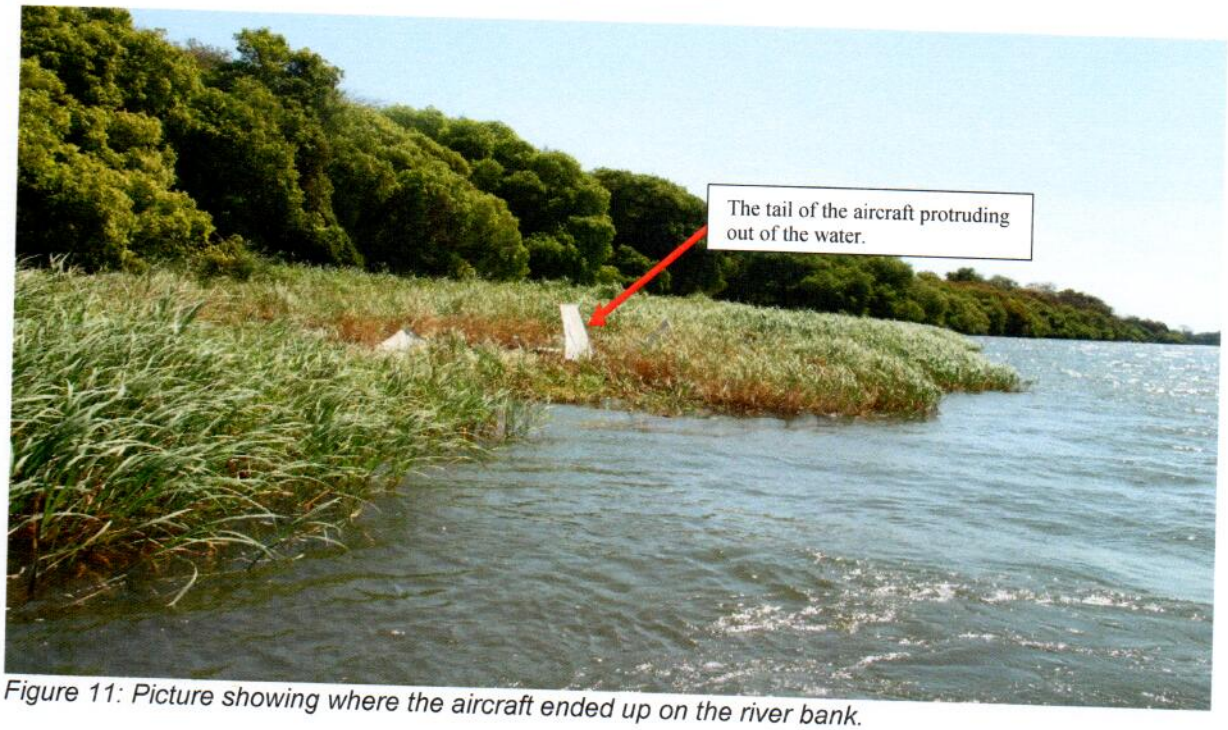


Figure 11: Picture showing where the aircraft ended up on the river bank.

1.13. Medical and Pathological Information

1.13.1. The pilot's medical certificate was valid at the time of accident. Autopsy and body examination data available revealed that the pilot and the four passengers were fatally injured in the aircraft crash.

1.13.2. The blood sample of the pilot was send to the Namibian Police Force Forensic Science Institute (NPFFSI) for analysis and it was found to contain a concentration of not more than 0.00 g of ethyl alcohol per 100 milliliters of blood.

1.14. Fire

1.14.1. There was no pre or post impact fire.

1.15. Survival Aspects.

1.15.1. The rescue operation was done by the 3 eyewitnesses who witnessed the aircraft accident. The Namibian Navy personnel later joined the first respondents in the rescue operation.

1.15.2. The first respondents found it very difficult to get to the wreckage as there was no boat available at the time. A boat was sourced from the eyewitness who stays close to the crash site and it was used to access the wreckage. The rescue was done by cutting a hole on top of the aircraft between the wings to gain access to the cabin. When access to the cabin was established all occupants were found strapped in their safety harnesses and the safety harness had to be cut to free the occupants from the wreckage. The pilot and the four passengers were found fatally injured. After the bodies were removed from the wreckage, they were transported to a mortuary in Katima Mulilo town. The time frame between the crash and accessing of the wreckage took approximately 40 minutes.

1.15.3. The safety harnesses were effective as per the specification, however the decompression of the cabin and the impact force was beyond human body tolerance resulting in all occupants being fatally injured in the crash.

Figure 12: Picture showing where a hole was cut on top of the aircraft between the wings to gain access to the cabin.

1.16. Tests and Research.

1.16.1. The engine of the aircraft was recovered from the water and transported to a DAAII facility in Windhoek. The engine was then transported to Wonderboom in South Africa for tear down and testing.

1.16.2. On the 20th of September 2022 the inspection and tear down of the engine started at around 09H00 with two DAAII investigators present at Aero engineering and Power plant in Wonderboom in South Africa.

The process focused on these aspects namely:

a. Mechanical integrity of the engine
b. The ignition system
c. The fuel system
d. Functionality of engine components

All auxiliary tubes and plates attached to the engine were removed before the testing started.

1.16.3. Mechanical integrity of the engine

The engine was relatively intact with all major components attached. When the engine was turned it showed the presence of pressure in all cylinders. The crankcase was opened and the crankshaft was rotating satisfactory.

The oil sump was removed and oil was found in the sump, no metal pieces were found.

Figure 13: Engine being turned.

Figure 14: Engine, after oil sump was removed.

1.16.4. Propeller

All propeller blades remained attached to the main hub as it was installed. The hub showed evidence of being lubricated and all bearings were intact and showed no sign of any defects. The blades were removed from the hub and examined. Minimal rotational damage was observed on the blades. Varying degrees of bending at or near the root end of the blades were observed, however there was more warping on the No 2 blade consistent with it being the first to strike at impact.

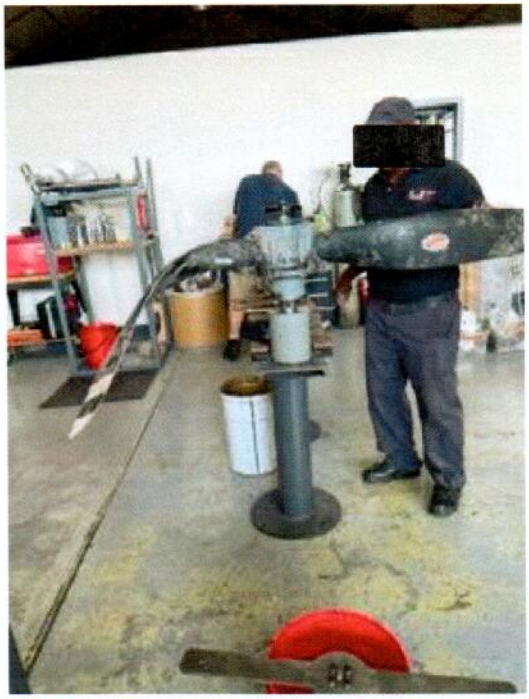


Figure 15: Propeller still attached to the hub.

Figure 16: No. 2 blade with more warping.

1.16.5. Fuel system

The manifold valve was examined and found intact. Presence of fuel was detected.

1.16.6. Ignition system

The spark plugs were removed and observed for any defects and there were no indications of wear, damaged or any other defects.

The magnetos were removed and bench tested for functionality. At first the results were inconclusive, this was found to be due the water in the enclosure. The units were dried and tested again with the result being satisfactory.

Figure 17: Magnetos being bench tested.

1.16.7. Mobile Phone Investigation

The mobile phones that were recovered from the wreckage were sent to the Namibian Police Force National Forensic Institute (NPFSI) the handsets were recorded as exhibit: 1, 2, 3, 4 and 5 respectively. The Institute was to examine the phones and retrieve data of the aircraft accident in the form of pictures, videos or voice notes if any of the accident sequence. Data from only one mobile phone could be recovered and that no data relating to the accident was found.

1.17. Organizational and Management Information.

1.17.1. This was a non-Scheduled flight conducted in accordance with the Civil Aviation Act No 6 of 2016 under the provision of Part 135 of the CAR of 2001 as amended. The operator was issued an Air Operating Certificate (AOC) on 17 May 2022 with an expiry date of 16 May 2023.

1.17.2. The operator was granted with an exemption from NAMCAR part 135.03.6(a)(i on the 12 August 2022, NO. EX-OPS003/2022. This exemption was granted for the period of 180 days from the date of approval.

NAMCARS 135.03.6(a)(I) states that: "The operator of a small aeroplane certificated in the aeroplane flight manual referred to in regulation 135.04.4 for single-pilot operations, shall ensure that- (a) the holder of a commercial pilot license (aeroplane) does not operate as pilot-in-command of the aeroplane unless-
i. when conducting passenger carrying operations under VFR outside a radius of 50 nautical miles from the aerodrome of departure, the pilot has a minimum of 300 hours of total flight time on aeroplanes or holds a valid instrument rating; ....."

1.17.3. A risk analysis and risk mitigation factor was done by the operator during the exemption application, however there is no evidence which indicates that the Regulator (NCAA) has done an oversight to assess the level of compliance with regards to the risk mitigation and re-assessment of what the Operator had highlighted in the application.

1.17.4. The operators Flight Operations Manual in Chapter 6.4.1 iv states that: "any online pilot, which is unfamiliar with a runway/ has not operated to before, shall receive a proper runway briefing from the Safety Manager and/ or Flight Ops Manager and/ or Senior Flight Crew". There was no evidence found during the investigation that the pilot received a briefing prior to undertaking the flight.

1.17.5. The Weight and balance for the flight that was done by the operator on the 29 August 2022 was found to have some inaccurate data. These inaccurate data are: Fuel quantity, luggage weight and weight of the pilot and passengers.

1.18. Additional Information

1.18.1. During the wreckage investigation it was found that the aircraft air speed indicator showed that the aircraft Indicated Airspeed was 55 kts at impact.

Figure 18: In the Picture the red arrow is pointing to the aircraft speed during the crash on the Airspeed indicator.

1.18.2. During the wreckage investigation the undercarriage lever was found selected in the up position and the undercarriage were found still in the retracted position. The undercarriage only dropped during the recovery and lifting of the wreckage out of the water, this was because of no hydraulic pressure to keep it in the retracted position.

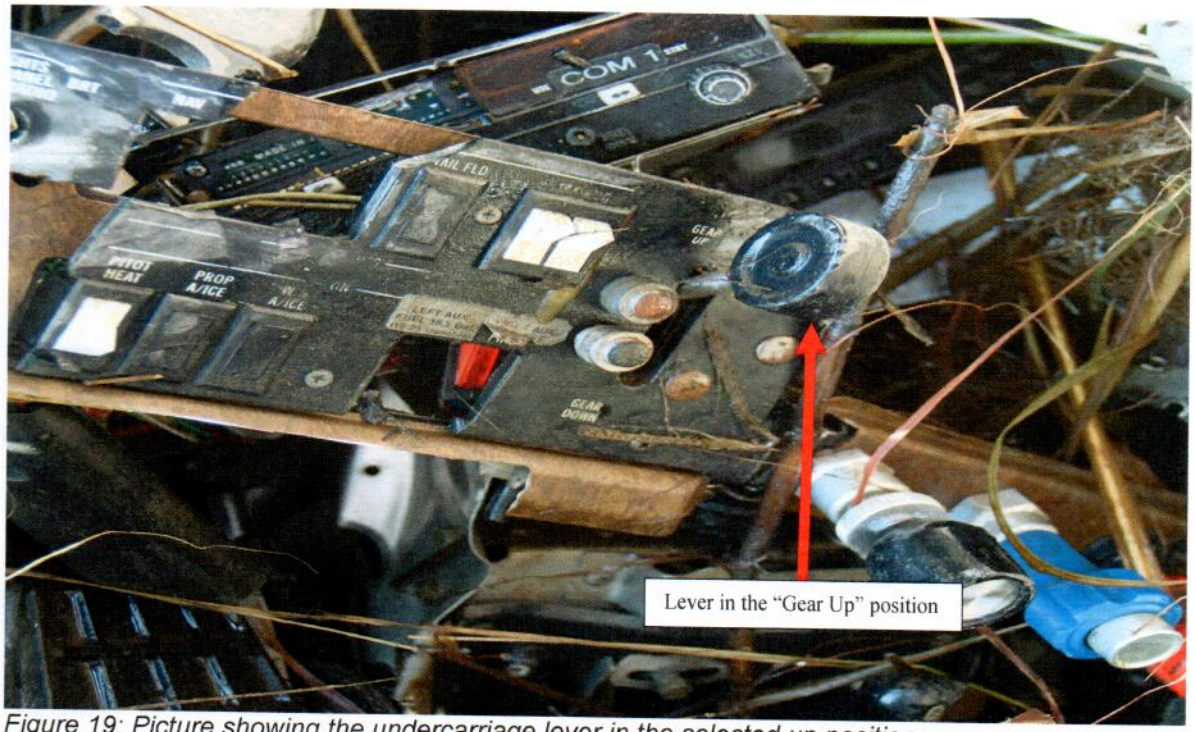


Figure 19: Picture showing the undercarriage lever in the selected up position

1.18.3. The position of the flaps was found fully retracted.

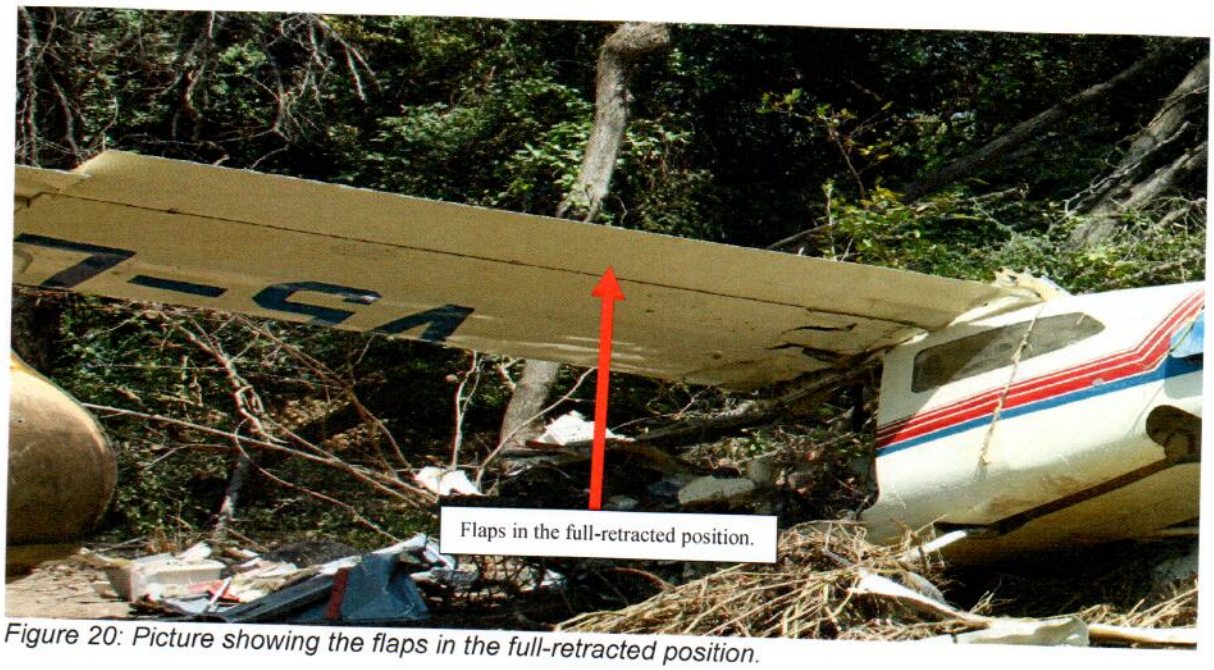


Figure 20: Picture showing the flaps in the full-retracted position.

1.19. Useful or Effective Investigation Techniques.

1.19.1 Not applicable.

2. ANALYSIS

2.1. Pilot

2.1.1. The pilot was a holder of a valid Commercial Pilot License and a valid Medical Certificate issued by South African Civil Aviation Authority on 04 October 2021 and 03 May 2019.The Medical Certificate was valid till 30 September 2022. The Cessna 210N was endorsed in her licence on the 16 November 2021. The pilot was issued with a Namibian Foreign Licence Validation Certificate by the Namibian Civil Aviation Authority valid from the 03/08/2022 until 30/09/2022.

2.1.2. The operator was granted with an exemption NO. EX-OPS003/2022 from NAMCAR 135.03.6(a)(i) on the 12 August 2022. The exemption was granted for the period of 180 days from the date of approval. In the exemption the pilot was included exempting her from complying with NAMCAR 135.03.6(a)(i). With the above records in place it is the view of the investigators that the pilot exercised her privileges and operated the flight legally. However, the Regulator could have ensured that all the risk analysis and safety mitigation factors were complied with before the exemption was granted.

2.1.3. By analysing the information obtained during the investigation and the landing manoeuver made by the pilot, during the landing phase shows that the pilot was having difficulty in landing at the airstrip. The evidence obtained during the investigation shows that was due to lack of experience, no briefing and non-familiarisation with the airstrip.

2.1.4. The data gathered during the investigation concluded that the aircraft stalled and crashed. The early turn to the left abeam threshold 28 at 212 feet AGL and the retraction of the flaps made it difficult for the pilot to recover the aircraft from stalling.

2.2. Machine (aircraft)

2.2.1. The last Maintenance inspection that was carried out on the aircraft was the Mandatory Periodic Inspection (MPI). The inspection was certified on the 14th of July 2022 at 12017.8 airframe hours. The aircraft had flown 37.4 hours since the last inspection was carried out. The aircraft was issued a Certificate of Airworthiness (CoA) on 17 February 2022 with an expiry date of 16 February 2023.The CoA was valid at the time of accident.

2.2.2. On-site investigation and further post-accident inspection of the wreckage (airframe and engine) revealed no pre-existing failures prior to the accident; all damage was caused during the accident. Records indicated that the aircraft was airworthy at the time. There were no recorded defects or operational difficulties experienced before the accident.

2.2.3. The takeoff weight of the aircraft is 3800 lbs that means the aircraft must be operated within that envelop for safe operation. However, evidence showed that the weight and balance of the accident flight was 3875 lbs which was 75 lbs more than the specified limit.

2.3. Weather

2.3.1. The weather at the time of accident was good with clear visibility and all other parameters in relation to safe conduct of the flight were within the limits. The weather was found not to be a contributing factor to the accident.

3. CONCLUSION

3.1. Findings

3.1.1. The pilot

3.1.1.1. The pilot had a valid Commercial Pilot License (CPL). According to the logbook the pilot flew a total of 310.2 hours, of which 82.1 hours were on the aircraft type at the time of the accident.

3.1.1.2. The pilot had a valid class 1 aviation medical certificate that was issued on 02 September 2021 with an expiry date of 30 September 2022.

3.1.1.3. The pilot was fatally injured during the accident.

3.1.2. The aircraft

3.1.2.1. The aircraft was issued a Certificate of Airworthiness (CoA) on 17 February 2022 with an expiry date of 16 February 2023.The CoA was valid at the time of accident.

3.1.2.2. The last Maintenance inspection that was carried out on the aircraft was the Mandatory Periodic Inspection. The inspection was certified on the 14th of July 2022 at 12017.8 airframe hours. The aircraft flew 37.4 hours since the last inspection was carried out.

3.1.2.3. The aircraft was airworthy without any defect reported prior to the accident and the maintenance records indicated that the aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures

3.1.2.4. A spider track* device was installed in the aircraft which transmitted information such as position of the aircraft, speed, GPS heading altitude and turning maneuver.

3.1.2.5. After all the necessary engine tests were done it was concluded that the Engine performed as per the design specification before the crash. It is therefore concluded the engine was not a contributing factor to the accident.

3.1.3. Operator

3.1.3.1. The accident flight was a non-Scheduled flight conducted in accordance with the Civil Aviation Act of 2016 (Act No 6 of 2016) and under the provision of Part 135 of the CAR of 2001 as amended. The operator was issued an Air Operating Certificate (AOC) on 17 May 2022 with an expiry date of 16 May 2023.

3.1.3.2. The operator was granted with an exemption NO. EX-OPS003/2022 from NAMCAR 135.03.6(a)(i) on the 12 August 2022 by Regulator. The exemption was granted for a period of 180 days from the date of approval.

3.1.3.3. No evidence was found that the pilot received a briefing as stated in the Flight Operation Manual chapter 6.4.1 iv.

3.1.3.4. The Weight and Balance for the flight that was done by the operator on the 29 August 2022 was found to have some inaccurate data such as: the fuel quantity, weight of the pilot and passengers and the weight of the luggage.

3.1.4. Regulator

3.1.4.1. No evidence was found that the Regulator ensured that all the risk analysis and safety mitigation factors in the application forms were complied with before the exemption from NAMCARS 135.03.6(a)(i) was granted.

3.1.5. Passengers

3.1.5.1. All four passengers were fatally injured in the accident.

3.2. Cause/s

3.2.1. The aircraft stall shortly after an early left turn abeam threshold 28

3.3 Contributing factor/s

3.3.1 Early aircraft left turn maneuver.
3.3.2 Aircraft over the weight limit.
3.3.3 Aircraft retracting flaps below the recommended flaps retraction speed.

4. Safety Recommendations

1.SAFETY RECOMMEDATIONS NUMBER 001/2023 V5-LMK

DAAII therefore recommend that Namibian Civil Aviation Authority (NCAA) should revise the process and procedures on the Exemption of operators/persons from NAMCAR 135.03.6(a)(i).

NOTE: *The safety recommendation above was issued to NCAA on the 02 December 2022 as a preliminary safety recommendation. The NCAA accepted the safety recommendation and implemented a revised exemption procedure.*

Thomas.H.Herman
Investigator-in-Charge

Date: 11/05/2023

Ben Engelbrecht
Co-Investigator

Date: 11/05/2023

Released by:

Hon John Mutorwa, MP
MINISTER: MINISTRY OF WORKS AND TRANSPORT

Date: 11/5/2023

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