AIRCRAFT ACCIDENT REPORT

DANAL/2021/03/14/F

Nigerian Safety Investigation Bureau

Final Report on the Serious Incident involving a Dornier 328-100 aircraft with nationality and registration marks 5N-BUN operated by Dornier Aviation Nigeria AIEP (DANA) Limited, which occurred at Murtala Muhammed Airport, Lagos on 14 March 2021.

This report is produced by the Nigerian Safety Investigation Bureau, (NSIB) formerly the Accident Investigation Bureau, Nigeria (AIB), Nnamdi Azikiwe International Airport, Abuja.

The report is based on the investigation carried out by Nigerian Safety Investigation Bureau, in accordance with Annex 13 to the Convention on International Civil Aviation, Nigerian Safety Investigation Bureau (Establishment) Act, 2022, and Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2023.

In accordance with Annex 13 to the Convention on International Civil Aviation, it is not the purpose of aircraft accident/serious incident investigations to apportion blame or liability.

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The Nigerian Safety Investigation Bureau believes that safety information is of great value if it is passed on for the use of others. Hence, readers are encouraged to copy or reprint for further distribution, acknowledging the Nigerian Safety Investigation Bureau, Nigeria as the source.

Safety Recommendations in this report are addressed to the Regulatory Authority of the State (NCAA) as well as other stakeholders, as appropriate. This authority ensures enforcement.

Printed in Nigeria for the Nigerian Safety Investigation Bureau (NSIB)

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

AMM	Aircraft Maintenance Manual
APU	Auxiliary Power Unit
CVR	Cockpit Voice Recorder
DME	Distance Measuring Equipment
DNMM	ICAO Locator Indicator code for Murtala Mohammed Airport ,Lagos.
DNPM	ICAO Locator Indicator code for Port Harcourt Military Airport
FDR	Flight Data Recorder
ft	Feet
IFR	Instrument Flight Rules
ILS	Instrument Landing System
kt	Knots
LOC	Localizer
NCAA	Nigeria Civil Aviation Authority
nm	Nautical Mile
NSIB	Nigerian Safety Investigation Bureau
OM-A	Operations Manual, Part A
OM-B	Operations Manual, Part B
PF	Pilot Flying
PM	Pilot Monitoring

RWY	Runway
VFR	Visual Flight Rules
VOR	VHF Omnidirectional Range, a short-range radio navigation system that helps pilots determine their position relative to ground stations.

Report number:	DANAL/2021/03/14/F
Operator:	Dornier Aviation Nigeria AIEP (DANA) Limited
Aircraft type and model:	Dornier 328-100
Manufacturer:	328 Support Services GmbH
Year of manufacture:	2001
Nationality and registration marks:	5N-BUN
Serial number:	3109
Location:	Runway 18L, Murtala Muhammed Airport, Lagos.
Date and time:	14 March, 2021 at about 15:44 h *(All times in this report are local time (UTC +1) unless otherwise stated)*

SYNOPSIS

The Nigerian Safety Investigation Bureau became aware of the serious incident through its Command-and-Control Unit on 14 March, 2021 at about 15:50 h. Investigators were dispatched to and they arrived at the scene of the occurrence at 17:20 h same day. Post occurrence assessment commenced immediately under the provisions of the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations and International Civil Aviation Organization (ICAO) Annex 13. All relevant stakeholders were notified.

On the 14 March 2021 at about 14:42 h, a Dornier 328-100 aircraft, 5N-BUN with call sign DAV 487 departed Port Harcourt Military Airport (DNPM) to Murtala Muhammed Airport, Lagos (DNMM) on an Instrument Flight Rules (IFR) flight plan with fuel endurance of 3 hours 30 minutes.

At 15:41 h, ATC cleared DAV487 to land runway 18L, wind 230^{o}/06 kt and to exercise caution on landing due bird activities, all of which the flight crew acknowledged. At 15:42, DAV487 touched down on the right side of the runway centre line (RWY 18L) and subsequently veered off the runway into the right grass verge. The aircraft was not damaged. All occupants disembarked normally without injury.

Causal factor

Inappropriate control handover during landing roll above recommended taxi speed

Contributory factor

Inadequate compliance with the checklist guidelines for directional control after landing

Two (2) Safety Recommendations were made.

1.0 FACTUAL INFORMATION

1.1 History of the flight

On the 14 of March, 2021 at 14:42 h, a Dornier 328-100 aircraft with nationality and registration marks 5N-BUN, operated by Dornier Aviation Nigeria AEIP (DANA) Ltd, departed Port Harcourt Military Airport (DNPM) for Murtala Muhammed Airport Lagos (DNMM) as a scheduled passenger flight DAV487 on an Instrument Flight Rules (IFR) flight plan. The incident flight was the third sector for the day by the same crew. On board were 20 persons inclusive of two flight crew, one cabin crew and one aircraft maintenance engineer. Fuel endurance at the time of departure was 3 hours 30 minutes. The Co-pilot was the Pilot Flying (PF) while the Captain was the Pilot Monitoring (PM).

The Take-Off, Climb, Cruise, Descend and Approach Phases of the flight were normal.

The flight crew stated that on contact with Lagos Control, DAV487 was cleared to LAG[1] direct EDGOT[2] to expect radar vectors for ILS Approach Runway 18L.

At 15:40 h, about 6 nm to the station and approximately five minutes to Touchdown, the aircraft was established on the ILS.

At 15:41 h, Tower cleared DAV487 to land RWY 18L, with reported wind at 230^{o}/06 kt and was advised to exercise caution on landing due bird activities, which the crew acknowledged. The PF callout on the capture of the glideslope but not of the localizer.

At 15:42 h, DAV487 touched down right of centre line, runway 18L.

According to the PF, during the Landing Roll, he retarded Power Levers to GROUND IDLE and then applied Thrust Reversers. Captain requested controls of the aircraft and

[1] Lagos VOR-DME Station Identifier.
[2] EDGOT is a way point/ reporting point located near Murtala Muhammed International Airport, Ikeja

the Co- pilot handed over control at speed below 60 knots decelerating. The PF further stated that at about 50 knots, the Captain noticed a sudden veering of the aircraft to the right and called for "CONDITION LEVERS MIN" position. He regained control of the aircraft momentarily. Thereafter, the aircraft veered to the right again, exited the runway onto the grass verge and stopped.

At 15:44:27, Tower called DAV487 to report position and confirm 'ops normal'. DAV487 responded, "Ops not normal…we overran the runway to the right". Tower asked DAV487 if they will need assistance to get back to the runway from the grass verge and the crew responded "we will need assistance please".

The flight crew started the Auxiliary Power Unit (APU) while the aircraft engines were shut down. The Captain briefed cabin crew and passengers. All passengers waited for the arrival of the emergency services, disembarked normally without injury and were conveyed in a shuttle bus to the terminal building.

The serious incident occurred in daylight and Visual Meteorological Conditions prevailed.

1.2 Injuries to persons

Injuries	Crew	Passengers	Total in the Aircraft
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor	Nil	Nil	Nil
None	4	16	20
Total	4	16	20

1.3 Damage to aircraft

The aircraft was not damaged.

1.4 Other damage

Nil.

1.5 Personnel information

1.5.1 Captain

Nationality:	Nigerian
Age:	54 years
Licence type:	Airline Transport Pilot Licence (Aeroplane)
Licence:	Valid till 1 March, 2022
Aircraft ratings:	BE-1900D, Dornier 328-100,
	ATR 42/72
Medical certificate:	Valid till 1 March, 2022
Instrument rating:	Valid till 31 March, 2021
Proficiency check:	Valid till 31 March, 2021
Total flying time:	7,100 h
Total on type:	2,011 h
Total on type (PIC):	2,011 h
Last 90 days:	10:35 h
Last 28 days:	10:35 h

Last 7 days:	2:55 h
Last 24 hours:	1:25 h

1.5.2 Co-pilot

Nationality:	Nigerian
Age:	59 years
Licence type:	Airline Transport Pilot Licence (Aeroplane)
Licence:	Valid till 31 July, 2021
Aircraft ratings:	BE-200, Dornier 328, Embraer EMB-145, SD360, BE-1900, Dornier-228, EMB-110, CRJ-700/900
Medical certificate:	Valid till 31 July, 2021
Proficiency check:	Valid till 31 March, 2021
Total flying time:	12,032 h
Total on type:	4,960 h
Last 90 days:	100:56 h
Last 28 days:	10:20 h
Last 7 days:	2:45 h
Last 24 hours:	1:25 h

1.5.3 Purser

Nationality:	Nigerian
Age:	23 years
Licence type:	Cabin Crew
Licence validity:	Valid till 31 December, 2022
Ratings:	B737-300, Dornier 328
Medical certificate:	Valid till 31 December, 2022

1.6 Aircraft information

The Dornier 328-100 twin engine regional transport airplane is designed for short to medium range flights at high cruising speeds.

The airplane features a high wing that mounts two Pratt & Whitney PW119B/119C turboprop engines with 6−bladed propellers for low cruise RPM. The low drag wing and the aerodynamically optimized fuselage with a large fuselage−to−wing fairing enables a wide speed range. The non−pressurized aft section with its T−tail is produced mainly of carbon fibre. The tail cone provides space for an optional APU.

The cabin interior provides a 2−1 seating arrangement for 30−33 passengers in the standard configuration.

1.6.1 General information

Manufacturer:	328 Support Services GmbH
Model:	DO 328-100
Serial number:	3109
Date of manufacture:	2001
Operator:	Dornier Aviation Nigeria AIEP (DANA) Limited
Certificate of airworthiness:	Valid till 3 April, 2021
Certificate of insurance:	Valid till 12 September, 2021
Certificate of registration:	Issued 9 December, 2016
Total hours since new:	14,636.38 h
Total cycles since new:	20,025

1.6.2 Powerplant

	Number 1	**Number 2**
Engine type	PW 119C	PW 119C
Manufacturer	Pratt & Whitney, Canada	Pratt & Whitney, Canada
Serial number	PCE–AZ0002	PCE–AZ0001
Time since new	29,353.25 h	25,539.20 h
Cycles since new	19,793	19,834
Year of manufacture	1998	1998

Fuel type used: Jet A-1

1.6.3 Propeller

	Number 1	**Number 2**
Propeller type	HD-E6C-3B	HD-E6C-3B
Manufacturer	Hartzell Propeller Inc., USA	Hartzell Propeller Inc., USA
Serial number	HL-224	HL- 207
Time since new	29,353.25 h	25,539.20 h
Time since overhaul	2,142.15 h	372.24 h

Figure 1: The aircraft after the occurrence

1.6.4 Excerpts from Dornier 328-100 Aircraft Maintenance Manual

POWER CONTROL - DESCRIPTION AND OPERATION (AMM 76-10-00-990-801-A01)

Operation of the Condition Lever

The CONDITION lever permits the flight crew to select the required propeller RPM. Feathering of the propeller blades is achieved mechanically by the condition lever or electrically by the auto-feather valve.

The condition lever is connected by the control cables to the hydro-mechanical fuel control unit (HMU) on the right-hand side of the engine.

The HMU and the constant speed unit (CSU) are interconnected by a control rod. The condition lever has the following positions:

MAX (Maximum Propeller Speed)

This position sets the propeller speed to a maximum of 1300 RPM which is used for take-off or other in-flight conditions that may occur.

MIN (Minimum Propeller Speed)

This position sets the propeller speed to minimum RPM which is used after landing and is used in conjunction with low power settings.

UNF (Unfeather)

This position moves the propeller blades from the feathered position into the propeller operating range. There is no gate or mechanical stop between the UNF and the MAX condition lever positions.

FEA (Feather)

To obtain the FEA position, the gate lever must be lifted before the condition lever can be further retarded. The FEA position moves the propeller blades into the feathered position. This position is selected in flight should an engine failure occur or when carrying out certain maintenance practices on the ground.

FUEL OFF

To obtain the FUEL OFF position, the gate lever must be lifted before the condition lever can be further retarded and detented. The FUEL OFF position is used during the engine shut down procedure. In this position the engine fuel shut-off valve is actuated to the closed position and the fuel supply is interrupted.

1.6.5 Excerpts from Dornier 328 – 100 Airplane Flight Manual, Normal Procedures, Section 05-08-00, Page 2

APPROACH / LANDING

BEFORE LANDING

LDG GEAR lever..... DN (below 200 KIAS)

DN LCK indicators (3) ..... Illuminated

FLAPS..... Set for LANDING

NOTE: For an intentionally touch and go manoeuvre ensure the GND SPOILER button is selected OFF.

EICAS status..... Check

E/P BRAKE lever..... Check released

Nose wheel steering tiller..... Confirm unobstructed and check centered in detent

Minimum approach airspeed..... V_{REF}

CONDITION levers (both) ..... MAX

Autopilot and YAW damper..... OFF - not below minimum use height as given in Section 2 – LIMITATIONS

1.6.6 Excerpts from Dornier 328 – 100 Airplane Flight Manual, Normal Procedures

AFTER LANDING/ENGINE SHUTDOWN

AFTER LANDING

CAUTION: DO NOT RETARD CONDITION LEVERS TO MIN AT HIGH SPEED OR IF THE NOSE WHEEL STEERING TILLER IS DISPLACED OR OBSTRUCTED.

When at safe taxi speed (below 30 knots ground speed):

CONDITION levers (both) ..... MIN

FLAPS..... 0°

WX RADAR..... Check STBY

Transponder..... ALT

LAND LH/RH lights switches..... OFF

STROBE lights switch..... OFF

WSHLD 1 and 2 buttons..... OFF

PROBES 1, 2 and STBY buttons..... OFF

ICE–PROTECTION..... OFF

ELPMP AUTO buttons (both) ..... OFF

ENGINE START selectors..... OFF

NOTE: If maximum braking was used throughout the landing, a brake inspection by maintenance is required.

1.6.7 Excerpts from Dornier 328 – 100 Airplane Operating Manual - VOL 2, Section 14−02−04, Page 1 Sep 01/12

LANDING GEAR

NOSE WHEEL STEERING

GENERAL

The airplane is equipped with a nose wheel steering system (NWS). The system is powered by the main hydraulic system and controlled by commands from either the rudder pedals or from a hand control unit (tiller). The command signals from the rudder pedals are always available but can be disabled by pressing and holding the pedal disconnect button on the tiller. Rudder pedal commands provide a maximum nose wheel deflection of +10°. The signals from the tiller are only available when both condition levers are set to MIN (airplane taxiing). The tiller provides a maximum nose wheel deflection of +60°. The signals from the pedal and tiller are summed but limited to a deflection of +60°. The NWS system is equipped with an anti-shimming device. The nose wheel is automatically centered when the nose gear extends or retracts.

Three methods of steering the airplane on the ground are provided:

- *nose wheel steering*
- *differential braking*
- *asymmetric engine power*

1.6.8 Brief description of the Nose Wheel Steering (NWS) system operation

During normal operation, the NWS button is switched ON from the engine start until the engine shutdown. Therefore, after touch-down, the NWS System is enabled automatically.

The NWS system has two modes that are triggered by the position of the condition levers:

1. *Low authority mode: Enables small nose wheel steering angles up to ±10°. This mode is used for higher speeds during landing or take-off run and is automatically activated after touch-down with condition levers above "MIN" position, steering operation via rudder pedals. The hand control unit (tiller) is inactive when the engine condition levers are set above "MIN" position.*
2. *High authority mode: Enables higher nose wheel steering angles up to ±65°. This mode is used for low speeds during taxi and is only activated when the condition levers of both engines are set to MIN or HIGH TAXI. Steering operation via hand tiller (max. ±65°) and pedal (max. ±10°).*

How non-adherence to the above caution impacts on the directional control of the aircraft

In case the condition lever is retarded to "MIN" position at high speed, the high authority mode is activated for nose wheel steering angles up to ±65° at high speed. Using the high authority mode at high speeds is not approved.

In case the condition lever is retarded to "MIN" position when the nose wheel steering tiller is displaced or obstructed, the nose wheel could suddenly deflect unintentionally. Either of these, and especially both together could result in a sudden breakout of the aircraft and a lateral runway excursion. Therefore, it is very significant to obey this caution note.

1.7 Meteorological information

Time	**1300 UTC**	**1400 UTC**	**1500 UTC**
Wind	240°/07 kt	250°/03 kt	210°/05 kt
Visibility	10 km	10 km	10 km
Weather	Nil	Nil	Nil
Cloud	BKN 390 m FEW 600 m CB (NE-SW)	BKN 90 m FEW CB 600 m (NW-SE)	BKN 390 m FEW CB 600 m (NW-E)
Temperature/ Dew point	29 /25 °C	29/25 °C	29/25 °C
QNH	1011 hPa	1011 hPa	1010 hPa
Trend	NOSIG	NOSIG	NOSIG

1.8 Aids to navigation

Status of the navigational aids at the Murtala Muhammed Airport on the day of the occurrence is as follows:

VOR/DME - 'Serviceable'

ILS/DME - 'Serviceable'

1.9 Communications

There was effective communication between the flight crew and Tower.

1.10 Aerodrome information

Murtala Muhammed International Airport, Ikeja, Lagos, has a location indicator DNMM, elevation of 135 ft and a reference point of 06°34'38" N 003°19'16" E. The Airport has two parallel runways with a concrete/asphalt surface designated as runways 18L/36R and 18R/36L. The runways are equipped with Instrument Landing System (ILS). ILS for

Runway 18L is 110.3 MHz and for Runway 18R is 108.1 MHz. A VOR/DME (113.7 MHz) is aligned with runway 18L centre line.

The runway length of 18L/36R is 9,006 ft (2,745 m) with blast pads of 50/65 m and Runway 18R/36L is 12,795 ft (3,900 m) with blast pads of 120 m on both ends. The approach lights on both runways were serviceable at the time of the occurrence.

1.11 Flight recorders

The aircraft was fitted with a Solid-State Flight Data Recorder (SSFDR) and a Solid-State Cockpit Voice Recorder (CVR).

	Flight Data Recorder	**Cockpit Voice Recorder**
Manufacturer	Fairchild USA	Fairchild USA
Model	F1000	A200S
Part number	S800-2000-00	S200-0012-00
Serial number	00947	02551

The flight recorders were retrieved and transported to the NSIB laboratory in Abuja for readout.

1.11.1 CVR recordings

The Fairchild A200S CVR was designed to record 30 minutes of audio on four channels (Public Address, Co-pilot, Pilot, Cockpit Area Microphone (CAM)) and 120 minutes of audio on two channels (combined crew Audio & Cockpit Area Microphone (CAM)).

The CVR was successfully downloaded and it contained 2 hours and 4 minutes of audio recording in both the combined crew audio and CAM channels, spanning the entire flight from engine start-up at departure till engine shut down after the occurrence; and

also capturing conversation between the flight crew as well as conversation with Tower after the occurrence. Thus providing useful insight into the overall conduct of the flight.

The CVR continued to record audio after engine shut down following the starting of the APU. Hence, the recording of the occurrence on the P/A, Co-pilot, Pilot and CAM were overwritten. The CVR information on the combined crew audio and CAM channels was preserved.

Figure 2: The right side CB panel showing the pulled CVR circuit breaker

1.11.2 FDR data recordings

The FDR data could not be downloaded due to unserviceability of download equipment and also due Covid 19 restriction other options of download facilities could not be explored.

1.12 Wreckage and impact information

Nil.

1.13 Medical and pathological information

Tests were conducted on the flight crew. The PM tested positive for Benzodiazepines (BZO) while the PF tested negative to all 13 psychoactive substances. The NCAA Aeromedical Standards (AMS) department provided the following information about Benzodiazepines "BZO commonly known as Benzodiazepine is an anxiolytic and antidepressant as well as a muscle relaxant medication. It's a prescription drug and when found during test for psychoactive substance abuse could be due to usage as a prescribed medication or its abuse by an individual.

1.14 Fire

There was no fire.

1.15 Survival aspect

The occurrence was survivable because the aircraft was structurally intact, there was liveable volume of space, the seat belts and harnesses were intact. The crew and passengers disembarked normally using the passenger exit doors.

1.16 Test and research

Nil.

1.17 Organizational and management information

1.17.1 Dornier Aviation Nigeria AIEP (DANA) Limited

Dornier Aviation Nigeria AIEP Limited is an airline based in Kaduna, Nigeria. The Nigeria Civil Aviation Authority granted Dornier Aviation Nigeria AIEP (DANA) a Permit for Scheduled operations and Charter flight Operations with reference number DAA/AOC/06-15/002 valid until 8th May 2021. It provides scheduled and charter flight services, as well as running a fixed-base and maintenance operation. It also undertakes agricultural flying, aerial photography and emergency medical evacuation services. Its main base is Old Kaduna Airport. The company was founded in 1979. It operates a fleet of Dornier 328 turboprop-powered aircraft.

1.17.1.1 Excerpts from DANA Ltd Dornier 328 Operations Manual Part B

AEROPLANE OPERATING MATTERS- TYPE RELATED, NORMAL PROCEDURES

02.01.04 Flight deck procedures

(a) Communication

Good communication between all crew members is essential for a safe operation. Crew members shall therefore brief each other on their intentions and inform them about any changes (e.g. setting of systems, etc.), unless their action is part of a procedure or does not affect the operation of the aircraft (e.g. opening or closing of vents, changing of standby frequencies during cruise, etc.). They shall ensure that they have understood each other and shall not hesitate to ask other crew members to repeat and/or explain any callout or information they have not understood. Crew members shall use their best judgment to avoid communicating too little and talking too much.

All communication shall follow the "closed loop" concept, whereby one crew member "opens a loop" by calling out a change or ordering an action and the other crew member performs the appropriate action and/or gives the appropriate response, thus

"closing the loop". Whenever a callout or order remains unanswered, it shall be repeated, thereafter it shall be considered as an indication of incapacitation (ref. OM-A 8.3 and abnormal and emergency SOPs).

Radio communication shall normally be handled by the Radio Personnel on ground and by the PM while airborne.

The English language shall be used for all procedure related to flight deck communication.

Below FL100 and/or during VFR operations and whenever the captain initiates it, including the operation of the airplane on ground, communication on the flight deck should be limited to operational aspects (= sterile cockpit procedure). The commander shall ensure that all persons on the flight deck adhere to these procedures, regardless of whether they are members of the crew or not.

1.17.1.2 Dornier Aviation Nigeria AIEP Ltd Operations Manual Part A

Chapter 8 - Operating Procedures

8.3.1.19 CRITICAL PHASE OF FLIGHT

Critical phases of flight include all operations (ground and flight) below 10,000 feet. DANA requires all its flight crew members to maintain a sterile cockpit policy during critical phases of flight. These include:

i) The implementation of the protocol for intra-cockpit communication and for communication between the flight crew and cabin crew;
ii) The mandatory use of headsets and boom microphones for communication with ATC;

iii) The restriction of flight crew activities to essential operational matters and enforcement of the requirement in paragraph 4.1.5 for flight crew member to remain at the assigned duty station.

iv) Prohibition of pilot flight crew members vacating an aircraft control seat for the purposes of transferring duties to another pilot flight crew member.

v) Any other time determined and announced by the flight crew (e.g in-flight emergency, security alert).

1.17.2 Nigeria Civil Aviation Authority (NCAA)

By virtue of Section 8 (3) of Civil Aviation Act 2022, Nigeria Civil Aviation Authority (NCAA) is the sole civil aviation regulatory body in Nigeria; this is notwithstanding anything contained in any other law.

It became autonomous with the passing into law of the Civil Aviation Act 2022 by the National Assembly and its assent by the President of the Federal Republic of Nigeria. The Act not only empowers the Authority to regulate Aviation Safety without political interference but to also carry out oversight functions of Airports, Airspace, Meteorological Services, etc. as well as economic regulations of the industry.

A series of well- coordinated procedures and rules used by NCAA in ensuring safety and economic regulatory standards in the aviation industry include Inspection, Operation, Certification, Licensing, Monitoring, Sanction and Enforcement.

Currently, the country has about 31 airports. There are about 39 AOC holders (for schedule and non- schedule flight operations) while about 28 foreign airlines are operating to Nigeria.

Going by the Licence Crew Data for Total Current (With Valid License) as at April, 2024: License Pilots, 2,049; Certification of validation for Pilots, 63; Aircraft Maintenance Engineer's Licence, 2,061; Aircraft Maintenance Engineer's Licence with validation, 102;

Aircraft Dispatchers' Licence, 840; Air Traffic Controllers (ATC), 420; Cabin Crew Licence, 3,770; Air Traffic Safety Electronic Personnel Licence, 443; and Aeronautical Station Operators' Licence, 161.

1.17.2.1 All Operators Letter AOL/19/003

The NCAA released an AOL on 16 August 2019 titled *Added Continuous Overwriting of Cockpit Voice Recorder (CVR) Information* to address recurrent instances of CVR information overwriting. See Appendix A.

The AOL requires among other things, that appropriate procedure addressing the requirements of Nig. CARs Parts 7.8.1.3 (b), 8.14.10.3 (a) and 8.5.1.24 (b) and (c) be developed/emphasised and such also incorporated into respective Operations Manual, within thirty (30) days of notice.

1.18 Additional information

1.18.1 Crew Resource Management (CRM)

CRM is a widely implemented strategy in the aviation community that acts as a training counter measure to human error. Traditionally, CRM has been defined as the utilization of all resources available to the crew to manage human error. From the onset, it is important to place CRM within the scope of Human factors training. CRM is but one practical application of human factors training, covered with supporting crew responses to threats and errors that manifest in the operating environment. The objective of CRM training is to contribute to incident and accident prevention. (Source :Skybrary)

1.19 Effective and useful investigation techniques

Nil.

2.0 ANALYSIS

2.1 GENERAL

The flight crew were licensed and qualified to operate the flight. The aircraft had a valid certificate of airworthiness as the time of this occurrence.

The analysis focuses on the conduct of the flight, Crew Resource Management and preservation of the CVR evidence.

2.2 Conduct of the flight

2.2.1 Approach and landing

The flight was uneventful until the Final Approach for landing. At about 6 nm to the station and approximately five minutes to Touchdown, the aircraft was established on the ILS.

During Final Approach however, the flight crew did not observe the principle of a sterile cockpit in accordance with DANA Dornier 328 Standard Operating Procedures (SOPs) on cockpit communication – (OM-B DO 328 02.01.04 – Flight deck procedures) as conversations on various matters unrelated to the conduct of the flight were ongoing.

The Approach/Landing checklist requires among other items, the confirmation that the Nose Wheel Steering Tiller is unobstructed and centred in detent. This confirmation was not captured on the CVR.

The PF callout on the capture of the glideslope but not of the localizer. It is unclear if this was a checklist omission or an inadvertent action.

Although the aircraft touched down right of the runway centreline, there were no cues from the conversation in the cockpit that either of the crew observed the drift that preceded this.

2.2.2 Loss of directional control during landing roll

Although the Condition Levers were found in the FUEL OFF position during post occurrence inspection as required by the engine shut down procedure, its position at Touchdown and during Landing Roll could not be conclusively determined from the crew witness accounts, nor was the use or effectiveness of the Tiller accounted for. The operation of the Thrust Reversers after control hand-over from First Officer to Captain could not be determined.

However, flight crew accounts indicated that the Captain requested for the Condition Levers retarded to MIN at about 50 knots during the Landing Roll, in contrast with the 30 knots Ground Speed recommended in the AFM. The PF's request for 'CONDITION LEVERS MIN' after the first veering action of the aircraft indicates a desire for directional control in the 'HIGH AUTHORITY' mode, indicating that the aircraft's response to his control inputs were not yielding expected actions. Whatever actions taken thereafter were inadequate to prevent the aircraft from uncontrollably veering right off the runway into the grass verge.

Without recorded flight data, the investigation was unable to evaluate the presence or influence of Thrust Asymmetry, Unequal Braking or abrupt Rudder input, in this occurrence.

2.3 Crew Resource Management (CRM) factors in this occurrence

The atmosphere in the flight deck appeared cordial throughout the flight. However, the casual disposition sensed from the crew's response to Checklist items and in handling the flight contributed to the uncoordinated reaction to the Approach and Landing. The non-observance of Sterile Cockpit principle contributed to crew distraction from their flight duties.

The position of the Condition Levers at Touchdown and during the Landing Roll could not be ascertained by the flight crew during post occurrence interview, considering the concerns expressed by the Captain as he attempted to control the aircraft during the Landing Roll. From the CVR recordings, there was no confirmation by the Co-pilot to the frantic calls of 'CONDITION LEVER MIN' by the Captain. The position of the Condition Levers after the aircraft came to a stop was also not referenced in the conversations captured on the CVR. See Appendix B

Thus, CRM in this occurrence was not effective.

2.4 Preservation of CVR evidence

The NCAA issued an All Operators Letter (AOL) AOL/19/003 on the overwriting of CVR recordings in 2019. Post-AOL issuance investigation experience of the Bureau has shown an improvement in compliance by the operators, although there is room for further improvement as evident in this case.

The flight crew in this occurrence were not prompted by procedure or checklist to take action to preserve CVR evidence after the occurrence.

The investigation into this occurrence highlighted the importance of isolating power to the CVR circuit immediately following an occurrence, because CVR continues to record audio after engine shut-down due power supply when APU power is online. Nonetheless, useful information required for this investigation were retrieved from the CVR recordings.

3.0 CONCLUSIONS

3.1 Findings

1. The flight crew were licenced and qualified to operate the flight.
2. The aircraft had a valid Certificate of Airworthiness.
3. Medical test revealed psychoactive substance in the captain's test result.
4. The mass and centre of gravity of the aircraft were within the prescribed limits.
5. The Co-pilot was the Pilot Flying while the Captain was the Pilot Monitoring.
6. The Take-Off, Climb, Cruise, Descent and Approach Phases of the flight were reported to be normal.
7. Captain requested control of the aircraft and the Co-pilot handed over control at speed below 60 knots and decelerating.
8. At about 50 knots, according to the Cockpit Voice Recorder, the Captain noticed a sudden veering of the aircraft to the right and called for "CONDITION LEVER MIN".
9. Aircraft veered to the right, was corrected, it then veered right again and exited the runway into the grass verge.
10. The aircraft stopped in the grass verge right of Runway 18L.
11. Control Tower raised the aircraft via radio to confirm if operation was normal.
12. The crew and passengers disembarked normally without injury.

3.2 Causal factor

Inappropriate control handover during landing roll above recommended taxi speed

3.3 Contributory factor

Inadequate compliance with the checklist guidelines for directional control after landing

4.0 SAFETY RECOMMENDATIONS

4.1 Safety Recommendation 2026-010

Dornier Aviation Nigeria AIEP Limited should put in place measures to ensure that its flight crew adhere strictly to company's Standard Operating Procedures, including adherence to Sterile Cockpit requirements and compliance with flight checklist procedures.

4.2 Safety Recommendation 2026-011

Nigeria Civil Aviation Authority in addition to the provisions of AOL/19/003 should include requirements to modify aircraft appropriate checklist procedures to include specific action for isolating power to the CVR following an occurrence.

APPENDICES

Appendix A: AOL/19/003

NCAA

NIGERIAN CIVIL AVIATION AUTHORITY

P.M.B. 21029, 21038, IKEJA-LAGOS.

ALL OPERATORS LETTER (FSG 003)

Ref: NCAA/FSG/AOL/19/003

Date: 30th July, 2019

To: All Aircraft Operators

From: Nigerian Civil Aviation Authority

Attn: Director of Flight Operations/Chief Pilot/Safety Manager

Subject: **CONTINUOUS OVERWRITING OF COCKPIT VOICE RECORDER (CVR) INFORMATION**

The purpose of this FSG All Operators Letter (AOL) is to alert all aircraft operators on the continuous overwriting of Cockpit Voice Recorder (CVR) Information by their flight crew members and the necessity to ensure compliance with the appropriate Nigeria Civil Aviation Regulations (Nig. CARs) requirements.

Background

The Nigerian Civil Aviation Authority (NCAA) has noticed that airline operators' flight crew members are in the practice of continuously overwriting the CVR information. This practice makes it impossible for the Accident Investigation Bureau (AIB) to retrieve actual data to aid in its investigation as required by Paragraphs 25 and 26 of the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2019. This action had also impeded and posed undesirable difficulty in ensuring that AIB successfully discharge its statutory mandate of investigating accidents and serious incidents.

Nig. CARs Part 7.8.1.3 (b), which is derived from the provisions of ICAO Annex 6, Section 11.6 states that, "To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with the accident/incident regulations of Nigeria".

Furthermore, Nig. CARs Part 8.14.10.3 (a) requires that "The operator/owner of the aircraft, or in the case where it is leased, the lessee, shall ensure, to the extent possible, in the event the aircraft becomes involved in an accident or incident, the preservation of all related flight recorder records and, if necessary, the associated flight recorders, and their retention in safe custody pending their disposition as determined by the Accident Investigation Bureau.

The operational requirement of the flight recorders by the flight crew as detailed in Nig. CARs, Part 8.5.1.24 (b) and (c) require that "The PIC may not permit a flight data recorder or cockpit voice recorder to be disabled, switched off or erased during flight, unless necessary to preserve the data for an accident or incident investigation" and "in event of an accident or incident, the PIC shall act to preserve the recorded data for subsequent investigation upon completion of flight" respectively.

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Switch Board: +234 (1) 7610036, +234 (1) 7610057; Email: info@ncaa.gov.ng; Website: www.ncaa.gov.ng

Actions Required:

All operators of aircraft with CVR installed are hereby required to:

1. Conduct in-house awareness training for their flight crews on the requirements of Nig. CARs Parts 7.8.1.3 (b), 8.14.10.3 (a) and 8.5.1.24 (b) and (c) immediately on receipt of this AOL;

2. Develop/Emphasize appropriate procedures addressing the requirements of Nig. CARs Parts 7.8.1.3 (b), 8.14.10.3 (a) and 8.5.1.24 (b) and (c) and incorporate same in their respective Operations Manual. This amendment must be submitted to the Authority for review, acceptance and approval within thirty (30) days from the date of issue of this AOL. These procedures must form part of the contents of the indoctrination training for flight crew members; and

3. Ensure continuous compliance with the requirements of the Nig. CARs on the preservation of flight recorder records.

The Authority will apply its enforcement processes, where non-compliances to the requirements of the Nig. CARs or non-conformance to the operator's approved procedures have been noticed.

Please, comply accordingly.

Director, Operations and Training
For: Director General.

Appendix B

TRANSCRIPT

CVR HR:MIN:SEC.0	FDR HR:MIN:SEC.0	ATC HR:MIN:SEC.0	UTC HR:MIN:SEC.0	SPEAKER	CONTENT	SOURCE
1:09:59.4	93861.4	0:25:19.4	19:47:58.4	P2	ok this guy it suppose to leave today bah... captain Maigida	
1:10:03.3	93865.3	0:25:23.3	19:48:02.3	P2	Abi otilo	
1:10:04.0	93866.0	0:25:24.0	19:48:03.0	P1	Atilo by now	
1:10:06.6	93868.6	0:25:26.6	19:48:05.6	P2	ehh... boya ati ano papa	
1:10:10.7	93872.7	0:25:30.7	19:48:09.7	ATS	dana four eight seven surface wind two three zero zero six knots cleared to land runway one eight left exercise caution on landing due bird activities	
1:10:17.6	93879.6	0:25:37.6	19:48:16.6	P1	copied four eight seven	
1:10:22.2	93884.2	0:25:42.2	19:48:21.2	P1	clear to land dana four eight seven	
1:10:23.4	93885.4	0:25:43.4	19:48:22.4	P2	thank yorrrr	
1:10:31.0	93893.0	0:25:51.0	19:48:30.0	P2	vref is set	
1:10:38.8	93900.8	0:25:58.8	19:48:37.8	P2	that is a good one oh	
1:11:02.6	93924.6	0:26:22.6	19:49:01.6	P1	asiko ooh	
1:11:12.7	93934.7	0:26:32.7	19:49:11.7	P2	landing field in sight	
1:11:32.4	93954.4	0:26:52.4	19:49:31.4	AC Voice	klin klin	
1:11:33.5	93955.5	0:26:53.5	19:49:32.5	P2	auto pilot off	
1:11:34.4	93956.4	0:26:54.4	19:49:33.4	P1	check	
1:11:35.0	93957.0	0:26:55.0	19:49:34.0	P2	I am going visual	
1:11:36.5	93958.5	0:26:56.5	19:49:35.5	P1	you can go visual	
1:11:39.2	93961.2	0:26:59.2	19:49:38.2	P(US)	crab	
1:12:12.0	93994.0	0:27:32.0	19:50:11.0	P2	ok your control	
1:12:13.2	93995.2	0:27:33.2	19:50:12.2	P1	ok	
1:12:14.6	93996.6	0:27:34.6	19:50:13.6	P1	condition lever	
1:12:16.5	93998.5	0:27:36.5	19:50:15.5	P1	yeh hehehe jo tori olorun	
1:12:19.8	94001.8	0:27:39.8	19:50:18.8	P1	waoo! what happen there	
1:12:27.8	94004.8	0:27:42.8	19:50:21.8	P2	Iwo lo Iwo lo je **	
1:12:25.4	94007.4	0:27:45.4	19:50:24.4	P1	control it for me ** condition lever min condition lever min oh my God ... oh my God oh what is oh my God	
1:12:33.2	94015.2	0:27:53.2	19:50:32.2	P2	captain you na you I don't know the control is in... Ehen	
1:12:37.6	94019.6	0:27:57.6	19:50:36.6	P1	oh my God	
1:12:42.0	94024.0	0:28:02.0	19:50:41.0	P1	oh my God... oh my God...oh my God... oh my God...	
1:12:51.1	94033.1	0:28:11.1	19:50:50.1	P(US)	**	
1:12:52.3	94034.3	0:28:12.3	19:50:51.3	ATS	dana four eight seven lagos tower	
1:12:58.7	94040.7	0:28:18.7	19:50:57.7	ATS	dana four eight seven lagos tower	
1:13:00.5	94042.5	0:28:20.5	19:50:59.5	P2	erh go ahead sir	
1:13:01.8	94043.8	0:28:21.8	19:51:00.8	ATS	confirm ops normal	
1:13:03.1	94045.1	0:28:23.1	19:51:02.1	P2	erh... ops is not normal	
1:13:04.8	94046.8	0:28:24.8	19:51:03.8	P2	we over erh... overran the I mean the ov... kai	
1:13:12.0	94054.0	0:28:32.0	19:51:11.0	P2	captain you controled the thing I actually just don't understand what happened again	
1:13:44.3	94086.3	0:29:04.3	19:51:43.3	P2	** make we shutdown... we need to shutdown	
1:13:51.4	94093.4	0:29:11.4	19:51:50.4	ATS	dana four eight seven lagos tower	

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TRANSCRIPT

1:13:56.3	94098.3	0:29:16.3	19:51:55.3	P2	lagos tower dana four eight zero we overran the runway to the left	
1:14:06.2	94108.2	0:29:26.2	19:52:05.2	ATS	confirm you will need assistance to get back to the runway if you are stuck at the grass verge	
1:14:10.4	94112.4	0:29:30.4	19:52:09.4	P2	erh we will need assistance please	
1:14:12.8	94114.8	0:29:32.8	19:52:11.8	P2	hold on now	
1:14:13.6	94115.6	0:29:33.6	19:52:12.6	ATS	copied	
1:14:14.7	94116.7	0:29:34.7	19:52:13.7	AC Voice	chime chime chime	
1:14:20.0	94122.0	0:29:40.0	19:52:19.0	AC Voice	chime chime chime	
1:14:59.5	94161.5	0:30:19.5	19:52:58.5	P1	ehm from the flight deck your captain speaking please bear with us we are just trying to get erh... the tower to come and evacuate us from here please just just sit tight	
1:15:17.4	94179.4	0:30:37.4	19:53:16.4	P2	erh... lagos dana four... eight seven	
1:16:17.2	94239.2	0:31:37.2	19:54:16.2	P2	erh... lagos dana four... eight seven lagos dana four eight seven	
1:16:25.1	94247.1	0:31:45.1	19:54:24.1	ATS	dana four eight seven we are trying to coordinate for vehicle to tow you out stand by please	
1:16:29.1	94251.1	0:31:49.1	19:54:28.1	P2	roger thank you	
1:18:03.6	94345.7	0:33:23.7	19:56:02.7	ATS	dana four eight seven standby arrangement is made for you standby	
1:18:07.3	94349.3	0:33:27.3	19:56:06.3	P2	erh roger standby	
1:19:17.5	94419.5	0:34:37.5	19:57:16.5	AC Voice	chime chime chime	
1:25:25.1	94787.1	0:40:45.1	20:03:24.1	ATS	dana four eight seven report registration marking POB	
1:25:28.8	94790.8	0:40:48.8	20:03:27.8	P2	five november bravo uniform november two one minus five	
1:25:36.7	94798.7	0:40:56.7	20:03:35.7	ATS	confirm your passengers are ok or they need assistance	
1:25:40.0	94802.0	0:41:00.0	20:03:39.0	P2	erh standby one erh... the captain will... get back to you	

Convert Back to CVR Time

FDR	666611.0	16:15:49.0	CVR
ATC	0:00:00.0	0:44:40.0	CVR
UTC	19:22:49.0	0:44:50.0	CVR