AIRCRAFT ACCIDENT REPORT

AASL/2021/02/16/F

Nigerian Safety Investigation Bureau

Final Report on Serious Incident involving a Boeing 737-500 aircraft with nationality and registration marks 5N-SYS operated by Azman Air Services Limited which occurred on Runway 18R, Murtala Muhammed Airport Lagos; Nigeria on 16 February 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.

Readers are advised that the Nigerian Safety Investigation Bureau, investigates for the sole purpose of enhancing aviation safety. Consequently, NSIB reports are confined to matters of safety significance and should not be used for any other purpose.

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)

TABLE OF CONTENTS

TABLE OF FIGURES

GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT

AOL	All Operators Letter
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATIS	Automatic Terminal Information Services
CT	Control Tower
CVR	Cockpit Voice Recorder
DME	Distance Measuring Equipment
DNAA	ICAO Location Indicator for Nnamdi Azikiwe International Airport, Abuja
DNMM	ICAO Location Indicator for Murtala Muhammed Airport, Lagos
DG	Director General
E	East
FAAN	Federal Airports Authority of Nigeria
FDR	Flight Data Recorder
FEW	Amounts of cloud cover (1-2 Oktas)
ft	Feet
G/S	Glide slope
h	Hour
hPa	hectopascal
ICAO	International Civil Aviation Organization

ILS	Instrument Landing System
INOP	Inoperative
km	Kilometer
kt	Knot
LASEMA	Lagos State Emergency Management Agency
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
MHz	Mega Hertz
MMEL	Master Minimum Equipment List
NCAA	Nigeria Civil Aviation Authority
NEMA	National Emergency Management Agency
Nig. CARs	Nigeria Civil Aviation Regulations 2015
nm	Nautical Miles
N	North
NOSIG	No Significant Change
NOTAM	Notices to Airmen
^{o}C	Degree Celsius
OCC	Operations Control Centre
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot in Command

QNH	Altimeter Setting Above Mean Sea Level
USA	United States of America
UTC	Universal Coordinated Time
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omni-directional Radio Range

Report number:	AASL/2021/02/16/F
Operator:	Azman Air Services Limited
Aircraft type and model:	Boeing 737-500
Manufacturer:	The Boeing Company, USA
Year of manufacture:	1997
Nationality and registration marks:	5N-SYS
Serial number:	28565
Location:	Runway 18R, Murtala Muhammed Airport, Ikeja, Lagos
Date and time:	16 February, 2021 about 17:58 h *(All times in this report are local times UTC+1 unless otherwise stated)*

SYNOPSIS

The Nigerian Safety Investigation Bureau, Nigeria (NSIB) formally AIB became aware of the serious incident through its Command-and-Control Centre on 16 February, 2021. Investigators were dispatched to the scene of the incident and commenced post incident assessments immediately under the provisions of Civil Aviation (Investigation of Air Accidents and Incidents) Regulations and Annex 13 to the Convention on International Civil Aviation.

On 16 February 2021, a B737-500 aircraft with nationality and registration marks 5N-SYS operated by Azman Air Ltd with a call sign AZM2325, departed Nnamdi Azikiwe International Airport (DNAA) for Murtala Muhammed International Airport (DNMM). At

about 3 NM to touchdown runway 18L, AZM2325 carried out a missed approach due to adverse weather conditions. At about 12 minutes later, AZM2325 reported established on ILS runway 18R. The airfield surface condition was passed and the aircraft was cleared to land. The aircraft landed past Alpha 2 on the runway and all the main landing wheel tyres burst. The aircraft was substantially damaged.

The investigation identified the following:

Causal factor

Main landing gear wheels lock during landing roll on a wet runway due to an unserviceable anti-skid.

Contributory factors

1. Decision to operate the flight with anti-skid system inoperative on a wet runway.
2. Decision to operate the flight outside the provision of the Azman Air Ltd approved B737 Minimum Equipment List on operation with anti-skid system inoperative (MEL Category C 32-2) and beyond the granted extension period.

Four (4) Safety Recommendations were made.

1.0 FACTUAL INFORMATION

1.1 History of the flight

On 16 February, 2021, at about 16:54 h, a B737-500 aircraft with nationality and registration marks 5N-SYS operated by Azman Air Services Limited departed Nnamdi Azikiwe International Airport, (DNAA) Abuja on a commercial scheduled flight for Murtala Muhammed International Airport, Lagos (DNMM) as AZM2325. There were 55 persons on board the aircraft inclusive of six crew members and an endurance of 3 hours 20 minutes. The Captain was the Pilot flying (PF) and Copilot was the Pilot Monitoring (PM). The incident flight was the fifth and the last sector for the day.

The flight crew stated that all necessary checks were carried out and reference was made to relevant documents on the anti-skid inoperative conditions before departing Abuja. The take-off, climb, cruise and the initial approach phases of flight were normal.

According to the flight crew, at about 600 ft to touchdown, during Approach there was heavy rain accompanied by Wind Shear Warning.

At 17:42 h, on reaching Minimum Decision Altitude (MDA) at about 3nm to Touchdown Runway 18L, the flight crew carried out a Missed Approach. According to the Lagos Tower Watch Book, AZM2325 requested for runway 36L but was vectored around other traffic to Runway 18R.

The Air Traffic Control (ATC) provided prevailing weather information to AZM2325 and requested the flight crew to state intention.

At 17:53 h, AZM2325 stated "we would like to make one Approach, runway 18R, if not [successful] we would divert to our Alternate…"

According to the flight crew, at Short Final, the Approach Light became visible even though there was some rain.

At 17:58 h, AZM2325 landed on runway 18R and was instructed to continue with Ground Control on 121.9 MHz. ATC observed that AZM2325 crossed the Touchdown Zone and landed past Link A2.

At 17:59 h, AZM2325 reported "121.9 MHz; we have an issue, we are on the runway…. we need assistance please. We're on the runway; we have an engine indication…. we have an engine indication, number one engine, we're on the runway [sic]."

At 18:00 h the fire unit were notify of the occurrence and they arrived the scene at 18:02 h. The fire units confirm to the flight crew that all the Main Wheel tyres were bursted.

At 19:07 h, the disembarkation of passengers was complete with only the crew and passengers' baggage on board the aircraft.

The Serious Incident occurred at 16:58:51 UTC in daylight and Instrument Meteorological Conditions (VMC) prevailed at the time of occurrence.

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	6	49	55
Total	6	49	55

1.3 Damage to aircraft

The aircraft was slightly damaged.

1.4 Other damage

Nil.

1.5 Personnel information

1.5.1 Captain (Pilot Flying)

Nationality:	Nigerian
Age:	39 years
License type:	Airline Transport Pilot License (Aeroplane)
License:	Valid till 7 May, 2022
Aircraft ratings:	DHC-8-Q400, B737-300/500
Medical certificate:	Valid till 31 December, 2021
Total flying time:	5,978:20 h
Total on type:	1,894:45 h
Total on type (PIC):	262:45 h
Last 90 days:	262:45 h
Last 28 days:	66:50 h

Last 24 hours:	07:50 h

1.5.2 Co-pilot (Pilot Monitoring)

Nationality:	Nigerian
Age:	35 years
License type:	Commercial Pilot License (Aeroplane)
License:	Valid till 12 November, 2024
Aircraft ratings:	B737-300/500
Medical certificate:	Valid till 27 January, 2021
Proficiency:	Valid till 31 December, 2020
Total flying time:	975:30 h
Total on type:	800 h
Last 90 days:	123:30 h
Last 28 days:	61:30 h
Last 24 hours:	05:20 h

The Nigeria Civil Aviation Authority (NCAA) issued an 'All Operators Letter' (AOL) with ref NCAA/DG/AIR/11/16/288 giving validity of the exemption on all holders of Nigerian Aircrew and ATCO Medical certificates earlier issued on 1st April 2020 to expire on 31st December 2020 extended to 31st January 2021". Affected crew are expected to carry a copy of this AOL and the exemption document along with the applicable license.

1.6 Aircraft information

1.6.1 General information

Type:	Boeing 737-500
Manufacturer:	The Boeing Company, USA
Serial No.:	28565
Year of manufacture:	1997
Nationality and registration marks:	5N-SYS
Total airframe time:	40,673:23 h
Total landing cycles:	35,137
Certificate of airworthiness:	Valid till 11 March, 2021
Certificate of insurance:	Valid till 25 April, 2021

Type of Fuel: Jet A1

The aircraft landed with a computed landing weight of 49,895 kg.

Maintenance History of the Tyres

Date	Defect/work required	Action Taken
10-02-2021	#3 and 4 tyres worn out	#3 and 4 mainwheel tyres replaced I.A.W 32-42-22
11-02-2021	#3 Main wheel heat shield 1of 6 Found missing	#3 Main wheel Assembly replaced I.A.W. AMM 32-45-11/401

1.6.2 Anti-skid System - Description and Operation

(Excerpt from Boeing 737-300/400/500 Aircraft Maintenance Manual, section 32-42-00, page 1 May25/2008)

General

I. *The antiskid system is an electro-hydraulic subsystem placed in the hydraulic brake system to prevent manual or automatic braking action that causes skidding. Under any runway condition or selected brake pressure, the antiskid system will monitor wheel deceleration rates and maintain maximum wheel adhesion. The antiskid system is programmed to provide touchdown and locked wheel protection from air-ground and wheel speed sensings. A landing gear lever operated switch provides a disable function for landing gear retraction braking. An ON-OFF switch gives the crew control of the antiskid system and an annunciator light gives notice of defective systems. A built-in-test capability provides continuous self-test and fault indication. Further manual testing is provided to detect component faults. The autobrake system shares air-ground and wheel speed sensing with the antiskid system and requires a fault free antiskid system to operate.*

II. *An alternate antiskid system is automatically scheduled to operate from hydraulic system A pressure when hydraulic system B pressure fails, transferring command by alternate antiskid to the operation of paired wheels of each gear.*

III. *The antiskid system consists of individual wheel speed transducers, an antiskid control unit, six antiskid control valves, a main gear squat switch, a nose gear squat switch and a landing gear lever switch. The system also includes an ON-OFF control switch and an INOP annunciator light.*

Built-in-testing is provided on an automatic/ continuous basis supplemented with a manual test capability at the antiskid control unit.

Touchdown Protection Mode

(1) Touchdown protection prevents brake applications prior to wheel spin-up on slick pavements or with light wheel vertical loading. A brake release signal is sent to the inboard wheel pair from the right main gear air-ground sensor and to the outboard brakes from the nose gear ground sensing switch. At ground sensing, the switches send signals through relay R278 (inboard wheels) and relay R321 (outboard wheels) which are located on the E11 shelf.

Circuitry within the antiskid control unit delays recognition of ground sensing for three seconds to ensure continued touchdown protection immediately following touchdown. Wheel spin up inputs override the air safety brake release inputs to allow brake application when wheel velocity reaches a preset level, even though the air safety relay may still be in the airborne mode.

Locked Wheel Protection Mode

(1) Locked wheel protection is provided by the antiskid control unit from a comparison of left and right inboard and left and right outboard wheel speed signals respectively. The locked wheel error signal will release the brake on the slower wheel when its speed drops to less than 40 percent of the faster wheel. Locked wheel drop out will occur at approximately 20 knots.

1.6.3 Excerpts from Boeing 737 Flight Crew Operations Manual (FCOM)

ANTISKID INOP

ANTISKID INOPERATIVE

Condition: An antiskid system fault occurs.

Caution! Locked wheel protection is not available.

1 AUTO BRAKE select switch. . . . . OFF

The autobrake system is inoperative.

2 Do **not** arm the speedbrakes for landing. Manually deploy the speedbrakes immediately upon landing.

Automatic speedbrake extension may be inoperative.

3 Check the Non-Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

4 **Checklist Complete Except Deferred Items**

Deferred Items

Landing Procedure Review

Use minimum braking consistent with runway length and conditions to reduce possibility of a tire blowout.

Do **not** apply the brakes until the nose wheel is on the ground and the speedbrakes have been manually deployed.

Brake initially using light steady pedal pressure. Increase pressure as ground speed decreases. Do **not** pump the brakes.

Continued on next page

▼ ANTISKID INOPERATIVE continued ▼

Descent Checklist

Pressurization
(CPCS airplanes). . . . . CAB ALT ____, LAND ALT ____

Pressurization
(DCPCS airplanes). . . . . LAND ALT ____

Recall . . . . . Checked

Autobrake . . . . . **OFF**

Landing data . . . . . VREF ____, Minimums ____

Approach briefing . . . . . Completed

Approach Checklist

Altimeters . . . . . ____

Landing Checklist

ENGINE START switches. . . . . CONT

Speedbrake . . . . . **DOWN detent**

Landing gear . . . . . Down

Flaps . . . . . ____, Green light

■ ■ ■ ■

1.7 Meteorological information

Time	1630 UTC	1700 UTC	1730 UTC
Wind	200/08 kt	210/07 kt	210/06 kt
Visibility	8km	8 km	8 km
Weather	Nil	Nil	Nil
Cloud	Few013	Few013	Few013
Temp/Dew point	31/25C	29/25^{o}C	29/25^{o}C
QNH	1008hpa	1008 hPa	1008 hPa
Trend	NOSIG	NOSIG	NOSIG

1.8 Aids to Navigation

VOR/DME 'LAG' VHF 113.7MHz	-	"Serviceable"
ILS 'ILB' VHF 108.1 MHz	-	"Serviceable"
ILS 'ILA' LLZ 110.3 MHz	-	"Serviceable"
ILS 'ILA' G/S	-	"Unserviceable"
ATIS 112.3MHz	-	"Serviceable"

1.9 Communication

There was two ways communication between the aircraft and the ATC units. All communications between ATC and the crew were recorded by ground based automatic voice recording equipment for the duration of the occurrence.

1.10 Aerodrome information

Murtala Muhammed International Airport, Lagos, has a location indicator DNMM, elevation of 135 ft and a reference point of N06^{o} 34' 38" and E003^{o} 19' 16". The airport has dual bi-directional runways with a concrete/asphalt surface, designated as runways 18L/36R and 18R/36L. Both runways are equipped with ILS;

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 Precision Approach Path Indicator (PAPI) was available for both runways.

1.10.1 Excerpt from the Aeronautical Information Publication (AIP) showing runway 18R, (Touchdown Zone, Links Alpha 2 & Alpha 3) of Murtala Muhammad International Airport, Lagos (DNMM).

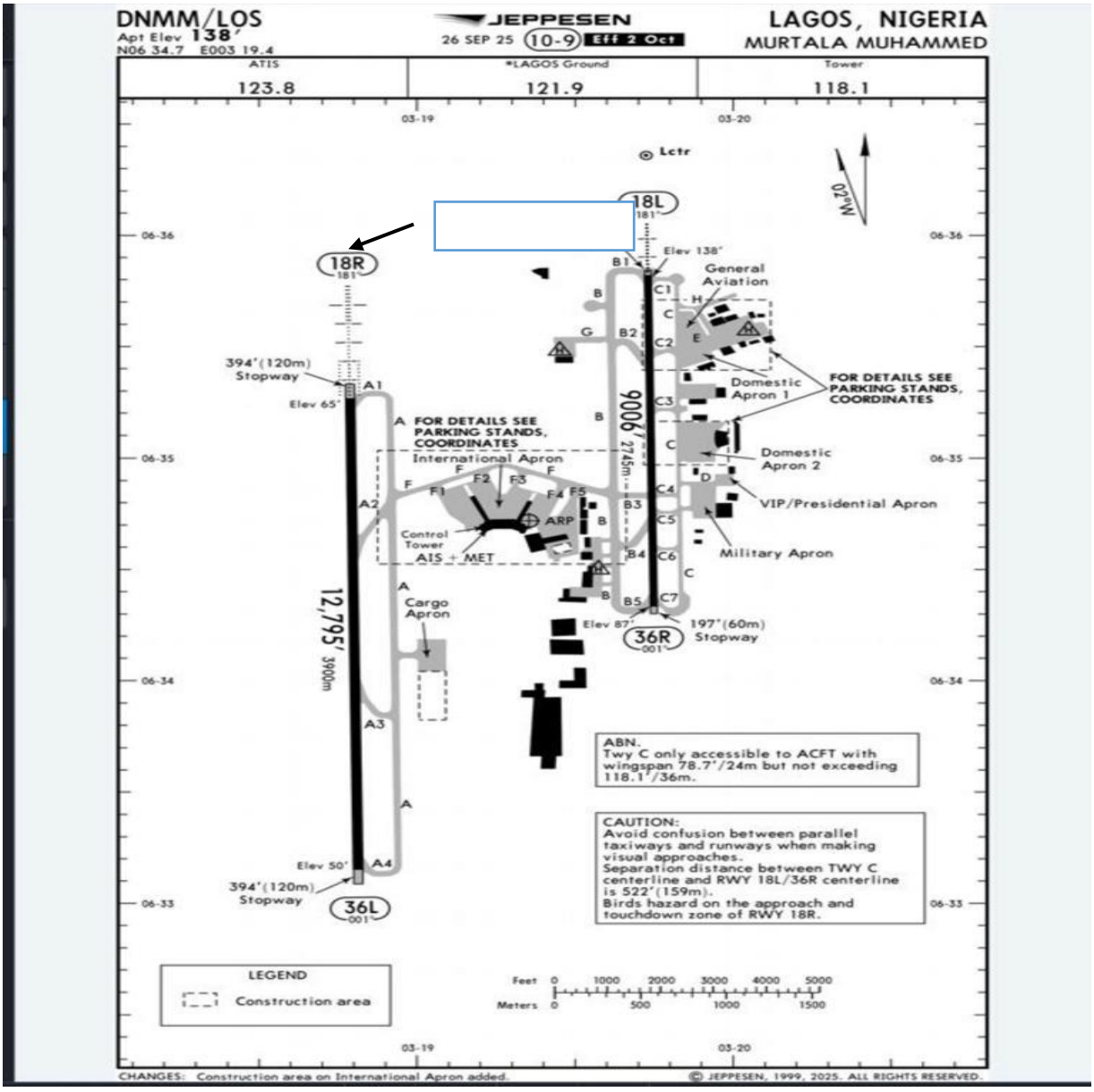

Figure 1: Aeronautical Information Publication (AIP) showing runway 18R, of Murtala Muhammad International Airport, Lagos (DNMM).

1.11 Flight recorders

The aircraft was equipped with both Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR). Both recorders were removed from the aircraft and transported to the Flight Safety Laboratory of Accident Investigation Bureau (AIB) now Transport Safety Laboratory in Abuja for readout. The FDR was successfully downloaded and data recovered was analysed. The CVR recording of the flight was overwritten.

	Flight Data Recorder	**Cockpit Voice Recorder**
Manufacturer	Honeywell, USA	Fairchild, USA
Model	SSFDR	SSCVR
Part Number	980-4700-003	S100-0080-00
Serial Number	SSFDR-08677	01937

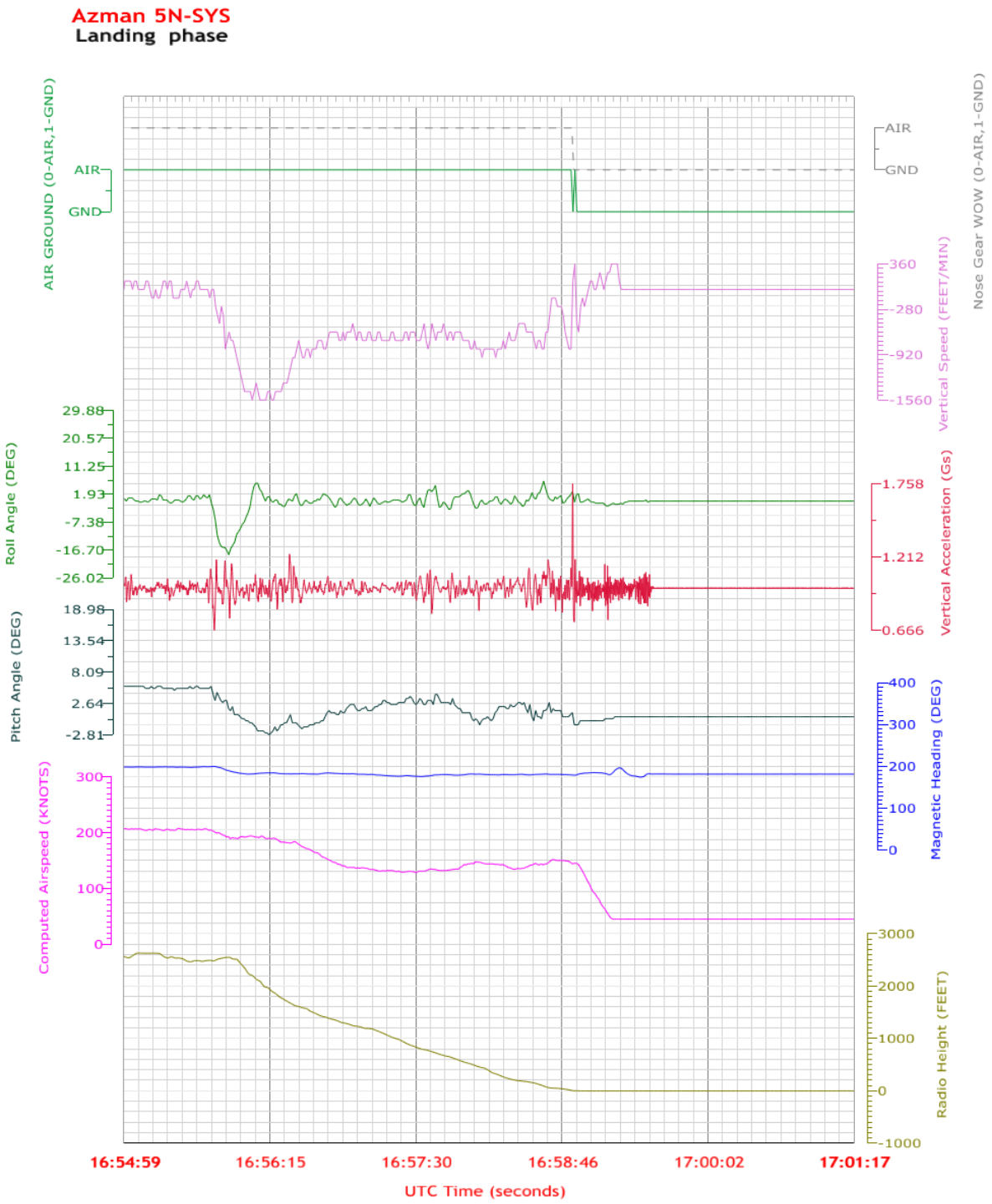

Figure 2: FDR Plot showing the landing phase

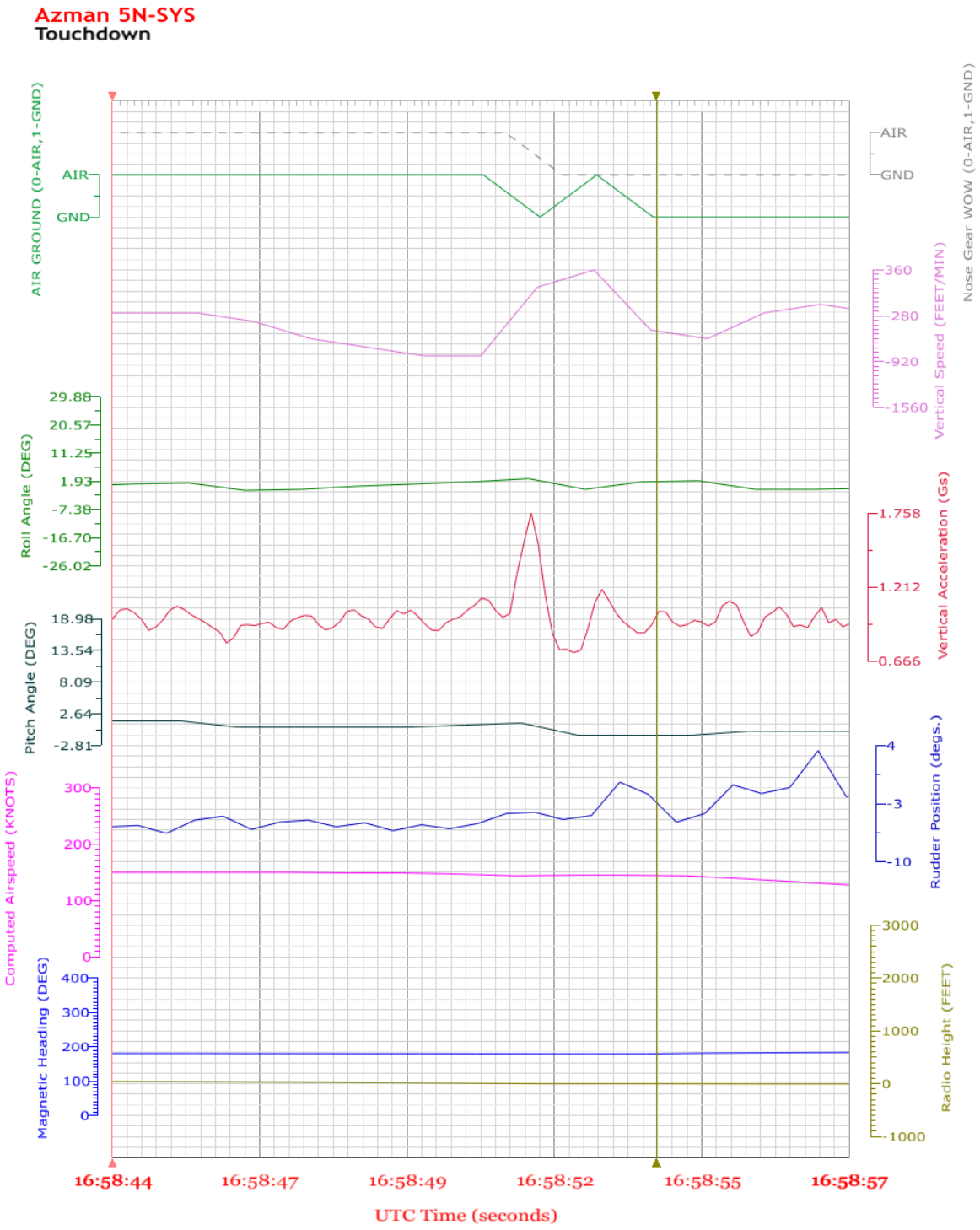

Figure 3: FDR Plot showing the touchdown sequence

The FDR plot of Touchdown sequence shows a spike in AIR-GRD indicating a likely bounce of the main landing gear. This corresponds with a spike in vertical Acceleration to a value of 1.758 G at point of first touchdown. The second main landing gear touch down occurs 2 secs later, at about 145 knots. pitch angle at touchdown is 1.7 degrees with a 2.8-degree roll angle. In addition, main gear touchdown, followed by nose gear 1 second later, likely indicating a positive landing.

1.12 Wreckage and impact information

The aircraft touched down after Link Alpha 2 of runway 18R and all the main wheel tyres burst. Flying debris from the burst tyres got into the No. 1 engine and the aircraft stopped on the runway after Alpha 3. The tyres were heavily worn-out exposing the canvass. Large reverted rubber tyre debris was found stuck in the left trailing edge flap. Several inlet fan blades on No. 1 engine were found damaged.

Figure 4: The Aircraft parked at the military hangar at DNMM after tyre replacement

Figure 5: Damaged fan blades of number 1 engine caused by ingestion of debris from the burst tyre

Figure 6: Damaged No. 1 & 2 main wheel tyres

Figure 7: Rear view of damaged no. 3 & 4 main wheel tyres

Figure 8: Tyre debris stuck in the flap track fairing

1.13 Medical and pathological information

Nil.

1.14 Fire

There was no fire.

1.15 Survival aspect

There was livable volume for the passengers and crew because the aircraft structure was not compromised during the occurrence. Also, the seats and the restraint system were intact.

1.15.1 Emergency response and aircraft recovery

AZM2325 landed on runway 18R at 17:58 h, the passengers remained onboard the aircraft until 19:07 (1 hour and 09 minutes) h when disembarkation of passengers was completed.

At 19:45 h, fire unit (MMF02) informed Control Tower that Lagos state Emergency Management Agency (LASEMA) and National Emergency Management Agency (NEMA) assistance would be needed in order to tow the disabled aircraft off the runway.

At 20:46 h, LASEMA personnel arrived the scene of the occurrence to carry out assessment on the aircraft to determine the type of equipment that will be required to remove the disabled aircraft from the runway.

At 21:00 MMF02 informed CT that LASEMA personnel were on ground with bigger equipment to move the disable aircraft.

At 23:21 h MMF02 informed CT that the disabled aircraft was out of the runway.

According to an eye witness account, a fire truck came calling the way of the stationery Aircraft. After barely 10 minutes of its arrival, the fire truck drove off. There was no any fire truck in sight or stationed throughout the period of the disembarkation of the passengers.

The eye witness further stated that it took 20 minutes before truck pulling the stairways drove to the foot of the aircraft and another 30 minutes before the Bus came and subsequently the disembarkation from the aircraft.

Aerodrome Rescue and Fire Fighting Services (ARFFS) stated that its crew had to respond to calls for refueling standby at D41 and another call on runway 18L. The ATC through RT 121.700 requested that the call be disregarded.

ARFFS Further stated that position of the incident was through an observation and was communicated to the ATC. However, the response from ATC was not cordial and coordinated.

1.16 Test and Research

Not applicable.

1.17 Organizational and management information

1.17.1 Azman Air Services Limited

Azman Air Services Limited is a privately owned Nigerian Airline founded in 2010.
The company was issued Air Operators Certificate (AOC) on 12th May, 2014 with No. AAS/AOC/05-14/01 in accordance with the Nigeria Civil Aviation Regulations (Nig.

CARs).

The Airline commenced operation on 15th May, 2014. The Operation and Principal Maintenance base is located in Kano where it maintains operational and airworthiness support facilities appropriate for the area and type of operation. Azman Air Services currently operates scheduled domestic flights. The Airline has five (5) aircraft in its fleet, comprising of two Boeing 737-500, two Boeing 737-300 and an Airbus A340.

1.17.1.1 Excerpts from Azman's Air Boeing 737-300/400/500 Minimum Equipment list (MEL) showing Remarks or Exceptions for Anti-skid System

B737-300/400/500 MINIMUM EQUIPMENT LIST

AIRCRAFT:	ISSUE: 02	REVISION NO :0	PAGE:
B-737	DATE:	28-JUL-2015	32-1

1. SYSTEM & SEQUENCE NUMBER / ITEM		2. NUMBER INSTALLED	3. NUMBER REQUIRED FOR DISPATCH	4. REMARKS OR EXCEPTIONS
32 - LANDING GEAR				
1. Gear Seal Warning System (-100/-200)	C			N/A
2. Antiskid System				
1) (-100/-200/-300/ -400/-500)	C	1	0	(O) May be inoperative provided operations are conducted in compliance with AFM.
2) (-600/-700/-800/ -900)	C			N/A
3. Parking Brake Valve (-300/-400/-500/ -600/-700/-800/ -900)	C	1	0	(M)(O) May be inoperative provided: a) Antiskid system is deactivated, and b) Operations are conducted in compliance with AFM inoperative decrements.
4. Parking Brake Light				
1) Solenoid Parking Brake Valve Installed (-100/-200)	C			N/A
2) Motor Operated Parking Brake Valve Installed	C	1	0	(M) May be inoperative provided parking brake shutoff valve is verified to operate normally.
3) External Parking Brake Light	C	1	0	(O) May be inoperative provided alternate procedures are established and used.
	D	1	0	May be inoperative provided procedures do not require its use.
5. Main Wheel Well Inflatable Seal System (-100/-200)	C			N/A

AZMAN AIR SERVICES LIMITED

02 OPERATION PROCEDURES
02 - 32 LANDING GEAR

ATA	ITEM	REMARKS OR EXCEPTIONS
32-2	**Antiskid System**	1. Place antiskid switch to OFF if maintenance action has not been performed. 2. Turn Autobrake System (if installed) OFF. 3. Advise dispatch. Payload may be affected due to takeoff and landing runway length requirements. 4. Adjust takeoff and landing gross weight limits as required for antiskid inoperative. 5. Extend speed brakes manually since automatic extension system may not be operative with antiskid inoperative. 6. Use antiskid inoperative braking procedure (AFM section 4).
32-8	**Rudder Pedal Nose Wheel Steering System**	Flight crew should be informed that the crew member with access to the tiller will be flying and the following procedures used: NOTE : *Pilots must use caution when using the nose wheel steering tiller (wheel) above 20 knots to avoid over controlling the nose wheels resulting in possible loss of directional control.* TAKEOFF: The crew member with access to the tiller should steer the airplane by manipulating the steering wheel control until the rudder becomes effective between 40 and 60 kts. The crew member not flying should assist by keeping the wings level and applying a light forward pressure on the control column until the tiller is no longer required for steering. LANDING: The crew member with access to the tiller should use the rudder and steering wheel control as required during the landing roll. The crew member not flying should assist by keeping the wings level and a forward pressure on the control column.
32-11	**Brake Temperature Monitor System**	Observe AFM Maximum Quick Turnaround Weight limitations.
32-12	**Nose Wheel Steering Switch**	Note: Nose wheel steering will not be available if Hydraulic System A power is lost.

END 02-32

AZMAN AIR SERVICES LIMITED

03 MAINTENANCE PROCEDURE
03 - 32 LANDING GEAR

ATA	ITEM	REMARKS OR EXCEPTIONS
32-2	**Anti Skid System**	1. Verify power is available to both inboard and outboard antiskid channels and antiskid switch is on. 2. Gain access to antiskid control unit in electronics bay E3-2. 3. Conduct a BITE check of antiskid control unit by placing wheel selector switch in position shown in table, pressing test switch indicated, and observing LED response. Any response other than normal response requires maintenance action as shown. NOTE: *Verify that wheel chocks are in place as above BITE check will require that parking brake be released (OFF) temporarily.* 4. Verify correct circuit breaker was pulled by repeating Step 3 after opening circuit breaker. powered channel will have responses as shown in table. No LED's will illuminate for components in unpowered channel. 5. Install a collar on open circuit breaker and install a placard near antiskid switch, ANTISKID INOP – ON. 6. Repeat Step 3 daily until aircraft is repaired in order to detect subsequent failures.

TEST SWITCH	WHEEL SELECT	NORMAL LED INDICATION	NON NORMAL INDICATION ACTION
VALVE	LO	Center Green LED	Open CB C195, Outboard Antiskid
VALVE	LI	Center Green LED	Open CB C196, Inboard Antiskid
VALVE	RI	Center Green LED	Open CB C196, Inboard Antiskid
VALVE	RO	Center Green LED	Open CB C195, Outboard Antiskid
VALVE	PB (Parking Brake SET)	Center Green LED	See DDPG Item 32-3
VALVE	PB (Parking Brake OFF)	Center Green LED	See DDPG Item 32-3
VALVE	L ALT	Center Green LED	See DDPG Item 32-10
VALVE	R ALT	Center Green LED	See DDPG Item 32-10
XDCR	LO	Right Green LED	Open CB C195, Outboard Antiskid
XDCR	LI	Right Green LED	Open CB C196, Inboard Antiskid
XDCR	RI	Right Green LED	Open CB C196, Inboard Antiskid
XDCR	RO	Right Green LED	Open CB C195, Outboard Antiskid

Date : JUL. 28, 2015
Issue : 2, Revision 0

B737 DDG

DDG : 03-32
Page : 03-32-1

Records from Azman's Air Operational Deferred Defect Log shows that the airline was granted a 3-day ANTI SKID INOP on 20 January 2021 by the Nigeria Civil Aviation Authority (NCAA), which expired on the midnight of 22 January.

Azman Airline Services was granted another 10-days extension from the 4 February 2021 which expired at midnight of 14 February.
The aircraft further operated from the 15 February 2021 till the time of the occurrence on the 16 February 2021 without maintenance action taken to rectify anti-skid inoperative condition.

1.17.2 The Nigeria Civil Aviation Authority (NCAA)

Per Section 8 (3) of the Civil Aviation Act 2022, The Nigeria Civil Aviation Authority (NCAA) is Nigeria's sole civil aviation regulatory body, 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 also to carry out oversight functions of Airports, Airspace, Meteorological Services, etc., as well as economic regulations of the industry.

The NCAA uses well-coordinated procedures and rules to ensure safety and economic regulatory standards in the aviation industry, including Inspection, Operation, Certification, Licensing, Monitoring, Sanctions, and Enforcement.

Currently, the country has about 31 airports. There are about 39 AOC holders (for scheduled and non-scheduled flight operations), and about 28 foreign airlines operate in Nigeria. At the time of the occurrence Nig. CARs 2015 was the regulations in force.

1.17.2.1 Excerpts from Nigeria Civil Aviation Regulations (Nig. CARs) 2015

General Instruments and Equipment Requirement-

7.1.1.4 (d) [AOC] No person shall commence a flight in commercial air transport operations unless the required equipment—

(3) Is in operable condition for the kind of operation being conducted, except as provided in the MEL.

1.17.2.2 Excerpts from Nigeria Civil Aviation Regulations (Nig. CARs) 2015

8.4.1.4. *—(a) Except as provided for in Subsection 8.4.1.3, no person may act as PIC or in any other capacity as a required flight crewmember of a civil aircraft of:*

(1) Nigeria registry, unless he or she carries in his or her personal possession the appropriate and current license for that flight-crew position for that type of aircraft and a valid medical certificate;

Nigeria Civil Aviation Authority (NCAA) issued 'All Operators Letter' (AOL) NCAA/DG/AIR/11/16/288 stating "the validity of the exemption on all holders of Nigerian Aircrew and ATCO Medical certificates which was earlier issued on 1st April 2020 to expire on 31st December 2020 is hereby extended to 31st January 2021". A copy of this AOL and the exemption document should be carried along with the applicable license as no license endorsement would be made by the NCAA.

1.17.3 Federal Airport Authority of Nigeria (FAAN)

Federal Airports Authority of Nigeria (FAAN) is a public service organization statutorily charged to manage all Commercial Airports in Nigeria and provide service to both

passenger and cargo airlines. Generally, to create conditions for the development in the most economic and efficient manner of air transport and the services connected with it. Its mission is to develop and profitably manage customer-centric airport facilities for safe, secure and efficient carriage of passengers and goods at world-class standards of quality.

1.17.4 Nigerian Airspace Management Agency (NAMA)

Nigerian Airspace Management Agency (NAMA) is an Air Navigation Service provider with the mandate to manage the Nigerian Airspace to a level consistent with the requirements of ICAO SARPs and make it rank among the safest in the AFI region and the world.

1.18 Additional information

1.18.1 Braking with Anti-skid inoperative

When the anti-skid system is inoperative, the following techniques apply:

- Ensure that the nose wheels are on the ground and the speed brakes are extended before applying the brakes
- Initiate wheel braking using **very light pedal pressure** and increase pressure as ground speed decreases
- Apply steady pressure and DO NOT PUMP the pedals.
  Source: Aircraft Flight Manual (AFM), Braking Techniques with Anti-Skid Inoperative.

1.18.2 B737 Minimum Equipment List (MEL)

The B737 MEL is an important technical document developed by the Azman Air Ltd and approved by the Nigeria Civil Aviation Authority (NCAA). The B737 MEL was based on the B737 Master Minimum Equipment List (B737 MMEL). The approved B737 MEL is a document developed to allow aircraft of specific type and with serial numbers and registration numbers to be released with inoperative equipment and systems within a certain period, the formulation of which is based on the MMEL according to the differences of aircraft configurations selected by the airlines, and it is combined with the company's operating ability, experience, and other differences.

The MEL shall comply with or be stricter than the MMEL for the relevant aircraft type. The main purpose of the MEL is to make full use of the safety margin of aircraft design and to allow an aircraft with failures to continue to fly within the prescribed period in the context of ensuring the safe operation. It is noteworthy that the MEL is not the maintenance standard of the aircraft, and a flight with failures is not advocated at all. The maintenance department shall complete the troubleshooting activities as soon as possible. The MEL are categorized with specific time frames for rectification.

Category A: The repair time is determined by the specific instructions in the operators MEL which may include a set of number of days or conditions for continued operations.
Category B: Repairs must be completed within three consecutive calendar days.
Category C: Repairs must be completed within 10 consecutive calendar days.
Category D: Repairs must be completed within 120 consecutive calendar days.

2.0 ANALYSIS

2.1 Generals

The pilot flying was certified and qualified to conduct the flight; the copilot medicals and proficiency had expired as at the time of the occurrence. It is worthy of mention here that "Although the First Officer's Medical Certificate and Proficiency Check have expired and there was no application to NCAA for the extension of First Officer's exemption document as required by the NCAA's All Operators' Letter (AOL). There is no evidence to suggest that the First Officer's performance was impaired during the entire incident flight".

The aircraft had a valid Certificate of Airworthiness (C of A), maintenance record shows the tyres were maintained in accordance with relevant procedures and the aircraft weight and balance were within prescribed limits.

The analysis focuses on crew licensing, crew experience in relation to Anti-skid Inoperative condition, Extension in accordance with the Minimum Equipment List, and Emergency response/ Passenger evacuation.

2.2 Crew licensing

The Nigeria Civil Aviation Authority (NCAA) issued 'All Operators Letter' (AOL) NCAA/DG/AIR/11/16/288 stating "the validity of the exemption on all holders of Nigerian Aircrew and ATCO Medical certificates which was earlier issued on 1st April 2020 to expire on 31st December 2020 is hereby extended to 31st January 2021". A copy of this AOL and the exemption document should be carried along with the applicable license as no license endorsement would be made by the NCAA.

Ensuring that a pilot has an up-to-date medicals and proficiency before flying an aircraft is crucial for legal, safety, and operational reasons. It is a regulatory requirement for pilots to hold a current license and medical certificate to operate an aircraft as captured in Nig. CARs 2015 sections 8.4.1.4 (a)(1) Current medical certificate ensures the pilot is physically and mentally fit to safely operate an aircraft.

Furthermore, valid licenses often require recent experience and/or recurrent training. This ensures the pilot is current and competent, reducing the risk of errors or poor decision-making. Operating an aircraft without valid documents may void insurance coverage and in case of an incident or accident, the insurance company may refuse to pay for damages or liabilities. This is in addition to reflecting the company's commitment to high standards

Investigation reveals that the exemption was necessary at that time due to COVID -19 pandemic. However, going by the referenced NCAA AOL, and all the risks or implications of not having up to date medicals as highlighted. It is expected that all affected crew should have complied by applying for exemption and carry same with their license for any flight conducted during this period. The co-pilot could not produce the exemption document as required when requested for by the investigation.

2.3 Crew experience in relation to Anti-skid Inoperative condition

The aircraft anti-skid brake system ensures that the tyres will not wear excessively or burst while braking by reducing the brake pressure when the wheel is locked, thereby ensuring the safety of aircraft on take-off and landing.

Landing the aircraft on a wet runway with anti-skid inoperative significantly increases the risk of skidding, reduced braking effectiveness, and directional control issues. With

the anti-skid inoperative, it is expected of the crew to brake more conservatively to avoid wheel lock by modulating brake pressure.

Although Azman's MEL (C 32-2) allows that the aircraft could be dispatched for operation under this condition, it is therefore important to note that the Captain has the prerogative to operate the aircraft in accordance with documented procedures. It might be that relatively low flying time on type as Pilot-in-Command (PIC) contributed to the handling of the aircraft with anti-skid inoperative on wet runway as revealed by the investigation.

If a landing must be attempted with anti-skid INOP on a wet runway e.g., emergency or no alternate, the crew are expected to use minimal braking initially, apply brakes very cautiously and gradually to avoid lockup.

Furthermore, the aircraft crossed designated touchdown and landing past Link A2 may have resulted in excessive braking by the flight crew in an effort to prevent a runway overrun.

The investigation deduced that the PF's brake application produced the reverted rubber condition causing tyre debris during landing roll suggesting that applying light pressure on the brake pedal (as advised in the Chapter 14, B737 Airplane Flight Crew Operations Manual- ANTI SKID INOP. Deferred Items - landing Procedures Review under this condition) was not duly followed. Therefore, the PF's excessive brake application was unhelpful considering the prevailing conditions of the aircraft and the contaminated (wet) runway surface.

2.4 Extension on the Minimum Equipment List (MEL) Requirements

The Minimum Equipment List (MEL) outlines which equipment and systems on an aircraft that may be inoperative for it to remain airworthy under specific conditions.

Though certain items can be deferred, prolonged inoperative equipment may increase operational risks as it is in this case. It can also lead to operational restrictions and/or limitations.

Azman Airline Services was granted a 3-day ANTI SKID INOP approval on 20 January 2021 by the Nigeria Civil Aviation Authority (NCAA), which expired on the midnight of 22 January. Azman Airline Services continued flight operations with same aircraft without seeking further extension till 3 February. The aircraft was operated from 24 January to 3 February with anti-skid inoperative and without clearance from the NCAA.

Azman Airline Services was granted another 10-day extension from the 4 February 2021 which expired at midnight of 14 February.

The aircraft further operated from the 15 February 2021 till the time of the occurrence on the 16 February 2021 without maintenance action taken to rectify anti-skid inoperative condition. No evidence that a further extension of the MEL provision was requested or granted by NCAA.

Investigation believes that the timely rectification of the antiskid could have ensured continued safe, and efficient operations of the aircraft.

Therefore, as at the time of the occurrence, the aircraft was technically unserviceable due anti-skid being inoperative and not being operated under MEL provisions.

2.5 Emergency response and Passengers evacuation

Complete passenger disembarkation was achieved one hour nine minutes after AZM2325 stopped on runway 18R, in its compromised state.

The fire truck initially stationed during the disembarkation was called away for another duty hence there was no fire truck positioned during the emergency disembarkation of the passengers. According to ARFFS, its crew had another call for refueling standby at Gate D41 and another call on runway 18L. ATC requested that the call be disregarded but the instruction was not heeded.

ARFFS further stated that the location of the occurrence was determined through visual observation and was subsequently communicated to the ATC. It also added that the response from ATC was not cordial and coordinated.

Good operational synergy between ATC and the ARFFS is critical before and during emergency response operations as it ensures rapid, clear, and coordinated action to save lives and property. ATC provides vital, real-time information about the aircraft's location, status, and movements, while the fire service relies on this to position resources, access the incident site quickly, and carry out rescue and firefighting operations safely and efficiently. Without effective communication and coordination, response times may be delayed, operational safety compromised, and risks to passengers, crew, and responders increased.

Furthermore, not having a fire truck stationed during emergency rescue or disembarkation operations after any occurrence is highly dangerous and can significantly increase the risk of fatalities, injuries, and long-term consequences for passengers.

In case of fire, exposure to post crash fires or hazardous substances, fuel leaks or toxic fumes can quickly endanger the lives of passengers. The longer the delay, the higher the chance these conditions become fatal.

The traumatic situation experienced before the landing of the aircraft is crucial for the passengers as delays in emergency rescue attention may further lead to shock or injuries.

Quick response and evacuation also allow rescue teams to preserve the scene, which is essential for accident investigation as delays may lead to environmental degradation of perishable evidence and/or unauthorized interference.

Investigation believes that more efficient and shorter time would have been spent in getting the passengers to safety if there was operational synergy among relevant stakeholders and evacuation option had been considered. Bearing in mind that runway 18R was a very active runway hence delay in such kind of situation should be avoided.

3.0 CONCLUSIONS

3.1 Findings

1. The aircraft had a valid certificate of airworthiness.
2. The PF is qualified to conduct the flight.
3. The co-pilot medical certificate and proficiency have expired as at the time of occurrence.
4. The flight was operated outside the provisions of the Azman's approved B737 Minimum Equipment List on anti-skid inoperative (MEL Category C 32-2) and beyond the extension period that was granted to Azman by the Nigeria Civil Aviation Authority.
5. The crew carried out a missed approach on runway 18L and was subsequently vectored to runway 18R.
6. According to the ATC, the aircraft crossed the Touchdown Zone and landed past Link A2 of runway 18R.
7. The runway 18R surface was wet at the time of the occurrence.
8. A loud bang was heard after touch down and the aircraft stopped on the runway.
9. All the main wheel tyres were found burst during post occurrence inspection.
10. MMF02 (Fire Unit) arrived at the scene of the occurrence promptly.
11. The fire truck initially stationed during the disembarkation was called away for another duty.

12. The ARFFS Mobile command vehicle could not be deployed as at the time of occurrence at it was unserviceable.
13. The release of buses for evacuation was delayed.
14. Passengers were disembarked on the runway after one hour nine minutes of the landing time.
15. The assistance of LASEMA (Lagos State Emergency Management Agency) and NEMA (National Emergency Management Agency) was required to tow the aircraft from the runway
16. The disabled aircraft was removed from the runway after about five hour nine minutes.
17. The delay in towing the disabled aircraft was due to the lack of specialized equipment required to avoid further damage to both aircraft and runway.
18. LASEMA and NEMA rendered assistance in the removal of the disabled aircraft.

3.2 Causal factor

Main landing gear wheels lock during landing roll on a wet runway due to an unserviceable anti-skid.

3.3 Contributory factors

1. Decision to operate the flight with anti-skid system inoperative on a wet runway.

2. Decision to operate the flight outside the provision of the Azman Air Ltd approved B737 Minimum Equipment List on operation with anti-skid system inoperative (MEL Category C 32-2) and beyond the granted extension period.

4.0 SAFETY RECOMMENDATIONS

4.1 Safety Recommendations 2026-006

Azman Air Services Limited should be proactive in ensuring that aircraft with open items in the technical logbook and deferred defect list are cleared within the stipulated time frame in accordance with standard maintenance practice, before such aircraft is released to service.

4.2 Safety Recommendations 2026-007

Nigeria Civil Aviation Authority should increase its oversight function on maintenance practices on Azman Air Services Limited to ensure that an open item in the technical logbook and deferred defect list is cleared within the stipulated time frame in accordance with standard maintenance practice.

4.3 Safety Recommendations 2026-008

Federal Airports Authority of Nigeria & Nigerian Airspace Management Agency should ensure improved operational synergy between the Airport Rescue and Fire Fighting Services (ARFFS) and the Air Traffic Control (ATC) before, during and after any emergency response operations.

4.4 Safety Recommendation 2026-009

Federal Airports Authority of Nigeria should ensure that Airport Rescue and Fire Fighting Services (ARFFS) appropriate number of Fire Trucks are strategically positioned during

emergency operations, including emergency evacuation, until the process is fully completed.