



**AIRCRAFT ACCIDENT REPORT
AERO/08/21/2010/F**

Accident Investigation Bureau

**Report on the Serious Incident involving
AERO CONTRACTORS NIGERIA LIMITED
Boeing 737-500 Registration 5N-BLE at Runway 28
Yakubu Gowon Airport, Jos, Plateau State, Nigeria
On 21st August, 2010.**

This report was produced by the Accident Investigation Bureau (AIB), Murtala Muhammed Airport, Ikeja, Lagos.

The report is based upon the investigation carried out by Accident Investigation Bureau, in accordance with Annex 13 to the Convention on International Civil Aviation, Nigerian Civil Aviation Act 2006, and Civil Aviation (Investigation of Air Accidents and Incidents) Regulations.

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 Accident Investigation Bureau investigates for the sole purpose of enhancing aviation safety. Consequently, Accident Investigation Bureau reports are confined to matters of safety significance and should not be used for any other purpose.

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

Recommendations in this report are addressed to the regulatory Authorities of the state (NCAA). It is for this authority to ensure enforcement.

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GLOSSARY OF ABBREVIATIONS USED IN THIS REPORT/REFERENCES

ABV	Abuja
AIB	Accident Investigation Bureau
ASL	Above Sea Level
C of A	Certificate of Airworthiness
CCM	Cabin Crew Manager
CDL	Configuration Deviation List
CVR	Cockpit Voice Recorder
DH	Decision Height

ETA	Estimated Time Arrival
ETE	Estimated Time En-route
FDR	Flight Data Recorder
IFR	Instrument Flight Rules
LOS	Lagos
MEL	Minimum Equipment List
NCAA	Nigerian Civil Aviation Authority
NDB	Non Directional Beacon
PF	Pilot Flying
PM	Pilot Monitoring
QNH	Airfield Pressure corrected for sea level
QOW	Owerri
TDP	Take-off Decision Point
TSN/CSN	Time Since New/Cycles Since New
TSO/CSO	Time Since Overhaul/Cycles Since Overhaul
VHF	Very High Frequency
VMC	Visual Meteorological Condition
VSI	Vertical Speed Indicator

Aircraft Accident Report No. **AERO 08/21/2010/F**

Registered Owner and Operator: Aero Contractors Company of Nigeria Ltd.

Aircraft Type and Model: Boeing 737 - 500

Registration: 5N-BLE

Place of Accident: Yakubu Gowon Airport, Jos
Runway 28

Date and Time: 21st August, 2010 at 1738 hours

(All the times in this report are local time equivalent to UTC + 1) unless otherwise stated).

SYNOPSIS

Accident Investigation Bureau (AIB) was notified of the serious incident on the same day 21st of August, 2010 and investigators arrived in Jos in the morning of the next day 22nd of August, 2010. All other stakeholders were notified.

On 21st of August, 2010, about 1738 hrs, Aero Contractors flight 210, a Boeing 737-500, 5N-BLE, skidded off the threshold of runway 28 while landing on approach into Yakubu Gowon Airport, Jos, Plateau State. The flight was operating under the provisions of NCAA regulations as a scheduled domestic passenger flight from LOS to Yakubu Gowon Airport, Jos. The flight departed LOS about 1627 hrs, with two pilots, three flight attendants, and 87 passengers on board. The airplane commenced an approach and touched down with the Right Main Wheel 135 metres from the threshold, skidded off the runway 28 to the left into the grass area, damaged three runway light assemblies and uprooted the armored cables at the

airport. All 92 persons on board sustained little or no injury, and the aircraft was substantially damaged. The airplane was operated on an instrument meteorological condition (IMC) flight plan. The incident happened at about 1738 hours.

The investigation identified the following causal and contributory factors:

Causal Factor

The decision of the crew to continue the approach in an unstabilized condition, coupled with the Captain in-appropriate attempt to take over control of the aircraft.

Contributory Factors

1. Fatigue, which impaired the Captain's performance and reflected the effects of a long, demanding duty day associated with check airman functions.
2. Poor Crew Resource Management.
3. The prevailing weather condition.

Two safety recommendations were made.

1.0 FACTUAL INFORMATION

1.1 History of Flight:

Flight AJ 345, 5N-BLE, B737-500 departed Lagos for Yakubu Gowon airport, Jos at 1627 hrs, with 87 passengers and 5 crew on board.

The weather report of Jos Airport for 1500 UTC was made available to the captain of the aircraft on ground Lagos. At 1703 hrs, Flight AJ 345 contacted Jos Airport and was updated with the hourly weather report. Heavy rain was reported in Jos at this moment, crew was advised and aircraft was about 35 minutes to the station. The aircraft was given an inbound clearance for Runway 28, which was acknowledged by the crew. The aircraft was released to Jos by Kano Area Control Centre at 1722 hrs, with descent and approach clearance given for runway 28 by Jos ATC.

Prior to this, FAAN Electrical Unit was informed by Jos ATC to switch on the Approach and Runway lights for Runway 28.

At 1729 hrs, the Tower cleared the aircraft to 7000 ft and for VOR/DME Approach on Runway 28.

The Captain requested for the runway lights to be turned ON by 1732 hrs and was told by the Tower that FAAN Electrical Unit was having problem putting on the lights.

The weather situation was bad even though the rain had stopped. There was low cloud base and wet runway. The runway 10 equipped with Instrument Landing System (ILS) was unserviceable.

At 7 nautical miles (NM) final, the Tower re-advised the crew that the runway lights were not ON due to technical problem encountered by FAAN Electrical Unit.

The captain reported 'Field in Sight' at 1737 hrs while Tower requested him to confirm "Runway in Sight" which he replied in the affirmative. Based on this confirmation, the aircraft was cleared to land on Runway 28.

According to ATC, within few seconds later, the aircraft was sighted about 1 nautical mile, struggling to align to the centre line of the runway.

The aircraft touched down with the Right Main wheel 135 meters from the threshold, skidded off the runway to the left into the grass area, damaged three runway lights and uprooted the armored cables.

The Starboard engine made contact with the runway, damaged the lower cowling and ingested foreign objects that resulted to fan blades damage and punctures at the air intake section of the engine.

The aircraft recovered from the grass area back to the centre line of the runway and came to rest at 2000 metres from the threshold of runway 28. The Nose gear shock strut collapsed and the two nose wheels were damaged and deflated.

The captain requested for step to disembark the passengers as he could not taxi the aircraft off the runway. Passengers were later evacuated in an orderly manner without injuries or further incident. The incident occurred at runway 28 of Yakubu Gowon Airport at about 1738 hours in daylight.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	Nil	Nil	Nil
Serious	Nil	Nil	Nil
Minor/None	5	87	Nil

1.3 Damage to Aircraft

The aircraft was substantially damaged.

1.4 Other Damage

3 Runway edge lights were damaged and armored cable uprooted with cuts. See fig 1.4 below;



Fig 1.4 Damaged runway edge lights and uprooted armored cable

1.5 Personnel Information

1.5.1 CAPTAIN

Age:	53 yrs
Gender:	Male
Nationality:	Nigerian
Licence No.:	ATPL 2002
Validity:	30 th November, 2010
Aircraft Rating:	Fokker F27, A310, B737-200, 737-300/500
Total Flying Hrs:	13800 Hrs
Hours on Type:	2172 Hrs
Proficiency Check:	19 th March, 2010
Medical (Validity):	30 th November, 2010
Last Simulator:	18 th March, 2010
Simulator Validity:	17 th September, 2010
Last 90 days:	171:20 Hrs
Last 28 days:	65:55 Hrs
Last 24 Hrs:	04:35 Hrs

The captain was qualified to fly the aircraft. According to records, he was not scheduled for the flight but for an earlier training flight. Being the fleet captain he accepted to operate the flight as the rostered captain was duty time expired while the standby captain was indisposed.

1.5.2 THE FIRST OFFICER

Age:	25 yrs
Gender:	Male
Nationality:	Nigerian
Licence No.:	ATPL 4863
Validity:	30 th November, 2010
Aircraft Rating:	Dash-8, DHC-6 (Twin Otter), B737-300/500
Total Flying Hrs:	2869 Hrs
Hours on Type:	1670.9Hrs
Proficiency Check:	14 th March, 2010
Medical (Validity):	30 th November, 2010
Simulator Validity:	13 th September, 2010
Last 90 days:	153:35 Hrs
Last 28 days:	78:40 Hrs
Last 24 Hrs:	1:16 Hrs

The first officer was qualified to fly the aircraft and was the PF at the time of the incident. He had total hours of 2869 hrs and 1670.9 hrs on type.

1.6 Aircraft Information

1.6.1 General Information

Type:	B 737-500
Serial No.:	26672
Manufacturer:	Boeing Aircraft Company, USA
Date of Manufacture:	7 th August, 1992
Airframe time:	43990:02 hrs
Cycles:	37709
TSN:	43990:57
CSN:	27709
C of A Validity:	9 th February, 2011

The Boeing 737-500 is a short-to-medium-range twin engine jet airliner. It seats up to 120 passengers and is powered by two CFM56 turbofan engines. See fig 1.6 below;



Fig 1.6 Picture showing aircraft long before the accident

1.6.2 Power Plant No.1:

Engine Type:	CFM
Manufacturer:	GE Aviation
Model:	CFM 56-3C-1
Serial No.:	726352
TSO:	43607:28 hrs
Cycles:	31935
Date of Manufacture:	June 1985

1.6.3 Power Plant No.2:

Engine Type:	CFM
Manufacturer:	GE Aviation

Model: CFM 56-3C-1
Serial No.: 721707
TSO: 55792:1 hrs
Cycles: 37111
Date of Manufacture: April 1987

Type of fuel Used: Jet A1

Weight and Balance was within limit.

1.7 Meteorological Information

The actual meteorological condition as obtained from Nigerian Meteorological Agency (NIMET) was as follows:

Time : 1500 UTC

Wind : 300/18kts
Visibility : 10km
Weather : Thunderstorm
Cloud : BKN 180m Few CB 420m SE
Temp. : 23^oC/20^oC
QNH : 1018 hPa

Time : 1600 UTC

Wind : 260/18kts
Visibility : 2500m
Weather : Thunderstorm
Cloud : BKN 150m Few CB 450m
Temp. : 19^oC
QNH : 1018 hPa

1.8 Aids to Navigation

NOTAM was issued showing that E/ILS Glide Slope with Frequency 330.2 MHz now serviceable and Non-Directional Beacon (NDB) with Frequency 270 KHz was not serviceable at the time of the incident and shut down for maintenance. Approach light of runway 10 and edge lights were reported to FAAN as unserviceable.

1.9 Communication

There was good communication between the aircraft and the control tower throughout the duration of the flight.

1.10 Aerodrome Information

The aerodrome is situated to the South, 34km from the city. It has elevation of 4232ft (1,290m). It is a controlled airfield for both IFR and VFR operations with runway orientation of 10/28.

The runway is 148ft (45m) wide and 9843ft (3000m) long.

The airport has an off-set VOR/DME approach on Runway 28. See below Fig.1.10a-b the Jeppesen chart on VOR/DME of runway 10/28.

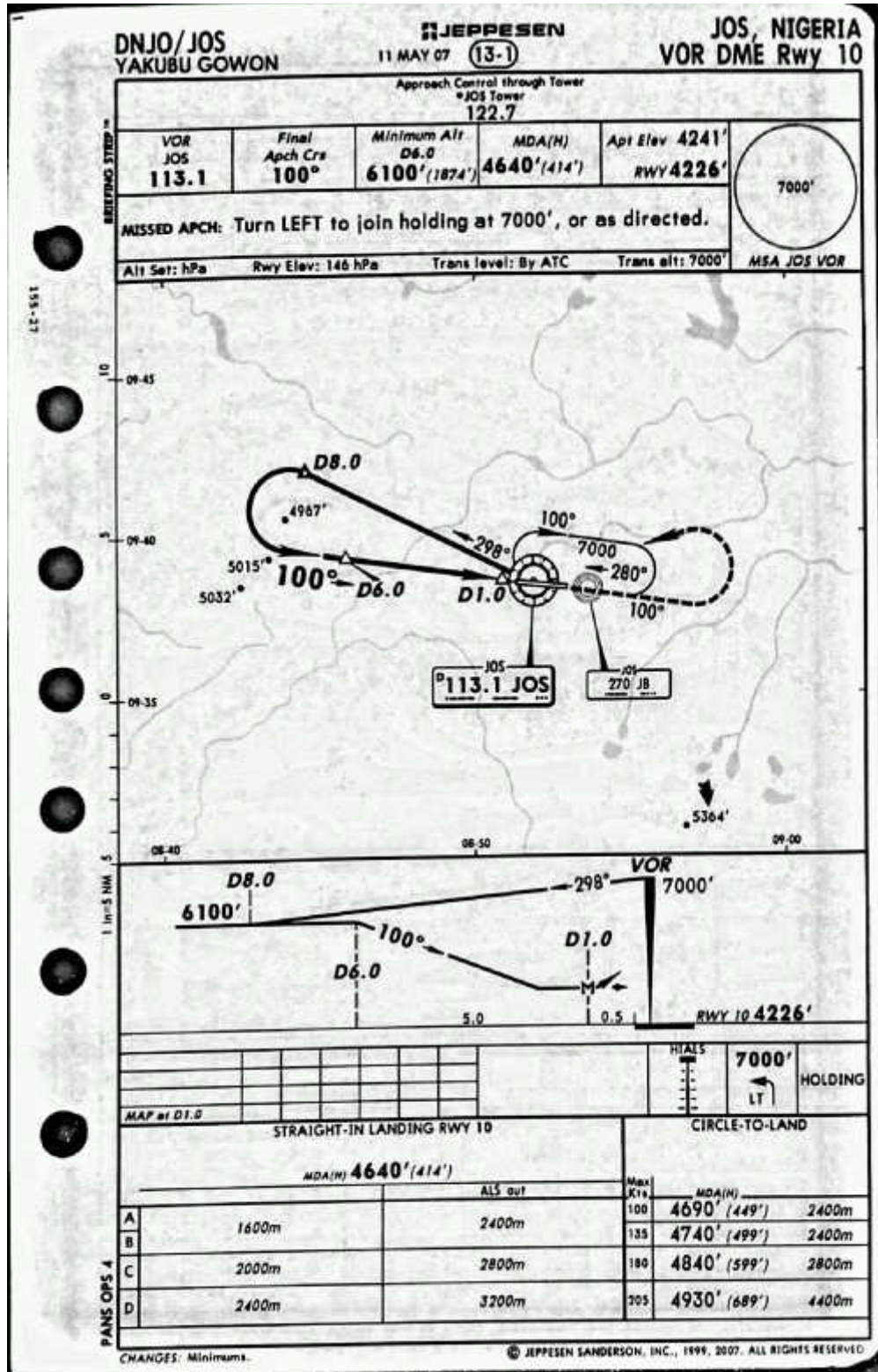


Fig. 1.10a Jeppesen Chart showing VOR/DME on Runway 10

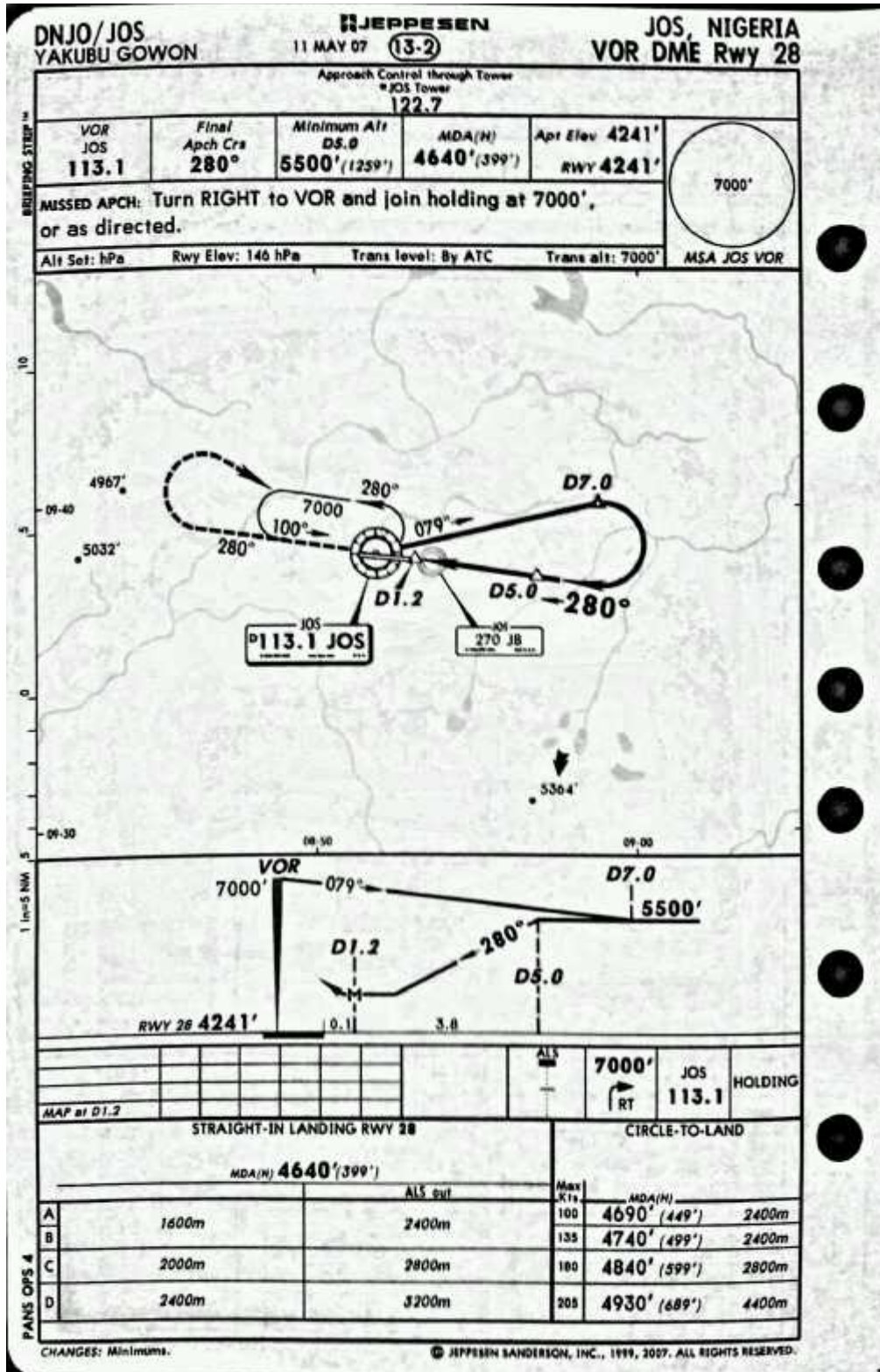


Fig. 1.10b Jeppesen Chart showing VOR/DME on Runway 28

1.11 Flight Recorder

The flight recorders were recovered in good condition and sent to UK Air Accident Investigation Branch (UK AAI) for download and analysis.

1.11.1 FLIGHT DATA RECORDER

Part Number: 980-4700-042
S/N: 0980
Date Code: 9508
Manufacturer: Honeywell

See fig. 1.11.1 below;



Fig. 1.11.1 Picture showing flight data recorder

1.11.2 COCKPIT VOICE RECORDER

Part Number: 980-6020-001
S/N: 2957
Date Code: 9918
Manufacturer: Allied Signal

See fig. 1.11.2 below;



Fig. 1.11.2 Picture showing cockpit voice recorder

1.12 Wreckage and Impact Information

The aircraft touched down with the Right Main wheel 135 metres from the threshold, skidded off the runway to the left into the grass area, damaged three runway lights and uprooted the armored cables.

The Starboard engine made contact with the runway, damaged the lower cowling and ingested foreign objects that resulted to fan blades damage and punctures at the air intake

section of the engine. Both fuel tanks were intact and not ruptured.

The aircraft recovered from the grass area back to the centre line of the runway and came to rest 2000 metres from the threshold of runway 28. The Nose gear shock strut collapsed and the two nose wheel were damaged and deflated. See fig 1.12a-g below;



Fig 1.12a Picture showing damaged lower cowling



Fig 1.12b Picture depicting nose landing shock strut collapse with burst tires



Fig 1.12c Picture showing nose landing gear with burst tires



Fig 1.12d Picture showing under fuselage damaged



Fig 1.12e Picture showing engine cowling with ingested materials and lip damages



Fig 1.12f Picture showing tyre marks of aircraft veered off the runway 28



Fig 1.12g Picture showing tyre marks of aircraft veered off the runway 28
and up-rooted armored cable

1.13 Medical and Pathological Information

Nil.

1.14 Fire

There was no evidence of fire in-flight or post impact fire.

1.15 Survival Aspect

The incident was survivable although the aircraft skidded off the runway, and the damage to the aircraft was substantial but a liveable volume existed. The crew and the passengers survived the incident without any fatality. The mishaps occurred within the vicinity of the airport.

1.16 Test and Research

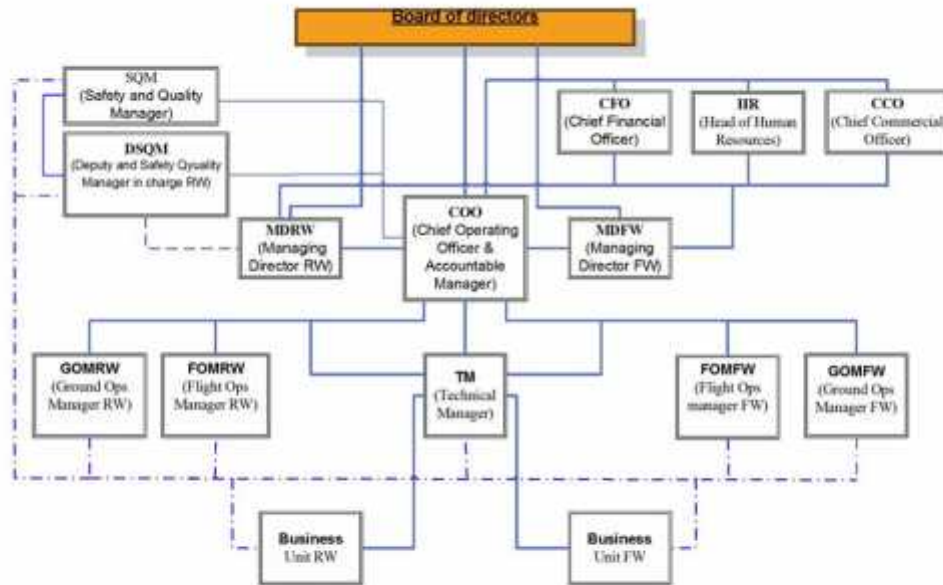
Not applicable.

1.17 Organization and Management Information

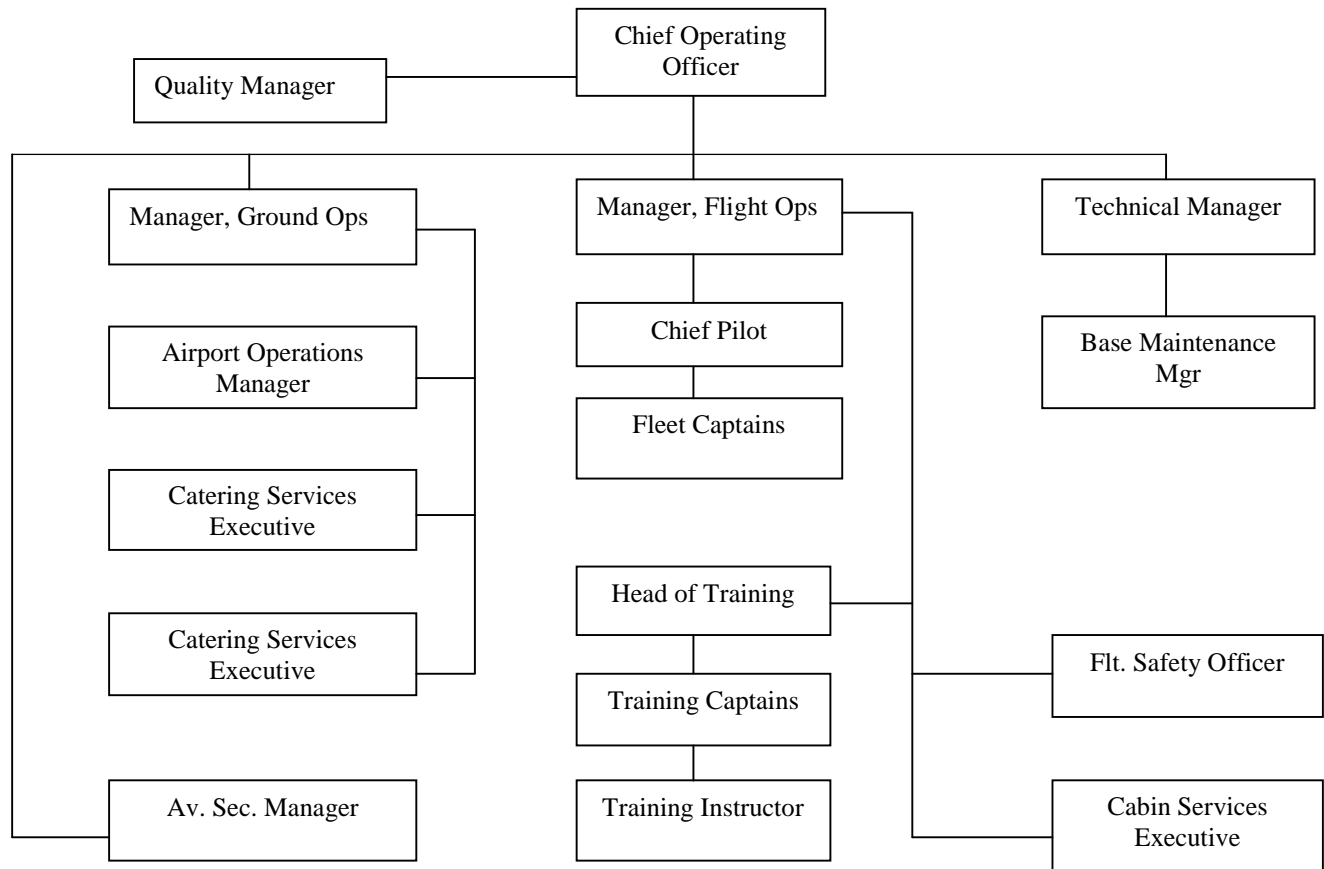
Aero Contractors Company of Nigeria Limited (ACN) was incorporated 1959 and operates both rotary and fixed wing services. ACN Provide scheduled fixed wing passenger services to various Nigerian domestic airports and international destinations in the West African sub-region.

Extract from Aero Contractors (ACN) Operations manual Part A, section 1

1.17.1 Group Organizational Scheme



1.17.2 Aero Fixed Wing Organization Scheme



1.17.2.1.1 AUTHORITY

All lawful commands given by the PIC for the purpose of securing the safety of the aircraft and of persons or property carried shall be obeyed by all passengers and aircrew.

RESPONSIBILITIES

The PIC shall:

- a. *Maintain familiarity with relevant Nigerian and International air legislation and agreed aviation practices and procedures.*
- b. *Maintain familiarity with such provisions of the Company operations manual as are necessary to fulfil his function ensuring that all operational procedures and checklists are complied with in accordance with the operations manual.*
- c. *Be responsible for the safe operation of the aircraft and safety of its occupants and cargo from the moment the cabin doors are shut for the purpose of flight, to the moment the cabin doors are open following engine shutdown.*
- d. *Have authority to give all commands he deems necessary for the purpose of securing the safety of the aircraft and of persons or property carried therein, and all persons carried in the aircraft shall obey such commands.*
- e. *Have authority to disembark any person, or part of the cargo; which in his opinion, may represent a potential hazard to the safety of the aircraft or its occupants.*
- f. *Not allow a person to be carried in the aircraft who appears to be under the influence of alcohol or drugs to the extent that the safety of the aircraft or its occupants is likely to be endangered.*
- g. *Have the right to refuse transportation of inadmissible passengers, deportees or persons in custody if their carriage poses any risk to the safety of the aircraft or its occupants.*

- h. Ensure that all passengers are fully briefed on:
 1. use of the seat belt;
 2. the location and operation of the emergency exits;
 3. the method of locating and jettisoning windows;
 4. the method of opening and emergency jettisoning of cabin doors;
 5. the method of deploying life rafts and their subsequent operation (as applicable);
 6. ETE, ETA, forecast weather en-route and at destination;
 7. the need to read the passenger safety briefing card;
 8. Restriction on use of portable electronic devices.*

- i. Ensure that the weather forecast and reports for the proposed operating area and flight duration indicate that the flight may be conducted without infringing company operating minima.*

- j. Decide whether or not to accept an aircraft with unserviceabilities allowed by the carried forward sheet, CDL and MEL.*
- k. Take all reasonable steps to ensure that the aircraft, and any required equipment is serviceable.*
- l. Ensure that the correct type of fuel and oil is loaded in sufficient quantity to meet the Company requirements for the proposed flight.*
- m. Take all responsible steps to ensure that the aircraft mass and balance is within the calculated limits for the operating conditions.*
- n. Confirm that the aircraft's performance will enable it to complete safely the proposed flight.*

- o. Not permit any aircrew-member to perform any activity during take-off, initial climb, final approach and landing except those duties required for the safe operation of the aircraft.*
- p. Take all responsible steps to ensure that before take-off and before landing the flight and cabin crew are properly secured in their allocated seats.*

NOTE: Required cabin crew should be properly secured in their allocated seats during taxi except for the performance of essential safety related duties.

- 17. Take all reasonable steps to ensure that whenever the aircraft is taxiing, taking-off or landing, or whenever he considers it advisable (e.g. in turbulent conditions), all passengers are properly secured in their seats, and all cabin baggage is stowed in the approved stowage's.*
- 18. Ensure that the documents and manuals listed in section 8.1 par.12 of this manual are carried and will remain valid throughout the intended flight or series of flights.*
- 19. Ensure that the pre-flight inspection has been carried out.*
- 20. Not permit:*
 - a. a flight data recorder to be disabled, or switched off or erased during flight nor permit recorded data to be erased after flight in the event of an accident subject to mandatory reporting;*
 - b. a cockpit voice recorder to be disabled or switched off during flight unless he believes that the recorded data, which otherwise would be erased automatically, should be preserved for incident or accident investigation nor permit recorded data to be manually erased during or after flight in the event of an incident or accident subject to mandatory reporting.*

- c. Any person to be in any part of the aircraft in flight which is not a part designed for the accommodation of persons, unless temporary access has been granted for a certain purpose.*
- 21. Be responsible to the Chief Pilot for any non-flying duties which may be allocated to him.*
 - 22. Maintain a high personal standard of discipline, conduct and appearance as a representative of the Company*
 - 23. In an emergency situation that requires immediate decision and action, take any action he considers necessary under the circumstances. In such cases he may deviate from rules, operational procedures, and methods in the interest of safety.*
 - 24. Have the authority to apply greater safety margins including airport operating minima if he deems it necessary.*
 - 25. Ensure that, in the event of third party maintenance being required while away from base, the procedures referred to in section 8.1.11 par.05 are followed.*
 - 26. Ensure that a continuous listening watch is maintained on the appropriate radio communication frequencies at all times whenever the flight crew is manning the aircraft for the purpose of commencing and/or conducting a flight and when taxiing.*
 - 27. Will comply with section 8.1.1 par.04*
 - 28. Will, allocate aircrew duties as such that, if necessary, he can devote himself mainly to supervision and decision making.*

1.17.2.2 DUTIES AND RESPONSIBILITIES OF CREW-MEMBERS OTHER THAN THE PIC

01 GENERAL

All aircrew members are responsible to the PIC to assist in the safe and efficient conduct of flight. In the event of the incapacitation of the PIC, the COP will assume command.

The departmental head to whom they are responsible when not reporting directly to a PIC, is the Chief Pilot.

When they are executing check and training duties, they are also responsible to the Chief Pilot.

02 COPILOT'S RESPONSIBILITIES

The COP must take all reasonable steps to:

- a) Maintain familiarity with relevant Nigerian and International air legislation and agreed aviation practices and procedures.*
- b) Maintain familiarity with such provisions of the Company Operations Manuals as are necessary to fulfil his function.*
- c) Assist the PIC as requested, concerning administrative duties in relation to the flight, and:*
- d) Support the PIC in the maintenance of a proper standard of aircrew discipline, conduct and personal appearance.*

It is the specific responsibility of the COP:

- e) To prepare the Operational Flight Plan and, when necessary, file the ATS Flight Plan with the appropriate Authority.*
- f) If stored plans are used then he should ensure that the correct plan has been activated.*
- g) To carry out such duties concerning the flight, in accordance with Company Standard Operating*

Procedures, including procedures, limitations and performance relating to the specific aircraft type, as are allocated to him by the PIC.

- h) To confirm the safe navigation of the aircraft, maintaining a continuous and independent check upon both the geographical position of the aircraft and its safe terrain clearance.*
- i) To volunteer such advice, information and assistance to the PIC, as may contribute favorably towards the safe and efficient conduct of the flight.*
- j) To seek and receive such information and/or explanation from the PIC, as may be necessary to enable him to fulfil his function.*
- k) To maintain a high personal standard of discipline, conduct and appearance as a representative of the Company, and thereby*
- l) Support the PIC, by active example, in the development and maintenance of a high standard of professional expertise and morale amongst the aircrew, when carried.*
- m) To report to the PIC any fault, a failure malfunction or defect which he believes may affect the airworthiness or safe operation of the aircraft including emergency systems,*
- n) To report to the PIC any incident that endangered or could have endangered the safety of operation,*
- o) To make use of the operators occurrence reporting schemes in accordance with section 2.2 and 11 of this manual.*

1.17.3 Duty Times For Management Pilots

Extract from Aero Contractors (ACN) Operations Manuals Part A, section 7.3

- 1) Time spent in the office is considered as duty time and should be logged as such.*
- 2) Management pilots are to ensure that they comply to the FDP on their scheduled flight days*
- 3) Management pilots are limited to a maximum of 40 flying hours in any consecutive 30 flying days*

1.17.4 Approach Briefing and Go-around procedures

Extract from Aero Contractors (ACN) Operations Manuals Part A, section 8.4.1.

1.17.4.1 Approach Briefing

This must be given by the Pilot Flying before the aircraft commences its initial descent for approach and should cover at least the following items:

- 1) Initial descent point navigational fix,*
- 2) Any airport special briefing,*
- 3) Safety altitudes, Sector Safety Altitude (SSA) and Minimum Safe Altitude (MSA) from approach plate,*
- 4) The STAR or arrival route including transition level, holding facility, minimum holding altitude and speed restrictions,*
- 5) The Instrument Approach Plate (Chart) covering procedures, radio aids, and approach minima,*

- 6) *The airport chart covering touchdown elevation, QNH/QFE (mBar / hPa) difference if relevant, expected visual cues on contact, runway conditions and expected runway exit,*
- 7) *Aircraft operation covering anti-icing, wind conditions, wipers, landing lights, and wheel brake requirements,*
- 8) *Planned alternate airport and fuel requirement,*
- 9) *Approach and Threshold speeds,*
- 10) *Questions.*

All pre-landing checks should be completed before descending below 1000 ft above the runway threshold excepting only type specific and/or late phase items such as landing lights, windscreen wipers etc.

This is in order that the final stages of the approach can be adequately monitored.

During all approaches the aircraft descent path must be carefully monitored. This is of particular relevance when conducting non-precision approaches where altitude/height versus range/fix checks are to be strictly observed.

For operations to airports where there are neither navigational aids nor published procedures, specific instructions are detailed in Part C.

1.17.4.2 Descent for Approach

An aircraft must not descend below the appropriate safety altitude except:

- 1) *By using an approved Instrument Approach procedure; or*
- 2) *When under positive radar control and the PIC is satisfied with the flight profile; or*

3) *When in continuing visual contact with the ground and able to ensure adequate clearance from all obstacles affecting the intended flight path.*

NOTE: Descent when using ILS glideslope information as the sole means of vertical guidance must not be made below the relevant safety altitude until the aircraft is established on the ILS localizer and is within 10 NM of touchdown.

The position of the aircraft must be positively established prior to commencing descent and reconfirmed prior to descending below the relevant safe altitude.

Except in an emergency, or when there has been a significant change in reported weather conditions, no more than two successive approaches to an airport may be carried out where both approaches have resulted in go-around.

1.17.4.3 Stabilized Approach

During any type of approach, the aircraft MUST be established in the landing configuration, on profile with the required speed and trim by 1000ft AFE. This may reduced to 500ft during a visual approach.

If the aircraft is not established as described above a Go-Around is mandatory.

1.17.5 Evacuation

Extract from Aero Contractors (ACN) Emergency Evacuation Card

If after landing an evacuation is required the PIC will announce:

“EVACUATION, EVACUATION, EVACUATION”

At this time the CCM’s will announce:

“OPEN SEATBELT, GET OUT, COME THIS WAY, (INFLATE LIFEVEST)

JUMP, RUN (SWIM).”

If after landing an evacuation is not required the PIC will announce:

“KEEP YOUR SEATS (ALL NORMAL)”

1.17.6 High Drag/Side Load Landing/Off Runway Excursion

Extract from Aero Contractors (ACN) Boeing (737-300/400/500) Aircraft Maintenance Manual

(1) The hard landing or high drag/side load or off runway excursion conditional inspection should be initiated whenever one or more of the following occurs:

- a) The airplane skids or overruns from the prepared surface.*
- b) The airplane lands short of the prepared surface.*
- c) The airplane makes a landing which involves the blowing of two tires.*

1. If the only inspection trigger that occurred was the blowing of two or more tires, then the blown tires do

not count as “damage” for the purposes of determining if a Phase II inspection is necessary because all damaged parts would be replaced before further flights.

In this case, if the Phase I inspection reveals no other damage beyond blown tires and damaged wheels or brakes, then the aircraft can be returned to service without having to complete a Phase II inspection.

d) The airplane skids on the runway such that damage of the airplane is suspected.

1.17.7 Nigerian Civil Aviation Authority (NCAA)

NCAA is the organization that regulates the aviation industry, as part of her Nigeria Civil Aviation Regulations (NCAR) - July 2009 which states;

- 1.17.7.1 NCAR.8.5.1.1.** *(a) The PIC shall be responsible for the operations and of the aircraft and for the safety of all persons on board, during the flight.*
- (b) The PIC of an aircraft shall have final authority as to the operation of the aircraft while he or she is in command.*
- (c) The PIC of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the PIC may depart from these rules in emergency circumstances that render such departure absolutely necessary in the interest of safety.*

1.17.7.2 Decision Height (DH or MDA)

NCAR 8.8.4.15 Where a DH or MDA is applicable; no pilot may operate a civil aircraft at any aerodrome or heliport below the authorized MDA, or continue an approach below the authorised DH unless--

(1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal manoeuvres;

(2) For commercial air transport operations, the descent rate will allow touchdown zone of the runway of intended landing;

(3) The reported flight visibility is not less than the visibility prescribed in the standard instrument approach being used or the controlling RVR is above the specified minimum; and

(4) At least one of the following visual reference for the intended runway is distinctly visible and identifiable to the pilot:

(i) The approach light system, except that the pilot may not descend below 100ft above the touchdown zone elevation using the approach lights as a reference unless the red terminating bars or the red side row bar are also distinctly visible and identifiable.

(ii) The threshold;

(iii) The threshold markings;

(iv) Threshold lights;

- (v) *The runway end identifier lights;*
- (vi) *The visual approach slope indicator;*
- (vii) *The touchdown zone or touchdown zone markings;*
- (viii) *The touchdown zone lights;*
- (ix) *The runway or runway markings; or*
- (x) *The runway lights.*

1.17.8 Federal Airport Authority of Nigeria (FAAN)

Federal Airport Authority of Nigeria (FAAN) mission is to develop and profitably manage customer oriented airport facilities for safe, secure and efficient carriage of passengers and goods at world class standards. Also have the responsibilities to manage airport lightings such as; approach lights, runway edge lights, runway markings etc.

1.17.9 Nigerian Airspace Management Agency (NAMA)

The Nigerian Airspace Management Agency (NAMA), was created by an Act No. 48 of 1999 of the Federal Republic of Nigeria, to develop the Nigerian Airspace to a level consistent with the requirements of the ICAO Standards and Recommended Practices (SARPs). The Agency is charged with the provision of Air Navigation Services to ensure a SAFE, efficient, expeditious and economic flight operations.

OBJECTIVES;

In order to achieve its mission, the Agency has the following objectives:

- *To continue to provide safe and functional air navigation services that will meet international standards.*
- *To increase Air Traffic Control (ATC) capacity in order to manage the increasing air traffic volume and simultaneously reduces delays.*
- *To enhance the services quality.*
- *To reduce cost for users.*

1.18 Additional Information:

1.18.1 Human Factor Elements:

- **Duty Cycle of the crew;**

The Captain resumed at 6:30hrs and had three sectors line training earlier in the morning.

The First Officer resumed at 11:30 hrs and waited long up to 17:30 hrs for an aircraft to operate the flight.

The Captain affirmed to the First Officer of tiredness.

- **Refueling;**

The crew waited long about one and half hours on ground for refueling of the aircraft.

The First Officer discussed with operations to cancel the flight due to sun rise - to - sun set operation into Jos airport including the weather forecast available to the crew.

- Crew resource management;

Accident investigations have proven that most crashes are not really caused by technical defects of the aircraft, but breakdown at the interpersonal level of the crew. Crew resource management is an effective tool in improving the interpersonal skills in the cockpit.

1.18.2 Evaluation of runway friction level:

“Runway contamination and related issues represent major runway excursion risk factors and point to an urgent need for a common understanding of the complex interaction between factors that affect the use and performance of aircraft braking systems. This involves a wide range of factors, including the reporting of runway conditions in a standardized manner such that flight crews are able to accurately determine aircraft take-off and landing performance.”¹

The runway was contaminated with rubberized deposits at the touchdown zones. However, runway friction level was not a factor in the incident, but investigations revealed that evaluation of runway friction level has never been carried out by FAAN.

1.19 Useful or Effective Investigation Techniques:

Nil.

¹ Fighting Runway excursions - Runway Surface Condition Assessment, Measurement and Reporting-www.icao.int

2.0 ANALYSIS

2.1 Conduct of Flight

The crew operated a scheduled public transport (passenger) flight AJ 345, from M.M.A. Lagos to Yakubu Gowon airport, Jos at 1627 hrs, with 87 passengers on board. They were aware of the NOTAM stating that E/ILS Glide Slope with Frequency 330.2 MHz serviceable and E/Locator Beacon Frequency 270 KHz was unserviceable and shut down for maintenance.

While approaching Jos airport, the Captain requested for the runway lights to be turned ON by 1732 hrs and was told by the Tower that FAAN Electrical Unit had problem to put on the lights.

According to ATC transcript, on approach, the captain reported 'Field in Sight' at 1737 hrs while Tower requested him to confirm "Runway in Sight" which he replied "affirmative". Based on this confirmation, the aircraft was cleared to land on Runway 28.

Few seconds later, ATC sighted the aircraft about 1 nautical mile away struggling to align to the centre line of the runway. The aircraft drifted off the extended centerline of runway 28.

The aircraft touched down with the Right Main wheel 135 metres from the threshold, skidded off the runway to the left into the grass area, damaged three runway light assemblies and up-rooted the armored cables.

The Starboard engine made contact with the runway, damaged the lower cowling and ingested foreign objects that resulted in fan blades damage and punctures at the air intake section of the engine.

The aircraft recovered from the grass area back to the centre line of the runway and came to rest 2000 metres from the threshold of runway 28. The Nose gear shock strut collapsed and the nose wheel was damaged and the tyres deflated.

The captain was busy calling Lagos, and the emergency evacuation was not accomplished as required by the Emergency Operation Check List and Company's Ops Manual see section 1.17.1.4 above.

He later requested for step to disembark the passengers as he could not taxi the aircraft off the runway. Passengers were disembarked without injuries or further incident. The investigation revealed that due to the nature of the incident there was a risk of fire outbreak. The crew did not follow the approved emergency and company procedures to mitigate this possibility.

According to the records available, the aircraft was serviceable at the time of the incident. The last Certificate of Airworthiness (C of A) was issued 3rd January 2009 and valid to 9th of February, 2011.

2.2 Extra Ordinary Events Preceding the Incident

According to evidence available to the Bureau, on the incident day, the captain (the fleet captain) was rostered on a route training flight (LOS-QOW-ABV-LOS), which he operated early in the day. Another captain was rostered to operate LOS-JOS-LOS later in the day.

The rostered captain was to position Lagos from Abuja. Unfortunately, the captain that operated into Abuja on diversion enroute Kaduna, had an issue with NCAA Air Safety Inspector and his licence was seized. He could not operate the flight any further.

The First Officer after reporting for duty on the incident day was informed of the delay (LOS-JOS-LOS) due to the fact that the flight operated by Chanchangi Airline aircraft had an incident the night before in Kaduna, and this resulted in the early morning Aero Contractors' flight from Lagos diverted to Abuja. This made the rostered captain for the LOS-JOS-LOS sector to operate the Kaduna flight from Abuja and subsequently LOS-KANO-LOS exhausting his duty time for the day.

Meanwhile, the fleet captain ended his route training flight arriving back to Lagos, met a scheduled flight (LOS-JOS-LOS) waiting to be operated. The captain was hoping to go home, as he had finished his flight for the day when the issue of the stand-by pilot who reported sick came up. The fleet captain (The captain) opted to operate the Jos flight with the rostered First Officer for the flight.

2.3.1 The Captain (Fleet Captain)

The captain was qualified to fly the aircraft. He had total flying time of 13800 hours and 2172 hours on type. He was not rostered for the flight while the captain scheduled for the service had exhausted his duty time for the day. The standby pilot reported sick and he (the fleet captain) had to re-position for the flight. He was the pilot monitoring (PM) on the incident flight. He did a route training flight for that day and performed the duties of a check airman.

He had good communication with the tower as the PM. The captain was doing the radio work while the first officer was the pilot flying.

2.3.2 The First Officer

He had total flying time of 2869 hours and as well rated on the aircraft. The first officer was qualified to fly the aircraft and was the pilot flying at the time of the incident. He had 1670 hrs on type.

2.3.3 Human Factor Elements

According to evidence from the crew, the captain resumed duty at about 6:30 hrs and did line training for three sectors. However, trainings are usually demanding and exhausting to flight crew. The Captain was tired and this was confirmed during the cause of discussions with the First Officer before the incident flight.

The long wait by the crew for about one and half hour for re-fuelling of the aircraft added to anxiety and further tiredness.

The First Officer resumed duty at 11:30 hrs and waited till 17:30 hrs for an aircraft to operate the incident flight. According to evidence obtained from the First Officer, he discussed the possibility of cancellation of the flight due to sunrise-to-sunset operation of Jos airport followed by the weather forecast made available to the crew; and to this the Operations Department disagreed.

There was element of organizational pressure to operate the flight, which the Captain accepted as the fleet captain B737 and a management staff of the airline. The Captain had the option to cancel the flight if he so wished based on the company's standard operating procedures on duty time. He was not rostered for the flight; but accepted to do the flight as all efforts to access another captain failed.

The unstabilised approach led to the Captain attempting to make necessary corrections with inappropriate procedure. The correct procedure would have been the Captain announcing that “*I have control*” which should be responded by the pilot flying “*You have control*”. The aircraft lost proper control which resulted in the runway excursion.

However, good airmanship requires the captain to take control of the aircraft early enough with a standard callout, when he noticed deviation from the runway centerline axis or make the standard call-out for “Go-around” as the PM.

2.3.4 Crew Resource Management (CRM)

The investigation also revealed poor crew resource management precipitated by lack of adequate communication and poor standard call-out. The CVR revealed that during touchdown neither the captain nor the first officer was in control of the aircraft. “*I wanted to go-around; I thought you were the one flying*”, crew comment captured in the CVR.

2.4 Meteorological Information

The meteorological condition as obtained from Nigerian Meteorological Agency (NIMET) was as follows:

Time	:	1500 UTC
Wind	:	300/18kts
Visibility	:	10km
Weather	:	Thunderstorm
Cloud	:	BKN 180m Few CB 420m SE
Temp.	:	23 ⁰ C/20 ⁰ C
QNH	:	1018 hPa

Time	:	1600 UTC
Wind	:	260/18kts
Visibility	:	2500m

Weather : Thunderstorm
Cloud : BKN 150m Few CB 450m
Temp. : 19⁰C
QNH : 1018 hPa

The weather report of Jos Airport for 1500 UTC was made available to the captain on ground Lagos. Heavy rain was reported when the crew had contact with Jos ATC about 35 minutes to the station. The weather situation was bad even though the rain had stopped. There was low cloud base and wet runway and high wind at 18kts coupled with the thunderstorm in the vicinity. This weather situation should have informed the captain to take control of the flight from the onset as part of initial planning. However, at short final the captain requested for wind and was given 300/05kts.

2.5 FAAN Electrical Department

According to records available to AIB in this investigation, the approach lights and the edge lights of runway 10 were severally reported unserviceable to FAAN Electrical Department.

The Duty ATC officer reported the case of approach light to Electrical department of FAAN as evident in the ATC record from June through July to August 2010; but nothing was done to rectify the issue. The aircraft landed without runway approach and edge lights **ON** on the day of the incident.

Approach lights allow the pilot to visually identify the runway environment and align the aircraft with the runway. It is installed on the approach end of an airport runway and consists of a series of light bars, strobe lights, or a combination of the two that extends outward from the runway end.

Runway Edge Lights are used to outline the edges of the runways during periods of darkness or restricted visibility conditions. Runway lightings are used at airports for day and night landings.

However, NCAR 8.8.4.15 stipulates what a pilot on approach should use as a visual reference. At Decision Height (DH), if the above references are not available, the pilot must call for a missed approach/go-around.

2.6 Flight Data Recorder/Cockpit Voice Recorder

The FDR and CVR were sent to the United Kingdom Air Accident Investigation Branch (AAIB) for download and analysis.

2.7 Approach Briefing and Go-around procedures

According to Aero Contractor operations manual part A section 8.4.1, approach briefing and go-around procedures are clearly stated to guide the crew in critical segments of flight operations. Industry best practices recommend the use of checklists and application of the relevant approach plate in approach briefing and go-around procedures.

The evidence available to AIB from CVR downloads indicated that the crew did not adequately make reference to checklists in the approach phase of the flight. The investigation revealed that the crew did not brief or execute a missed approach when it became obvious that the aircraft was unstabilised to continue with the approach.

2.8 Descent and Approach

The weather situation was bad even though the rain had stopped. There was low cloud base and wet runway. The runway 10 equipped with Instrument Landing System (ILS) and the Non-Directional Beacon (NDB) were unserviceable and shut down for maintenance (See Appendix A&B). See section 1.17.1.3.1.

Therefore, the Tower could not advise the captain to consider Runway 10 on VMC approach landing.

At 7 nautical miles final, the Tower re-advised the crew that the runway lights were not ON due to technical problem encountered by FAAN Electrical Unit.

The captain reported 'Field in Sight' at 1637 UTC while Tower requested him to confirm "Runway in Sight" which he replied affirmatively. Based on this confirmation, the aircraft was cleared to land on Runway 28.

Few seconds later, the aircraft was sighted about 1 nautical mile away struggling to align to the centre line of the runway.

The aircraft touched down with the Right Main wheel 135 meters from the threshold, skidded off the runway to the left into the grass area, damaged three runway light assemblies and uprooted the armored cable.

2.9 Stabilized Approach

According to Aero standard operational procedure (SOP), which requires that for a precision approach the pilot must be established in the landing configuration, on profile with the required speed and trim by 1000ft. If the aircraft is not established as above, a missed approach or a go-around must be initiated. However, the height may be reduced to 500ft during a visual approach.

The crew did not adhere to the above requirements, instead continued the approach, which resulted into runway excursion and substantial damage to the aircraft.

2.10 Nigerian Airspace Management Agency (NAMA)

According to the record available, it was evident that two days after the accident on 23rd of August 2010 the E/ILS glide slope became operational. NOTAM was issued accordingly (See Appendix A &B).

2.11 Evacuation

The CVR download, revealed that the captain did not initiate Emergency evacuation procedure as was prescribed in Aero Operations manual; instead the captain was engaged in notifying Lagos about the loss of tyres saying “Lagos Lagos, we lost two tyres ... ”. No command of emergency evacuation was carried out. The pilot could not respond to the Cabin Crew Manager (CCM) who came into the cockpit to request for evacuation. From the company’s standard operational procedure, the pilot is to initiate or announce the evacuation of the passengers.

Extract from Aero Contractors (ACN) Emergency Evacuation Card

If after landing an evacuation is required the PIC will announce;

“EVACUATION, EVACUATION, EVACUATION”

At this time the CCM’s will announce:

“OPEN SEATBELT, GET OUT, COME THIS WAY, (INFLATE LIFEVEST)

JUMP, RUN (SWIM).”

If after landing an evacuation is not required the PIC will announce:

“KEEP YOUR SEATS (ALL NORMAL)”

From the cockpit voice recorder (CVR) readout, the normal flight procedures were not followed by the captain as specified in the NCAR below;

NCAR 8.5.1.1. (a) *The PIC shall be responsible for the operations and of the aircraft and for the safety of all persons on board, during the flight.*

(b) *The PIC of an aircraft shall have final authority as to the operation of the aircraft while he or she is in command.*

(c) *The PIC of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the PIC may depart from these rules in emergency circumstances that render such departure absolutely necessary in the interest of safety.*

2.12 Evaluation of Runway Friction Level

Normally, assessment review of the runway friction level is performed on annual basis and where appropriate takes the following actions;

- *If the friction level is below the Maintenance Planning Level (MPL), maintenance should be arranged to restore the friction level ideally to a value equal to or greater than the Design Objective Level (DOL).*

- *If the friction level is below the Minimum Friction Level (MFL), maintenance should be arranged urgently in order to restore the friction level and in accordance with ICAO Annex 14 Vol. I Paragraph 2.9.5, a NOTAM shall be issued advising that the runway may be slippery when wet.*

3.0 CONCLUSIONS

3.1 Findings

- 3.1.1 The Instrument Landing System (ILS) on runway 10 which was reported unserviceable and NOTAM was issued in the last three months was made serviceable 24 hours after the incident.
- 3.1.2 The faulty runway lighting system on runway 28 was rectified shortly after the incident occurred.
- 3.1.3 Runway surface friction assessment has never been carried out, and no record of the current friction level to enable ATC advise pilots in wet runway condition.
- 3.1.4 The first officer was the pilot flying at the time of the incident.
- 3.1.5 The runway was wet after the heavy rainfall reported earlier at the station.
- 3.1.6 The cloud base was low at the time of the incident.
- 3.1.7 The pilot was advised and also aware of the weather and runway lightings situations prior to commencement of VOR/DME approach on Runway 28.
- 3.1.8 The airport has an off-set VOR/DME approach on the Runway centre line.
- 3.1.9 The Non Directional Beacon (NDB) was unserviceable and NOTAM.
- 3.1.10 The aircraft was serviceable and had no deferred defects.
- 3.1.11 The aircraft had a runway excursion.
- 3.1.12 The crew did not carry out emergency evacuation.

3.1.13 No evidence to confirm that approach briefing was carried out.

3.1.14 The crew did not execute a go-around procedure following an unstabilised approach.

3.1.15 The captain was not the rostered pilot initially for the flight.

3.1.16 The captain as a fleet captain B737 had earlier carried out a route training flight before the incident flight.

3.1.17 The captain was tired based on the duty schedule of the day which involves three training sectors as check airman.

3.2 Causal Factor

The decision of the crew to continue the approach in an unstabilized condition, coupled with the Captain inappropriate attempt to take over control of the aircraft.

3.3 Contributory Factors

1. Fatigue, which impaired the Captain's performance and reflected the effects of a long, demanding duty day associated with check airman functions.
2. Poor Crew Resource Management.
3. The prevailing weather condition.

4.0 RECOMMENDATIONS

4.1 Safety Recommendations

Aero Contractor should review its Safety Management System making all safety critical staff aware of their responsibility to alert the system whenever signs of stress, fatigue or disordered behaviours are noticed in any operating flight crew members.

4.2 Safety Recommendations

Aero Contractor should re-emphasize adherence to safety and company operating procedures by flight crew members and for captains to take over control of the aircraft promptly whenever critical operational deviations are noticed during flight in adverse weather conditions.

APPENDIX A

NAMA Date Stamp

NIGERIAN AIRSPACE MANAGEMENT AGENCY
AERONAUTICAL TELECOMMUNICATIONS SERVICE

Heading SS 25/05/09

Address ANJOY0YX

Origin ANKNY0YX

Text:- 1059/09 NOTAMR 1024/09
Q/ANKK/QNLXX/IV/NBO/AE/000/999
A/ANJO B/0905251452
C/0908251452 EST E/LOCATOR
BEACON FREQ. 270KHZ IDENT
"JB" SHUT DOWN FOR MAINTENANCE

Sent/Received	Sent	Sent	Sent
To/From	To	To	To
At	At	At	At
By	By	By	By

Originator's Signature Priority
(For SS/DD/Traffic)

APPENDIX B

NAMA Date Stamp

NIGERIAN AIRSPACE MANAGEMENT AGENCY
AERONAUTICAL TELECOMMUNICATIONS SERVICE

Heading 63 23/08/10

Address ANKWYOYX

Origin ANKWYOYX

Text: 1084/10 NOTAM C 1061/10
Q/ANKK/QIGAK/W/NB0/A/000/000
A/ANJO B/1008230600
E/ILS GLIDE SLOPE FREQ. 330.2MHz
NOW SERVICEABLE X

Sent/Received	Sent	Sent	Sent
To/From	To	To	To
At	At	At	At
By	By	By	By

Originator's Signature [Signature] Priority
 (For SS/DD/Traffic)