



FEDERAL REPUBLIC OF NIGERIA  
MINISTRY OF AVIATION LAGOS.

REPORT ON THE ACCIDENT TO THE OKADA AIR  
BAC 1-11 REGISTERED 5N-AOT  
PORT-HARCOURT INTERNATIONAL AIRPORT  
ON THE 7TH SEPTEMBER, 1989.

CIVIL AVIATION ACCIDENT REPORT  
NO. CIA. 148

BAC 1-11 REGISTERED 5N-AOT AT PORT-  
HARCOURT INTERNATIONAL AIRPORT ON  
THE 7TH SEPTEMBER, 1989.

ACCIDENT INVESTIGATION BUREAU 21029,  
IKEJA

AIRSAFETY, LAGOS

CIA. 149/05/90 /150

96348

30TH MAY. 1990.

The Honourable Minister,  
Federal Ministry of Aviation,  
14, Broad Street,  
Lagos.

Dear Sir,

CIVIL AIRCRAFT ACCIDENT REPORT  
NO. CIA. 148

I have the honour to submit the report by the Accident Investigation Bureau on the circumstances of the accident involving the Okada Air Ltd's aircraft BAC-1-11 registered 5N-AOT, which occurred on the Runway 21st at Port Harcourt International Airport on the 7th of September 1989.

I have the honour to be sir,

Yours respectfully,

K. K. O. Sagoe,  
*Deputy Director*  
Accident Investigation Bureau.

## **AIRCRAFT DATA**

Type: - BAC 1-11

Model: - 320L AZ

Serial No.: - BAC 133

Registration: - 5N-AOT

Date of Construction: - 1968

Manufacturer: - British Aerospace Corporation  
Weybridge, Surrey-England.

Owner: - OGI Air Charter  
21/22 Iganmu Industrial Estate,  
Ebute Matta - Lagos.

Operator: - Okada Air Limited  
Airport Road  
Benin City, Bendel State.

Engines: -

Airframe Time: - 2 Rolls Royce Spey 511 14  
- 42,575 Hours

Souls-on-board: - 88 Passengers & 4 crew = 92

Commander: - Captain Akinbowale Johnson

First Officer: - F/O Chinedum Ogbonna

Place of Accident: - Port-Harcourt International Airport

Location: - No.5 00.9 / E006 57.0

Date & Time: - 7th September 1989 at 1805  
Hours UTC.

## SYNOPSIS

The accident was notified to the Chief Inspector of Accidents in Lagos at about midnight of the day of occurrence and an investigation began the following day at about noon.

The accident occurred at the touchdown zone of runway 21 when the aircraft at , point in the landing sequence bounced off the runway surface and landed again on the nose wheel.

The nose wheel rim was crushed and the gear axle pulled through one of the wheel hubs thereby rendering the aeroplane directionality uncontrollable in\_ its landing roll The aircraft veered off the runway onto the left shoulder, collided with bird dispersal automatic cannon gas cylinder before running into the trench which existed on the shoulder for about a year or two before being loosely refilled with soil.

The impact with the trench knocked-off the right main landing gear before the aircraft careered to a stop a few meters from the trench. The wreckage recovery exercise inflicted more damage than from the over-run itself.

The report concludes that the incident occurred at touchdown point, when the aircraft impacted with the runway; but the trench on shoulder escalated the hard landing into an accident without injuries or death to any souls on board or on the ground.

## 1. FACTUAL INFORMATION

### 1.1

#### HISTORY OF FLIGHT

Okada Air Flight OKJ 307 Originated from Murtala Muhammad Airport Domestic Terminal 2, at about 1710 hours UTC en-route to Port-Harcourt (PHC) International Airport as a scheduled passenger flight.

Take-off weight from Lagos was 37 tonnes which consisted of 7 tonnes of fuel and 92 souls. By 1740 hours, at flight level (FL) 250, the aircraft established contact with Port-Harcourt Tower and was cleared to "PR" Radio Beacon.

1700 hours weather was passed onto the crew with the assurance not to expect any delay for an ILS approach to runway 21.

75 Nautical Miles from Port-Harcourt, the aircraft was cleared to FL.90 and the crew reviewed their approach briefings. The First Officer was still flying when the aeroplane was further cleared to 2000 feet with the instructions to call the tower after the procedure turn when established on the localizer.

At 700 feet, the Commander had the field-in-sight but the flying pilot had not. Then the Commander stated that he quickly took over the control from the First Officer, "because of the aircraft's proximity, to the runway and also to ease transition from the instrument phase to the visual". Mean while, the' Commander had instructed the First Officer to call the tower to announce field-insight. The Captain also requested the tower to increase approach lights intensity because of the drizzling rain.

The following is the description in Captain's own words, now he completed the final ft of flight 307: About 50ft I, was commencing my flare. I already brought back my throttle by a few inches. Up to the threshold, the rain was still light, when we hit a heavy downpour and it would not be a good decision to 'Go-around'. At that stage, we had positive contact with the runway. The aircraft had a slight bounce up and then down again".

The right nose wheel shattered instantaneously while the second nose wheel fractured at the hub, rolled for about 90 metres and crumbled under the weight of the aircraft. When both wheels of the nose gear had broken away, the wheel axle made contact with runway to cut grooves onto the runway surface for about 25 metres before the nose strut finally gave way. The aircraft now stooped forward on the nose fuselage section and continued off the runway on to the left shoulder as there wash directional control.

On the shoulder, the aircraft ran into the wide trench which was covered up with loose soil and the impact severed off the right main gear from the attachment point on the primary structure of the airframe I he aircraft eventually came to a stop at and all the passengers were immediately evacuated.

The accident occurred at latitude N05 00.9 and longitude E 006 57.0, the airport elevation 81 feet and the time was 1805 hours UTC. Natural light condition at the time of the accident was sunset with a cloud overcast.

## 1.2 **INJURIES TO PERSONS**

There were no reported injuries to the four crew members and the 88 passengers.

## 1.3 **DAMAGE TO AIRCRAFT**

The whole of nose gear was destroyed including the two wheels associated with it. The right main gear was broken off from its attachment point to the main frame. A part of the leading edge of the right wing was crushed and sustained a substantial dent beyond the front-spar as the wing impacted with the bird dispersal mechanism. The gas cylindrical tank of the mechanism imbedded itself on the wing permanently.

There was extensive damage to the forward fuselage right from the Radom frame rearwards to front left cabin entrance. The right hand inboard flap was broken off and there was evidence of damage to the structure and skin panels aft of the rear-spar.

Number 1 engine did not show evidence of damage but there was evidence of grass and mud ingestion. No. 2 engine's cowling compressor section was badly crushed on the inboard side. The right hand wing was in contact with the ground and its outboard flaps along with the ailerons were damaged.

The salvage exercise escalated the seemingly salvageable aeroplane to total loss of hull. The Nigerian Airports Authority did not have the simplest means of removing any type of wrecked aircraft as its disposal at the station. The operator hired two cranes of 40 and 50 tonne capacities to evacuate the aircraft from the runway shoulder but the steel cables from the crane booms virtually sliced the fuselage circumferentially. So, more damage was hitherto inflicted on the aeroplane than the accident, such as splitting of the skin, crushing of the stringers that the aircraft is now a total write-off.

## 1.4 **OTHER DAMAGES**

The bird dispersal mechanical gun placed on the runway shoulder was crushed and its cylindrical gas tank became imbedded into the leading edge of the aircraft. Two runway edge light fittings were knocked off, one runway edge light isolating transformer was damaged and different sizes and lengths of edge light cables were damaged or severed.

## 1.5 **PERSONNEL INFORMATION**

1.5.1 The Commander of this aircraft is 27 years old, a Nigerian and holds a Nigerian Air Transport Pilot Licence Number 2860 issued to him in Lagos on the 20th December, 1982. The licence was valid till 30th September, 1989.

At the time of the accident, the Commander had accumulated 5230 hours of flying experience with 3500 of them on type. He holds a Part I ratings on BAC 1-11 and Part II on Boeing 707 aircraft. His last proficiency check was given to him on the 23rd July 1989. He was therefore, qualified to carry out the flight of the 7th September, 1989.

1.5.2 The First Officer is 27 years old, a Nigerian and holds a Commercial Pilot Licence No. 3893 issued to him in Lagos on the 1st February, 1989. The licence was valid until 6th July 1990 and his medical examination was valid until the 6th January, 1990.

The First Officer's Instrument Rating was valid till 6th September, 1989. He has total flying hours of 783 hours, 493 of which are on BAC 1-11 as Part II Officer.

## 1.6 **AIRCRAFT INFORMATION**

The Certificate of Airworthiness of this aircraft was renewed on the 21st August 1989 and was valid until the 19th August, 1990. The Certificate was renewed after the aircraft had just undergone an annual inspection or "C" check. No deficiencies which might have bearing on the accident were known to exist prior to and during the flight previous to the accident.

The aircraft was certified for maximum take-off weight on 40,597 Kilograms (98,500 lbs) and the actual take off weight on the load sheet was 36 499 Kilograms (80,466 lbs) The calculated weight and centre of gravity were found to be within the prescribed limits during the phase of operation related to the accident. Aviation fuel type JET A-1 was in use at the time of the accident.

1.7 **METEOROLOGICAL INFORMATION**

At 1740 hours, that aircraft established radio contact with Port-Harcourt tower and 17(10 hours weather report was passed to the crew as visibility of 5000 metres in thunderstorm with a cloud base of 210 metres.

The 1800 UTC weather report for Port-Harcourt had it as:

Surface Wind	- From 300 degrees' at 6 Knots
Visibility	- 3000 metres
Cloud	- 6 Scst at 150m base Cumulonimbus in scattered directions at 600m base
Weather	- Thunderstorm
Temp/ Dew Point	- 24/23 degrees Celsius
QFE	- 1007 Hctp
QNH	- 1010 Hctp

Both forecasts were passed to the crew.-Natural Light condition at the time of the accident was sunset in rain. Meteorological station in Port Harcourt does not have equipment facility to forecast 'Runway Visual Range' (RVR). Another problem encountered at this station is the availability of proper DAM forms to disseminate weather information to end users like the tower, airline operators and other general aviation. operators. Even common writing papers to disseminate weather reports were often not available.

1.8 **AIDS TO NAVIGATION**

The following landing aids were available at Port-Harcourt and their status are given below:

Locator	- Serviceable
---------	---------------

Also the following Visual ground aids were available:

Runway Edge Lights	- Serviceable
Approach Lights	-
Visual Approach Slope Indicator (VASI)	-
Weather Radar	- Unserviceable

1.9 **COMMUNICATIONS**

For Borne years now, there had never been any good means of communications within the airport complex. information that would have been dispatched through the telephone are now being hand carried from the tower on the 8th floor to other airport. users like Meteorological Canard, Aeronautical Information Services, duty officer of airline operators etc. This communication problem m has prompted the MET Centre to send hourly weather forecast to the tower instead of half-hourly. The elevator to the tower has not been working for years and the NAA is financially handicapped to effect any repairs. There is no telephone communication between the airport and Port-Harcourt township which is about 40 kilometres away.

The radar has been out of service and-shut-down since December, 1987. There was communication between the pilot and the tower, but the ATC tape deck was not operating because the air conditioner which cools the instrument room had broken down, so the tower could not record communications with this aircraft and others. The Chief of Facility hinted that funds were on the way and the tape deck would soon be functioning.

1.10 **AERODROME IN FORMATION**

Port-Harcourt's runway 21 is 3000 metres long and along this length at the left shoulder trenches were dug which had now partially been re-filled with soil but not well compacted as to sustain the aircraft weight. Information was given that the trenches were dug there in 1986 so that the buried runway lighting cables, which were incessantly being short circuited by water log, could be brought to the surface and laid along the runway length. The trenches were recommended to be re-filled after they have catastrophically contributed to some landing incidents. The earth re-filling job was haphazardly performed that the trench continued to remain dangerous to any aircraft which was forced to use the runway shoulder,

As at the time of this accident, some parts of the trenches still remained uncovered or half-filled with earth. At the point where this aircraft ran off the runway the partially filled trench was so soft but a shovel pushed into it was completely emersed into the mud up to its handle. (Please see Appendix., ... -

**1.11 FLIGHTRECORDERS**

Both the Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR) were recovered intact an the playback of the CVR was excellent.

No information could be retrieved from the Penny 6 Giles Steel Wire Recorder, because the fine steel wire had shopped prior to this accident, as a result, no flight date on flight 307 could be retrieved for analysis.

**1.12 WRECKAGE AND IMPACT INFORMATION**

This aircraft touched down at exactly 673 meters from the threshold. The nose wheel disintegrated 10 metres after the touch down point and parts such as nose wheel bearing rollers, bearing outer race, grease seals, cast aluminum wheel rim fragments, sheared nose wheel assembly fasters and bolts were evident on the runway. Further ahead of these were remnants of what used to be the nose wheel rims assembly, nose gear door and nose wheel steering pulley assembly.

The right hand main landing gear assembly was torn off from its pintle bearings on the fuselage when it ran into the poorly filled trench on the shoulder. The aircraft came to rest only about twenty metres after the main gear assembly came off. At the final resting place, the whole fuselage' aircraft still looked encouragingly recoverable until the Wreckage removal exercise totally destroyed the hull.

**1.13 MEDICAL AND PATHOLOGICAL INFORMATION**

None required.

**1.14 FIRE**

No fire outbreak.

**SURVIVALASPECTS**

passenger evacuation was well-co-ordinate by the Cabin Crew with assistance of Flight Crew. There were one or two minor injuries which did not require medical attention. Absence of fire made this accident survivable.

**1 16 TESTS AND RESEARCH**

None

**1 17 ADDITIONAL INFORMATION**

1 17.1 The following three accidents had occurred at Port-Harcourt International Airport within the last 24 months:

- (A) Accident to the Airbus A-310 registered 5N-AUG on the 8th September, 1987.
- (B) Accident to the Boeing 737 registered 5N-ANW on the 15th October, 1988.
- (C) Accident to this BAC 1-11 registered 5N-AOT on the 7th September, 1989.

In all the three accidents, those horrid trenches along runway 03121 escalated the hitherto landing incidents to total accidents. Out of the three accidents above only the Airbus was repairable.

At each instance of the above accidents, reports have strongly recommended the trenches for permanent closure and that the runway shoulder should be brought back to its original status of "aircraft weight bearing specifications" as specified by ICAO Document 9167-AN/901 Part 1.

#### 1.17.2 **COMPANY OPERATIONS MANUAL**

The Company Operations Manual is a requirement for airline operators which is outlined and emphasised by ICAO's Document 8335 - AN/879/2 titled MANUAL OF PROCEDURES FOR OPERATIONS CERTIFICATION AND INSPECTION.

The document says under Chapter 8.1 GENERAL:- "8.1.1 according to the standard of Annex 6, part 1, an operation Manual, developed by the operator, is a mandatory requirement for International Commercial Aviation Operations and may be used, in the system of State Licensing and supervision of operations outlined earlier in this publication, as a means, of facilitating compliance with State Regulations for safety, efficiency and regularity of flights. The document, together with all amendments and revisions, must be submitted to the Director, who may require the inclusion in it of such additional materials as he considers necessary.

"8.1.2. The Operations Manual serves both the operator and the States. It is the principal means on which the operator implements operating procedures and safety regulations and is the primary medium through which he issues directives on these matters to operations personnel. It also provides the Director with a means which may also be used to facilitate compliance with State Regulations and Rules".

Section 1.3.a and 1.3.S of this ICAO Document detail out the responsibilities of both the Pilot-in-command and the co-pilot respectively.

#### 1.17.3 **BAC1-11 FLIGHT MANUAL**

Every commercial aircraft manufacturer issues a handbook called 'Flight Manual' by which the aeroplane must be operated and flown. The Company Operations Manual does not replace the manufacturer's Flight

The normal procedure section of the Flight Manual of this aircraft has described how the aeroplane must be flown and landed, it has also issued warnings against non-compliance with certain operating procedures; example of these is "When approaching the threshold, power should be reduced by approximately 2% HP RPM so as to cross the end of the runway at a speed as close as possible to the target threshold speed for the weight.

"For the landing, power should be reduced smoothly so that the throttles are fully closed by the end of the flare-out. If the speed is too low, or if too flat an approach has required a higher than normal power setting, a premature tendency to sink will be experienced if power is reduced too abruptly".

## 2. ANALYSIS

### 2.1 **FLIGHT DATA RECORDER (FDR)**

When the FDR was opened at the laboratory facility of the British Aircraft Accident Board at Farnborough-England, the fine steel wire which serves as the recording medium was found broken and it was impossible to determine for how long in calendar time that the wire had remained broken.

However, the last recorded information on the wire were reproduced, but none bore resemblance to known parameters of flight 307 nor to those of the airport of the incident.

The unavailability of raw data from the FDR takes exactitude from flight performance analysis of 5N-AOT especially during the final approach and landing phases of flight 307. The information such as airspeed, altitude, pitch angle, engine performance and 'G' forces were not recorded.

### 2.2 **THE APPROACH**

Though, the crew gave evidence that the approach profile was good and stable, there is no other means of knowing this except through the flight data recorder which was not working. Nevertheless, the flight deck conversation from the Cockpit Voice Recorder (CVR) depicts that at 20 seconds before rim

pact, the Captain could be heard saying to his First Officer, "you are too high" and later he said "all the way down", which could signify that the aircraft had not yet stabilized on the glide path. About 17 seconds from touchdown the Captain took over the control may be because of this unsterilized approach profile. However, the crew knew that there was rain over the airport and that the runway was wet. They also knew that the wind over the airport was relatively calm and also that their estimated landing weight was 34 tonnes but came over the threshold with the landing speed of 133 knots. Also the absence of height call-out which the crew summarised as not very important at the final approach is also considered to have deprived the Captain, that height-above-the-ground cue which is very significant to the flare out. The crew may think it insignificant because the company operations manual which should have emphasised on such an assistant from the non-flying pilot is not available within the organization itself.

### 2.3 THE LANDING

The evidence from Cockpit Voice Recorder indicates that the First Officer was flying down to 17 seconds before impact. The Captain gave evidence that he took over the controls because he had the runway in sight first. Only seven (7) seconds after the change-over, the rain suddenly intensified and the Captain reached for faster wiper speed which left the time before the impact to be less than ten seconds. Also, the Captain gave evidence that over the threshold, he

was decreasing power gradually when the aircraft ran into a heavy downpour and could not execute ob-around as aircraft was sin kina fast. But as he wanted to nave positive contact with me runway, rte chopped. power". This seems to-have-contravened the warning by the Flight Manual that "for the landing, power should be reduced smoothly so that the throttles are fully closed by the end of the flare-out. If the speed is too low,, or if too flat an approach, has required a higher than normal power setting, a premature tendency to sink will be experienced if power is reduced too abruptly". If we consider 'chopping off power' to be synomimous with "power is reduced too abruptly", then the aircraft which was already plummeting would be aided further down by the abrupt reduction of power which would make the aircraft to impact with the runway a lot harder. The throttles should have been gradually closed as the aircraft was flared for the gear/runway contact.

On the second touchdown, it handed on its nose-wheel. The Captain should have expected this and all efforts should have been made to hold the nose wheel off the around.

The nose wheel ran on the around for about 1.08 meters before the two main aear simultaneously contacted with the runwav surface (Dlease see Appendix 1). The nose wheels suffered massive over-load and their rims shattered through the hubs while the other crumbled a few meters away from the impact point. The sounds from the CVR confirmed the sequence of the gears touching down.

The time elapse of 1.9 seconds which was associated with touch down sounds as recorded by the CVR was good enough for the nose gear to touch down first, rolled for about one metre (1m) on the runway before the two main gear impacted simultaneously with the runway at the second touchdown after the bounce.

### 2.4 THE LANDING ROLL-OUT

After the aircraft lost the two nose-wheels. the axle flanges started to cut grooves onto the runway surface until the nose-gear strut collapses and the aircraft's nose, under the Radom, came in contact with the runway and every ground directional control was lost. The aircraft now drooping nose-down, continued the landing roll towards the left side of the runway onto the unsafe shoulder. (please see picture in the Appendix). The aircraft remained on the paved runway for 660 meters from the touch down point before running into the trench which had been partially refilled with loose soil.

The filling did not serve the intended purpose - "to be able to sustain the weight of aeroplane which might be running off runway". Just as had been the case m the previous landing accidents on runway 03/21 of Port-Harcourt International Airport, Flight OKJ 307.anded kip, down in the trench and suffered the same catastrophe.

The right main landing gear ran into the loosely tilled trench and became detached from its pintle bearing in the wheet well cavity before the aircraft came to rest about 95 metres from the trench.

## 2.5 WRECKAGE RECOVERY

At the final point, the aircraft came to rest with its right hand wing in contact with the ground because the right gear had sheared off and the left gear became buried in the soil. (please see photographs in the Appendix). At this stage, the aircraft had lost the nose gear, the right main gear, right inboard flaps .

and one engine cowling. The recovery effort escalated the situation of the seemingly salvageable fuselage.

The Nigerian Airports Authority did not have even the barest minimum requirement of removing an incapacitated, aircraft at its airports. ICAO recommended an airport to equip itself with at least the following:

- Flat Steel Matting
- Plates - Slings
- Air
- Bags -
- ETC

They should also have trained personnel to handle wreckages. Fork lifts are not the proper equipment for removing disabled aircraft and NAA should desist from using fork lifts on any aircraft.

### 3. CONCLUSIONS

#### 3.1 Findings

- 3.1.1 The aircraft was certified in accordance with Civil Aviation Regulations.
- 3.1.2 The flight deck crew was certified and qualified to take the flight.
- 3.1.3 The operator does not have a Company Operations Manual which may guide the crew in how to handle the aeroplane in the special conditions of the environment.
- 3.1.4 FDR was in but was not functioning for some time before the accident.
- 3.1.5 The CVR was functioning but the playback had a very poor signal-to-noise ratio. The voices were incomprehensible.
- 3.1.6 The First Officer was flying the aircraft down to 17 seconds before the impact.
- 3.1.7 About 10 seconds before the impact, the rain intensified.
- 3.1.8 The aircraft made a hard landing, bounced up and made the second touch-down on its nose-wheel.
- 3.1.9 About 82 meters after impact, the aircraft lost the nose gear assembly and fuselage nose section contacted the runway.
- 3.1.10 About 600 meters after touchdown, the aircraft left the paved runway and ran into the trench on the runway shoulder.
- 3.1.11 The trench broke off the right hand main landing gear and the aircraft stopped 735 meters after touchdown.
- 3.1.12 Wreckage recovery escalated the landing incident to total loss of hull.

#### 3.2 CAUSE OF ACCIDENT

The probable cause of this accident is the poor handling of the controls at the critical movement of final approach and landing phases, probably due to the sudden loss of azimuth in the heavy down pour of rain.

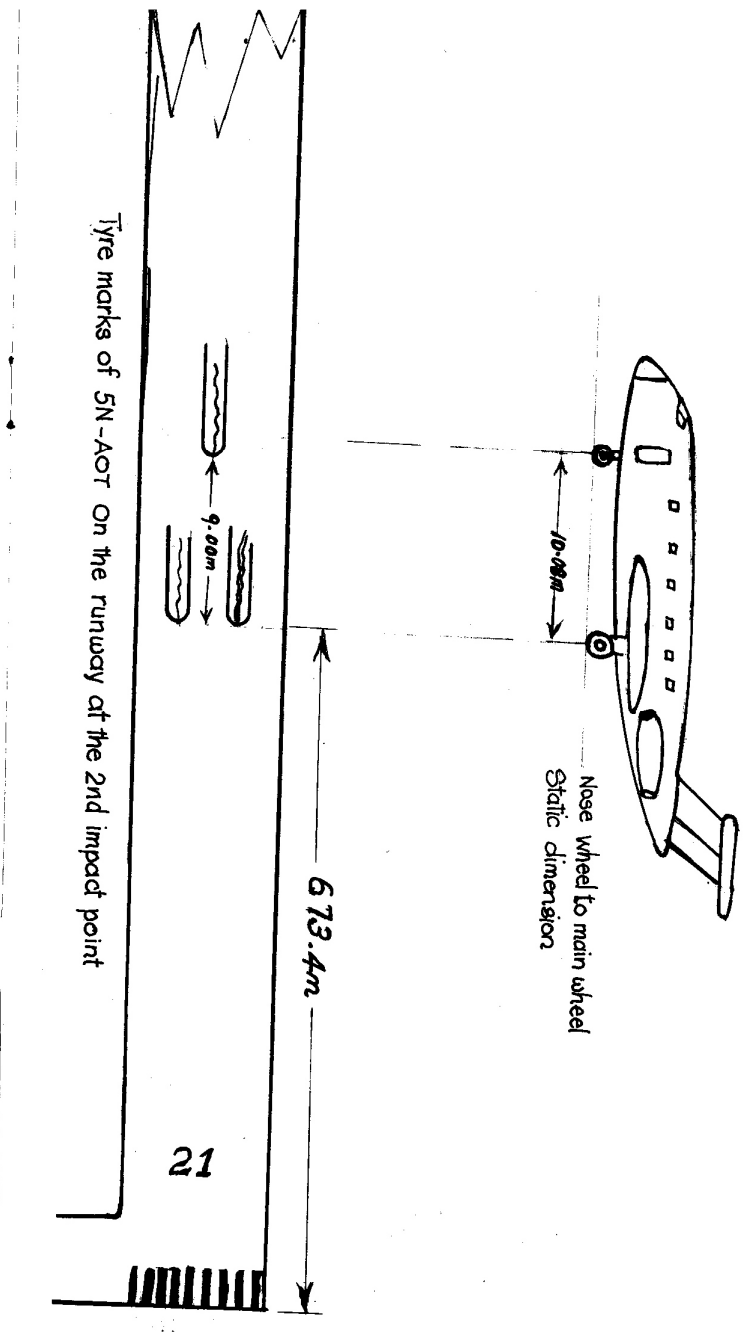
The contributory factor to the accident is the excavation and improper refilling of the outrageous trenches of wide dimensions along the length of runway 03/21.

### 4. RECOMMENDATIONS

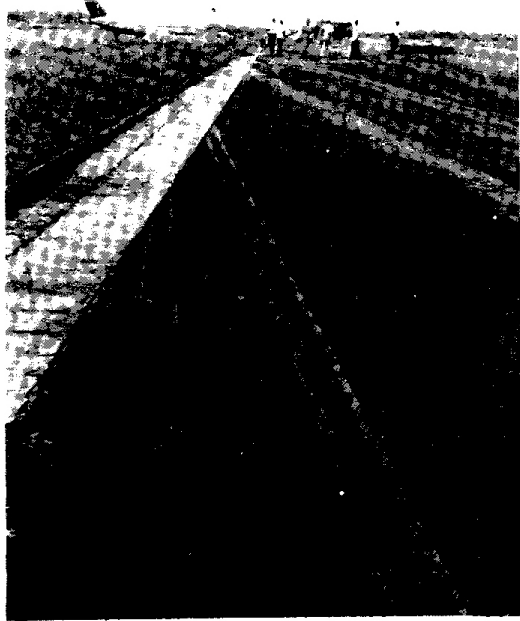
- 4.1 The Operator should, with immediate effect produce its Company Operations Manual and distributes copies to all concerned parties.
- 4.2 Whenever it is necessary for the flight crew to change over the control at the critical moment of the final approach, pilots should be encouraged to exercise a GO-AROUND.
- 4.3 The Nigerian Airports Authority should be made aware of its safety responsibilities to aircraft operators as far as airport operations are concerned. The Authority should desist from using untrained personals who could not recognize potential aviation hazards when many of these hazards are obvious, 4.4 Nigerian Airports Authority must have the simplest implements to recover disable aircraft from its runways.
- 4.5 Nigerian Airports Authority should bring the runway shoulder to the load bearing standard as recommended by the ICAO document 9157 - AN/901 Part 1.

- 4.6 The Meteorological Station at Port-Harcourt should be provided with working materials like CLAM Forms, Runway Visual Range Equipment etc.
- 4.7 Quick dissemination of meteorological information must be made possible at Port-Harcourt and impediments like faulty lifts, radar, recording machines etc must be given their due maintenance.

LANDING ACCIDENT TO 5N-AOT AT PHC



A



Photograph showing the left main wheel tyre and the nose section marks on the runway after the nose gear had been broken off.

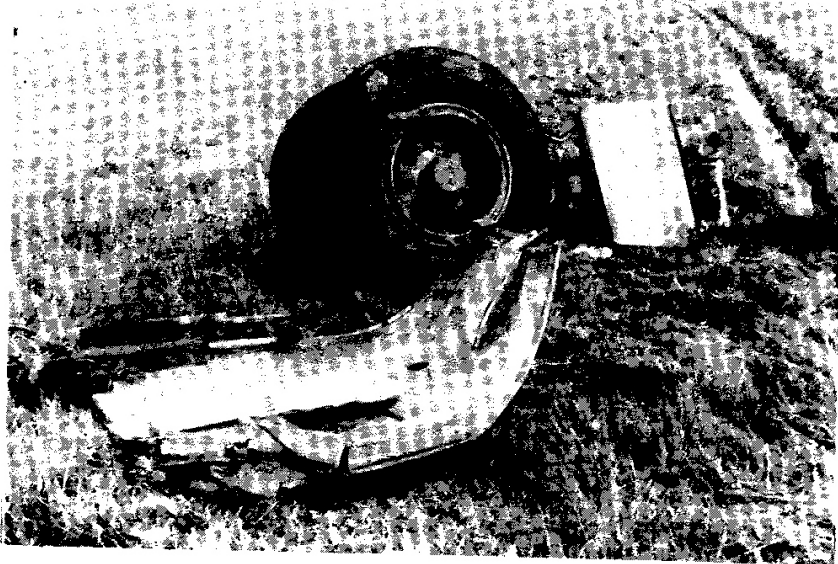
B



The runway shoulder showing pool of water where the main wheels ran into the poorly filled trench.

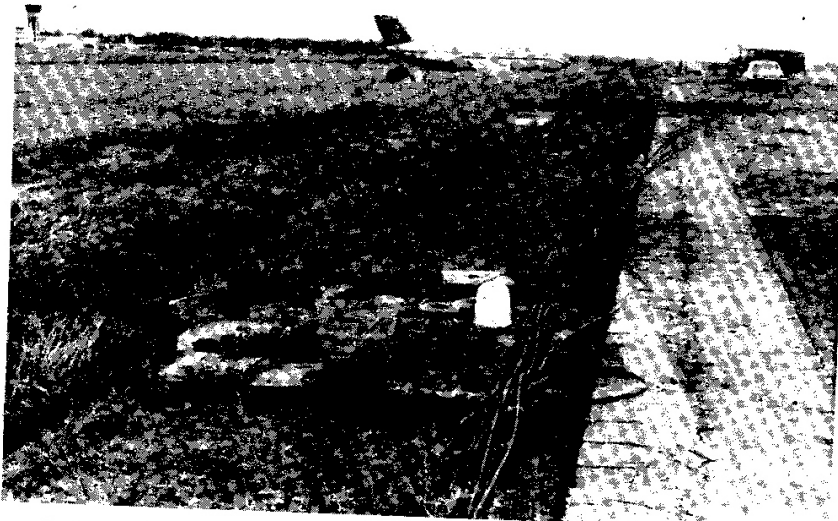
Appendix 3

A



The severed right landing gear after running into the trench.

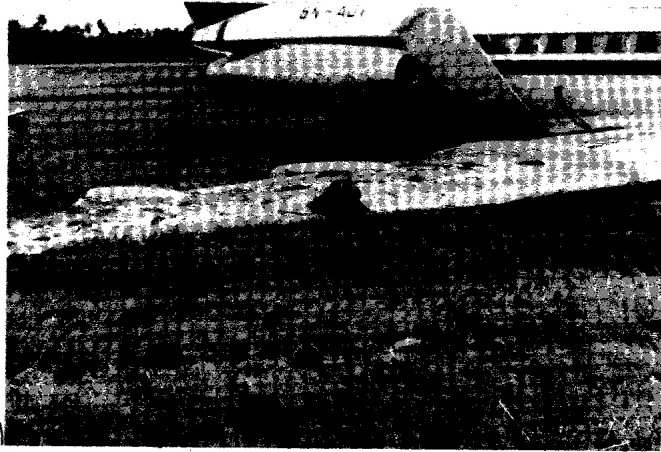
B



Photograph showing the type of hazardous refilling job performed along the runway shoulder.

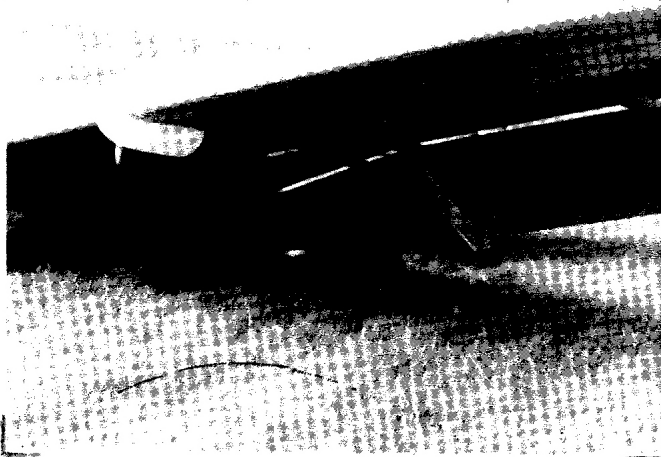
Appendix 4

A



The right wing in contact with ground and showing the imbedded bird dispersal gun's gas tank.

B



The other main landing gear was deeply sunk into the ground at the final resting place.