CIVIL AVIATION ACCIDENT REPORT

No, FMA/AIPB/424

MINISTRY OF AVIATION
FEDERAL REPUBLIC OF NIGERIA

FINAL REPORT ON THE ACCIDENT TO SOSOLISO AIRLINES DC 9-32 AIRCRAFT REGISTERED 5N - BFD AT PORT HARCOURT-INTERNATIONAL AIRPORT ON 10TH DECEMBER 2005

JULY 2006

FEDERAL MINISTRY OF AVIATION
Accident Investigation & Prevention Bureau
Federal Secretariat Complex ,Shehu Shagari Way,Abuja

FMA / AI PB/ 424 / 94

20TH JULY 2006

The Honourable Minister,
Federal Ministry of Aviation,
Federal Secretariat Complex,
Shehu Shagari Way,
P.M.B 5012,
Wuse, Abuja.

Dear Sir.

CIVIL AVIATION ACCIDENT REPORT No. 424

I have the honour to present the final report on the accident involving Sosohso Airline's DC-9-32 aircraft registered 5N BFD that crashed at Port Harcourt International Airport, Rivers State on 'Saturday 10th December 2005.

Engr. A.I. Ozoka (FNSE),

mni Director, AIPB

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FINAL REPORT ON THE ACCIDENT INVOLVING SOSOLISO AIRLINE'S DC-9-32 AIRCRAFT REGISTERED 5N-BFD AT PORT HARCOURT INTERNATIONAL AIRPORT, RIVERS STATE ON SATURDAY, IOTH DECEMBER 2005.

Aircraft Data

Type	-	**DC - 9 – 32**
Year of Manufacture	-	**1973**
Manufacturer	-	**McDonnell Douglas Corporation, USA**
Serial No.	-	**47562**
Registration -	-	**5N – BFD**
Operator	-	**Sosoliso Airlines Ltd** **73B Aba Johnson Crescent, Off Adeniyi Jones, P.O.Box 515, Ikeja, Lagos** **Nigeria.**
Owner	-	**Jat Yugoslav Airlines** **Jat Trade Bulevar Umetnosti** **No. 16 11070 Novi Beograd,** **Yugoslavia**
Airframe Time	-	**51, 051hrs**
Cycles	-	**60,238**

Engines

Type	-	**JT 8 D - 9A**
Manufacturer	-	**Pratt & Whitney**
		NO. l NO.2
Serial No.		**666415 666946**
Total Hours		**28,688 43,804**
Cycles		**28,041 48,710**
		(As at 2nd December 2005)

Crew Data

Commander

Name -	Benjamin Adekunle Adebayo
Nationality -	Nigerian
Date of Birth -	29`h October 1957
Licence No. -	ATPL 3128
Validity -	28'1' February 2006
Aircraft Ratings -	BAC 1-11, l~ -2 7, MD - 80, DC - 9
Total Flying time -	10,050Hrs
On type -	1,900Hrs

First Officer

Name -	Gerad Yakubu Andan
Nationality -	Ghanaian
Date of Birth -	17 Th October 1972,
Licence No. -	CPL - P- 466
Validity -	28Th February,2006
Aircraft Ratings -	DC- 9, PA - 28, PA - 32
Total Flying Time -	920 Hours
On type -	670 Hrs

SYNOPSIS

On Saturday, 10Th December, 2005, the Sosoliso aircraft registered 5N-BFD with call sign OSL 1145 departed Abuja at 1225 hours UTC on a scheduled passenger flight enroute Port Harcourt with 110 persons on Board (103 passengers and 7crew).

The flight continued normally until final approach to Port Harcourt. The aircraft was carrying out an ILS approach to Runway 21 and had reported established on the glide and localiser at 6 miles to touch down. The controller then cleared the aircraft to land but to exercise caution as the runway surface was slightly wet and the pilot acknowledged.

Soon after, the aircraft made impact with the grassy strip between Runway 21 and taxiway i.e. 70m to the left of the runway edge and 540m from the Runway 21 threshold. At about 60m from the first impact, the aircraft tail section impacted heavily with a concrete drainage culvert and the aircraft then disintegrated and caught fire along ifs path. The total wreckage trail covered a distance of 1120m (L 12km). The accident resulted in 108 fatalities and 2 survivors.

1.0 FACTUAL INFORMATION

1.1 History of Flight

The aircraft with call sign OSL 1 145 which departed Abuja at 1225 hrs UTC (1.25 pm local time) with endurance of 2 hours 40 minutes was on a scheduled passenger flight enroute Port Harcourt with 110 Persons on Board (103 Passengers and 7 Crew) and the flight continued normally. At 1241 hours UTC, the aircraft cruising at FL240 (24,000ft) Above Sea Level (ASL) got in contact with Port Harcourt Approach Control. The Approach control
gave the OSL 1145 in - bound clearance to expect no delay on ILS Approach to runway 21, QNH of 1008 and temperature of 33° C.

At about 1242 hours UTC (1.42pm local), the Approach controller passed the 1230 hours UTC weather report to the aircraft as follows:

Wind	-	260° /02kts
Visibility	-	12km
Weather	-	Nil
Cloud	-	BKN 420m, few CB (N-SE) at 690m
QNH	-	1008HPA
Temperature	-	33° C

About 1250 hours UTC (1.50 pm local), the aircraft, which was 90 nautical miles to the station, contacted Approach Control for initial descent clearance and was cleared down to FL 160. The aircraft continued its descent until about 1300 hours UTC (2.00 pm local) when the crew asked Approach Control whether it was raining over the station to which the controller reported negative rain but scattered CB and the crew acknowledged.

At 1304 hours UTC, the crew reported established on the glide and the localizer at 8 nautical miles to touch down. Then the Approach controller informed the aircraft of precipitation approaching the station from the direction of runway 21 and passed the aircraft to Tower for landing instructions.

At 1305 hours UTC, the aircraft contacted Tower and reported established on glide and localizer at 6 nautical miles to touch down. The controller then cleared the airplane to land on runway 21 but to exercise caution as the runway surface was slightly wet and the pilot acknowledged.

At about 1308 hours UTC, the aircraft made impact with the grass strip between runway 21 and taxiway i.e. 70m to the left of the runway edge, and 540m from the runway 21 threshold. At about 60m from the first impact, the aircraft tail section impacted heavily with a concrete drainage culvert. The airplane then disintegrated and caught fire along its path spanning over 790m. The cockpit section and the forward fuselage were found at about 330m from the rest of the wreckage further down on the taxiway creating a total wreckage trail of 1 120m.

Fire and rescue operations were carried out after which 7 survivors and 103 bodies were recovered. Five of the survivors died later in the hospital. The accident occurred in *`Instrument Meteorological Conditions' (IMC)* during the day.

1.2 Injuries to Persons

Injuries	**Crew**	**Passengers**	**Others**
-	7	101	Nil
Serious	Nil	2	Nil
Minor/None	Nil	TNil	Nil

1.3 Damage, to aircraft

The aircraft was destroyed due to impact and fire outbreak.

1.4 Other damage

None

1.5 Personnel information

1.5.1 The Commander

The commander was a 48yr old male Nigerian with a Licence No. ATPL 3128, which was valid until 28"' February 2006. He had aircraft ratings on BAC1-1 1, F-27, MD-80, DC-9 and a total flying experience of 10,050 hours out of which 1,900 hours were on type. He had his last simulator training at PANAM International Flight Academy Miami on 7th July 2005. The simulator was valid until 6`h January 2006. The simulator evaluation report comprises amongst other things the following exercises: Descend, Approaches, landings, abnormal procedures during any phase, missed Approach from precision approach and rejected landing.
The pilot was off duty on 7`h and 8th December 2005 and resumed flying on the 9`h December 2005 wherein he accumulated 4 hours of flight.

1.5.2 The First Officer

The first officer was a 33yr old male Ghanaian with a Licence No.CPL-P466, which was valid until 28`h February 2006. He also had aircraft ratings on DC-9; PA-28, and PA-32 with a total flying time of 920 hours out of which 670 hours were on type. He joined Sosoliso Airlines having secured a contractual agreement of one year with the company as co - pilot on 4`h may 2005. Before he joined Sosoliso Airlines, he had passed Nigerian Air law conducted by the NCAA on 22"a April 2005. Sosoliso Airlines also conducted a Route Check (Port Harcourt - Abuja - Port Harcourt) on him on 25 `h April 2005 and the report was satisfactory. He also had his last simulator training on 5`h August 2005 with the .same exercises as that of the commander, though with longer hours. His performance report was also satisfactory.
The pilot was off duty on 7'h and 8`h December 2005 and resumed flying on the 9Th December 2005 wherein he accumulated 5 hours of flight.

1.6 Aircraft information

The aircraft was manufactured in 1973 and entered the Nigerian register on the 12. `h June 2003. AIPB found out that the aircraft had been maintained in accordance with the prescribed schedules and inspections. The last `C' checks were carried out at the airframe time of 49912.21 hrs and total cycles of 58612 at the facility of Jat Airways, Yugoslavia, an NCAA approved maintenance organization. Certificate of Release of the aircraft to service was thereafter issued on the 17th March 2005. The next `C' checks would have been due at the airframe time interval of 2000 hrs or calendar time of 15 months, whichever came first.
Therefore, the next checks would have been due on 7'11 June 2006 going by the calendar time. The aircraft was up to date in its compliance with service bulletins and airworthiness directives. All other inspections were carried out as at when due. The aircraft had a valid Certificate of Airworthiness till 16th December 2005. The aircraft was certified airworthy to fly on the day of the accident.

1.7 Meteorological Information

1.7.1 The trends in meteorological conditions obtained from the Nigerian Meteorological Agency (NIMET) were as follows:

Time: 1200 hours UTC

Wind	-	260° /02kts
Visibility	-	12km
Weather	-	N₹l

Cloud - BKN 420m, few CB (N-SE) at 690m

Temperature- 33° C

QNH - 1008 HPA

Time: 1230 hours UTC

Wind - 230° /08kts

Visibility - 12km

Weather - Nil

Cloud - BKN 420m, few CB (several directions) at 720m

Trend - Temporary Thunderstorm

QNH - 1007HPA

Time: 1300 hours UTC

Wind - 220° /09kts

Visibility - 12km

Weather - Nil

Cloud - BKN 390m, few CB (several directions) at 690m

Temperature - 29° C

QNH - 1007HPA

TIME: - 1308 UTC(SPECI)

in

Wind - 360° /05kts

Visibility - 3000m

Weather - Thunderstorm (visibility reducing thunderstorm)

Cloud - BKN 360m, few CB (several directions) at 660m

Trend - Visibility 2000m in thunderstorm

TIME: 1312 Hours UTC (SPECI)

Wind - 360° /l5kts

Visibility - 3000m

Weather - Thunderstorm (Visibility reducing in thunderstorm)

Cloud - BKN 360m few CB (several directions) at 660m

QNH - 1007HPA

1.7.2 The meteorological information obtained from Satellite Imagery by Boeing Aircraft Company in USA is as follows:

Surface Observations

Day Time Hr	St Co St id	T °F	Td °F	Dir	Spd kts	Gus	AltSet mb	Vis nil	Weather	Cell
10 1000	NG DNPO	86	77	000	0		1010.0	7.00		5/013
10 1100	NG DNPO	88	77	180	2		1009.0	7.00		5/014

- A sea breeze front, possibly reinforced with outflow, pushed inland and was in the vicinity of Port Harcourt at 1300 UTC.
- The leading edge of the boundary, in theory, could have included an abrupt increase in wind speed and significant horizontal and/or vertical wind shear.
- Rain showers and/or thunderstorms also likely accompanied the passing of the boundary as warm, moist air was lifted into the atmosphere,

1.8 Aids to navigation

The status of navigational aids available at the airport was as follows:
VOR/DME - Serviceable
ILS/DME - Serviceable

Locator Beacon	**-**	**Serviceable**
Radar	**-**	**None**

The aircraft was on ILS approach on that day. The ILS was calibrated on the 1Ith October 2005. The navigational aids are under the management of the Nigerian Airspace and Management Agency (NAMA).

1.9 Communication

There was good communication between the aircraft and the Approach/ Tower Control on the day of the accident.

1.10 Aerodrome information

The aerodrome has runway 21/03 which is 3000m long and 60m wide, located on latitude 05° 00'52"N longitude 006° 57'01"E on an elevation of 87ft (ASL). There exists exposed drainage concrete structure, between the runway 21 and taxiway. The runway is equipped with PAPI, edge lights and approach lights, which were all serviceable. On the day of the accident, there was power failure at the station due to electrical fault and FAAN officials maintained that the fault was rectified at 1205 hours UTC. Eyewitness accounts from the air traffic controllers and fire/rescue personnel stated that the airfield lightings were not on.

Federal Airports Authority of Nigeria (FAAN), among other things maintains and controls the airfield lightings (Runway edge lights, Approach lights and PAPI).

In practice at this airport, the airfield lightings are switched ON in the night (1800 hours - 0600 hours UTC) and OFF in the day (0600 hours UTC - 1800 hours UTC) except on request by pilots and, or when controllers observe deteriorating trend in weather conditions.

1.10.1 Airport Emergency Response

The airport has an emergency response plan which was last revised in September 2005. However, this plan has not been tested at least, not for a very long time. The airport fire cover is category 8. As at the time of the accident, the fire cover had most of the components of this category except the following: Standard Ambulance, Rapid Intervention Vehicle (RIV) and adequate trained personnel.

1.11 Flight recorders

The cockpit voice recorder (CVR) was taken along with the Flight Data Recorder (FDR) to the facilities of UK AAIB for analysis.

1.11.1 Flight Data Recorder

The FDR was manufactured by Honeywell Avionics and the type is a Solid State Universal Flight Data Recorder (SSUFDR) with part number 980 - 4120 and serial No. 20241. Inspection of the FDR revealed that crash protected

13 assembly interface connector had been damaged during the impact, which necessitated the removal of the memory from the enclosure. All available data from the memory was then downloaded in a file. The file was taken to the facilities of National Transportation Safety Board for analysis.

The FDR recording contained approximately 26 hours of data. Timing of FDR data is to the nearest second, which is referred to as FDR subframe Reference Number (SRN). The accident flight was the last flight of the recording and its duration was approximately 42 minutes.

The conversion algorithms used for the FDR data were based on documentation from the FDR manufacturer. The FDR read out showed that the following parameters were recorded:

- Pressure altitude
- Indicated airspeed
- Magnetic heading
- Vertical acceleration
- VHF keying
- Sink rate (calculated based on pressure altitude)

1.11.2 Cockpit Voice Recorder

The CVR tape was a polyester type, which originated from a Honeywell AV557B1 AV557C or AV557D Model. Upon inspection, no thermal damage to the type was evident.

The tape transport is a coaxial reel to bi-direction design, recording total of 30minutes of audio data. It recorded four channels of audio data in one direction for fifteen minutes and then reversed direction before recording four channels in the opposite direction. The recorder is designed so that the oldest data is erased just prior to the recording of new data. The tape was found to have been severed at one location upon inspection. The transport showed the effects of high loads with the erasure magnet and capstan assembly deformed and broken due to overload.

The coaxial spools were under tension during normal operation of the unit. When the tape was severed, the spools would have spun freely which resulted in the release of additional tape into the transport area. The tape was then removed from the two spools and installed into a reel-to-reel recorder, which facilitated the recovery of the data. Digital recordings were then made of the four channels.

During the replay of the CVR, it was noted that the data pertaining to a period in time prior to the last 30 minutes of the flight could also be heard; indicating that the erase function of the CVR was not fully serviceable and the recovery of

intelligible data may have been hampered by the fault in the unit. A significant echo effect was also evident.

The digital CVR audio file downloaded on a compact disk in UK AAIB was also taken to the NTSB facilities along with the FDR file. During the replay of the CVR, the problems of echo, unintelligible data and erase capability fault were noted. However, the data were filtered several times until the audio became reasonably intelligible.

1.12 Wreckage and impact information

The aircraft made impact with the grass strip between runway 21 and taxiway, 70m to the left of the runway edge and 540m from the runway threshold. At about 60m from the first impact, the aircraft rear fuselage impacted heavily with a concrete drainage culvert where the No 2 engine and the rear staircase of the aircraft were detached and lodged. The aircraft then disintegrated and caught fire along its path spanning over 790m. The cockpit section with the forward fuselage was found at about 330m from the rest of the wreckage on the taxiway, giving a total wreckage distance of 1 120m.

1.13 Medical and pathological information

The crew and the passengers died of injuries associated with the accident.

1.14 Fire

The aircraft disintegrated and caught fire along its path after heavy impact of its rear fuselage with a concrete drainage culvert.

1.15 Survival Aspects

Survivability of victims was reduced to the barest minimum as the aircraft broke up and disintegrated into several parts with the wreckage area covering a distance of 1.12km (1120m) making rescue and fire fighting very difficult.

1.16 Test and Research

Test and research carried out on the Global Positioning System (GPS) did not produce any significant information.

1.17 Organizational and management information

Sosoliso Airlines Limited

There was no evidence from the training documents of Sosoliso Airlines to show that adverse weather conditions associated with wind shear recognition and recovery was part of its simulator training programme. The company designs the simulator training programme in collaboration with the training institutions which is then sent to the regulatory authority for approval. In practice, the training captains of the airline who are also

authorized examiners conduct the training of their pilots abroad at NCAA approved facilities.

1.18 Additional information

1.18.1 Cockpit Instrument Readings

Flap lever - UP position but the flap indicator was at 15°

Gear lever - UP position

Throttle Position - Could not be determined due to cable stretch and /or Breakage

1.18.2 Eye Witness Account

This eyewitness is a Nigerian Airspace Management Agency (NAMA) security guard stationed at the VOR site located at about l km to the runway 21 threshold. He has a high school certificate and has been working as a security guard at the site since December 2003.

The security guard was on day shift (0600 hrs UTC - 1900 hrs UTC) on the day of the accident. He had observed aircraft taking off and landing on that day.

At about 1300 hrs UTC, the eyewitness stated that it was dark and there was a little drop of rain. He later heard the noise of an inbound aircraft and therefore came out of the watch room to see the aircraft. The guard stated that he heard more noise from the engine as if they added power. He noticed that the aircraft was not stable as it passed over him.

He further stated that the approach lights were not on and everywhere was dark and raining. Continuing, he stated that the aircraft was not on fire when it passed him. Shortly after, he heard a loud bang with fire and thick smoke. He however, stated that he could not leave his duty post since he was the only one manning the post at that time.

Other witnesses including Sosoliso pilot who departed to Enugu and a helicopter pilot who departed from the airport before the crash confirmed the presence of adverse weather which made them alter their course on departure. The fire men also stated that they were forced to reposition their equipment due to the effect of strong wind in order to effectively carry out the fire fighting.

1.19 Useful or effective investigation techniques

NIL

2.0 ANALYSIS

2.1 Aerodrome Aspect

The available runway 21/03, which is 3000m long and 60m wide, is designed to accommodate jet planes for take offs and landings. The runway is equipped with edge lights, Precision Approach Path Indicator (PAPI) and approach lights, which were serviceable but not available for use at the time of the accident. However the runway is not equipped with centerline lights. In practice at this airport, the airfield lightings, which are under the control of FAAN, are switched on at night (1800 hrs-0600 hrs UTC) and off in the day (0600 hrs1800 hrs UTC) except on request by pilots and, or when controllers observe deteriorating trend in weather conditions.

The reason for this practice is due to the unstable power supply from the National grids and lack of funds and resources to maintain the power from generating sets on a regular basis at the airport. Though there was a deteriorating trend in weather conditions when the aircraft was on final approach, the pilot neither requested for the airfield lightings nor did the Tower Controller request FAAN for the airfield lightings to be switched on when they observed the deteriorating trends in weather conditions.

The navigational aids were all serviceable and available for use on that day and the aircraft was established on the ILS at 6 miles to touchdown. The ILS was calibrated on the 11t^{h} October 2005 barely two months before the crash. There had not been any report from pilots who have been using the facility of any malfunction nor its unreliability.

The exposed concrete drainage culvert located at about 70m to the left of runway 21 edge and 540m from the threshold portends serious danger to aircraft during landing and takeoff. The aircraft impacted heavily with the drainage culvert, which resulted into its disintegration and fire outbreak. The first physical evidence of fire was observed at about 200m from the culvert.

2.2 Flight Recorders

2.2.1 Flight Data Recorder (FDR)

The FDR read out indicates that the flight was normal until the last moment into the final approach to Port Harcourt airport. At 30 seconds before the crash, the airplane descended through 357ft (ASL) at the airspeed of 153 knots and a heading of 207.3° . The airplane heading at this point is a departure from its initial heading of 211^{0}. At 23 seconds before the crash, the airplane leveled off at an altitude of about 204ft, which is below the Decision Altitude (DA) of
307ft (ASL). The altitude then remains relatively steady for the next 14
seconds. During this time, the airspeed decreased below 145 knots.

17 At 7 seconds before the crash, the airspeed began to increase reading 151.3knots. The increase in speed would indicate an engine power input by the crew to initiate a `Go Around'. Meanwhile, the aircraft had sunk further below 204ft (ASL) and its heading deviated to the left of the runway magnetic heading of 210°. The aircraft could not recover when the crew later decided to initiate a go -around. At the time of impact when the FDR recording stopped, the aircraft had a heading of 196.9° and airspeed of 160.2 knots and a descent rate well over 2000ft/min.

2.2.2 Cockpit Voice Recorder (CVR)

The conversation within the cockpit environment reveals that the flight was uneventful until the final approach to land. The CVR read out shows that the aircraft was configured for landing when one of the pilots called for gear down approach checklist.

At about 16 seconds to the crash, the captain called for a go-around, gear up and flaps before the crash. A warning horn then came on followed by a `too low gear' aural sound from the cockpit area microphone. It appears that the crew had difficulty in sighting the runway and should have carried out a missed approach at the Decision Altitude (DA) of 307ft ASL instead of continuing descent below 204ft (ASL).

The gear was down and locked with the landing flap set prior to the go around. When the crew decided to go around, the flap lever was selected up while the gear was still in the extended position but probably not locked. The warning horn then sounded because the gears were no more in the landing position and the flaps had not yet retracted to less than approximately 18 degrees. The warning horn was immediately followed by the "too low gear" sound i.e. Ground Proximity Warning System (GPWS).

2.3 Weather Factor

2.3.1 On Approach To Port Harcourt

At 1241 hours UTC, the aircraft was in contact with Port Harcourt Approach and the controller informed the aircraft to maintain FL 240 and to expect no delay on I LS approach to runway 21. Thereafter, the controller passed the weather report for 1230 hrs as: 260° /20kts, visibility 12km, nil weather, BKN 420m, Few CB, (N-SE) at 690m, QNH 1008, temp 33° C; whereas this was the weather report for 1200 hrs.

The actual 1230hrs weather report was 230° /08kts, visibility 12km, BKN 420m, Few CB (several directions) and trend thunderstorm.

These two weather reports (1200 hrs and 1230 lirs) appear relatively the same with the exception of the Cumulonimbus (CB), which was in several directions and the trend thunderstorm. If the correct weather information were passed at the time, it would have placed the crew in the correct perspective on the weather situation to expect at the station. Invariably, the 1200 hrs report was the only detailed weather information available to the crew till the time of the crash.

At 1300 hrs, the pilot requested to know if it was raining over the station; to which the approach controller reported negative rain but scattered CB. Also at 1304 hrs, the approach controller informed the aircraft that from tower observation, precipitation was approaching the station; but no information about the wind direction and speed nor visibility were transmitted to the aircraft and neither did the pilot request for the information.

At about 1305 hrs, when the aircraft was in contact with the control tower, one would have expected the controller to give the aircraft the prevailing wind conditions to the pilot but instead, he only cleared the aircraft to land and to also exercise caution, as the runway, surface was wet (neither did the pilot request for the wind).

2.3.2 Adverse Weather Phenomenon

The weather reports obtained from the Nigerian Meteorological Agency (NIMET) and the one compiled from the Satellite Imagery by the Boeing Aircraft Company (USA), both showed that there was a change in the wind speed and direction when the aircraft was approaching the station. The weather reported by the station and the pilot report (pirep) indicated fast deteriorating weather situation which was a low cloud condition with reducing visibility in thunderstorm and rain. This change in wind speed and direction contains ingredient of wind shear.

Wind Shear is defined as a change in wind speed and / or direction within a short time that takes place close to the ground. This change causes a shearing or tearing effect which is of great concern to pilots and the airline industry. A search of the National Transportation Safety Board (NTSB) database-reveals that from 1 " January 1980 to date, there were 238 accidents in which wind shc,,ir was a factor.

On the day of the accident, the aircraft which was coming in with a head wind in its approach soon encountered a tail wind on its final approach to land on runway 21. The pattern of the wind at the station is as follows:

260° /02 knots @ 1200hours UTC (head wind) 230° /08 knots @ 1230hours UTC (head wind) 220° /09 knots @ 1300hours UTC (head wind) 360° /05 knots @ 1308hours UTC (tail wind)

The problems aircraft have with adverse weather (which may be associated with wind shear activity) occur when they are flying slightly above stall speed such as case in point. When the airplane was flying with an increasing head wind, extra lift was generated by the increasing speed of the wind.. And when the aircraft was on final approach, the wind changed to a tail wind with an attendant decrease in speed.

2.4 Aircraft Handling

At 6 miles to touch down, the crew reported established on the glide slope and localizes after which the tower controller cleared the aircraft to land. Shortly after, the aircraft encountered adverse weather conditions (headwind to tailwind). The crew was not aware of the prevailing adverse weather conditions since they were not equipped with actual wind situation.

AlP13 is of the view that due to the reducing visibility in thunderstorm, rain and low cloud, the crew could not sight the runway particularly when the airfield lightings were not on. In the process, the crew descended well below the Decision Altitude (DA) of 307ft ASL before they decided to initiate a 'go*around'*.

Decision Altitude = 307ft (ASL)

Airfield Elevation = 87ft (ASL)

Therefore,

But the aircraft descent - 204ft (ASL)

Airfield Elevation = 87ft (ASL)

Therefore,

Aircraft Height = 117ft (AGL)

Therefore, Deviation (Error) = Decision Height - Aircraft Height
= 220ft - 117ft

= 10311

This implies that the crew descended the aircraft below the Decision Height (DH) by 103ft and so was not fully prepared to execute a missed approach/goaround at the Decision Altitude.

The captain was on the radio until he commanded 'go-around', gear up and flaps in quick succession. The warning horn then sounded because gears were no more in the landing position. The warning horn was immediately followed by the "too low gear" sound i.e. Ground Proximity Warning System (GPWS).

From the CVR analysis, there is an indication that the commander handed over the controls to the First officer about 25miles to the station while the commander was on the radio until he called for `go- around'. The hand over of the controls to the First officer is allowed in aviation practice to enable the officer acquire more experience but nothing precludes the commander from taking over the controls if and when the need arises.

It would appear that the crew did not apply the correct procedure for a 'goaround' from an I LS approach, even though records show that the crew received training for an ILS missed approach/go-around.

The normal procedure for a missed approach is

*Set takeoff thrust.

*Set flaps to 15° /slats extend;

*Accelerate to VREF +10kts while rotating smoothly to between 13° and 17° pitch attitude and;
*Retract landing gear after a positive rate of climb is established.

Even if the crew were carrying out a recovery from adverse weather associated with wind shear, the procedure adopted by the crew was improper.

3.0 CONCLUSION

3.1 Findings

(i) The aircraft had a valid Certificate of Airworthiness and there were no known defects that could have contributed to the accident.

(ii) The crew had valid licence and qualified to fly the aircraft on the day of the accident except that the first officer had limited experience.

(iii) The simulator training attended by the crew was conducted by the airlines training captain abroad. However, both the training institutions and the training examiners were approved by the NCAA.

(iv) The aircraft, which departed Abuja enroute Port Harcourt, got in contact with the Approach controller at 1241 hrs UTC maintaining FL240.

(v) Approach controller then gave the aircraft an in-bound clearance of no delay expected on ILS Approach runway 21.

(vi) Thereafter, the Approach controller passed the 1200 hrs UTC meteorological report as wind of 260° /02kts, visibility 12km, Nil weather. BKN 420m, few CB (N - SE) at 690m, QNH 1008 and temperature 33° C.

(vii) Basic meteorological equipment for measuring visibility and cloud conditions are lacking at the airport. However, the data generated by NIMET officials is in agreement with the data obtained from the Satellite Imagery from the USA.

(viii) The aircraft continued its descent until about 1300 hrs UTC when the crew asked approach whether it was raining over the station but the approach controller reported negative rain but scattered `CB'.

(ix) At 1304 hrs UTC, the crew reported established on the glide and localizer at 8 miles to touch down and the Approach Controller informed the aircraft of precipitation approaching the station from the direction of runway 21 before passing it to the Control Tower for landing instructions.

22 (x) At 1305 hours UTC, the aircraft contacted Tower and reported established on the ILS at 6 miles to touch down. The controller then cleared the airplane to land on Runway 21 while exercising caution as the runway surface was slightly wet. No wind information was given to the pilot and neither did he request for it.

(xi) The aircraft on final approach encountered adverse weather with change in wind speed and direction: 220° /09kts (headwind) in nil weather to 360° /05kts (tailwind) while the visibility was reducing in thunderstorm and rain.

(xii) The recording of the Cockpit Voice Recorder was poor as there were problems of echo effect, unintelligible data and faulty erase function. This was however taken care off by filtering at the read out facility.

(xiii) There was no standard instrument call-out by the crew as evidenced in the CVR.

(xiv) The crew continued the descent and went well below the Decision Altitude without having visual contact with the runway.

(xv) The crew initiated a 'go-around' below the altitude of 204ft, which is 103ft below the Decision Altitude; the attempt of which was not successful. They were not fully prepared to execute a missed approach.

(xvi) At about 1308 hours UTC, the aircraft tail section made contact with the grass strip between Runway 21 and taxiway, 70m to the left of the runway edge and 540m from the runway threshold.

(xvii) At about 60m from the first impact, the aircraft rear fuselage impacted heavily with an exposed concrete drainage culvert where No.2 engine and the rear staircase of the aircraft were detached and lodged.

(xviii)The exposed concrete drainage structure is badly located and poses a real danger to aircraft landing on Runway 21.

(xix) The aircraft disintegrated and caught fire along its path spanning over 790m. The cockpit section with the forward fuselage was found at a further 330m from the rest of the wreckage trail on the taxiway giving a total wreckage distance of 1 120m.

23 (xx) The response time of the fire services is reasonable (about one minute) except that they were hampered by wide spread fire covering 1.12km, very strong winds and inadequate resources.

(xxi) The Rescue team recovered 103 bodies and 7 survivors. Five (5) of the survivors later died in the hospital while two (2) are still receiving treatment.

(xxii) Federal Airports Authority of Nigeria (FAAN), among other things, maintains and controls the airfield lightings (runway edge lights, approach lights and PAPI etc). These airfield lightings though were operational/serviceable were not on. In practice at the airport, the airfield lightings are switched on in the night (1800 hrs - 0600 hrs UTC) and *off* in the day (0600 hrs UTC - 1800 hrs UTC) except on request by pilots and, or when controllers observe deteriorating trend in weather conditions. This is as a result of lack of funds and resources to maintain the power supply on a regular basis. But no NOTAM was issued to that effect.

3.2 Probable Cause

3.2.1 The probable cause of the accident was the crew's decision to continue the approach beyond the Decision Altitude without having the runway and/or airport in sight.

3.2.2 The contributory factors were:

3.2.2.1 The crew's delayed decision to carry out a missed approach and the application of improper procedure while executing the go-around.

3.2.2.2 The aircraft encountered adverse weather conditions with the ingredients of wind shear activity on approach.

3.2.2.3 The reducing visibility in thunderstorm and rain as at the time the aircraft came in to land was also a contributory factor to the accident. And the fact the airfield lightings were not on may also have impaired the pilot from sighting the runway.

3.2.2.4 Another contributory factor was the fact that the aircraft had an impact with the exposed drainage concrete culvert which led to its disintegration and subsequent tire outbreak.

4. 0 Recommendations

4.1 Where the training captains of Nigerian operators' conduct simulator training for their pilots at overseas institutions, the final check should be carried out and certified by instructors designated or appointed by the host country's Civil Aviation Authority for transparency.

4.2 Pilots flying into Port Harcourt and other coastal areas in the country should be mindful of weather hazards such as wibd shear activity. Recognition and recovery from adverse weather/wind shear should be mandatory part of pilot's initial and recurrent simulator trainings.

4.3 NIMET should provide appropriate equipment to generate data on visibility and cloud conditions near the runway threshold and also ensure that adequately equipped briefing office is provided at the airport (and in all airports) for en route weather information among others.

4.4 There should be provision of on board wind shear detection /monitoring equipment and also at the airfield. There is also the need to carry out further studies into wind shear phenomenon at the airports.

4.5 There is the need for the provision of Uninterrupted Power Supply UPS) to the airfield lightings to ensure that all critical aids are on throughout the operational period of the airport. If this can not be achieved, the operational hours should be reduced/modified

4.6 The airfield lightings presently under FAAN Electrical Department Should be transferred to NAMA so as to be regulated at the Control Tower in case of pilot's request for lighting intensity adjustment. Hence, the airfield lighting control at the tower should be reactivated. This is because the situation where controllers have to contact the FAAN Electrical Department to switch on or control the intensity of the airfield lightings is unacceptable and is not in consonance with the recommended practice.

4.7 The Airport Emergency Plan should be well structured and periodically tested with all the various agencies (FAAN, NAMA, City Hospitals, and Red ('rots etc) participating, Adequate fire cover should be provided at the airport (Category 8) otherwise, it should be appropriately graded.

4.8 Airline operators should be required to equip their aircraft with DFDR that is capable of reading several parameters (minimum of 32), and solid state CVR for enhanced recording.

4.9 The Nigerian Civil Aviation Authority, NCAA should monitor and strictly enforce standards on airfield lightings, fire cover and aviation personnel training:

Photograph showing the first impact of the aircraft; having the runway to the right.

APPENDIX 5.2

Mr. Dennis Jones of NTSR, USA assessing the impact/wreckage of the aircraft

APPENDIX 53

Photograph showing heavy impact with concrete drainage culvert

APPENDIX 5*4

Part of the wreckage trail of the aircraft

APPENDIX 28.5

% -WA

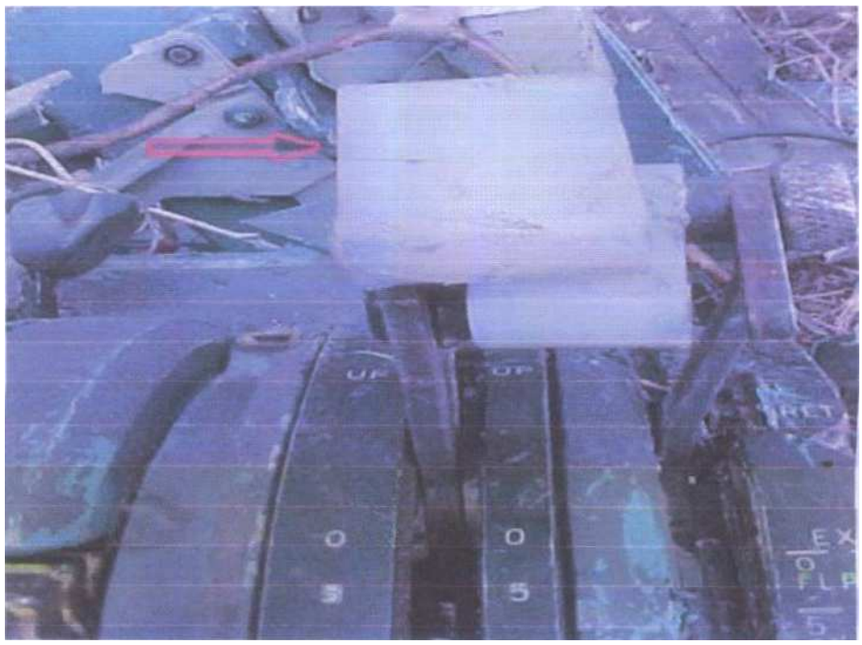
Part of the aft fuselage of the aircraft

APPENDIX 5.6

APPENDIX 5.29

Photograph showing the Instrument panel found on taxiway, 330m away from the rest of the wreckage

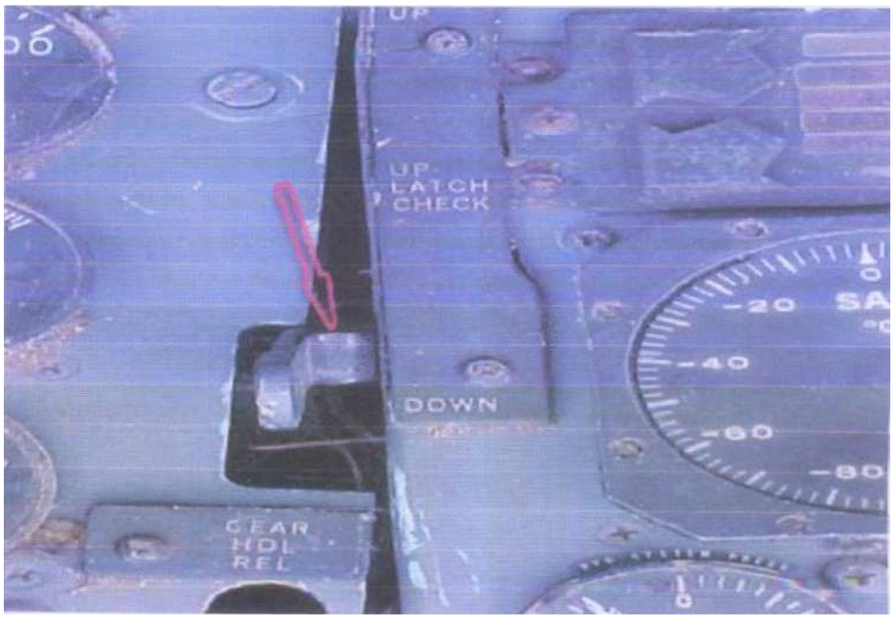
APPENDIX 5.8



Arrow showing the Flap lever at up position

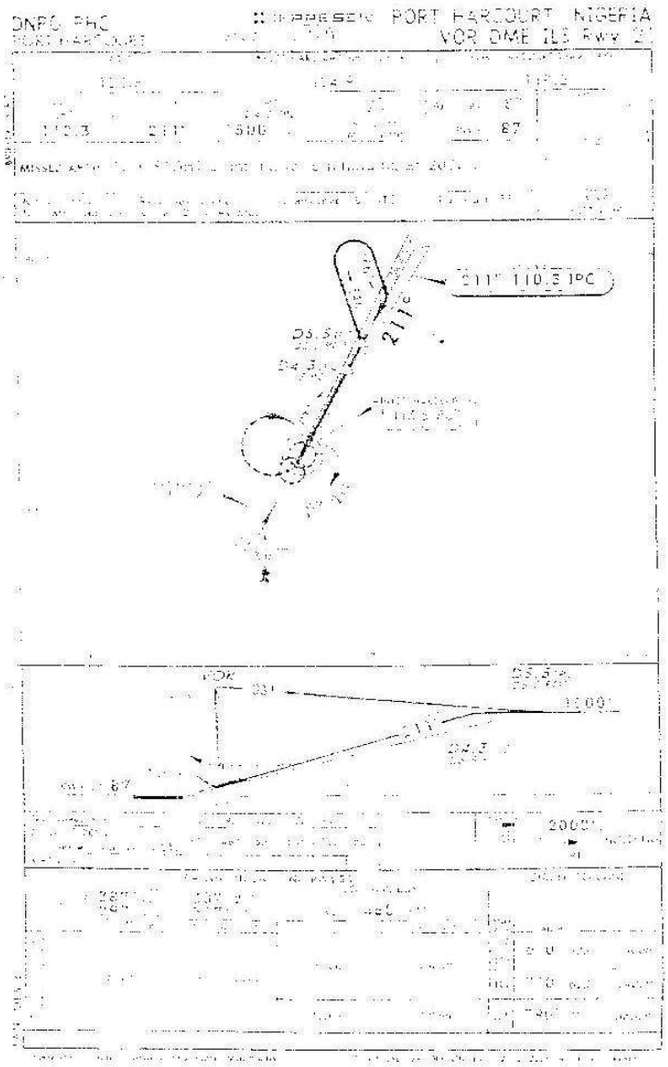
APPENDIX 5.9

Picture showing a main landing gear APPENDIX 5.14



Arrow showing the position of the landing gear lever

APPENDIX 5-11



APPENDIX 5.12

AGENCE
POUR LA SECURITE
DE LA NAVIGATION AERIENNE
EN AFRIQUE ET A MADAGASCAR

32-36 AVENUE JEAN JAURES
B.P. 3144 DAKAR SENEGAL
TEL : (221) 849 66 00
FAX : (221) 823 45 54
www.asecna.com

DIRECTION
[illegible]
[illegible]

Aéroport [illegible]
[illegible]
TEL : [illegible]
FAX : [illegible]
Email : [illegible]

FLIGHT CHECK

PROVISIONAL REPORT N° 211/05

STATION	PORT HARCOURT - ILS / DME
CHECK TYPE	ROUTINE
DATE	11/10/2005

PORT HARCOURT Localizer (ALCATEL411) NIGERIA
CHECK TYPE : ROUTINE 11/10/2005

AIRCRAFT

	A110-42
CRATION	6V-AEV

CREW

FLT CHECK MANAGER	DIAGBOU
AFSE	DIADIBOMBOLUTE
INSPECTOR- GR INSPECTOR	NGANATOUTIE

METEOROLOGY

BILITY	km
MPERATURE	29 °C
ND	[illegible]
UDS	< 1500 feet
	OVC
	OVC
SURFACE CONDITIONS	DRY

STATION

RWAY	QFU 20R
IDENTIFICATION	IPC
TECHNOLOGY	110.30 MHz
EQUIPMENT	ALCATEL411
ARRAY TYPE	3 ANTENNES
NUMBER OF TRANSMITTERS	2
CATEGORY	2
LOCATOR WIDTH	3.04
TRADE	DGPS (Glonass)

PORT HARCOURT Localizer (ALCATEL411) NIGERIA

CHECK TYPE : ROUTINE 11/10/2005

AIRCRAFT

	A110-42
CRATION	6V-AEV

CREW

	DIZEH BOU
AFNS	DIADHIOU MBOUP
INSPECTOR - GR INSPECTOR	NGANAVTOUBE

METEOROLOGY

	km
	20
	/
	> 1500 feet
	OUI
	OUI
	DRY

STATION

	QFU 208
	IPC
	110.30 MHz
	ALCATEL411
	3 ANTENNES
	2
	2
	3.64
	DGPS / Glonass

PORT HARCOURT Localizer (ALCATEL411) — **NIGERIA**
CHECK TYPE ROUTINE 11/10/2005

Frequency: 110.30 MHz — Sector: 3.64° — Identification: PHC

NORMAL CONDITION

PARAMETERS	TOLERANCES	TRANSMIT. 1	TRANSMIT. 2
AXIS POSITION			
Displacement between A and B fields	± 6.4 µA ÷ ± 8.1 µA		
SECTOR			
Course sector	3.86° ÷ 4.06°	3.96°	3.96°
20 dot sector	1.96° ÷ 2.06°	2.00°	2.00°
90 Hz/150 Hz	3.85 ÷ 4.04	3.90	3.90
BALANCE ADJUSTMENTS			
90 Hz Modulation	0 µA ÷ ± 10 µA	0.00	0.00
150 Hz Modulation	240 µA ÷ 264 µA	252.00	252.00
90 Hz Modulation depth			
150 Hz Modulation depth			
COVERAGE AT 4 NM			
90 Hz Coverage (90 Hz)	(from 0° to 40°) ÷ 150 µA	150.00	150.00
150 Hz Coverage (150 Hz)	(from 0.35° to 90°) ÷ 150 µA	150.00	150.00
COVERAGE AT 17 NM			
90 Hz Coverage (90 Hz)	(from 0° to 10°) ÷ 150 µA		
150 Hz Coverage (150 Hz)	(from 0 to 20°) ÷ 150 µA		
COVERAGE AT 25 NM			
90 Hz Coverage (90 Hz)	(from 0 to 10°) ÷ 150 µA		
150 Hz Coverage (150 Hz)	(from 0 to 10°) ÷ 150 µA		
IDENTIFICATION	At least 6 times / minute	Correct	Correct
FREQUENCIES			
Carrier frequency	± 1 000 KHz	Not tested	Not tested
Clearance Frequency	± 1 000 KHz	Not tested	Not tested
Transmission Ratio and Coupling	4 KHz ÷ 5 KHz	Not tested	Not tested
Identification Frequency (1020)	± 50 Hz	Not tested	Not tested
COURSE STRUCTURE			
Lobes A			
Lobes A and B			
Lobes B and C			
Lobes C and D			
Lobes D and E			
Lobes E and F			
Clearance			

PORT HARCOURT GLIDE (ALCA-FeL 41 1) 11KYAW"
CHECK TYPE : ROUTINE 11/1012005

AIRCRAFT

AM d.
W Im W

GREW

;:)ii OV: Ff%HA Olin

METEOROLOGY

"KIAM

152· Awl

CON% 1 K 3,;

STATION

OAR ! 0 A"

PORTHARCOURT GLIDE (1LCATEL41·1)
GHECKTYPE : ROUTINE 11110/2005

AIRCRAFT

CREW

METEOROLOGY

STAPON

PORT HARCOURT GLIDE (ALCATEL111) ISLAIST!,
CHECK TYPE ROUTINE 11/10/2005

Fafll: :3,0W lv~ Sector: U.36 ldollLill(;'Jiolis

NORMAL CONDI'l 101\1

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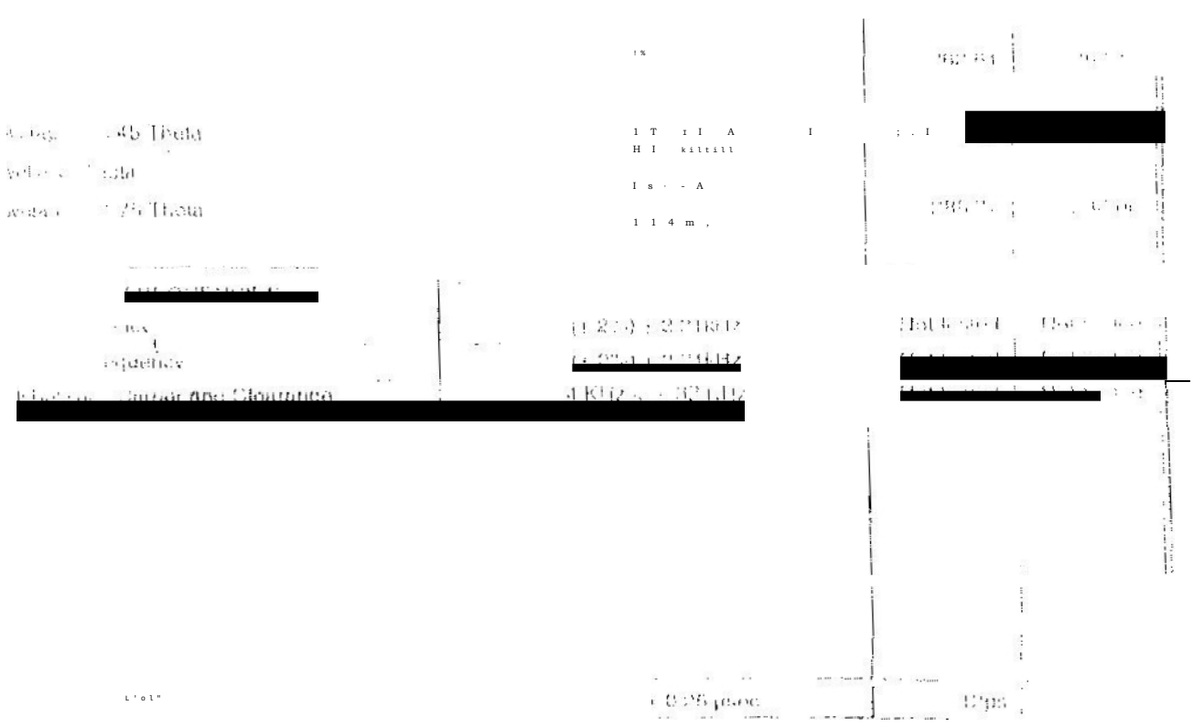
ANCE, ADJU'~'I.NIFWS



34

PORT HARCOURT Localizer (ALCATEL411) **NIGERIA**

CHECK TYPE ROUTINE 11/10/2005

[illegible]equency: 110.30 MHz Sector: 3.64° Identification: [illegible]

NORMAL CONDITION

PARAMETERS	TOLERANCES	TRANSMIT 1	TRANSMIT 2
AXIS POSITION			
[illegible] between A and B points	-6.4 µA - + 6.4 µA	[illegible]	[illegible]
SECTOR			
[illegible] sector	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3.34 - 4.04	3.70	[illegible]
BALANCE ADJUSTMENTS			
[illegible] Balance	[illegible] µA - [illegible] µA	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Modulation depth			
[illegible] Modulation depth			
COVERAGE AT 4 NM			
[illegible] coverage (90 Hz)	(from 0 to 90°) > 150 µA	[illegible]	[illegible]
[illegible] coverage (150 Hz)	(from 0 to 90°) > 150 µA	[illegible]	[illegible]
COVERAGE AT 17 NM			
[illegible] coverage (90 Hz)	(from 0 to [illegible]) > 150 µA		
[illegible] coverage (150 Hz)	(from 0 to [illegible]) > 150 µA		
COVERAGE AT 25 NM			
[illegible] coverage (90 Hz)	(from 0 to 10°) > 150 µA		
[illegible] coverage (150 Hz)	(from 0 to 10°) > 150 µA		
IDENTIFICATION	At least 6 times a minute	[illegible]	[illegible]
FREQUENCIES			
[illegible] frequency	± 1.099 KHz	Not tested	Not tested
[illegible] frequency	± 1.099 KHz	Not tested	Not tested
[illegible] between Course and Clearance	4 KHz - [illegible] KHz	Not tested	Not tested
[illegible] Frequency (1020)	± 50 Hz	Not tested	Not tested
COURSE STRUCTURE			
[illegible] A			
[illegible] A and B			
[illegible] B and C			
[illegible] and [illegible]			
[illegible] B and D			
[illegible] and [illegible]			

[illegible]

PORT HARCOURT Localizer (ALCATEL411) NIGERIA
CHECK TYPE ROUTINE 11/10/2005

Frequency: 110.30 MHz Sector: 3.64 ° Identification: IPC

MONITORING

PARAMETERS	TOLERANCES	TRANSMIT 1	TRANSMIT 2
DISPLACEMENT SENSITIVITY			
[illegible] half sector wide alarm	< 2.19 °	2.07	2.08
[illegible] half sector wide alarm	< 2.19 °	2.10	2.09
[illegible] sector wide alarm	> 4.39 °	4.21	4.11
[illegible] half sector narrow alarm	> 1.56 °	1.69	1.72
[illegible] half sector narrow alarm	> 1.56 °	1.75	1.79
[illegible] sector narrow alarm	> 3.11 °	3.41	3.51
COURSE ALIGNMENT ACCURACY			
[illegible] Course Alarm (150 Hz)	< 10.5 µA	9.0	9.0
Right Course Alarm (90 Hz)	> 10.5 µA	9.0	9.0
COVERAGE AT 4 NM IN ALARMS			
[illegible] Alarm Coverage (90 Hz)	(from 0 to 190°) > 150 µA		
Right Alarm Coverage (150 Hz)	(from 0 to 190°) > 150 µA		

[illegible]

[illegible] monitoring operates correctly

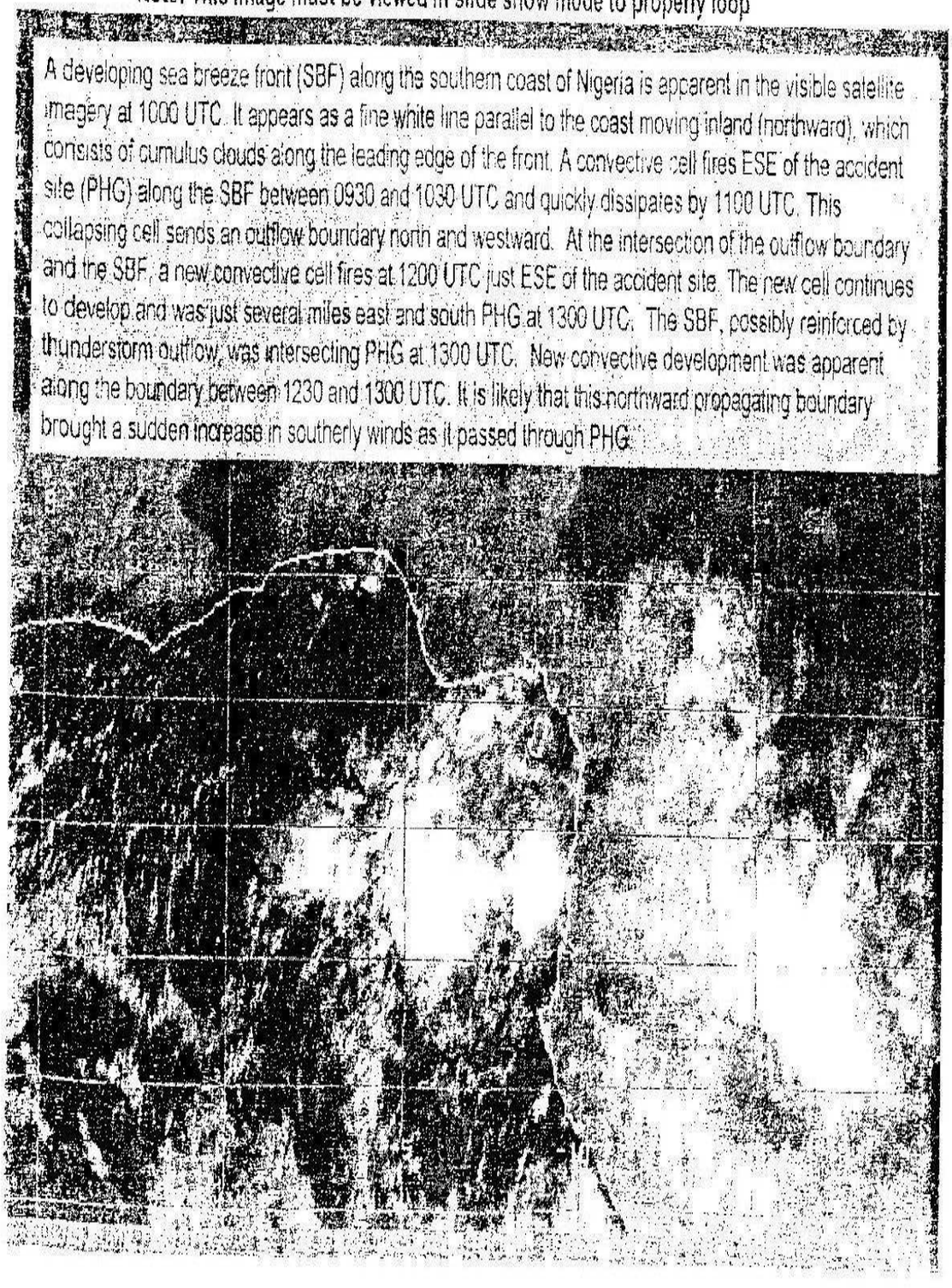
*Note: This image must be viewed in slide show mode to properly loofa

A deveiaping sea breeze front (SBF) along me s:)LAhern coast of Nigeria is apparent in the ;risible satelii'e an g?ry at 1600 UTC It appears as a fine white fine para:'iel to the coast rr)nvir,,g ".Oard fndrthward?. wl ich conr;s s ref cumulus clouds-a:ong the leading edge of ;he faint A ccnve-t :e ˙,tall fires ESE˙of the accident sIFe (PHG? along the SBF between 0930 and 103-0 UTrj and quioKly dissipates by 11 t'0 UTC. This c:;lkr3psii~~ c>wll scads do ouCflow-bourtciary r arir! anc~ ~westwara_ At the interseetien oc';t~A o:~`f~c~ro bc~r;dory anfJ tre SBF, a ncyv.convecfj ve cell fires at 1200' UTC just ESE of the accident site I˙he ciau cell continues to develop:and wajs~just several miles east and south PHG at 1300 UTC-; The SBF, possibly thunderstriFn~.outf ew

a.ang ˙:ne˙boundarv k tN en˙1 30 and 1300 UTC. It :$ likelv that this:roorthArvarO propagating boundarv brought a sudden irxr'ease it southerly winds 6s it passed through PHG-"˙

Visible Satellite Loop

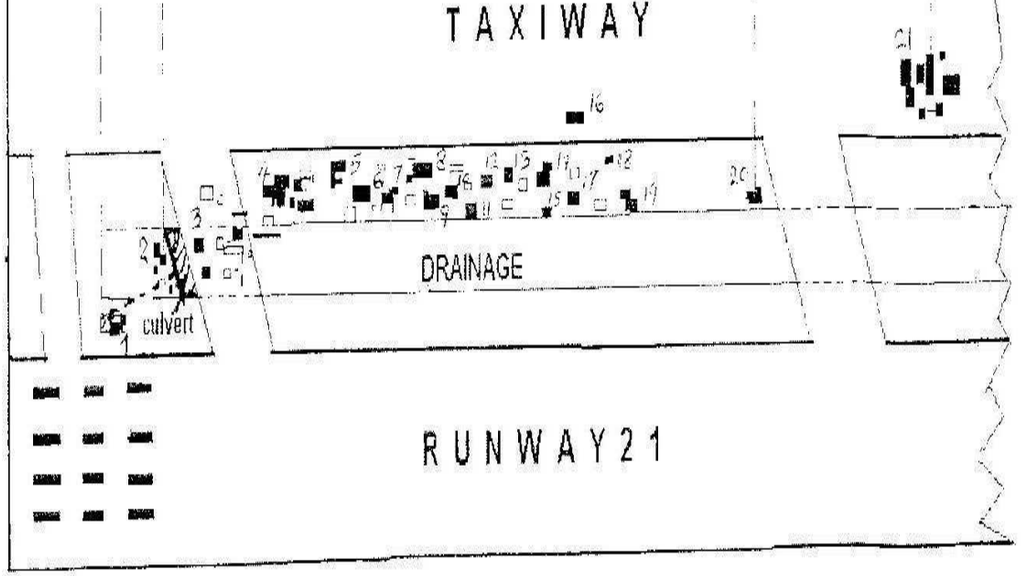
*Note: This image must be viewed in slide show mode to properly loop



Surface Observations

Day	Time hhmm	StCo	Stn id	T [F]	Td [F]	Dir	Spd [kts]	Gus	AltSet [mb]	Vis [mi]	Weather	Ceil
10	1000	NG	DNPO	86	77	000	0		1010.0	7.00		5/013
10	1100	NG	DNPO	88	77	180	2		1009.0	7.00		5/014
10	1300	NG	DNPO	84	73	220	9		1007.0	7.00		5/013

All available Port Harcourt surface observations from 10 December 2005 are shown above. Both the temperature and dewpoint dropped 4 degrees between 1100 and 1300 UTC; the winds went from S at 2 kt to SW at 9 kt as well. These observations support the idea that a sea breeze front/outflow boundary passed through or was in the process of passing through Port Harcourt near 1300 UTC. Also note that the 1300 UTC wind speed observation is a 2-minute average taken between 1258 and 1300 UTC. Conceivably, there could have been an abrupt wind speed increase that was not detected by this observation, which could have occurred just prior to or at 1300 UTC.



Clothings, shoes, bags, books, cushions, a/c seats etc.

Aircraft parts

7. 2nd bird major impact with the drainage culvert(Eng No.2. rear stab lodged in the culvert)

3. APU, Tail cone, elevator cable drum, pylon etc

4. Parts of aileron & Flaps

5. Part of the flaps

6. Airconditioning system

8.parts of the wing with flaps in extension

9. Empennage with horiz. stab & elevator

10.Parts of the fuselage

11. Main Landing Gear (MLG)

12. Engine cowling

13.Parts of the wing with slats

14.Eng No 1 Compressor

15. Nose wheel

16.Parts of the wing with slats

17.Main wing with fuselage

18. NLG

19.Eng No.1

20.Nose Tyre

21.FWD fuse