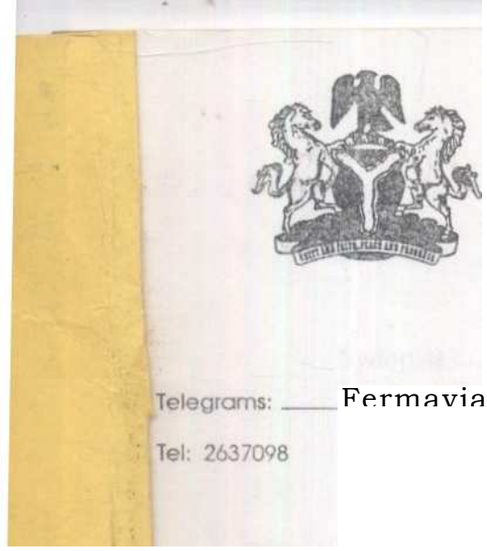
CIVIL AVIATION ACCIDENT

Report No. 04/344

Federal Republic of Nigeria

Ministry of Aviation Air
Transport Headquarters
14, Broad Street, Lagos.

REPORT ON THE ACCIDENT TO THE NIGERIA AIRWAYS LTD'S BOEING 707 - 320C ON MONDAY THE 19TH DECEMBER 1994 AT KIRI KASAMA, HADEIJA LOCAL GOVERNMENT AREA.



Federal Ministry of Aviation

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Ref. No; 04/344

30th May, 1996

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

Civil Aircraft Accident Report No. 04/344

I have the honour to submit the report on the circumstances of the accident to the Nigeria Airways limited, Boeing 707, registered 5N-ABK which occurred on Monday the 19th December 1994 at Kiri Kasama, Hadeija Local Government Area.

K: K. O. SAGOE,
Head of the Accident Investigation Bureau

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Aircraft Accident Investigation Civil

Aircraft Accident Report No. 04/344.

Aircraft: Type: Boeing 707-320C

Nationality: Nigerian

Registration: 5N-ABK

Operator: **Nigeria Airways Ltd.**

Place of Accident: **Kiri Kasama, Hadeija Local Government Area of Jigawa State.**

Date and Time: **18 December 1994 at 1806 hrs.** UTC.

Synopsis

The aircraft was on a cargo operation from Jeddah in Saudi Arabia to Mallam Amino Kano International Airport in Nigeria. Tire total cargo uplifts were 35 tones packed in 13 pallets and some loose bundles of merchandise that were packed into the underbelly cargo hold.

The normal flight should be four and a half hour's duration and this proceeded without an incident until the aircraft was about thirty minutes from a touchdown at Kano. It was reported that just before tile initial descent of tile aircraft, noxious fumes emanated from the cargo compartment. 'The Flight Engineer was asked to investigate the source of the fumes and pallet number 11 was suspected. The pallet was sprayed with a fire extinguisher and tile smoke evacuation procedure was carried out. This stopped tile fumes temporarily. At 125 nautical miles from Kano when tile initial descent was commenced the Ground Engineer who was then sitting in the cargo compartment reported to tile cockpit that the fumes had started again with increasing intensity. Soon the cockpit was flooded with the fumes to the extent that tile occupants could hardly see their neighbors'. The Captain recollected that the aircraft was set to an initial rate of descent close to 3000 feet per minute and later the pitch trims became ineffective before the aircraft crashed into the marshland. Tire ground marks at the scene of the accident indicated that the aircraft must have descended very slowly into the elephant grass and may have somersaulted on contact with the water, then exploded and disintegrated along tile wreckage trail.

1. Factual information

1.1 History of the flight.

The crew members and the aircraft were scheduled for a ferry flight to Jeddah on the 17th of December 1991 with 13 empty pallets on board. Cargo would then be picked up in Jeddah for the comma vial flight into Mallarn Aminu Kano Airport. The crew found only five pallets on board the aircraft because the officer holding tile keys to tile stores area where the other pallets were stored did not report for duty. The Captain was on the brink of canceling the flight when the crew was informed that arrangements have been made to supply the shortfall of seven pallets in Jeddah. The aircraft took off close to 17 hrs UTC and arrived in Jeddah a few minutes past 22:00 hrs. UTC. Normally the turnaround time on the ground in Jeddah was an hour and a half, but this time the crew envisaged a time of two and some half hours as th[e] pallets had to be loaded after the aircraft arrived in Jeddah. The aircraft was ready to depart at 00:30 hrs UTC. When the engine start up procedure commenced engine number .; started normally, but engine number 4 could not be started. After performing an engine blow out and the engine would still not start, engine numbers 2 and l were started. Engine number 4 was tried for starting again and had to be abandoned. Maintenance engineers were invited from Saudia to assist the Ground Engineer of the Nigeria Airways who accompanied the aircraft from Lagos, in carrying out the rectification of the engine. The Captain and the First Officer retired into a hotel, and the Flight Engineer had to stay with tile aircraft as he did not have his passport on hire for entry into Jeddah, he was said to have taken his rest period in the office of Arena, the ground handlers of the aircraft and the load master also remained at the airport to supervise the loading of tile aircraft.

The fault on engine: ;umber 4 was rectified and the aircraft departed from Jeddah at 13:48 firs UTC. The Captain was not notified about any classified cargo on board the aircraft. As the aircraft approached N'Djamena at Flight Level 35, the Flight Engineer felt a strange odour in the cockpit, the Ground Engineer and the Load-master who were sitting in the cargo compartment area of the aircraft were invited into the cockpit, and they confirmed that the sensation of smell had persisted for a while around them. The time at this point was close to **17:00 U1 C, Azare was estimated at 18:04 firs. and the Estimated Time** of Arrival in Kano was 18:1 9 firs. UTC.

The two staff members were sent back to trace the source of the odour. It was later reported that the area around pallet number I 1 was misty. A fire extinguisher was handed to the Ground Engineer and the Load-master by the Flight Engineer and **the two returned**

to the cockpit some ten minutes later breathing heavily to report that the extinguisher had been applied around pallet 11. The Flight Engineer also went into the cargo compartment for four minutes and noticed the misty fumes as well.

The Captain, after this, called for a smoke evacuation of the interior of the aircraft. This was carried out from the emergency checklist after which the cockpit crew-members removed their oxygen masks. The aircraft was now precisely halfway between N'Djamena and Kano with about 40 minutes flight time to go. Maiduguri was 10 to 15 minutes behind.

The aircraft was cleared to commence descent by Kano and the Commander requested the descent and approach checklist precisely at 18:00 hrs UTC. Soon after, at 18:01, hrs UTC the MASTER WARNING LIGHT came on, the First Officer looked up (at the enunciator panel) and probably did not see the annunciated warning and immediately silenced the warning bell. The warning light went off with the cancellation. The Captain and the Flight Engineer were disturbed by the fact that they were not given a chance to know whether the warning was a fire warning. 'File burning smell penetrated into the cockpit by 18:02:23 hrs UTC. Later the FIRE WARNING BELL sounded in erne stat 18:02:42 hrs UTC.

At 1804:23 hrs, the Commander told the Flight Engineer "Alhaji let me start going down" and this was the time when the descent of the aircraft was deliberately commenced.

The two surviving crew members, the Commander and the Flight Engineer, each reported a first explosion that rocked the aircraft violently and tripped the autopilot. This explosion was not recorded in the cockpit voice recorder as the electrical circuit of the recorder must have been severed. However it is significant to note that a radio transmission by the Flight Engineer to the Airline's dispatch unit that started at 1804:57 hrs ended abruptly at 1805:04 hrs. This was when the cockpit voice recordings ended on Nigeria Police Force's Bell 412 helicopter expectedly.

1.2 Injuries to persons.

Injuries	Crew	Passengers	Others
Fatal	1	2	Nil
Serious	2	Nil	Nil
Minor	Nil	Nil	Nil

1.3 Damage to aircraft.

The aircraft disintegrated into fragments of which the largest was **a wing** section measuring twenty-seven feet. The semi-monologue design of the cockpit area

offered more resistance to the impacts mid remained fairly intact from the cockpit entrance door to the Gent area behind the redome.

1.4 Other damage.

There was no damage to any property outside the aircraft. However the total of 35 tonnes of cm go that the aircraft was transporting was completely destroyed.

1.5 Personnel information.

Commander:	Male, aged 55 years.
Licence:	Airline Transport Pilot Licence 1079
Ratings	F-27, F-28, Boeing 737, Boeing 727, Boeing 707, DC-10.
Validity:	27 January 1995.
Medical Certificate:	Valid until 27 January 1995.
Total pilot hours:	10,917.35 hrs.
Total on type:	3594.5.5 hrs
Duty times last 28 day	50.35 hrs.
Simulator Checks:	24 July 1994.
Previous flight on B.797	10 December 994.
First Officer:	
Licence:	Commercial Pilot's Licence No 2224
Ratings:	Boeing 727, Boeing 707.
Validity.	29th February 1995

Medical certificate:	29th February 1995
Total pilot hours:	5201 hrs.
Total on type:	Over 2000 hrs.
Duty times last28 days:	62:15 hours.
Simulation checks:	28 August 1994. 10
Previous flight on B.707	December 1994.
Flight Engineer:	
Licence:	Flight Engineer's licence No. 104
Ratings:	Boeing 727, Boeing 707.
Validity:	19th December 1995
Medical certificate:	19th December 1995
Total hours:	2293.55 hrs.
Total on type:	2293:55 hrs.
Duty times last 28 days:	62:55 hrs.
Simulator checks:	28 August 1994.
Previous flight:	13 December 1994.
Air Traffic Controller:	
ATC Licence No	152
Date of renewal	19 April 1994
Date of expiry	18 January 1994

1.6 Aircraft information.

1.6.1 Leading particulars:

Type:	Boeing 707-320C
Registration:	5N-ABK
Manufacturer:	Boeing Commercial Aircraft Company Seattle, Washington, U.S.A.
Date of manufacture:	1972
Manufacturer's Serial No.	20669
Certificate of airworthiness:	No 300
Category:	Transport (Cargo)
Validity:	17 March 1995
Registered Owner:	Nigeria Airways Ltd. Airways House, Ikeja.
Total Airframe hrs.	31,477 hrs.
Certificate of registration:	Number 300

1.6.2 Engines:

Type: Pratt and Whitney JT-3D-3C

No	Serial Number	Total Hours	Time Since Overhaul
1	P644429	42,584.43	1276.48 firs,
2	P668809	31,296.09	490.05 hrs.
3	P668854	26,193	302 hrs.
4	P667720	37,494.18	2178.07 hrs.

1.6.3 Aircraft weight and balance.

Maximum allowed take off weight:	151,000 Tonnes
Take off ramp weight:	141,026 Tonnes
Estimated landing weight:	111,026 Tonnes

The weight and balance chart indicated that the centre of gravity of the aircraft was within the prescribed limits.

Fuel:

Type;	Jet A- I
Quantity at the time of accident:	Fuel endurance of 02:30 hrs.

Meteorological information.

The aircraft was flying at FL 350 and no turbulence or adverse weather was reported. At ground level the weather reports for Kano at 18:00 hrs. were as follows:

Wind:	From 110 degrees magnetic at 7 knots
Temperature:	18 degrees Celsius
Visibility;	4,000 meters.
Cloud;	BKN 9,000 m.
Q.F.E.	960 MB.
Q. N, H.	1,016 M13.

Aids to navigation.

The aircraft was equipped with an Inertia Navigation System.

KA VOR/DME on 112.5 MI-1Z. Serviceable.

ILS for runway 06 on 109.5 MHZ Serviceable.

1.9 Communications.

There were adequate communication between the aircraft and the control tower at Kano on 124. I Ml HZ. and the H IF radio link was available on 8903 Ml HZ. The watch log for the Air Traffic Services recorded a transmission at 1805 UTC. which reads "At 1805 UTC Captain NGA 9805 called to inform me that he is noticing smoke (from where he did not state) and making an emergency descent passing FL 340, thereafter no response from the aircraft and all my calls to the aircraft were not answered."

1.10 Aerodrome information.

The aircraft had alternate aerodromes available at N'Djamena, Maiduguri, Fort Lamely and Niamey.

1.11 Flight recorders.

The Flight Data Recorder and the Cockpit Voice Recorder were taken to the laboratories of the National Transportation and Safety Board {NTSB} at Washington, D.C. for a read out. A transcript of the cockpit voice recording was successfully accomplished, but the Flight Data Recorder made no readings. The recorder was a Sundstrand model with the foil recording medium. The NTSB reported that the foil was damaged and there was no evidence to indicate that the recorder had been operating at the time of the accident. There was no retrievable data from the recorder.

Upon removing the recorder from the cartridge, it was noted that the foil was ripped in several places. Further inspection revealed an apparent malfunction since no activity was registered on the foil

1.12 Wreckage and impact information.

The wreckage pattern displays the typical laws of inertia in that heavier masses tend to dissipate their kinetic energy over a longer distance before coming to a stop. Within the incipient energy, it is discernible that the total energy of the crash suggests an aircraft at high speed. Even though the aircraft did not dive into the ground as there were no deep craters to support the suggestion, it was clearly flying to the ground at a high speed. The scatter covered a distance of 5,005 feet with a width of close to 1,500 feet. The cockpit area of the aircraft that remained fairly intact was the heaviest particle at the crash site and this section ended up at the furtherest extreme of the wreckage distribution. The tact that the vertical stabilizer went further than the main

sections of the wings (a heavier mass) gives credence to the suggestion of the aircraft went into a somersault as the wheels got embedded in the mud on the initial impact. The detailed wreckage distribution chart is attached in an appendix (1)

1.13 Medical and pathological information.

The Load-master, the Ground-Engineer and the First-Officer died of their worries as a result of the crash. The Commander and the Flight-Engineer were rescued from marshland by the villagers after being exposed to the elements overnight for twelve hours. Commander suffered head injuries that he claimed had resulted from his attempt to irate himself from the wreckage. The Flight-Engineer suffered a serious compound fracture is right arm and some head injuries. There was no indication of any influence of drugs or hole in their medical reports.

1.14 **Fire.**

An in-flight insurgence of heavy smoke was reported by the Crew to the Air Traffic Controller in Kano at 1805 his. The cockpit conversations as evidenced in the transcript of the Cockpit Voice Recorder showed the Ground-Engineer traced the source of the fumes to pallet number 11. Each of the two surviving crew members reported a huge explosion just before the aircraft became uncontrollable and this was followed by other minor explosions. The fact that no explosions were heard in the cockpit recordings indicated that the explosions occurred after 1805:04 UTC when the recordings ended abruptly. This was when the Flight Engineer was making a report on the smoke to his company's Flight Dispatch Unit at Kano.

The outbreak of fire as a result of the impacts was minimal. Ground fire was mainly confined to areas of fuel spillage. The fact that the aircraft crashed into'a marshland with regions of deep ponds may have reduced the severity of the fire.

1.15 Survival aspects.

The Commander and the Flight Engineer survived the crash. The fact that the cockpit area of the aircraft remained intact and undistorted may have given protection to the two Officers. The rigidity of the cockpit area which is semi-monologue in design is the only explanation for survival in an environment of tremendous disintegration.

The Flight Engineer, in his interview noted that the Ground Engineer and the Load-master came into the cockpit to escape the choking fumes that started from the main cargo area of the aircraft and were seated on the jump seat and the navigator's seat. Later on the smoke penetrated into the cockpit and enveloped all the occupants. The two seats are normally equipped with oxygen masks which must be switched on to 100% in readiness for use. During a normal engine start there is provision for adjusting

the oxygen masks in the checklist. the Flight Engineer calls out "Oxygen" followed by the response and action of selecting 100% by each occupant of a seat in the cockpit. As the two new arrivals in the cockpit were seated in the cargo compartment during the engine startup, it is most likely that they could not get the supply of oxygen into their masks. The Flight Engineer reported the two gentlemen as gasping for air and shouting on the First Officer to open the windows. It may be possible that the two died of asphyxia before the aircraft made an impact with the ground.

1.16 Tests and research.

None.

1.17 Additional information.

None.

1.18 New investigation techniques.

None.

2. Analysis.

2.1 Early warnings and response to the fumes.

After take off from Jeddah at 13:48 hrs. UTC until the aircraft approached N'Djamena, the flight proceeded without an incident known to the crew members. The Flight Engineer in the cockpit was the first to notice and comment on the strange odour he perceived. The Ground Engineer and the Load Master confirmed the presence of the smell and a throat irritation that they experienced for quite a while around them in the cargo compartment. The Flight Engineer was justified in getting angry with them for not notifying the cockpit from the moment they felt the unusual sensations. The two fellows were sent back to investigate the source of the odour and the report was that a misty haze was seen around pallet 11. The Flight Engineer then handed a fire extinguisher to the Ground Engineer who returned to the cargo compartment with the Load Master to spray the general area of pallet 11 with the fire extinguisher They returned to the cockpit ten minutes later, breathing heavily.

It is a comment that the attitude of the Ground Engineer, to a strange sensation of smell in the cargo compartment was rather lackadaisical bearing in mind his knowledge that the aircraft was carrying tonnes of fuel that can explode in seconds. This casual approach to the problem was transferred to all the crew members in their response to the developing emergency. The Flight Engineer handed over a fire extinguisher to the Ground Engineer and he himself spent only four minutes at the cargo compartment, relying on the Ground Engineer's decisions and judgement in handling the incident. After the incident was reported to be under control,

the commander then carried out the smoke evacuation drill. The time at this point is estimated at about 17;20 hrs.

2 .2 The cockpit conversations.

The cockpit voice recorder's transcript is reproduced in appendix (1) and a lot of the conversation and response of the crew were duly recorded. The recordings commenced at 1733;56 hrs when the aircraft was maintaining an altitude of 35,000 feet with the Commander on the controls and the First Officer on the radio transmissions. The conversations centred on other matters beside the smoke or fumes on the aircraft. It was clear that the crew had put the problem of fumes behind them so much so, that the First Officer received a long lesson from the commander on when descent should commence. At 1748:24 the Commander was ready to celebrate deliverance over the rigours of the day as he said "I want wine and 1 will drink beer today." The Accident Investigation Bureau is satisfied that the Commander did not actually consume alcohol on the flight and, in fact, there was no alcohol on board the aircraft from Jeddah. The events that followed shortly after this completely falsified the sense of relief.

2.3 The onset of the emergency.

The Crew members were all relaxed, and there was completely no sense of the impending catastrophe and at 1757;54 hrs. the Captain requested the Flight Engineer to call the Nigeria Airways' dispatch office in Kano and pass the arrival information. In between this the First Officer called the Kano approach control for the first time at 1758:22 hrs. None of the transmissions informed anyone of the fumes that earlier evolved inside the aircraft. Then the master warning light with the aural warning were canceled by the First Officer by 1801:38 without identifying the warning. lie apparently canceled the warning and ran to ease himself. The Captain and the Flight Engineer clearly expressed their dismay at the nonchalant attitude.

The Accident Investigation Bureau must, again, comment on the lackadaisical attitude to the evolving emergency.

At 1802;23 hrs, the First Officer asked the Ground Engineer if he could smell anything strange and the reply, simplicity, was that he could. It may be noted that there was no sense of reporting the smell until he was asked.

The Crew finally believed that there was a real emergency at 1802;44 when the FIRE WARNING BELL sounded and it was identified this tithe as a "Main cargo smoke."

2. 4 Implications of tile abrupt stoppage of the voice recordings.

The Flight Engineer began a transmission to the Airline's dispatch control at 1804-57 hrs and at 1805-04 hrs when he said "we have smoke in wrapped up baggage's the

cockpit voice recording ended abruptly. This must be the time when the electrical circuit between the voice pick up microphone and the cockpit voice recorder itself was severed. As the voice level did not fade off gradually as a result of melting of the wires and cables, it is probable that the severance was instantaneous due to an explosion. Interviews carried out with the two surviving crew members revealed that the aircraft suffered a first explosion that rocked and sent the aircraft into a violent yaw. The autopilot also disconnected on its own. The phenomenon of the cockpit voice recorder lends credence to the crew reports. Furthermore it was verified that the total electrical power supply on the aircraft did not fail at this point. The watch log at Kano Flight Information Centre recorded at 1805 hrs that the First Officer made a radio transmission to say that he was noticing smoke and the aircraft was making an emergency descent passing flight level 340. This transmission was not recorded in the cockpit voice recorder. This clearly proves that the First Officer's radio was still transmitting a few seconds after the cockpit voice recorder was disrupted.

2.5 Uncontrolled Descent From Flight Level 340.

In the interview and on a written statement by the Commander of the aircraft it was stated that after the first and the second explosions that went off within seconds of one another he either lost consciousness or he became oblivious to anything happening around him until the chill of the swamp water where he fell jolted him back into consciousness. 'The Boeing 707 if at all attained a rate of descent of 3000 feet per minute between 1804;23 when the descent was initiated and 1805;04 when the first explosion was estimated, it would be at an altitude close to 34,000 feet when the Commander blanked out of consciousness. Within this period the Commander also experienced the ineffectively of both the electrical and the manual pitch trims. The pitch trims become ineffective when the Boeing 707 plunges into a dive. In the absence of a good read out of the Flight Data Recorder, it is not possible to reconstruct the exact motions and the flight path of' this aircraft to the point at which it plunged into the marshland What is certain is that the flight was not controlled and from the evidence of the four shallow craters that indicated the points of first contact of the engines with the water, the aircraft can be said to be in a shallow dive or close to being level.The distribution of the wreckage suggests that the aircraft may have somersaulted as it disintegrated.

2.6 Alternate aerodromes for the landing.

The first indication of problems with this flight came up at about 1700 hrs UTC when the aircraft maintaining FL 350 and Azare was estimated at 1804 his. For some reasons, the Ground Engineer failed to grasp the seriousness of the emergency and his attitude penetrated into the rest of the Crew. The Commander and the rest of the crew entertained a false conviction that the aircraft would land in Kano. There was no time the Crew gave a thought to making an emergency landing at possible aerodromes such as N'Djamena Maiduguri, etc.It was a foregone conclusion that an inspection of the cargo, especially the contents of pallet 1 I would be carried out in Kano. The Accident Investigation Bureau must recommend that any form of in-flight fire whether controlled or not, should warrant an

emergency landing at the nearest aerodrome where a comprehensive inspection can be carried out on the ground. This is because noxious fumes some-times can produce a feeling of euphoria that lures the crew into a sense of well being, but in this case it will be shown later that the euphoria was induced by fatigue.

2.7 Fatigue and duty cycles.

The Crew arrived at the Lagos airport at 1400 hrs. for the flight that was crooker made scheduled to depart at 1500 hrs. There was a delay in the departure of close to one hour, and the landing in Jeddah was close to 2 100 hrs. on the 17 December 1994. Due to the delay in loading the aircraft and the problems encountered on engine number 4 the aircraft was airborne from Jeddah at 1348 hrs on the 18 December 1994. The Commander and the First Officer were checked into a hotel, but the Flight Engineer, the Load Master and the Ground Engineer stayed at the airport. The Flight Engineer stated that he took his rest in the office of the ground handlers Areen. It is questionable whether or not the Flight Engineer had a proper rest period as the fault in the aircraft was an electrical problem on which he is a qualified and licenced to repair. Still, there is no evidence to disprove his word that he did not participate or was not an intelligent onlooker throughout the process of repairing the aircraft.

The onus of repairing the aircraft rested squarely on the Ground Engineer who was assisted by Engineers from Saudia. It is certain that the attention of the Ground Engineer would have been focused on getting the aircraft repaired and he would not have abandoned the aircraft to the team from Saudia. At 1700 hrs when the flight emergency started on the 18th December, the Ground Engineer had gone through an uninterrupted twenty seven (27) hours duty cycle.

The Accident Investigation Bureau was particularly drawn into investigating the circumstances of the Ground Engineer because there are adequate evidence of diminished responsibility on the part of the Ground Engineer that can only be explained by his tiredness and subsequent fatigue. He did not find it fit to notify the cockpit when a strange odour surrounded him in the cargo compartment and it took the prompting of the Flight Engineer before he tought of investigating the source of the odour. The same argument can be applied on the Load-master, but his limited technical knowledge may be his excuse. Again, in the written testimony of the Captain, as the aircraft began the initial descent the warning bell sounded, the Ground Engineer immediately appeared in the cockpit to advise that the warning should be disregarded as the warning may be "a fall out from the area he had just taken care of with the Load-master."

The conclusion is that the Ground Engineer was very tired and was not in a position to take any initiative and would rather wish away any problems.

Again, it can be said that the disposition of the Ground Engineer penetrated the rest of the Crew members because if an adequate realization of the problems was made, the Commander and his crew would have planned an emergency landing in one of the airports that were available close to the flight path. The Nigeria Airways Ltd. must be invited to consider

The provision of proper resting Facilities, such as bunkers etc. for all its personnel on board a flight to ensure an adequate rest from their duty periods.

The Accident Investigation Bureau will not accept the argument that the work of the lienced Engineer was only confined to the ground in Jeddah. His influence throughout this flight was formidable and was again given the job of finding Out the dangerous substance had the aircraft landed in Kano.

2.8 Carriage of dangerous goods.

The substance that initiated the fumes from pallet number eleven (11) could not be identified by the investigators. It may have dissipated itself into smoke or burnt itself out In the marshland this would he like finding a needle in a haystack. Annex 18 "The safe transport of dangerous goods by air" contains the International Standard and Recommended Practices (SARP). Going through the annex and the supporting documents of the International Civil Aviation Organization give, adequate information to States and Airline Operators on the carriage of dangerous goods. All cargo handlers and transporters may refer to these documents for guidance. However, the Accident Investigation Bureau has asked some questions that may be peculiar to the Nigerian environment. Why should any-one hide a dangerous substance inside bails of fabric? The answer may be due to ignorance, it may be an attempt to evade payment of customs duties, or it may be that the dangerous substance can be traced to a criminal activity such as the printing of security documents and currency notes. The loss of the dangerous substance is nothing compared to the loss of the haul of the aircraft and the loss of human lives. Cargo operating airlines must therefore safeguard their interests by devising proper screening methods, educating cargo consignors, and meeting the recommended handling procedures for the carriage of dangerous goods.

3. Conclusions.

(a) Findings

(1) The Crew of the aircraft were properly licensed and possessed sufficient experience for the flight.

(2) The aircraft had a valid Certificate of Airworthiness and had been maintained in accordance with an approved maintenance schedule.

(3) The aircraft's weight and centre of gravity were within the prescribed limits.

(4) The weather conditions had no bearing on this accident.

(5) The aircraft had adequate communications with ground stations both on VHF and HF up to the point of the emergency descent.

(6) The aeroplane had at least two alternative aerodromes close to its flight path if an emergency landing was decided.

(7) The Flight Data Recorder was unserviceable and evidence indicated that the Recorder had been faulty from the point of its installation. However, the Cockpit Voice Recorder contained useful data.

(8) There was a heavy insurgence of smoke into the Cockpit just before a huge explosion rocked the aircraft and rendered the (light controls unusable.

(9) The cockpit crew relied heavily on the judgement of the Ground Engineer in determining the severity of the in-flight emergency while the Ground Engineer himself may have been suffering from an acute state of tiredness and duty fatigue.

(10) The aircraft may have descended uncontrollably from a height of 34,000 It. before plunging into marshlands at Kiri Kasama.

(B) Probable cause of the Accident

The probable cause of this accident was a heat generating substance that was hidden in a cargo of fabrics inside pallet No. 11 in the cargo compartment of the aircraft. The heat that emanated from the pallet resulted in smoke that caused a major distraction in the cockpit and later caused an explosion which seriously impaired the flight controls of the aircraft.

Safety Recommendations.

Cargo handling Airline Operators are specifically directed to Annex 18 "The safe transport of dangerous goods by air" of (he International Standards and Recommended Practices {International Civil Aviation Organization) to ensure compliance with all the provisions of the Annex.

Consignors of cargo must be supplied with a list of items that are classified as

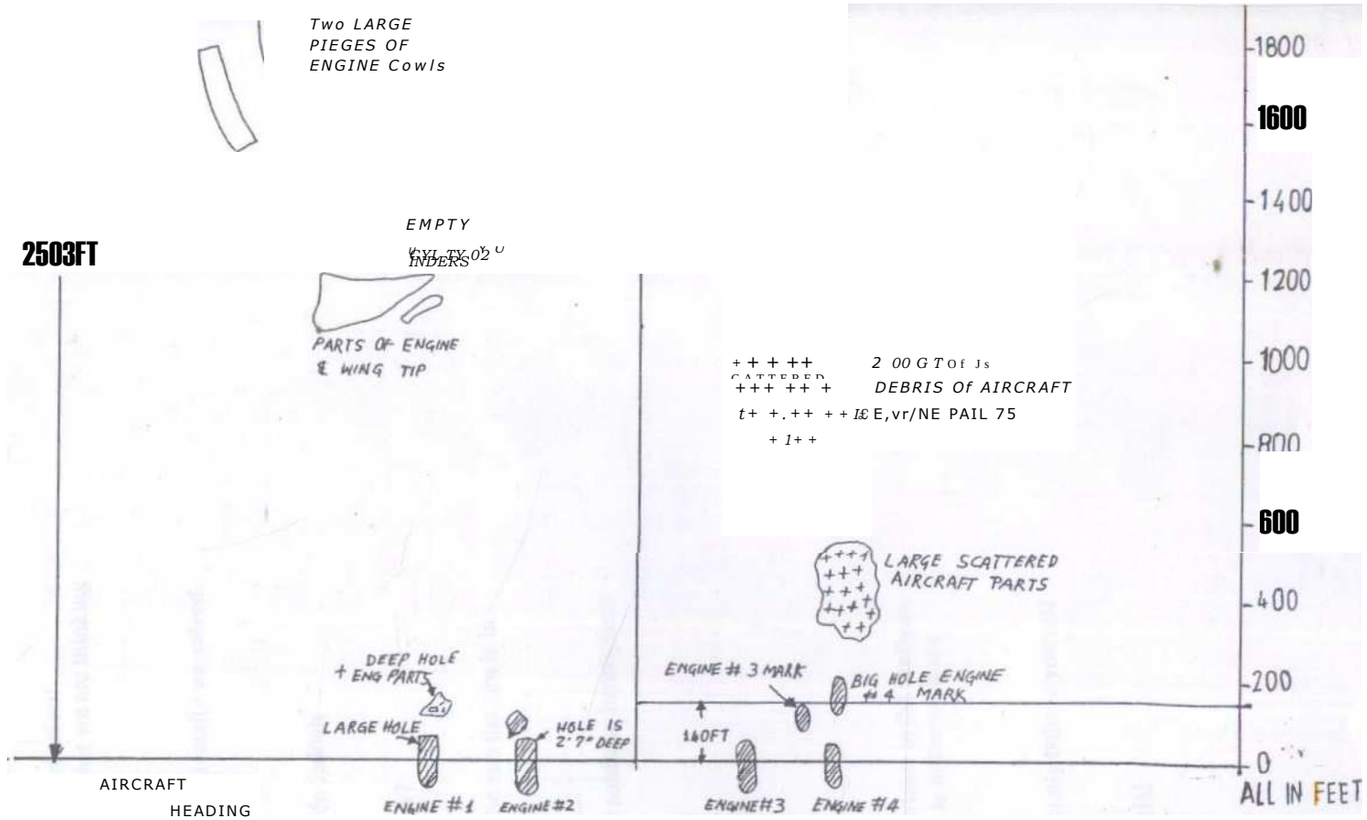
dangerous goods. Furthermore, the Airlines must devise a way of educating the owners of cargo on the repercussions of failure to declare dangerous goods.

3. Airlines may design screening methods for the detection of dangerous goods

4. The Commander of an aircraft must ensure that all visitors to the cockpit have access to an oxygen mask. The oxygen mask must be switched to deliver 100% oxygen throughout the visit to the cockpit.

S. Any form of in-flight fire whether controlled or not, should warrant an emergency landing at the nearest aerodrome where a comprehensive inspection can be carried out on the ground. The landing may also minimize any side effects of fumes on the crew.

6. Airline Operators are invited to consider the provision of proper resting facilities, such as bunkers etc. for all their personnel on board a flight to ensure an adequate rest during extended duty periods. Extended duty periods are defined as duty times in excess of sixteen hours.



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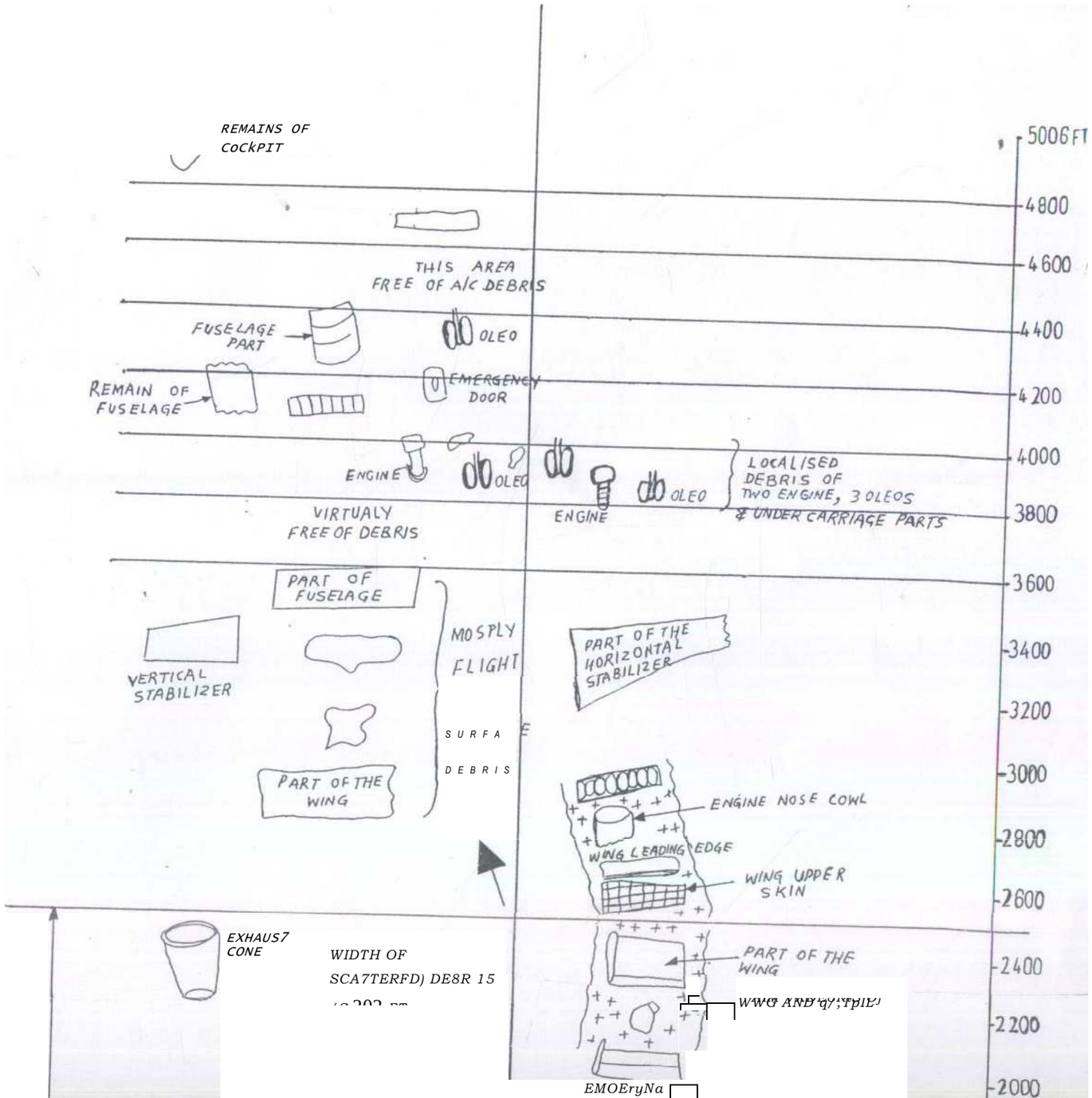
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SCA7TERFD) DE8R 15

NIGERIA Accident

START of Recording

START of TRANSCRIPT

>1733;56 ((10:05)

(:AM-2 Not in Africa where such things could be received

We should be made to (ell them exactly what we are thinking about it

> 1734:06 100:15)

CAM-1 two major problems number one is the university we solved it now it is the campus Ada look at it oh

>1734:23 (00;32}

CAM- I When could he have positioned outside Jeddah

>1734;33 (00;42}

CAM-1 it is only half past six why is it so dark?

>1734;36 100:45)

CAM-2 This is harmallan This is harmallan the sun the sun is in the southern hemisphere now

> 1734:41 100:50)

CAM-1 Young man is it the sun being in the southern hemisphere or harmallan which one is it.?

>1734;54 101:031

CAM-2 bone worry Captain

>1134:56 {01;05} CAM-1
No l want to know

>1734;58 (01:07}

a CAM-2 I have given you an answer this is winter in the northern hemisphere harmallan here the sun is in the southern hemisphere finish

>1735;10 (01;19}

CAM-2 You don't like to believe people you only believe yourself

>1735:17 (01;26}

CAM-1 We are in the tropics in the equatorial

> 1735;22 (01:31)
CAM-2 is that right ?

>/7_ U2? /O/.:1//

CAM-1 We are neirher south

>1735:24 101:33)

CAM-2 Why do you feel cold in Kano you should be burning in Kano

>1735:28 (01:37)

CAM-2 As soon as hannattan begins I bet you, you can't put your A/C on I am sure for the past two weeks you have not put your A/C on in Kano

> 1735:37 (01:46)

CAM-3 A/C.' in your house?

> 1735:39 (01:48) CAM-2 No in Kano

>1735:41 (01:50) (.'AM-3 Ah no o

>1735:43 (01:52)

(,'AM-2 it drops now only God knows what the temperature is now in Jos

>1735:49 (01:58)

('AM-2 No No they said they are using heater > 1735:53 102:02)

CAM-1 When even my wife was there she bought heater

>1735:55 (02:04) CAM-3 Sir

>1735:56 (02:051 CAM-2 Eh he

>1735:57 (02:06) ('AM-3 So o

>1735:58 102:07)

CAM- It still remains there

>1736:05 (02:14)

CAM-2 Yeah You are coming from the back now

>1736:09 102:18) CAM- Yes >1736:09 (02:18) CAM-2 I beg you 1 hope it is not too much again

>1736:11 (02:20) CAM It is clearing

> t736:14 102:23)

CAM How is your boot?

>1736:16 102:25)

CAM It is going down gradually

>1736:22 102:31)

CAM Its just like the other one

>1737:06 (03:15)

CAM- l Instead of this nonsense carrying [lower is better o the highest to begin is to give you false e e e e what you suggest you believe in you cannot just brrrr

>1738:20 (04:291

RDO Kabo Kabo 664 out of 100 (wo four miles estimating Azare at five zero Maiduguri at two zero'!'! ?

>1738:35 (04:44)

RW Welcome

>1738:38 104:47)

CAM- l That is going to delay our descent

> 1738:55 (05:04)

CAM-2 Oocxxxxx>oooocx>oo What time are we descending

> 1738:59 (05:09)

CAM-1 What has happened

> 1739:00 (05:09)

CAM-2 What of what will you have

>1739:04 (05:13)

CAM-3 No offence because the cabin will come down at that time

>1739:08 (05:17)

CAM-1 Eli need to know what of the wind in Kano

>1739:12 (05:211

CAM-2 Cm 1 can get that later hold on

> 1739:22 (05:31)

CAM- 1 The whole thing is to use runway zero what about runway two four after this he e

>1739:26 105:35) CAM-1 How can you?

>1739:30 (05:39)

CAM- l The important thing is that once we are within 25 miles of this thing

> 1739:36 (05:451 CAM-2 of eh what?

>1739:37 (05:46)

CAM-1 Come, Kano yon should just concentrate on how to land the aeroplane fast

>1739:50 (05:59)

CAM-1 Tell Alhaji to carry on wills the check list

>1739:55 106:04)

(:AM-1 Overhead vor 30 seconds, 290, 30 seconds QN11 3000 we hold hank 110 ILS as per chart calm

> 1740:54 (07:03)

CAM-1 There is nothing else anybmly can do about control with FIC 8563 you cannot get them (here is nothing. I am sure Jeddah had told them about our departure and that of the Airbus

> 1741:33 (07:42)

KANO Kabo 1345 position?

>1741:37 (07:46)
RIX) Azare

>1741:39 (07:48) KANO 1S
37 report FR-02

>1744:06 (10:15)

RDO All stations Nigeria 987 all stations FL350 direct track

Jeddah to Kano position ABEK 1744 estimating Sutam 1806 FT Nigeria 987 west bound FL350 Jeddah to Kano

>1744:48 (10:57)

CAM-3 I low many miles will you commence your descent please?

>1744:51 (110))

CAM-2 About 80 em em mites

>1744:58 (11:07)

CANI-1 Who told you what what what measure are you taking I ?h times 3 plus 10 what is it?

>1745:10 111:19)

CAM-2 What is it? what DME do you want to descend

>1745:13 (11:22)

CAM- I My friend comes to me

> 1745:15 111:24)

CAM-2 I know what you mean when do you want to descend

>17'15:20 (11:29)

CAM- I It should be when we are like 130 miles

>17'15:24 (11:33)
CAM-2 130

> 1745:27 (11:36)

CAM-1 Tbis times 3 plus It) even if you decide to descend on 200
miles you could sfill shoot an approach outside safet

>1745:40 (11:49)

CAM-1 No the rule of thumb is times 3
> 1745:43 111:52) CAM-2 What is it times 3

> 1745:46 (11:55)

CAM-1 The attitude you ale on
> 1745:47 (11:56) CAM-2 I know now

>1745:48 (11:57) CAM-2 It is 35 times 3

>1745:54 (12:03) ('AM-1 That is 105

>1745:57 (12:061

CAM- I That is 105 plus 10 that is 115
> 1746:09 112:18)

CAM-2 When I said 180 to I was very close
> 1746:16 (12:25)

CAM-1 80 miles from where
> 1746:20 (12:29)

CAM-2 From where you asked the question
1746:22 112:31)

CAM-1 We were 276, what were you using
>1746:29 (12:391

('AM-I Not 80 miles from here > 1746:38 (12:47)
CAM- I We were at about 280 miles

>1746:42 (12:51)

('AM-2 Are you saying we should descend at 200*1
>1746:44 (12:53)

CAM-1 That is not what 1 mean we have to speak the mine
language we have to do the emergency there is no landing
>1746:57 (13:06) CAM-3 That's o.K.

> 1747:07 (13:16)

CAM-1 We will be going down technically in the next 20 minutes that is
about 05 past the hour you did not pass the

estimate accurately

>1747:43 (13:52) CAM-2 laughter

> 1747:46 113:55)

CAM-1 Your language is .....,

>1747:46 (13:55)

CAM-2 We are about 20 minutes late

>1748:24 114:33)

CAM-1 I want wine and I will drink beer today

>1748:29 114:38) CAM Laughter

>17'18:34 114:43) CAM-3 Cap(. Ukeje

>1748:37 (14:46)

CAM-1 God has beet very kind because this sort of things what you don't know can barely plaster you bia open it

>1748:49 114:58)

CAM-1 If you don't understand it see runway, hell cabin, rough you saw it when we are taking off

> 1748:56 (15:05)

CAM- I You have to highlight this one

>1749:15 115:241 CAA4-3 Captain fire with us

>1749:19 (15:28) CAM-1 Eh e

>1749:22 115:31)
CAM-2 Azare is 88
miles >1749:27
115:36)
('AM-1 Certainly with no other traffic at 35000 Azare is 88 miles then there is no way anybody will be made past Azarc

> 1750:59 (17:08)

CAM-3 Capt. twenty minutes

>1751:03 (17:12)

CANT-1 Eh, I beg you twenty minutes stile

>1751:18 (17:27) CANI- door

>1751:19 117'28)

CAM-1 Is something happening? It does not matter

>1751:27 (17:36)

CAM-1 "Need to know" let me get you something
>1751:31 (17:40) CAM-1 For my son

> 1751:46 (17:55)

RI DO Kano This is Kalbo 664 position zero out of 220 for 250
>1751:58 118:07)
RDO ?????

> 1752:00(18:09)

RDO 1 will call you
>1752:09 (18:18)

CAM-1 Gear down to just talk to idiot
>1752:13 (18:22) CAM-1 We will be

>1752:14 (18:23) CAM-2 Eh >1752:15 (18:24) (:AM-1 They should start it o

>1752:16 (18:25) CAM-2 What good

>1752:18 (18:27)

CAM-1 Accepting an y manner of cargo that we are going to carry everybody
say it should be those with the manual in Europe they will not get
through with people accepting that Was
that not why we refuse to carry raw battery with acid
> 1752:45 (18:54)

CAM-2 Do you think Jeddah will see a terrible thing and load it?
>1752:50 118:591

CAM-1 These people they will do these things
>1752:58 (19:07)

CAM-3 The way they wrap all these things
>1753:01 (19:10) ('AM-2 Eli

>1753:01 (19:10)

CAM-3 That is what 1 was telling okonkwo there is no way you can know
>1753:07 (19:16)

CAM-1 "Need to know" what we are saying is that they should be a

little more intelligent about these things there is nobody
who will see something injurious and load it

>1753:19 119:28)

CAM-3 They passed through this airplane they should
have detected it
>1753:30 (19:39)

RDO Kano Centre the 064 vhf contact with Maiduguri requesting vhf
> 1753:51 120:(X))

KANO Contact Maiduguri

>1753:51 (200)) RDO
Good night Sir

> 1756:00 1220)) CAM-1 0 God

>1757:49 (23:58)

CAM- I If I can get a kind of VHF
>1757:54 (24:03)

CAM-1 Alhaji 1 beg you are doing thus try and call dispatch
>1758:02 124:11)

CAM-2 Kano Centre this is Nigeria 9805 good evening
>1758:11 124:20)

KANO 9805 Good evening go ahead >1758:13
(24:22)
CAM-2 9805 from Jeddah to Kano airborne Jeddah 1348 estimate position Azare 18 04
flight level 350 KA 1819 aircraft Boeing 707 5N-ABK 05 on board endurance
remaining 0230 hrs. go ahead

> 1758:49 (24:58)

KANO Confirm KA 1819
> 1758:53 (25:02) CAM-2 Confirmed

> 1758:58 (25:07)

KANO 9805 cleared Kano level 350 no delay VOR approach runway 06 call on the hour.

>1759:07 125:16)

KANO Weather at 1800 wind calm, visibility 40000 dust haze, QNH 1016 temperature 20
c
>1759:19 (25:28)

CAM-2 1016 20c Confirm your ILS serviceable
> 1759:27 (25:36)

KANO Confirmed

>1800;24 (26;33) CAM-2 OK

> 1800;27 (26;36}

('AM-I Descent and approach checklist
>1759;45 (25;54}
CAM-3 Capt. Ukeje, first officer (Alfa?) Eweana, flight Eng. Mohammed,
Ground Engr. Onwumeh, and load Master Okonkwo
> 1800;06 {26;15}

DSP OK I copied Nigeria 9805, estunating Chokes at 20, Capt.

Ukeje in coin mand, and we have h/O Eweana F/I? Mohammed
> 1800:24 {26;33}

CAM-3 Confirmed my Brother that is correct
> 1800;27 {26;361

DSP See yon on ground at 20,9805
> 1800;30 (26;39)

DSP Confirm that you are coming empty
>1800:34 (26:43)

CAM-3 We have cargo on board we are loaded
> 1800;39 {26;48}

DSP I low much cargo is on board
:-1800;41 {26;50}

('AM-3 We have 35 tonnes of cargo
> 1800:46 {26;55)

DSP 35 tonnes of cargo and confirm your next destination is Nairobi

>1800:51 {27:00}

CAM-1 We don't know you are the dispatcher
> 1800;55 {27;(A}

CAM-3 Yon are supposed to know you are dispatching the (light
>1801:01 (27:{0)

115P OK that is copied sec you on ground at 20
> 1801;09 (27;181 (.'AM-1 Which one is this

>1801:16 {27;25) ('AM-1 Let me see

> 1801;20 {27;33}

CAM-3 That is that Eh smoke

> 1801;22 {27:31)
CAM-1 Eh

>1901;22 {27;31) CAM-
3 May be that time

>1801;24 (27;33}
CAM-1 No We did

>1801;25 (27;341

CAM-3 But you have to identify it before request airconditioning, anyway through the ikamoni identify
> 1801;38 (27:47)

CAM-2 It is the master warning that carne up 1 looked up and didn't see anything
>1801;40 (27;49}

CAM-1 You did not see anything and then you ran

>1801;43 {27;52}
CAM-2 I ran to urinate

> 1801;45 (27;54}

CAM-3 And know exactly what it is whether its fire warning

>1801;53 {28;02)

CAM-2 Did you tell the dispatch about the smoke we had

> 1801;59 {28;08} CAM-3
I did not tell them

> 1802;00 (280))

CAM-2 You (lid not tell them"?

> 1802;03 (29;12}

CAM-1 You are going clown with blame

> 1802;14 (28;23}

CAM-2 Let me ask Owtunch whether he sees anything there.

> 1802;21 (28;30} CAM-
1 1 have seen cargo.

> 1802:23 128:32) CAM-2
Are you smelling?

>1802;24 (28;33}
CAM Yes

>1802;25 {28;34)
CAM-2 Eh?

> 1802;25 {28;34}

CAM Yes
> 1802;28 {28:37}

CAM-3 Wait can you tell the load where they are and identify it?
>1802:34 (28:43}

CAM It is difficult to really know
>t802;42 (28;51}

CAM FIRE WARNING BELL
> 1802:43 (28;52} CAM-2 OK Light is on

> 1802;44 (28;53} CAM-3 Alhaji

> 1802;47 {28;56}

CAM Main cargo smoke
> t802;50 (28;59} CAM-2 ? It is on now

> 1802;56 (29:05}

CAM-2 You have no choice than to start going to Kano
>1803:08 {29;17} CAM-] Main cargo smoke

>1803:09 (29:18}

CAM-2 But this is correct this indication is correct and it is for real
> 1803;13 {29;22}

OKONKWO is it because we are having smoke now whether you want it

1803:20 (29:29) CAM-2 Safe journey

> 1803;24 {29;33}

CAM-2 It has come up now is for real and this is not false warning I request descent
> 1803;31 {29;40} CAM-1 No no no

>1803:32 129:411

CAM-3 But I will do it in another way
>1803;33 (29;42} CAM-3 Captain

> 1803:46 {29;55}

CAM-1 We have about 20 minutes to go

>1803;56 (30;05}
CAM-2 What is in it

>1803:58 {30;07}
CAM-2 Calm calm
cabin
>1804:00 (30:09}

CAM-3 The cabin has started coming down
>1804;01 {30;10}
CAM Yes

>18(A:03 {30;12}
CAM-2 You are
right

> 1804;18 (30;27}

CAM-3 I **am** repositioning the outflow valve I am normalizing the cabin now
>1804;23 (30;32}

CAM- I Alhaji let me start going down now.
> 1804;26 {30;35} CAM-2
Yes yes >1804:26 (30;35}
CAM-3 let us go down
now

>1804;28 (30;37}

CAM- I there is smoke everywhere now
> 1804;30 (30;39}

CAM-2 It is coming now fetus notify Kano Tower
now > 1804;37 (30;46}
CAM- I there is smoke everywhere now
>1804;37 (30;46}

CAM-2 there is smoke everywhere now all of you leave that place
>180-1;43 (30;52}

CAM-2 You don't hear hummmmmm it is getting more serious now it is getting more serious
> 1804;48 {30;57}
CAM-1
OOOOEEE
> 18(4:49 (30:58)

CAM-3 Close cockpit door sit down I beg
>1841;51 (310))

CAM-2 Take it easy, take it easy
>1804:55 (31:04}

CAM-2 Knock off autopilot knock off autopilot.

> 1804;56 {31;05}

CAM-2 'fake it easy take it easy
> 1804:57 (31:06)

CAM-3 Kano Kano dispatch Nigeria 9805
>1805;01 {31;10}

DSP Nigeria 9805

>1305;04 {31;13}

CAM-3 we have smoke on wrapped up baggages
END of RECORDING

END of TRANSCRIPT