CIVIL AVIATION ACCIDENT

REPORT NO 04/380

FEDERAL REPUBLIC OF NIGERIA

MINISTRY OF AVIATION

FINAL REPORT ON THE ACCIDENT TO
NETWORK AVIATION SERVICES LTD.
PARTENAVIA (P68C) AIRCRAFT
REGISTERED 5N - ATE AT
IGBOGBO VILLAGE, IKORODU
LAGOS STATE
ON SATURDAY 16TH JUNE 2001

Federal Ministry of Aviation

Accident investigation and prevention Bureau

FEDERAL SECRETARIAT, SHEHU SHAGARI WAY, ABUJA.

Tel: 5238568

Ref: No. 04/380

15th October 2001

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

Dear Madam

CIVIL AVIATION ACCIDENT REPORT

I have the honour to present the final report on the accident to the Network Aviation Services' partanavia P68C aircraft registered 5N-ATE that crashed at Igbogbo Village, Ikorodu, Lagos State on the 16th of June, 2001.

K. K. O. SAGOE
DIRECTOR,
Accident Investigation and Prevention Bureau

Report on the Accident to Network Aviation Services Limited Partenavia (P68C) Aircraft Registered 5N-ATE at Igbogbo Village, Ikorodu, Lagos State On Saturday 16th June 2001.

Aircraft Data

Type:	Partenavia P68C
Serial No:	244
Year of Manufacture:	1981
Registration:	5N-ATE
'C of A' Validity:	9th February 2002
Total Airframe Time:	528 hours
Manufacturer:	Partenavia Costrusioni Aeronautiche SPA 80026 Casoria-Naples Italy
Owner:	Network Aviation Services Limited 8A Ogunjebe Street, Papa Ashafa, Dopemu Agege, Lagos State.
Operator:	Network Aviation Services Limited.

Engines

Type:	Lycoming IO – 360 – AIB6	
	No. 1	*No. 2*
Serial No:	L-21196-51A	L-21195-51A
Year of Manufacture:	September 1979	September 1979
TSN:	528 hours	528 hours

Propellers:	Variable Pitch
Type:	HC-C2YK-2CUF
Manufacture:	Hartzell
Year of Manufacture:	1994
Place of Accident:	Igbogbo Village, near Ikorodu, Lagos State.
Date and Time:	16th June 2001 at 1028 hrs UTC

Commander	Captain Abiodun Babalola Olushola
Maintenance Engr.	O. O. Olushola
ATC	Noah Olushola Agboola

Synopsis

5N-ATE departed from runway 19L of Murtala Mohammed Airport, Ikeja at about 1000 hours UTC with two souls on board: the pilot and the Photo Navigator. Destination was to be Calabar, Cross River State for an aerial survey project. Only 22 minutes after airborne, the pilot radioed Lagos tower for return clearance to station owing to an undeclared "technical problem". Few minutes after the clearance was granted, the pilot announced problem on engine number one and then declared emergency. The AIB was immediately put on an alert when initial contact was lost with the aircraft, which enabled the Bureau to be at the site soon after the crash. A football field within a school premises was selected for the landing, but the left wing of the aircraft made an impact with a fir tree at the edge of the field which produced the turning moment force that diverted the landing roll towards the school's perimeter fence. The second impact resulted in instant fatality to the pilot and serious injury to the camera navigator who was sitting behind the camera assembly in the cabin.

1.1 History of flight

The previous flight performed by 5N-ATE before the eventful mishap, was dated 20th May 2001 in the *Technical Logbook* sheet, showing the aircraft's total time of 528 hours as of that date. This number was then, carried over to the next page in anticipation of any ensuing flight. Incidentally, the next flight happened to be this unfortunate one. Apart from the brought forward total time, no further entry was made in the *Technical Logbook* sheet for this flight. So, other necessary information, such as the crew name, date, mission, total **FUEL** and **OIL** on board and other contingencies were conspicuously missing from the current page for this eventful flight.

In the morning of the day of the accident, 16th June 2001, the pilot and his passenger were brought and dropped at the Murtala Mohammed Airport General Aviation Terminal, where the aircraft was moored. As usual, the captain prepared the aircraft by himself for the departure without any assistance from the ground crew. The uncompleted technical logbook was of no help, in that nobody knew what was done on the aircraft and the amount of fuel uplift before departure from Lagos was not logged. The pilot requested for start-up clearance and the request was granted at 0837 hours UTC. One hour after the start-up clearance, the aircraft taxied out of its mooring apron at 0938 hours and was, eventually, airborne at 0951 with 2 souls on board and the pilot reported 4 hours endurance to the tower. It was not known if the engines were actually started immediately after the clearance, which would have left the engines running for more than one hour before taxing out.

At 1005 hours, ATE made a position report as being established on course, passing 4000ft and that it was about 29 nautical miles DME from Lagos. Procedurally, the aircraft was then granted the request to set course after the TMA boundary and was assigned to flight level 70. At DME 36nm and time 1012 (21 minutes after departure) the pilot announced an intention/request to return to Lagos owing to some technical problem. When the Controller demanded for the nature of the problem, the pilot responded that he had high temperature on number one engine. The request was granted and the aircraft was cleared to FL 50 with assurance not to expect any delay for an ILS approach to runway 19L. At 1014 hours, the pilot requested for priority descent and landing; again the Approach quickly consented and descended him further to 2200 feet. When the controller enquired whether the pilot was declaring

emergency, the pilot then answered in the affirmative and gave his ETA as 1027, 2 souls on board and 3 hours endurance. When the Controller called the aircraft at 1026 hours for position report, the pilot gave a "standby " response and this was the last conversation between the pilot and the Controller. After many trials to re-establish communication had failed, the Controller's supervisor was then immediately summoned to the control room and the search for the aeroplane commenced in earnest. AIPB was instantly notified at this juncture.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	1	0	0
Serious	0	1	0
Minor/None	0	0	0

1.3 Damage to Aircraft

The aircraft was completely destroyed by the second impact with the perimeter fence.

1.4 Other Damage

The School perimeter fence, about 10 metres long, into which the aircraft crashed, crumbled like a pack of cards. The fence had since been re-constructed.

1.5 Personnel Information

1.5.1 The commander of the aircraft was a 40 year old Nigerian male with a Nigerian issued Airline Transport Pilot Licence Number 2582. The Licence was valid until 3rd November 2001. As at the time of the accident, the commander had purportedly accumulated the total flying experience of 10,172 hours and his flying experience on the type was unscrupulously recorded as being 2,724 hours. The commander held Part 1 ratings on PA-23, C-172, Baron-55 and Partenavia P68C. He also held Part II rating on B-737.

1.5.2 The Aircraft Maintenance Engineer.

The aircraft's maintenance engineer is a 67 year old Nigerian male with a Nigerian issued Aircraft Engineer's Licence (AMEL) No.259. He had his licence renewed on 3rd November 2000. Aircraft type endorsements on

the licence are F-27 (Airframe), F-28 (Airframe), PARTENAVIA P68C airframe and a "Category C" on Avco Lycoming IO-360-AIB6 engine, the type that was installed on this aircraft. He had the P68C airframe and the engine (A & C) ratings in 1992.

1.5.3 The Approach Control

The controller on duty is a 40 year old Nigerian male holding an ATC Licence No.240, which expires in April 2002. He has ratings on Aerodrome & Approach Control. The controller was in contact with the aircraft at 0952 hrs UTC on 124.7 MHZ soon after the aircraft was airborne. There were good communications (transmissions and receptions) between the controller and the aircraft up to the last moments of the crash. At 1027 hrs UTC, when the controller lost communications with 5N-ATE, he engaged the over-flying aircraft to watch out for the ATE on radial 130. The report of the over-flying aircraft was negative and he therefore declared emergency.

1.6 Aircraft Information

1.6. (a) The P68C airframe was constructed in 1981 by Partenavia Company, Casoria–Naples, Italy and the reciprocating engine powerplant was manufactured in September 1979 by Textron-Lycoming, Williamsport, Pennsylvania, USA. 5N-ATE was specifically designed and constructed for aerial surveying and was equipped with a ground scanning camera, which was mounted on the central cabin floor with a single seat behind it for the navigator. Messrs CARNET DE-ROUTE REISDAGBOEK of Belgium was the first operator of the aircraft before being acquired by Messrs. ASTRO SURVEYS LTD of Kano, Nigeria and the aircraft was, consequently, transferred to the Nigerian registry in 1984, when the total airframe time was 164 hours. Astro Surveys was an aerial Surveyor, who brought the aircraft into the country in a 'private' category to do its own business and the "Certificate of Airworthiness" was properly issued in that respect. The ownership of the aircraft, however, changed hands in 1994 and it was transferred to the possession of Network Aviation Services, Ikeja.

1.6(b) Airworthiness Certificate

The 5N-ATE was certificated as 'Private' category aircraft as indicated on its Airworthiness Certificate. The aircraft was being used for 'hire and reward' in aerial services and in fact, was on a survey mission to Calabar

for the Cross River State Government, when it crashed at Igbogbo village on the day of the accident. Network Aviation Services has only DASH-7 aircraft endorsement on its Air Operator's Certificate (AOC); no other aircraft is included on the certificate.

1.6(c) Weight and Balance

The original seating configurations of the aircraft – 2 pilots, I photo Navigator and the mounted Camera type WILD RC 10 in the centre of the cabin did not change the prescribed centre of gravity during the phase of operation and therefore had no relationship with the accident.

1.7 Meteorological Information

The aircraft was flying at 7000 ft and 36 nautical miles DME when the pilot decided to return to Lagos for technical reasons. The meteorological conditions prevailing around Lagos airport at 1000 hours UTC were as follows:

QAN (Wind)	180^0 magnetic at 7 knots
QBA (Visibility)	10 kilometres
QBB (Cloud)	BKN 390 m, 600 CB
DNY (Weather)	Nil
QNY	1013 HPA
Temperature	28^0c

The weather conditions did not have any bearing on the accident.

1.8 Aids to Navigation

The aircraft took off from 19L, the equipment were as follows:

127.3 MHz.	Serviceable
124.7 MHz. & Monitor	Serviceable
118.1 MHz.	Serviceable
123.8 MHz.(ATIS)	Serviceable
HF 8903 & 9495 KHz.	Serviceable
Computer & Associated Printers	Serviceable
Weather RTTY	Unserviceable
LAG VOR/DME	Serviceable
ILA, ILB, ILS	Serviceable

1.9 Communication

There were good communications between the aircraft and the approach control on 124.7 MHz. until about 2 minutes to the crash when the approach controller could no longer establish contact with the aircraft.

The last communication from the pilot was 'standby' at 10.26 hours UTC when the approach controller was asking for the aircraft position.

1.10 Aerodrome Information. (The crash site)

In the absence of an aerodrome, the selected ditching ground for the emergency landing could have, successfully, contained the landing roll, if not for an unforeseen circumstances on the part of the pilot. The landing area is a large football field contained within the perimeter compound of Zumusat Isillamiyah Secondary School, Igbogbo Ikorodu, Lagos State. The Southern part of the compound is adorned with two rows of fir-trees right and left of the main entrance access road from the gate. The access road leads to the tutorial and administrative buildings located deep down in the compound of the school (Please see appendix 5.2 for the sketch of the school's compound). The football field commences from behind the front concrete fence of the compound and stretches westward towards the administrative buildings. Some high-tension electric wires were spurn directly high above the front fence of the school compound; the pilot must have taken cognisance of this when he was manoeuvring for landing. The aircraft approached the field from the North and glided above the power line before making a right hand turn, to intercept the beginning of the field. The landing could have been successful if the emergency manoeuvre had been well executed. But the left wing made a first impact with the first adorning firtree. The impact now changed the intended direction of the aeroplane towards the opposite row of the adorning trees lining along the concrete fence. (Please appendix 5.6)

1.11 Flight Recorders

The aircraft was equipped with neither Cockpit Voice Recorder(CVR) nor Flight Data Recorder(FDR). This category of aircraft is not mandated by the Civil Aviation Regulations to carry such equipment on board

1.12 Wreckage and impact information

The first impact after touch down was the left wing colliding with the first fir-tree at the beginning of the football field. The collision with the tree now changed the direction of the landing roll towards the school's perimeter fence along which there are other fir-trees that adorn the other side of the leading access road in the School's compound. The second and fatal impact was with the concrete wall fence and some adorning trees. This impact spelt the doom of the unfortunate aircraft and the pilot. The wreckage was intact in one piece only that the two wings, the radome

and the cockpit area were totally crumbled and mangled owing to the horrific impact with the concrete wall and trees. Fuel spillage was not noticeable on the ground, as there was no serious spillage as would have been expected of fuel quantity to last an endurance of 3 hours for the type of this aeroplane as declared to the tower by the pilot at the final stage of the flight.

1.13 Medical and Pathological Information

The pilot was instantly killed by the second impact but the camera navigator was rescued from the wreckage, because he was sitting behind the mounted camera. The pilot's body was deposited at the Ikorodu General Hospital's morgue, while the passenger was rushed to a private clinic in Ikorodu town. The seriously injured navigator was taken to the clinic by the virtue of the fact that the clinic's accountant's car was among the early callers at the scene of the accident.

The AIB's Inspector of Accidents got to the clinic after leaving the site of the accident at about 1900 hours UTC. The Patient was found in a deplorable condition and the clinic's authority did not give the necessary medical attention. For instance, the patient's room and bedside were like an exhibition fair with spectators trooping in and out of the room. No X-ray photographs had been taken of a patient with multiple fractures on both legs and arms, only the superficial bruises were treated since the time the patient was admitted in the early part of the afternoon. Observing that this condition was not too congenial to the patient, the AIB official quickly travelled to the Accident and Emergency Medical Centre attached to Ikeja General Hospital and arranged for the patient's transfer to the Emergency Centre. He was transferred and arrived at the Hospital at about 0230 hours UTC on Sunday morning. The patient was hopelessly disoriented and still had bruises and blood patches all over his face. The legs had been turning purple owing to lack of immediate care in the clinic. The patient had suffered fracture of Collarbones, multiple fractures of both legs and arms. Lacerations and bruises to the head and the scapulars were, also, well manifested all over the patient's body.

Around the early hours of the new day, about 0300 UTC, the Vice Consular of the British High Commission was contacted by the AIB to seek assistance for Mr. Roger Bouchet, who was the photo navigator on board, to be transferred to his home country. But meanwhile, the man remained under intensive care at the Accident and Emergency Hospital,

where he was yielding positively to better treatment at the Ikeja General Hospital. Mr. Roger Bouchet was released on Thursday 21st June at 1700 hours UTC to the medical doctor (Dr. Joseph Milbaum) in charge of TOCARO Air ambulance for onward transfer to Europe for better treatment. Autopsy report was not issued on the deceased pilot, because the family objected to the request by Ikorodu General Hospital to perform any autopsy examination on the body.

1.14 Fire

The saving grace in this accident was that, there was no fire outbreak.

1.15 Survival Aspects

1.15.1 The survivability of this accident is due to the fact that there was no fire out-break and also to the fact that the second soul on board did not occupy the right hand cockpit seat, which was totally destroyed by the second impact with the wall fence. In fact, that side of the cockpit was structurally damaged more than that of the commander's side, which collided directly with a tree. The co-pilot's seat was enmeshed with the instrument panel at the second impact; no human could have survived such a devastating impact.

1.15.2 **The Search Operation**

(a) When it was imminent that the aircraft was really in problem and the ATC could not re-establish communication with the pilot, the controller sent another aircraft in the circuit to search for the distressed aeroplane. At 1029hours, a Donnier-228 belonging to DANA Air with the call-sign DAV-465 was instructed to assist in contacting ATE, if possible, by radio and visual contact. The aircraft was instructed to fly eastwards on radial 130 for the search. The instruction was carried out at time 1035 hours, but the distressed aircraft was not sighted nor was there any contact by radio means.

(b) Another aircraft, a Mobil Production Company Beechcraft registered 5N-MPA coming from Eket was also instructed at 1038 hrs UTC to go in search of ATE. MPA reported picking a distress radio signal from 25 to 30 nautical miles but could not ascertain the direction of the signal.

(c) Another aircraft, a DHC-8 reported at 1054 hours about picking up a distress signal coming intermittently at 50nm and became stronger at 25nm.

(d) Aeroline 282 confirmed picking up the same distressed radio signal when it was at 25nm to the VOR station, but no sight of any aircraft on ground.

(e) The ATC's suspicion that the aircraft had crashed became stronger and the FAAN fire department of the airport was contacted and sent on blind search towards the approach path. Bristow Helicopters (Nig.) Ltd was contacted for the search effort and a helicopter 5N-SKY joined the search group but all efforts to locate the wreckage did not yield any information as per the location of the wreckage of ATE. Police Airwing was contacted for the search assistance but the Police Airwing did not have any operational aircraft. Pan African Airlines (Nig.) Ltd had no aircraft on ground but the company's Project Manager assisted by providing some information.

Accident Investigation Bureau was put on the alert immediately the ATC began seeking outside assistance to join in the search effort. The first information about the accident location came at about 1245hours, when Ikorodu Police Force called the Murtala Mohammed International Airport terminal's police detachment that an aeroplane accident had been reported at Igbogbo Village.

1.15.3 Rescue Operation

Incidentally, at about the time that 5N-ATE declared emergency and was scouting for an appropriate ditching point, many observers around the outskirts of Ikorodu township saw the distressed aircraft. As the aircraft came over treetop to Igbogbo village, some observers followed the aircraft's trail by driving along the Igbogbo main street – Bayeku Road and followed the aircraft to the accident-point within the Schoolyard.

One of those early callers was, fortunately and unfortunately, an employee of the Ikorodu clinic driving the clinic's ambulance in the wake of the aeroplane. The fortunate aspect is that he had an impromptu idea and resourcefulness of how to approach the safety evacuation of the survivor and the unfortunate aspect, because he was prejudice of the hospital where to rush the survivor. The survivor was extricated from the wreckage and rushed to a private clinic, where the above-mentioned spectator works, rather than the Ikorodu General Hospital, which is closer

to the site of the accident than the clinic. The sole survivor was found unconscious, though regained consciousness at the clinic, but was seriously and psychologically disoriented. The officers of the Aircraft Accident Investigation and Prevention Bureau transferred him from Ikorodu clinic at about 0230 hours in the early hours of Sunday morning to the Accident and Emergency Medical Centre. Mr. Roger Bouchet was still disoriented, but rapidly responding to treatment before he was flown out to his home country on Thursday of the week.

1.16 Tests and Research

The left hand Textron Lycoming engine was removed for stripping in the AIPB laboratory to determine the initial problem of the aircraft. At the site of the accident the engine could not be rotated by hand whereas No. 2 engine had free rotation and that confirmed the pre-impact problem, which the pilot previously reported to the approach control.

When the engine was opened up, the No 3 cylinder was found deficient, the type that could cause the high temperature initially developed by the engine. Part of the top compression ring-land of the piston was found to have been chipped off, because it had been badly pitted by corrosion. The metal chips and other metal fragments were rubbing against the cylinder walls as the piston travelled up and down the cylinder wall. There were other maintenance malpractices that contributed to the high temperature initially displayed by the engine's cockpit instrument:

1.16.1 **Research Findings**

(a) Near total blockage of the oil cooler's air inlet to the heat exchanger of the cooler. This would inhibit effective cooling of the engine oil. (See appendices 5.3A and 5.3B)

(b) Cooling and lubricating engine oil system hose had ruptured since an unspecified time before the accident and the two halves were passed through a canvass conduit instead of replacing the entire hose with a new one.

(c) There were traces of engine oil spray on all the engine-driven accessories and other components. It is probable that the quantity of the engine oil could have diminished to below effective cooling level.

(d) The No.3 piston top compression ring-land was found chipped. (Appendices 5.5A and 5.5B)

(e) The type of residual fuel drained from the carburettor and from the engine driven pump of the stripped engine is suspected to be different from LL-100 aviation fuel recommended for this reciprocating Lycoming engine.

(f) When the engine oil filter was cut open, metal chips and filings were detected within the folding elements of the oil filter cartridge.

(g) There were indications of carbon deposits on the piston head and the cylinder wall.

1.17. Organisation and Management Information

1.17.1 Network Aviation Services.

Network Aviation Services holds an Air Operator's Certificate No NAS/99 with permission to operate Dash 7-102 aircraft type, in the Transport (Passenger) Category. The certificate was dated 15th day of October 1990 and was to remain in force until 24th December 1999. In the Volume II of the aircraft file submitted by the Nigerian Civil Aviation Authority (NCAA), the company, Network Aviation Services had been handling the Airworthiness responsibilities of 5N-ATE prior to December 1993 when this file was opened. The owner of the aircraft then was Astro Surveys Limited, Kano Nigeria. NCAA could not produce the Volume I of this file despite repeated demands for the Volume. So AIPB was deprived of the liberty to investigate the aircraft's airworthiness record to pre-1993 period. From the two Volumes (vol. II and vol. III) of the airworthiness file surrendered, it could be observed that the Network Aviation Services performed the maintenance of the aircraft on flight hourly maintenance schedule basis and had accomplished the manufacturer's recommended Service Bulletins (SB's). Also, the Airworthiness Directives (AD's) were accomplished on the aircraft as at when due. The company had been taking care of the aircraft's maintenance and repairs until the company finally acquired it from Astro Survey in 1994.

1.17.2 Cooper Aerial Surveys Ltd,

Messrs Cooper Aerial Survey Ltd. is an aerial survey company operating at Gamston Airport in United Kingdom, who entered into a contract with Network Aviation Services Ltd to perform the aerial mapping of Calabar on its behalf. Mr Roger Bouchet (the sole survivor of the accident) is the employee of the company sent to Nigeria to assist in manning the scanning camera, which was installed in 5N-ATE. The aircraft was, therefore, operating for "hire and reward" when it crashed.

1.17.3 Aerial & Satellite Company Ltd of Nigeria was the original winner of the Calabar aerial mapping contract, which was awarded by the Cross River State Government. Then this company re-awarded the contract to Cooper Aerial Surveys Ltd and Cooper Surveys sub-contracted the job to Network Aviation Services.

1.18. Additional Information

1.18.1 Eyewitnesses' Account

Eyewitnesses gave account that the Pilot seemed to have first chosen a place within the vicinity close to him when he was in search for an appropriate landing place. His first choice was Oreyo Grammar School, Igbogbo Village but the idea was dropped because of human activities around the school's football field. Then the pilot made for the next football field at Zumusat Isillamiyah Secondary School within the same vicinity.

1.18.2 The second eyewitness account came from a 41-year-old man by the name Mr. Yinka Alabi who lived near the site of the accident. He stated that he rushed out of his house when he heard the impact sound of the aircraft. On arriving at the site, he saw the presence of the two men inside the aircraft. He said that other onlookers and him waited for some minutes expecting an explosion before they started to approach the wreckage. When there was none, they then moved collectively to rescue the occupants on board the aircraft. The Pilot was, of course instantly killed by the impact.

1.18.3 Another eyewitness is a 39 year old – Mr Olabode Ogunyemi, who lives at 53 Oba Ogunlewe Road, Igbogbo. He said that, it was around 11 something, when he was standing close to Oreyo Grammar School that he

observed the approaching aeroplane with its two engines stopped, because both propellers were not rotating. He said that he saw the aeroplane descending and that he, immediately, knew there was a problem, so he joined a car and they pursued the aircraft. At a point, the right engine's propeller tried to start working again, but then stopped. The aeroplane finally came down at the school and crashed.

1.18.4 Another eyewitness account was from a 56 year old Chief Ali Yahaya Kashimawo Audu, the Boba-Shelu of Igbogbo land, whose place of abode is at No 60 Obafemi Awolowo Way (directly opposite the school of the crash site). Chief kashimawo gave evidence that he was sitting at his balcony when he observed the aircraft approaching the football field across from his house. He said that the left engine had stopped and that the aircraft was flying rather too low. He said that one engine wanted to pick up, because it had initially packed up. He said that he saw the "aircraft dropping fuel along the flight path". And when the airplane crashed there was little fuel at the crash site. He contended that if there was much fuel, there should be fire. The Chief also stated that when he approached the aircraft, the split fuel on ground could not be more than 20 litres. The Chief claimed that he was the first person to report the crash to the police and then to the head chief of the Village and his other chiefs.

2.0. Analysis

2.1. Aircraft Category

Usually, the size of an aircraft does not determine what category to append on the surface of its airworthiness certificate. It is possible to operate a Boeing-747-400 in the 'private' category regime, if the aircraft is used for operating or promoting the owner's business without taking any compensation either in kind or reward from a third party for the services rendered. It is also equally possible to own a Cessna-150 and operate it for "hire and reward" in the Transport (Passenger/Cargo) category, that is, if the operator collects reward for the services rendered. On the other hand, if the Boeing –747 above is sold out to a commercial airline operator who will now use the aircraft for passenger carrying purposes, then the appellation on the new certificate must be re-issued to read 'Transport Category' in accordance with the Civil Aviation Regulation of 1965 a.k.a. Nigerian Civil Aviation Regulations of 1999.

When 5N-ATE aircraft was changing ownership, the "Private Category" on the original Certificate of Airworthiness should have been, simultaneously changed to "Aerial Work Category", since the primary purpose of business of the new owner is not aerial surveying but a multi-purpose aviation business not including surveying profession. But it turned out that, the Network Aviation, was actually operating the aircraft in the category, which was in contravention of the authorisation granted it on its 'C of A'. The aircraft was on survey contract mission for the Cross River State government when it crashed at Igbogbo Village on the day of the accident. This mission was for a reward.

The implication in this complexity is that, under the 'Aerial Work Category' the owner of ATE did not have options of maintenance other than to follow the maintenance schedule as in accordance with the suggested aircraft manufacturer's prescription, or as pre-arranged with the Regulatory Authority. Under the 'Private' category, the owner has the option to maintain the aircraft as minimal as pre-planned by the manufacturer, or opt for a higher standard as prescribed for the 'Transport Category' type of maintenance scheduled.

Borrowing words from the earlier analogy, the Certificate of Airworthiness of 5N-ATE should have been re-issued as 'Aerial Work Category' when the aircraft was changing ownership in 1994, which necessitated the ownership name on the 'Certificate of Registration' from

Astro Survey Ltd to Network Aviation Services Ltd. Drawing emphasis from the Civil Aviation Regulations of Nigeria, every 'certificate of airworthiness' shall specify such a category as is appropriate to the aircraft and a certificate shall be issued subject to the condition that the aircraft shall be flown ONLY for the purpose indicated on its certificate of airworthiness. An aircraft with 'C of A' displaying 'Private Category' cannot, therefore, fly for the purpose of "Aerial work Category" which is for hire and reward. The Surveyors of NCAA have, therefore, erred by re-issuing the 'C of A' under the "Private Category" regime.

2.2 Major Maintenance, No "Certificate of Compliance" issued

A Nigerian registered aircraft, shall not fly if any part of the aircraft, or of such of its equipment as is necessary for the airworthiness of the aircraft has been overhauled, repaired, replaced or modified or has been inspected as provided in the Civil Aviation Regulations. For this purpose "certificate of Compliance" shall be issued that "this and this" maintenance has been performed on the aircraft. Such a certificate must be entered into the Aircraft logbook and signed by a licensed maintenance Engineer.

Sometime in June 1999, 5N-ATE was taken out of Nigeria to either Colchester United Kingdom or to Accra Ghana for C of A annual inspection. No entry was logged into the "aircraft Logbook" and yet, according to the maintenance worksheet presented to this Bureau, a foreign company named United Aviation Services Ltd. in Colchester, England performed extensive maintenance and modification jobs on the aircraft. When the operator was queried as to why the aircraft was flown out to Colchester, England, the maintenance engineer tried to explain that the aircraft was flown to Accra, Ghana for the general maintenance in November 1999. The engineer could not explain why the maintenance transaction was not entered into the aircraft logbook. It does not matter where an aircraft is maintained or its component overhauled, whether in England, Ghana or Siberia, the type of repairs done must be entered into the respective logbook and a "certificate of Compliance" issued and be duly signed by qualified personnel.

If the aircraft is maintained outside the country, the maintenance organisation to perform the job must have the NCAA's approval to work on a Nigerian registered aircraft. But it is not clear if the United Aviation Services Ltd, Colchester England has the approval from the NCAA to

perform the major maintenance which was done between June 1999 and January 2000. Neither was the job entered into the aircraft logbook and yet the NCAA renewed the 'C of A' for the period 10th February 2000 – 9th February 2001. This is a contravention of the Nigerian Civil Aviation Regulations concerning mandatory logbook entries. The aircraft was then released to service on the 10th of January 2000 and it had been flying since then till the time of the accident. It was defensible to state here that the NCAA was not, at any time, aware of this misdemeanour. Nor was the issue of the external maintenance authorised by the Authority. According to the regulations, NCAA is mandated to approve any external maintenance organisation, which is to work on any Nigerian registered aircraft. The NCAA has failed to both monitor Network Aviation, the aircraft's logbook and also monitor who does what on a Nigerian registered aircraft. This is a dereliction of statutory duties.

2.3 Aircraft Technical Logbook

There are many ways the A*ircraft Technical Logbook* is being abused in Nigeria. So also are many cries been made by the AIB and the NCAA, but operators and their employees-pilots and engineers continued to disrespect the use of the legal book, even though the issue is entrenched in the Civil Aviation's Regulations, 1965. Another way of abusing the use of the technical Logbook is cited as example in this accident. It is stated in the opening chapter 1.1 of this report that the aircraft total time of 528 hours was sometime brought forward into the technical log sheet in advance for this flight. If the employee who entered this number into the new sheet had performed any job, like fuelling the tanks or done some repairs on the aircraft, this job could have been entered into the book at the time of the number transfer. If the pilot had done his walk-around inspection and then pumped fuel into the aircraft, the first thing to do when he entered the cockpit was to fill in how much fuel and oil he had picked up before starting the engines at all. But this commander did not even date the tech log-page before taxing out even though he spent more than one hour before doing so on that day.

The AIPB is, therefore, appealing for stiffer penalty if pilots and engineers fail to fill whatever is supposed to be entered into the technical logbook. If the logbook is not used, as it should, it could signify an act of hiding one's identity for a work not well done, in case something happens and one doesn't want to be picked-up on his or her activity on the aircraft. We have seen engineers working on major component on the aircraft from a small piece of paper handed over to him by a pilot and when the

job is completed, nothing is entered into the technical logbook and no one knows what has been done. In fact, the Airworthiness Surveyor will not find the work done in any part of the aircraft's maintenance record. Someone has to be set as an example in aviation industry here in Nigeria to serve as a deterrent to others.

2.4 Personnel Record

There are some improprieties and falsifications of record-keeping lapses on the part of the deceased pilot, who had grossly inflated his "personal flying logbook" by logging imaginary flying time. The Regulatory Authority was not able to detect these lapses, when the pilot had submitted his document for renewal purpose and the renewal submissions were made many times between 1990 and 2001 and the misrepresentation of logbook information was not detected. This could be a pointer to the fact that, perhaps most of the Nigerian young general aviation pilots do inflate their records to achieve personal ego boosting or for any other mischievous purpose. For instance, this pilot was able to log more flying hours from this Partenavia than the whole hours that the aircraft ever flew in its lifetime. The following table will elucidate the type of falsification recorded in the deceased pilot's personal flying logbook:

Year	5N-ATE's Logging per Year	Pilot's Logging per Year On 5N-ATE alone
1990	9 hrs 36 min.	948 hours
1991	8 hrs 54 min.	290 hours
1992	0 hr 30 min.	1,121 hours
1993	2 hrs 27 min.	350 hours
1994	31 hrs 45 min.	83 hours

It is not possible to log these unrealistic hours on the same aircraft with the same registration mark. The pilot had, therefore, proved to be very dishonest in keeping his own record and so, all his other flying experience records are, therefore, presumed to be unreliable. His logged experience on Boeing-737 too cannot be vouched for. Yet, in the midstream of his career, the pilot claimed to have transferred some 6,433 hours experience from his former logbook, which when added together to the current one, accounted for his 10,172 total hours of professional flying experience. The first logbook was never presented to the AIB for verification.

The Regulatory Authorities should take this aspect into consideration when young pilots, who are more aggressive in accumulating flying time to achieve their own selfish ambition, approach the licensing officials for renewal, type rating or endorsements.

2.5 The airplane's maintainability.

Airframe and power-plant manufacturers always prescribe how their products and other system components are to be maintained for the onward reliability and airworthiness of the aircraft. For these reasons, airframe's life is broken into series of periodical maintenance, inspections and reliability checks, such as 'A'-Check, which comes up on every 50 hours; others are **'B'**-Checks, **'C'**-Checks and the ultimate **'D'**-Checks. The 'D'-Check entails that, at the accomplishment of certain number of flight hours, or at a certain number of calendar years in service, which ever comes first, an aircraft must be torn down into its certain basic structure and be duly inspected or maintained in accordance with a prescribed standard. Similarly, the maintenance lives of the engines are scheduled for periodic inspections and maintenance requirements, such as the Time Between Overhaul (TBO), boroscope Inspection of critical and sensitive dynamic parts within a turbine engine core. The TBO, which entails that the engine be completely knocked down for detailed inspection, measurement of clearances to specifications and total replacement of some parts within the engine core and shell.

Investigation into the maintenance of ATE's **airframe** shows that the aircraft had been up-to-date. It was discovered that Manufacturer's directives were accomplished promptly and are duly recorded in the aircraft logbook. Periodic inspections, such as, compliance with manufacturer's Service Bulletins (SB) and the Airworthiness Directives (AD) were entered into the appropriate log book as being accomplished and the NCAA had certified them as being achieved as per the laid down instructions of the alert bulletins. The certificate of airworthiness was supposedly renewed annually, upon these claims of compliance and maintenance.

2.6 The Powerplant.

Textron Lycoming Inc, manufactured the powerplant of this aircraft in September 1979. The powerplant consisted of 2 In-line Horizontally Oppose Reciprocating Engines type IO-360-A1B6, which were fitted to the airframe in 1981. After the crash, AIPB conducted a detailed and thorough investigation into the cause of the high temperature on No.1

engine as reported by the pilot at the onset of this mishap. The engine serial numbered L-21196-51A was, therefore, removed from the wreckage and disassembled in the AIPB's workshop at Ikeja. Findings show that this type of the engine is normally due for total overhaul after operating for about 2,000 hours in service. According to the Service Instruction No. 1009AQ, the manufacturer recommends that, in the alternative, the engine be overhauled periodically every 12 calendar years interval, which ever comes first. It happened that in 20 years, the aircraft only flew 528 hours in its entire life. The overhaul should have been performed since 1993, but this was overlooked when the time was due and the certificate of airworthiness was symbolically renewed for another year. After the accident, the No.2 engine was not considered for investigation, because the crankshaft of the engine could turn freely when manually rotated. The number one engine was then retrieved from the site of the accident and transferred to the AIB's office in Ikeja. But before the disassembly commenced, the engine was externally inspected for pre and post accident conditions. The following discrepancies, which in the opinion of the AIPB, are deemed to be contributory to the initial problem of the engine overheat were noticeable:

(I) Intake Air Filter

The air-filter, which filters the atmospheric air into the induction system of the engine cylinders, was almost totally blocked by dirt and dust. This could account for partial loss of engine power. A similar condition is applicable to the second engine, because they were both operated in the same atmospheric environment. Power developed by any engine under this condition would be grossly inadequate to sustain a single engine flight.

(II) The Engine Oil Cooler

The heat exchanger of the engine oil cooler's air-duct side was about 90% blocked by dirt and long time dead insects such as beetles, moths, butterflies, crickets, leaves and caked engine oil (Please see appendix 5.3A and B).

It looked like the heat exchanger had never been removed for cleaning since the original installation at the factory, yet Network Aviation logged that the oil cooler was replaced on the 10th February 2000. The most disturbing discovery was the claim in the aircraft logbook that the oil cooler was newly replaced only 54

flying hours before the crash. This claim will not be acceptable to the AIPB.

(III) Engine Oil Pressure Hose

The engine oil pressure line from the oil cooler, which was carrying lubricating oil into the engine accessory gearbox had fibrous rupture and had snapped in two, due to depreciation from high oil temperature or mishandling by personnel. The two severed rough ends were then passed through the hose's canvass conduit. Engine oil passage could be badly restricted, engendering poor and ineffective cooling, lubrication and proper circulation. The engine oil was badly seeping through the woven canvass. (Please see appendix 5.4A and 5.4B) and evidence of such seepage was manifested around accessory gearbox area, that some accessories like magnetos, engine driven fuel pump, engine driven propeller governor and vacuum pump were sprayed with engine oil, which made everywhere looked messy and soggy with oil.

2.7 The Result of the Engine Disassembly

When the engine was eventually opened up in the AIB's workshop, it was discovered that the piston in the number 3 cylinder had an inherent problem for some time. To be specific, the piston was claimed to have been changed on the 29th August 1997 when the engine compression check was unacceptable. The cylinder no.3 pressure was then reading 25% of its normal acceptable compression. The engineer's entry in the aircraft tech. logbook was 'found cylinder No. 3 rings sticky' and then also wrote 'replaced with new piston and rings' after the replacement had been done. AIB is not happy with this type of maintenance work in that the source of the new piston and rings were not proven. Normally, the green tag, accompanying such new parts should have been attached to the engine logbook sheet where the work was entered to authenticate its genuine source. Or a yellow coded tag if the piston had been previously reworked or overhauled. This practice is in accordance with the international standard and to discover if a component is a bogus one. Network Aviation has not complied with this practice, because no such evidence was indicated in the engine logbook and this is a sign of bad maintenance practice. The airworthiness inspector should have insisted on seeing the tag during his or her inspection of the aircraft or before the certificate of airworthiness was renewed.

However, opening up the engine in the laboratory showed that the supposedly replaced 'new' piston was the problem again. It was discovered that the top compression ring-land of the piston had chipped off owing to corrosion pitting. About 43 millimetres section of the top compression ring-land's circumference had broken loose and the fragments were only held in place by the cylinder wall. (See appendix 5.5A and B). No wonder some metallic flakes were found in the engine oil filter paper element, when it was cut open by the AIPB for any indication of pre-impact engine break-up problem. Evidently, the maintenance engineers, who had previously worked on the cylinder, had forcefully removed the 'sticky rings' and had, in the process, damaged the compression ring-land. Our impression here is that the same piston and compression rings were returned into the cylinder and the engine re-assembled and put back to service. Entering the job in the engine logbook as 'replaced with new piston and rings' is misleading and the AIPB will hold on to the belief that these cylinder parts were not actually replaced with new ones, until the Network Aviation services presents the tags removed from the 'new' piston package. When the engineer was contacted to tender this tag, he responded that the tags would be brought to AIB's office at Ikeja and this has not been done till date.

The analysis of the broken compression ring-land is that when the piston is on the 'compression stroke', a lot of the **air/fuel charge** in the cylinder will escape into nowhere else, but the crankcase. The cylinder will not deliver full power or it will develop just about 25% of its power as the above compression check had indicated. Evidence of this could be seen on the piston head and the cylinder wall, where carbon deposits were pronounced. The exhaust blow-by was, also, evident inside the cylinder wall and traces of this were found in the engine's crankcase, showing that both the exhaust and the charged air found their ways into the crankcase on each stroke of the piston. The indication of this finding is that, the exhaust fume in the crankcase would generate high temperature of the operating engine, most especially in the cylinder No.3, which would be to the detriment of the engine's output performance.

2.8 Single Engine Performance

The current Certificate of Airworthiness was renewed on the 29 March 2001. For this purpose, Network Aviation presented a series of work sheets and documents as pre-requisite to prove that the aircraft was,

indeed, airworthy for the next 12months. Among these papers are Flight Test results as a proof that the aircraft had performed a single engine rate of climb on the No.2 (right) engine. The expected rate of climb of this engine according to the aircraft manufacturer's specification, should be 200 feet per minute as compared with the result obtained by the deceased pilot, the achieved rate of climb was 182 feet per minute, which was within limit and was acceptable.

From the date of the flight test to the day of the accident, the aircraft had only performed 8 flights totalling 15 hours and 50 minutes. So the engine No. 2 should still be of good health to sustain any single engine flight for more than 3 minutes to return to the Airport from DME 7 nautical miles to threshold 19L. But instead, the aircraft changed course and the pilot was looking for a suitable ground to ditch. When the engine No.1 failed on this aircraft, then engine No.2 should have continued the flight to runway 19L as directed by the ATC. The question then is, could the pilot not return to Lagos, because the only engine available could not generate enough power required? Or did the pilot just rather choose to crash-land at Igbogbo football field for the fun of it? Obviously, the second engine must have been in trouble too. Reason being that, more than two eyewitnesses gave account that they saw the two engines stop working. The only reason why the two engines would stop working simultaneously at this critical time of emergency was, if the aircraft had run out of fuel to feed the two engines.

The eyewitnesses' account also said they saw the aircraft pouring out fuel. But this is not possible, because this type of aircraft is never ever provided with the facility to jettison fuel under any circumstance. Reference to the fuel system schematic in appendix 5.1 shows clearly that the aircraft does not have provision to dump fuel at any time. When the aircraft crashed, one learned eyewitness who arrived at the site first did so, because he was sitting on his balcony when he observed the airplane approach the field, which is located exactly across the road from his house. The gentleman gave evidence that he was one of the earliest callers, who first approached the wreckage and noticed that the fuel spillage on the ground was very scanty. He was even precise to quantify the amount of the spillage as "not more than 20 litres" of fuel. He also asked us, "if the tanks were filled with fuel, then why no fire?" The chief is not an aviator yet he was accurate to some extent. This amount of fuel can only be the residual or unusable fuel in the two wing tanks. The

Partenavia fuel tanks would hold 538 litres total when full and that is 4 hours of endurance. Three hour's endurance would amount to 403.5 litres. Then where did the 3 hours endurance of fuel that the pilot announced just less than 3 minutes before the crash evaporate to? Obviously, the aircraft did not have enough fuel to last 3 hours of flight, as the pilot would want the ATC to believe.

The AIB wonders, if a pilot of such experience could take off with an aircraft without enough fuel for the duration of his intended journey? The pilot, whether by omission or commission, did not enter the fuel quantity in the appropriate logbook, thereby committing an offence against the Civil Aviation Regulations of Nigeria. AIB could not locate any observer at the airport, who saw the pilot fuelling the aircraft before departure of the flight that morning. The company assistant, who dropped the pilot and the passenger at the aircraft's apron, could not confirm the activities of the pilot that morning, because he was running an errand for the captain and the place was away from the airport's precinct. The passenger who was involved in the accident with him was totally incoherent to interviews given by the AIB officials. The man was still, hopelessly, disoriented when he departed in an air-ambulance from the shores of Nigeria.

During the C of A renewal exercise, a single engine rate-of-climb performance was claimed by the same pilot to have been carried out and it was upon this performance report that the current C of A was renewed. Then why could the same engine not able to continue the flight to the Lagos Airport? The airplane design certification had guarantied that; this single-engine performance could be achieved effortlessly and would deliver the aircraft to a safe and perfect emergency landing. The designer and manufacturer of the aircraft had folded up, so the AIB could not have its comment on the aircraft's last single engine performance. From every indication, the airplane's second engine seemed to have suffered fuel starvation on that fateful journey.

2.9 Type of fuel used.

Normally, the type of fuel prescribed for the IO-360 type of reciprocating engine is LL-100 aviation fuel. This is a low lead avgas with the minimum grade of 100 octane rating and it is usually blue colour coded. The fuel is difficult to get in Nigeria and is often imported in 200 litre drums from neighbouring countries. ATE was about the last aircraft

using avgas in Nigeria. Then, where did the Network Aviation Services get its own fuel supply from?' "Republic of Benin" the company retorted.

When the culprit engine was brought into the Laboratory of AIB for disassembling, only a very insignificant amount of residual fuel could be drained from the carburettor and the engine driven fuel pump's cavities. The investigators were amazed to find a red coloured substance as the fuel, which is similar to the automobile fuel pump type of petrol, the highest grade of which is only 94 octane (or less in Nigeria) and red in colour. The sample was taken to the Nigerian Joint User Hydrant Installation (JUHI) at the aviation fuel farm near the international airport, Murtala Mohammed Airport for analysis. JUHI then referred us to a commercial company-Marina Technical Services International Nigeria Ltd., Apapa, which specialises in fuel analysis and the same company handles such tests for JUHI too. But the company requested for a minimum quantity of, at least, 35centilitre (Coca-Cola bottle size) to be able to perform the test, but the AIB could only drain about 4 or 5 teaspoonful from the carburettor. So, the AIB's effort to confirm type of fuel used in the aircraft was thwarted.

This Bureau cannot write on the permissiveness of the Lycoming Engine manufacturer's approval of this type of automobile fuel for use in some specific (and not all) reciprocating engines operating in some civilised countries. If this is permitted in other countries, can such a blanket approval be granted to the Nigerian operators? A definite NO is the answer, because here in Nigeria, any liquid is pumped as fuel into an unwary car owner's petrol tank. Aero Flying clubs are, mostly, susceptible to this temptation of using automobile fuel in their light aircraft in substitute to the aviation gasoline and the Airworthiness Authority must positively disallow this practice.

2.10 The landing catastrophe

To ditch an airplane in time of emergency is not an unusual manoeuvre, pilots are equally trained to handle ditching if and when necessary, but execution of the exercise is the aspect that can result in calamity if extreme caution is not observed. The commander of this airplane was very contemplative for giving consideration to not using the first chosen football field, because of the human movement around the area. He abandoned the field and headed for another one nearby. Any other pilot

in this situation would panic and be forced, willy-nilly, to use the field irrespective of the situation on ground. If he had done that, fatalities could have obviously been more than one.

According to eyewitnesses, the aeroplane approached the second field from the North and glided powerlessly, skimming over trees and high-tension electric cables, until the school was reached and the pilot manoeuvred the aircraft over the school's front perimeter fence. He must have been paying attention to many things simultaneously: the fence, the high-tension wire, the treetop, the alignment and the correct perspective orientation of the field before making the dive for the landing when it was most appropriate to do so. He would have, also, manoeuvred the aircraft to align with the beginning of the length of the field, so that he could take full advantage of the distance for the landing roll after touchdown.

The AIPB believes that it was in this process that the pilot selected full flaps for the landing and hence the beginning of the accident. With full flaps deployed, a powerless airplane will become uncontrollable when it comes within the ground proximity. At this point, the **lift** would have, sharply, decreased and the **drag** would have increased abruptly, since the smooth airflow over the airplane's wing-top would no longer be maintained. The aeroplane would then **stall** and drop more quickly than anticipated by the pilot. This is the fundamental aerodynamic principle of an airplane in flight and as simple as that. Generally speaking, to recover from an unexpected stall, power must be quickly added, that is, height over ground permitting. But things are different with a powerless aeroplane such as 5N-ATE, approaching the stalling speed and getting close to the ground with full flaps. Once the stalling starts, it's hard to recover from it when in ground proximity and especially, when there is no power to play with.

The scenario in this accident is that, the landing wheels' impression on ground showed that, the aircraft touched down, unexpectedly, towards the end of the field's width. This could be assumed to be an improvised **baseleg**, in expectation of the pilot's plan to align with the longer length of the field, as an improvised **final approach** before the eventual touchdown. The unanticipated aircraft's dropping, (owing to the full flap deployed) would have caught the unaware pilot by surprise and there was nothing dramatic he could do to prevent what was coming ahead-the inevitable collision with the first impact (the tree). The first impact,

serving as a turning moment force when about 25% of the left wingspan collided with the first tree, which directed the airplane's heading towards the school's perimeter fence, instead for the aircraft's rolling on the ground in parallel to the fence (Please see appendix 5.2). The collision with the trees and the perimeter fence of the school was, unfortunately, inevitable. This second impact proved to be fatal to the commander and also inflicted serious injuries to the Photo Navigator, who was occupying the rear cabin seat behind the camera stand. Nobody on ground was injured.

3.0 CONCLUSIONS

3.1 Findings

3.1.1 The Partenavia (P68C) aircraft was manufactured in Italy in November 1981 and was imported into Nigeria at the total time of 164 hours by Astro Survey Ltd, Kano Nigeria with "Private Category" on the Certificate of airworthiness. Textron Lycoming, USA, manufactured the reciprocating engines power plant in September 1979.

3.1.2 Network Aviation Services Ltd took over the maintenance of the aircraft sometime before April 1993. The aircraft's maintenance activities before April 1993 could not be investigated owing to the unavailability of the airworthiness file Volume I.

3.1.3 From the available records, it could be concluded that all the applicable "Service Bulletins" and "Airworthiness Directives were punctually incorporated as at when due. Insurance cover and the "Certificate of Airworthiness" were found current at the time of the accident.

3.1.4 The aircraft ownership changed hands in 1994 when Network Aviation Services acquired it from Astro Survey. The changeover should have affected the type of category on the aircraft's Certificate of Airworthiness and be reissued as "Aerial Work Category".

3.1.5 The commander of the aircraft was duly qualified to conduct the flight of the Partenavia P68C on the day of the accident.

3.1.6 The commander was greatly in default of the Civil Aviation Regulations, which stipulate that information about 'fuel, oil and other contingencies' be entered into the technical logbook.

3.1.7 The personal flying records of the pilot were fictitious and full of falsified entries, but which may not have necessarily or directly affected his flying performance.

3.1.8 The total airframe time on the aircraft was 528 hours, while the pilot claimed to have flown 2,724 hours flying experience on this same airplane. This is not possible.

3.1.9 The aircraft's engines lacked proper maintenance and equally lacked proper monitoring by the airworthiness Authority.

3.1.10 5N-ATE was taken out of the country to United Aviation Services Ltd, Colchester-UK for heavy maintenance and modifications in June 1999. This activity was not logged into the Aircraft Logbook and the NCAA was not aware of the activity.

3.1.11 The aircraft Logbook is not factual enough in keeping the particulars of all maintenance work carried out on the aircraft or its equipment. Some components were claimed to have been repaired or replaced but were proved to the contrary.

3.1.12 The aircraft had a low utilisation rate (528 hours in 20 years) and the overhaul recommendation by the engine manufacturer in apprehension of this shortcoming was not followed by the aircraft owner, neither could the NCAA detect the elusiveness of this important manufacturer's directive.

3.1.13 The pre-departure handling and the engines performance: the activities of the pilot before departure, how much fuel on board and what happened to the second engine of the aircraft

on its last voyage left unverifiable tracks. All these are factors in the analysis of this accident.

3.1.14 Finding shows that with the declared endurance of 3 hours, the aircraft was believed to still have the capability to return to the airport and should have returned to the airport.

3.1.15 The landing performance at the ditching time was not well executed. Full flap with a powerless aircraft was not the best decision for an emergency landing of a propeller driven aeroplane.

3.2 Cause of Accident

3.2.1 The probable cause of the accident was that the aircraft was stalled, then it prematurely hit the ground, owing to the extension of full flap when in ground proximity without engine power.

3.2.2 The first contributory causal factor was the contact with the first fir-tree, which change the direction of the airplane's heading towards the perimeter fence.

3.2.2 The second contributory cause of the accident was the engine's problem of high temperature in flight, which disabled the continuation of flight and demanded for the emergency landing.

4.0 Recommendations

4.1 The Personnel Licensing Authority should pay more attention to monitoring young pilots' logging. Younger pilots are more prone to inflating flying time to achieve some covert ambition. The Licensing Officials should device means of checking the veracity of the younger pilots, when they are submitting their flying documents for renewal, type rating or other endorsements in their licences.

4.2 The NCAA should wakeup to their statutory responsibilities of paying more critical attention to the aircraft maintenance programmes, because there were many falsified records and some prevaricated maintenance information that may not be logged in the aircraft's logbooks and the Airworthiness Surveyors may not detect these abnormalities.

4.3 Aviation Fuel (LL-100) for general aviation and reciprocating engine aircraft is almost extinct world-wide. Flying clubs and other light aircraft owners in Nigeria should be discouraged from using automobile fuel in such aircraft. No Nigerian commercial automobile petrol station can guarantee the recommended octane rating of petrol at the fuel pump.

4.4 **Technical Logbook** is a 'must carry document' on an aircraft, but some pilots are in the habit of not making entries in the logbook but prefers verbal communication or scribbling aircraft snags on a piece of paper to circumvent using the logbook. Pilots and ground engineers must be discouraged from this habit. Only the NCAA can impose this discipline on the aviation personnel.

4.5 Incidents of fuel starvation are becoming more frequent within the Nigerian airspace. Pilots who are caught in this practice should be seriously dealt with to serve as deterrent to others and also to forestall serious accident resulting from aircraft fuel starvation.

5.0 Appendices

5.1 A schematic drawing of Partenavia's fuel system, to show that there was no fuel dumping facility, whether in flight or on ground.

5.2 Schematic drawing of Zumusat Isillamiyah Secondary School's compound showing point of touchdown and impacts with the tree and the fence.

5.3 Photographs A and B showing the filthiness and a neglected oil cooler's heat exchanger radiator.

5.4 Photographs A showing the kinky oil passage in the hose's conduit and B, showing the fibrous failure of the oil pressure hose as it was inserted into the conduit.

5.5 Photographs A and B showing the damaged piston, the 43-millimetre gap in the top compression ring-land and carbon deposit on the piston head.

5.6 Picture of the first impact with the fir-tree, which is used for lining the school's access road from the gate.

5.7 Photographs A, showing the wreckage's point of the second impact and B, showing the football field in the background.

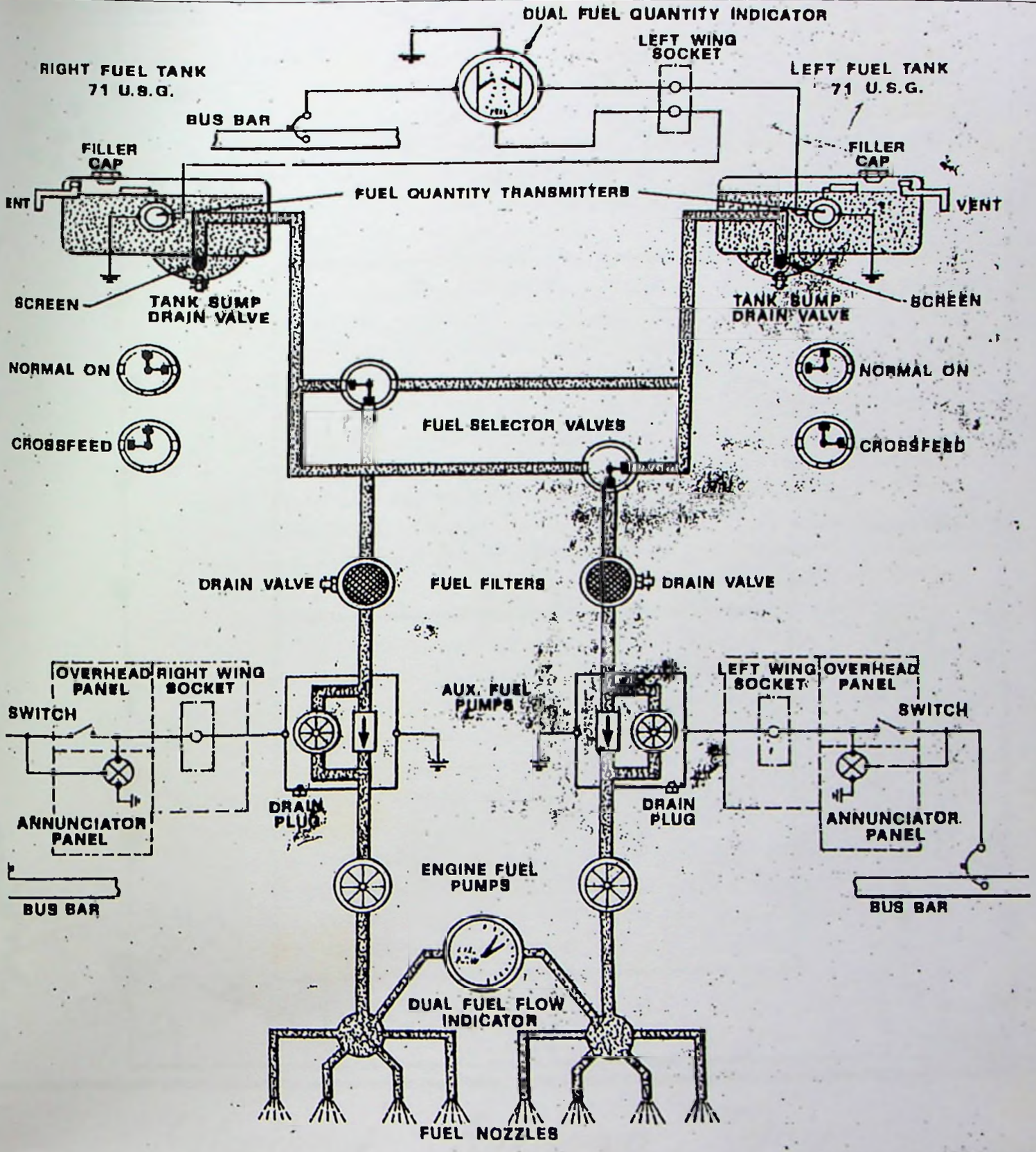
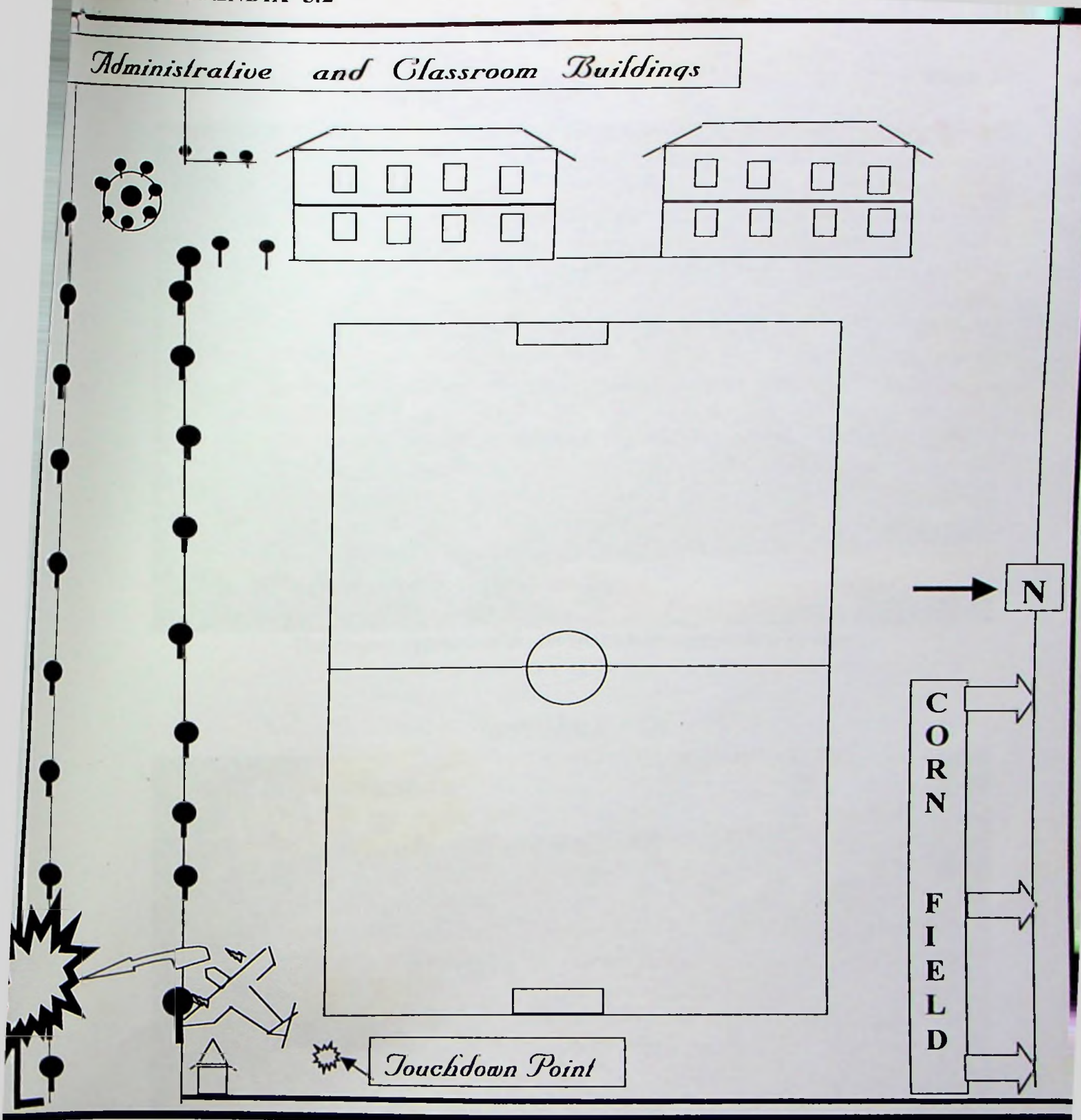


Fig. 2-2 Fuel system schematic

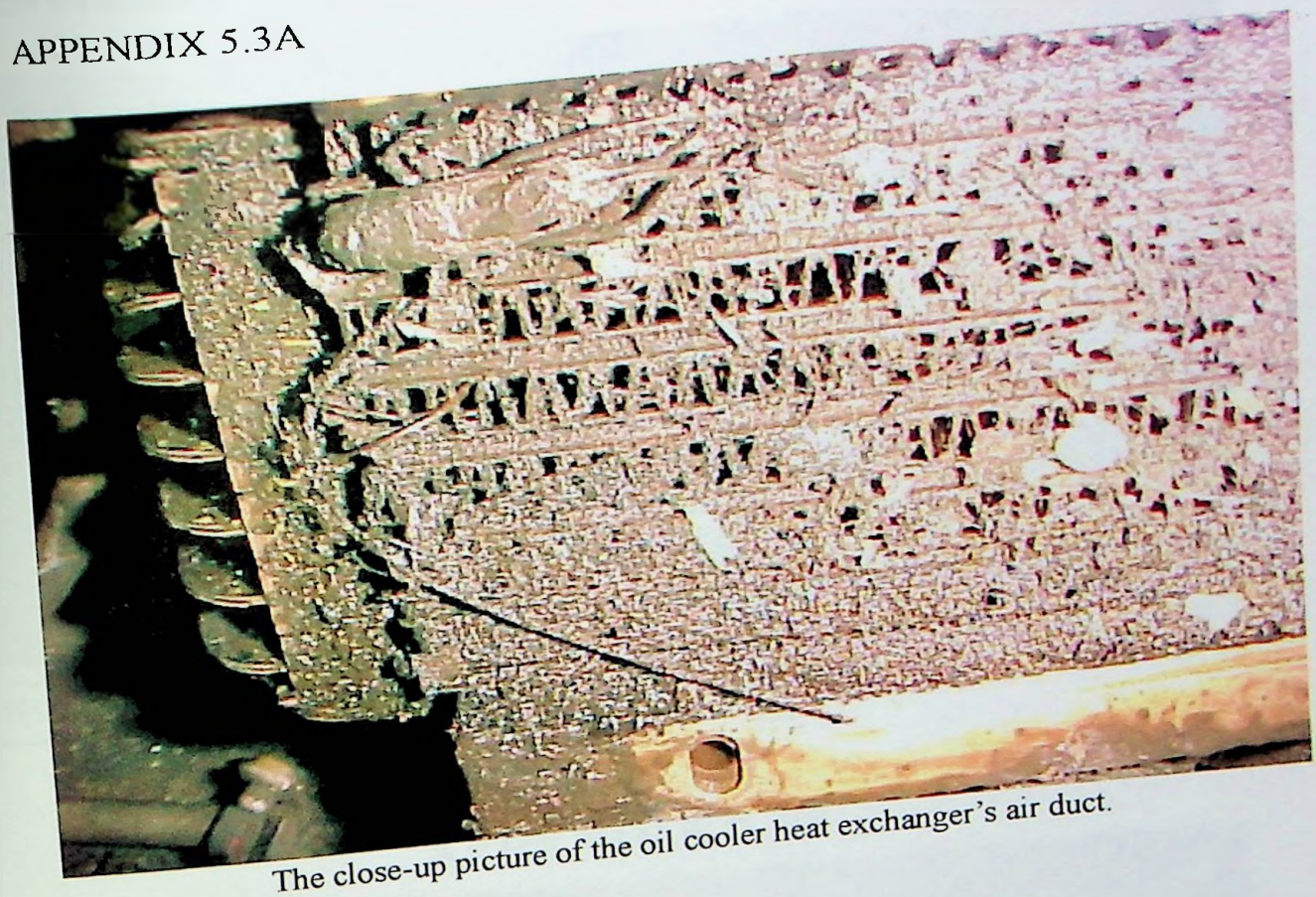
APPENDIX 5.2



Obafemi Awolowo Way

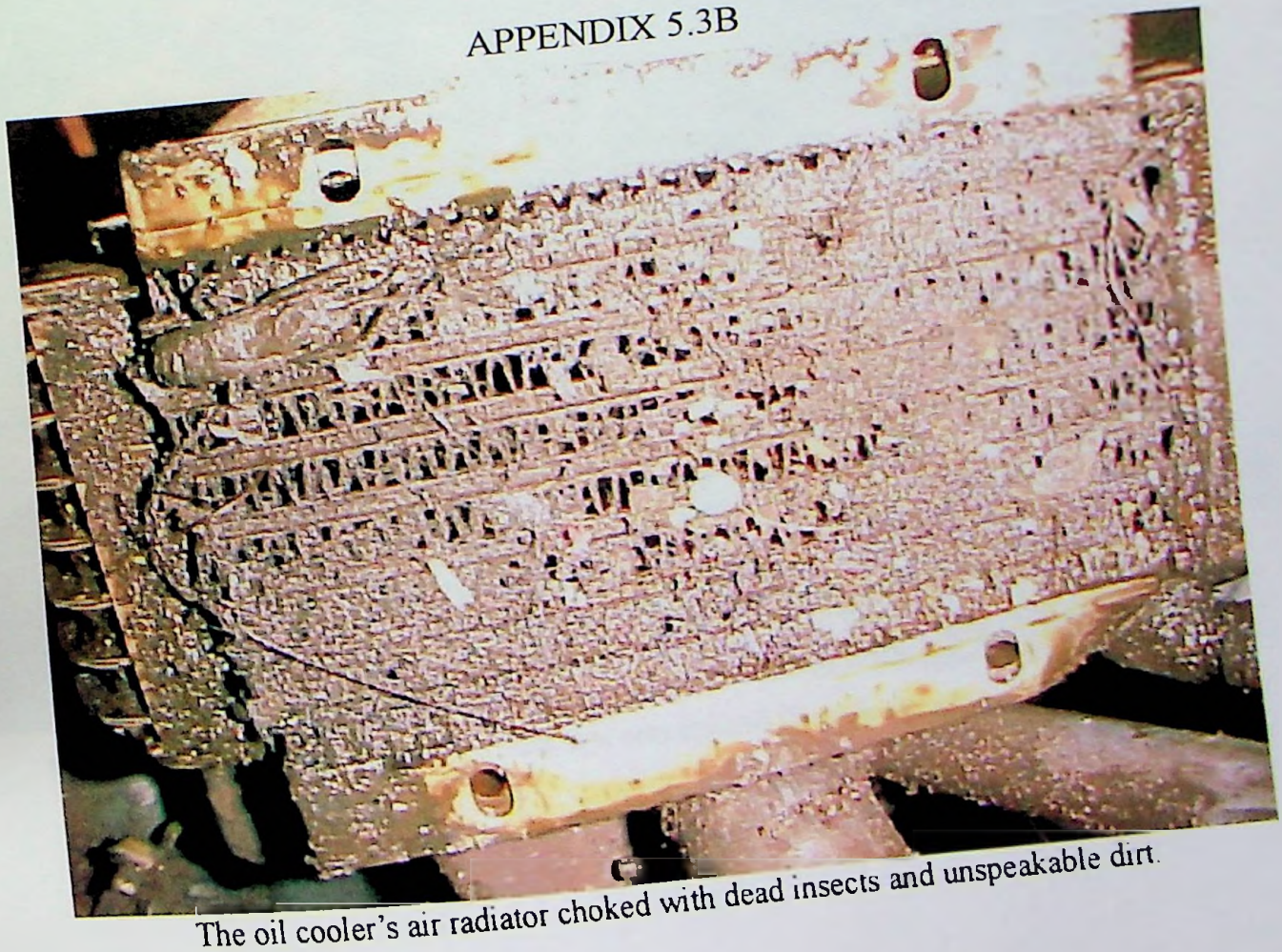
Chief's House

APPENDIX 5.3A



The close-up picture of the oil cooler heat exchanger's air duct.

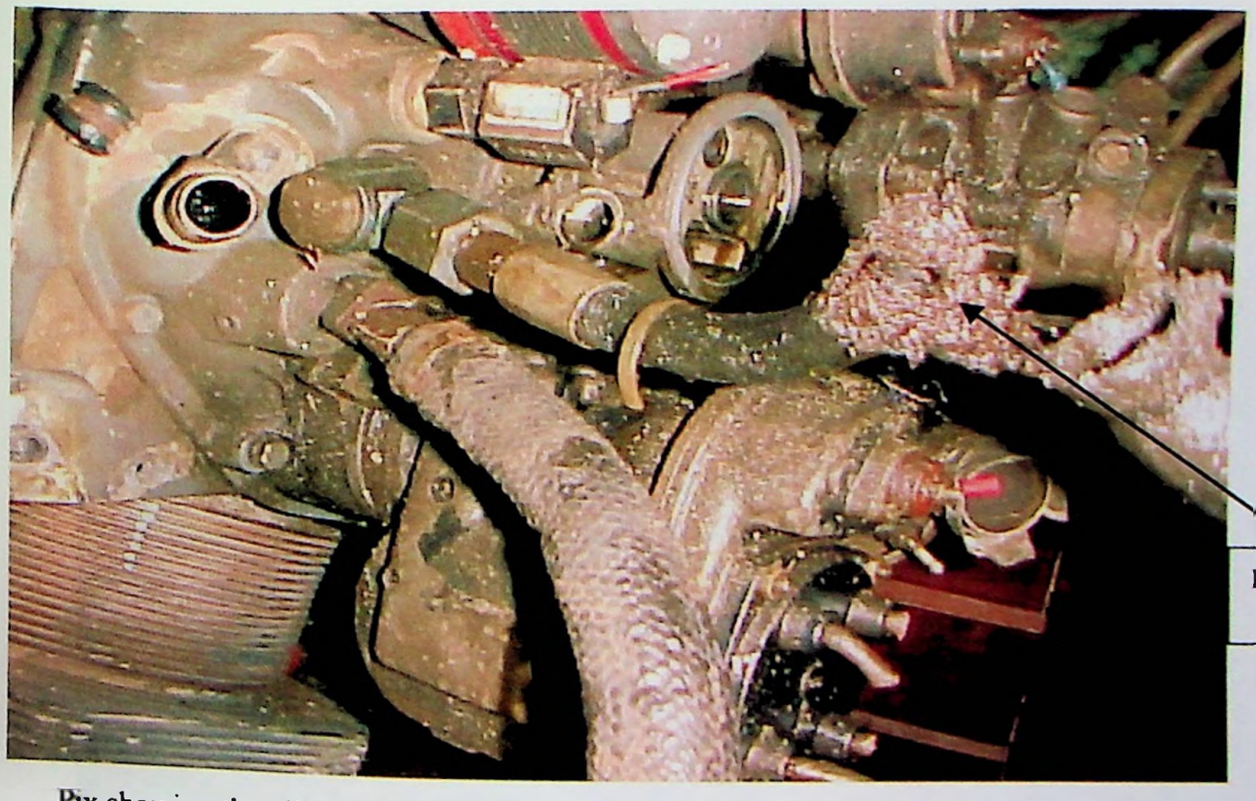
APPENDIX 5.3B



The oil cooler's air radiator choked with dead insects and unspeakable dirt.

APPDX 5.4A Picture of the canvass conduit, housing the accessory gearbox's broken high pressure hose

APPENDIX 5.4B



Pix showing the oil's high pressure hose that was spliced through the canvass conduit.

The number 3 piston showing the damaged top compression ring-land.

APPENDIX 5.5B

The close-up picture of the top compression ring-land and the carbon deposit.

Picture showing the impact mark on the fir tree

Picture showing the aircraft's wreckage at the crash site

APPENDIX 5.7B

5N-ATE's wreckage showing the Zumusat Isillamiyah football field in the back-ground