

**COMMISSION OF INQUIRY INTO THE ACCIDENT
INVOLVING AIRCRAFT REGISTRATION 5Y-CDT**

TYPE AS 350 B3e



CHAIRPERSON:

**LADY JUSTICE KALPANA RAWAL, EBS
JUDGE OF COURT OF APPEAL**

COMMISSIONERS:

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CAPT. PETER M. MARANGA
MR. FREDRICK AGGREY OPOT**

JOINT SECRETARIES:

**BROWN I. OTUYA, MBS
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**COMMISSION OF INQUIRY INTO THE ACCIDENT INVOLVING
AIRCRAFT REGISTRATION 5Y-CDT, TYPE AS350 B3e**

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NAIROBI.

Your Excellency

**The Hon. Mwai Kibaki, C.G.H., M.P.,
President and Commander-In-Chief of the
Defence Forces of the Republic of Kenya,
Harambee House
NAIROBI.**

Your Excellency,

We, Lady Justice Kalpana Rawal, (Judge Of Court of Appeal), Maj Gen (Rtd) Harold M. Tangai, Capt. Peter M. Maranga and Mr. Fredrick Aggrey Opot were, in exercise of the powers conferred on Your Excellency by section 3 of the Commissions of Inquiry Act, appointed on 29th day of June 2012 by Gazette Notices No. 9043 and No. 9044 to be members of the Commission of Inquiry into the Accident involving Aircraft Registration 5Y-CDT Type AS 350 B3e.

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We immediately undertook this responsibility and got to work as guided by the Terms of Reference. It is a responsibility that we have discharged with due diligence and to the best of our knowledge, expertise and ability.

We are pleased to submit this report, as we take the opportunity to express our gratitude for the trust bestowed on us and the opportunity to help bring closure to a most trying, painful and tragic event in our Nation. We are confident that the findings and implementation of the recommendations in this report will impact aviation safety positively and therefore the precious lives of Kenyans that were lost in this tragedy will not have been lost in vain.

Yours Sincerely,

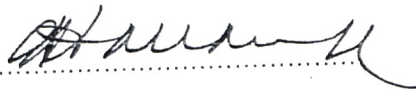
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Maj Gen (Rtd) Harold M. Tangai, MGH, EBS



Capt. Peter M. Maranga



Mr. Fredrick Aggrey Opot



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ACKNOWLEDGEMENTS

We wish to express our gratitude to His Excellency Hon. Mwai Kibaki, The President and Commander in Chief of the Kenya Defence Forces of the Republic of Kenya for having appointed us to this Commission charged with the responsibility of Inquiry Into The Causes of The Aircraft Accident Involving Helicopter Registration No. 5Y-CDT Type AS 350 B3e that occurred on 10th June, 2012.

We appreciate the immense support from The British High Commissioner to Kenya, H.E Dr Christian Turner, The French Ambassador to Kenya, H.E. Mr Etienne De Poncins, and The Canadian High Commissioner to Kenya H.E. Mr David Collins who facilitated examination and testing of the accident aircraft components in their respective countries.

We also acknowledge the great support we received from Maryann M. Njau-Kimani and Mr. Brown I. Otuya, who served the Commission as joint secretaries.

We further thank Ms. Lucy Kambuni, the Lead Counsel assisted by Faith Ireri, James Warui, Charles Mutinda & Morris Kaburu in preparing and leading examination of the Commission witnesses, and Counsel appearing for the bereaved families and interested parties for their assistance.

We acknowledge the invaluable support of Col. (Rtd.) Enos Ndoli, James Kimuri and Dr. James Kigotho, who were instrumental in analyzing technical information.

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LIST OF ABBREVIATIONS

the entire	AAID	Air Accident Investigation Department
Media	ACP	Assistant Commissioner of Police
Stephen	ADD	Acceptable Deferred Defect
Iuia and	AeSK	Aeronautical Society of Kenya
the final	AIC	Aeronautical Information Circular
	AMO	Aircraft Maintenance Organisation
	AOC	Air Operator Certificate
for their	ATC	Air Traffic Control
not have	ATPL	Airline Transport Pilot License
	AUW	All Up Weight
	BEA	Bureau d'Enquêtes et d'Analyse
	C of A	Certificate of Airworthiness
	CAA	Civil Aviation Authority
	CARs	Civil Aviation Regulations
	CG	Centre of Gravity
	Com Exh.	Commission Exhibits
	CPL	Commercial Pilot License
	CRM	Crew Resource Management
	CVR	Cockpit Voice Recorder
	CW	Commission Witness
	CWP	Caution and Warning Panel
	DCA	Directorate of Civil Aviation
	DECU	Digital Electronic Control Unit
	DG	Director General
	EASA	European Aviation Safety Agency
	EBCAU	Engine Back-up Control Ancillary Unit
	EDR	Engine Data Recorder

Our appreciation is also expressed for the support we received from the entire secretariat team, namely Mr John Maina Kairu the Communications and Media Liaison Officer, Ketra Mung'asia, Margaret Ngaruia, Kevin Goga, Stephen Njehia, Carolyn Atieno and Kellen Karimi.

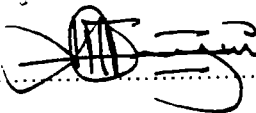
Our thanks are also expressed for ICT support we got from Kioko A. Muia and Daniel K. Ngaruni from the Presidency and Cabinet Affairs Office in the final arrangement of the report.

We finally thank all witnesses and other members of the public for their cooperation and assistance to the Commission without which it would not have been possible to discharge our mandate.

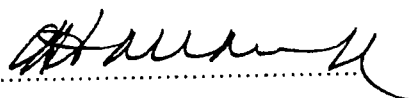
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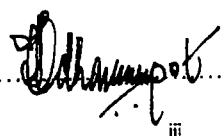
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Capt. Peter M. Maranga


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Mr. Fredrick Aggrey Opot


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EECU	Electronic Engine Control Unit
EEW	Equipped Empty Weight
ELT	Emergency Locator Transmitter
ENG	Engine
EW	Empty Weight
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Electronic Control
FDR	Flight Data Recorder
FT	Feet
GMT	Greenwich Mean Time
GPS	Global Positioning System
HKNW	Nairobi Wilson Airport
HSI	Horizontal Situational Indicator
HV	High Velocity
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IR	Instrument Rating
ISA	International Standard Atmosphere
KAAO	Kenya Association of Air Operators
KCAA	Kenya Civil Aviation Authority
KM	Kilometre
KPAW	Kenya Police Air Wing
KRA	Kenya Revenue Authority
KWS	Kenya Wildlife Service
LDR	Lightweight Data Recorder
LH	Left hand side
LT	Local Time

MCM	Maintenance Control Manual
MCP	Maximum Continuous Power
MEL	Minimum Equipment List
METAR	Meteorological Weather Report
MFD	Multi-functional Display
MGB	Main Gear box
Min	Minute
MMEL	Master Minimum Equipment List
MOE	Maintenance Organisation Exposition
MOU	Memorandum of Understanding
MPM	Maintenance Procedures Manual
MSL	Mean Sea Level
MTOP	Maximum Take-off Power
MTOW	Maximum Take-Off Weight
N1	Engine generator speed
N2	Free Turbine
NM	Nautical Mile
NR	Rotor speed
OAT	Outside Air Temperature
OEWE	Operating Empty Weight
P/L	Payload
PF	Pilot Flying
PFD	Primary Flight Display
PIC	Pilot in Command
PM	Pilot Monitoring
PNF	Pilot Not Flying
PPL	Private Pilot's License
PSI	Pounds per square inch
QNH	Barometric Pressure Reduced to Sea Level

EXECUTIVE SUMMARY

The core mandate of the Commission which was at the heart of all the Terms of Reference was to establish the cause or causes of the accident and make recommendations that would prevent a similar occurrence. From the onset and in the spirit of openness and transparency, the Commission welcomed all interested parties to apply to be enjoined in the proceedings. The Commission conducted the Inquiry in public with full participation of counsel for families, Kenya Police Air Wing, Kenya Civil Aviation Authority, and Eurocopter the manufacturer of the subject aircraft. All the major media houses were in attendance during the public hearings and members of the public showed their interest by attendance. Having received and analysed evidence from various sources, submissions from Counsel of interested parties and looking at different reports, the Commission has finalised its report in accordance with its mandate.

Various components that required specialized testing and download of data were sent to properly equipped laboratories abroad with the assistance of friendly foreign governments, namely, the UK, France and Canada. In spite of great effort, the components were found to have been severely damaged by fire and did not yield any useful data.

Formal hearings were held at the KICC where testimony and evidence was brought before the commission under intense cross examination. Evidence before the Commission revealed breaches in the procurement process including disregard for the advice by the PS for Internal Security to the KPAW to use a Pre-Qualified list that had already been approved for the Administration Police. Kenya Police Service and the Tender Committee shortlisted and invited bids from two suppliers, Eurocopter and Bell Helicopters on the basis of a letter from

RH	Right hand side
RPM	Revolutions Per Minute
SB	Service Bulletin
Sec	Second
SMS	Safety Management System
SSTC	Special Security Tender Committee
TBC	To be confirmed
TBD	To be defined
TC	Type Certificate
TGB	Tail rotor Gear Box
TIT	Turbine Inlet Temperature
TOR	Terms of Reference
TRGB	Tail Rotor Gear Box
TRQ	Torque
UL	Useful Load
UTC	Universal Coordinated Time
VEMD	Vehicle and Engine Multifunction Display
VFR	Visual Flight Rules
VIP	Very Important Person
VMC	Visual Meteorological conditions
Vne	Maximum Never exceed speed

the best starts with a regulatory oversight vacuum brought about by Section 2 of the
ission is Civil Aviation Act Cap. 394, which defines police aircraft as 'state aircraft.'

Without reading other provisions of the Act and Civil Aviation Regulations,
KPAW and the KCAA hold the view that KPAW does not fall within the
33 from regulatory oversight boundaries of the KCAA. KPAW therefore operates with
ted. Then no internal safety mechanism, self-regulation or exercise of regulatory power by
ercise of KCAA. This has led to the operational and airworthiness shortcomings that the
Commission observed in respect of the subject aircraft. There is a clear sense of
a poor safety culture at KPAW.

the subject

350 B3e The Commission further found that KPAW did not have an approved AMO to
maintain the aircraft and the subject aircraft was maintained by an unauthorised
representative of Eurocopter (the supplier of the aircraft).

ation was

mission The Commission also found that KPAW lacks the financial autonomy and the
t, the A institutional management structure capable of expeditious decision making.
ered at the Hence KPAW does not have a robust operational structure or modern operations
ie time of control facilities, the human resources, accountabilities and responsibilities
ocurement necessary for very demanding tasks. It was also noted that most of their aircraft
are in a state of disrepair. This obviously has implications on air safety and the
scarce national resources.

mitted b

December The subject aircraft was prepared for a flight to Ndhiwa on the morning of 10th
November June 2012 to fly the Hon George Saitoti and the Hon Orwa Ojode. The
disclosed Commission was not able to establish whether this was an official trip or a
private one. The Pilot in Command, Nancy Gituanja, had flown the Minister
before and she had also flown to Ndhiwa previously. A Visual Flight Rules
with serious flight plan was filed with Air Traffic Control since both the pilot in command
erator. It and the co-pilot were not instrument rated.

the KCAA which was purported to have indicated these two models as the best performers in the country. After looking at the KCAA letter, the Commission is of the view that the KCAA did not make such an assertion.

The evidence shows that the decision to purchase the AS 350 B3 from Eurocopter was made well before the procurement process was initiated. The subsequent tendering and inviting of bids was purely and simply an exercise in going through the motions to give the appearance of due process.

It should be noted that the TORs given to the Commission identified the subject aircraft as AS 350 B3 but the Commission has referred to it as AS 350 B3e throughout the report, since this is the type that was finally delivered.

Though the two helicopters have the same Type Certificate, this variation was not approved through due process by the Tender Committee. The Commission has however established that though there was a variation in the contract, the AS 350 B3e, is an upgraded version of the AS 350 B3 which was delivered at the contract sum. The AS 350 B3 was no longer in production by the time of delivery of the helicopter. Notwithstanding the glaring flaws in the procurement process the delivered aircraft was new.

The Commission would like to bring forth a glaring irregularity committed by Eurocopter; in that it installed a prototype VEMD in the aircraft on 4th December 2011 after its Acceptance was signed on pre-delivery inspection in November 2011. As per evidence before the Commission this fact was not disclosed to KPAW, the user of the aircraft.

The picture that emerges of KPAW is one of an institution with serious shortcomings. It lacks all the major components of a modern Air Operator. It

After incisive examination of the wreckage and in absence of identification of the source of ignition, the Commission did not find any of the classic tell-tale signs of an in-flight fire.

The Commission learnt that there is no protocol to guide post mortem examinations and there is absolutely no coordination between the various government institutions involved; Government chemist, Government pathologist, the Kenya Police Scene of Crime and Aircraft Accident Investigators. The Commission was shocked to learn that toxicology results were not taken into account in the determination of the cause of death and that it is not common practice for Government pathologists to do so. Further, the histology of the deceased was not reviewed nor were radiological tests carried out. There were also no consultations between the participating pathologists at the autopsy before the final conclusions were arrived at. It was depressing to hear that even simple refrigeration facilities are lacking and no samples had been preserved from which the Commission could conduct its own validation tests.

The upshot of all this is that, an opportunity was lost to conclusively and accurately determine the cause of death. Was it due to carbon monoxide, traumatic injuries, fire injuries or a combination of any of these?

For this reason the Commission recommends the urgent establishment of a National Forensic Teaching and Research Facility that will ensure that the country has well trained forensic professionals. This establishment will also spearhead the development and sustainability of standards in forensic science commensurate with international best practice.

Having reviewed all the available evidence, and in the absence of adequate evidence on the issues of carbon monoxide poisoning in the blood of the co-pilot

The Load Sheet provided to the Commission indicates that the aircraft was overweight by at least 11kg. The centre of gravity for take-off was at the edge of the CG safe limit. Such high gross weight condition in combination with other factors is capable of causing aircraft control difficulties. At 0837:50LT the crew informed Wilson Control Tower that they were near the Control Zone Boundary. Wilson Tower handed them over to Nairobi Area Air Traffic Control. Nairobi Area Control centre did not receive any communication from the subject flight. Eye witnesses in the Kibiku area saw the helicopter flying very low over tree tops in very poor visibility conditions. The witnesses reported that there was mist, fog and drizzle in the area at the time and shortly after they heard the sound of a crash.

The helicopter crashed at about 0842LT in a Eucalyptus tree plantation in Kibiku, near Ngong. It disintegrated on impact and was destroyed by a combination of the impact forces and ground fire. The two pilots, the Government Ministers and their bodyguards died in the crash. Post mortem reports indicated that all the six occupants died from traumatic injuries sustained in the crash and the fire. Samples for toxicological tests were taken from the two pilots and the Hon Minister Saitoti and sent to the Government Chemist for analysis. Two of the samples returned negative results while the sample from the Co-pilot indicated carbon monoxide poisoning of 68.6%. It was argued before the Commission that such a high level of carbon monoxide poisoning, would point to inhalation of the gas before the crash since injuries sustained at impact were incompatible with life. It was also submitted that there was a source of carbon monoxide prior to the crash, possibly from an in-flight fire and that the Co-pilot with such a high dose was probably dead before the crash.

- 5) KCAA should take up the matter of prototype VEMD and send a protest note to European Aviation Safety Authority on the basis that Eurocopter knowingly allowed for the use of a prototype part on a certificated and operational aircraft;
- 6) KCAA requires total transformation in order to make it deliver on its objectives and purposes to reflect the following:
 - i. Limit itself to its regulatory functions by removing the functions of the ANS and EASA which are service provision units,
 - ii. Enhanced funding. Recognising that the ANS and EASA have been generating the bulk of KCAA's revenue, the Commission recommends, that KCAA gets a percentage of the airport tax which is now collected by Kenya Airports Authority in line with the recommendation made in a proposal to the Minister of Transport prior to the 2012 budget.
 - iii. A competitive remuneration package able to attract and retain an adequate number of high calibre of professionals.
 - iv. Continuous and recurrent training for the human resource in line with international best practices for the industry.
 - v. Implementation of the State Safety Programme in line with ICAO doc 9859.
- 7) A National Forensic Teaching and Research Facility should be established as a matter of urgency.
- 8) The Commission therefore recommends and strongly persuades the Office of the President to consider giving this Report to the Commission on Administrative Justice (Ombudsman) to oversee the implementation of the recommendations of this Commission.

and the in-flight fire theory, it is the opinion of the Commission that the most probable cause of the accident was loss of aircraft control due to loss of situational awareness, attributable to continuation of flight into Instrument Meteorological Conditions for which the crew were not qualified. This resulted in crew disorientation. The loss of control was made worse by high gross weight conditions and the centre of gravity being at the edge of the safe limit.

The commission arrived at this conclusion after analysis of the evidence on the subject aircraft's flight shortly before the crash:

- (i). Erratic changes of aircraft speed, altitude, tight turns;
- (ii). Excessive left bank angle and nose down attitude at impact;
- (iii). Final flight trajectory indicating a very steep descent path; and
- (iv). High speed close to the ground.

MAIN RECOMMENDATIONS

- 1) KPAW should be restructured and transformed into an autonomous unit with a CEO who will be the Accountable Manager with financial autonomy. A possible model for adoption is the KWS.
- 2) The new KPAW should meet Air Operator Certificate requirements of the Civil Aviation Regulations before they are permitted to transport non Police officers.
- 3) KPAW should install a Lightweight Data Recorder (LDR) on their fleet of aircraft which will enable proactive management of operational trends and safety threats. The LDR will also be a useful tool in incident investigation.
- 4) The government should develop and implement a policy on carriage of passengers by the Police Air Wing.

CHAPTER ONE

1.1 INTRODUCTION

Following the fatal accident involving aircraft registration 5Y-CDT type AS 350 B3e on 10th June, 2012, at Kibiku area near Ngong, the Minister for Transport, in exercise of powers conferred by Regulation 9 of the Civil Aviation (Investigation of Accidents) Regulations, appointed Lady Justice Kalpana Rawal, Judge of Court of Appeal, on 18th June, 2012, to hold a public inquiry into the causes and the circumstances surrounding and leading to the fatal accident. She was to be assisted by Maj General (Rtd) Harold M. Tangai, Maj (Rtd) Charles Wachira, Capt. Peter M. Maranga and Mr. Fredrick Aggrey Opot.

Despite the team having been sworn in to start its inquiry, public interest and outpouring emotions on the accident did not wane. In consideration of these, and in exercise of powers conferred by section 3 of the Commissions of Inquiry Act, His Excellency the President and Commander in Chief of the Kenya Defence Forces, of the Republic of Kenya, appointed the same Commissioners and directed them to hold an inquiry with immediate effect. The Minister of Transport revoked the earlier appointment in exercise of the powers conferred by regulation 9 of the Civil Aviation (Investigation of Accidents) Regulations, to facilitate the operationalization of the Commission of Inquiry.

Major (Rtd) Charles Wachira declined the appointment since he was of the view that he was a crucial witness for the Commission, having examined and qualified the two late pilots to fly the aircraft type.

1.2 TERMS OF REFERENCE

The Terms of Reference for the Commission were to:

- a. Probe into the procedures surrounding the procurement and purchase of Aircraft Helicopter Eurocopter Registration 5Y-CDT type AS 350 B3e;
- b. Probe into the servicing, maintenance, usage and storage of Aircraft Helicopter Eurocopter Registration 5Y-CDT type AS 350 B3e prior to the accident;
- c. Look into the circumstance surrounding the flight control of Aircraft Helicopter Eurocopter Registration 5Y-CDT type AS 350 B3 by Wilson control tower on the morning of 10th June, 2012;
- d. Probe and establish the causes that led to the fatal accident of Aircraft Helicopter Eurocopter Registration 5Y-CDT type AS 350 B3;
- e. Look into any other matter relating or consequential to the accident of Aircraft Helicopter Eurocopter Registration 5Y-CDT type AS 350 B3; and
- f. Make such recommendations as the Commission may deem appropriate.

1.2.1 Mandate

In the discharge of its mandate, the Commission had authority to receive views from members of the public and receive oral or written statements from any person with relevant information and was at liberty to inter alia:

- a) Use official reports of any previous investigations;
- b) Use any investigation report by any institution or organization;
- c) Carry out or cause to be carried out such studies or research in any relevant areas;

- d) Determine its own rules of procedure and develop its own work plan; and
- e) Summon any person or persons concerned to testify on oath and to produce any books, plans and documents that the commissioners may require.

Having been appointed under The Commissions of Inquiry Act and keeping in mind the circumstances under which it was appointed, the Commission was aware, to quote from *H. W. R. Wade and C. F. Forsyth, Administrative Law, 8th Edition, Claredon Press (2000) pg. 973*, that, a Commission of Inquiry is "a procedure of the last resort, to be used when nothing else will serve to allay public disquiet usually based on sensational allegations, rumours or disasters."

1.2.2 Guiding Principles

Taking into consideration the wide mandate given to the Commission and the subject matter of the Inquiry, the Commission gave due regard to the suggestions made by *Justice Jack Beatson of the High Court of England and Wales*, in his article titled "Should Judges Conduct Public Inquiry?" published in 2005 issue of the *Law Quarterly Review* that; *to be effective, a Commission shall have to be impartial and vigilant as an independent court of law, to ascertain the terms of reference looking at the background in the workings, structures and legal provisions and regulations of relevant state institutions and departments, consider the evidence and then arrive at the findings and recommendations*, and in this case, that go a long way in transforming the safety in the aviation industry in Kenya.

Therefore, the method of work adopted by the Commission was guided by the following principles:

- a) Openness and transparency; and
- b) Public consultations and participation.

1.2.3 Guiding Pillar

From the beginning, it was very clear to the Commission that the assignment was to be carried out under the pillar of air safety, and hence all evidence received or obtained was analyzed and recommendations made with air safety and improvement of the regulatory regime of the aviation industry in mind.

1.2.4 The Method of Work

Justice Jack Beatson, in the article quoted here before, asserts *that the aim of public inquiries is to find out what happened, to restore the confidence of the public in a service, an organization or the government, and thus to draw a line under a crisis...* While agreeing with him and recognizing that the process of the inquiry was as important as the outcome, the Commission involved the representatives of the affected families and other interested parties in as much as was practicable in adopting its method of work.

In accordance with the mandate given, the Commission:

- a) Determined and gazetted its Rules of Procedure. The rules were crafted keeping in mind the observations made by Prof. Wade and Mr. Forsyth (page 974) posit, *"Experience of Tribunals of enquiry has revealed the dangers to which a procedure of this kind is naturally prone. The inquiry is inquisitorial in character and usually takes place in a place of publicity. Very damaging allegations may be made against persons who may have little opportunity of defending themselves and against whom no*

legal charge is preferred. The Tribunal is usually presided over by an eminent judge, who can be relied upon to mitigate these dangers, so far as possible".

The Rules were published on the 13th of July 2012 vide Gazette Notice No. 9425.

- b) Held its inquiry in public mainly in Nairobi but also visited sites and institutions that were crucial to the fulfilment of its mandate. Various visits were also conducted to KPAW offices and hangar, Wilson Airport Tower, JKIA Tower, the Kenya Met Department, Lady Lori Ltd and the Air Wing of the KWS to gather and collect pertinent information. The Commission also visited and held a session in the Kibiku area to hear three eye witnesses who had earlier appeared before the Commission. This was necessary so as to see and evaluate the exact positions and distances in relation to the final moments of the subject aircraft in order for the Commission to fully appreciate the critical testimony of these eye witnesses.
- c) Used official reports of previous aircraft accident investigations; In this regard the Commission had the following reports for reference; The Report on the Public Inquiry into the Busia Aircraft Accident 2003 and the Report of Investigation into Accident of Kenya Police Helicopter 5Y-UKW at Kapsabet, 2009.
- d) Used investigation reports by other institutions and organizations. For example, the Commission studied the Report of the Committee of Aviation Experts on Police Air wing, 2011.

- e) Requested different experts to give their views on areas that were deemed to be pertinent to the mandate of the Commission. These included experts on training of pilots, safety management systems in the aviation industry, aviation meteorology, forensic pathologists and aeronautical engineers.
- f) Summoned witnesses to testify on oath and to produce documents and other material that the Commission required. In this regard, sixty six (66) witnesses testified before the Commission. The High Court has interpreted Sections 3 and 10 of the Commissions of Inquiry Act, in *High Court Misc. Civil Application. No. 1279 of 2004, Republic-vs.- The Judicial Commissions of Inquiry & 3 Others* and has upheld the right of Commissions to summon all the witnesses who can assist in their work.
- g) Received submissions from Stakeholders in the aviation industry i.e. Kenya Air Traffic Control Association; Kenya Association of Air Operators, Aeronautical Society of Kenya.
- h) Commissioned the analysis of the following components of different parts retrieved from the accident aircraft:
 - (i). Garmin Aera 550 GPS
 - (ii). Garmin 695 GPS
 - (iii). Engine (boroscope examination and strip inspection).
 - (iv). Gear box and transmission system (inspection).
 - (v). Vehicle and Engine Multifunction Display (VEMD) (data down-loading).
 - (vi). Full Authority Digital Engine Control (FADEC) (analysis).
 - (vii). Skytrac (data downloading).

- i) Received and considered submissions from all the counsel after the closure of the open sessions.

1.3 CHALLENGES AND LIMITATIONS

In the course of fulfilling its mandate, the Commission encountered some challenges that had an impact on the pace and efficiency with which the Commission would have wished to complete its work.

These include:

- a) The need for the testing of several components in different countries; the process, including identification of countries with the requisite expertise and facilities as well as the testing itself, consumed a lot of valuable time.
- b) The fact that the Air Accident Investigation Department (AAID) does not have a hangar to lay out the wreckage made it cumbersome whenever it was necessary to re-examine parts of the wreckage. The wreckage had to be stored in a container and it is possible that some evidence could have been damaged every time the parts were removed and put back into the container. This had to be done frequently each time the Commission wished to verify some information or to make further observations during the Inquiry;
- c) It is also a fact that the accident investigators at the AAID do not have the necessary tools and equipment for investigative work. It was a big challenge to the Commission when removing the wreckage from the accident site and even when it came to dismantling the different components for testing and analysis, tools and equipment had to be borrowed;
- d) Diverse interests; the Inquiry was conducted in a very open and transparent manner consistent with the current Constitutional dispensation

in the country. The Commission was acutely conscious of the diverse interests in the Inquiry and sought to accommodate them in line with its Rules of Procedure and the Commissions of Inquiry Act, Cap 102. These interests included:

- (i). High public expectations,
- (ii). The affected families,
- (iii). Eurocopter the helicopter manufacturer,
- (iv). KCAA and
- (v). Kenya Police Air Wing.

While the declared objective of everyone was to establish the truth, each interest group, as would be expected, brought a different perspective and emphasis to the Inquiry. This affected the pace of the Inquiry as the different interests were often at cross purposes. This was a challenge to be expected in an open and public inquiry, a challenge that the Commission had to contend with.

- e) A lot of evidence emerged late into the inquiry with corresponding hypotheses as to the possible cause/s of the accident including the possibility of in-flight or pre-impact fire, the presence of toxic carbon monoxide and the related effect on occupants. All these had an impact on the Commission's time frame as it necessitated further investigation to confirm the veracity or to discount the theories. Due to the nature of the Inquiry and the different interests involved, it was found prudent to source for more experts and laboratory services to carry out further analysis outside the country with the assistance of friendly Governments. This was a process that the Commission had little control over.

f) Procurement of different experts and services; given the time the Commission had and the rigorous procurement procedures, the Commission had to forego some of the desired services.

g) The transition from the accident investigation under the Civil Aviation (Investigation of Accidents) Regulations to a Commission of Inquiry under the Commissions of Inquiry Act; gave rise to some protocol issues.

1.4 ORGANIZATION OF THE REPORT

Due to the nature of the Terms of Reference (TORs) that were given to the Commission, it was found necessary to devote different chapters to different related Terms of Reference.

Chapter Two, deals with procedures surrounding the procurement, Servicing, maintenance, usage and storage of the subject aircraft; TORs (a) and (b).

Chapter Three deals with the technical investigation of the accident and therefore deals with TORS (c), (d) and (e). The format of the chapter borrows heavily from Annex 13 of the Chicago Convention, Investigation of Aircraft accidents guidelines. It includes the Commissions' findings, conclusions, the cause of the accident and recommendations based on the technical investigation.

Chapter Four analyses the legal framework and the Institutions that are the basis of the Commission's other recommendations.

Chapter Five analyses shortcomings in the performance of key activities of different Government departments and in the Civil Aviation Legal framework.

CHAPTER TWO

2.1 Overview

This Commission's unique composition was intended to allay great public anxiety and dismay over the tragic aircraft accident, the subject of this inquiry. It is in the public domain that rumours in the guise of sensational allegations were rife and some of them spilled over to the public hearings before the Commission. It thus became the onus of this Commission to draw a line by probing and sifting through the voluminous evidence gathered during its open proceedings.

The Commission was mandated under TOR 1 (a) to investigate the process of procurement of the Aircraft 5Y-CDT Type AS 350 B3e (referred to as 'the aircraft') and under TOR 1 (b) to inquire into the process of servicing, maintenance, usage and storage of the aircraft.

2.2 Evidence on Procurement:

The Public Procurement and Disposal Act (PPDA) provides in Section 2 that the objectives of the Act are inter alia to promote competition and ensure that competitors are treated fairly, to promote integrity and fairness of those procedures, to increase transparency and accountability in those procedures and to increase public confidence in those procedures.

The Kenya Police Air Wing sent the procurement requisition for the financial year 2010/2011 for incorporation into the Police Department's combined procurement plan (CW2). The aircraft, being a security-related good was on the

restricted list, a confidential document approved by the Permanent Secretary, Office of the President, Ministry of State for Provincial Administration and Internal Security and the Director-General of the (PPOA) (CW 1, and CW 8 (s 133 of PPDA) . CW 49, the Commandant of the Kenya Police Air Wing (KPAW) on the 15th October 2010 (Com Exh. 49 E (1) wrote to the Police Commissioner addressing the need to buy suitable helicopters for the Kenya Police Air Wing. In the letter, he indicated what aircraft were operational at KPAW and presented justification for the purchase of a new aircraft.

The witness testified that the MI-17 currently in use is a heavy lift helicopter and expensive to operate on missions of lighter load. KPAW, therefore, needed to buy a smaller size helicopter.

The KPAW also considered other missions that the Police undertake including traffic control in the city, which, require a versatile, easily manoeuvrable helicopter able to land in confined areas. The KPAW proposed the Eurocopter AS 355 and the AS 350 B3 as well as the Bell 407, which they considered suitable for their purpose.

The Commission heard conflicting evidence from CW19 and CW49 on the procurement process. This was in such areas such as the development of the technical specifications for the suitable aircraft, communication and consultations of the tender process. CW19 testified that, despite being the deputy Commandant and the Chief engineer, he was not aware that the tender had been awarded to Eurocopter till he was asked to go for the pre-delivery inspection of the aircraft.

CW 49 testified that the KPAW decided on Eurocopter AS 350 B3 Helicopter and on the 11th November 2010, (Com Exh. 1 No. 2) the Police Commissioner

wrote to the Permanent Secretary requesting authority for direct procurement of the aircraft from Eurocopter, France. On the 22nd November 2010 (*Com Exh. 1 No. 3*) the Permanent Secretary advised the Department to use either open tender or restricted tendering or use the prequalified list approved for use by the Administration Police. Despite this advice, on the 8th of December 2010 (*Com Exh. 1 No. 4 (a)*), the Commissioner of Police wrote to the Director General of Kenya Civil Aviation Authority (KCAA) seeking guidance on the *'types and models of helicopters widely used in Kenya which also have sound and reliable service and maintenance back up locally'* and *'helicopter manufacturers who have local representation / dealership'*.

CW 9, for the Director General of the KCAA, by letter dated 17th December 2010 (*Com Exh. 1 No. 4 B*), advised that *'the types and models commonly used in Kenya today are EC130 134 – seven (7) seater and AS 350 – six (6) seater... manufactured by Eurocopter and the local representative / dealer is Everett Aviation Limited...the maintenance facilities available ...are the Lady Lori Kenya Ltd and Everett Aviation Ltd'...* *'The other locally operated helicopter is the Bell 407 and Bell 206 (seven seater) manufactured by Bell Helicopters a Textron Company. There is no local representative dealer...the maintenance facility for the Bell helicopters is Kenya Wildlife Service...'*

On the 20th of December (erroneously indicated as November) 2010, (*Com Exh. 1 No. 4 (C)*) (CW5) wrote to the Permanent Secretary to the effect that *'The Police Department wishes to procure one (1) helicopter through restricted tender in accordance with section 73 (2) (b) of the Public Procurement and Disposal Act from the following two firms:- 1. Africair Inc (Bell Helicopters) 2. Eurocopter, Paris. Our request to seek for restricted tenders from the two firms has been based on technical recommendation from the Kenya Civil Aviation Authority (KCAA) who are the regulators of the aviation industry. KCAA has*

advised that helicopters from the above manufacturers are widely used in Kenya and hence their performances in the country is well-known and have reliable service and maintenance and backup locally....' CW 9, testified that the 'advice' attributed to him in Commission Exhibit 1 No. 4 (C) was erroneous and was not based on his letter (Com Exh. 1 No. 4 B). He reiterated that his letter was not a recommendation. He only stated what was available in the country and informed the Police Commissioner that he "may obtain operational specification depending on your operational needs from the local dealer." The witness stated that his letter was not intended to be 'advice' as the Police were better versed with the purpose for which they were acquiring the aircraft.

On 8th March, 2011, the Special Security Tender Committee (SSTC) discussed the request by the Kenya Police and granted the Police the authority to float the bids to the two firms they had requested for, that is, Bell Helicopters and Eurocopter (CW 1,) and on the same day (Com Exh. 1 No. 5 (a)) communicated its decision to the Administrative Secretary, Police Headquarter (testimony of CW 1). CW2 testified that his Department prepared the 'Standard Tender Document for Procurement of Goods, Kenya Police Air Wing (KPAW) No.2/2010-2011, Supply and Delivery of a new Helicopter' (Com Exh. 2 A). The specifications were availed by the Kenya Police Air Wing Commandant. On the 12th of April, 2011 CW2 dispatched the tender to Africair in Miami (Com Exh. 2B), and Eurocopter in Marignane, France (Commission Exhibit 2 C) but the bid was redirected by the latter to Eurocopter, South Africa, PTY, Limited (testimony of CW2 and CW 56 . CW 56 testified that Eurocopter Southern Africa PTY is the agent for Eurocopter France and services about 20 countries and the tender, therefore, was directed to Eurocopter Southern Africa PTY by the Mother company.

On 20th April 2011 (*Com Exh. 1 No. 6*), the Accounting Officer in the Ministry of State for Provincial Administration and Internal Security, appointed members to the Tender Opening Committee and the Technical Evaluation Committee.

On 4th May 2011 the Tender Opening Committee, in the presence of I Nascimento and Adrian Wilcox the representatives of Eurocopter and Bell Helicopter respectively, opened both bids (*Com Exh. 1 Nos 8E and 8F respectively*) and the Secretary prepared and caused the minutes of the meeting to be signed (*Com Exh. 1 No. 8 A*).

On 6th May, 2011 the Technical Evaluation Committee evaluated both bids. It was not clear whether under one of the Criteria (maximum take-off weight of 5000 Lbs) was in reference to internal or external weight or both and the Commission heard that the members agreed to take the average of the internal and external take-off weight (*Com Exh 1 No. 10 page 5*) *Com Exh 1 no's 8 (E) and 8 (F)* indicate that the external and internal weight for the Eurocopter AS 350 B3 was 6172 and 4961 pounds respectively whilst that of the Bell 407 was 6000 and 5250 pounds respectively. The Bell, therefore, had both Internal and External weight of above 5000. The Eurocopter Internal take-off weight was below 5000. CW4, Maintenance Manager with the Kenya Wildlife Service (KWS), and a member of the Evaluation Committee testified that the average was purely for purposes of accommodating both bidders in view of the fact that the specification was not explicit. CW 49 (the Commandant) testified that 'whoever was giving the criteria for evaluation of take-off weight omitted internal and external, he only said maximum take-off weight and with that in mind although the internal weight of the AS 350 is 4960 it is well below the 5000 pounds, we could not disqualify this bidder because the external weight of the same aircraft is 6172'. So taking that into consideration and bearing in mind.

there was no specific, whether it was internal or external, we just said they are both responsive on the strength of the external weight which is 6172'. According to CW2, the two bidders were responsive and the recommendation to award the tender to Eurocopter was made on the basis of being the lowest bidder at (Euros 2,200,000 equivalent of KShs 272, 229, 760/) compared to Africair Inc. at US\$3,774,518 (KShs 315, 014, 855.60).

The Commission was told that at the time of the evaluation of the bids, there were five local maintenance agents with facilities for Eurocopter and one for Bell. In cross-examination, however, CW 4 conceded that one of the five, Eurocopter South Africa PTY, a KCAA Approved Maintenance Organization, is based in South Africa and not in Kenya.

By a letter dated 12th May 2011 (*Com Exh. 1 No. 10*), the Police Department sent the original tender documents to the SSTC for adjudication (*testimony of CW 1 and CW 2*).

On 13th May, 2011, (*Com Exh 1*) the SSTC granted the Police Department authority to procure the Eurocopter AS 350 B3 (*testimony of CW 1 and CW2*) which was communicated by a letter dated 16th May 2011 (*Com Exh 1 No. 11 (a)*), CW 1 received by the Police Department on the 25th of May 2011.

On the 26th of May 2011, CW 2 sent a letter to Eurocopter informing them that their bid was successful and called upon them to confirm acceptance within 14 days while Africair Inc was informed that their bid was not successful on 13th June 2011 (*Com Exh 2 G*). CW 2 conceded in cross-examination that he should have communicated to all the bidders on the same day.

On 23rd November 2011 a team nominated by the Permanent Secretary, Provincial Administration and Internal Security, travelled to South Africa for pre-shipment inspection of the aircraft.

CW 19, the Chief Engineer and Deputy Commandant at the KPAW testified that he was the technical person on engineering and maintenance in the team. He first checked all the documents listed in the Acceptance Protocol (*Com Exh 19B*) including service bulletins and airworthiness directives. He also checked the components that had cards in the aircraft manufacturer's logbook. He noted that they all had zero hours as at the time of installation. He testified that the bid by Eurocopter indicated two Primary Flight Displays (PFDs) and one Multi - Function Display MFD (*Com Exh 1 No. 8 (E)*). However according to CW19, only one PFD and one MFD had been installed on the captain's side only and there was need for a PFD on the co-pilot's side. Upon inquiry he was informed by Eurocopter that the Commandant of KPAW had approved the cockpit layout through an email dated 5th September 2011 (*Com Exh 19 B1*), stating "*Hi. The cockpit layout is okay.*"

CW 19 then noted that the aircraft did not have wipers and upon inquiry, he was informed that the wipers were optional equipment. On the 1st of December 2011 (*Com Exh 19 (2)*), he wrote to the Commissioner of Police requesting for the procurement of the Captain and Co-pilot windshield wipers and an external removable fuel pump.

After the inspection, the Director of Logistics, Police Headquarters, a member of the pre-shipment inspection team, signed the Acceptance Certificate on 30th November 2011 and a Certificate of Conformity dated 30th November, 2011 was issued (*Com Exh 19 C*).

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CW 19 further testified that, while in South Africa, he was not aware that eleven parts in 15Q 1(C) had been removed and replaced with other parts on the 11th of November 2011(except the VEMD, which, was removed on the 2nd of December 2011) nor was he aware of the reasons for their removal . During the Inquiry, for example, he checked the records and found that the "altimeter", had a different serial number of the item from the one he inspected in South Africa. He stated during cross examination that, had he been aware of the replacements, he would not have taken delivery of the aircraft.

CW 19 further testified that the remark "*not eligible for installation on an in-service type certificated aircraft*" on the Authorised Release Certificate (Commission Exhibit 15 Q 1 A), with regard to the VEMD which had been replaced on the 2nd of December 2011, means that the part cannot be fitted on an aircraft that is operational. He reiterated that had he known about this replacement, he would not have taken delivery of the aircraft. He only knew of the Authorized Release Certificate (15 Q I A) releasing the VEMD on 4th October 2011 from the Assisting Counsel.

CW 56, the Chief Executive officer of Eurocopter testified that the removed items were installed in France as part of the basic standard configuration of the aircraft and were replaced with parts as ordered by the KPAW.

When questioned why Eurocopter allowed the VEMD to be installed in the aircraft in view of the qualification in the Authorized Release Certificate, the witness stated that it was because that component came from the manufacturer and was delivered as a brand new replacement. Thales could not, at the time, deliver the EASA Form 1 with the normal remarks as the VEMD had not yet been certified as a spare unit by the DGCA, which is the French equivalent of the Kenya Civil Aviation Authority. It was certified as equipment coming with

the helicopter and "*is a complex matter of certification*". With regard to the remarks, "*Not eligible for installation on in-service type-certificated aircraft.*", the witness conceded that 5Y-CDT was at the material time, an in-service type-certificated aircraft. The Authorised Release Certificate for the VEMD serial No. 7843 was later released on the 17th of September 2012 during the currency of this Inquiry (*Com Exh. 56A4 (4)*). The witness would not answer the question whether he informed the Commandant about the changes in the equipment and configuration of the aircraft and merely stated that '*the only thing I can answer you on that is that, that VEMD was noted in all the documentation*'.

CW 56, in cross – examination cited differences between the AS 350 B3, which the Eurocopter had tendered for as specified by KPAW and AS 350 B3e that was delivered. In response to the question as to why AS 350 B3e was delivered instead of AS 350 B3, the witness explained that the AS 350 B3e was not in the market at the time of bidding and it only became certified on 16 May 2011. The 5Y-CDT, AS 350 B3e was about the 50th unit delivered and the first in Africa. At the time of delivery, the AS 350 B3 was no longer in production.

When tasked to explain that the Contract executed by the parties on 28th June 2011 (*Com Exh. 56(A) (11)*) is for the supply of an aircraft AS 350 B3 and not an AS 350 B3e, CW 56 reiterated that the AS 350 B3e '*is superior to the normal AS 350 B3 in its performance and all aspects*'. The witness reiterated that as per the Type Certificate Eurocopter supplied an AS 350 B3. The designation E is what in the industry is called "*the commercial appellation*" to explain to the market that there is a new evolution.

CW 56 further testified that on 8th December 2011, an acceptance flight test was performed and some defects noted were all rectified; however it was noted that there was no defect rectification report prepared.

The Final Acceptance (*Com Exh. 19D*) was signed on 8th December 2011

2.3 Analysis of Evidence:

The Kenya Police Air Wing is a Government department and therefore obliged to observe, the provisions of The Public Procurement and Disposal Act, 2005 and the Regulations made under the Act. The purchase of the subject aircraft therefore, was expected to have been guided by the procedures spelled out in the Act and the Regulations.

Having analysed the evidence adduced, the Commission observed as follows:

- (i). That the decision to procure the aircraft was not supported by any KPAW internal documented process or any strategic objectives involving major equipment acquisition.
- (ii). The Police Department appears to have made a decision to procure a Eurocopter AS 350 B3 from the onset and sought authority from the Permanent Secretary for single sourcing. The PS however advised them to use either the Open Tender or Restricted Tendering method of procurement using the prequalification list approved for the Administration Police. Despite this advice, the Department sought an opinion from KCAA, and basing their argument on their views of the opinion given by KCAA, sought authority to invite tender bids from the only two firms named in the request. This action circumvented the requirement for the use of a prequalified list for a restricted tender as required by the Procurement Act.
- (iii). The Department opted to use Restricted Tendering under Part VI – Alternative procurement procedure under Section 73(2)(b) which was not

the appropriate provision for this procurement process. This Clause must be read together with the threshold matrix where the minimum amount is KShs.1million while the maximum amount is KShs.20million. The cost of the aircraft at KShs. 272,229,760 was thus far beyond the maximum of KShs 20 million provided for in the clause under which the department was seeking authority.

- (iv). Various technical specifications were ambiguous and were not exhaustive. The Evaluation Committee was therefore unable to come up with an objective evaluation standard as evidenced by the averaging of the external and internal weight of the Eurocopter bid to arrive at the requirement for 'maximum take- off weight'. This did not comply with the Procurement Regulation 16 (5).
- (v). The cost of operating the different equipment although provided by both bidders was not evaluated as it was not part of the technical specifications.
- (vi). The Police Department communicated to the unsuccessful bidder three weeks after Communication had been given to the successful bidder, in contravention of the Procurement Act thus denying the unsuccessful bidder the statutory right to appeal. Sections 67(1) of the Act on notification of the award of the contract provides that before the expiry of the period during which tenders must remain valid, the procuring entity shall notify the person submitting tenders that his tender has been accepted, while section 67(2) states that at the same time as the person submitting the successful tender is notified, the procuring entity shall notify all other persons submitting tenders that their tenders were not successful.
- (vii). The Police Department had a very casual approach to the whole procurement process of the aircraft as variations to their own specifications were accepted without due process. This exposed the

Department to accepting non specified equipment contrary to the contract provisions.

(viii). The Police Department took delivery of an aircraft with different specifications without due process for variation.

(ix). The replacement of the VEMD in South Africa with a prototype, despite the certificate of the prototype specifically stating that it should not be installed to an in-service aircraft, was not explained in evidence. This is illegal and in contravention of the Civil Aviation (Airworthiness) Regulations.

(x). Despite these variations the Commission established that the aircraft delivered was new.

2.4 Recommendations:

- 1) There is need for strict compliance with the Procurement Act and Regulations as it fosters transparency and competition.
- 2) The Police Service should be made into a single procurement entity.
- 3) KPAW should develop internal consultative procedures on the departmental procurement plans.
- 4) The process of acquisition of major equipment, like aircraft, should be provided for in the Kenya Police Service Standing Orders. The Inspector General should ensure that a detailed manual for this purpose is developed expeditiously.
- 5) A comprehensive independent audit of the procurement process should be carried out with a view to prosecuting those found to have violated the Law.
- 6) There is need to develop a procurement quality system for the Kenya Police Service procurement entity.

- 7) The Cabinet Secretary responsible for Internal Security should order special audit to identify those who violated various aspects of the Procurement Act with a view to applying the appropriate sanctions.

2.5 Evidence on registration, servicing, maintenance, storage and usage:

2.5.1 Registration:

For an aircraft to be registered in Kenya it must meet the requirements of the KCAA Airworthiness Code, AIC23/08 (*Com Exh. 10A*) which provides that aircraft that have been certified by the Federal Aviation Administration (USA) or the UK's Civil Aviation Authority or the European Aviation Safety Agency (EASA) are acceptable in Kenya. The subject helicopter had earlier on been inspected while still in South Africa by (CW 15) on 27th August 2011 and found to be suitable for registration. An Aircraft Registration Acceptance Note Form Air -051 (*Com Exh. 13 G*) was filled by CW 15 and forwarded to KCAA for further action.

Following the issuance of the C of R the aircraft was subsequently inspected for issuance of the Certificate of Airworthiness (C of A) on 18th January 2012. The inspection was once again conducted by CW 15 who used the Rotorcraft Inspection Checklist Form Air – 39 (*Com Exh. 13 D*) to confirm whether the aircraft met all the requirements. The checklist was then countersigned by two officers namely (CW 14) and (CW 13) who recommended the issuance of the C of A, which was issued on 23rd January 2012.

The Force Standing Orders, Chapter 11 clause 7, provides that aircraft should be operated in compliance with the Kenya Air Navigation Regulations, now referred to as the Civil Aviation Regulations.

2.5.2 Servicing and Maintenance:

Under the Kenya Civil Aviation Authority Act, Cap. 394, Police aircraft are categorized as state aircraft and are exempt from the operations of this Act by virtue of the limitation in the definition of the term "aircraft" in the Act. However, Section 20 of the Act provides;

"Any part of this Act or any regulation made there under may, if it so expressly provides or if the minister so directs by order published in the Gazette, apply to state aircraft or to any class or classes of aircraft."

Regulation 247(1) of the Civil Aviation (operation of aircraft) Regulations provides;

"These Regulations shall apply to aircraft, not being military aircraft, belonging to or exclusively employed in the service of the Government, and for the purposes of such application, the department or other authority for the time being responsible for management of the aircraft shall be deemed to be the operator of the aircraft, and in the case of an aircraft belonging to the Government, to be the owner of the interest of the Government in the aircraft."

By virtue of Section 20 afore-stated, the Commission observes that this regulation expressly puts police aircraft, being aircraft belonging to or exclusively employed in the service of the government within the purview of these regulations. The only aircraft exempted are those belonging to the military.

Regulation 3 thereof requires an aircraft to display the proper registration markings prescribed in the Civil Aviation (Aircraft Registration and Marking) Regulations. The subject police helicopter which was owned by the Ministry of State for Provincial Administration and Internal Security applied for and was granted registration number 5Y-CDT by KCAA in compliance with this regulation.

Regulation 54 of the Civil Aviation (Airworthiness) Regulations, 2007 also expressly provides that the airworthiness regulations apply to police aircraft. Regulation 8 thereof prohibits any person from flying an aircraft unless there is in force in respect of that aircraft a certificate of airworthiness duly issued under the law of the state of registry.

Eurocopter designated one Engineer from their South African AMO who is CW 50 and in his own statement he describes his mission "*to assist the operators as decided by my superiors in performing the maintenance.*" He further stated that he also assisted other operators of Eurocopter aircraft in Kenya. The evidence before the Commission is that CW 50 was not authorised to undertake any maintenance work in Kenya and he was only qualified in airframes and engines. Eurocopter did not have a KCAA approval to carry out maintenance in Kenya although their Engineer carried out work and released the subject aircraft to service on several occasions.

CW 56 the CEO of Eurocopter South Africa testified that Eurocopter applied for Nairobi Line Station approval on 11th June 2012, a day after the subject aircraft crashed, which KCAA approved by letter dated 21st June 2012 (Com Ex 56C13).

The Commission heard from CW 19 that the first scheduled maintenance inspection (a 30 hour check) to be performed on the aircraft in Kenya was carried out on 8th December 2011 by a Eurocopter Engineer. This check was carried out in accordance with Aircraft Maintenance Manual (AMM) Chapter 05-26-00 and was entered into the South African Flight Folio (*Com Exh. 15x*). Thereafter the aircraft was parked in the KPAW hangar pending the issuance of the C of R and C of A.

CW 19, the Chief Engineer, told the Commission that KPAW wrote a letter to the Commissioner of Police on 18th January 2012 (*Com Exh. 19E*) seeking authority to source for maintenance services for the subject helicopter from Everett Aviation. There was no response to the request; and again on 20th February 2012 KPAW wrote a further request for authority to process a restricted tendering from Everett Aviation Ltd, Aircraft Leasing Services and Lady Lori Ltd. with respect to maintenance services for the subject helicopter (*Com Exh. 19F*). Another letter was written to the Commissioner on 7th March 2012 still seeking authority to procure maintenance services for the subject helicopter at a Eurocopter Maintenance Facility (*Com Exh 19 H₁, H₂, H₃*). However as at the time of the accident, KPAW had not yet entered into any maintenance agreement for the helicopter. The two scheduled "100 Hour" maintenance checks were conducted by Eurocopter South Africa gratuitously as KPAW went on with their quest for a maintenance arrangement.

During cross examination CW 19, the Chief Engineer, told the Commission that once a contract is in place for maintenance, then it is the responsibility of the contracted AMO to ensure airworthiness of the aircraft. In the case of this subject aircraft he contended that the contract had a clause for warranty, and therefore Eurocopter were obliged to ensure airworthiness during the warranty period.

Evidence before the Commission was that maintenance records in the Tech 1 (Com Exh. 18B) and Log books had been poorly kept. Flight hours were severally incorrectly entered, maintenance actions were not at all times entered and where this was done the details were not precise or complete, names and signatures of those required to make entries were often missing and details of fuel and oil uplifted were frequently not recorded.

The tech log sheet (Com Exh. 18 B serial no.0001) that was filled on this date shows that a pre-flight inspection was carried out by CW 22 in accordance with the aircraft maintenance manual. However, when asked to produce the said manual CW 22 told the Commission the manual was never availed to KPAW by Eurocopter SA Ltd.

The second maintenance appears to have been carried out on 25th January 2012. On this date the battery was removed for a deep cycle servicing (Com Exh. 15 Q1). It is not clear who removed the battery or where it was taken for the said deep cycle. This maintenance is not reflected anywhere in the tech log and can only be deduced from the aircraft battery log book (Com Exh. 15 Q1 D).

Another battery deep cycle service was conducted on 3rd February 2012 at Phoenix Aviation Ltd and the battery was found to be satisfactory. The Commission heard that the battery was removed by CW 50 and CW 20; however there were no records of removal and replacement of the battery in the log book. CW 50 also testified to having previously shown the KPAW how to drain the pitot-static system of moisture accumulation when the flight crew had complained of erroneous airspeed indication.

As per evidence received, CW 20 conducted approximately 33 pre/post flight inspections although he had not received any formal training on the aircraft type.

On 10th March 2012 the 100 hr. maintenance check was carried out by a Eurocopter Engineer (CW 50), at this time the aircraft had done 100hours 50mins. The various tasks that were accomplished during this maintenance are set out in *Com Exh. 19* which included various calendar-due checks. The Engineer (CW 50) signed a certificate of release to service (CRS). On this date the external pump which was said to be inoperative was removed for repair. The Commission was told that this pump was only used for external re-fuelling of the aircraft when in remote areas. As at the time of the aircraft crash this pump had not been re-installed.

On 12th March 2012, maintenance was carried out by the Eurocopter Engineer on the aircraft's tail rotor long rod. As per the tech log a heat shrinkage sheath was replaced in accordance with the aircraft's maintenance manual and the aircraft released to service. This maintenance action was however not recorded in the aircraft log book.

On 6th May 2012 another scheduled maintenance (100 hour check) was carried out by a Eurocopter Engineer at 201hours 51mins (time since new) as recorded in the Tech Log. The details of what this inspection entailed are in *Com Exh. 19B*, also including various calendar-due checks. The Eurocopter Engineer released the aircraft to service on the same day after conducting this maintenance check.

Eurocopter through their employee CW 50 released the subject aircraft back to service on various occasions based on the South African CAA Approval (AMO 177) as evidenced in Com Ex 50H that bears the AMO 177 stamp. CW 50 stated that although he used the South African stamp for the releases he believed that Eurocopter had a Kenyan CAA approval (Com Ex 15G) and that their operation

in Kenya was under the Satellite AMO concept. CW 50 did not have a Keny CAA approval to work on Kenyan registered aircraft.

Not all Maintenance work carried out on the subject aircraft by Eurocopter was recorded in the appropriate log books. Some of the work would be in the tech log and not in the aircraft or engine log book or vice versa.

The Commission was told that on 31st May 2012 the aircraft developed what was perceived as a major defect during an attempt to start-up for a flight. The red and amber governor lights illuminated on the VEMD and could not go off; the aircraft could not start. The Eurocopter Engineer was called in and from his diagnosis, and in consultation with another Engineer from Turbomeca (engine manufacturers), he concluded that the defect was due to failure of the EECU. He contacted Eurocopter South Africa who advised him to fill the AOG (aircraft on ground) order form and a warranty claim form for a replacement EECU. Subsequently, a new EECU was delivered to Nairobi from South Africa on Friday 8th June 2012.

The Eurocopter Engineer (CW 50) told the Commission that upon receiving the new component he checked its documentation and confirmed that they were in order. He then proceeded to remove the defective EECU and installed the new one in accordance with the engine maintenance manual. An engine ground run was performed and the replacement EECU confirmed to be satisfactory except that an "EDR failure" message appeared on the VEMD upon engine shut down. CW 50 stated that he contacted his employers enquiring on this additional defect. The Eurocopter South Africa Technical Assistance Manager sent an email message to the Commandant of KPAW, notifying him that "*the EDR failure does not affect flight safety and the aircraft could be flown for another 200 hours with this defect without any danger*". The Commission further heard

that on the strength of this email, CW 50 released the aircraft to service on 8th June 2012. CW 50 further testified that he had previously noted the EDR failure message on the maintenance page of the VEMD on 1st June 2012. This defect was however not covered by the MMEL. The MMEL was amended by Eurocopter to include this defect on 27th September 2012 (*Com. Ex 50F*).

Immediately thereafter at 1400LT the aircraft was flown to Voi by Captains Chiwe and Nancy Gituanja of the KPAW on a recovery mission. It landed back at Wilson Airport on the same day at 1730LT. According to Captain Chiwe the aircraft flew with no problem apart from the EDR failure message that appeared on the VEMD upon engine shut down.

On 9th June 2012 a pre-flight inspection was done by a KPAW Technician to prepare the aircraft (5Y-CDT) for a flight. The Commission was told that the aircraft did not fly as the mission that it was to undertake on this day was cancelled. As at this date the aircraft was recorded to have done 240hours 31mins.

On 10th June 2012 a technician (CW 20) carried out a pre-flight inspection on the aircraft in preparation for a flight to Ndhiwa. Captain Nancy Gituanja also conducted the pilot's pre-flight inspection. According to CW 20, the aircraft was in good condition for flight. The Commission heard that the aircraft took off normally at about 0832LT and at 0842LT the aircraft disappeared from the JKIA approach radar. Soon thereafter it was reported to have crashed in Kibiku area near Ngong Town.

2.5.3 Operation and Usage

The Commission was informed by Commandant (CW 49) that the aircraft was operated in accordance with the Standard Operating Procedures (*Com. Exh 49C*) adapted from the Kenya Air Force. He further informed the Commission that the Force Standing Orders stated that the operations were to be done in compliance with the Kenya Air Navigation Regulations. From evidence given by CW 49 the Air Wing aircraft including the accident aircraft were operated under his direct control and as authorised by the Commissioner of Police on each operational mission.

The Commandant (CW 49) further informed the Commission that he personally scheduled crew who flew on each mission. When questioned on the crew scheduling policy, he stated that he only tasked those who were qualified. He further stated that whilst KPAW did not have a safety management system, he nevertheless was responsible to ensure safety of operations.

The Commandant further testified that the helicopter was used for carrying Government VIPs and that there was no policy addressing this issue. However, he sought approval to transport the Government Officials from the Police Commissioner.

2.5.4 Storage

The Commission established from evidence and fact finding visits to KPAW that the subject aircraft together with most of the other Air Wing aircraft were stored or parked in the KPAW hangar when not in use.

The hangar facility is situated at the Wilson Airport which is under Kenya Airport Police Unit (KAPU) and the Kenya Airports Authority security officers' surveillance at all times. The airside is manned jointly by both the KAPU and the KAA personnel, while the landside is manned by officers from the Wilson Airport Police Station.

2.5.5 Analysis of evidence:

From the evidence received from CW 9 and CW 49 there seems to be a misconception that Police aircraft, being state aircraft as defined in sec 2 of the Civil Aviation Act, are not subject to the regulatory provisions of the Act. This is not the case as has been observed from the provisions cited herein before. In the considered opinion of the Commission, those Regulations have been made under Sec. 20 of the Act and therefore apply to State aircraft.

The Commission observed that the process of Registration and Certification was fraught with inconsistencies and omissions. These were carried out and issued with undue discretion and without requisite compliance.

The Commission heard that KPAW applied and was issued with a C of A. for the subject aircraft on 23rd January 2012. The C of A was in the category of Commercial Air Transport (passengers). It is not clear why C of A was in this category yet KPAW is not in the business of commercial air transport.

Having considered the Law governing maintenance and continuing airworthiness of aircraft which are applicable to Police aircraft, the Commission is of the opinion that KPAW did not comply with these Regulations.

Though a technical log book (*Com Exh. 18 B*) was maintained for the aircraft, the Commission was led through various instances when the entries made therein were incomplete and/or erroneous. The Commission observed that the record keeping at the KPAW is, at its best, deplorable. A few examples are here-under:

- (i). Serial no. 0046 – the aircraft flew for 1 hr. 20 minutes but only 4 minutes were reflected. Therefore there was an erroneous entry of the hours the aircraft had done as at that date.
- (ii). Serial 0055 – the previous flight time recorded was 181 hours and on this day the aircraft flew for 5 hours 30 mins but at the close of the day the total hours recorded were 187 hours 30 mins instead of 186 hours 30 mins.
- (iii). Serial No. 0060 – on 5th May 2012 the aircraft is indicated to have flown from Wilson Airport to Magadi between 1225LT and 1400LT. It is also shown to have flown from Wilson Airport to Mavoko from 1350LT to 1600LT. This cannot be correct because as at 1350LT when it is indicated to have departed Wilson Airport for Mavoko, it would have been airborne on its way back from Magadi.

Regulation 21(1) of the Civil Aviation (Airworthiness) Regulations places the burden of maintaining an aircraft in an airworthy condition on the owner or operator of that aircraft. However, the Commission notes with concern that, the KPAW did not have qualified maintenance personnel for the subject aircraft, neither did they have a contracted approved maintenance organization nor the requisite maintenance data. It is clear that the maintenance needs of the helicopter were not considered when it was procured and introduced into service. This was likely to have a negative impact on the continuing airworthiness of the subject aircraft.

The Commission noted that, despite the fact that KPAW had made three applications to the Police Commissioner for approval to procure maintenance services for the subject aircraft, the same had not been granted as at the time of the accident.

Pursuant to KCAA-AC-AWS 008A issued in July 2008 made under Regulation 22 of the Civil Aviation (Airworthiness) Regulations, 2007 KPAW was supposed to develop a maintenance program, in respect of the subject aircraft, to be approved by KCAA.

The Commission observes that the crew did not have appropriate operational support in the performance of their duties. For example, the KPAW does not seem to have a proper dispatch process of flights.

There is also no evidence that the KPAW has an effective flight following process and facilities.

The Commission further established that while the hangar was a security facility and therefore closely guarded to ensure only authorized entry, it was possible to gain entry without strict security checks. This is a serious security breach.

The Commission observes that the KCAA approval granted to Eurocopter was limited for maintenance activity at their Lanseria facility in South Africa. The Eurocopter maintenance activities in Kenya involving KPAW as well as other Operators were therefore not approved; a fact that they were alive to, as they applied to KCAA for Nairobi Line Station approval on the 11th June 2012. The concept of Satellite AMO in Nairobi under the South African CAA Approval or the KCAA Approval was not supported by any documentation. Even though Eurocopter, SA, had an AMO Certificate from the KCAA they chose to release

Kenyan registered aircraft using the South African CAA approval (AMO 1 instead of the Kenyan reference K/AMO/F/59, an act that was irregular.

The Commission noted that the maintenance support in Nairobi that was rendered by Eurocopter to KPAW, a new operator, consisted of one individual (CW 50), with minimal facilities and without authorization. This is hardly what would be expected of maintenance support for an operator from a station. organization of the status of satellite AMO as claimed.

After encountering the EDR failure message on the VEMD of the subject aircraft on 8th June 2012, CW 50 sought quite correctly, for guidance from the Technical Seniors at Eurocopter South Africa. The Commission observed that while the aircraft should have been grounded, on the basis of an email from Eurocopter (*Com. Ex 50M*) indicating that it was safe to fly the subject aircraft for another 200 flight hours the aircraft was released to service. This email was in relation to a response of a similar failure to an aircraft registered in South Africa and was not supported by the known established methods of communication to all operators. Such communication would be formal and addressed to all operators, usually in the form of Service Bulletins, Service Letters or Emergency Bulletins giving credence to the engineering considerations or processes underlying the decision. It is worth noting that the defect was later included in the MMEL by Eurocopter the manufacturer on 27 September 2012, thus formalising the matter almost four months down the line.

Eurocopter knowingly allowed the subject aircraft, a type certificated aircraft to be fitted with a non-certificated (prototype) VEMD. The Commission observed that in spite of clear remarks in Box No. 12 of the respective EASA Form (*Com EX 19M1*) that such should not be installed in an in-service aircraft. This essentially invalidated the Certificate of Airworthiness for the duration of the

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said occurrence. The Commission heard that this information was not brought to the attention of KPAW by Eurocopter and neither did KPAW note it during the process of application for C. of A. in Nairobi and thereafter.

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The installation of a prototype VEMD which was discussed under procurement was a violation which effectively invalidated the C of A of the subject aircraft.

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The Commission observes that there was no evidence to show that mandatory checks at 15 hour (7-day) and 25 hour (14-day) were accomplished when due, except during two occasions when 100 hour maintenance checks were carried out on the 10th of March 2012 and 6th May 2012. This is in violation of the scheduled maintenance requirements which could have had serious consequences on continuing airworthiness of the subject aircraft.

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2.5.6 Recommendations:

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1) KCAA should stringently enforce the provisions of the Civil Aviation Act and the attendant Regulations relating to registration and certification of aircraft irrespective of the status of the applicant;

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2) KCAA should ensure that KPAW adheres to all the pertinent Regulations including those that relate to Air Operator Certificate holders;

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3) KCAA should take up the matter of prototype VEMD and send a protest note to European Aviation Safety Authority on the basis that Eurocopter knowingly allowed for the use of a prototype part on a certificated and operational aircraft;

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CHAPTER THREE

3.1 SYNOPSIS



Figure 1: 5Y-CDT parked outside the police air wing

This Chapter deals with the technical investigation of the accident and therefore deals with TORS (c), (d) and (e). The format of this chapter borrows heavily from Annex 13 of the Chicago Convention, Investigation of Aircraft Accidents Guidelines.

3.2 FACTUAL INFORMATION

3.2.1 History of the flight

On 10th June 2012, a Eurocopter AS 350 B3e helicopter registration mark 5Y-CDT operating with a call sign Falcon 230, while on a flight from Nairobi, Wilson Airport to Ndhiwa, a small town near Lake Victoria in Western Kenya

crashed at Kibiku area near Ngong Hills in the south-western outskirts of Nairobi killing all six occupants.

The flight had established contact with Wilson ground control at 0820LT requesting for engine start. The crew reported to have three and a half hours endurance. Engine start request was approved and the aircraft was assigned transponder code 2053. The aircraft was soon thereafter transferred to Wilson Airport Tower frequency on 118.1 MHz at 0830LT. The flight was airborne at 0832LT and the crew was instructed to report on reaching the Nairobi Control Zone Boundary. After lift-off, the helicopter turned left to a heading of 266° (magnetic) climbing to 7000ft at a ground speed varying between 78 knots to 137 knots as read from the Nairobi Radar data (*Com. Exh 46A*).

The crew was informed of the flight to Ndhiwa at around 1800LT on 9th June 2012 by the KPAW Commandant. The flight, which was to take the Minister of Provincial Administration and Internal Security, Hon. Saitoti to Ndhiwa, was previously scheduled to depart at 0800LT but was, delayed due to late arrival of Hon. Ojode, the Assistant Minister in the same Ministry.

The commandant also testified that he was not aware that the Assistant Minister was travelling with the Minister and stated:

"So, I checked with the crew whether everything was ready because the take-off was to be at 8.00 a.m. The crew confirmed that everything was ready. So, I went to the VIP lounge and told the Minister in person that the crew and aircraft are ready and anytime he was ready we could go and board. It is at that time that he told me he was waiting for Hon. Orwa Ojode who was not in the manifest I was given earlier."

The commandant also testified that a Load Sheet was prepared for the flight on which an average passenger weight of 80 kilograms was used since the actual weights were not taken. The medical certificate for the pilot in command indicated she was 64 kilograms while the co-pilot's indicated he was 97 kilograms. It was however noted that the PIC and the flight dispatcher did not sign the load sheet, only the technician who carried out the pre-flight inspection signed the document.

Falcon 230 called Wilson tower at 0837:50LT reporting that they were estimating to reach the Control Zone Boundary in one minute. Wilson Tower transferred Falcon 230 to the Nairobi Control Centre on 118.5 MHz, a standard procedure and this was acknowledged by Falcon 230 (*Com Exh 46A*). This was the last communication that was received from Falcon 230 at 0837LT.

Note:

Timings are based on Wilson Tower Clock.

Wilson transcript is 2mins behind the tower clock.

Nairobi radar is 5mins behind the tower clock

3.2.2 Location of the Accident

The helicopter crashed approximately 2.2 Nautical miles North of Ngong town in a wooded area covered by medium sized eucalyptus trees and other vegetation, at approximately 0842LT.

The impact point was at coordinates, S 01°19.738' E 036°38.292' at an elevation of 6620ft MSL.

The last radar contact point was at coordinates, S 01° 19.217' E 36°37.667'.



Figure 2: Aerial photo of the site of the accident

3.2.3 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	2	4	-
Serious	-	-	-
Minor/None	-	-	

3.2.4 Damage to aircraft

The aircraft, which totally disintegrated, was destroyed by the-high energy ground impact and the ensuing severe ground fire.

3.2.5 Other damage

Several trees were knocked down by the crashing aircraft while a few others and the surrounding vegetation were destroyed by the post-crash fire. There was oil and fuel contamination of the soil after the impact.

3.2.6 Personnel information

Pilot in command

The Captain (Pilot in command) of Falcon 230 was 34 years old and a holder of a valid Kenya Civil Aviation Authority (KCAA) Commercial Pilot Licence (CPL) YK-5091-CL (H). She was not Instrument rated and not trained to fly in IMC. She had a claimed experience of 1,146 total flight hours, 902 hours as a pilot in command (PIC). Her experience on AS 350 B3e was 76 hours of which 69 hours were as a pilot in command (*Com Exh 16A-16RR1*).

She was type rated on the AS 350 which was endorsed on her CPL on 25th Jan 2012 and Bell 206 endorsed on her CPL on 03rd Dec 2009 under Group 1. She was also rated on the MI-17 endorsed on her PPL on 16th April 2010.

She had flown for 5 hours in the preceding 7 days, 21 hours in the previous 28 days and 99 hours in the previous 90 days. The last entry made in her personal flying logbook was on 30th May 2012. She was scheduled to be on standby duty during the week together with the Commandant and her last flight before the

accident was to Voi on 08th June 2012 in the same aircraft where she was the PIC.

It is presumed that she was the PF of the subject aircraft on the material day since the Co-pilot was the one communicating with the air traffic control (ATC).

She held a class 1 medical certificate which was issued on 8th September 2011 and was valid for 12 months. The medical certificate required the pilot to use photo chromatic lenses. The certificate indicated she weighed 64 kilograms.

She was seated on the right hand crew seat according to eyewitness (CW 49 and CW 20)

The PIC had previously flown to Ndhiwa as a co-pilot with the KPAW Commandant in the same aircraft.

On 16th and 18th May 2012 the two pilots (PF and PM) had been paired together and flew the subject aircraft with her as the PIC on both occasions. She last flew the Bell 206 on 30th May 2012 as the PIC for 2 hours.

She had previously held a Private Pilot Licence on Aeroplanes which had lapsed.

The PIC underwent a Pilots Conversion Course in the Kenya Army Helicopter Training School between July 2005 and Dec 2005. She was awarded a Certificate of Qualification.

No evidence of military categorization of the pilot was documented or seen in the KCAA crew file or KPAW pilot file by the investigation. Based on the conversion course, she applied for a PPL (Helicopters) which was issued by KCAA.

Co-pilot

The Co-pilot aged 36 was a holder of a Commercial Pilot Licence, YK-4992-CL(H) issued by KCAA on 17th January 2012 and was valid up to 16th January 2013. He was not Instrument rated and was not trained to fly in IMC.

He claimed a total experience of 965 hours of which 822 hours were as PIC and 48 hours on AS 350 B3e. He had flown 5 hours in the preceding 7 days, 33 hours in the previous 28 days and 90 hours in the previous 90 days. 28 hours were as a PIC on the AS 350 B3e.

He was type rated on AS 350 which was endorsed on his CPL on 16th February 2012 under Group 1. He was also type rated on the MI-17 and the Bell 206. On 08th June 2012 he had flown the Bell 206 for 4 hours 50 minutes as the PIC.

He held a class one medical certificate valid for 12 months issued on 17th January 2012. The medical certificate contained no limitations. The certificate indicated he weighed 97 kilograms.

He was scheduled to fly the Minister of State for Provincial Administration and Internal Security on 9th June 2012 to Bomet and back to Nairobi on the same day but the flight was later cancelled because the Minister's schedule changed. He did not operate any other flight on that day.

On 16th and 18th May 2012 the two pilots (PF and PM) had been paired and flew the subject aircraft with him as the co-pilot on both occasions.

The last entry made on his personal flying log book was on 8th May 2012. He had previously held a PPL (Aeroplanes) which had lapsed.

The co-pilot underwent a Helicopter Conversion Course at the Kenya Army Helicopter Training School between July 2005 and Dec 2005. He was awarded a Certificate of Qualification. No evidence of military categorization of the co-pilot was documented or seen in the KCAA crew file or KPAW pilot file by the investigation. Based on the conversion course, he applied for a PPL (Helicopters) which was issued by KCAA on 2nd April 2008.

3.2.7 Aircraft information

The Eurocopter AS 350B3e helicopter registration mark 5Y-CDT, serial number 7238, manufactured by Eurocopter, France on 27th July 2011 was powered by Turbomeca Arriel 2D turbo shaft engine. This model -B3e is an evolution of the -B3 installed with Arriel 2D engine in place of Arriel 2B found in the AS 350 B3. The engine model 2D has enhanced power, an extended time limitation at maximum continuous power and features the Engine Data Recorder (EDR).

The main rotor system is a starflex design consisting of three composite main rotor blades with a diameter of 10.69 meters (35.07ft) with a nominal rotor speed of 386 rpm.

The tail rotor system consists of a gear box driving a flexible seesaw two blade design with a diameter of 1.86 meters (6.10ft).

Landing gear consists of conventional skids with a provision for detachable ground handling wheels.

The fuel system consists of a composite material storage tank with a capacity of 540 litters located behind the passenger cabin. The fuel is delivered from the tank by an electrical booster pump via plumbing and several filters to the engine

my driven pump and the automatic fuel metering unit into the engine for
d a combustion.

co- The standard cabin ventilation and heating system as typical for non-pressurized
the aircraft consists of a scoop that introduces ambient air through a diffuser /mixer
'PL into the cabin. Cabin heating and windshield de-misting is accomplished by a
system which taps bleed air at the centrifugal compressor stage of the engine.
This partially compressed air at approximately 200° C is piped in a fire-proof
duct to the diffuser/mixer prior to being introduced into the cabin. Since this is
iber an un-pressurized cabin, it features sliding windows that can be opened in flight
by for additional ventilation. This was explained by the Chief Engineer of Lady
the Lori, an Air Operator, (CW 64) in evidence and during the Commission's visit
350 to their hangar at Wilson Airport.

n at The hydraulic system is mainly employed to provide the necessary assisting
power to operate the flight controls by actuating the main rotor and tail rotor
ain blade angles during flight. Synthetic hydraulic fluid is stored in a reservoir near
otor the main gear box feeding the hydraulic pump. The pump raises the system
working pressure to approximately 500 psi necessary to operate the three
lade actuators for the main rotor blades and one actuator for the tail rotor blades.
Associated with the actuators are accumulators which retain some residual
hydraulic pressure to be used following the main hydraulic system failure.

able The aircraft is equipped with an electronic Vehicle and Engine Multifunction
Display (VEMD) which displays aircraft and engine system status and
ty of highlights any defect on a screen in the cockpit. It is this system that was
the reported by the Eurocopter South Africa Maintenance Engineer (CW 50) to have
gine displayed the defect of the EECU on the 31st May 2012 and defect of EDR on 7th
June 2012 after the replacement of the EECU. It is noted that the unit fitted on

5th December 2011 in South Africa was a prototype (pre-certificated) unit which was fitted without the knowledge of the Commandant (CW 49) and the Chief Engineer KPAW.(CW 19).

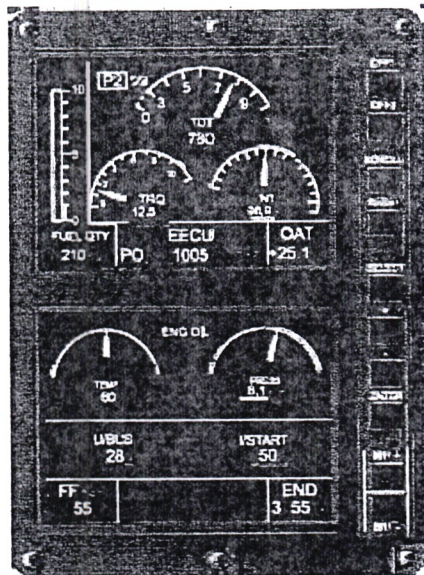


Figure 3: VEMD

The helicopter is fitted with a Full Authority Digital Electronic Control (FADEC) also referred to as Engine Electronic Control Unit (EECU) with a dual channel system which enables an automatic engine start cycle and the subsequent engine control. The dual system would act in redundancy; the second channel automatically taking over from the first failed channel and apart from the display of failure on the VEMD screen, operations would proceed normally. Should the second channel also fail during operation, the flight would proceed using the stand-by channel Emergency Back-up Control Auxiliary Unit (EBCAU), but thereafter the system would not permit an engine start while the defect persists. The system had totally failed on 31st May 2012 and was subsequently repaired by replacing the unserviceable Engine Electronic Control Unit (EECU).

"The EDR is matched to its engine; it contains data required for controlling and managing the engine_log book. It must systematically accompany the engine, and must not be used with another engine even during fault isolation operations."

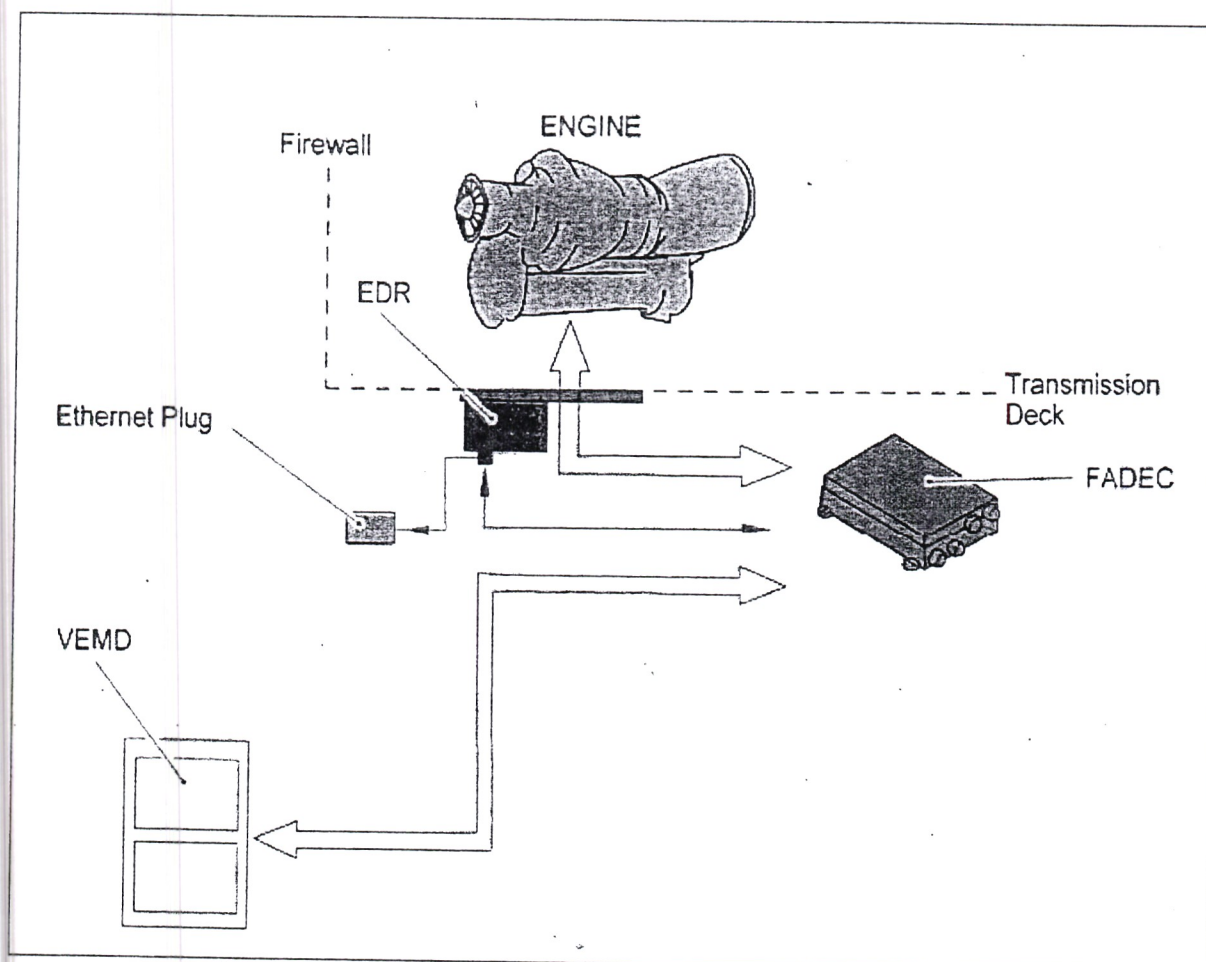


Figure 5: Engine Data Recorder System

The subject helicopter is a modern design featuring the glass cockpit configuration consisting of Garmin 500H dual screen electronic flight display (PFD and MFD). This necessitated the removal of certain cockpit analogue instruments to match the layout approved by the Police Air wing Commandant as stated by CW 56. This reconfiguration was carried out in South Africa prior to delivery of the aircraft in Nairobi.

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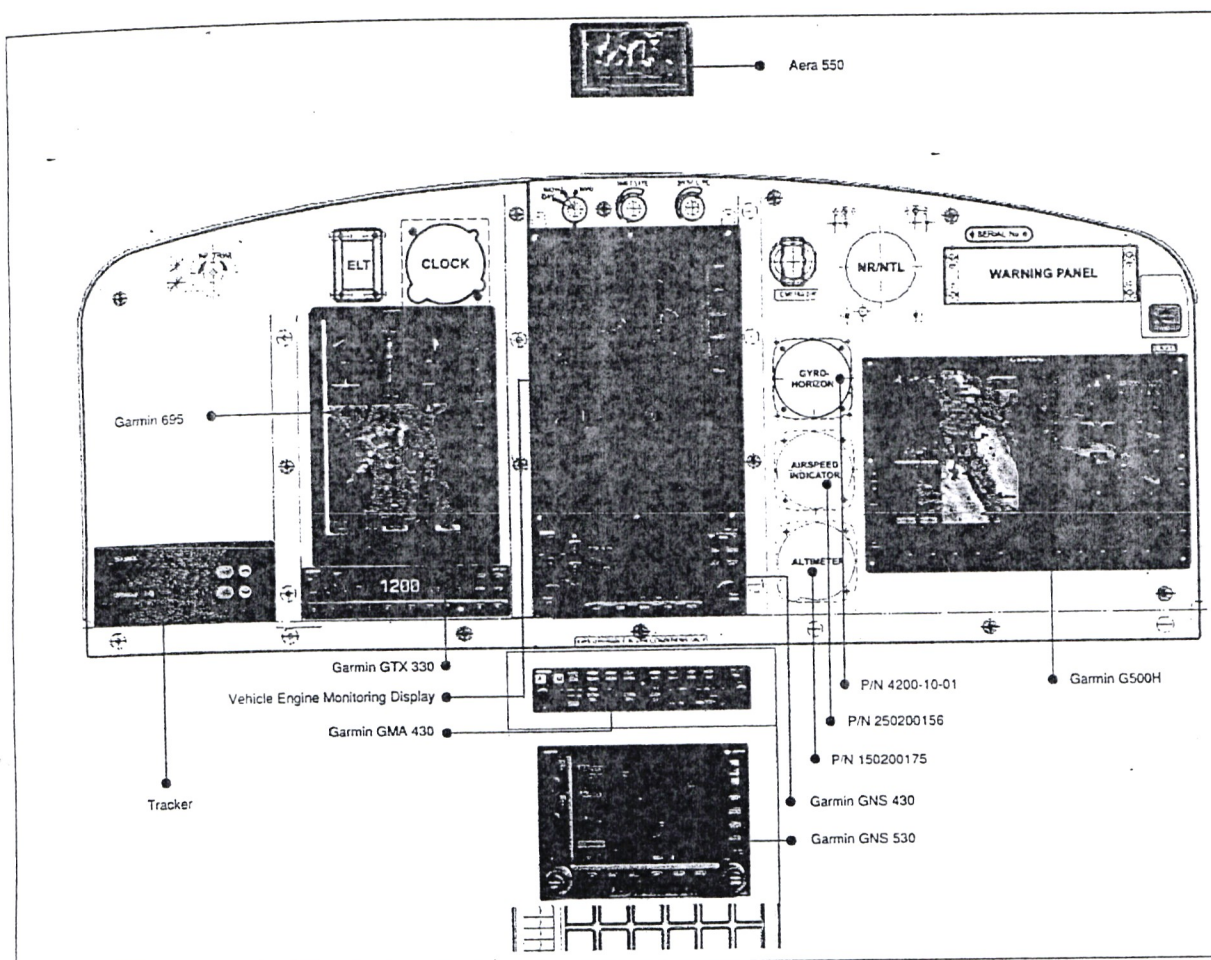


Figure 6: 5Y-CDT Cockpit layout as requested and approved by the Kenya Police Air Wing Commandant

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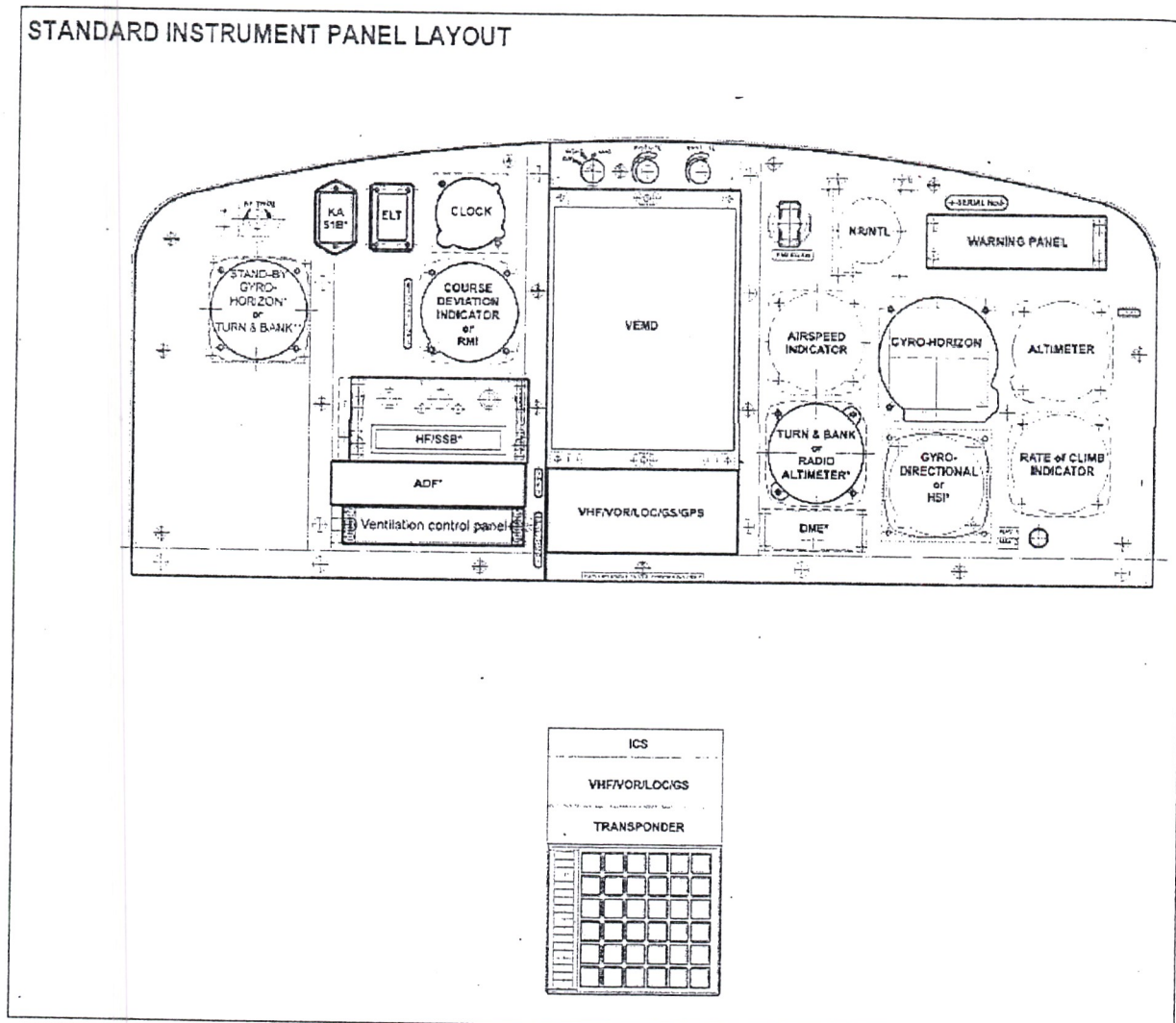


Figure 7: Standard Instrument Panel Layout

The helicopter was configured with dual engine and flight control systems for a two crew operation as requested by Police Air Wing. This meant that the subject helicopter could be flown from either the left or right hand front seats.

The subject helicopter, with a seating capacity of six, is certificated for a maximum take-off weight of 2250 kgs (4960 lbs) with internal load and a certified maximum landing weight of 2250 kgs (4960 lbs).

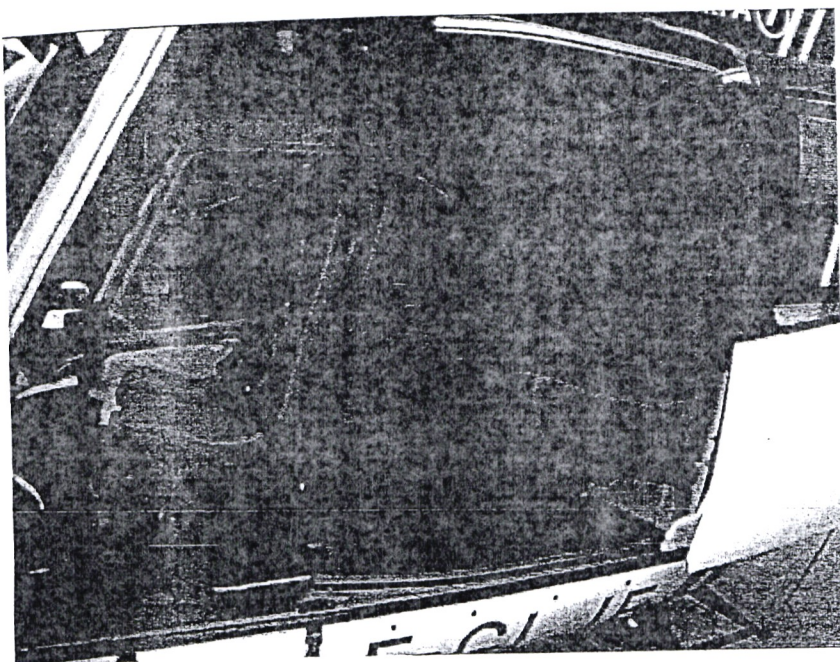


Figure 8: 2 Crews and 4 passengers' seat configuration

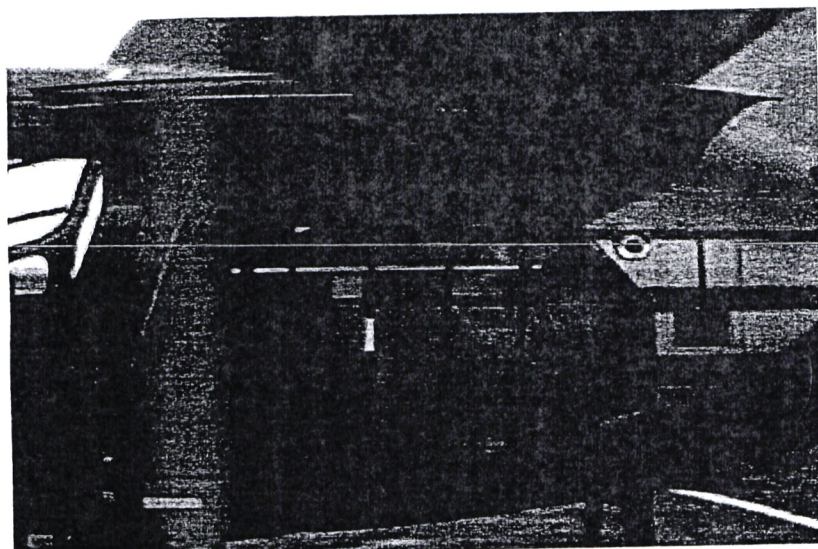


Figure 9: Baggage cabin

The aircraft was manufactured in France, dismantled and shipped to South Africa where it was reassembled and customized to Kenya Police Air Wing specifications. It was later flown from South Africa to Nairobi arriving on 7th December 2011 with the South African registration marks (ZS-HHO).

It was registered in Kenya with marks 5Y-CDT on 12th January 2012 under Certificate of Registration Serial number 2360 to Ministry of State for Provincial Administration and Internal Security, Kenya Police Department to be

operated by Kenya Police Air Wing. The aircraft had a valid Certificate of Airworthiness Serial number 2779 issued on 23rd January 2012 by the Kenya Civil Aviation Authority which was due to expire on 22nd January 2013.

The most recent scheduled maintenance was a '100 Hour' inspection check carried out on 6th May, 2012. The Certificate of Release to Service (Class 1) in force at the time of the accident, was issued by ESAL (AMO 177) and was dated 6th May, 2012 and was due to lapse after a total of 301hours 51mins of flight time or on 5th May, 2013, whichever occurred first.

The aircraft also underwent some unscheduled maintenance on 8th June 2012, when the EECU was replaced, after having been found defective and grounded from 31st May 2012. As at 9th June 2012, the helicopter had accumulated 240 total flight hours.

3.2.8 Weight and Balance

Most helicopters have an internal maximum take-off weight, which refers to the weight within the helicopter structure and an external maximum take-off weight, which refers to the weight of the helicopter with an external sling load.

The helicopter was last weighed on 23rd November 2011 in South Africa. (*Com Exh 15U*). The basic empty weight was established to be 1356 kgs. The maximum certificated take-off weight was 2250.3 kgs.

Load sheet

The load sheet, *Com Exh 49 F1* completed on 10th June 2012 estimated the passenger weight at 480 kg and 540 litres of fuel weighing 425 kg, therefore, the all up weight for the flight was (1356+480+425) 2261kg.

Servo transparency

If the helicopter is maneuvered in such a way that the airspeed and/or rotor disc loading (commonly known as g-loading) become excessive, aerodynamic forces on the rotor blades can exceed the maximum force that can be produced by the servo actuators. If this occurs, the aerodynamic forces will be progressively fed back to the flying controls, which become heavy to operate. This phenomenon is commonly known as 'jack stall', but is termed 'servo transparency' or 'control reversibility' by Eurocopter.

In a Service Letter, SL 1648-29-03, Eurocopter advised owners and operators of all AS 350 series helicopters about the servo transparency phenomenon, stating that it: *'can be encountered during excessive maneuvering of any single hydraulic system equipped helicopter, if operated beyond its approved flight envelope.'*

The 'Limitations' section of the AS 350 B3e Flight Manual contained the following, under 'Maneuvering limitations': *'Do not exceed the load factor corresponding to the servo control reversibility limit,'*

'The maximum load factor is determined by the servo-control transparency limit. Maximum load factor is a combination of TAS, density altitude, gross weight. Avoid such combination at high values associated with high collective pitch. The transparency may be reached during maneuvers such as steep turns, hard pull-up or when maneuvering near Vne''.

The Commission has considered these Principles in the analysis.

3.2.9 Meteorological information

The Commission heard evidence concerning weather on the material day affecting the subject flight from four distinct sources; the Kenya Meteorological Department (KMD), pilot reports, Kenya webcam.com and eye witnesses.

The coded weather report (METAR) given to the pilots from the KMD consisted of observations made at Nairobi Wilson airport and observations made at the Ngong (HKNG) station which is quite close to the scene of the accident. The observations were made at 0800 and 0900 local time. These reports were produced before the Commission and interpreted by CW 57, the Senior Assistant Director, Aviation Meteorological Services at KMD. He also produced satellite pictures that indicated general cloud cover over a wide area including Nairobi and its environs.

Nairobi Wilson Weather Reports:

METAR HKNW 100500 00000KT 9999 BKN016 15/14 Q1024.1

METAR HKNW 100600 00000KT 9999 BKN018 OVC080 16/15 Q1024.7

The weather reports from the Nairobi Wilson station at 0800 and 0900 Local Time both indicate a visibility of better than 10 km, clouds covering between 5/8 to 7/8 of the sky with a cloud base at 1600 feet and 1800 feet respectively. The temperature and dew point as 15°C and 14° C. These two values when close to each other indicate a relatively high level of humidity in the atmosphere. The closer the values are the higher the level of humidity. When the two values are the same they indicate 100% humidity.

Ngong Met. Station Weather Reports:

METAR HKNG 100500 09005KT 8000 -FG SCT 009 OVC015 13/13 QFE 806.8

METAR HKNG 100600 13005KT 8000 -FG SCT009 OVC015 14/14 QFE 807.7

The weather reports from the Ngong Station at 0800 and 0900 local time both indicate a visibility of 8000m, light fog and two layers of clouds, the lower one, covering 3/8 to 4/8 of the sky with a cloud base of 900 feet and the higher one, covering the entire sky (overcast) with a cloud base of 1500 feet. Each cloud system has a certain amount of thickness and since the two cloud systems were over the same area, it should be expected that there was overlap and the space between the layers would then be less than 600 feet.

Of special note is the dry bulb temperature vis a vis the wet bulb temperature which was 13/13° C and 14/14° C at 0800 and 0900 respectively. This indicates 100% humidity. This is a condition conducive to the formation of fog. The effect of fog and all other visible moisture such as mist and clouds is to reduce visibility.

Satellite imagery from the visible channel taken at 0845 local time (Fig 10) produced by CW 57 indicated shallow low level clouds along the intended route was consistent with the imagery from the infra-red channel exhibited to the Commission.

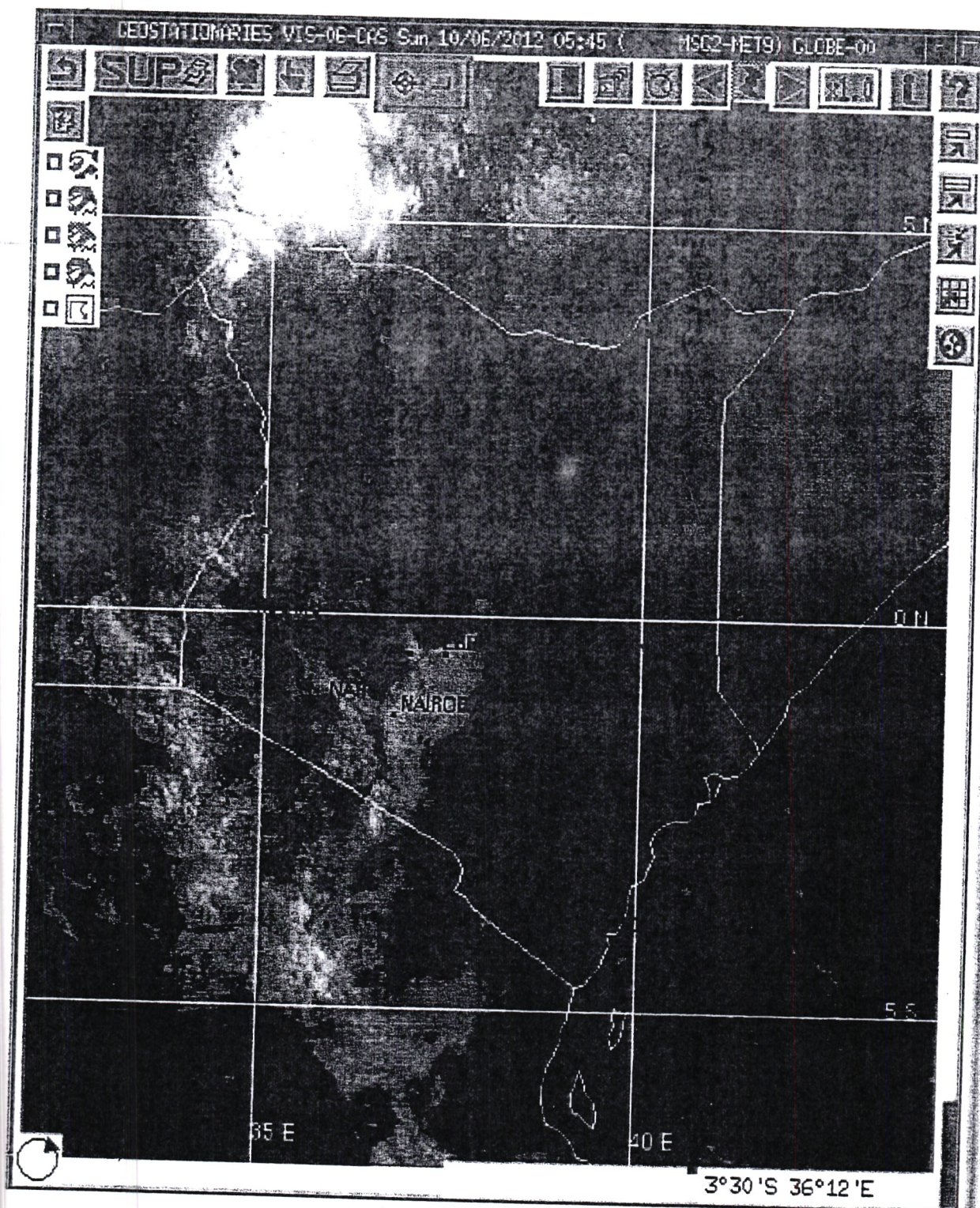


Figure 10: Satellite imagery from the visible channel taken at 0845 local time

The Commission heard from CW 57 that, Visibility is estimated by an observer on the ground. The International Civil Aviation Organisation (ICAO) Annex 3, defines visibility for aeronautical purposes as *"the greatest distance at which a*

black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background". It is evident from the definition that reported visibility does not represent a constant value in all directions from the observer position. It simply represents the greatest distance that can be expected but could be less depending on the direction of observation. It is also worth noting, that reported visibility refers to objects situated near the ground.

Pilots are recognised as sources of timely actual weather conditions encountered by an aircraft in flight. They are encouraged to make such reports to the nearest ground station. These reports are called PIREPs (Pilot Reports). CW 35, a helicopter pilot with over 4000 flight hours testified that he took off from Wilson Airport at 0818LT on the material day, heading northwards on a flight to Lewa, to the north of Nairobi. This was approximately 14 minutes before the subject helicopter (5Y-CDT) took off for Ndhiwa.

He further testified that the weather was not a problem for take-off out of Wilson Airport. After take-off he climbed to approximately 500 feet above the ground and flew at this height in order to stay below the clouds. However in a few minutes the cloud base got lower and lower as the aircraft crossed Waiyaki Way near Safaricom House to the north of Wilson Airport. Visibility was also rapidly reducing, in his judgment, to below VFR minimums of 1.5 km. He was forced to slow down the helicopter to 60 knots, the recommended speed when encountering hazardous situations even as he attempted to manoeuvre the aircraft to stay in visual conditions. In the end he radioed Wilson Control Tower that he was going to divert to Windsor Hotel due to deteriorating weather conditions where he landed at 0831 LT. It was his evidence that from his observation the weather conditions looked "worse" to the west in the area of Ngong.

CW 49 and CW 47, Kenya Police Air Wing pilots with a call sign Falcon 220, took off at 0914 Local Time in a helicopter from Wilson Airport in the general direction of the departure path taken by Falcon 230 on a search and rescue mission. While within the Nairobi Control Zone, they were asked by Wilson Control Tower how the visibility was and the answer was, "very poor, especially towards Ngong, "we are actually coming back."

Skytrac data indicated that Falcon 220 at this point was less than a kilometre from the accident site yet they could not locate it. These witnesses also stated that the cloud base was quite low and they were flying just above trees.

The kenyawebcam.com is a network of cameras installed at 17 locations in different parts of Kenya for weather and scenic observations. The webcam system is connected to internet services and can be accessed at <http://kenyawebcam.com/>. The webcams are used in the tourism sector to observe weather at beaches, Safari Lodges and other tourist points of interest. Pilots also use the system as a tool to aid them in evaluating actual, very near to real time weather observations as they plan their intended VFR flights to specific areas covered by the webcam system.

The webcam installations are on a voluntary basis by members of the Aero club of East Africa at locations of their choice or interest. One such location is in the Karen area of Nairobi. The GPS coordinates for the webcam location are S01° 22.171□□ E036° 43.701□□ at a roof-top art studio in a private residence along Lamwia Road in Hardy Estate, Nairobi according to (CW65).

The camera is a Teltonika Edge camera model and uses a 12V DC power supply. It is mounted on a steel beam structure at an approximate altitude of

5,900' MSL, facing the Ngong Hills at 240° magnetic. The camera uploads the photo shots to the webcam website at intervals of 10 minutes.

A snap shot taken at 0823LT, on the 10th of June 2012, by the Karen webcam was produced before the Commission. A review of the snap shot taken from Karen shows the farthest visible and recognisable object as two tall Eucalyptus trees in the middle of the picture at a bearing of 222° magnetic from the webcam location. The Ngong Hills are not visible. But in a comparative picture taken by the same Karen webcam on the 14th June 2012 at 1530 the Ngong Hills are clearly visible. The two blue gum trees are located at an altitude of 6,020' ASL. The approximate GPS coordinates of the two blue gum trees are S01° 22.544□ and E036° 42.897□. The distance from the Karen webcam to the two eucalyptus trees was worked out to be 1.65km. This indicates that visibility from the Karen Webcam towards the west was less than 2 km.



Figure 11: Webcam Photo taken on Sunday 10th June 2012 at 0831



Figure 12: WebCam Photograph taken on 14th June 2012 at 1230

CW 36, CW 37 and CW 38, eye witnesses in the vicinity of the accident site, gave accounts before the Commission that left no doubt that there was mist and low visibility in Ngong area at the time of the accident. Estimates of visibility from the witnesses ranged from 100m to 500m. The helicopter was flying very low according to these witnesses.

CW 36 stated that she was at the Napenda Kuishi street boys' rehabilitation Centre when she saw a helicopter approach from the direction of Limuru which is to the North. The helicopter was flying so low that she was able to read the words KENYA POLICE written on the belly in spite of the misty, drizzling weather. When asked about the sound of the aircraft the witness replied, "It was

high and then sometimes it could lower and then it goes high again." (sic) "The helicopter "disappeared to the south before turning back." It caused the buildings to shake and she thought it was going to strike an electric post which was about 200m from where she was standing. Shortly after that she heard a bang. Then she saw fire followed by smoke.

CW 37 a neighbour to CW 36 also testified of hearing and seeing the helicopter approaching from the direction of Limuru flying overhead the position he was at and that it was flying so low that it hit a blue gum tree on his farm. The aircraft was flying southerly towards the Ngong Hills but approximately two minutes later returned flying northwards, very low and fast. At this time the witness stated that he saw fire trailing the helicopter from the exhaust. He also stated that the aircraft had an unusual "*cracking or grinding*" sound and in less than two minutes "*it dropped*" into the forest. He stated that the weather was misty and estimated the visibility to have been 500 meters.

CW 38, a farm hand at the Napenda Kuishi boys centre was attending his normal duties when he heard and saw a helicopter flying northwards from the direction of Ngong Hills. The weather was misty and it was drizzling according to CW 37 and CW38. This is consistent with the 100% relative humidity as deduced from the temperature dew point/values in the weather reports from the KMD. CW 38 testified that the helicopter was flying very low, "*barely above the trees of a height of about 20 m.*" The sound of the helicopter "*was frightening.*" About two minutes later he heard a crashing sound.

CW 61, an advocate of the High Court of Kenya, was cycling approximately 1-2 km from the accident site when he heard a helicopter overhead "*flying quite low*". He observed that it was a "*damp, grey morning and the cloud was particularly low.*" The witness stated that he "*distinctly thought it was quite*

unusual for a helicopter to be flying that low in such weather." He looked up but was not able to see the helicopter due to the misty weather. The mist was *"just over the tree tops."* The helicopter 'circled' twice and in his estimate the helicopter was in the area between 6-8 minutes before he heard a sound as of a muffled gas explosion.

3.2.10 Aids to navigation

Not significant for this investigation.

3.2.11 Communications

Communications from Falcon 230 to Wilson Tower on 118.1 MHz commenced as the Co-pilot requested for start-up clearance at 0828LT from Wilson ground control on 121.9 MHz and was transferred to tower at 0830LT. Voice transcript obtained from Wilson Tower indicated that the helicopter was in communication with the tower until they reported to be one minute to the control zone boundary. At this point, the controller at Wilson Tower advised Falcon 230 to change frequency and contact Nairobi Area Control Centre on 118.5 MHz which they acknowledged. These communications up to this point were standard as expected (Appendix F).

No communication was received from the aircraft on the Nairobi Area Control Centre frequency or Wilson tower thereafter.

Counsel for the late Minister , in his cross examination of Commission witnesses and in his submissions asked the Commission to consider the possibility that the Co-Pilot cleared his throat severally in his last communication with the Wilson Tower suggesting signs of distress.

3.2.12 Aerodrome information

The aircraft departed from Wilson Airport, where the pilot had filed a VFR flight plan. Wilson Airport (ICAO designation HKNW) is located five kilometres south of Nairobi and serves both domestic and international traffic. It is located at latitude S01° 19.3' and longitude E036° 48.9' at an elevation of 5536 feet MSL. The aerodrome operating hours are from 0330LT to 1730LT. The airport has four asphalt runways 07/25 (4800×79 ft.) and 14/32 (5118×75 ft.). The airport is not equipped with Instrument Landing System (ILS). Approach, threshold and runway lighting is not provided for runway 14/32.

The airport is also equipped with a control tower normally manned by four air traffic controllers per shift.

The Commission established that Wilson airport does not provide radar services. Wilson Airport tower is provided with a slave display of the JKIA radar picture for the purposes of situational awareness only.

Flight recorders

The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR); and neither was required by regulations.

Wreckage and impact information

The wreckage was distributed over a rectangular area measuring 43m by 18m. The impact crater was situated at S01° 19.75' E036° 38.28' and the wreckage trail followed a general direction of 075° magnetic.



Figure 13: Crash site

Four of the occupants were violently thrown out as a result of the high energy impact and fuel tank explosion while the other two remained within the main wreckage area.

The tail boom together with the tail rotor assembly were severed from the fuselage and other than the damage that occurred on impact, were not affected by the ground fire. The main skid was detached from the fuselage and found lying two (2) meters away.

The aircraft impacted the ground with such momentum that caused the centre post to be embedded approximately 0.6 metres into the ground while the lower wire cutter was embedded approximately 0.5 metres into the ground. The cockpit centre post and the wire cutter had a heading of 175°M. The tail boom skid slid around a vertical tree stump as the helicopter hit the ground.

The cabin, engine and main rotor transmission assembly having spun approximately 100°, rested within four meters from the initial impact point, where a fierce ground fire seemed to concentrate, causing further damage to the remaining structure.

The crew seat lower frame was found broken and bent to the left.

The engine, main transmission gear box and main rotor mast were found lying in a heap adjacent to the burnt out cabin. The subject aircraft had three main rotor blades: one had sheared off and was flung 42.94 meters from the initial point of impact, the second one was deeply embedded in the adjacent ground and the third while still attached to the mast was burnt off at the root by the ground fire.

The fuel tank made of a composite material had ruptured into small fragments as a result of the impact.

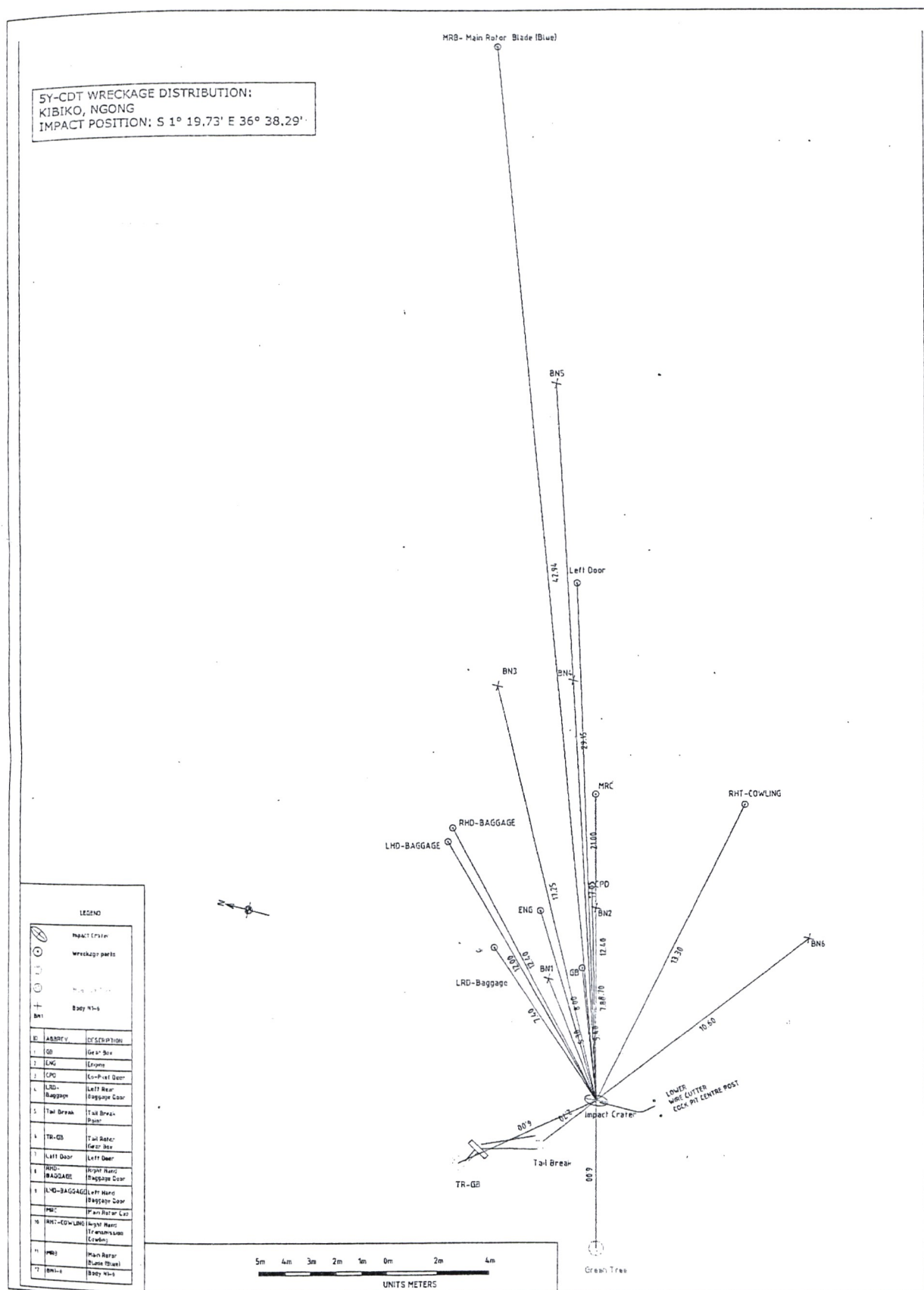
The engine was damaged by impact and fire as reported by (CW53) who carried out the engine stripping exercise.

The transmission system had suffered damage commensurate with the ground impact and fire as was observed by the investigators at the accident site and as reported by CW54.

- (i). The tail rotor drive shaft had sheared off leaving a fairly intact tail rotor assembly and the tail rotor gear box;
- (ii). The main drive shaft between the engine and main gear box had sheared and was burnt by fire.

- (iii). The main gear box and main transmission assembly suffered external fire damage.
- (iv). All the doors and various access panels were found lying in the general vicinity of the fuselage wreckage, the locking provisions of the main doors were observed to be in the locked position.
- (v). The major parts of the helicopter were accounted for at the scene of the crash; all the engine and flight controls, the engine and its accessories, main and tail rotor blades as well as the cockpit display panel were identified.
- (vi). On site Investigation of possibility of in-flight fire did not reveal the classic tell-tale signs of smoke streaks and soot on the tail boom of the helicopter.

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3.2.13 Medical and Pathological Information

The aircraft had taken off from Wilson Airport with Six (6) souls on board, consisting of two (2) crew members and four (4) passengers. All the persons on board sustained fatal injuries during the accident. All the persons were positively identified, with their respective positions at the accident site recorded. Post mortems were carried out on the crew and the passengers by the Government Pathologist. Toxicology and DNA analysis was also carried out by the Government Chemist. The findings were as follows:-

Pilot in Command (body 1)

The body of the PIC was found in the main wreckage. The body was completely burnt (over 100% 4th degree burns) and identified as female by the Government Pathologist at the accident site. The clothing was burnt out blue uniform. She was not covered by wreckage.

Post-mortem examination report by Government Pathologist (*Com Exh 39 (A)*) revealed charred remains. The mandible (lower jaw), maxilla (upper jaw) and frontal skull bone were fractured. The eye balls were missing and the body was in a pugilistic position. There were multiple rib fractures and soot was found in the trachea. The heart was ruptured and the liver burnt out. There were multiple skull fractures and brain injury.

Specimen taken for toxicology tests were blood, liver, stomach and its contents, kidney and muscle tissue for DNA for identification analysis.

The post-mortem specimens were examined by the Government Chemist for chemically toxic substances with negative results (*Com Exh 32(B)*).

DNA profiles was generated from the body tissue taken from the deceased and filed (*Com Exh 33 (G)*).

Cause of death was reported as multiple injuries and severe burns due to aviation accident.

Co-Pilot (body 4)

The body of the co-pilot was located approximately 12 meters from the main wreckage. The body was in a navy blue Kenya Police Air Wing uniform. He was still trapped in one of the seats at the accident site. Further inspection at the site of accident revealed that his upper body, particularly the head, was partially covered by the seat, which had been smouldering after the post impact fire. There was copious amount of soil covering his body at the crash site. This was as a result of first responders using soil in the process of extinguishing the fire.

The post-mortem examination which was conducted by Government Pathologist (*Exhibit Com. EXH 39 (D)*) revealed a crushed head, with mixed degree burns, on the chest, abdomen, face, upper and lower limbs. There was also crush injury below knee on both limbs with fractures on both wrists and ankle joints.

Also revealed were a fractured sternum and multiple bilateral rib fractures with injuries to both lungs. The heart was ruptured with tears in the liver and partially digested food in the stomach. The head was crushed totally with no brain matter within the vault.

Specimens removed for further examination included blood sample from chest cavity for toxicology, liver, kidney and stomach with its content and muscle tissue for DNA testing.

A DNA profile was generated from the muscle specimen and filed (*Com Exh 33 (G)*).

Post-mortem specimens were examined by Government Chemist and carbon monoxide was detected in the blood of the deceased at a concentration of 14mls per 100mls of blood indicating a level of 68.6% carboxy-haemoglobin (*Com Exh 32 (D)*).

No other chemically toxic substances were detected in the post-mortem specimens.

Cause of death was reported to be multiple injuries and burns due to aviation accident.

Passengers

The bodies of the four passengers were examined by the Government Pathologist in post-mortems carried out 24 hours after the accident. Specimens were also taken from all the bodies for DNA testing and from one body for toxicological examination. All the bodies were positively identified by witnesses during the post-mortem examination. The findings were as follows:

Passenger 1 (body 2)

The body was also trapped in the main wreckage. He had sustained severe burns and was charred beyond recognition (100% 4th degree burns). He was not covered by wreckage. Post-mortem findings (*Com Exh 39 (B)*) were charred remains, crushed head with multiple thermal fractures of the skull. Also found was thermal amputation of both upper limbs at the level of mid-shaft radio-ulnar

bilaterally. Thermal amputation of lower limbs at the level of the knee (left Limb), and mid-shaft fracture of the tibia-fibular. There were 4th degree burns on the entire body surface.

There was extrusion of all internal organs.

Specimen removed for further examination were muscle samples for DNA, and a DNA profile was generated and filed (*Com Exh 33 (G)*).

The cause of death was concluded to be severe burns due to aviation accident.

Passenger 2 (body 3)

The body was located about 10 meters from the main wreckage. He was not covered by wreckage. The post-mortem report (*Com Exh 39 (C)*) revealed the body was charred due to the burns sustained in the accident. The head was crushed with multiple facial fractures in the mandible and the maxilla. There was a degloving injury of right upper limb with "sescal" fractures of humerus and radio-ulnar. There was a degloving injury of left upper limb with mid shaft radio-ulnar fracture, crushed pelvis with degloving injuries of the entire right lower limb with "sescal" fractures of the right lower limb. There was amputation at level of mid shaft tibia-fibular right lower limb. There was a fracture at distal third of the femur and amputation at the level of the knee on the left lower limb.

The body had mixed degree burns.

Multiple rib fractures anterior and posterior in the right and left hemithorax, with fractured sternum and bilateral perforation of the lungs. There was soot in the trachea. Extensive vascular injuries were found, with multiple myocardial

lacerations. Haemoperitoneum (bleeding in the abdominal cavity), multiple lacerations of liver, spleen, kidney and multiple perforations of the intestines and a torn urinary bladder were also found.

Multiple skull fractures and total loss of brain tissue was also found.

Specimen removed from the body for further analysis included muscle samples for DNA testing. A DNA profile was generated from the specimen by the Government Chemist and filed (*Com Exh (G)*).

The cause of death was concluded to be multiple injuries and severe burns due to aviation accident.

Passenger 3 (body 5)

The body was located approximately 30 meters from the main wreckage. He was not covered by wreckage. The post-mortem report (*Com Exh 39 (E)*) revealed the body had mixed degree burns widespread over the whole body. There was a deep laceration across the face extending from the left cheek to just above the right eye approximately 10cm long. There were multiple skull fractures with a gaping wound on the right side of the head extending from the right parietal to the parietal occipital region measuring about 17cm long.

There were multiple rib fractures bilaterally and there was soot in the trachea. There were multiple myocardial lacerations, with multiple lacerations and contusions of liver, kidneys, spleen and intestine.

There were also multiple pelvic fractures, multiple skull fractures and total loss of brain matter. There was complete cord transection at T4-T5, then T6-T7.

Post-mortem specimens removed were examined by the Government Chemist for chemically toxic substances with negative results (*Com Exh 32(F)*).

A muscle tissue specimen was also removed during the post-mortem for DNA testing. A DNA profile was generated from the specimen by the Government Chemist and filed. (*Com Exh 33 (G)*).

After the post-mortem, the cause of death was concluded to be multiple injuries and burns due to aviation accident.

Passenger 4 (body 6)

The body was located approximately 10 meters from the main wreckage. He was not covered by wreckage. Post-mortem report (*Com Exh 39 (F)*) indicated that the body had 1st-3rd degree burns including the whole body sparing the left foot. There were also multiple fractures on the skull with loss of part of the bone tissue and part of the brain tissue exposed. There were fracture on the left thumb at the level of proximal interphalangeal joint. There was a distal third radio-ulnar fracture on the right side, and a left humerus midshaft fracture. Also found were bilateral degloving injuries involving entire lower limbs. The right femur had a midshaft fracture, and a right distal tibia-fibular fracture. There was traumatic amputation of left leg at the level of midshaft tibia-fibular. There were maxillary and mandibular fractures.

Internally, there were multiple rib fractures bilaterally anterior and posterior. The diaphragm was torn, a proximal third spinal fracture and soot was found in the trachea.

The pericardium was torn and right ventricle lacerated. The great vessels were severed with extensive vascular injury.

The liver, spleen and kidneys had multiple lacerations. There was multiple contusions of intestines and mesentery.

There was extrusion of brain and multiple skull fractures, with loss of brain tissue.

Specimen were removed during the post-mortem which included muscle tissue for DNA testing. A DNA profile was generated from the specimen by the Government Chemist and filed. (*Com Exh 33 (G)*).

After the post-mortem, the cause of death was concluded to be multiple injuries and burns due to aviation accident.

Note 1:

Only one of the passengers, the late Hon. Saitoti (body 5), had blood sample taken for toxicological test by Government Chemist. The result revealed negative indication to carbon monoxide contamination.

Note 2:

The results of toxicological investigations were not taken into account when the pathologist made his report.

Note 3:

Other pathologists present, CW 51, CW 52 as well as an expert for the late Minister's family, CW 62 stated that there was indication of "cherry pink" discoloration of blood in all the six bodies. In their opinion, the appearance of the "cherry pink" suggests presence of carbon monoxide. The "cherry pink" discoloration was not noted in any of the post-mortem reports.

Fire

There was a conflagration that destroyed the main wreckage consisting of the broken fuselage, engine and main rotor gearbox. This fire extensively burnt most parts of the aircraft structure, surrounding vegetation and bodies of the crew and passengers.

Photographs taken by the Police indicate a very extensive and intense fire. From the pictures no 19,20,21 it appears that the co-pilot was still strapped on his seat and was lying face down with his head covered by the back rest of the seat and head rest.

Parts of the helicopter as well as bodies were flung some distance away whilst burning.

Evidence was received from one eye witness (CW 37) out of four witnesses claiming to have seen fire at the exhaust area of the helicopter just prior to the crash.

Testimony was received from a Materials Engineer (CW 54) who was contracted to investigate the failure pattern of the gear box and transmission

system, to the effect that there was evidence of an in-flight fire near the main gear box which damaged the hydraulic pump. He went further to conclude that the resulting hydraulic failure caused difficulty in control thus resulting in the crash. During cross examination he could not explain the source of ignition that set the hydraulic fluid on fire. He further theorized that this fire due to incomplete combustion must have produced carbon monoxide which found its way into the cabin.

The tail boom was examined and showed no evidence of burning or smoke trail.

The inner surface of the engine and the main gearbox cowlings did not have any evidence of soot deposits or smoke streaks emanating from the vents.

Survival aspects

This being a sideways high energy impact crash, it resulted in some of the mechanical injuries described which could have caused immediate death or some degree of incapacitation. The post impact severe ground fire must have started due to the instant combustion of a fuel spray as the fuel tank was ruptured, possibly causing inhalation of toxic gas and severe burns. The combination of those circumstances made the accident not survivable. The commission observed that the crew harnesses and passenger seat belts did not show evidence of latching mechanism failure.

3.2.14 Tests and research

Engine test and inspection

Objective:

The purpose of these inspections was to assess the state of the engine; whether or not it was functioning at impact.

Result:

A boroscope inspection was done at the KPAW hangar using equipment borrowed from Air Kenya Ltd. and the report was prepared and submitted by a Power-plant Engineer CW 53.

The boroscope inspection did not have conclusive results because the engine was at this stage partially ceased thus limiting the scope of inspection. The engine was submitted for an engine strip inspection.

The strip inspection was conducted at the Lady Lori hangar, Wilson Airport, using tools and equipment borrowed from Eurocopter SA in the presence of representatives of French BEA, Eurocopter, and other interested parties. The report was compiled and presented by CW 53.

The engine modules were dismantled to make the vital parts accessible for inspection. The damage observed was commensurate with the impact and fire. There was also evidence of minor damage caused by foreign debris.

There was indication of excessive torque at the output shaft coupling nut manifested as two misaligned pointer marks, indicating that when the gear train was suddenly stopped, due to the main rotor system blade strike, the engine was still rotating, thus giving the typical "blade strike" or "sudden stoppage" indication. The evidence available indicates that the sudden stoppage was at the point when one of the main rotor blades dug into the ground.

There was debris including foliage found ingested by the engine indicating that the ingestion took place when the engine intake was in close proximity to the ground and the gas generator was coasting-down after interruption of the fuel supply.

All the above observations indicate that the engine was delivering power at the point of impact.

Gear boxes and transmission train examination.

Objective:

The purpose of this examination was to examine the failure pattern of the power train in order to determine whether or not the transmission system was operating at the time of ground impact or blade strike.

Result:

The examination was conducted at the Lady Lori hangar at Wilson Airport by CW 54 who gave his report to the Commission.

The examination of the torque shafts (the engine output to main gear box shaft and the main gear box to tail rotor gear box shaft) revealed failure in torsion.

This is a classic indication that the gear system was in rotation until it was brought to a sudden stop while the engine was still running.

The investigation of the internal parts of both the main rotor transmission gear box and the tail rotor gear box revealed that there was no damage to the gears, and they were not impeded in rotation by any object.

CW 54 commented on the fire damage. He particularly drew attention to a burnt out part of an aluminium alloy bracket at the end of the drive shaft to the main gear box, on which the hydraulic pump is mounted. He concluded that the burn pattern on the bracket and the pump drive pulley *"points at damage by fire emanating from a pressurized source such as a canister"*. His theory is that this "torching effect" was likely due to a small fracture of the hydraulic system plumbing, resulting in a high pressure (500 psi) fluid jet. He further postulated that the resulting fire during flight is what consumed the part of the bracket together with the mounted hydraulic pump. He went further to speculate that the resulting hydraulic failure is what made the aircraft impossible to control and hence the crash.

During examination CW 54 could not explain or establish the source of ignition of the hydraulic fluid jet, which he nevertheless observes has fire retardant additives. His in-flight fire theory was stretched further during cross examination when he stated that the resulting *"incomplete combustion in the hydraulic pump area produced carbon monoxide which entered the passenger cabin"*.

GPSs data readout

Objective:

The purpose of this effort was to get additional data which would verify with greater accuracy the position of the aircraft prior to the crash.

Results:

The down-load exercise was conducted at the UK AAIB laboratory in Farnborough.

The laboratory tests on the memory chips did not yield any results for Aera 550 and Garmin 695 due to the nature of damage on the components caused by the crash and fire.

Skytrac system data readout

The helicopter was equipped with a Skytrac Systems ISAT-200R, serial number 30200, paired with ITRAY-200R mounting tray number 10251. A DVI-300 interface and CDP-300 display panel were also installed in the cockpit. The ISAT-200 system is designed to be a flight following solution.

The Skytrac receiver was hand delivered to the manufacturer, Skytrac System Ltd in Kelowna BC Canada, for data extraction and readout from the storage chip, which would give data of position of helicopter every five (5) seconds as an improvement to the available data recorded every 60 seconds.

The following screen shot shows Sky Web server data for the subject aircraft on the material day as reported by the ISAT-200R at 60 second intervals.

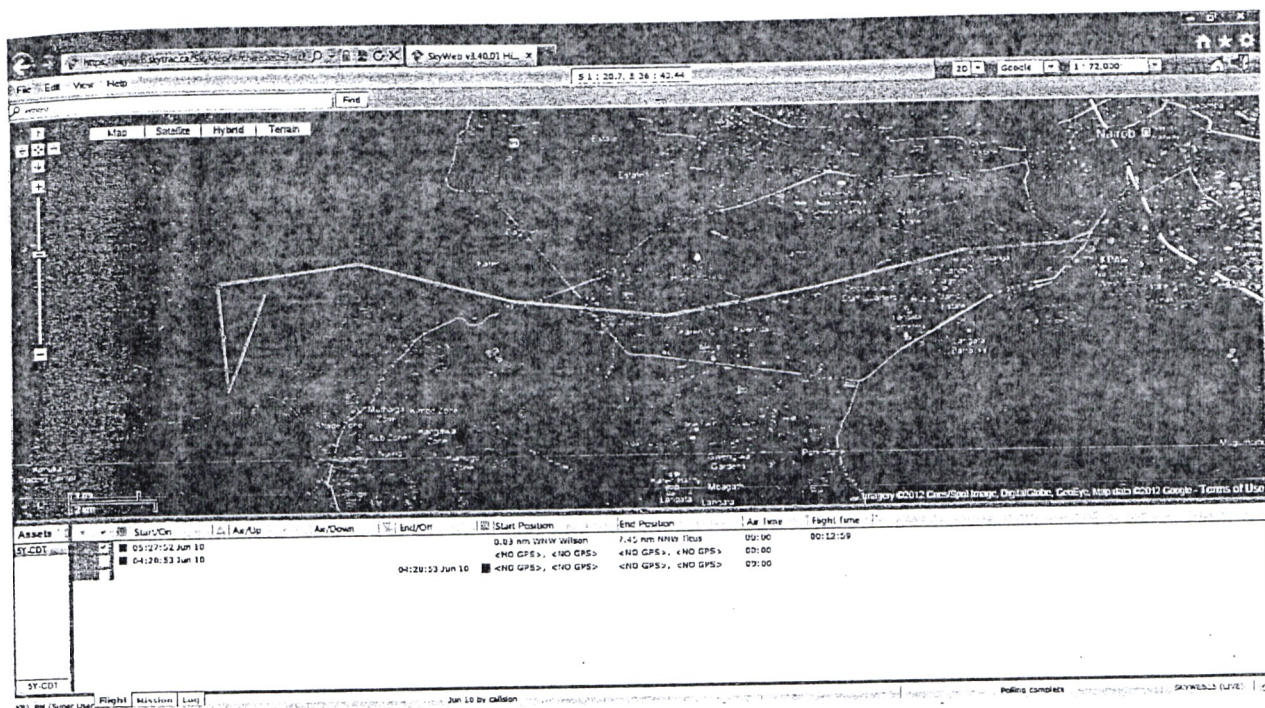


Figure 15: Figure of Sky Web Server Data

The ISAT-200R is not intended to meet the crash and thermal survivability ratings of a Flight Data Recorder (FDR) or Lightweight Aircraft Recording System (LARS), so the log extraction was to be performed on a 'best effort' basis only.

The data extraction was performed according to the ISAT-200R data extraction procedure detailed in F912, ISAT-200 Data Recovery Checklist. The completed form is included in Appendix E.

The initial inspection revealed extensive mechanical damage and overheating of the ISAT-200R as shown in the following figures.

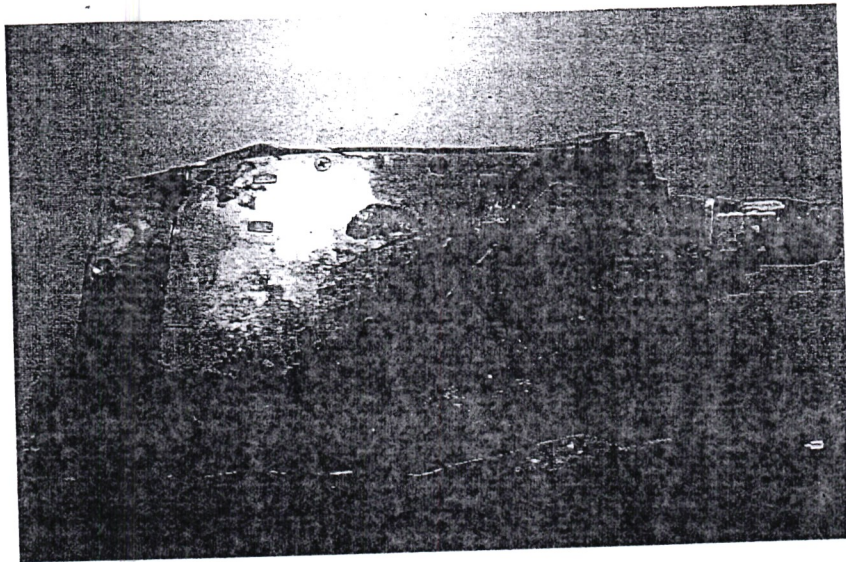
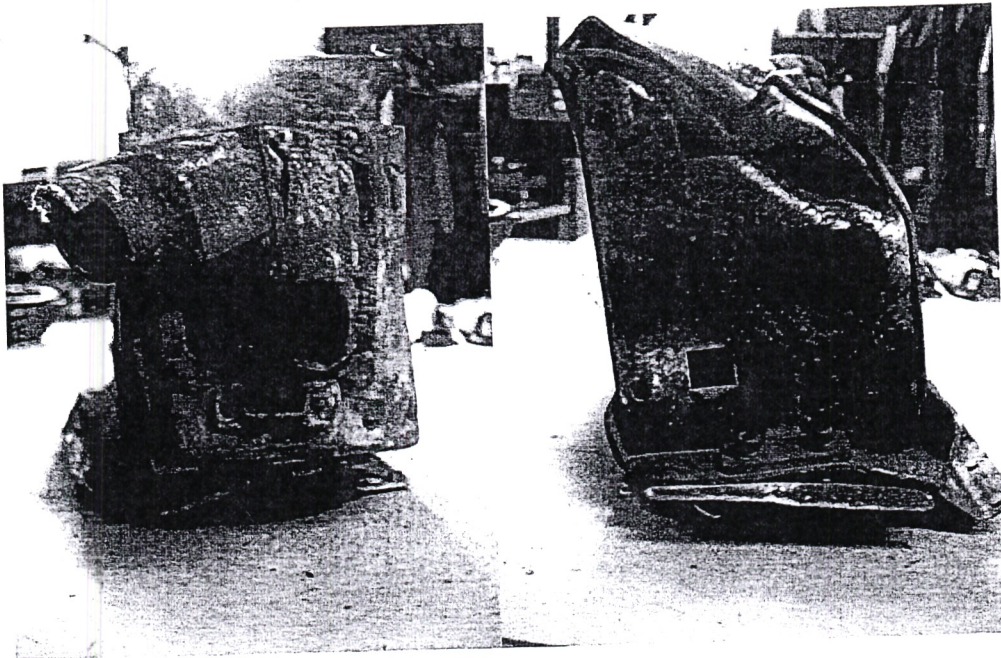


Figure 16: ISAT Exterior



ISAT Back

ISAT Front

Due to the extensive damage the unit was not serviceable by standard procedures. In order to gain access to the internal circuitry, the ISAT needed to be cut out of the mounting tray. A Dremmel tool with a cutting wheel was used to remove the tray as shown in the following figures.

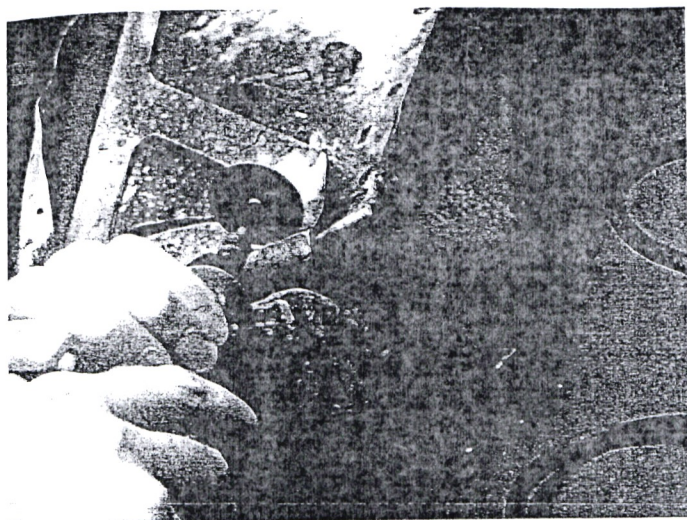


Figure 17: ITRAY Removal

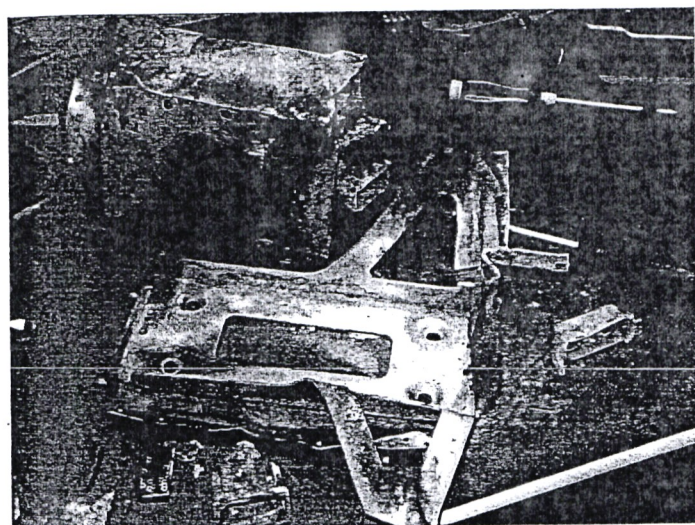


Figure 18: ITRAY Removed

It is worth noting that balls of once-molten aluminium were found between the ISAT and the mounting tray, and the external ARINC connector was completely destroyed by heat.

With the tray removed, the ISAT side-cover was opened to access the internal electronics. The following photos reveal the extent of the internal damage.



Figure 19: ISAT Side Cover

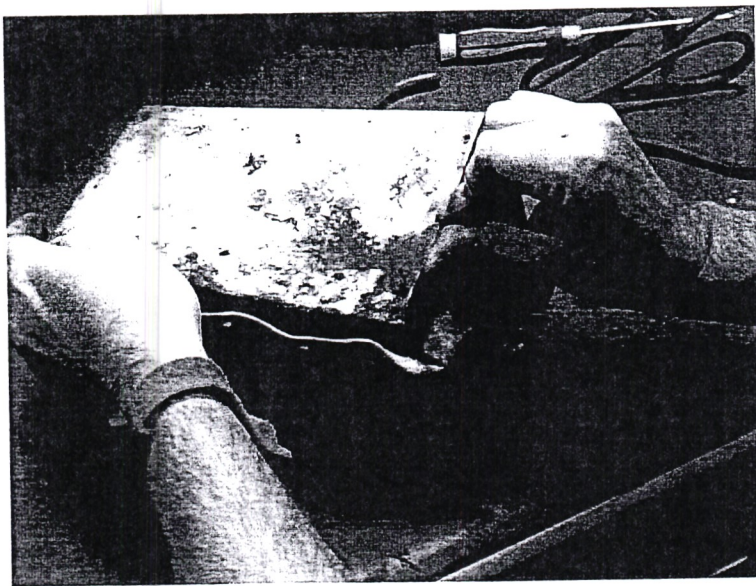


Figure 20: ISAT Side Cover Removal

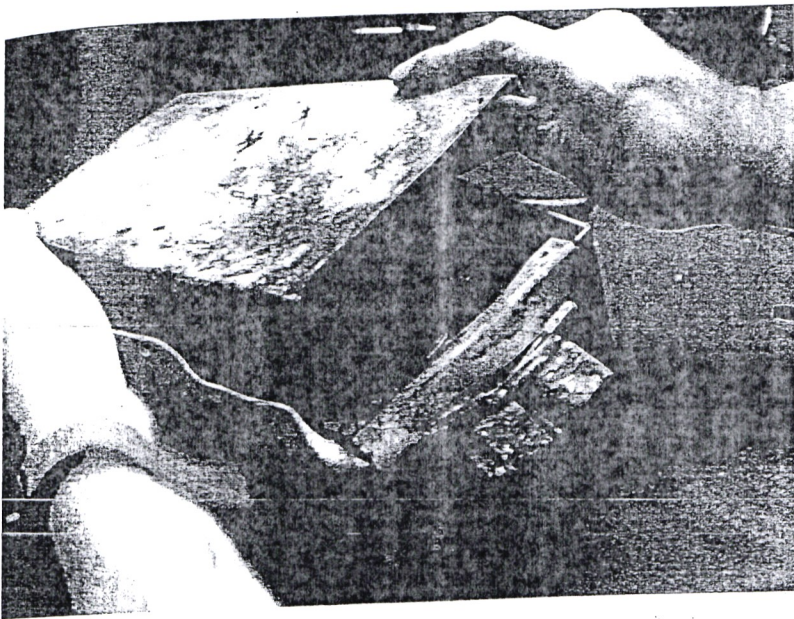


Figure 21: ISAT Side Cover Removal

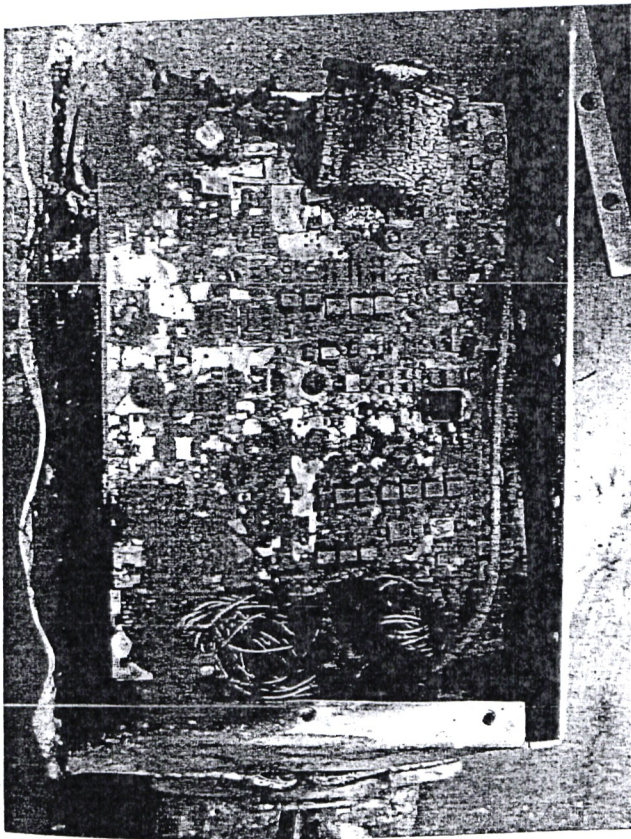


Figure 22: ISAT Side Cover Removed

The heat generated at the time of the crash caused many of the Integrated Circuits (IC) to melt off the board, including the flash IC, which was located within the red circle in the following picture:

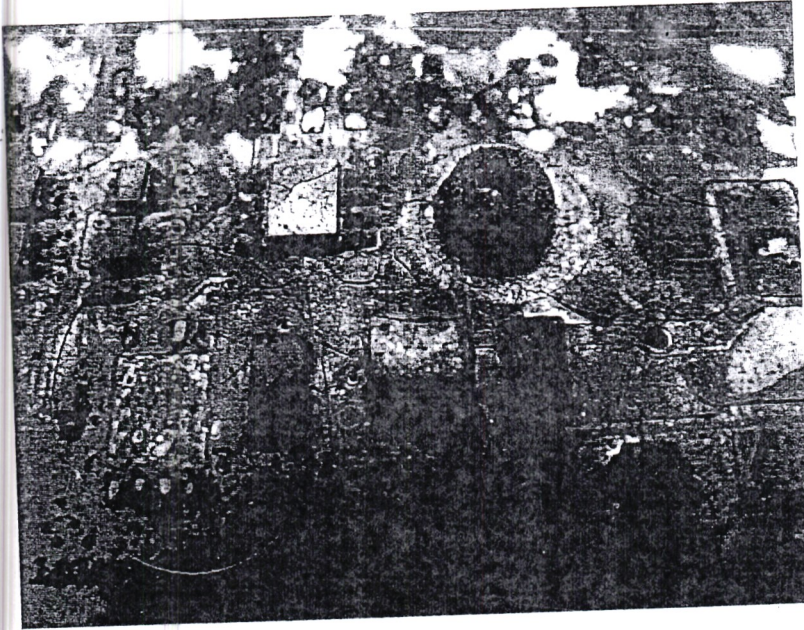


Figure 23: Flash IC Printed Circuit Board Location

Within the debris that fell out of the unit, SkyTrac was able to locate the flash IC.



Figure 24: Internal Debris

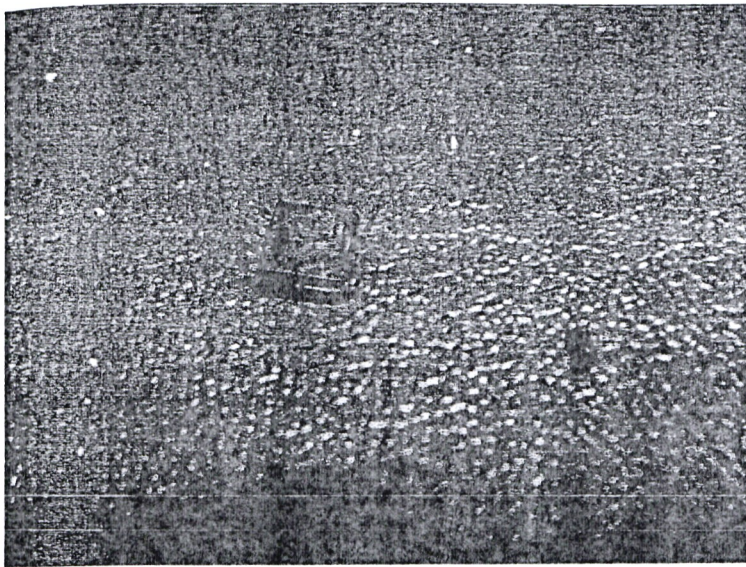


Figure 25: Flash IC

The pin-to-pin resistances of the recovered flash were evaluated against an identical new component to look for open-circuits or internal shorts. All resistances were found to be on the same order of magnitude so it was deemed safe to proceed with the extraction.

As the leads of the recovered flash were charred, the IC was soaked in isopropyl alcohol in an attempt to prepare them for soldering. After several unsuccessful attempts to solder the recovered flash to the new board, a Zero Insertion Force (ZIF) socket was used to connect the flash to the PCB.

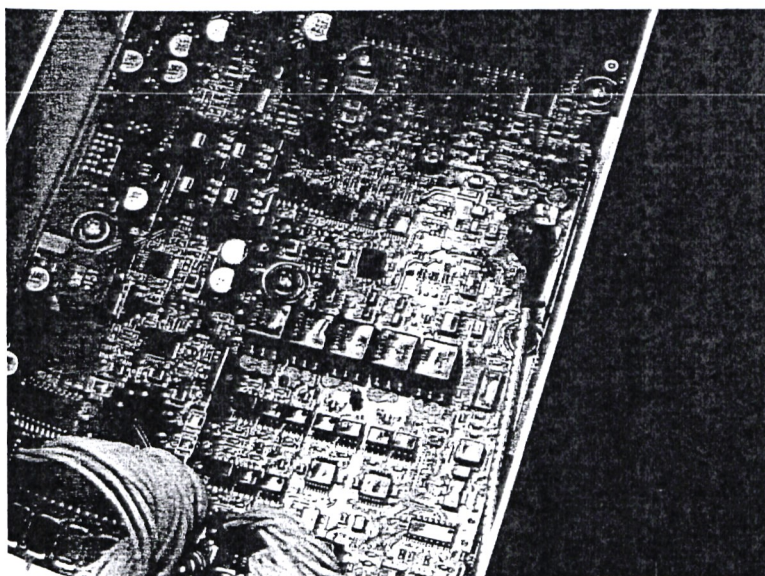


Figure 26: Soldering Recovered Flash to New PCB

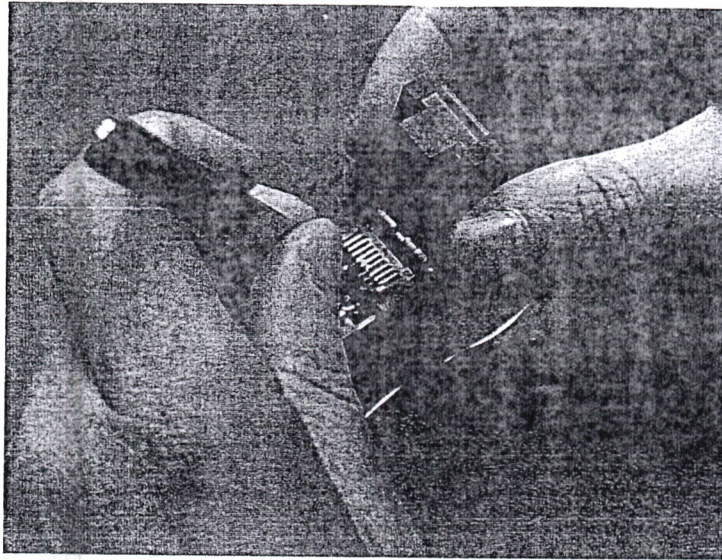


Figure 27: Insertion of Flash into ZIF Socket

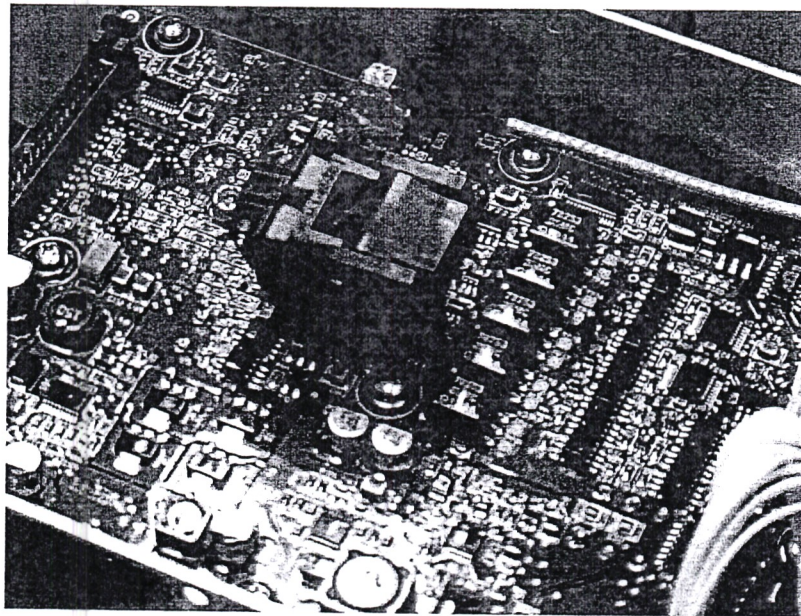


Figure 28: ZIF Socket Installed on PCB

Power was then applied to the fully assembled ISAT as per the standard procedure, however upon receipt of multiple 'Serial Flash Failed' debug messages the extraction was terminated.

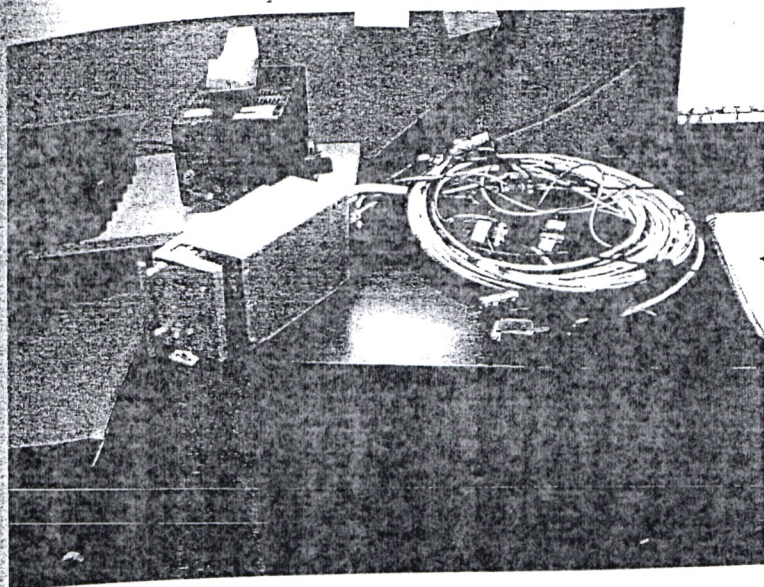


Figure 29: ISAT Log Recovery Setup

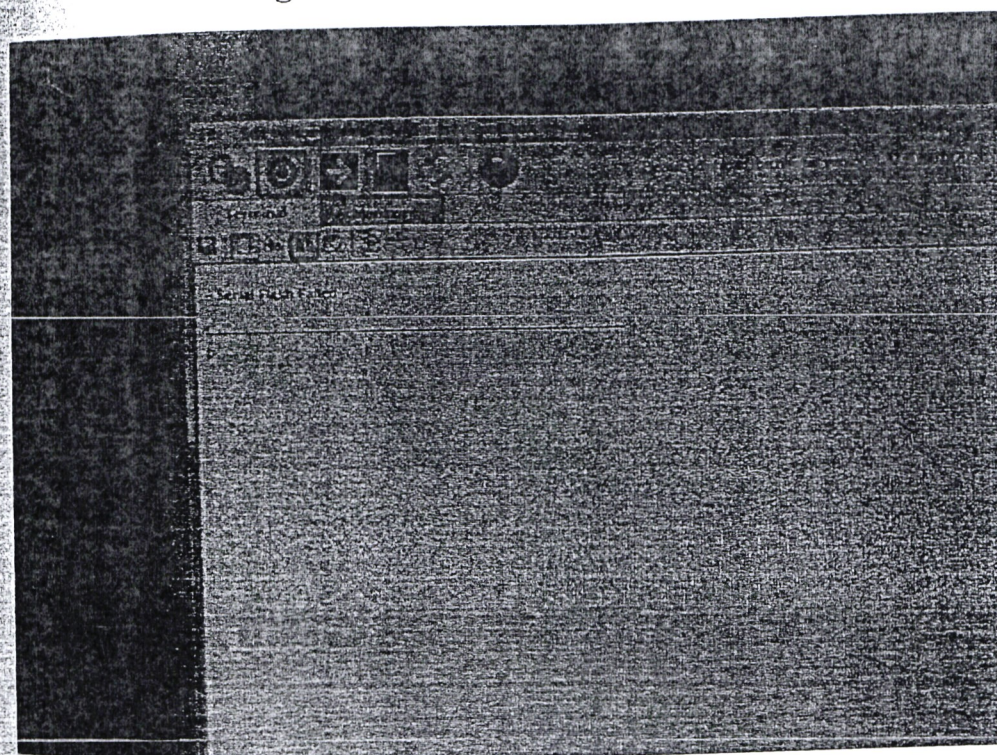


Figure 30: Debug Error Message

Results

Despite SkyTrac's best efforts, the internal log files were not recoverable from the on-board flash due to the extensive damage and overheating of the ISAT-200R at the time of the accident. The thermal conditions at the time of the

accident exceeded the survivability rating of the flash, rendering it non-functional.

VEMD and FADEC examination and analysis

The two components were recovered from the accident site and later sent to the French accident investigation branch, BEA for data readout and analysis.

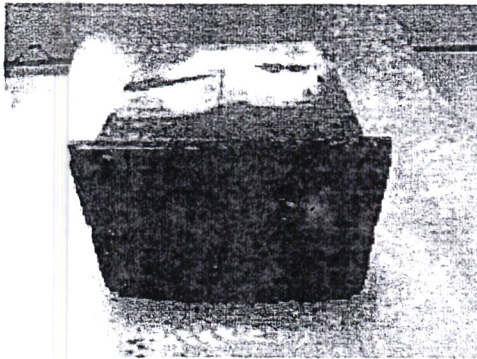


Figure 31: VEMD recovered from the site

The purpose of the readout was to establish the recorded “health” of the helicopter and engine systems prior to the crash. However no data could be retrieved or recovered from the VEMD or the FADEC.

According to an expert report obtained from BEA, the two memory components (AT28HC256 and PLCC32) were found damaged after opening the VEMD and unsoldering the electronic components from the mother board. To further examine the memory chips an X-ray was performed and it revealed some broken bond wires on one of the components. The connecting pins also were found to be in an open circuit condition.

The FADEC was burnt and its casing partially melted. BEA noted that the motherboards were completely burnt. All electronic components were unsoldered from the motherboard and severe damage was observed. The

evidence suggested that the components could have been exposed to temperature in excess of 600°C. At these temperatures all the electronic data stored by these devices are lost.

To fully test the functionality of each memory component, BEA stated that there was a possibility to perform some complementary electrical test on the internal die if they were extracted from the memory chips an exercise carried out by dedicated laboratories. BEA also noted from experience that electronic data are lost when components are exposed to severe temperature conditions similar to those of the subject VEMD.

3.2.15 Additional information

According to the Police Air Wing Training and Categorization Instructions, aircrew professional standards are set and maintained through the application of the categorization scheme. The scheme requires the air crew to undergo conversion and continuation training. It also states that all personnel in the air wing holding flying appointments be categorized in accordance with the test, examination and assessments prescribed there in. These categorization tests include: pilot ground exam, general flying, Instrument flying, Night flying and Transport Support and Tactical Flying Test. For continuation training the crew are to undergo Route Training and Monthly Training.

The training files of both pilots did not contain any evidence of the above mentioned training.

3.2.16

Useful or effective investigation techniques

Radar data was used to plot an overlay path on Google earth from the point where the helicopter seemed to depart from its normal straight and level flight commencing a sharp climb and a turn to the left and the subsequent abrupt manoeuvres until it disappeared from radar screen at 0842:07LT. The final two radar returns were at 0841:58LT and 0842:04LT with no altitude indication and were located in the vicinity of the accident site.

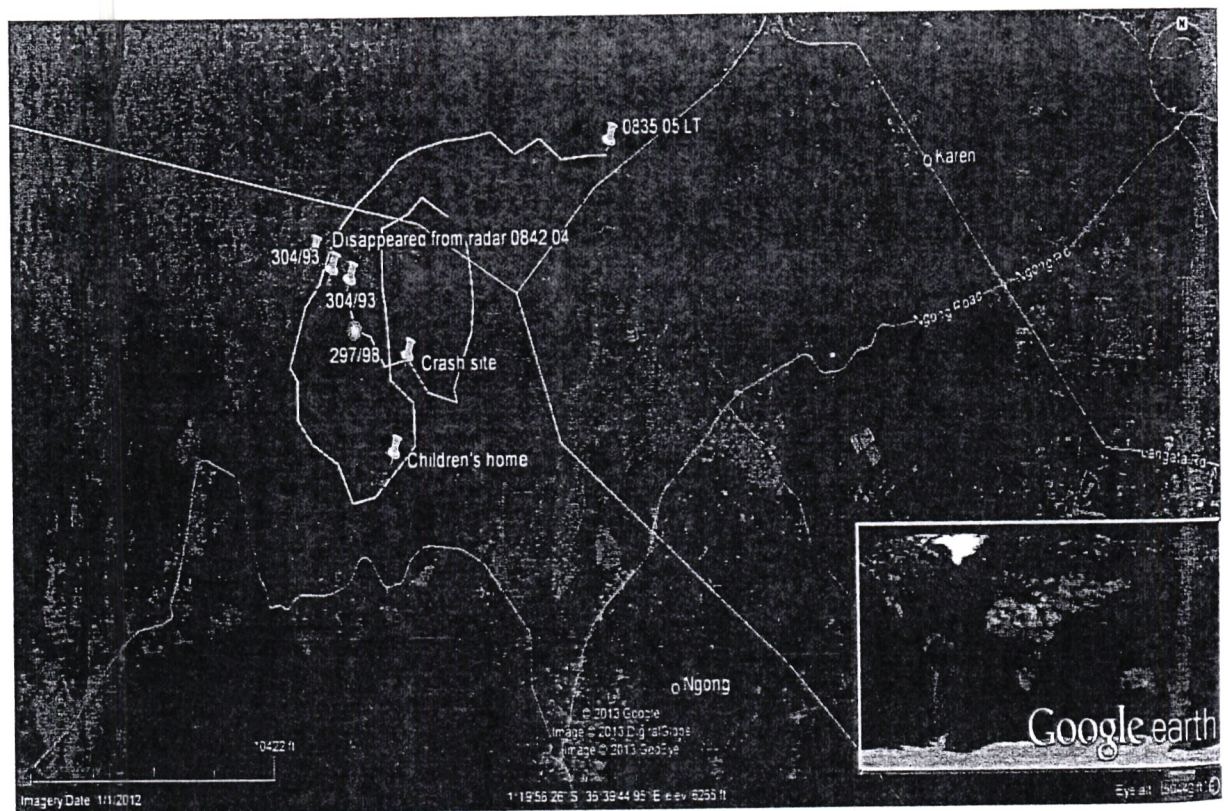


Figure 32: Falcon 230 radar track shortly before the accident

3.2.17 ANALYSIS

From the foregoing evidence and factual information gathered, some hypotheses have emerged which the Commission has analyzed as follows:

The Commission approximates that the accident occurred at about 0842LT.

3.2.18 Weight and Balance

As earlier noted the all-up-weight of the subject aircraft was 2261 kgs which included;

Basic aircraft weight	-	1356 Kgs
Fuel (540 lts)	-	425 Kgs
Passengers and crew	-	480 Kgs (estimated at 80kgs per person)
Total		<u>2261 Kgs</u>

MAUW	-	2250 Kgs
Overweight	-	11 Kgs

These calculations are further illustrated by the sample load sheet and CG chart below

3.2.19 Load sheet: AS350 B3

FUEL PLANNING	
RESERVE	48
TRIP	373
STARTS (@ 2 kg / start)	4
	425

JET-A1		
Kg	Arm	Moment
8	3.475	28
16	3.475	56
32	3.475	111
47	3.475	1 63
63	3.475	219
79	3.475	275
119	3.475	414
158	3.475	549
198	3.475	688
237	3.475	824
277	3.475	963
316	3.475	1098
419	3.475	1456

% Fuel	Liters	Mass (kg)
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HELICOPTER (A)	MASS (Kg)	ARM (m)	MOMENT
BASIC EMPTY WEIGHT (Inc. Oils)	1356	3.493	4736.5
FUEL (See calculation above)	425	3.475	1476.9
CREW (1 x pilot)	80	1.55	1241.5
BASIC OPERATING WEIGHT (A)	1861		6337.4
AVAILABLE PAYLOAD	111		0

PAYLOAD (B)	MASS (Kg)	ARM (m)	MOMENT
Co-pilot / Front Pax	80	1.55	1241.5
Rear Fwd. Facing Pax (RH)	80	2.54	2032

10	53	42
20	106	83
30	159	125
40	212	167
50	265	209
60	318	250
70	371	292
80	424	334
90	477	376
100	530	418

Rear Fwd. Facing Pax (Mid - RH)	80	254	203.2
Rear Fwd Facing Pax (Mid - LH)	80	254	203.2
Rear Fwd Facing Pax (LH)	80	254	203.2
LH Side Baggage Hold (Max 120 kg)	0	3.2	0
RH Side Baggage Hold (Max 100 kg)	0	3.2	0
Aft Baggage Hold (Max 80 kg)	0	4.6	0
Sling (15.6 kg)	0	13.02	0
Searchlight (19.226 kg)	0	4.888	0
LEO camera (139.2 kg)	0	157	0
Hoist (44.0 kg)	0	2.693	0

PAYLOAD (B)	400	936	
BASIC OPERATING WEIGHT (A)	1861	6537.4	
GROSS WEIGHT (A+B)	2261	7474	
C of G (Take Off)			
Calculated Fuel Burn off (C)	377	1847.5	1210.075
TOTAL (A+B-C)	1884		5964.125
C of G (Landing)		17	

Figure 33: Load Sheet

Note: The Gross Weight in red in figure 33.

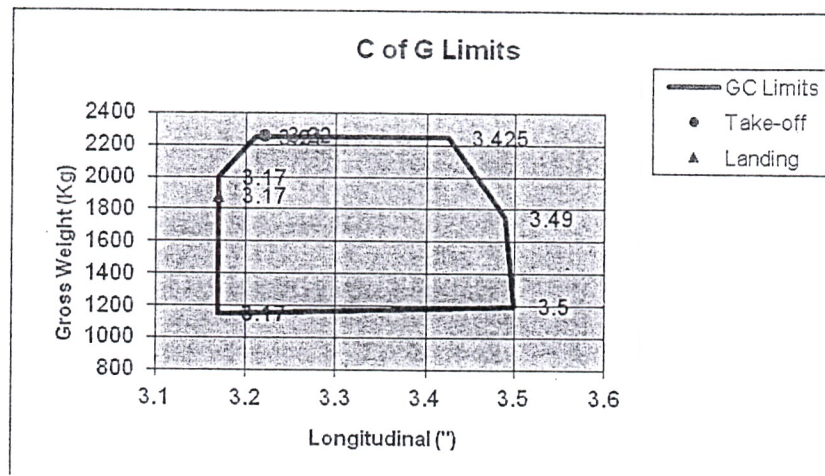


Figure 34: CG of the subject aircraft

The graph above indicates that the CG of the subject aircraft was at the edge of the flight envelope. Any abrupt manoeuvre therefore was placing the flight outside the safe margin of the flight envelope.

The above weight and centre of gravity calculation are based on the conservative estimates provided to the Commission by the KPAW.

The aircraft was most likely heavier during the subject flight since one of the pilots weighed 97kg and the four passengers were certainly more than 80kg each. This would have presented difficulties in manoeuvring the subject aircraft safely during the flight.

In-flight fire causing hydraulic failure

There were four persons who came forward to give eye-witness evidence and all of them were in the vicinity of the crash site. One witness (CW37) who saw the helicopter head towards Ngong Hills claimed to have seen the helicopter shortly

afterwards heading north and this time he saw a trailing flame. The other two (CW36 and CW38) who were at the Napenda Kuishi Children's Home, within a kilometre of the first witness CW37 did not notice any flame or smoke. Of the four, one witness heard but did not see the aircraft, however the three witnesses saw the helicopter prior to the crash flying low, a little while later there was silence followed by a huge fire and smoke.

An inspection of the tail boom at the site did not reveal the classic sign of trailing smoke and soot streaks, so the account of the one witness was not corroborated and was therefore discounted as the classic eye witness syndrome often encountered in air accidents.

CW54 concluded from his evaluation that the bracket on which the hydraulic pump is mounted was burnt by a directed (torch-like) flame which started due to the leakage of hydraulic fluid as a high pressure jet. He states that this occurred during flight consuming the bracket together with the mounted pump.

This theory founded on the study of fire-damaged parts, did not appreciate the fierce ground fire after the crash which consumed several parts that were in close proximity to the fire. The witness did not visit the crash site and therefore did not consider the effect of the post-crash ground fire dynamics;

The witness could not identify the source of ignition. This fire is said to have ignited in the main gear box area, which is not a hot area and is not considered a fire prone area by the manufacturer and as further explained by CW 64.

The fluid pressure which he stated to be approximately 500 psi is a relatively low hydraulic pressure compared to conventional hydraulic systems; typically at

3000 psi which are not known to cause spontaneous ignition during hydraulic leaks.

Further examination of the wreckage did not reveal remnants of molten aluminium alloy on the pan beneath the main gear box as would have occurred if the hydraulic pump and bracket had indeed been consumed by the said in-flight fire. Neither were any smoke and soot streaks observed in the openings of the cowlings covering the gear box area.

CW 54 proceeded to postulate that the resulting hydraulic failure made flight controls unmanageable thus causing the helicopter to crash.

It was explained by CW 64, an experienced helicopter engineer that the hydraulic system incorporates accumulators which would give residual hydraulic pressure in the event of system failure, to allow flight crew to execute a safe landing. Further, the helicopter is designed to fly without hydraulics, albeit with extra effort. This is a standard exercise during training and qualification of crew (CW 6 and CW 31) and is also accomplished during each annual test flight (CW 54).

Hydraulic failure alone need not be a life threatening event; in this particular instance there were plenty of places to land. The fact that the crew did not send any distress signal or communication of any emergency, and neither was there any evidence of the helicopter slowing down to land, is reasonable cause to discount this possibility.

3.2.20 Controlled flight into terrain (CFIT)

The investigators considered this as a possibility during their investigation. Whenever an aircraft crashes into terrain in reduced visibility or at night, one of the possibilities considered is a situation in which the crew would be flying oblivious of the approaching terrain.

The flight pattern of Falcon 230 as indicated by the radar track and skytrac data reveals erratic flight manoeuvres in the final three minutes.

In a typical CFIT accident the aircraft is always in a controlled flight with crew totally oblivious of the impending danger.

The possibility of CFIT can therefore be discounted due to the apparent erratic flight and the final sideways crash.

3.2.21 Carbon monoxide poisoning

The post mortem forensic pathology and associated toxicological investigation indicated that one or more of the helicopter occupants had exhibited carbon monoxide poisoning. The cause of death for all the deceased was attributed to multiple injuries caused by severe trauma and fire. These injuries were analyzed by various expert pathologists as being incompatible with life.

Three samples were tested by the Government Chemist CW 32. In one of them, from the co-pilot carbon monoxide poisoning of 68.6% was detected while the other two returned negative indication.

These puzzling results were however not presented to the Police Pathologist for his final official report and determination of cause of death.

The toxicology results meant that the pilot who had 68.6% carbon monoxide contamination had exceeded the lethal dose considered to be 30% - 50% and hence had for all purposes been dead from the gas inhalation.

Two of the Government Pathologists (CW 51 and CW 52) who were present during the autopsy of the six bodies brought new evidence after the official report that all the bodies had a "cherry pink" discolouration.

As per the well-known forensic expert Dr. Bernard Knight 's book on Forensic Pathology" At autopsy the most striking appearance of the body is the colour of the skin especially in areas of the post mortem hypothesis. The classical cherry pink colour of caboxyhaemoglobin is usually evident if the saturation of the blood exceeds about 30 percent"

Both of them further testified that the "cherry pink" discolouration was evident from the available post mortem photographs (*Com. Exh. 41B....*).

The official report of Government Pathologist (CW 39) however did not refer to the "cherry pink" discolouration on the bodies.

It is also worth noting that the Pathologist had prepared his final report without considering the toxicology reports from the Government Chemist since it was not delivered to them.

CW 62, a Consultant Pathologist for the late Minister's family testified that he could see the "cherry pink" discolouration on all the bodies, from the photographs of the post mortem shown to him. He gave a contrasting picture of

how the post mortems are conducted in Kenya by explaining the typical facilities and processes available for Forensic Pathology in South Africa.

A Nairobi University Senior Lecturer in Forensic Pathology CW 66 testified that she did not appreciate the "cherry pink" discolouration in any of the bodies from the post mortem photographs. She further asserted that the "cherry pink" discolouration would be ideally observed from photographs of muscle dissection, which were not produced. The expert also cast doubt on the toxicology report which produced starkly contrasting results between the tested persons. She gave an opinion that the laboratory result should have been subjected to some control process to ascertain quality and authenticity.

A Forensic Pathologist also a Senior Lecturer at Wales Institute of Forensic Medicine at Cardiff University also studied the post mortem reports and photographs and he too, did not identify the "cherry pink" discolouration. He proceeded to state that this discoloration manifests in cases of refrigerated remains. He further opined that several of the bodies exhibited fracture patterns on skulls and charred limb bones associated with heat. He also indicated that he could not conclusively give an opinion on the post-mortem results due to the scanty information given to him.

There was an argument advanced that since the injuries were so severe and were likely to have resulted in instant death, the carbon monoxide and soot must have been inhaled prior to the crash. The alternate argument was that the deceased inhaled the noxious gases from the post-crash ground fire.

If the carbon monoxide was inhaled during flight the possible source would have been from an in-flight cabin fire. If this was the case, a cabin fire would have emitted smoke which would have prompted the occupants to open the

sliding doors, the pilots to communicate the emergency situation over the radio and attempt to land immediately. There was no evidence of any of these happening.

Cabin heating and de-misting air is tapped from the engine's centrifugal compressor and this hot compressed air is piped through a fire-proof hose to beneath the cabin where it is mixed with air from a special ambient air scoop and therefore the possibility of contamination is made rather remote by this design.

The possibility of occupants breathing in the noxious smoke in the post-crash ground fire was not all together discounted as CW 66 said this could happen during the brief "agonal breath" or last gasps for air prior to death. In a paper "*Injury Prevention in Aircraft Crashes: Investigative Techniques and Applications*", presented at Farnborough, UK, 24-25 November 1997 on Aviation Pathology by Dr. Cogswell also refers to this as "*agonal respiratory excursion*".

While the injuries were considered incompatible with life, there was also a possibility that some of the brain or major organ ruptures observed during autopsy investigation could have been as a result of the severe heat of the ground fire. The Journal on Aviation Pathology cautions that some of the fractures observed may be as a result of heat (thermal fractures) rather than mechanical force. In determining the cause of death, the mechanism of injuries should be carefully analyzed and documented so as to add value to the human factors aspect of the entire investigation. The pathology report did not address this issue of mechanism of injuries so as to differentiate between thermal and mechanical injuries. This was necessary to conclusively arrive at the cause of death.

In analysing all the foregoing facts and arguments it must finally be stated that if in the remote chance there was an in-flight fire emitting smoke, all occupants of the confined helicopter cabin would have been exposed to the same noxious gasses; a fact that is not conclusive, given the inadequate investigation results recorded by the forensic investigators.

If the extent of carbon monoxide poisoning reported on the co-pilot is to be believed to have occurred in flight, we yet have to find an explanation why two or three minutes prior to the crash, he is the one who sent a coherent if not accurate report of the flight as “*tower falcon two three zero will be checking zone out in the next one minute*” followed by acknowledging the Air Traffic Controller’s direction to report to a different radio station frequency (Area Control Centre) by responding, “*one one eight decimal five*” and finally signing out by saying “*good day*”. Hardly an indication of one overwhelmed by the effects of a ‘death gas’.

There is also evidence of the post mortem report, which shows that the body of the same pilot sustained injuries of both wrist and ankle joints, typical of crew members with hands and feet on the controls during a crash (CW 66). This is an instinctive reflex action of any pilot faced with an imminent danger.

This would be unlikely if one was under the level of reported carbon monoxide poisoning.

On the basis of the above, the Commission therefore discounts the possibility of carbon monoxide poisoning during flight.

Inhalation of carbon monoxide in the post impact fire.

Available literature, FAA, Office of Aviation Medicine, DOT/FAA/AM-00/9, February 2000, shows that most carbon monoxide poisoning found in victims

happens in post impact fires. Such post impact accidents usually happen out in the open. The argument has been made that carbon monoxide poisoning happens where fire occurs in a confined space. However, all the victims of this accident were thrown outside the cabin and were in open space. In many instances where there is post impact fire the aircraft will have broken up as was the case in the subject aircraft. Nevertheless the wreckage may have pockets of confined areas. Carbon monoxide poisoning would likely occur in such confined spaces.

After the analysis of evidence and submissions received from all the parties it became evident that contrary views came to the fore with regards to the issue of carbon monoxide. This issue became more complex by deficiency in the post mortem process. Noting that this Inquiry is an inquisitorial process rather than an adversarial one, and in order to dispel grey areas in the circumstances surrounding this inconclusive but vital aspect of the evidence, the Commission deemed it fit to exercise its power under Section 10 of Cap 102 and TOR (e); thus obtained and reviewed a raw video footage that was in the public domain and had been aired by most of the media houses.

The raw video confirmed the images of the co-pilots photographs under the crew seat. The video shows a raging fire at the scene of the accident with people milling around possibly trying to identify occupants of the helicopter who may have needed assistance. The Commission observed from the video that the upper trunk and head of the co-pilot was partially covered under the smouldering crew seat with smoke billowing from the burning seat material. It is the opinion of the Commission that this space under the seat of the smouldering crew seat was a confined space. The video also shows that a Samaritan was throwing soil on his body in an attempt to douse the fire

The fuselage and other post impact injuries sustained by the co-pilot were reported as incompatible with life in the post-mortem. However, this does not rule out that the co-pilot may still have been alive and breathing for a short while after the impact, albeit "agonal breaths" as testified by CW 66. The Post-mortem could not ascertain the exact time of death, and thus the possibility of the pilot being alive during the post impact fire cannot be ruled out. Similarly the duration of his survival after the impact cannot be conclusively ascertained. The contradictory evidence and diverse theories presented before the Commission made it difficult to determine the validity or otherwise of the 68.6% carbon monoxide poisoning.

To this end, the most probable explanation of this carbon monoxide poisoning could be the inhalation of the gas from the smouldering seat covering his head during the post impact fire, unless further tests show otherwise.

3.2.22 Adverse weather and spatial disorientation

Weather Analysis

The Commission received testimony with regard to weather and its effect on flight operations from CW 59, an aviator of long experience who has worked as an Airline captain, General Aviation pilot, Aircraft type rating instructor and examiner, Instrument Rating instructor and examiner. Further evidence on this matter was received from CW 31 a helicopter pilot of long standing in both military and civil flying. These witnesses provided information from a practical perspective and from personal flying encounters with weather. The testimony of the witnesses led the Commission to look carefully and conscientiously into the possible consequences of the prevailing weather to the subject flight.

CW 57 had produced weather reports for Wilson Airport and Ngong Weather Station of 10th June 2012 at the prevailing period. In explanation he stated that visibility is estimated by an observer on the ground which may differ with visibility experienced at altitude. The evidence before the Commission indicated that the temperature/dew point readings at Ngong were 13/13 and 14/14 at 08.00 LT and 09.00 LT respectively. This is a condition conducive to the formation of fog, a situation that was corroborated by the eye witnesses.

Weather is a critical element in aviation. Aircraft fly above the ground at levels where various elements of weather are present; cloud, rain, mist, fog, wind, turbulence and thunderstorms. All these weather elements singly or in combination are hazards with inherent threats that increase the operational complexity of flight and pose a safety risk to flight at some level. Such threats and risks require to be managed through prudent planning, airmanship and compliance with regulations.

It is not within the scope of this Inquiry to go into the various weather elements and the risks they pose to aviation. Suffice it to say that various types of weather can and do affect flight operations in ways that can result in an aircraft being in an undesired state. That is to say that the aircraft is not in the configuration, orientation or position it ought to be in for that phase of flight. Put in another way the aircraft is flying outside the safe flight envelope. Of particular interest to this inquiry are the weather elements in the vicinity of the accident area, the resulting visibility and the possible impact on the flight.

Aircraft in flight are affected by weather in various ways, such as turbulence which can range from light to very severe. Thunderstorm activity can lead to such phenomena as wind shear and micro bursts which can suddenly alter the

flight path of an aircraft through un-commanded deviations in speed, altitude and attitude.

Reduced visibility due to significant weather elements such as low cloud, rain or fog presents a challenge to safe flight in all phases of flight. When visibility is reduced or lost, a pilot is no longer able to maintain situational awareness by external visual cues. This is an integral part of human limitations.

Significant Weather near or in the flight path of an aircraft is therefore almost always a potential hazard that poses a risk to safe flight and must be carefully evaluated before and during flight.

In order to manoeuvre and orientate an aircraft properly in space and to navigate accurately, a pilot requires either visual reference of the natural horizon or an artificial horizon presented by flight instruments in the cockpit or a combination of both. In some weather conditions when visibility is reduced or in a dark moonless night the natural horizon is not visible. A pilot flying in this environment has to rely purely on flight instruments to keep the aircraft properly orientated in space and to navigate accurately as desired. This requires both knowledge and skill that must be gained through rigorous training and confirmed through regular proficiency checks.

Civil Aviation Regulations have prescribed rules for flights intended to be flown by visual reference and rules for flights that must be flown with reference to instruments. The Rules are dependent on the prevailing meteorological conditions. The Regulations have defined these weather conditions into two broad categories with corresponding flight rules that pilots must adhere to when they intend to operate within those meteorological conditions. These categories are Visual Meteorological Conditions (VMC) in which a pilot is authorised to

use Visual Flight Rules (VFR) and Instrument Meteorological Conditions where it is mandatory for a pilot to operate under Instrument Flight Rules (IFR). In VMC weather conditions, a pilot is allowed by regulations and should be able to manoeuvre an aircraft safely by visual references only. In IMC conditions the visual cues necessary for safe flight are not available and Visual Flight Rules are not authorized. A pilot wishing to operate in these conditions must do so in accordance with Instrument Flight Rules.

In order to fly in IMC conditions under Instrument Flight Rules, a pilot is required to be licensed and to be Instrument Rated. This entails undertaking extra training to obtain an Instrument Rating, commonly known as I/R. The rating qualifies the holder to fly solely by reference to instruments when visual cues are not available or are lost in flight. This therefore means that a pilot who does not hold an instrument rating should not operate in IMC. Likewise, even though a pilot is instrument rated he cannot fly an aircraft in IMC if that aircraft is not certified for flight in IMC.

An aircraft to be flown in IMC in accordance with Instrument Flight Rules must be certified for Instrument Flying by meeting specific requirements with regard to flight and navigation instruments and any other conditions that regulations may impose on specific types of aircraft. Thus, both the aircraft and the pilot are required by regulations to be certified in order to operate in accordance with Instrument Flight Rules. In short, in order to operate a flight in IMC, a pilot must adhere to Instrument Flight Rules, be a holder of a current instrument rating and the aircraft must be certified for IFR flights. A Flight Plan is then filed with Air Traffic Control specifying the flight rules nominated by the pilot. It will be noted that a pilot who is not Instrument rated such as the crew of the subject aircraft has no choice but to fly in accordance with Visual Flight Rules.

If the conditions do not allow for VFR, then delaying the flight might be the only option until conditions improve to allow VFR flight.

However there are cases where a VFR flight with a VFR only pilot commences a journey in VMC but weather subsequently changes and deteriorates. In this scenario the pilot is required to manoeuvre the aircraft so as to maintain VMC which might include diversion to an alternate airport or in case of a helicopter carry out a pre-cautionary landing in a suitable ground en route. Accident statistics, however, reveal many cases of VFR flights inadvertently entering into IMC. When this happens the pilot is faced with imminent risks. The principal risk is loss of situational awareness. This means inability to interpret the attitude and position of the aircraft in relation to the surrounding environment and where the aircraft will be in the next short while.

The Directorate of Civil Aviation (the predecessor to Kenya Civil Aviation Authority) Aeronautical Information Circulars (AIC) No 11/1968, No. 18/79 (Accident Prevention No. 7), 33/79 (Accident Prevention No. 14) and AIC 3/84 (Accident Prevention No. 34) address hazards of disorientation in aviation caused by loss of visual reference. AIC 33/79 states, "*Surface references and the natural horizon may at times become obscured although visibility may be above Visual Flight Rules minimums, lack of natural horizon or surface reference is common on over water flights, at night, and especially at night in extremely sparsely populated areas, or in low visibility conditions. A sloping cloud formation, an obscured horizon....can provide inaccurate visual information for aligning the aircraft correctly with the actual horizon. The disoriented pilot may place the aircraft in a dangerous attitude.*"

The Circular goes on to recommend;

"You, the pilot, should understand the elements contributing to spatial disorientation so as to prevent loss of aircraft control if these conditions are inadvertently encountered.

-Before you fly with less than 3 miles (5km) visibility, obtain training and maintain proficiency in aircraft control by reference to instruments.

-Check weather forecasts before departure en route, and at destination. Be alert for weather deterioration.

-Do not attempt visual flight rules when there is a possibility of getting trapped in deteriorating weather.

-Rely on instrument indications unless the natural horizon or surface reference is clearly visible"

It is for these reasons among others that Pilots are trained to read, interpret and understand weather reports and forecasts so that they are able to plan and operate their flights in such a way as to mitigate the adverse effects of weather. An important part of the pilot's pre-flight planning involves a study of weather reports and forecasts for the destination, alternate airports, and the routes he intends to operate into or through. Once a careful evaluation of the weather has been done the pilot plans his flight and nominates the route to take.

Accident sequence

The subject aircraft appeared on Nairobi Approach Radar, a minute after take-off on a radar squawk 2053. The radar data recorded at intervals of 5 seconds includes altitude from the Transponder returns, track, ground speed and the aircraft position. Using this data a radar track was plotted which indicates a flight in a generally westerly direction with slight changes of heading and

altitude until reaching the Nairobi Control Zone boundary in the Ngong area. The aircraft sharply turns to the left to a southerly heading then continues the left turn to head back north again. It continues on a left turn and then right turn and crashes heading 175°. Most of these turns were done in very steep bank angles with erratic changes in altitude. The ground speed recorded during these erratic manoeuvres was between 74 kts and 137 kts. The sound from a helicopter in such erratic manoeuvres would be varying cyclically due to the rapidly changing pitch of the rotor blades which would explain the eye witness account of unusual helicopter sound as it flew over Ngong area prior to the crash.

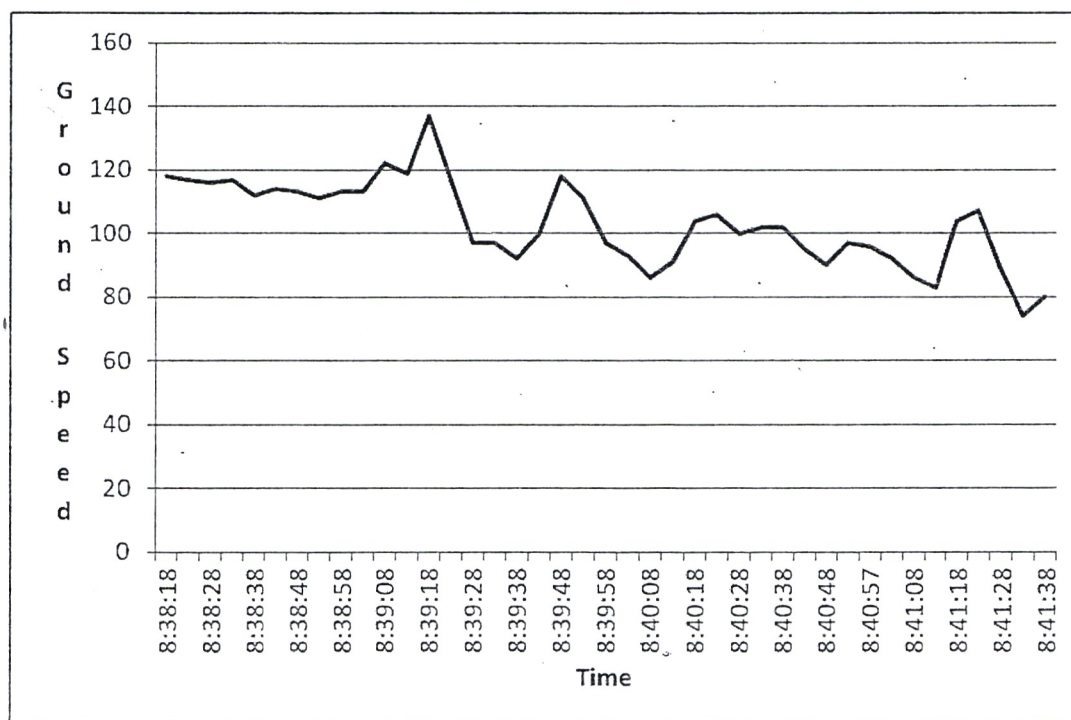


Figure 35: Erratic ground speed for the final sector of the flight

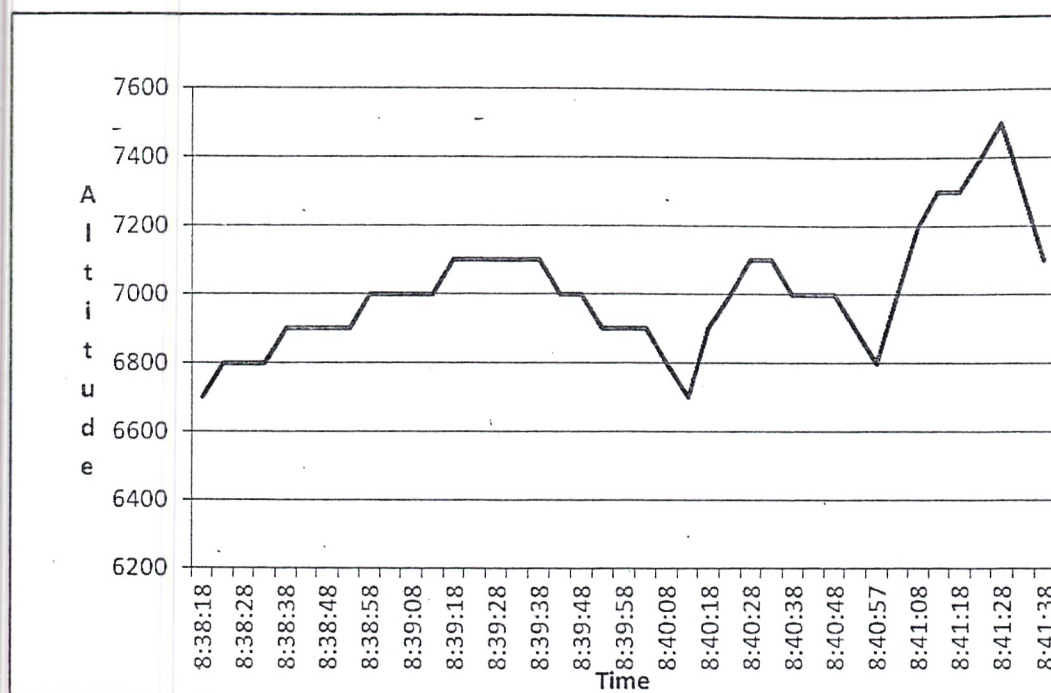


Figure 36: Altitude variance final sector of the flight

The helicopter was also fitted with the Skytrac flight following system that uses satellite based navigation for flight tracking. Skytrac system data corroborated the radar data in the reconstruction of the flight path.

The on-site investigation revealed that the final trajectory of the flight before impact indicated a flight path angle of approximately 40° to the horizontal as shown by figure 37.

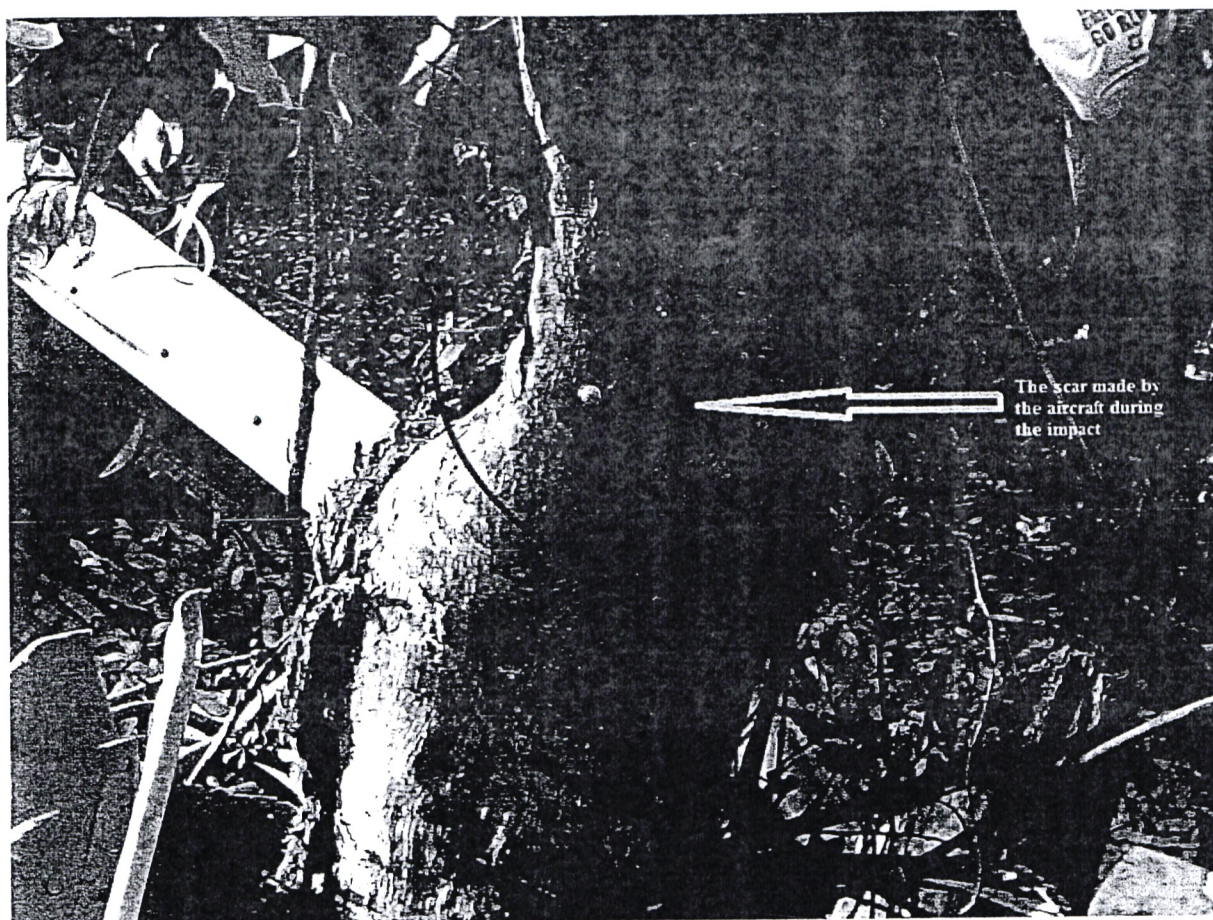


Figure 37: Estimate of the Final trajectory before Impact

The tail boom protection skid slid cleanly into a one meter vertical tree stump with the left side of the aircraft resting on the ground. For this skid to slide in this manner the aircraft would have to be in a left bank of approximately 75 to 90 degrees. This is well beyond the normal flight envelope. The tree stump would have arrested some of the momentum of the helicopter as the tail boom sheared off. In spite of this, the helicopter impacted the ground with significant force that created a crater approximately half a meter deep. The helicopter totally disintegrated and pieces of wreckage were scattered over an area approximately 43m by 18 m. One of the main rotor blades was flung over 40m away. The embedded cockpit centre post and lower wire cutter indicate a significant nose down attitude.

The evidence from the wreckage site therefore indicates an aircraft at high speed, extremely steep left bank and nose down at impact. This is not a normal attitude for flight, hover or a landing manoeuvre. And this evidence when considered together with the erratic manoeuvres a few minutes before the crash reveal the classic signature of an aircraft out of control at impact due to control inputs of spatially disoriented pilot.

The Commission observed that the flight took off at high gross weight and prior to the crash was flying in conditions of significant density altitudes and with erratic manoeuvres apparent in the last phase of flight. These are typical conditions of servo transparency which may have contributed to the control difficulties that led to loss of control.

Testimony from CW 36 indicated that the helicopter went silent before the 'sound of the crash.' The Commission notes that the sound from a helicopter is mostly from the rotating main rotor blades. At the point of impact the rotor blades were suddenly stopped and the sound 'cut off.' This was followed by the exploding conflagration. The sound from the explosion is what the witness must have heard and perceived to be the sound of the crash. The crash sound in such wooded area would be muffled, but it occurred at the time the rotor noise stopped.

3.2.23 VIP transport and Crew complement

The Commandant (CW 49) testified that he receives the approval of Government officials travelling as passengers from the office of the Police Commissioner stating their number and destination. The Commandant would then, based on the mission decide on the aircraft and crew to undertake the assignment. There was no evidence of a laid down policy which would include mission analysis, risk management and the following guidelines:

- (i). The requirements for classification of Government officials and other passengers to be flown by crew of a certain qualification and experience.
- (ii). Consideration of seniority / rank while determining crew composition.
- (iii). The type of aircraft required for various missions.
- (iv). The limitation of combination of VIPs to be transported in one aircraft.

3.3 CONCLUSION

3.3.1 Findings

The following findings emanating from factual information, evidence received and the subsequent analyses will lead us to the most probable cause of accident:

- 1) The helicopter was certified as airworthy notwithstanding the fact that it had an irregularly installed prototype VEMD which rendered the C of A invalid.
- 2) The release of the subject aircraft to service following the EDR failure was irregular, as it was not entered as a deferred defect
- 3) The subject aircraft was not certified for IFR flight.
- 4) Both pilots were licensed to operate the subject helicopter but did not have Instrument Rating and thus did not have requisite skills to fly in IMC conditions.
- 5) KPAW did not apply due diligence on important aspects of continuing airworthiness such as qualified maintenance personnel, maintenance data and maintenance arrangement.
- 6) The subject aircraft was overweight by at least 11kgs based on conservative weight figures of 80 kgs per passenger used in the load sheet by the KPAW.
- 7) The centre of gravity for take-off was at the edge of the CG safe limit.

- 8) The official weather reported at Wilson Airport between 0800LT and 0900LT indicated VFR conditions.
- 9) The cloud base to the west of Wilson Airport (Ngong area) was much lower. Ground elevation rises as you go west from Nairobi Wilson.
- 10) A comparison of the Wilson Airport weather report and the Ngong station weather report at 0800LT indicated that visibility was reducing to the west, cloud base was lower, and the relative humidity was rising to 100%.
- 11) The sky over Ngong area and the natural horizon were obscured by two layers of cloud.
- 12) The Karen webcam indicated a visibility of less than 2 km. This would be an indication that the visibility was rapidly reducing as one moved to the west from Wilson Airport.
- 13) Eye witnesses agreed that the subject aircraft was flying very low and in very poor visibility over the Ngong area.
- 14) According to the recorded radar readings the subject aircraft did not slow down to the recommended speed for emergency or hazardous situation.
- 15) The subject aircraft never slowed down to the recommended speed for emergency or hazardous situation.
- 16) As the flight approached the Nairobi Zone Boundary it went into erratic manoeuvres prior to the crash.
- 17) Despite the aforementioned in (13), (14), (15) and (16) above the flight did not report any emergency situation prior to the accident.
- 18) The subject aircraft was in IMC characterised by fog, drizzle, low cloud and mist resulting in poor visibility prior to the crash and was out of control at impact.
- 19) The helicopter finally crashed in a forest apparently out of control and was immediately engulfed in a fierce ground fire.

- 20) All occupants were fatally injured by the trauma and accompanying ground fire.
- 21) The evidence of carbon monoxide has presented several difficulties in terms of varying contamination levels and the possible source, which was compounded by the shoddy pathological and toxicological investigation reports.
- 22) Inability of CW 54 to identify the source of ignition in respect of his propounded theory of in-flight fire was found to be unsustainable,

3.3.2 Cause of accident

This has been a rather complex and intricate investigation into this tragic accident. The Commission has sincerely and faithfully considered all evidence, documents, reports and submissions presented before it. The task of analysing evidence, technical and legal aspects of the inquiry and arriving at conclusions was executed with due integrity, openness and fairness and accordingly we have arrived at the following conclusion:

The probable cause of the accident was loss of aircraft control due to loss of situational awareness, attributable to continuation of flight into Instrument Meteorological Conditions for which the crew were not qualified. This resulted in crew disorientation. The loss of control was made worse by high gross weight conditions and the centre of gravity being at the edge of the safe limit.

The Commission is of the considered view that the following factors may have contributed to this accident:

- (i). The absence of requisite experience for flight in IMC conditions;
- (ii). Servo transparency.

- (iii). Poor safety culture of the KPAW, fortified by serious shortcomings in maintenance processes and lack of effective safety oversight by KCAA.
- (iv). Lack of effective dispatch system within KPAW.
- (v). With the flight delayed, the crew might have been under subtle pressure to depart so that their VIP passengers are not late for the function in Ndhiwa.

3.4 SAFETY RECOMMENDATIONS

The implementation of the following recommendations will help reduce the possibility of similar accidents:

- 1) Amend the Civil Aviation Act to enable the safety oversight of state aircraft as detailed in Chapter 5.
- 2) KPAW should be modernized and transformed to enable it perform its mandate with the required high safety standards. Refer to Chapter 4 and the report by Committee of Aviation Experts on KPAW for detailed proposal.
- 3) KPAW should adopt a safety management system in all its processes.
- 4) KPAW should install a Lightweight Data Recorder (LDR) on their fleet of aircraft which will enable proactive management of operational trends and safety threats. The LDR will also be a useful tool in incident investigation.
- 5) KPAW should take its responsibility for continuing airworthiness seriously whether it develops its own maintenance capability or contracts it to other entities.
- 6) If KPAW should continue to provide transport to Government Institutions it must comply with the regulations for the issue of Air Operator Certificate.

- 7) All KPAW pilots carrying passengers should have a CPL with IR, additionally should undergo 'aircraft upsets and unusual attitudes' training.

CHAPTER FOUR

4.1 OVERVIEW

This Chapter deals with the Term of Reference (e) which required the Commission to look into any other matter relating or consequential to the accident of Aircraft Helicopter Eurocopter Registration 5Y-CDT type AS 350 B3e, in order to come up with recommendations to prevent similar occurrences.

In the course of the inquiry which involved technical investigations, public hearings as well as receiving reports from experts and stakeholders, the Commission came across various scenarios and gathered information as follows:

4.2 TRAINING AND QUALIFICATION

4.2.1 Pilot Training

Training of flight crew is the one aspect of aviation that is given priority despite its expensive nature. We find that (Personnel Licensing) Regulations extensively lay out the requirements for training and guidelines for syllabi, whilst (AOC and Administration) Regulations call for specific requirements for training programmes by all operating entities. The regulations particularly emphasize the requirements for continuous or recurrent training during the practising life of each pilot, considering that this is a skill based profession that requires constant practice to keep it honed.

CW 59 took the Commission through the training requirements at the various levels of pilot qualifications like Private Pilot License, Commercial Pilot

License, Airline Transport Pilot License including Instrument Rating. He particularly underscored the need for instrument flying training which is vital for operations in instruments meteorological conditions (IMC) which includes low visibility.

4.2.2 Qualification

The need for flight crew to have proven qualifications is not lost on all including operators, regulators as well as passengers. Again (Personnel Licensing) Regulations are very clear on requirements for qualifications, while (Operation of Aircraft) Regulations are very elaborate on flight crew requirements. While the onerous task of maintaining the required qualifications is placed on the individual pilot, the responsibility of operating with qualified crew complement is however squarely at the door of the operator.

Various witnesses gave evidence on how KCAA tests and licenses pilots at different levels (CW 16, CW 17) and external examiners (CW 6 and CW 31). KCAA the licensing authority grants Instructor's Ratings in accordance with (Personnel Licensing) Regulation 70, and also uses external examiners appointed from within the industry to test and recommend candidates for the issue of the various categories of licenses and ratings. The requirements for appointment of flight examiners are provided for in (Personnel Licensing) Regulation 80.

4.2.3 Analysis of evidence

The following deficiencies were observed in the entire training and qualification system as currently practised in the industry:

- (i). Examiners do not have comprehensive standards published by KCAA for assessing candidates leaving it at the discretion of examiners, which may breed subjectivity (CW 6).
- (ii). There is an obvious shortage of instructors/examiners from evidence of CW 6. KCAA is then compelled to resort to ad hoc appointments which may lead to the use of unqualified personnel like the case of CW 6.
- (iii). This shortage further has an adverse effect on the industry as it leads to delays in qualifying pilots.
- (iv). There is lack of objective assessment criteria for the aviation professionals as deduced from the evidence of CW 6.
- (v). There is no quality system of the examination process which would narrow down the exercise of indiscriminate discretion by examiners.
- (vi). The fact that the syllabus is part of the Regulations means that it cannot be amended as and when the need arises.

4.2.4 Recommendations

- 1) KCAA should have in house qualified examiners, one of whom should be the Chief Examiner.
- 2) KCAA should appoint an adequate number of instructors/examiners commensurate with the Industry needs.
- 3) KCAA should develop and publish standards and procedures for the appointment of examiners.
- 4) Assessment criteria should be published and regularly reviewed in Examiners Standardization Meetings convened by KCAA.
- 5) KCAA should set up a quality system with an internal audit process for all examinations.

- 6) The Government Department responsible for aviation matters should amend the regulations to remove the syllabi and include them in separate KCAA publications which can be easily reviewed.
- 7) KCAA should develop and publish an Examiners Manual.

4.3 KENYA POLICE AIR WING

4.3.1 Institutional Structure

The KPAW is a formation of the Police Service whose mandate is to provide air transport operations facilitating Police activities such as security surveillance, traffic or crowd control, crime prevention, anti-stock theft, as well as the transportation of Police Officers and Government officials including VIPs to remote parts of the country (Refer to Force Standing Orders)

At the time of the Commission hearings the KPAW was under the Commandant, a Senior Assistant Commissioner of Police, who is in charge of the operation of a fleet of aircraft and was directly responsible to the Commissioner of Police. The majority of the employees under the Commandant at the Air Wing are professional pilots, licensed engineers, technicians and operations officers.

The KPAW owns seven (7) aeroplanes and eight (8) helicopters including the subject aircraft, out of which two (2) aeroplanes and four (4) helicopters were serviceable at the time of the Inquiry.

4.3.2 Safety oversight

The management and personnel of the KPAW recognize that the Police aircraft are state aircraft and therefore assume that they are exempt from the provisions

of the Civil Aviation Act, therefore not under the oversight of Kenya Civil Aviation Authority. The Commandant (CW 49) however stated that the KPAW chooses to comply with some Regulations as and when deemed necessary for the purposes of standards. Contrary to this, the Deputy Commandant (CW 19) during cross examination was very categorical that the KPAW was subject to the Regulations.

The Force Standing Orders stipulate in Chapter 11, clause 7 that the Police aircraft are to be operated in accordance with the Air Navigation Regulations, which are currently the Civil Aviation Regulations 2007.

In practice the Police aircraft are registered in the Kenya Civil Register in accordance with the Civil Aviation (Registration of Aircraft) Regulations 2007; its technical personnel, both pilots and engineers are licensed in accordance with the Civil Aviation (Personnel Licensing) Regulations 2007; it was indicated in the report by Committee of Aviation Experts, on Police Air Wing (*Com. Exh 60 D*) that the KPAW has applied for maintenance approval in accordance with the Civil Aviation (Approved Maintenance Organization) Regulations 2007.

4.3.3 Pilot Training

The evidence adduced before the Commission revealed that there is no structured training at KPAW. Type rating training is often done ad hoc in private arrangements between KPAW pilots and other pilots outside the organisation.

4.3.4 Crew Resource Management Training (CRM)

CRM training is recognised as critical in complementing pilots technical skills with non-technical skills crucial to air safety. Among these non-technical skills is how to develop and maintain team work through communication skills,

leadership, cooperation and followership. CRM also trains crew to identify threats that face them in normal flight operations and how to manage and mitigate the threats. CRM training is especially critical in a multi crew operation. KPAW uses multi crew in their operations. In a good CRM environment there is no doubt who the pilot in command on a flight is and who is the pilot flying/monitoring at any one moment.

Following the accident, the commandant operated a rescue flight with CW 47. During the hearings both the commandant and CW 47 the co-pilot claimed to have been the pilot flying in the rescue flight. This is a clear indication that CRM is lacking at the highest level at KPAW.

The evidence before the Commission was that there is no meaningful CRM training going on at KPAW. The Commandant was unable to explain satisfactorily why there was no CRM training.

4.3.5 Procedures

Over and above the Force Standing Orders, which require to be amended to meet the present circumstances, the KPAW has drafted Standard Operating Procedures (*Com Exh 49 C*) which borrows from some of the operational requirements of the Kenya Air Force as stated by CW 49.

The Commission took note of the finding by the Committee of Aviation Experts on Police Air Wing (*Com Exh 60 D*) that there are no published approved procedures to cover maintenance, quality management, training as well as safety management for the organization.

4.3.6 Analysis of evidence

- (i). The lack of operational and financial autonomy by the KPAW, coupled with the cumbersome Government procurement process has contributed to the state of unserviceable aircraft in general and the inability to secure the required maintenance arrangement for the subject helicopter in a timely manner. This does not capacitate the Commandant to be an accountable manager.
- (ii). The remuneration for personnel is not competitive enough to attract and retain the right calibre of professionals required. (Findings of Committee of Aviation Experts on Police Air Wing).
- (iii). The grey area caused by the lack of clarity on requirements of State aircraft and how they are over-sighted can be a recipe for unsafe conditions as observed by the AeSK Chairman CW 63.
- (iv). Consequently, the unique operations of the Air Wing, which are often in difficult and at times dangerous situations coupled with no clear safety over-sighting authority, lead to sub-standard practices which compromise safety.
- (v). The lack of published procedures on maintenance, quality, safety and training is a contributor to unsafe conditions.
- (vi). The observed inefficient internal communication between the Commandant, the Chief Engineer and the Quality Manager is a symptom of a deeper organizational communication system failure.
- (vii). The lack of a Training Manual leaves the training standards at the discretion or behest of the contracted training institutions or external examiners, who may have their varying or diverse standards, some of which may not be tailored to the operational requirements of the Air Wing. It also means that there is no control of the content and scope of the various training programmes.

- (viii). The absence of CRM training creates an environment for very unsafe operations and especially in multi crew operations
- (ix). The Commission observes that, although KPAW is a specialised unit operating very expensive and sophisticated equipment, the level of funding is not commensurate. This often leads to short cuts or omissions critical areas of operations which compromise safety.

4.4 Recommendations

- 1) The Department responsible for Internal Security should implement the recommendations by the Committee of Experts on the Kenya Police Air Wing as a matter of urgency.
- 2) KPAW should be restructured to reflect the following:
 - (i). A unified command, for the air resources within the Kenya Police and Administration Police units and renamed the Kenya Police Service Air Wing (KPSAW), to reflect the Constitutional imperative in respect of the Police Service. The Air Wing should be responsible to the Inspector General.
 - (ii). Financial and operational autonomy.
 - (iii). A competitive remuneration package able to attract and retain a high calibre of professionals.
 - (iv). The Air Wing should adhere to all the pertinent Regulations including those that relate to Air Operator Certificate holders with necessary exemptions when need be.
 - (v). The alternative to (iv) above, the Cabinet Secretary responsible for Public Transport should make separate Regulations governing the operations of Police aircraft as 'State aircraft'.

- 3) Pending the restructuring of the Air Wing, KPAW should:
- (i). Immediately develop and implement training programmes based on an approved Training Manual.
 - (ii). Start the process of ensuring that they adhere to all the pertinent Regulations including those that relate to Air Operator Certificate holders;
 - (iii). Review the relevant chapters of the Force Standing Orders to accord with the current aviation industry best practices;
 - (iv). Not to procure any aircraft unless they have an approved maintenance arrangement and qualified personnel for the type;
 - (v). Have the Police hangar and the supporting facilities improved to an acceptable standard;
 - (vi). Urgently install and maintain a flight following system; this includes equipment, trained personnel, policy and procedures.
 - (vii). The KPAW should develop an emergency response and management programme;
 - (viii). KPAW should ensure the proper keeping and reporting of accurate records of accidents and incidents; and
 - (ix). Ensure that internal operating procedures are adhered to and written communication be emphasized for purposes of accountability.
 - (x). KPAW should develop and implement a Safety Management System (SMS) as a matter of urgency.

4.5 KENYA CIVIL AVIATION AUTHORITY

4.5.1 Institutional Structure

This is a body formed in 2002 pursuant to Section 3 of the Civil Aviation Act (Cap 394) Laws of Kenya, whose current objectives and purposes are to plan,

develop, manage, regulate and operate a safe, economical and efficient civil aviation system in Kenya.

The most important functions of KCAA in the objective of regulating safety are the development of robust and effective regulations and the subsequent safety oversight of organizations and associated processes.

The present structure of the KCAA incorporates:

- (i). The Regulatory and Inspectorate Services overseeing Flight Operations, Airworthiness, Air Navigation, Aerodromes and Air Transport;
- (ii). The Air Navigation Services (ANS) comprising Air Traffic Control, Navigation and Communication Maintenance as well as airspace management; and
- (iii). The East African School of Aviation (EASA).

The International Civil Aviation Organization (ICAO), supported by other stakeholders, has recommended that, the ANS and EASA, being service provision units, be made autonomous so that they come under the oversight of KCAA.

4.5.2 Analysis of evidence

The Commission received evidence on the procurement, registration and certification of the subject aircraft. From the evidence given by CW 10, CW 15, CW 12, CW 13 and CW 14, the Commission observed the following:

- (i). There are inadequate internal procedures to guide the various processes such as registration of aircraft, issue and renewal of C of A;

- (ii). The Forms used to assess the different processes were not significantly reflective of and relevant to the tasks. Refer to *Com. Exh 13C, 13D, 13E*
- (iii). There was a half-hearted attempt at applying the requirements of the relevant Regulations on KPAW, under the misconception that the aircraft was a State Aircraft.
- (iv). The KCAA has not provided sufficient guidance material to assist the Industry achieve compliance with the relevant Regulations.
- (v). KCAA inspectors are involved in activities that should ideally be left to Operators while they should be carrying out audit and surveillance of organisational systems.
- (vi). The working space at the Air Traffic Control facilities at JKIA and Wilson Airport are not adequate.
- (vii). Due to the Low Manning levels at Nairobi and Wilson Air Traffic Control facilities, the personnel are over stretched during peak periods, contributing to possible fatigue related errors.
- (viii). The inadequate funding of the KCAA, leads to manpower deficiency, poor remuneration, insufficient training and development of the industry.

4.5.3 Recommendations

- 1) KCAA requires total transformation in order to make it deliver on its objectives and purposes to reflect the following:
 - (i). Limit itself to its regulatory functions by removing the functions of the ANS and EASA which are service provision units,
 - (ii). Enhanced funding. Recognising that the ANS and EASA have been generating the bulk of KCAA's revenue, the Commission recommends, that KCAA gets a percentage of the airport tax which is now collected by Kenya Airports Authority in line with the

recommendation made in a proposal to the Minister of Transport prior to the 2012 budget.

- (iii). A competitive remuneration package able to attract and retain an adequate number of high calibre of professionals.
 - (iv). Continuous and recurrent training for the human resource in line with international best practices for the industry.
 - (v). Implementation of the State Safety Programme in line with ICAO doc 9859.
- 2) KCAA should put priority on the development of procedures (in conjunction with the industry) to guide all the processes envisaged by the regulations, in order to remove ambiguity or discretionary application of the regulations.
- 3) As a matter of priority KCAA should fashion its oversight function to concentrate more on effective surveillance of organization systems and leave the day to day continuing airworthiness and safety management to the approved organizations as provided by the regulations.
- 4) The ANS should;
- (i). Have a competitive remuneration package able to attract and retain an adequate number of high calibre of professionals.
 - (ii). Have continuous and recurrent training for the human resource in line with international best practices for the industry.

4.6 AIR ACCIDENT INVESTIGATION DEPARTMENT (AAID)

The Air Accident Investigation Department is established under the Civil Aviation Act to carry out investigations of aircraft accidents occurring in Kenya

and to prepare reports for submission to the Minister of Transport. The reports should contain the cause of the accident and make the necessary safety recommendations that would help to prevent similar occurrences. These should be widely disseminated to the industry.

Kenya (AAID) does not have a hangar to lay out any wreckage which makes it cumbersome whenever it is necessary to re-examine parts of wreckage.

It should be seriously noted that even the Commission did not get the accident report on the Police aircraft accident in Marsabit, or any of the reports touching on accidents that have occurred over the years around the Ngong area.

4.7 Recommendations

- 1) The AAID should be made an autonomous body and its mandate expanded to include all other modes of transportation.
- 2) Aircraft accident reports should be widely disseminated to the directly affected parties and to the whole industry, to ensure that the recommendations are implemented to prevent similar occurrences.
- 3) The Department should have a hangar to facilitate expeditious and effective examination of parts of wreckage.
- 4) The Department should be equipped with an analysis laboratory.
- 5) Have a competitive remuneration package able to attract and retain an adequate number of high calibre of professionals.
- 6) Have continuous and recurrent training for the human resource in line with international best practices for the industry.
- 7) The Department should be funded to purchase the necessary tools and equipment for investigations, survival kits in difficult places and protective attire for personnel.
- 8) The Department should take the initiative to discuss with other specialists, especially the Police scenes of crime investigators, pathologists and

forensic scientists with a view to setting specific protocols to be followed in the event of air accidents.

- 9) The draft Civil Aviation (Accidents Investigations) Regulations should be finalized gazetted and implemented urgently.

CHAPTER FIVE

5.1 FURTHER RECOMMENDATIONS

5.1.1 Overview

In the course of the Inquiry, the Commission observed glaring shortcomings in the performance of key activities of different Government departments, which were crucial to the effective discharge of the Commission's mandate. They require immediate remedial actions.

The Commission has also made observations on the shortcomings in the Civil Aviation Legal framework and made recommendations for amendments.

This chapter contains those observations and the recommendations.

5.1.2 Legal Framework

The definition of State aircraft in Cap 394 and the Regulations made there under has been a source of confusion in the aviation industry. This has effectively left the operation of Police Air Wing to proceed unregulated, save for the voluntary option of the Air Wing to comply with what they deem necessary (CW 49).

In the light of this unacceptable situation and the apparent inadequate standards as highlighted in Chapter 4 of this report as well as in the report made by the Committee of Aviation Experts on Police Air Wing, it is recommended that the Civil Aviation Act Cap 394 and the relevant Civil Aviation Regulations 2007 be amended as specified below.

5.1.3 Cap 394 Civil Aviation Act:

Section 2 Interpretation

Amend: "aircraft" by removing the last part which states 'but excludes state aircraft'. This will bring it in line with the interpretation of "aircraft" as given in all the regulations, which are in accordance with the interpretation in the Annexes to the Convention.

Section 3 Application of the Act

Subsection (2) to be amended to bring state aircraft under the Act and to provide for appropriate and separate regulations to be made to cater for state aircraft as proposed in 5.1.4 below.

5.1.4 The Proposed Civil Aviation Bill

Section 82 Regulations (proposed Bill)

- (i). To expressly provide for separate regulations catering for state aircraft as proposed herein.
- (ii). To include specific regulations spelling out the participation of the industry players in the rule making activity.

Section 2 Interpretation (proposed Bill)

To include the definition of "rules of the air"

Section 7 Functions of the Authority

Amend 7 (o) to specifically include comprehensive circulars or guidance materials in order to standardize the compliance processes.

5.1.5 Civil Aviation Regulations, 2007.

a) Civil Aviation (Registration of Aircraft) Regulations, 2007.

Reg. 28 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

b) Civil Aviation (Operation of Aircraft) Regulations, 2007.

Reg. 247 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

c) Civil Aviation (Rules of the Air) Regulations, 2007.

Reg. 90 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act and in consonance with Reg. 3- Compliance with the Rules of the Air and Air Traffic Control.

d) Civil Aviation (Personnel Licensing) Regulations, 2007.

Reg. 184 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

e) Civil Aviation (Instrument and Equipment) Regulations, 2007

Reg. 97 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

f) Civil Aviation (Air Operator Certificate) Regulations, 2007.

Reg. 99 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

g) Civil Aviation (Approved Maintenance Organization) Regulations, 2007

Reg. 49 (2) (3) Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

h) Civil Aviation (Airworthiness) Regulations, 2007.

Reg. 54 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act and in consonance with Reg. 3 Application.

i) Civil Aviation (Aerial Work) Regulations, 2007.

Reg. 77 Application of regulations to Government and visiting forces etc.

This regulation only exempts military aircraft and those of visiting military; it therefore may be taken to be the Minister's exercise of Section 20 of the Act to include other State aircraft. However, it may be considered necessary to promulgate separate regulations to cater for state aircraft as proposed in 5.1.4.

5.1.6 REGULATIONS FOR STATE AIRCRAFT

From the foregoing and considering that whilst state aircraft ought to be regulated and placed under the oversight of the Civil Aviation Authority for purposes of safety, the regulations must be specific and relevant to the special Police operations. It is recommended that regulations be immediately formulated borrowing from other Jurisdictions e.g. the United Kingdom CAP 612.

In the interim it can be taken that the Minister has invoked Section 20 of the Civil Aviation Act to make the current provisions of the regulations apply to Police aircraft as 'state aircraft.'

5.1.7 TRIBUNAL

Section 66 of The Civil Aviation Bill 2012 has proposed to strengthen the previously ineffective Tribunal, which is now named, The National Civil Aviation Administrative Review Tribunal.

- (i). Section 69 (b) and (c) of the Bill should include certificates and authorizations.
- (ii). Section 69 should include complaints on delays in performance of the various obligations by the Authority which cause loss of business or contracts by owner or operator.

5.1.8 PATHOLOGICAL REPORTS

5.1.8.1 Processes

The process of post mortem examination starting from the scene of accident (CW 40) and photography (CW41) culminating in the actual autopsy by the Government Pathologist (CW39) produced a report that apparently did not take into consideration the results of the toxicology examination done by Government Chemist (CW48). Assessment of injuries was not supplemented with x-ray examination.

The Commission heard that there is lack of coordination among the Police, the Government Chemist and the Government pathologists as there is no documented procedure to guide this process.

5.1.8.2 Analysis of evidence

The Government departments did not appreciate the importance of autopsy investigation in general and especially for air accident investigation. To quote a paper titled "*Injury Prevention in Aircraft Crashes: Investigative Techniques and Applications*", presented at Farnborough, UK, 24-25 November 1997 on Aviation Pathology by Dr. Cogswell, 'the role of the pathologist is to document and interpret injuries to determine how they occurred and how to minimize or

prevent them in future; this being the core of human factors data for analysis by investigators. Incorrect injury pattern interpretation compromises investigations'.

The Commission took note of the following short comings and deficiencies:

- (i). There are no documented procedures to guide this process in the event of air accident cases;
- (ii). The Government post mortem facilities available in the country are inadequate in all respects;
- (iii). Considering there were six bodies that were examined in a day, the facilities available were not adequate ; this was further constrained by the fact that the viewing of the bodies was going on at the same time;
- (iv). The gridding and mapping of the body positions at the accident site in relation to the wreckage was not done ; which would have assisted the Pathologists to determine the mechanisms of injuries;
- (v). There were no prior consultations among the Government Chemist, Government Pathologist, the Police and aircraft accident Investigators and as a result crucial steps, like gridding and mapping of body positions, were omitted;
- (vi). The final reports were arrived without the consultation of all the participating pathologists,
- (vii). They also did not take into consideration the toxicological examination reports.
- (viii). The post mortem reports did not take into consideration various areas like histology, spinal cord, and other injuries.
- (ix). The time taken was considered not adequate for conducting post mortem on six bodies;
- (x). The presence of soot in the trachea was not exhaustively addressed.

- (xi). There were no radiological examinations done to reveal all injuries.
- (xii). The Police photographer left before the completion of the autopsy procedures.
- (xiii). Due to the lack of coordination among the relevant Government Departments dealing with the post mortem examinations and tests, it is possible that crucial evidence was lost which could have helped the Commission arrive at conclusive observations on the cause of death.
- (xiv). The Commission inferred professional negligence in the way the post-mortem and toxicological processes were handled.

It is clear from the above that the post mortem exercise was conducted in a deplorable manner which led the Commission to agree with the following quotation:

"Show me the manner in which a nation cares for its dead, and I will measure with mathematical exactness, the tender mercies of its people, their loyalty to high ideals and their regard for the laws of the land" –Sir William Gladstone, British Prime Minister and Statesman 1808-1898.

5.1.8.3 Recommendations

The results of a well done post mortem investigation can establish the accurate cause of death which can assist in unravelling the cause of an accident. Establishing how injuries occurred in an accident not only helps in the investigations but also helps in improving the survival aspects in the design of aircraft.

- 1) A Manual detailing procedures on air accident pathological and medical investigations should be developed and stringently complied with.

- 2) The post-mortem facilities should be improved to accord with international best practice.
- 3) The office of the Government Pathologist in conjunction with the Air Accident Investigation Department should prepare specific protocols to be used during the post-mortems in accident cases.

The following questions may guide the preparation of the protocol:

- a) Who died?
- b) What was the "cause of death"?
- c) What was the manner of death?
- d) What specific interactions between victim and aircraft structures/components resulted in injuries?
- e) If the aircraft had provisions for in-flight escape, why did the victim(s) fail to escape?
- f) If the victim(s) survived the decelerative forces of the crash, why did they fail to escape from the lethal post-crash environment?
- g) What role, if any, did the victim(s) play in causing the crash?
 - (i). Who was flying the aircraft?
 - (ii). Was the pilot incapacitated?
 - (iii). Were physiological aberrations initiating or contributory cause factors in the accident?

Note: The injuries seen at autopsy are most conveniently and usefully separated by the location of injury (head/neck, abdomen, extremity, etc.) detailing the mechanism of each injury. Injury mechanism may be categorised into decelerative, impact, intrusive, and thermal.

- 4) The examinations done by the Government Chemist should be forwarded to the pathologist to facilitate a conclusive determination of the cause of death, prior to the release of final reports.

- 5) Reports of air accident victims should, at all appropriate times, consider toxicology for all occupants to detect alcohol, drugs or noxious gas inhalation.
- 6) Reports of air accident cases should include the analysis of the mechanism of injuries.
- 7) A more holistic approach to post-mortem examinations should include all important aspects such as histology and radiography.
- 8) A National Forensic Teaching and Research facility should be established as a matter of urgency.

5.1.9 FORENSIC LABORATORY TOXICOLOGICAL REPORTS

5.1.9.1 Process

The samples for toxicological analysis were taken to the Government Chemist by the Police investigators. The Government Chemist (CW 48) carried out the tests and presented the results to the Police. The Police did not forward the results to the Government pathologist.

5.1.9.2 Analysis of evidence

Some of the deficiencies were highlighted by Government Chemist CW 48 and expert pathologist CW 66:

- (i). Lack of adequate refrigeration facilities hindering preservation and storage of samples.
- (ii). Apparent lack of test controls or quality control systems that may have compromised the validity of the results.

- (iii). Failure of the Police to forward the toxicological results to the pathologists may have compromised the conclusive determination of the cause of death, prior to the release of final reports.

5.1.9.3 Recommendations

1. Facilities for storage of samples should be improved.
2. Results should expeditiously be relayed to the pathologist.
3. Quality Control system should be in place to validate results
4. Toxicological investigation of air accident victims should test for alcohol, drugs, and noxious gases.
5. The result must be comprehensively presented.
6. Samples should be preserved in case of further clarification or additional testing.
7. Tests must be considered as part of the wider investigations and accident prevention effort.

There is need to cultivate a culture of professional performance in all aspects of service provision.

5.1.9.4 COMPLIANCE FOLLOW UP

The Commission has made various recommendations with the sole aim of improving services given by the various public institutions and strengthening some of the regulatory and procedural requirements. This has been driven by the singular objective of bringing the required improvement to air safety, so as to minimize the risk or prevent the occurrence of similar accidents. It is imperative that all the recommendations in this report be implemented fully and expeditiously.

The Commission strongly believes that, had the recommendations of previous air accident investigation reports been implemented, this accident may have been averted.

The Commission therefore recommends and strongly persuades the Office of the President to consider giving this Report to the Commission on Administrative Justice (Ombudsman) so as to oversee the implementation of the recommendations of this Commission.

The Commission of Inquiry is required to table its report to Parliament. It therefore urges Parliament to ensure that the recommendations are fully implemented to ensure air safety in the aviation industry.

ANNEXES

- Appendix A - Gazette notices
- Appendix B - List of witnesses
- Appendix C - List of public reports referred to
- Appendix D - List of exhibits
- Appendix E - Reports on components analysed
- Appendix F - Wilson Ground/Tower Communication transcript
- Appendix G - Video clip

"APPENDIX A"- LIST OF GAZETTE NOTICES

1. Gazette Notice dated 29th June, 2012. (Special Issue)
2. Gazette Notice dated 13th July, 2012.
3. Gazette Notice dated 14th September, 2012. (Special Issue)
4. Gazette Notice dated 10th December, 2012. (Special Issue)
5. Gazette Notice dated 15th January, 2013. (Special Issue)

APPENDIX "B" - LIST OF WITNESSES

WITNESS NUMBER	NAME	NO. OF DAY(S) BEFORE THE COMMISSION.	DESIGNATION OF WITNESS
CW 1	Paul Njoroge Mwangi	1	Head of Supply Chain Office of The President
CW 2	Joel Kiptoo Ngolekong	1	Assistant Director Supply Chain Management of The President
CW 3	Patricia Njeri Mambo	1	Supply Chain Management Officer 11
CW 4	Simon Njoroge Mugo	2	Maintenance Manager Kenya Wildlife Service
CW 5	John Mwai Wambugu	2 (Recalled)	Chief Finance Officer Kenya Police
CW 6	Capt. Evans Kipkemoi Sigilai	2	Pilot, Sicham Aviation
CW 7	Benson Mwaure Thiga	2	Flight Operations Inspector, KCAA
CW 8	Maurice Jone Oduor Juma	2	Director General, PPOA
CW 9	Capt. Joe Mutungi	2	Director Aviation Safety Standards & Regulations, KCAA
CW 10	Nicholas Muhoya Ngatia	2	AG Manager Airworthiness/Chief Airworthiness Inspector
CW 11	Salim Mohamed Dafala	1	Aircraft Engineer, Skylink Flight Services
CW 12	Paul Githaiga Kiriba	1	Chief Airworthiness Inspector, KCAA
CW 13	Peter Katuse	2	Chief Airworthiness Inspector, KCAA
CW 14	George Kaundu	1	Airworthiness Inspector, KCAA
CW 15	Kingsley Ongaya	5	Senior Airworthiness Inspector, KCAA
CW 16	Naomi Njambi Mwangi	2	Chief Aviation Licensing Officer, KCAA
CW 17	James Gikandi Muchemi	1	Licensing Officer 1, KCAA
CW 18	Maurice Oketch Ouma	2	Deputy Chief Engineer, KPAW
CW 19	Johnson Githatu Mwangi	5	Chief Engineer, KPAW

CW 20	Cpl. Humphrey Bulimu Agamu	2	Aircraft Technician, KPAW
CW 21	Moses Mulinge Wanduka	1	Aircraft Technician, KPAW
CW 22	Michael Wafula Kong'ani	3	Aircraft Technician, KPAW
CW 23	Anna Kilolo Kanyeale	1	Telephone Operator, KAA Wilson Airport
CW 24	Thomas Sayianka Sikempei	1	Security in Charge, Wilson Airport
CW 25	Selina Chepkemboi	1	PC (W) Wilson Airport Police Station
CW 26	John Gikundi	1	PC Wilson Airport Police Station
CW 27	Titus Ndivo	1	PC Wilson Airport Police Station
CW 28	C.I Benjamin Kiprono	1	C.I Wilson Airport Police Station
CW 29	Benjamin Kahora Ranu	1	Driver, Transport Section - Harambee House
CW 30	I.P Samuel Topoika	1	IP Uhuru Camp
CW 31	Capt. Charles Wachira	2	Pilot, North Wood Agencies
CW 32	Joyce Wairimu Njoya	1	Assistant Government Chemist
CW 33	John Kimani Mungai	1	Government Analyst
CW 34	William Kailo Munyoki	1	Government Analyst
CW 35	Capt. Ian Mimano	1	CEO, Lady Lori
CW 36	Anastacia Nduku Mulei	1	Co-ordinator, Napenda Kuishi Home for Street Children (Eye Witness)
CW 37	Salim Lekishon Montet	1	Eye Witness
CW 38	Patrick Karanja Ndung'u	1	Eye Witness
CW 39	Dr. Johansen Oduor	1	Government Pathologist
CW 40	C.I Lacton Mwalimu Bengi	1	C.I, Crime Scene Support Services
CW 41	Cpl. Johana Tanui	1	Crime Scene Support Services
CW 42	C.I Moses Mwangi Mburu	1	C.I, C.I.D Headquarters Kajiado North
CW 43	D.C.I.O Julius Emase	2	D.C.I.O Kajiado North
CW 44	C.I Charles Koilege	1	C.I, Firearms Examiner
CW 45	Ephraim Elijah Chiwe	1	Assistant Commissioner of Police/Pilot KPAW
CW 46	John Lwimbu Minjo	1	Duty Air Traffic Controller, Wilson Airport
CW 47	Capt. Joseph Kuto	2	Pilot, KPAW
CW 48	Catherine Sera Murambi	1	Government Chemist

CW 49	Col. Rogers Mbithi Muneene	2	Commandant, Kenya Police Airwing
CW 50	Aristide Loumouamou	2	Aircraft Maintenance Engineer, Eurocopter Southern Africa (Pty) Limited
CW 51	Dr. Dorothy Njeru	1	Pathologist
CW 52	Dr. Amritpal Kalsi	2	Pathologist
CW 53	Kamau Mbogo	1	Engineer, Global Engineering Consulting Limited
CW 54	Eng. George Onyango, Ogw	2	Metallurgy Expert
CW 55	Keziah Ogutu	1	Chief Air Traffic Control Officer, KCAA
CW 56	Fabrice Cagnat	3	CEO, Eurocopter
CW 57	Sospeter Muiruri	1	Director, Meteorological Department
CW 58	Peter Clever Oduor	1	Chairman and CEO, KATCA
CW 59	Captain Isaac Munyi	1	Flying Instructor
CW 60	Col. Eutyclus Karumba Waithaka	1	Executive, Kenya Association of Air Operators
CW 61	Richard Harney	1	Eye Witness
CW 62	Dr. Robert Ngude	1	Pathologist (South Africa)
CW 63	Doctor Faustine Ondore	1	Chairman, Aeronautical Society of Kenya
CW 64	Eng. Peter Nthiga Njagi	1	Engineer, Lady Lori
CW 65	Clatus Macowenga Odhiambo	1	Accident Investigator, Ministry of Transport
CW 66	Dr. Emily Adhiambo Rogena	1	Senior Lecturer, School of Medicine, University of Nairobi

APPENDIX "C" - LIST OF PUBLIC REPORTS REFERRED TO

1. Committee of Experts Report on Police Air Wing
2. Report on the MI17 Helicopter accident at Kapsabet
3. Report on the Marsabit Accident Police Aircraft

APPENDIX "D" - LIST OF EXHIBITS

<u>Exhibit Number</u>	<u>Exhibit Description (s)</u>
CWEXH 1	Bundle of Documents
CWEXH 2	Statement by Joel Kiptoo Ngolekong
CWEXH 2 (A)	The Standard Tender Document
CWEXH 2 (B)	Dispatch documents to Eurocopter
CWEXH 2 (C)	Dispatch documents to Africair Inc.
CWEXH 2 (D)	Minutes of the Technical Evaluation Meeting
CWEXH 2 (E)	Letter dated 13/6/2011 communicating to Eurocopter
CWEXH 2 (F)	Letter dated 26/5/2011 communicating to Africair Inc.
CWEXH 3	Statement by Patricia Mambo
CWEXH 4	Statement by Simon Njoroge Mugo
CWEXH 5	Statement by John Mwai Wambugu
CWEXH 5 (A)	Transaction documents collectively.
CWEXH 6	Statement by Captain Evans Kipkemoi Sigilai
CWEXH 6 (A)	General declaration document
CWEXH 6 (B)	KCAA ATS Flight Plan Sample Form.
CWEXH 6 (C)	Form 64
CWEXH 7	Statement by Benson Mwaura Thiga
CWEXH 8	Statement by Maurice Jone Oduor Juma
CWEXH 8 (A)	Letter dated 18 th October, 2011
CWEXH 8 (B)	Letter dated 5 th December, 2011
CWEXH 9	Statement by Captain Joe Mutungi
CWEXH 9 (A)	Letter dated 19/10/2009
CWEXH 9 (B)	Letter dated 4/11/2009
CWEXH 9 (C)	Certificate of Registration of Aircraft
CWEXH 9 (D)	Certificate of Airworthiness
CWEXH 9 (E)	Letter dated 9/08/2005
CWEXH 9 (F)	Document dated 18/1/2012 (Titled Appendix 1)
CWEXH 10	Statement by Nicholas Muhoya Ngatia
CWEXH 10 (A)	AIC 23/08 Circular
CWEXH 11	Statement by Salim Mohamed Dafala
CWEXH 11 (A)	Licence of Salim Dafala
CWEXH 11 (B)	Compass Swing Data sheet
CWEXH 11 (C)	Deviation card recovered from the scene.
CWEXH 12	Statement by Paul Githaiga Kiriba
CWEXH 12 (A)	Recommendation Memo sheet
CWEXH 13	Statement by Peter Katuse
CWEXH 13 (A)	Export Certificate of Airworthiness

CWEXH 13 (B)	Type Certificate Data Sheet
CWEXH 13 (C)	C of A Issue/ Renewal confirmation – Form Air 39
CWEXH 13 (D)	C of A Issue checklist – Form Air 39
CWEXH 13 (E)	Registration/Acceptance Checklist
CWEXH 13 (F)	Receipt dated 18/1/2012
CWEXH 13 (G)	Aircraft Registration Acceptance Note
CWEXH 14	Statement by George Kaundu
CWEXH 14 (A)	Form AIR – 010 (C of A Renewal Checklist)
CWEXH 15	Statement by Kingsley Ongaya
CWEXH 15 (A)	Order (Acceptance of Aircraft for Registration)
CWEXH 15 (B)	Order (Issue of a Certificate of Airworthiness)
CWEXH 15 (C)	Memorandum dated 5/8/2011
CWEXH 15 (D)	Imprest Warrant dated 19/8/2011
CWEXH 15 (E)	Receipt dated 19/8/2011 Serial 0005623
CWEXH 15 (F)	AMO Fees Invoice dated 28/9/2011
CWEXH 15 (G)	AMO Certificate for 1/10/2011 to 30/9/2012
CWEXH 15 G1	2 nd Page of CWEXH 15(G) above.
CWEXH 15 (H)	Type Certificate Data Sheet (An extract of CWEXH 13 (B))
CWEXH 15 (I)	Certificate of conformity dated 27/7/2011
CWEXH 15 (J)	Type certificate dated 7/6/2011 by Turbomeca
CWEXH 15 (K)	Helicopter Inventory dated 26/7/2011
CWEXH 15 (L)	Master Minimum Equipment List
CWEXH 15 (M)	Letter dated 7/2/2012
CWEXH 15 (N)	Aircraft Logbook (France)
CWEXH 15 (O)	Airframe Logbook (South Africa)
CWEXH 15 P1	Aircraft Logbook (Kenya)
CWEXH 15 P2	Journey Log (France)
CWEXH 15 Q1 (A)	Authorised Release Certificate
CWEXH 15 Q1 (B)	Recordable concession
CWEXH 15 Q1 (C)	The complete Original Engine Logbook (Transparent yellow folder)
CWEXH 15 Q1 (D)	Aircraft battery log book - Extract from 15 Q1 C above.
CWEXH 15 Q2	Engine Logbook (South Africa)
CWEXH 15 (R)	Engine Logbook (Kenya)
CWEXH 15 (S)	Airworthiness Directives
CWEXH 15 (T)	Flight Test Report
CWEXH 15 (U)	Aircraft Mass and Balance Certification dated 23/11/2011
CWEXH 15 (V)	Aircraft Time Overview (ZS - HHO)
CWEXH 15 (W)	Flight Manual

CWEXH 15 (X)	Flight Folio and Defect Report
CWEXH 15 (Y)	Sample checklist of initial issue of C of A
CWEXH 15 (Z)	Approval Note
CWEXH 15 (AA)	Certificate of completion for Mr. K.L Ongaya
CWEXH 15 (BB)	E-mail dated 10/8/2011 and response dated 13/8/201
CWEXH 15 (CC)	E-mail dated 13/8/2012 with response
CWEXH 15 (DD)	E-mail dated 13/8/2012 in response
CWMFI 15DD	Letter dated 2/8/2011
CWMFI 15EE	Response letter dated 4/8/2011
CWMFI 15FF	B Notices (5Y - CDT)
CWEXH 15GG	AS 350 Assembly T1 O5 – 001 document
CWEXH 15HH	AS 350 Receipt configuration T1 O5 – 002 document
CWMFI 15II	Aircraft Inventory
CWEXH 15JJ	Letter dated 13/1/2012 (From KPAW Commandant to DG KCAA)
CWEXH 16	Statement by Mrs. Naomi Njambi Mwangi
CWEXH 16A-16RR1	File for the late Capt. Nancy Gituanja
CWEXH 16SS-16HHHH	File for the late Capt. Luke Oyugi
CWEXH 17	Statement by James Gikandi Muchemi
CWEXH 17 (A)	Letter dated 2/8/2011
CWEXH 17 (B)	Letter dated 4/8/2011
CWEXH 17 C1	Letter dated 4/1/2012
CWEXH 17 C2	Application for Registration or Re-registration of Aircraft
CWEXH 17 C3	Invoice Commercial from Eurocopter
CWEXH 17 C4	C 17B Customs Regulations
CWEXH 17 (D)	KCAA – L – (100) – CL Document dated 5/1/2012
CWEXH 17 E1	Eurocopter letter dated 19/12/2011
CWEXH 17 E2	Export C of A issued on 14/12/2011
CWEXH 17 E3	Certificate of cancellation
CWEXH 17 (F)	Certificate of clearance for certificate
CWEXH 17 (G)	Forwarding form for approval of an Aircraft (C of R)
CWEXH 18	Statement by Maurice Oketch Ouma
CWEXH 18 (A)	Maurice Oketch Ouma's KCAA Licence
CWEXH 18 (B)	Aircraft Tech Log for the AS350 B3e
CWEXH 19	Statement by Johnson Githatu Mwangi.
CWEXH 19 (A)	Johnson Githatu Mwangi AME's Licence
CWEXH 19 (B)	Acceptance Protocol
CWEXH 19 B1	Letter dated 23/09/2011
CWEXH 19 B2	Cockpit image
CWEXH 19 B3	E-mail communication between Mbithi and Eurocopter

CWEXH 19 (C)	Certificate of conformance
CWEXH 19 (D)	Final Acceptance Certificate
CWEXH 19 (E)	Letter dated 18/1/2012
CWEXH 19 E1	Letter dated 18 th January, 2012 from Everett Aviation to the Commandant
CWEXH 19 E2	Letter dated 20 th February, 2012 to the Commissioner of Police from the commandant.
CWEXH 19 E3	Maintenance Agreement between Kenya Police Dept. and Eurocopter Southern Africa (PTY) Ltd.
CWEXH 19 (F)	Letter dated 20/2/2012 addressed to The Commissioner of Police
CWEXH 19 (G)	Letter from Eurocopter and Everett Aviation to Col. Mbithi
CWEXH 19 (H)	Letter dated 7 th March, 2012
CWEXH 19 H1	Document dated 3/5/2012
CWEXH 19 H2	Agreement (Providing for the agreement and record of certain standard terms)
CWEXH 19 H3	Maintenance Agreement
CWEXH 19 I1	Work parks - Bundle
CWEXH 19 I2	Work parks - Bundle
CWEXH 19 (J)	Certificate for Michael Wafula Kong'ani – collectively
CWEXH 19 (K)	Certificate for Moses Mulinge Wanduka – collectively
CWEXH 19 (L)	Certificate for Isaac Kombo Maoncha – collectively
CWEXH 19 (M)	Engine Logbook (Turbomeca)
CWEXH 19 M1	EASA Form 1
CWEXH 19 M1 (A)	Appendix Document
CWEXH 19 M1 (B)	Component Card
CWEXH 19 M2	Replacements/Changes (5 pages)
CWEXH 19 M2 (A)	Engine/Module Storage Sheet
CWEXH 19 N	E-Mail
CWEXH 19 O	Aviation Service Flight Receipt
CWEXH 19 P	Letter dated 16/11/2011
CWEXH 19 Q	Letter dated 1/12/2011
CWEXH 20	Statement by CPL. Humphrey Bulimu
CWEXH 20 (A)	KCAA Exam Results Notification dated 13/6/2012
CWEXH 20 A1	Receipt dated 15/6/2012
CWEXH 20 A2	Results slip (CAT 'C' – GAS T. Engines (GTE))
CWEXH 20 (B)	Worksheets (1 - 18)
CWEXH 20 (C)	KCAA Document dated 22/6/2012 (For booking exam

	&Receipt dated 14/6/2012)
CWEXH 20 C1	KCAA document dated 16/5/2012 & Exam Result slip (CAT 'A' Aeroplanes)
CWEXH 20 (D)	Flight Manual
CWEXH 20 (E)	Flight plan
CWEXH 20 (F)	Photographs
CWEXH 20 (G)	"
CWEXH 20 (H)	"
CWEXH 20 (I)	Certificate of Release to service No. 0206
CWEXH 20 (J)	Certificate of Release to service No. 0219
CWEXH 20 (K)	Russian Certificate No. 441
CWEXH 20 (L)	Russian Certificate No. 1206 - 88
CWEXH 21	Statement by Moses Mulinge Wanduka
CWEXH 22	Statement by Michael Wafula Kong'ani
CWEXH 22 (A)	AME Licence for Michael Wafula Kong'ani
CWEXH 22 B1	Certificate from Kenya Armed Forces; Serial 00159
CWEXH 22 B2	Certificate from Atlas Aviation dated 23/3/1995
CWEXH 22 B3	Certificate from Atlas Aviation dated 23/3/1995
CWEXH 22 B4	Certificate from Kenya Christian Industrial Training Institute dated 20/8/2004
CWEXH 22 B5	Certificate from Ameta dated 28/8/2009
CWEXH 22 (C)	Weekly Order No. 23/2012 for week ending 10/6/2012
CWEXH 22 (D)	Hangar Floor Plan
CWEXH 22 (E)	Visitors Book (2 Page extracts)
CWEXH 22 (F)	Visitors Pass to KPAW Hangar
CWEXH 22 (G)	Maintenance Servicing Manual (MSM)
CWEXH 23	Statement by Anna Kilolo Kanyeke
CWEXH 24	Statement by Thomas Saiyanka Sikempei
CWEXH 24 (A)	Wilson Airport Civil Aviation Security Programme
CWEXH 24 (B)	Minutes dated 24/5/2012
CWEXH 24 (C)	Minutes dated 21/6/2012
CWEXH 25	Statement by Selina Chepkemboi
CWEXH 26	Statement by John Gikundi
CWEXH 27	Statement by Titus Ndivo
CWEXH 28	Statement by C.I Benjamin Kiprono
CWEXH 29	Statement by Benjamin Kahora Ranu
CWEXH 30	Statement by I.P Samuel Topoika
CWEXH 31	Statement by Captain Charles Munyeki Wachira.
CWEXH 31 (A)	KCAA Licence for Charles Wachira No. YK - 1833 - AL (H)
CWEXH 31 (B)	Renewal of Licence by KCAA
CWEXH 31 (C)	Logbook for Captain Charles Wachira

CWEXH 31 D1 – 31 D12	12 Certificates
CWEXH 31 (E)	Appointment to be Commissioner
CWEXH 31 (F)	KCAA (L) 75 dated 05/5/2008
CWEXH 31 (G)	KCAA (L) 75 dated 26/10/2009
CWEXH 31 (H)	Letter dated 13/01/2011
CWEXH 31 (I)	Letter dated 01/02/2012
CWEXH 32	Statement by Joyce Wairimu Njoya
CWEXH 32 (A)	Exhibit Memo Form (H 154/12)
CWEXH 32 (B)	Government Analyst Report (H 154/12) dated 10/7/2012
CWEXH 32 (C)	Exhibit Memo Form (H 153/12)
CWEXH 32 (D)	Government Analyst Report (H 153/12) dated 22/6/2012
CWEXH 32 (E)	Exhibit Memo Form (H 155/12)
CWEXH 32 (F)	Government Analyst Report (H 155/12) dated 10/7/2012
CWEXH 33	Statement by John Kimani Mungai
CWEXH 33 (A)	Exhibit Memo Form Body 1
CWEXH 33 (B)	Exhibit Memo Form Body 2
CWEXH 33 (C)	Exhibit Memo Form Body 3
CWEXH 33 (D)	Exhibit Memo Form Body 4
CWEXH 33 (E)	Exhibit Memo Form Body 5
CWEXH 33 (F)	Exhibit Memo Form Body 6
CWEXH 33 (G)	Report dated 15/6/2012 by J.K Mungai
CWEXH 34	Statement by William Kailo Munyoki
CWEXH 34 (A)	Exhibit Memo Form L 23/IL
CWEXH 34 (B)	Report dated 15/6/2012 by W.K Munyoki
CWEXH 35	Statement by Capt. Ian Mimano
CWMFI 35 (A)	Kenya webcam photograph 1 (see CWEXH 65 (A))
CWMFI 35 (B)	Kenya webcam photograph 2 (see CWEXH 65 (A))
CWEXH 35 (C)	Licence of Ian Mbuthia Mimano
CWEXH 36	Statement by Anastacia Nduku Mulei
CWEXH 37	Statement by Salim Lekishon Montet
CWEXH 38	Statement by Patrick Karanja Ndung'u
CWEXH 39 (A)	Post-mortem Form for Body 1 (PP 1440/12) – Nancy Gituanja
CWEXH 39 (B)	Post-mortem Form for Body 2 (PP 1441/12) – Sgt. Thomas Murimi
CWEXH 39 (C)	Post-mortem Form for Body 3 (PP 1442/12) – Hon. Joshua Ojode
CWEXH 39 (D)	Post-mortem Form for Body 4 (PP 1443/12) – Luke Oyugi
CWEXH 39 (E)	Post-mortem Form for Body 5 (PP 1444/12) – Hon. George Saitoti
CWEXH 39 (F)	Post-mortem Form for Body 6 (PP 1445/12) – Joshua

	Tonkei
CWEXH 40	Statement by C.I Lacton Mwalimu Bengi
CWEXH 40 (A)	Finger Prints (3 sets collectively)
CWEXH 40 (B)	Letter dated 11/6/2012
CWEXH 41 (A)	Report by Cpl. Johana Tanui
CWEXH 41 (B)	Photographs (Brown folder CID HQ REF. 1687/12)
CWEXH 42 A1	Handwritten statement for C.I Moses Mwangi Mburu
CWEXH 42 A2	Typed statement for C.I Moses Mwangi Mburu
CWEXH 42 B1	Rough sketch plan
CWEXH 42 B2	Fair sketch plan
CWEXH 42 (C)	Ballistic Exhibit Memo Form
CWEXH 42 (D)	Ballistic Expert Report
CWEXH 42 (E)	Report dated 12/6/2012
CWEXH 43	Statement by D.C.I.O Julius Emase
CWEXH 44	-
CWEXH 45	Statement by Ephraim Chiwe
CWEXH 45 (A)	KCAA Licence (YK – 69090 – PL – (H) for Ephraim Elijah Chiwe
CWEXH 46	Statement by John Lwimbu Minjo
CWEXH 46 (A)	Voice Tape transcript of Air accident
CWEXH 46 (B)	Weather Report
CWEXH 46 (C)	A/C Movement logbook
CWEXH 47	Statement by Capt. Joseph Kuto
CWEXH 47 (A)	KCAA Licence (YK – 6080 – CL – (H) for Capt. Joseph Kuto
CWEXH 47 (B)	Certificate of qualification as pilot
CWEXH 48 (A)	Exhibit Memo Form dated 10/7/2012
CWEXH 48 (B)	Report dated 02/8/2012
CWEXH 49	Statement by Col. Rogers Mbithi Muneene
CWEXH 49 (A)	KCAA Licence (YK – 6908 – CL (H) for Rogers Mbithi Muneene
CWEXH 49 A1	Bundle of Certificates.
CWEXH 49 (B)	Force Standing Orders (Circulated earlier)
CWEXH 49 (C)	KPAW Standard Operating Procedures
CWEXH 49 (D)	KPAW Training and Categorisation Instructions
CWEXH 49 (E)	KPAW Brochure
CWEXH 49 E1	Letter dated 15 th October, 2010.
CWEXH 49 F1	KPAW Passenger Manifest/Weight Schedule
CWEXH 49 F2	Sky track (2 pages) Image
CWEXH 49 F3	Sky track Image
CWEXH 49 F4	“
CWEXH 49 (G)	Flight Authorization and Flying Times (OPS & TRG

CWEXH 31 D1 – 31 D12	12 Certificates
CWEXH 31 (E)	Appointment to be Commissioner
CWEXH 31 (F)	KCAA (L) 75 dated 05/5/2008
CWEXH 31 (G)	KCAA (L) 75 dated 26/10/2009
CWEXH 31 (H)	Letter dated 13/01/2011
CWEXH 31 (I)	Letter dated 01/02/2012
CWEXH 32	Statement by Joyce Wairimu Njoya
CWEXH 32 (A)	Exhibit Memo Form (H 154/12)
CWEXH 32 (B)	Government Analyst Report (H 154/12) dated 10/7/2012
CWEXH 32 (C)	Exhibit Memo Form (H 153/12)
CWEXH 32 (D)	Government Analyst Report (H 153/12) dated 22/6/2012
CWEXH 32 (E)	Exhibit Memo Form (H 155/12)
CWEXH 32 (F)	Government Analyst Report (H 155/12) dated 10/7/2012
CWEXH 33	Statement by John Kimani Mungai
CWEXH 33 (A)	Exhibit Memo Form Body 1
CWEXH 33 (B)	Exhibit Memo Form Body 2
CWEXH 33 (C)	Exhibit Memo Form Body 3
CWEXH 33 (D)	Exhibit Memo Form Body 4
CWEXH 33 (E)	Exhibit Memo Form Body 5
CWEXH 33 (F)	Exhibit Memo Form Body 6
CWEXH 33 (G)	Report dated 15/6/2012 by J.K Mungai
CWEXH 34	Statement by William Kailo Munyoki
CWEXH 34 (A)	Exhibit Memo Form L 23/IL
CWEXH 34 (B)	Report dated 15/6/2012 by W.K Munyoki
CWEXH 35	Statement by Capt. Ian Mimano
CWMFI 35 (A)	Kenya webcam photograph 1 (see CWEXH 65 (A))
CWMFI 35 (B)	Kenya webcam photograph 2 (see CWEXH 65 (A))
CWEXH 35 (C)	Licence of Ian Mbuthia Mimano
CWEXH 36	Statement by Anastacia Nduku Mulei
CWEXH 37	Statement by Salim Lekishon Montet
CWEXH 38	Statement by Patrick Karanja Ndung'u
CWEXH 39 (A)	Post-mortem Form for Body 1 (PP 1440/12) – Nancy Gituanja
CWEXH 39 (B)	Post-mortem Form for Body 2 (PP 1441/12) – Sgt. Thomas Murimi
CWEXH 39 (C)	Post-mortem Form for Body 3 (PP 1442/12) – Hon. Joshua Ojode
CWEXH 39 (D)	Post-mortem Form for Body 4 (PP 1443/12) – Luke Oyugi
CWEXH 39 (E)	Post-mortem Form for Body 5 (PP 1444/12) – Hon. George Saitoti
CWEXH 39 (F)	Post-mortem Form for Body 6 (PP 1445/12) – Joshua

	Tonkei
CWEXH 40	Statement by C.I Lacton Mwalimu Bengi
CWEXH 40 (A)	Finger Prints (3 sets collectively)
CWEXH 40 (B)	Letter dated 11/6/2012
CWEXH 41 (A)	Report by Cpl. Johana Tanui
CWEXH 41 (B)	Photographs (Brown folder CID HQ REF. 1687/12)
CWEXH 42 A1	Handwritten statement for C.I Moses Mwangi Mburu
CWEXH 42 A2	Typed statement for C.I Moses Mwangi Mburu
CWEXH 42 B1	Rough sketch plan
CWEXH 42 B2	Fair sketch plan
CWEXH 42 (C)	Ballistic Exhibit Memo Form
CWEXH 42 (D)	Ballistic Expert Report
CWEXH 42 (E)	Report dated 12/6/2012
CWEXH 43	Statement by D.C.I.O Julius Emase
CWEXH 44	-
CWEXH 45	Statement by Ephraim Chiwe
CWEXH 45 (A)	KCAA Licence (YK – 69090 – PL – (H) for Ephraim Elijah Chiwe
CWEXH 46	Statement by John Lwimbu Minjo
CWEXH 46 (A)	Voice Tape transcript of Air accident
CWEXH 46 (B)	Weather Report
CWEXH 46 (C)	A/C Movement logbook
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CWEXH 49 F4	“
CWEXH 49 (G)	Flight Authorization and Flying Times (OPS & TRG

CWEXH 56 A4 (4)	Authorised Release Certificate (THALES) dated 17 th September, 2012
CWEXH 56 A5	Letter dated 11 th October, 2011
CWEXH 56 A6 (1)	Purchase Order dated 6 th June, 2012
CWEXH 56 A6 (2)	D.A.W Sheet dated 8 th March, 2012
CWEXH 56 A7	Breakdown of The MSM
CWEXH 56 A8	E – mail between Col. Mbiithi and Gilbert Nascimento
CWEXH 56 A9	Letter 8 th November, 2011
CWEXH 56 A10	Pilot Training Course
CWEXH 56 A11	Letter dated 16 th October, 2012 and The Contract Document.
CWEXH 56 B	Supplementary Statement dated 17 th October, 2012
CWEXH 56 B2	Signon Cargo Centre document (9 Pages)
CWEXH 56 B3 (1)	Acknowledgement receipt dated 9 th May, 2012
CWEXH 56 B3 (2)	DHL Document with a shipment receipt overleaf dated 9 th May, 2012
CWEXH 56 B4 (1)	Acknowledgement receipt dated 9 th May, 2012 with a DHL document overleaf
CWEXH 56 B4 (2)	Shipment Receipt dated 15 th May, 2012
CWEXH 56 (C)	Statement dated 30 th October, 2012.
CWEXH 56 C1	KCAA letter dated 21 st June, 2012 (Aircraft 5Y – BYG 600 HRS INSPECTION)
CWEXH 56 C2	Eurocopter letter dated 20 th June, 2012 from Eurocopter.
CWEXH 56 C3	KCAA letter dated 21 st June, 2012 (Aircraft 5Y – HNB 600 HRS INSPECTION)
CWEXH 56 C4	Eurocopter letter dated 24 th May, 2012 from Eurocopter.
CWEXH 56 C5	KCAA Letter dated 4 th July, 2012
CWEXH 56 C6	Eurocopter letter dated 6 th August, 2012
CWEXH 56 C7	Eurocopter letter dated 23 rd March, 2011
CWEXH 56 C8	Eurocopter letter dated 23 rd March 2010
CWEXH 56 C9	Eurocopter letter dated 19 th March, 2009
CWEXH 56 C10	Eurocopter letter dated 5 th March, 2008
CWEXH 56 C11	Certificate of Release to service (CRS) dated 10 th May, 2012
CWEXH 56 C12	KCAA letter dated 27 th September, 2012
CWEXH 56 C13	KCAA letter dated 21 st June, 2012
CWEXH 56 C14	AMO certificate (Previously marked as CWEXH 15G)
CWEXH 56 C15	Form AC – AWS006A
CWEXH 56 C16	E – Mail between Christian and Rudie
CWEXH 56 D1	Extract of the Flight Manual
CWMFI 56 D2	Airworthiness Bulletin dated 14 th May, 2007
CWEXH 56 D3	Eurocopter letter dated 15 th December, 2011

CWEXH 56 D4	Eurocopter letter dated 16 th November, 2011
CWEXH 56 D5	E – mail dated 16 th December, 2011
CWEXH 56 D6	Letter dated 19 th December, 2011
CWEXH 56 D7	Eurocopter letter dated 28 th October, 2007 and other documents collectively
CWEXH 56 D8	EASA Type – Certificate Data Sheet
CWEXH 56 (E)	Free translation of document from the French DGC
CWEXH 57	Meteorological Report
CWEXH 57 (A)	Bundle of documents from the Meteorological Department
CWEXH 57 (B)	Meteorological documents (From the witness)
CWEXH 58	Report dated 3 rd September, 2012 by Kenya Air Traffic Controllers Association.
CWEXH 59	Presentation by Captain Isaac Munyi.
CWEXH 60	Statement by Col. Eutyclus Karumba Waithaka
CWEXH 60 (A)	Report by Kenya Association of Air Operators.
CWEXH 60 (B)	Bundle of certificates
CWEXH 60 (C)	Certificate dated 8 th November, 1979 from Central Flying School
CWEXH 60 (D)	Committee of Aviation Experts on Police Air Wing
CWEXH 60 (E)	Aviation Consumer Satisfaction Survey Report
CWEXH 60 (F)	Aircraft History in the register document
CWMFI 60 (G)	
CWEXH 61	Statement of Richard Harney
CWEXH 61 (A)	Copy of A Map.
CWEXH 62 (A)	Forensic Pathologist Report by Dr. Robert Ngude
CWEXH 62 (B)	PowerPoint presentation by Dr. Ngude
CWEXH 63 (A)	Statement by Dr. Faustine Ondore
CWEXH 63 (B)	AeSK Report.
CWMFI 63 (C)	Witness own document (copy to be dispatched)
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CWEXH 63 (E)	ICAO Safety Oversight Manual
CWEXH 64	Statement by Eng. Peter Nthiga Njagi
CWEXH 64 (A)	AME's Licence No. YK – C336 – AMEL for Peter Nthiga Njagi
CWEXH 65	Revised Report on Webcam by Mr. Clatus Macowenga
CWEXH 65 (A)	5 Kenya webcam Photographs circulated by Mr. Gross
CWEXH 66	Statement by Dr. Emily A Rogena

"APPENDIX E" - LIST OF COMPONENTS ANALYSED

1. FADEC and EECU (DECU) analysed in France
2. Skytrack analysed in Canada
3. GPS (AERA 550 and Garmin 550H) in The United Kingdom
4. Gearbox Strip by Eng. Onyango at Lady Lori
5. Engine Strip by Eng. Kamau Mbogo at Lady Lori

APPENDIX "F" - WILSON GROUND TOWER COMMUNICATION TRANSCRIPT APPENDIX F

TAPE TRANSCRIPT BETWEEN WILSON GROUND FREQUENCY (121.9MHZ and FALCON230
REG 5YCDT ON 10TH JUNE, 2012

TIME in UTC	STN TX	STN RX	INTELLIGENCE
05:26:05	FALCON230	TWR	WILSON GROUND FALCON TWO THREE ZERO, HELICOPTER GOOD MORNING
05:26:08	TWR	FALCON230	FALCON TWO THREE ZERO GOOD MORNING, GO AHEAD.
05:26:11	FALCON230	TWR	REQUEST START UP SIR AS PER THE FLIGHT PLAN FOR NDHIWA, SIX ONBOARD WITH THREE AND A HALF ENDURANCE
05:26:29	TWR	FALCON230	FALCON TWO THREE ZERO START UP APPROVED QNH ONE ZERO TWO FOUR
05:26:35	FALCON230	TWR	ONE ZERO TWO FOUR START UP APPROVED. REPORT READY TO LIFT VIP ONBOARD
05:26:40	TWR	FALCON230	FALCON TWO THREE ZERO SQUAWK TWO ZERO FIVE THREE
05:26:44	FALCON230	TWR	SQUAWKING TWO ZERO FIVE THREE FALCON TWO THREE ZERO
05:26:48	TWR	FALCON230	THAT IS CORRECT TWR ONE EIGHTEEN ONE
05:26:52	FALCON230	TWR	ONE EIGHTEEN ONE FALCON TWO THREE ZERO
05:27:01	FALCON230	TWR	GROUND FROM FALCON TWO THREE ZERO
05:27:04	TWR	FALCON230	FALCON TWO THREE ZERO GO AHEAD
05:27:07	FALCON230	TWR	SQUAWK?
05:27:10	TWR	FALCON230	TWO ZERO FIVE THREE
05:27:13	FALCON230	TWR	AM SQUAWKING

TAPE TRANSCRIPT BETWEEN WILSON GROUND FREQUENCY (118.1MHZ and FALCON230
REG SYCDT ON 10TH JUNE, 2012

TIME in UTC	STN TX	STN RX	INTELLIGENCE
05:28:33	FALCON230	TWR	TOWER GOOD MORNING, FALCON TWO THREE ZERO
05:28:37	TWR	FALCON230	FALCON TWO THREE ZERO, GO AHEAD
05:28:39	FALCON230	TWR	WE ARE READY TO LIFT AHHSIX ONBOARD THREE AND A HALF HOURS ENDURANCE FOR NDHIWA.
05:28:48	TWR	FALCON230	FALCON TWO THREE ZERO SURFACE WIND CALM, CLEARED LIFT WITH A LEFT TURN- OUT
05:28:52	FALCON230	TWR	CLEAR LIFT WITH A LEFT TURN-OUT FALCON TWO THREE ZERO
05:29:50	TWR	FALCON230	FALCON TWO THREE ZERO AIRBORNE THREE TWO NEXT ZONE OUT
05:29:53	FALCON230	TWR	WILL CALL YOU ZONE OUT NEXT FALCON TWO THREE ZERO
05:35:04	FALCON230	TWR	AHH... TOWER FALCON TWO THREE ZERO WILL BE CHECKING ZONE OUT IN THE NEXT ONE MINUTE.
05:35:08	TWR	FALCON230	FALCON TWO THREE ZERO CENTER ONE ONE EIGHT DECIMAL FIVE
05:35:13	FALCON230	TWR	ONE ONE EIGHT DECIMAL FIVE, GOOD DAY SIR
05:35:15	TWR	FALCON230	GOOD DAY

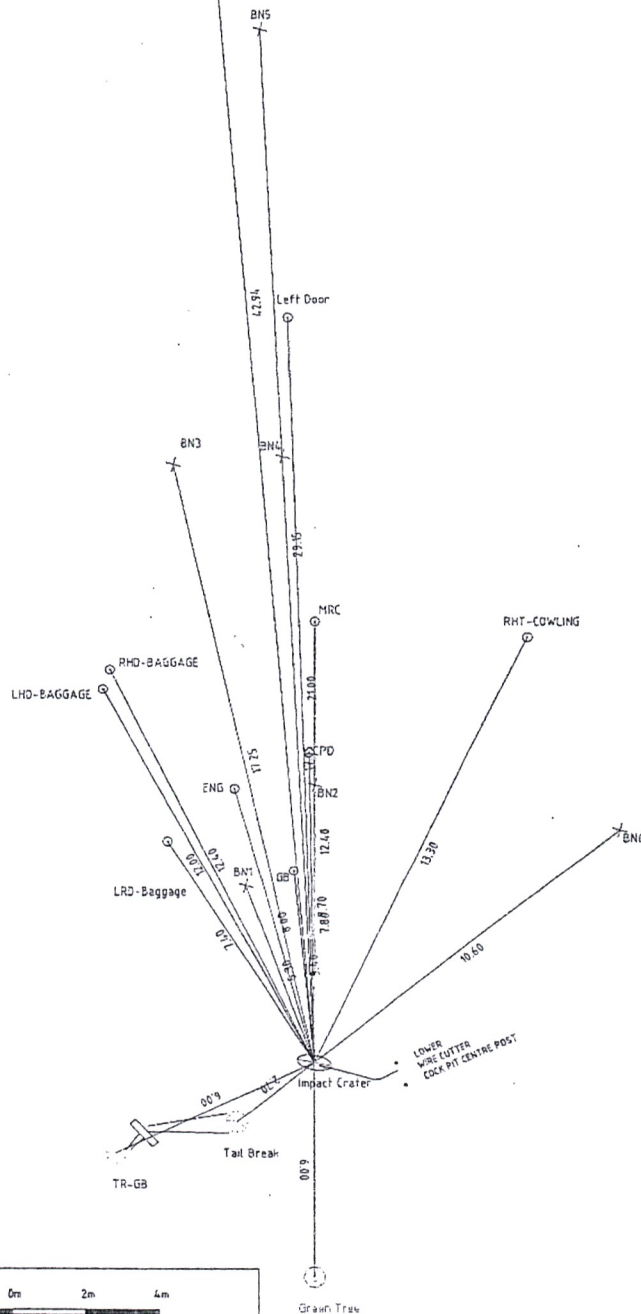
CWEXH 56 D4	Eurocopter letter dated 16 th November, 2011
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MRB- Main Rotor Blade (Blue)

5Y-CDT WRECKAGE DISTRIBUTION:
KIBIKO, NGONG
IMPACT POSITION: S 1° 19.73' E 36° 38.29'



LEGEND

	Impact Crater
	Wreckage parts
	Blue Gull Eros
	Body Nils

ID	ABBREV	DESCRIPTION
1	GB	Gear Box
2	ENG	Engine
3	CPO	Co-Pilot Door
4	LBD	Left Rear Baggage Door
5	Tail Break	Tail Break Point
6	TR-GB	Tail Rotor Gear Box
7	Left Door	Left Door
8	RHD-BAGGAGE	Right Hand Baggage Door
9	LHD-BAGGAGE	Left Hand Baggage Door
10	MRC	Main Rotor Case
11	RHT-COWLING	Right Hand Transmission Cowling
12	MRB	Main Rotor Blade (Blue)
13	BN1-6	Body Nils

5m 4m 3m 2m 1m 0m 2m 4m
UNITS METERS

