PROCEDURES MANUAL

OF

AIRCRAFT ACCIDENT/INCIDENT INVESTIGATION

DIRECTORATE GENERAL OF CIVIL AVIATION

FOREWORD

In conformity with Article 26 of the Convention on International Civil Aviation, it is incumbent on every State in which an aircraft accident or incident occurs to institute an inquiry into the circumstances of the accident and incident.

The sole objective of an aircraft accident or incident investigation is the prevention of future accidents and incidents and not to apportion blame or liability. The emphasis of an aircraft accident or incident investigation is on remedial actions. An aircraft accident provides evidence of hazards or deficiencies within the aviation system. A well-conducted investigation should therefore identify all immediate and underlying causes of an accident and recommend appropriate safety actions aimed at avoiding the hazards or eliminating the deficiencies. The investigation may also reveal other hazards or deficiencies within the aviation system not directly connected with the causes of the accident.

Safety of Civil air operations in Indian territory and Indian Civil Registered aircraft operating outside Indian territory are regulated under Section 5A of the Indian Aircraft Act which provides that the Director-General of Civil Aviation or any other officer specially empowered by the Central Government may, from time to time, by order, issue directions, to any person or persons engaged in aircraft operations or using any aerodrome, in any case where the Director-General of Civil Aviation or such other officer is satisfied that for securing the safety of aircraft operations it is necessary so to do. Further the person or persons to whom such direction is issued shall comply with every such direction.

Without prejudice to the generality of the foregoing power, Indian Aircraft Rules may -

(a) require notice to be given of any accident in such manner and by such person as may be prescribed;

(b) apply for the purposes for such investigation, either with or without modification, the provisions of any law for the time being in force relating to the investigation of accidents;

(c) Prohibit pending investigation access to or interference with aircraft to which an accident has occurred, and authorise any person so far as may be necessary for the purposes of an investigation to have access to examine, remove, take measures for the preservation of or otherwise deal with any such aircraft; and

(d) authorise or require the cancellation, suspension, endorsement or, surrender of any licence or certificate granted or recognised under the Indian Aircraft Act when it appears on an investigation that the licence ought to be so dealt with, and provide for the production of any such licence for such purpose.

If any action as stated in (d) above is taken by the Director General it is in the capacity as the regulator. Investigations shall include the observations on the performance of air traffic services or navigational aids, Airworthiness of aircraft, Competency of flight crew and/or Permit holders, Competency of Approval holders or maintenance personnel, breach of the Civil Aviation Act or Regulations, Flight crew medical qualifications etc. In case an Inspector of Accident carries out the investigation he shall also ensure to determine whether performance of the functions of various wings of the Directorate General of Civil Aviation as a Regulatory Organisation was a factor.

CHAPTER 2

PURPOSE OF THE MANUAL

The purpose of this Procedure Manual for accident & incident investigation is to convey a commitment to investigate significant aircraft accidents and serious incidents and identify the role and responsibilities of the investigation authority, which is presently with the DGCA for minor accidents and serious incidents & with the Central Government for investigation of major accidents. The relationship and interaction with other Directorates of DGCA, Operators, Airports Authority of India and other civil agencies in this regard is specified. Following are the main purposes :

- Formalise notification, analysis and reporting procedures and obligations
- Formalise standard procedures for the Investigating Officers to follow when investigating any aircraft occurrence (accident/ incident)
- Provide a post-aircraft occurrence investigation system to enable to identify safety deficiencies
- Provide reference and guidance material to assist Investigating Officers in the conduct of investigations
- Detail essential resources for conducting the investigation.

This manual provides general information to assist the Inspector of Accidents, Chairman Court / Committee of Inquiry and others who may participate in aviation accident investigation. It is intended to provide guidance on the process of conducting an investigation, from initial notification to the adoption of the final report, probable cause, and recommendations. Although it includes some technical information related to investigative activities in aviation accidents, it is primarily intended to provide guidance of a procedural or administrative nature. Investigators should refer to Annex 13 of the International Civil Aviation Organization (ICAO) for procedural references and to the ICAO Manual of Aircraft Accident Investigation for technical information and examples of investigative techniques.

CHAPTER 3

DEFINITIONS

Following terms when used in this Manual have the following meaning :

Accident. An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

a) a person is fatally or seriously injured as a result of:
— being in the aircraft, or
— direct contact with any part of the aircraft, including parts which have become detached from the aircraft,
or
— direct exposure to jet blast,

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:
— adversely affects the structural strength, performance or flight characteristics of the aircraft, and
— would normally require major repair or replacement of the affected component,

except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or is completely inaccessible.

Accredited representative. A person designated, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State.

Adviser. A person appointed, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

***Causes*.** Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident.

***Flight recorder*.** Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Incident. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

***Investigation*.** A process conducted for the purpose of accident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations.

Inspector of Accidents. A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation under Rule 71 of the Indian Aircraft Rules 1937..

***Maximum mass*.** Maximum certificated take-off mass.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

***Preliminary Report*.** The communication used for the prompt dissemination of data obtained during the early stages of the investigation.

***Safety recommendation*.** A proposal of the accident investigation authority of the State conducting the investigation, based on information derived from the investigation, made with the intention of preventing accidents or incidents.

Serious incident. An incident involving circumstances indicating that an accident nearly occurred. List of examples of serious incidents is at Appendix 'A'

Serious injury. An injury which is sustained by a person in an accident and which:

a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or
b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or
d) involves injury to any internal organ; or
e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or

f) involves verified exposure to infectious substances or injurious radiation.

State of Design. The State having jurisdiction over the organization responsible for the type design.

State of Manufacture. The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

State of Occurrence. The State in the territory of which an accident or incident occurs.

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

State of Registry. The State on whose register the aircraft is entered.

CHAPTER 4

REVIEW AND AMENDMENT

The Manual will be reviewed by the Director Air Safety (Hqrs.) O/O the Director General of Civil Aviation from time to time and he will be responsible for issuing the Amendments, if any, as and when he believes that any information in this manual is incorrect, inconsistent or outdated. The Statutory provisions and other related documents are as given below:

STATUTORY PROVISIONS

Statutory provisions, relating to the investigation of an aircraft accident or incident are:

1. The Aircraft Act 1934; Section 7

2. Indian Aircraft Rules 1937

    a) Part X – Investigation of Accidents (Rules 68-77A)
    b) Part X-A – Investigation of Incidents (Rules 77B-77D)

RELATED DOCUMENTS

Documents and reference material relating to the content of this manual are:

AIP India
Air Safety Circulars
Aeronautical Information Circulars, India
Civil Aviation Requirements of DGCA, India
ICAO Annex 13

CHAPTER 5

APPLICABILITY

The contents are applicable to aircraft registered in any other contracting State and operated pursuant to an agreement for the lease, charter or interchange of the aircraft or any similar arrangement by an operator who has his principal place of business, or, if he has no such place of business, his permanent residence in India, provided that an agreement has been reached between the government of the State of registry of the Aircraft and the Government of India in regard to transfer of functions and duties pursuant to Article 83 bis of the Chicago Convention.

The contents are not applicable to aircraft registered in India and operated pursuant to an agreement for the lease, charter or interchange of aircraft or any similar arrangement by an operator who has his principal place of business or if he has no such place of business, his permanent residence in a contracting State, provided that an agreement has been reached between the Government of India and the Government of that contracting state in regard to transfer of functions and duties pursuant to Article 83 bis of the Chicago Convention.

CHAPTER 6

NOTIFICATION

6.1 GENERAL

An aircraft accident shall be notified in accordance with the provisions of sub-rules 3, 4 & 5 of rule 68 of the Indian Aircraft Rules, 1937. The notice and information of the accident shall be sent as soon as possible by the most suitable and quickest means available by the person in command of the aircraft or if he be killed or incapacitated the owner, operator, the hirer or other persons on whose behalf he was in command of the aircraft to the

a) Director General of Civil Aviation including the Regional Air Safety Office(s) where the Operator is based and where the location of the accident falls. and

b) District Magistrate and the Officer Incharge of the nearest police station.

Telephone, facsimile, e-mail or the Aeronautical Fixed Telecommunication Network (AFTN) will in most cases constitute "the most suitable and quickest means available". This information for DGCA addresses may be obtained from the DGCA Website http://www.dgca.nic.in. More than one means of communication may be used.

The format and the content of the accident or serious incident information should be as given in the Appendix 'C'**.** As soon as it is possible to do so, the details omitted from the notification as well as other known relevant information shall be dispatched to Director General of Civil Aviation and its respective Regional Air Safety Offices.

Though the statutory responsibility of notification is as given above, yet the Regional offices of the Civil Aviation Department and ATC units of Airports Authority of India, are expected to report to the Director General of Civil Aviation, any civil aircraft accident which comes to their knowledge.

6.1(a) In case a notification is received from the State conducting the investigation, on request, shall be provided with pertinent information on any organization whose activities may have directly or indirectly influenced the operation of the involved aircraft.

6.2 ACCIDENTS OR SERIOUS INCIDENTS TO AIRCRAFT REGISTERED WITH ANOTHER CONTRACTING STATE

6.2.1 Air Safety Directorate (Hqrs.) Office of the DGCA shall forward as soon as possible by the most suitable and quickest means available the information of the accident or serious incident to the State of Manufacture, the State of Design, State of Registry, the State of the Operator and ICAO as per Appendix 'D'. The State of the Operator shall also be requested to intimate the presence and description of dangerous goods on board the aircraft, if any.

6.2.2 A list of addresses of aircraft accident and incident investigation authorities can be found in the Manual of Aircraft Accident and Incident investigation, Part I – Organization and Planning (Doc 9756). A copy of the list is enclosed at the end of this Manual also for ready reference. (Appendix 'E')

6.2.3 The notification shall be in plain language and contain as much of the information as is readily available but its dispatch shall not be delayed due to the lack of complete information.

6.2.4 As soon as it is possible to do so, the details omitted from the notification as well as other known relevant information shall be dispatched to the State of Manufacture, the State of Design, State of Registry, the State of the Operator and ICAO.

6.2.5 In case of foreign registered aircraft, the State of Registry, State of Operator, State of Design or State of Manufacturer shall each be entitled to appoint an accredited representative to participate in the investigation. The State of Registry or the State of the Operator may appoint one or more advisers, proposed by the operator, to assist its accredited representative.

6.2.6 When neither the State of Registry, nor the State of the Operator appoints an accredited representative, Operator should be invited to participate, subject to the procedures of the investigation.

6.2.7 When neither the State of Design, nor the State of Manufacture appoint an accredited representative, organizations responsible for the type design and the final assembly of the aircraft shall be invited to participate, subject to the procedures of the investigation.

6.2.8 Any State, which has on request provided information, facilities or experts in conducting the investigation, shall be entitled to appoint an accredited representative to participate in the investigation. Such a State shall also be entitled to appoint one or more advisers to assist the accredited representative in the

investigation and these advisers assisting accredited representatives shall be permitted, under the accredited representatives' supervision, to participate in the investigation to the extent necessary to enable the accredited representatives to make their participation effective.

Participation in the investigation shall confer entitlement to participate in all aspects of the investigation, under the control of the Inspector of Accidents, in particular to:

a) visit the scene of the accident;
b) examine the wreckage;
c) obtain witness information and suggest areas of questioning;
d) have full access to all relevant evidence as soon as possible;
e) receive copies of all pertinent documents;
f) participate in read-outs of recorded media;
g) participate in off-scene investigative activities such as component examinations, technical briefings, tests and simulations;
h) participate in investigation progress meetings including deliberations related to analysis, findings, causes and safety recommendations; and
i) make submissions in respect of the various elements of the investigation.

6.2.9 These accredited representatives and their advisers:

a) shall provide all relevant information available to them; and
b) shall not divulge information on the progress and the findings of the investigation without the express consent of the State conducting the investigation.

6.2.10 Similarly a State, which has a special interest in, an accident by virtue of fatalities or serious injuries to its citizens shall, upon making a request to do so, be permitted to appoint an expert who shall be entitled to:

a) visit the scene of the accident;
b) have access to the relevant factual information;
c) participate in the identification of the victims;
d) assist in questioning surviving passengers who are citizens of the expert's State; and
e) receive a copy of the Final Report.

6.3 ACCIDENTS OR SERIOUS INCIDENTS TO INDIAN REGISTERED CIVIL AIRCRAFT IN THE TERRITORY OF ANOTHER CONTRACTING STATE

6.3.1 In case an Indian Registered Civil aircraft is involved in an accident or serious incident in the territory of another contracting State, and information/ notification of the accident/ serious incident is received from the State of Occurrence, it should be acknowledged to the State of Occurrence.

6.3.2 Upon receipt of the notification and as soon as possible , any relevant information available shall be provided to the State of Occurrence regarding the aircraft and flight crew involved in the accident or serious incident. Intention if any shall also be informed whether to appoint an accredited representative and if such an accredited representative is appointed, the name and contact details as well as the expected date of arrival should be provided to the State of Occurrence.

When the State conducting an investigation of an accident to an aircraft of maximum mass of over 2250 kg specifically requests, accredited representative shall be appointed for that accident.

6.3.3 Upon receipt of the notification and with a minimum of delay and by the most suitable and quickest means available, the State of Occurrence shall be provided with details of dangerous goods on board the aircraft.

6.4 ACCIDENTS OR SERIOUS INCIDENTS TO INDIAN REGISTERED CIVIL AIRCRAFT IN THE INDIAN TERRITORY, IN A NON-CONTRACTING STATE OR OUTSIDE THE TERRITORY OF ANY STATE

6.4.1 In case the location of the accident or the serious incident to an Indian Civil registered aircraft cannot definitely be established as being in the territory of any State, the investigation shall be instituted and conducted However, the investigation in whole or part may be delegated to another State by mutual arrangement and consent.

6.4.2 When the accident or the serious incident to an Indian registered Civil aircraft has occurred in the territory of a non-Contracting State which does not intend to conduct an investigation in accordance with Annex 13, investigation will be carried out in cooperation with the State of Occurrence but, failing such cooperation, investigation will be carried out with such information as is available.

6.4.3 As a State of Registry when an investigation is being conducted under the Aircraft Rules into an accident or serious incident to Indian Civil Registered aircraft in the Indian territory or in a Non Contracting State or outside the Territory of any State notification shall be forwarded to the State of the Operator, the State of Design, the State of Manufacture and the International Civil Aviation Organization as per Annex 13.

6.4.4 When any civil aircraft other than the Indian Civil Registered aircraft is involved in any accident or serious incident in International waters and the location is nearest to the Indian Territory, all assistance shall be provided as possible. Similarly in case an Indian Civil Registered aircraft is involved in an accident or serious incident in International waters request shall be made to the State nearest to the location to provide assistance as possible.

6.4.5 In case the State conducting the investigation of an accident or an incident, requests, all the relevant information available shall be provided to that State. Information pertinent to accident or incident shall be otherwise also provided to the State conducting investigation of accident or incident.

6.4.6 PARTICIPATION BY STATE OF REGISTRY/ OPERATOR, STATE OF DESIGN OR THE STATE OF MANUFACTURE

In accordance with ICAO Annex 13, if a request is received from the State of Design or the State of Manufacture that the aircraft, its contents, and any other evidence remain undisturbed pending inspection by an accredited representative of the requesting State, all neceessary steps shall be taken to comply with such request, so far as this is reasonably practicable and compatible with the proper conduct of the investigation; provided that the aircraft may be moved to the extent necessary to extricate persons, animals, mail and valuables, to prevent destruction by fire or other causes, or to eliminate any danger or obstruction to air navigation, to other transport or to the public, and provided that it does not result in undue delay in returning the aircraft to service where this is practicable.

6.5 RESPONSIBILITIES OF KEY PERSONNEL

6.5.1 Early notification is essential to initiate and organize the investigation. Initial information concerning the facts and circumstances of the occurrence will often be incomplete and erroneous. For this reason, early factual information transmitted for alerting purposes must be handled with considerable discretion. Parties notified are to be cautioned about the preliminary nature of the data.

6.5.2 Whenever an accident occurs, the Owner, Operator, Pilot-in-Command, Co-pilot of the aircraft shall take all reasonable measures to protect the evidence and to maintain safe custody of the aircraft and its contents for such a period as may be necessary for the purposes of an investigation subject to the Indian Aircraft Rules 1937. Safe custody shall include protection against further damage, access by unauthorized persons,

pilfering and deterioration.

6.5.3 DGCA Regional Office(s) / The Officer Incharge of Aerodromes, Airports Authority of India closest to the site of accident shall also assist in coordination with Local Police Authorities and shall take immediately all reasonable measures to protect the evidence until the arrival of the Inspector of Accidents at the scene whenever accident occurs at a place under their jurisdiction. Normally, the action taken for arranging for guarding of the wreckage include the preservation, by photographic or other means of any evidence which might be removed, effaced, lost or destroyed.

6.5.4 All the documents relating to the aircraft shall be segregated and sealed by the Operator and shall be handed over to DGCA Officers who shall determine the adequacy of action as deemed appropriate and may seal any other documents etc. pertinent to the investigation of the accident as any of the material could be of use to the investigating authority. The broad outlines of the records, which should be segregated and sealed immediately as soon as possible after the accident occurs are given at Appendix-B.

6.5.5 The assistance of civil authorities, particularly that of local police is also necessary to ensure that vital evidence is not lost. The Inspector of Accidents or any other authorised person shall co-ordinate with the police authorities/ Local Government Authorities to initiate action to extricate persons from the aircraft, to arrange for immediate first aid and medical attention, to extinguish fire and removal of the persons dead or alive from the wreckage.

6.5.6 The Police authorities shall ensure that the Captain and the Co-pilot are immediately subjected to medical check up for consumption of alcohol. The doctors carrying out such a medical check up shall take sample of blood, urine etc. required for detailed chemical analysis.

6.5.7 In the event of death of the crewmembers, complete autopsy examination of fatally injured flight crew and, subject to the particular circumstances, of fatally injured passengers and cabin attendants shall be carried out. These examinations shall be expeditious and complete. The police authorities shall ensure that the bodies are subjected to these examinations. (Refer Air Safety Circular 3 of 1984).

6.5.8 If appropriate the Medical examination of the surviving crew, passengers and involved aviation personnel, should be carried out by a physician,

preferably experienced in accident investigation. These examinations should be expeditious.

6.5.9 Additional Director General Medical Services (ADGMS) DGCA (Hqrs.) shall be associated in the Post Mortem(s) and he shall give the reports to the Inspector of Acciodents.

NOTE 1 While rescuing the injured crewmembers, their identification and location in or around the aircraft must be carefully observed and recorded. In case the pilot and/or copilot are found dead, the necessary photographs must be taken in situ prior to the removal. The removal action should be such as to cause minimum of disturbance to the aircraft wreckage/parts and any such disturbance should be fully recorded. The location of the passengers should also be recorded immediately during rescue operation. However, removal of the injured to the nearest hospital must not be delayed for want of formalities with regard to the recording as stated above.

NOTE 2 Safe custody shall include protection against further damage, access by unauthorised persons, pilfering and deterioration. All the parts of the aircraft or relevant matter picked up from the wreckage should be preserved. The positions at which the flight data and voice recorders are found if installed on the aircraft should be recorded on a sketch.

6.5.10 If, in the course of an investigation it becomes known, or it is suspected, that an act of **unlawful interference** was involved, the Inspector of Accidents shall immidiately initiate action to ensure that the **aviation security authorities i.e. BCAS** is informed who in turn shall submit the report to DGCA after carrying out their investigation on the involved aspects.

6.5.11 Typically, the operator should provide sufficient support to the Inspector of Accidents and other personnel in the initial coordination effort necessary to make arrangements for the investigation team to reach the site. Operator should also help with such important items as travel arrangements, hotels, rental cars, and on-site administrative support. Whenever possible, the team of the operator should travel with the investigation team to the accident site. It is important that the investigative process should begin as soon as possible and with the most current and accurate information.

6.5.12 In case of accident to Foreign registered aircraft, the aircraft, its contents or any parts thereof shall be released as soon as they are no longer

required in the investigation, to any person or persons duly designated by the State of Registry or the State of the Operator, as applicable. For this purpose access to the aircraft, its contents or any parts thereof shall be facilitated, provided that, if the aircraft, its contents, or any parts thereof lie in an area within which it is impracticable to grant such access, removal shall be effected to a point where access can be given.

CHAPTER 7

ORGANISATION AND CONDUCT OF THE INVESTIGATION

7.1 AIRCRAFT RULES FOR INVESTIGATION

7.1.1 RULES PERTAINING TO ACCIDENT INVESTIGATION

7.1.1.1 Rule 71 of Aircraft Rules 1937 lays down the requirements of investigation of the accidents by Inspector of Accidents appointed by Director General of Civil Aviation. Rule 74 and Rule 75 of the said Rules stipulate the modalities of investigation of air accidents by Committees and Courts of Inquiry.

7.1.1.2 These investigating authorities shall have independence in the conduct of the investigation and have unrestricted authority over its conduct. The investigation shall include:

a) the gathering, recording and analysis of all available information on that accident or incident;
b) if appropriate, the issuance of safety recommendations;
c) if possible, the determination of the causes; and
d) the completion of the final report.

When possible, the scene of the accident shall be visited, the wreckage examined and statements taken from witnesses.

7.1.1.3 On receipt of accident information & other details, the Inspector of Accidents appointed under Rule-71 of the Indian Aircraft Rules, 1937 by DGCA should immediately proceed to the site of accident to conduct the investigation. In case a Committee of inquiry under Rule-74 or the formal investigation (Court of inquiry) under Rule-75 is ordered by Government to carry out a particular accident investigation which normally takes some time to set up after the accident date, the Inspector of Accidents who had already commenced onsite investigation work shall on instructions from Committee/Courts of Inquiries shall assist the Committee or the Court as the case may be with all the relevant factual information.

7.1.1.4 A public notice that investigation into the causes of the accident is taking place may be given by the Director-General/ Central Government in such a manner as is thought fit and every such public notice shall state that any person who may desire to make representation concerning the circumstances or causes of the accident may do so in writing within the time specified in the notice.

7.1.1.5 The Inspector of Accidents shall make a report to the Director-General stating all relevant facts with regard to the accident and his conclusions with regard to the causes of the accident and adding any observations and recommendations which he may think fit to make with a view to preservation of life and avoidance of similar accidents in future.

7.1.1.6 Before acceptance by the DGCA, the Investigation report of the Inspector of Accidents shall be discussed from the technical angle at the DGCA Headquarters (Air Safety Directorate). Formal review of the accuracy of all the factual material obtained during the investigation shall be carried out. At this stage if any problem regarding investigation issues is there should be resolved or at least addressed to the Inspector of Accidents.

7.1.1.7 The Director-General shall forward the report of the Inspector of Accidents to the Central Government with such comments as the Director General may think fit to make and the Central Government may, at its discretion, make the whole or part of any such report public in such manner as it may consider fit.

7.1.1.8 The Committee of Inquiry shall make a report to the Central Government stating all relevant facts with regard to the accident and its conclusions with regard to the causes of the accident, and adding any observation and recommendation which it may think fit to make with a view to preservation of life and avoidance of similar accidents in future. The Central Government may cause the whole or part of any such report of the Committee of Inquiry to be made public in such manner as it may think fit.

7.1.1.9 The Court shall make a report to the Central Government stating its findings as to the causes of the accident and the circumstances thereof and adding any observations and recommendations which the Court thinks fit to make with a view to the preservation of life and avoidance of similar accidents in future, including, a recommendation for the cancellation, suspension or endorsement of any licence or certificate issued under these rules.

7.1.1.10 Any judicial or administrative proceedings to apportion blame or liability should be separate from these investigations.

7.1.2 RULES PERTAINING TO INCIDENT INVESTIGATION

7.1.2.1 The Director-General may order the investigation of any serious incident involving an aircraft or a person associated with the maintenance and operation of aircraft, or both, and may, by general or special order, appoint a competent and duly qualified person having experience in aviation

accident/incident investigation as Inquiry Officer for the purpose of carrying out such investigation.

7.1.2.2 The Inquiry Officer shall make a report to the Director-General stating all relevant facts with regard to the incident and his conclusions with regard to the causes of the incident and adding any observations and recommendations which he may think fit to make with a view to avoidance of similar incidents in future.

7.1.2.3 The Director-General shall forward the report of the Inquiry Officer to the Central Government with such comments as the Director-General may think fit to make and the Central Government may, at its discretion, make the whole or part of any such report public in such a manner as it may consider fit.

7.2 POWERS

7.2.1 The investigation of aircraft accidents and incidents has to be strictly objective and totally impartial and must also be perceived to be so. The Aircraft Rules empowers an investigating personnel to withstand political or other interference or pressure.

7.2.2 Rule 72 of the Aircraft Rules, empowers the Inspector of Accident and Committee of Inquiry :

(a) by summons under his hand to require the attendance of any person whom he thinks fit to call before him and examine for such purpose and to require answers or returns to any inquiries he thinks fit to make;

(b) to require any such person to make and to sign a declaration regarding the true nature of the statements made by him;

(c) to require and enforce the production of all books, paper, documents and articles which he may consider necessary for the investigation, and to retain any such books, papers, documents and articles until completion of the investigation; and

(d) to have access to and examine any aircraft involved in the accident, the place where the accident occurred or any other place, the entry upon and examination of which appears to the Inspector necessary for the purpose of the investigation.

7.2.3 The Court of Inquiry investigating into the causes of the accident shall have, for the purpose of the investigation, all the powers of a Civil Court

under the Code of Civil Procedure, 1908 and without prejudice to these powers the Court may:-

(a) enter and inspect, or authorise any person to enter and inspect, any place or building, the entry or inspection whereof appears to the Court requisite for the purposes of the investigation; and

(b) enforce the attendance of witnesses and compel the production of documents and material objects; and every person required by the Court to furnish any information shall be deemed to be legally bound to do so within the meaning of section 176 of the Indian Penal Code.

7.2.4 Any judicial or administrative proceedings to apportion blame or liability should be separate from these investigations.

CHAPTER 8

SIZE AND SCOPE OF THE INVESTIGATION

When a large transport aircraft meets with an accident, and the accident is ordered to be investigated under Rule 74 or 75 of the Indian Aircraft Rules 1937 i.e. by Committee or Court of Inquiry a substantial team of investigators, set up in specialised groups, will usually be necessary to cover all aspects. In the case of an accident involving smaller aircraft, the effort in terms of manpower required for the investigation is proportionately smaller. Even so, the degree of individual effort and diligence in determining and recording the facts has to be of the same high standard as for a large aircraft.

8.1 GROUP INVESTIGATION

Depending on the size & complexity of the investigation, nature of accident and investigation skills available, Director Air Safety, DGCA (Hqrs.) may constitute appropriate groups from the following after obtaining information from site and analysing the preliminary information and evidences on the accident.

a) Operations Group – to develop all facts concerning the history of flight and flight crew activity in the final phases of flight, during an after the accident.
b) Weather Group – to collect and compile all factual meteorological data pertinent to accident.
c) Air Traffic Services Group – to review ATC unit records and to determine operating status of navigational aids, communication equipment, radar, transponder equipment, computers etc.
d) Witness Statement Group – to contact and interview all persons who may have seen or heard some portion of flight or have knowledge of the flight or weather conditions at the time of accident.
e) Flight Recorder Group – to locate and secure the flight recorders carried on the aricraft and prepare their readouts.
f) Structures Group – to locate and identify aircraft components and parts, prepare wreckage distribution chart and investigate airframe and flight controls.
g) Powerplant Group – to investigate engines(s) including fuel and oil systems, propeller(s) and engine and powerplant controls.
h) Systems Group – to examine all aircraft systems namely hydraulics, penumatics, electrical, radio communication, navigational, air-conditioning and pressurisation etc.
i) Maintenance Records Group – to review all maintenance records to ascertain maintenance histroy of the aircraft in respect of adequacy of inspections, malfunctions that might be related to the occurrence.

j) Human Factors Group – to investigate aero-medical and crash injury aspect of the investigation.
k) Evacuation, Search, Rescue and Fire Fighting Group – to investigate the circumstances of evacuation, search and rescue and performance of ground fire fighting services.

The groups so constituted would assist Inspector of Accidents appointed under Rule-71 of Aircraft Rules and render their report on involved aspects in writing to him including the evidences in original. The final investigation report shall be submitted by the Inspector of Accidents taking into consideration the reports of the various groups assisting him in the investigation. During the investigation there would be continuous liaison between the Inspector of Accidents and group leader(s).

CHAPTER 9

ON SITE INVESTIGATION

9.1 AIM OF ON-SITE INVESTIGATION

The aim of the on-site investigation is to collect as much evidence as possible before the wreckage has been disturbed. Sometimes the time available for an on-site investigation may be limited by factors outside the control of Investigation Personnel, such as weather, or a hazardous location. You should concentrate on collecting relevant evidence rather than trying to analyse the occurrence on-site.

9.2 ON ARRIVAL AT THE SITE

The Inspector of Accidents/ Investigating Personnel must complete the following immediately on arrival at the site:

9.2.1 Check with the Police whether there has been any disturbance of the wreckage during any rescue operations and record the extent of the disturbance.

9.2.2 You may require that the site is not disturbed by persons such as the land owner, aerodrome owner or local authority agencies. Pursuant to the Indian Aircraft Rules 1937, it is however an offence for a person to hinder, or prevent, access by an authorised person to a place to which access is necessary. You need to be mindful of the normal functional use of the occurrence site.

9.2.3 Review arrangements for guarding the site and impress on any guards the importance of their duties, in order to:

- Prevent disturbance of the wreckage
- Protect and preserve, where possible, any impact marks made by the aircraft
- Admit only those persons or vehicles authorised.

9.3 PRECAUTIONARY MEASURES

Observe the following precautionary measures:

9.3.1 If the site has been attended by emergency services any fire has probably been extinguished. As long as there is fuel in the wreckage and ignition sources for example, batteries precautions must be taken to prevent an outbreak of fire. In particular you should check that electrical power is not still applied to any system which could cause a hazard to personnel for example, radiation from a radar

transmitter. Fire appliances should be kept at hand as long as the risk remains. If residual fuel has to be drained from the aircraft as a precautionary measure, the quantity removed and from which tank(s) it was removed must be recorded.

9.3.2 During subsequent examination of the wreckage beware of causing further fire/explosion hazard by rupturing any system component for example, oxygen supply lines. Other hazards, which may be present at the site, particularly after a fire has occurred, are associated with the following:

- Inflated tyres
- Compressed springs
- Hydraulics/pneumatics
- Oleos
- Igniters
- Oxygen systems fixed and portable
- Fire extinguishers
- Evacuation chutes
- Flares
- Life rafts and jackets
- Composite materials.

9.3.3 Dangerous cargo may have been in the aircraft. This may be confirmed by the aircraft operator. In this case examination of the wreckage must not commence until there is confirmation by an expert that the site is safe for personnel to work in. This applies particularly to radioactive or biological cargo. Remember that fire or impact may have damaged protective packaging of dangerous cargo thus rendering them most hazardous and difficult to recognise, especially if labelling has been destroyed or has come off.

9.4 INITIAL SURVEY OF THE SITE

9.4.1 The primary considerations at this time are to establish:

- A probable flight path
- Impact angle
- Impact speeds
- Whether or not the aircraft was under control
- Whether structural failure occurred prior to impact.

9.4.2 A check that all of the major components of the aircraft, particularly the extremities, are present at the accident site will provide a good indication (though not a completely reliable one) of whether or not structural failure contributed to

the occurrence. You should be aware that items of wreckage may be submerged, buried or otherwise concealed.

9.4.3 Proceed as follows when carrying out the initial survey:

9.4.3.1 After discussions with the police (or other local authority in charge) carry out a preliminary survey. Do not attempt a detailed examination at this stage. The aim is to obtain as complete and clear a picture as possible of the circumstances under which the accident occurred.

9.4.3.2 Establish the point of initial contact with the ground or other objects and then follow the subsequent path of the aircraft by searching for marks or scars on the ground, on buildings, trees, shrubs, rocks, etc.

9.4.3.3 Take into account the general state of the wreckage including location of items of wreckage, contents of the aircraft and location of survivors and bodies. The wreckage itself should not be moved or disturbed.

9.4.4 The impressions gained during the general survey of the wreckage and the knowledge gained of the terrain will assist in planning further investigation and assessing priorities in the work to be undertaken.

9.5 SITE RECORDS

All physical evidence and deductions made for various aspects from the wreckage/aircraft must be recorded. This would be most useful during later analysis of the occurrence. Additionally, a pocket-sized notebook will be convenient for recording details at the accident site. This should be retained for later reference.

9.6 ACCIDENT LOCATION

9.6.1 Determine and record the precise location of the accident site. This can be a problem in remote, rugged terrain where ground features are scarce. A Global Positioning System (GPS) receiver would be useful for this purpose.

9.6.2 Determine the site elevation and significant terrain gradient as both may be relevant to the accident. A surveyor may later be engaged to provide this information if it cannot be determined from maps and other sources.

9.7 EVIDENCE

9.7.1 Review the arrangements for guarding the site when making the preliminary survey of the entire accident scene. Use this opportunity to re-emphasise to all

concerned that the pieces of wreckage must not be moved or disturbed. Since the preservation of impact marks is very important, careful note should be made of all ground marks so that guard arrangements may be amended where necessary to provide additional security.

9.7.2 Ensure that all aspects of the wreckage trail are preserved until they have been photographed and their description and location have been recorded. This includes such items as marks and scars upon trees or rocks, location of pieces of wreckage, and location of bodies or human remains.

9.7.3 Ensure that flight recorders are immediately retrieved and kept in safe custody for analysis purposes.

9.8 PRESERVATION OF EVIDENCE

9.8.1 In carrying out an occurrence investigation, officers will be required to handle various articles, which may be required as evidence (in the form of exhibits) in various proceedings. These articles may consist of documents or aircraft components or material. You must, therefore:

- Ensure that the integrity of these potential exhibits is preserved.
- As a general rule, handle evidence as little as possible.
- Retain the item as closely as possible in its original condition.
- Make immediate arrangements for appropriate preservation and safe storage. This may include oiling, greasing, wrapping or sealing.

Note: Investigators collecting parts should not attempt to match fracture surfaces together, because of the damage that can be caused to those surfaces.

9.9 COLLECTION AND HANDLING OF FLUID SAMPLES AS EVIDENCE

9.9.1 Fuel and other fluid samples require special consideration. If there is any likelihood of the fluid samples being required as evidence, they should be obtained in accordance with the following procedures:

9.9.1.1 If possible, three samples should be taken in the presence of the person giving permission.

9.9.1.2 Each sample should, if possible, be placed in an identical sample bottle.

9.9.1.3 The sample bottles should then be security sealed.

9.9.1.4 Each bottle should be marked with the source, date, time and place of the taking of the sample and should be signed by the officer concerned.

9.9.1.5 The three sample bottles should then be distributed as follows:

- One to the owner or, with the owner's permission, an agent, pilot in command or the person responsible for the maintenance
- One for analysis
- One to be retained as a control.

If it is not possible to comply with the above conditions, try to obtain a sample in the best way the circumstances allow.

9.10 RELEASE OF WRECKAGE :

There should be no pressure to release all of the on-scene wreckage. Often it is better to arrange for wreckage removal and storage and to retain control of the wreckage in case there is a need to examine it later.

9.10.1 When on-site investigation has been completed the aircraft wreckage should be handed over to the owner or their representative so that salvage/clean-up operations can commence. It is essential to obtain a receipt for the evidence. You must record the movement of that evidence.

9.10.2 In case of an occurrence to an aircraft registered in other contracting State, the aircraft, its contents or any parts thereof shall be released by Director Air Safety, DGCA (Hqrs.) as soon as they are no longer required in the investigation, to any person or persons duly designated by the State of Registry or the State of the Operator, as applicable.

9.10.3 For this purpose access to the aircraft, its contents or any parts thereof, shall be facilitated provided that, if the aircraft, its contents, or any parts thereof lie in an area within which it is impracticable to grant such access, removal shall be affected to a point where access can be given.

9.11 PERSONAL EFFECTS

Record the position of personal effects found at the site of an occurrence. Hand them to police, obtaining a receipt for significant items, when no longer required for the investigation and make a record of this.

9.12 ALLOCATION OF TASKS

After the initial survey in case groups have been formed for investigation purposes, the Inspector of Accidents/ Chairman Court/ Committee of Inquiry assigns the investigation tasks to the members of the team(s), having regard to their special qualifications and to the initial assessment of the priorities of gathering factual information relating to the accident. The importance of timely discussion with other groups when key evidence is discovered should be emphasised. Additionally, regular meetings of the groups should be held to review the progress of work and to permit a free interchange of ideas and information by group members. Investigators will often be working in unpleasant conditions, and the group leaders should impose realistic targets for individual members. All investigators should be permitted reasonable rest periods.

9.13 PHOTOGRAPHS

Take photographs as soon as possible after the occurrence and before the wreckage is moved or disturbed. Where bodies are present, photographs are desirable before removal. Photograph impact marks as a first priority, preferably during the initial walk-through of the site, as these may be obliterated by later activity at the accident site. Good photographs furnish the best possible record of an occurrence site. Since many photographs will be taken, it is essential that they are labeled and indexed in some way to assist later analysis. A simple title-board written with a felt pen and sheet of paper can be used to identify close-up photographs. Note that some recent cameras provide the facility not only to date/time-stamp each photo, but to also digitally enter a caption. Photographs should cover general views of the scene from four directions and also back along the wreckage trail to the first point of contact. A good coverage of the wreckage in the condition in which it is found and before it is disturbed is essential. Record the location and direction of each photograph, paying particular attention to the following:

- Engine(s), before anything is moved, showing details of condition and damage from all angles, to include:

    - Engine control lever positions at the engines
    - Engine components, and accessories
    - Engine instrument readings and positions of control levers and switches.

Note: While important, these indications and settings are easily affected by forces of the crash and are not always conclusive indications of positions at the time of impact.

- Instrument settings and readings
- Position of controls in the cockpit
- Radio settings
- Autopilot setting
- Fuel selectors
- Switch positions
- Undercarriage and flap selector positions
- Engine control lever positions
- Position of flap jacks, undercarriage jacks, latches
- Control surface positions
- Trim tab settings
- Suspicious breakages or bends
- Propeller/rotor blades showing pitch positions
- Fire damage
- Impact marks
- Seats and seat belts.

Consider also any photographs or video imagery taken by witnesses.

9.14 WRECKAGE

9.14.1 WRECKAGE DISTRIBUTION CHART

After you have made your initial study of the general scene of the accident and taken photographs, your first step in the actual investigation is usually that of plotting the distribution of the wreckage from a convenient datum. This task must be carried out carefully and accurately, as the study of the completed chart may later suggest possible failure patterns or sequences. You will refer to it frequently during the investigation and it will supplement your written report. In most accidents the chart should record the following:

- Locations of all major components, parts and accessories Freight
- Locations at which any accident victims were found
- The initial contact markings and other ground markings, with suitable reference to identify the part of the aircraft or component responsible for the marking
- If terrain features appear to have a bearing on the accident or on the type or extent of structural damage they too should be noted
- Pertinent dimensions, descriptive notes and also the locations from which photographs were taken add to the completeness of the chart.

9.14.2 EXAMINATION OF IMPACT MARKS AND DEBRIS

Determine which part of the aircraft impacted first. This can usually be done by locating the marks of the first impact of the aircraft, and examining the distribution of the wreckage. The path of the aircraft may be deduced by careful examination of ground marks or scars on trees, etc. Wing tips, propellers or landing gear leave telltale marks or torn-off parts at points of contact with fixed objects. Ground scars used in conjunction with height of broken trees will assist in establishing angle, attitude and speed at impact. From these marks it is usually possible to form a preliminary mental picture of :

- The direction, angle and speed of descent
- Whether it was a controlled or uncontrolled descent
- Whether the engines were under power at the time of impact
- Whether the aircraft was structurally intact at the point of first impact.

9.14.3 WRECKAGE IN THE WATER

Investigation at times may involve an aircraft which has ended up in water. Recovery may be expensive and time-consuming and this has to be weighed up with the likely benefit to be achieved. Wreckage in salt water can deteriorate quickly, particularly magnesium and, to a lesser extent, aluminum parts. As this process accelerates on exposure to air, wreckage collected from salt water must be washed thoroughly with fresh water as soon as it is raised. Further preservation action will be required for any components that must be subjected to metallurgical examination. Water-displacing fluid, oil or inhibited lanolin may be used as an interim preservative solution. Components such as CVR and flight-data recorders should not be dried but kept in fresh water until a specialist can assume responsibility.

9.15 OPERATIONS INVESTIGATION

9.15.1 OVERVIEW OF OPERATIONS INVESTIGATION

The Operations Investigation is concerned with facts relating to the history of the flight and to the activity of the flight crew before and during the occurrence. The major areas involved in the Operations Investigation are:

- Crew histories
- Flight planning
- Weight and balance
- Weather
- Air traffic services
- Communications

- Navigation
- Aerodrome facilities
- Aircraft performance
- Compliance with relevant instructions
- Examining witness statements
- Determination of final flight path
- Sequence of flight.

There is a close link between the work in the Operations Investigation and that in other investigation areas — for instance, the flight path of the aircraft as constructed from air traffic control and witness statements should be compared with that derived from flight recorders. Such corroboration, whenever possible, constitutes one of the principles of a properly executed investigation, namely, cross-checking the validity of information from one source against information on the same subject from a different source.

9.15.2 CREW HISTORIES

A study of all the facts pertaining to the crew forms an important part of both the Operations and Human Factors investigations. Because these two aspects are closely related, a high degree of coordination in the collection and evaluation of the relevant facts is required to achieve the best possible use of the information collected. The crew histories should cover their overall experience, their activities, especially during the 72 hours prior to the occurrence, and their behaviour during the events leading up to the occurrence.

9.15.3 FLIGHT PLANNING

A flight plan may have been prepared and filed with air traffic services. This will provide the data such as the route, cruising altitudes and timings. It may also provide fuel load and fuel consumption etc, which may need to be examined in detail and correlated to the actual flight path. Commercial operators often have flight planning sections, which prepare all flight plans, and will have a copy of the flight plan even if one is not available in the aircraft. In the case of occurrences involving navigation factors or fuel consumption questions, it may be necessary to check flight plans and navigation logs to ensure that the data from which the flight plans were derived were relevant to the particular circumstances of the intended flight, such as weather, aircraft type and model, cruising altitude etc. In the case of light aircraft operated on private and training flights, it will be useful to ascertain the crew's intentions regarding the flight and any manoeuvres planned.

9.15.4 WEIGHT AND BALANCE

A weight and balance sheet based on the planned flight may have been prepared. Commercial flights generally use a standard form for these calculations. In the case of light aircraft, a weight and balance sheet is rarely prepared. Since weight, balance and load are critical factors that affect aircraft stability and control, especially in light aircraft, considerable effort should be made to deduce the most probable weight of the aircraft at the time of the occurrence, having regard to the flight time since take-off. It will be necessary to check flight manual load data sheets, fuel records, freight and passenger documentation to arrive at a final estimate. Elevator trim settings may give a clue to the centre of gravity at the time of the occurrence.

9.15.5 WEATHER

Weather conditions at the time of the occurrence may be obtained from actual observations or by a post-flight analysis requested from the Indian Meteorological Department.

9.15.6 AIR TRAFFIC SERVICES

Circumstances of an occurrence may require that an operations or air traffic specialist be included to investigate these aspects of an occurrence. This person is responsible for establishing, recording and verifying the accuracy of all information relevant to Air Traffic Services in connection with the flight. These include the following:

- Relevant AIPs
- NOTAM
- Aeronautical Information Circulars (AICs)
- Flight plan
- Flight plan and departure messages
- Various progress strips
- R/T transcripts
- Radar plots
- Manual of Air Traffic Services (MATS)
- ATS procedures
- ATS software.

The various functions exercised by Air Traffic Services such as ground movement control, departure control, area control, approach control and aerodrome control may enable to trace the progress of the flight from the planning stage up to the occurrence.

9.15.7 COMMUNICATIONS

Communications between aircraft and ATS are normally recorded. ATS tapes relevant to the accident are to be removed and sealed immediately. Since the tapes are recycled every 30 days, an immediate request must be made to ATS if access to them is required.

9.15.8 NAVIGATION

The navigational equipment carried in the aircraft should be checked against the aircraft records and the remains of the navigational equipment recovered from the wreckage. The serviceability and performance of navigation aids which may have been in use should be checked. This may include comments from other users. The possibility of use of Global Positioning System (GPS) must also be considered. The adequacy of current maps and charts and the currency of the charts used in the aircraft should be checked.

9.15.9 AERODROME FACILITIES

The status of aerodrome facilities used by the aircraft may have to be examined and verified. Assistance of an Aerodrome Personnel in this part of the investigation should be taken as this is his/her area of expertise.

9.15.10 AIRCRAFT PERFORMANCE

The basic source of information concerning aircraft performance is the Flight Manual/Operations Manual, the amendment status of which is important. While this information will prove to be adequate for normal investigation purposes in most cases, it may be necessary, in some instances, to examine the data from which the Flight Manual performance is determined, to establish its validity to the particular circumstances of the occurrence. This will require consultation with the manufacturer.

9.15.11 COMPLIANCE WITH INSTRUCTIONS

A necessary part of the operational investigation is to establish whether particular directives were complied with. The directives should also be examined to establish whether, in the light of the accident, they were proper and adequate for ensuring safety of operations, and whether they were presented in a format easily understood. In examining these matters it is important to distinguish what material has mandatory effect and what is advisory. The directives may have many different forms including the following:

- Flight Manual
- Operations Manual
- NOTAM
- Aeronautical Information Publications (AIP)
- Aeronautical Information Circulars
- Aircraft Manufacturer's Notices
- Airworthiness Directives
- Maintenance Control Manual
- Maintenance System.

9.15.12 STATEMENTS OF WITNESSES

Witness Statements may be used in conjunction with evidence obtained from other sources of operational information. You may then have to go back to witnesses to resolve discrepancies. When statements from witnesses' conflict with each other and with evidence obtained from other sources, you may need to re-interview the witness in question to try to resolve the discrepancies.

9.15.13 DETERMINING THE FINAL FLIGHT PATH

The reconstruction of the last stage of the flight, that is, the accident phase, necessitates close cooperation between the various groups or individuals involved in the investigation. If a separate group has been set up for Operations Investigation, this becomes its primary concern. The intention should be to build up a complete picture of the final events as they occurred, in proper sequence, and to evaluate their interrelationships. The period of time to be covered will depend on the circumstances. Generally, the period should commence when the flight departs from normal (safe) operation and should terminate when the inevitability of the accident is indisputably apparent. This may or may not always be the point of impact — for example, in the case of an in-flight break-up.

9.15.14 SEQUENCE OF FLIGHT

Although the investigation will focus on the occurrence, it is usually desirable to discuss the development of the entire sequence of the flight.

9.16 FLIGHT RECORDERS

The term 'Flight Recorders' encompasses three separate and distinct types of airborne recorders: the Flight Data Recorder (FDR), the Cockpit Voice Recorder (CVR) and Quick Access Recorder (QAR).

9.16.1 RECORDER TYPES

9.16.1.1 FLIGHT DATA RECORDER

The FDR, often referred to as the 'flight recorder', or Digital Flight Data Recorder (DFDR), is a system for recording the values of defined basic flight parameters in relation to a time base. The number of parameters recorded varies from aircraft type to aircraft type. The parameters recorded for a particular aircraft can be obtained from the operator. The digital recorders in use in the majority of aircraft have a limited recording cycle of 25 (operating) hours. If they are required for investigation, prompt action is required to ensure their removal from the aircraft. Although FDRs are built to withstand rough handling, including shock, immersion in water and fire, and are internally shielded, they should be handled with care until they are handed over for analysis by specialist. No attempt should be made to open them or apply electrical power to any cables or sockets. Keep them away from any radiation (radar source) or strong magnetic fields.

9.16.1.2 COCKPIT VOICE RECORDER

The CVR is a system for recording cockpit crew conversations (and ambient noises) via a multi-directional microphone, the cockpit intercommunications system, the Public Address system and radio-telephone (R/T) communications.

9.16.1.3 QUICK ACCESS RECORDER

The QAR, or Flight Data Acquisition Unit, is a recorder installed in some aircraft which uses the same information sources as the impact-protected DFDR.

9.16.1.4 AIR TRAFFIC SERVICE RECORDINGS

Communications with Air Traffic Services are normally recorded and may be made available provided the tapes are requested before they are recycled through the system (after 30 days). If an opportunity to listen to a communications tape is made available, the Inspector should not only listen to any spoken words but also listen to background noises. While background noises are often difficult to discern, different sounds — for example, stall warning, undercarriage warning, horn or fire warning bells — may be heard. Other sources of communications evidence should not be overlooked although some may not be recorded. Other aircraft on the frequency and ground stations monitoring it may be useful. When appropriate, communications on the operator's communication network should also be investigated. Continuous recordings are made of communications on ATS frequencies as well as radar data. These tapes are re-used after a period. This period, usually 15 to 30 days, is to ensure that they are available for any

investigations. For Radar tapes ATS needs to be advised as soon as possible, so that relevant tapes can be removed from circulation.

9.16.1.5 During the investigation, effective use shall be made of flight recorders. Read out of the Flight Recorders, if installed, should be prepared and the correlation of both the recorders be carried out. Arrangement for readout shall be carried out with the assistance of Office of the DAS (Hqrs.) without any delay. In the event adequate facilities to read out the flight recorders are not available in India, facilities made available by other States should be used, giving consideration to the following:

a) the capabilities of the read-out facility;
b) the timeliness of the read-out; and
c) the location of the read-out facility.

If required the Read-outs of flight recorder recordings should be carried out in coordination with the Judicial Authorities.

9.16.1.6 When an aircraft involved in an accident or a serious incident lands in Indian Territory and the State conducting the investigation, requests than that State shall be provided with the flight recorder records and, if necessary, the associated flight recorders.

9.16.1.7 DISCLOSURE OF RECORDS :

Following records shall not be made available for purposes other than accident or incident investigation:

a) all statements taken from persons by the investigation authorities in the course of their investigation;

b) all communications between persons having been involved in the operation of the aircraft;

c) medical or private information regarding persons involved in the accident.

d) cockpit voice recordings and transcripts from such recordings; and

e) opinions expressed in the analysis of information, including flight recorders information.

These records shall be included in the final report or its appendices only when pertinent to the analysis of the accident or incident. Parts of the records not relevant to the analysis shall not be disclosed.

9.17 STRUCTURAL INVESTIGATION

9.17.1 OVERVIEW OF AIRCRAFT STRUCTURE INVESTIGATION

The aircraft structure investigation concentrates on the airframe, including primary and secondary structure, lift and control surfaces. When investigating an accident caused by structural failure of the airframe or system, study the wreckage and evaluate separated components and fractured surfaces. Failure of the airframe structure, fittings, attachments, and other components are sometimes obscured by the ensuing accident. However, these may have been the primary cause of in-flight disintegration or ground impact in an out-of-control situation. Knowledge of the history of the flight, prevailing weather conditions, aircraft behaviour, and the probable type of air loads sustained during flight manoeuvres will assist in determining failure areas.

9.17.2 RECONSTRUCTION OF WRECKAGE

Reconstruction is employed for specific components such as a wing panel, tail surface or control system, although in some instances it has been necessary to reconstruct almost all major components. Reconstruction is performed in two stages:

- Stage 1 Identify the various pieces and arrange them in their relative positions
- Stage 2 Examine in detail the damage to each piece, and establish the relationship of this damage to the damage on adjacent or associated pieces.

The latter is the chief purpose of reconstruction

9.17.2.1 PRELIMINARIES

Before commencing reconstruction work,

1. Photograph the entire site and wreckage.
2. Complete the wreckage distribution chart.
3. Inspect and make notes on the manner in which the various pieces were first found, by walking around the site.

9.17.2.2 IDENTIFICATION OF PIECES

The difficulty in reconstructing a component, such as a wing, lies in identifying the various pieces of wreckage. If the wing has broken up into a few large pieces, the task is relatively simple. If, on the other hand, the wing has broken into a

number of small pieces as a result of high impact speed, reconstruction can be extremely difficult. The most positive means of identification are:

- Part numbers which are stamped on most aircraft parts, which can be checked against the aircraft parts catalogue
- Colouring (either paint or primer)
- Type of material and construction
- External markings
- Rivet or screw size and spacing.

9.17.2.3 RECONSTRUCTION ON-SITE

Collect parts from the suspected area, identify them and then arrange them on the ground in their relative positions. Lay out major components such as the wing, tail and fuselage in plan form for ease of later examination. Note, however, that if the suspected area is at the junction of the major components, these areas are sometimes reconstructed separately. For ease of examination, lay out individual cable runs with their associated bell cranks, idlers and quadrants separately. If significant markings are found on any of these latter items, corresponding markings must be sought out in the relative positions in the wing, fuselage etc.

9.18 EXAMINATION OF THE AIRCRAFT STRUCTURE

Specific components or items may require additional examination and the same be got examined at appropriate Laboratories of National Aeronautical Lab, Bangalore or Directorate of Research & Development of DGCA or other approved facilities. When carrying out a detailed examination of an aircraft's structure, specialists should be consulted for:

- Properties of metals and fracture analysis - Materials Evaluation Facility specialists
- Basic causes and contributing factors associated with in-flight structural failures of major components - Engineering Specialists
- Specific evidence that can be obtained by studying the scores, smears, indentations and other markings, both at the impact site and on aircraft parts -. Engineering Specialists

9.18.1 AIRFRAME

The first priority during the preliminary examination at the accident site is to determine if a structural failure occurred before impact. To do this, the first step is to separate impact damage from in-flight structural failure damage. Valuable information can be gathered from a study of the various smears and scores found

on different parts of the wreckage. Where possible, study these before the wreckage is disturbed, since movement of the wreckage may destroy clues or create misleading ones.

9.18.2 MAINPLANES, FUSELAGE AND TAIL UNIT

One of the primary aims when examining the structure is to determine whether there is evidence that any part of the structure was not in its correct relative position at the time of impact. Components such as cables, pulleys, hinges and tab mechanisms must be examined to determine whether the failure of any of these items was caused by wear, inadequate maintenance or impact.

9.18.3 UNDERCARRIAGE

Examine the selector, link mechanism, up and down locks and position of the operating jacks or actuating cylinders to ascertain whether the undercarriage was up or down. If the gear had failed or separated, note the direction of the force which caused the failure or separation.

9.19 POWER PLANT INVESTIGATION

9.19.1 OVERVIEW OF POWERPLANT INVESTIGATION

The failure or malfunction of one or more power plants may be the cause of an occurrence. For this reason it is essential that a careful examination of the power plants and their associated components be made to determine whether they are involved as a causal or predominant factor in the particular occurrence under investigation. The purpose of powerplant investigation and analysis is to determine:

- The condition of the engine at the time of impact
- The engine power or thrust at the time of impact or failure
- The sequence of failure and cause of any engine malfunction or failure.

The powerplant investigation should include a carefully detailed documentation of all evidence, to include:

- A comprehensive survey of the impact site and extent of wreckage distribution,
- length and depth of ground impact scars and craters,
- consistency and hardness of the terrain, and

- the slope of the impact area.

This information will already have been recorded during the initial site inspection. Any additional details that the power plant investigation turns up should be added as overlays to the original site plan and wreckage-distribution chart, and later copied to the original. An inventory of the engine(s) to ensure that all engine parts, components, and accessories are accounted for and aligned with each respective engine.

9.19.2 PROCEDURE FOR EXAMINING ENGINE COMPONENTS AND SYSTEMS

Follow this procedure when examining various engine components and systems.

- Check the original Site Plan and Wreckage Distribution Chart for the geographical location and scatter pattern of all engine, parts and accessories, and correct where necessary.
- Note the identity and location of any part that may be moved (or removed from the crash site for any reason), altered, or affected by rescue, salvage, or weather conditions.
- Note in particular:
    - Evidence of case penetration
    - Burn-through damage
    - Ruptured fuel or oil lines
    - Loose fittings
    - Any items that are suspected to be of foreign origin.

- Collect any fuel, oil, and hydraulic fluid samples to minimise post-impact contamination or loss of the limited quantities that may remain.

Note: Where powerplant failure occurs and fuel contamination is a suspected cause, not only should samples of fuel be obtained from the aircraft system, but an immediate investigation should be made of the fuel servicing and storage facilities at the last refuelling point.

- Examine the fuel system, including:

    - All filters, screens and pumps
    - Check tanks and cells
    - Fuel lines and valves.

- Examine propeller(s) for:

- Impact damage and overall condition
- Evaluate broken blades to determine the reason for failure that is, impact, overspeed, malfunction, or fatigue breakage. Blade angle is a function of power being delivered by the engine. Therefore, blade angle may be one method that can be used to establish engine power or thrust. As a rule, propellers under high power at impact can be expected to bend or curl forward at the tips, while under low power, the blades should curl rearward at the tips. Windmilling or stationary blades should be bent rearward.

9.20 SYSTEMS INVESTIGATION

9.20.1 OVERVIEW OF SYSTEMS INVESTIGATION

Systems Investigation covers investigating and reporting on:

- Hydraulics
- Electrics and electro-pneumatics
- Vacuum
- Pressurisation and air conditioning
- Ice and rain protection
- Instruments
- Air data computer
- Flight director
- Stall warning
- Radio and navigation systems
- Autopilot
- Fire detection system
- Oxygen system.

There is inevitably a degree of overlap with systems covered under sections relating to structures and power plants. The technical information necessary to enable a detailed analysis of individual aircraft systems/components should be obtained from the Manufacturer/ Operator.

9.20.2 INVESTIGATING AIRCRAFT SYSTEMS

Each aircraft system must be accorded the same degree of importance regardless of the circumstances of the occurrence. There is no way to determine adequately the relationship of any system to the general area without a thorough examination. Data developed by the examination of one system may be helpful in proving or disproving the integrity of other systems. The examination of the system will generally involve more than examination of components in-situ. It can involve the

functional testing, under laboratory conditions, of an individual component, or of the complete system using off-the-shelf duplicates of the component or system. Computer software fitted in some modern aircraft may be recovered and operated in a simulator to determine its role in the occurrence. For each system that you investigate:

- Obtain from the aircraft manufacturer or from the operator, appropriate detailed schematic diagrams or working drawings to determine what components are included in each system. The diagrams will also be helpful in analysing the effect of a malfunctioning component on the rest of the system.
- Make every effort to account for all the components. Each system can be broken down into six areas as shown below. This should assist in accounting for components. These areas are:

  - Supply
  - Pressure
  - Control
  - Protection
  - Distribution
  - Application.
  - Documentation of components should include:
  - Nomenclature
  - Component manufacturer's name
  - Part number
  - Serial number
  - Specification number (where provided).

Some components having the same part number may be used in various parts of the same system, especially in the hydraulic and pneumatic systems. It may be necessary to obtain listings showing actual location of these components in the system by serial number. The positions of switches and controls in the cockpit, together with the found (as-is) position of any moving parts will have been photographed during the initial stages of the investigation. Obtain copies of these photographs and crosscheck the readings on all available instruments. If the original photographs are not ready, take an additional set of photographs to supplement your documentation.

9.21 MAINTENANCE INVESTIGATION

9.21.1 OVERVIEW OF MAINTENANCE INVESTIGATION

The purpose of the maintenance investigation is to review the maintenance history of the aircraft in order to determine:

- Information that could have some bearing on the occurrence, or which could point to a particular area of significance for regulatory investigation and action
- Whether the aircraft has been maintained in accordance with the specified standards
- Whether, having regard to information gained during the investigation, the specified standards are satisfactory.

9.21.2 SECURE AIRCRAFT AND MAINTENANCE DOCUMENTATION

Following notification of the commencement of a regulatory investigation of an aircraft occurrence, secure the related documents by applying to the operator to hand over the following:

- Aircraft log books
- A copy of the current, and if possible, expired Maintenance Releases
- Maintenance work-packages and any other appropriate certification documentation.
- Approved Maintenance System, or the applicable accepted maintenance schedule for the aircraft.

9.21.2.1 AIRCRAFT LOG BOOKS AND MAINTENANCE RELEASE

Inspect the aircraft log books and both current and expired maintenance releases to ascertain the following information:

- The operating history of the airframe, engines, and associated components; the hours flown, cycles, landings, and, where appropriate, the status of any life-limited components
- The history of accidents, incidents, defects and irregular or abnormal operations which have been reported or which become known during the investigation and any subsequent rectification or other action taken
- Whether all required maintenance, including applicable Airworthiness Directives, have been carried out
- That all modifications incorporated have been accomplished in accordance with approved data
- Whether the aircraft history has been entered in the log books in accordance with the applicable log book instructions.

9.21.2.2 MAINTENANCE DOCUMENTATION

In addition to an inspection of the aircraft documentation, an examination of the maintenance organisation's work packages and any other certification documentation relating to maintenance should be undertaken to determine:

- That all maintenance and modifications has been carried out on the aircraft by authorised or approved persons
- That all the maintenance carried out was certified-for in accordance with applicable legislation by authorised or approved persons If the maintenance system has been followed correctly Record any discrepancies or omissions.

9.22 HUMAN FACTORS INVESTIGATION

The prime object of the Human Factors investigation is to obtain evidence through an examination, if any such evidence exists, of abnormal behaviour or fatigue of the operating crew, the cabin attendants and passengers, air traffic controllers, maintenance personnel and other ground staff, that may have caused or contributed to the occurrence.

9.23 ORGANISATION FACTORS INVESTIGATION

It is argued that modern aircraft accidents occur, for the most part, as the result of complex interactions between many causal factors — for example:

- Active failures committed by those at the 'sharp end' (cockpit, flight line), having immediate impact upon the integrity of the aircraft
- Local triggering factors
- Latent failures, originating in the managerial and organisational spheres, whose consequences may lie dormant for long periods. While the origins of mechanical failures and individual human errors are now reasonably well understood, the protagonists of reliability have yet to produce an agreed theory for organisational accidents. The basic elements of such a theory, as proposed by Professor James Reason of the University of Manchester in 1991 are:

    a) Organisational processes
    b) Task and environmental conditions provoking unsafe acts
    c) The varieties of unsafe acts (error and violation types).

This leads to a set of retrospective analytical steps that allow accident investigators to trace the causal pathways from unsafe acts to the organisational origins of a particular accident or incident. Professor Reason researched and developed an analytical model for the purposes of broad systems analysis. The principles of the Reason model are described in his book 'Human Error' (1990), and further developed in a paper presented to the International Society of Air

Safety Investigators 22nd Annual Seminar 1991 ('Identifying the Latent Causes of Aircraft Accidents Before and After the Event'). Central to Reason's approach is the concept of the 'Organisational Accident', in which latent failures arising mainly in the managerial and organisational spheres, combine adversely with local triggering events (weather, location, etc) and with the active failures of individuals at the 'sharp end' ('Errors and procedural violations' Reason, 1991, p1).

9.24 UNSAFE ACTS

Unsafe acts as described by Professor Reason, can be categorised into two distinct groups:

1. Errors.
2. Violations.

All involve deviations but they differ with regard to the nature of this deviation. The figure below summarises the psychological varieties of unsafe acts, classified initially according to whether the act was intended or unintended, and then distinguishing errors from violations.

Errors may be of two kinds:

Attentional slips and memory lapses, involving the unintended deviation of actions from what may be a perfectly good plan. Mistakes, where the actions follow the plan but the plan deviates from some adequate path to the desired goal.

UNINTENDED ACTION
UNSAFE ACTS
BASIC ERROR TYPES
SLIP LAPSE MISTAKE

CHAPTER 10

OCCUPATIONAL HEALTH AND SAFETY APPLICABLE TO AIRCRAFT ACCIDENT INVESTIGATIONS.

It is recognised that safe working environment which is without any risk to health should be maintained for all engaged in accident investigation & wreckage examination. The following guidelines apply to all who are likely to face exposure to potentially infectious or injurious substances or objects when conducting occurrence investigations. Everyone has a responsibility to ensure that he or she works safely, and so protects others in the workplace. Adherence to the work practices described, together with the use of appropriate personal protective equipment, will reduce on-job risk for all exposed to accident site hazards. Application of the procedures set out in this chapter will ensure that:

- Everyone is given relevant and up-to-date information to enable them to make responsible decisions when faced with possible exposure to conditions that may pose a safety or health hazard.
- Measures are taken to safeguard health and, where exposure does occur, to provide appropriate levels of treatment and counseling to minimise long-term effects arising from the exposure.

Because of the specialised health and safety risks arising from accident investigation tasks, these procedures should be applied wherever and whenever necessary.

10.1 Pathological Hazards

Contact with human and animal remains and body fluids is a serious health hazard because of the risk of bacterial, viral and fungal contamination. Exposures to pathogens are unpredictable and since infection can be transmitted through direct contact with the eyes, nose and mouth (mucous membranes), an open cut, dermatitis rash/chafed skin, or open skin sore, it is required that General Precautions be taken by all while working on-site where the potential for exposure exists.

10.2 General Precautions

General precautions shall be observed to minimise exposure to infectious materials. Risk reduction precautions shall include the following:

- Direct contact with any potentially infected wreckage or soil should be avoided.

- Until properly protected, any investigative procedure on potentially infected wreckage or soil, which might tend to splash, spray, generate droplets or otherwise disperse contaminated particulate matter should be avoided.

- Do not eat, drink, smoke, apply lip balm or skin cream, or handle contact lenses while in those areas defined as bio-hazard areas.

- Use antiseptic hand towel immediately after leaving the bio-hazard area and removing personal protective equipment.

- Wash your hands with antiseptic soap and running water as soon as feasible after using the antiseptic towels.

- Any personal investigative equipment, (cameras, notebooks, etc.) which may become contaminated with infectious materials shall be examined and either decontaminated or disposed of as appropriate, prior to removal from the bio-hazard area.

- Wash your skin or flush mucous membranes with water as soon as feasible following contact of your body areas with potentially infectious materials.

- No one with a pre-existing condition that would facilitate the spread of a blood-borne pathogen for example, open hand or facial cuts, skin rashes, open sores will be permitted access to the bio-hazard area.

10.3 Bio-hazards

Biohazards are blood-borne pathogens that cause disease in humans. They are microorganisms which, when they enter human blood, can cause disease in humans. Infectious pathogens can be found in fatally injured persons as well as injured survivors. These pathogens include, but are not limited to:

- Hepatitis B Virus (HBV)
- Human Immunodeficiency Virus (HIV)
- Malaria
- Meningococcal bacterium
- Lyme Disease
- Queensland Tick Typhus
- Ross River Fever

- Syphilis
- Tetanus.

The General and workplace infection control procedures apply to both HBV and HIV. Infection transmission of other pathogens are interrupted by the procedures adopted for HBV/HIV.

HIV

HIV affects the immune system, weakening it to the point where the individual becomes more susceptible to other infections - for example, pneumonia, tuberculosis or cancers. In the early and mid-1980s, it was generally believed that the HIV virus would not survive long outside the body, Recent studies have changed this thinking. In some cases, dried plasma held at room temperature retained infective virus for more than three days. No cases of insect transmission are presently known. A vaccination against HIV infection is not available to date.

HBV

Hepatitis B virus causes inflammation of the liver, and may result in an individual becoming an HBV carrier with the potential to infect others. Liver failure and death can follow infection. HBV can remain viable outside the human body for some days and can exist in dried blood/body fluids. The disease, because of its abundance in a given infected blood sample, relative to HIV, is potentially many times more infective and therefore the greater site risk. The best defence against Hepatitis B infection is vaccination. Should a known exposure occur it is usual medical practice to give a Hepatitis B Immuno Globulin (HBIG) injection within 24 hours.

Malaria

Except for one strain of malaria, human malarias are generally not life threatening, but produce a repetitive series of shaking chills and rapidly rising temperatures followed by profuse sweating over several days. Relapses may occur at irregular intervals and the infection may persist for upwards of 50 years. Transmission is by the bite of an infective mosquito. Personal protection on the work-site will be achieved by regular use of insect repellent containing diethyltoluamide (DEET), in addition to wearing the protective clothing provided.

Meningococcal Meningitis

A bacterial infection characterised by fever, delirium and possible coma, intense headache, nausea and often a stiff neck. Case fatality rates have been reduced from 50% to less than 10%, by modem therapy nevertheless prompt treatment is required. Transmission of the disease is by direct contact, including respiratory

droplets from the nose and throat from infected persons. Wearing a partial face respiratory mask as for HIV/HBV exposure provides necessary protection.

Lyme Disease

A tick-bone disease characterised by fever, fatigue and a distinctive skin lesion. Encephalitis or meningitis are possible. Quite a while after the skin rash occurs, swelling and pain in the large joints, primarily the knees, will occur in untreated patients. Chronic arthritis can result. Transmission occurs mainly in summer from tick bite after the tick has fed for several hours. The same insect repellent used for the malarial mosquito, when applied to shirtsleeves and pants legs has proven to be effective.

Queensland Tick Typhus

A tick home disease which causes mild to severe fever. Transmission is similar to Lyme Disease and similar protective measures apply.

Ross River Fever

A viral disease carried by kangaroos, other marsupials and wild rodents. Transmission to man is by mosquito bite. This disease is characterised by fever, (although fever may be absent), arthritis in the wrist, knee, ankles and small joints of the extremities. A rash on the trunk and limbs usually accompanies the arthritis. The disease is self-limiting. Protection from mosquito bite (as for Malaria) is the accepted prevention method.

Syphilis

This disease can occur concurrently with HIV infection and is spread in a similar way, namely through contact with infectious body fluids and secretions. Syphilis is characterised by skin lesions and a rash involving the palms and soles. As the disease develops it attacks the central nervous system and cardiovascular system. Transmission of infection will be interrupted by procedures adopted for HIV protection.

Tetanus

An acute disease characterised by painful muscular contractions primarily around the jaw and neck followed by contractions of the trunk muscles. Around the world, case fatality rates range between 30% and 90%. The disease is introduced into the body through a puncture wound contaminated with soil, street dust or animal/human faeces. Often the wound is unnoticed or too trivial for

medical consultation. Active immunity can be obtained from an immunisation which lasts nominally 8 to 10 years. Tetanus control is best achieved by active immunisation since it is rarely possible to recover
and identify the organism at an infection site.

10.4 General Work Practice Controls

All accident sites are potentially hazardous areas and entry to the site should be in accordance with the provisions of this manual. Controls may be revised once potential hazards have been eliminated.

10.5 Personnel on Site

To limit exposure to potentially hazardous situations, only personnel who have a need to be on-site as part of the investigation team should be allowed access to the occurrence site, and then too, only for the minimum possible period. The aircraft manufacturer and operator may be requested to advise on possible hazards associated with the aircraft or its cargo. As part of the on-site safety process, pre-entry briefings will be conducted for all personnel entering the occurrence site.

10.6 General Precautions

Personal safety at the occurrence site is a combination of common sense and proper procedures. One must exercise caution and use all appropriate protective devices when working at the occurrence site and should not work alone at an occurrence site unless the site location and circumstances adequately provide for his or her personal safety.

10.7 Work in Confined Spaces

A confined space at an occurrence site is defined as a tank, fuselage segment, crater, trench or other enclosure, not designed for human occupancy except for the purpose of performing work, and which has one or more of the following conditions:

- A limited number of openings for entry or exit
- Poor natural ventilation
- An oxygen deficient atmosphere
- Airborne hazardous substances.

Before anyone enters a confined space a qualified person must confirm that the space is safe. Appropriate rescue equipment must be available. An additional person must be appointed to closely monitor the confined work-site and be ready to rescue the person inside immediately, should the need arise.

10.8 Isolated Sites

One should not normally work alone at an isolated occurrence site. An isolated site is defined as one which would involve more than two hours travel time to an appropriate medical facility, or which would otherwise present difficulties if immediate removal of an inspector were necessary.

10.9 Physical Condition

Everyone is responsible for ensuring that they are fit enough to endure the sometimes arduous conditions found at an occurrence site and should be aware of the effects of fatigue long before exhaustion sets in. In addition to being aware of the current condition of the site, one needs to be aware of the condition of the participants in the investigation. The symptoms of heat exhaustion are a pale face, cold sweat and shallow breathing. Heat exhaustion is considered to be shock from exposure to heat. Place the individual on their back in a shady spot, elevate their feet and loosen tight clothing. Apply cool, wet clothes. Symptoms of heatstroke are red, hot, dry skin; high body temperature; rapid pulse; slow and noisy breathing; confusion or unconsciousness. This condition is serious and must be treated immediately. Seek shade, place the individual on their back and undress down to the underwear. It is especially important to cool the head. Have the individual drink fluids and rest.

10.10 Overview of Hazardous Materials

Adhere to the following guidelines:

Assume that hazardous materials are present at the occurrence site. Suspect all freight, mail, and passenger baggage until positively identified. Always assume that pressure vessels are explosive until rendered inert.

Before examining any wreckage, perform a personal site-safety check. If a danger has not or cannot be neutralised, use alternative methods for gathering evidence such as photography, photogrammetry, or witnesses. Aircraft always contain hazardous materials such as fuel, oil and hydraulic fluid. When possible, clean any serious contamination of fuel and lubricant from the wreckage using a detergent wash and rinse, and when

necessary, an approved absorbent. Be aware of the ever-present danger of fire and explosion when cleaning contaminated wreckage. Burning or smouldering aircraft interiors and modern composite materials emit noxious and highly toxic gases and possibly carcinogenic particles.

10.11 Radioactive Material

As soon as possible after the notification of an occurrence, one should determine if radioactive materials were on board the aircraft, either as cargo, equipment or as part of the aircraft structure. This information must be obtained from the aircraft operator. Although a member of the crew, if unhurt, and not suffering from shock, may also be able to provide this information, it is better to obtain such information from a person or agency that has not been traumatised. If it is established that radioactive material is in the wreckage, inform all personnel involved in the investigation and take adequate precautionary measures to avoid undue exposure of the investigation group to the contaminated area until expert advice is obtained.

10.12 Chemical Hazards on Site .General

Chemical injury can occur through simple atmospheric contamination and exposure, or by physical contact of toxic and corrosive substances. Modern synthetic agricultural chemicals used in aerial spraying applications are often toxic and carcinogenic. When it is suspected that there is possible chemical contamination, restrict admittance to the occurrence site until a qualified chemical hazard authority has released the site. The local Fire Department or Police will be able to contact such an authority. If necessary, quarantine the area until cleared by appropriate experts. Use absorbent materials such as sand or commercial neutralising agents to confine a spill.

Caution

Consumption of alcohol before or after exposure to chemicals may aggravate their side-effects.

Agricultural Chemicals

Use caution when approaching the wreckage and occurrence site of any aircraft used in the aerial application of chemical compounds. In such a situation, exposure to toxic substances is a very real hazard. Among the multitude of fertilisers, pesticides, insecticides, herbicides, rodenticides,

fungicides and nematocides currently available for aerial application, many are toxic to humans and readily absorbed through the skin. Fertilisers and crop nutrients may cause skin, eye and lung irritation, but generally do not cause serious or permanent damage.

Do not approach the wreckage of an agricultural aircraft until the chemicals on board have been positively identified by an authority on chemical hazards, and appropriate precautions have been taken.

CHAPTER 11

SUBMISSION OF REPORTS

11.1GENERAL

11.1.1 Preliminary report by the Inspector of Accidents should be finalized preferably within ten days of the accident in the proforma (Appendix H). It shall contain the requisite information including any safety hazard, either in human factor, Aircraft factor and/or any other relevant factor that is prima facie evident during the early stages of investigation such as lack of piloting proficiency if any or any unwarranted disregard of safety requirements, in case these are obvious to enable framing and implementation of immediate corrective safety measures.

11.1.2 The Inspector of Accidents/ the Committee of Inquiry or the Court is required to make a Final report to the Central Government stating its findings as to the causes of the accident and the circumstances thereof and adding any observations and recommendations with a view to the preservation of life and avoidance of similar accidents in future. The format of the Final Report in the Appendix I should be used. Appendix G contains detailed guidance material on completing each section of the final report. However, it may be adapted to the circumstances of the accident or incident.

11.1.3 The report should be self-contained in respect of its text The body of the final report should comprise the Factual Information; Analysis; Conclusions & Safety Recommendations. The causes should include both the immediate and the deeper systemic causes. The recommendations should be for the purpose of accident prevention and any resultant corrective action. Photographs, sketches and evidence of particular significance such as mandatory references should appear as Appendices to the report.

11.1.4 In all cases where a blame is likely to be apportioned to any person, compliance with Rule-71 sub-rule(3) must be ensured, as far as practicable, by the Inspector of Accidents appointed under Rule-71 of Aircraft Rules. The performa to be used for addressing a communication to the blameworthy person is attached (Appendix F). After affording such an opportunity, a reference to the effect must be made at the end of the report under Heading "Compliance with Regulations."

11.1.5 If, after the investigation has been closed, new and significant evidence becomes available, the investigation shall re-open. However, when the earlier investigation was not instituted by Indian Central Government consent of the State shall be obtained which instituted the investigation.

11.1.6 Any preventive action that is considered necessary to be taken promptly to enhance aviation safety at any stage of the investigation of an accident or incident, the same shall be recommended to the appropriate authorities, including those in other States,

11.1.7 When appropriate, any safety recommendations arising out of investigations shall be addressed to the accident investigation authorities of other State(s) concerned and, when ICAO documents are involved, to ICAO.

11.2RESPONSIBILITIES AS A CONTRACTING STATE

11.2.1 If a draft investigation report from the State conducting the investigation is received for comments, the draft report or any part thereof, or any documents obtained during an investigation of an accident or incident, shall not be circulated, published or given access without the express consent of the State which conducted the investigation, unless such reports or documents have already been published or released by that State.

11.2.2 As and when safety recommendations are received from any contracting State, the proposing State shall be informed of the preventive action taken or under consideration, or the reasons why no action will be taken.

11.3 RESPONSIBILITY AS A STATE CONDUCTING THE INVESTIGATION

11.3.1 ACCIDENTS TO AIRCRAFT OVER 2 250 KG

When the aircraft involved in an accident is of a maximum mass of over 2,250 kg, preliminary report shall be sent to:

a) the State of Registry or the State of Occurrence, as appropriate;
b) the State of the Operator;
c) the State of Design;
d) the State of Manufacture;
e) any State that provided relevant information, significant facilities or experts; and
f) the International Civil Aviation Organization.

11.3.2 ACCIDENTS TO AIRCRAFT OF 2 250 KG OR LESS

When an aircraft, not covered by 11.3.1, is involved in an accident and when airworthiness or matters considered to be of interest to other States are involved, Preliminary Report shall be forwarded to:

a) the State of Registry or the State of Occurrence, as appropriate;
b) the State of the Operator;
c) the State of Design;
d) the State of Manufacture; and
e) any State that provided relevant information, significant facilities or experts.

11.3.3 The Preliminary Report shall be submitted to appropriate States and to the International Civil Aviation Organization in English.

11.3.4 The Preliminary Report shall be sent to the above mentioned States by facsimile, e-mail, or airmail within thirty days of the date of the accident unless the Accident/Incident Data Report has been sent by that time. When matters directly affecting safety are involved, it shall be sent as soon as the information is available and by the most suitable and quickest means available.

11.3.5 A copy of the draft Final Report shall be sent to the State that instituted the investigation and to all States that participated in the investigation, inviting their significant and substantiated comments on the report as soon as possible. The draft Final Report of the investigation shall be sent for comments to:

a) the State of Registry;
b) the State of the Operator;
c) the State of Design; and
d) the State of Manufacture.

11.3.6 If the comments are received from the State concerned within sixty days of the date of the transmittal letter, either the draft Final Report shall be amended to include the substance of the comments received or, if desired by the State that provided comments, the comments shall be appended to the Final Report. If no comments are received within sixty days of the date of the first transmittal letter, the Final Report shall be issued, unless an extension of that period has been agreed with the States concerned.

11.3.7 A copy of the draft Final Report should also be sent, through the State of the Operator, to the operator to enable the operator to submit comments on the draft Final Report.

11.3.8 A copy of the draft Final Report should also be sent, through the State of the Design and the State of Manufacture, to the organizations responsible for the type design and the final assembly of the aircraft to enable them to submit comments on the draft Final Report.

11.3.9 The Final Report of the investigation of an accident shall be sent with a minimum of delay to:

a) the State that instituted the investigation, if any
b) the State of Registry, in case of foreign registered aircraft
c) the State of the Operator, in case of foreign operator
d) the State of Design;
e) the State of Manufacture;
f) any State having suffered fatalities or serious injuries to its citizens; and
g) any State that provided relevant information, significant facilities or experts.

11.3.10 In the interest of accident prevention, the Final investigation Report shall be released as soon as possible.

11.3.11 The Final Report should be released in the shortest possible time and, if possible, within twelve months of the date of the occurrence. If the report cannot be released within twelve months, an interim report should be released on each anniversary of the occurrence, detailing the progress of the investigation and any safety issues raised.

11.3.12 When the investigation into an accident or an incident involving an aircraft of a maximum mass of over 5 700 kg has been conducted and a Final Report has been released, a copy of the Final Report shall also be sent to the International Civil Aviation Organization.

CHAPTER 12

ADREP REPORTING

12.1 In accordance with Annex 13 – Aircraft Accident Investigation, States are required report to ICAO information on all aircraft accidents, which involve aircraft of a maximum certificated take-off mass of over 2,250 kgs. Director Air Safety (Headquarters) O/O DGCA shall compile the data as given below and send the same to ICAO as per the requirements. Some factual and circumstantial information related to an accident is normally available within the first weeks of the investigation. All endeavours should be made to send the Preliminary report within 30 days of the accident.

12.1.1 Accident data report in the format should also be compiled once the investigation has been completed and final report approved. This data report should provide accurate and complete information including factors, causes and safety recommendations.

12.2 ACCIDENT/INCIDENT DATA REPORT

12.2.1 ACCIDENTS TO AIRCRAFT OVER 2 250 KG

When the aircraft involved in an accident is of a maximum mass of over 2 250 kg, Accident Data Report shall be sent, as soon as practicable after the investigation, to the International Civil Aviation Organization.

12.3 ADDITIONAL INFORMATION

Pertinent information additional to that made available in the Accident/Incident Data Report should be provided to other States upon request.

12.3.1 INCIDENTS TO AIRCRAFT OVER 5 700 KG

However if it is found that an incident is significant enough to warrant an investigation, then the incident data report should be sent. In this regard when the aircraft involved in an incident is of a maximum mass of over 5,700 kg and the investigation has revealed matters which might be of interest to other States, Incident Data Report shall be sent, as soon as practicable after the investigation, to the International Civil Aviation Organization.

CHAPTER 13

ACCIDENT PREVENTION MEASURES

13.1 INCIDENT REPORTING SYSTEMS

As per the Annex 13 a mandatory incident reporting system is to be established. At present all the scheduled Airlines report the incidents to Regional Air Safety Offices and DGCA Headquarters. In order to facilitate collection of information on actual or potential safety deficiencies the incident information and its investigation reports are analysed at DGCA Headquarters.

Airlines have been encouraged and a voluntary incident reporting system has been established by the Airlines. This data on receipt from the Airlines is also perused by the Regional Air Safety Offices/ DGCA Headquarters to facilitate the collection of information that may not be captured by a mandatory incident reporting system. The voluntary incident reporting system is non-punitive and affords protection to the sources of the information.

13.2 DATABASE SYSTEMS

Based on the above information an accident and incident database to facilitate the effective analysis of information obtained has been established, including that from its incident reporting systems. The accident data base at present is in the summary form and is available on the DGCA Web site.

The data base system is being transferred to the standardized formats to facilitate data exchange.

13.3 ANALYSIS OF DATA — PREVENTIVE ACTIONS

- The information contained in accident/incident reports and the incident database is analysed to determine any preventive actions required.

- In the analysis of the information contained in the database, if safety matters considered to be of interest to other States are identified, such safety information is shared with the Manufacturers so that same can be further forwarded to other States as soon as possible.

- In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources,

including safety audits, surveillance etc. and such safety recommendations are addressed to concerned organizations.

13.4 EXCHANGE OF SAFETY INFORMATION

The Safety information available in the form of CARs, AICs, Safety Circulars, accident summaries and major accident reports which have been accepted by the Government are available on the DGCA website and can be used or down loaded for free by the users of the aviation system sharing networks should be established to facilitate the free exchange of information *on actual and potential safety deficiencies among all users of the aviation system.*

APPENDICES

Appendix A - **List of examples of serious incidents.**

Appendix B - **The broad outlines of the records, which should be segregated and sealed immediately after the accident.**

Appendix C - **The format and the content of the accident or serious incident information/ Notification**

Appendix D - T**he State(s) to which information of the accident or serious incident is to be sent.**

Appendix E - **Addresses of aircraft accident and incident investigation authorities of States.**

Appendix F - **The Performa to be used for addressing a communication to the blameworthy person**

Appendix G - **Detailed guidance material on completing each section of the final report.**

Appendix H - **Preliminary report Performa.**

Appendix I - **The format of the Final Report**.

Appendix J - **Investigation Field Kit**

APPENDIX A

LIST OF EXAMPLES OF SERIOUS INCIDENTS

Serious incidents are the incidents involving circumstances indicating that an accident nearly occurred. Following is the list of typical examples of incidents that are likely to be serious incidents. The list is not exhaustive and only serves as guidance to the definition of serious incident.

- Near collisions requiring an avoidance maneuver to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate.
- Controlled flight into terrain only marginally avoided.
- Aborted take-offs on a closed or engaged runway.
- Take-offs from a closed or engaged runway with marginal separation from obstacle(s).
- Landings or attempted landings on a closed or engaged runway.
- Gross failures to achieve predicted performance during take-off or initial climb.
- Fires and smoke in the passenger compartment, in cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents.
- Events requiring the emergency use of oxygen by the flight crew.
- Aircraft structural failures or engine disintegrations not classified as an accident.
- Multiple malfunctions of one or more aircraft systems seriously affecting the operation of the aircraft.
- Flight crew incapacitation in flight.
- Fuel quantity requiring the declaration of an emergency by the pilot.
- Take-off or landing incidents such as undershooting, overrunning or running off the side of runways.
- System failures, weather phenomena, operations outside the approved flight envelope or other occurrences which could have caused difficulties controlling the aircraft.
- Failures of more than one system in a redundancy system mandatory for flight guidance and navigation.

APPENDIX B

SEGREGATION AND SEALING OF DOCUMENTS IN CASE OF AN AIRCRAFT ACCIDENT OR SERIOUS INCIDENT :

The following are the broad outlines of the records which should be segregated and sealed as soon as possible after the accident occurs:

a) Air Traffic Services:

i) Log books of all the relevant ATS including Radar Units.
ii) All messages pertaining to the aircraft including data like flight progres strips, etc.
iii) All messages detailing information passed to the aircraft.
iv) Log books of all ATS vehicles employed for search and rescue, fire fighting and visits to the site of accident etc.

Note: The vehicle log book should be sealed after relevant entries are made. These entries should be made immediately on return from the operation.

b) Aeronautical Communication Service:

i) All tapes containing messages exchanged with the aircraft.
ii) All tapes containing messages exchanged/communicated regarding alerting, search and rescue and fire fighting etc.
iii) All messages regarding the aircraft.

iv) Relevant records/log books of all the Navaids used just prior to accident.

v) The dairy of Duty Officer of Communication Centre.

c) Rescue and Fire Fighting Services:

i) The occurrence book of the Fire Fighting unit concerned.

ii) Log books of the vehicles engaged in the search and rescue and actual fire fighting operations.

Note: These books should be sealed after necessary entries have been made regarding completion of rescue and fire fighting operations.

d) Meteorological Department (Aviation);

i) All records pertaining to Metars, TAFORS & ROFORS, Specis & weather warning which could be of relevance to the aircraft involved.

ii) All records forming basis of the information regarding Metars, Tafors and Rofors.

iii) The special weather observation recorded immediately after the accident.

iv) Log books of the Duty Officers at different positions.

e) Documents of aircraft:

i) All documents including log books regarding, maintenance, servicing etc. of aircraft should be segregated and sealed by the Operator and handed over to the Inspector of Accidents or his representative.

ii) Documents such as aircraft file, flight reports, performance reports and concessions granted if any.

f) Fuel Sample:

The sample of fuel/oil uplifted should be preserved by the fuel vendor. A separate fuel/oil sample should also be collected and sealed by Inspector of Accidents or his representative.

APPENDIX C

The format and the content of the accident or serious incident information/ Notification

a) for accidents the abbreviation ACCID, for serious incidents INCID;

b) manufacturer, model, nationality and registration marks, and serial number of the aircraft;

c) name of owner, operator and hirer, if any, of the aircraft;

d) name of the pilot-in-command;

e) date and time (local time or UTC) of the accident or serious incident;

f) last point of departure and point of intended landing of the aircraft;

g) location of the accident or incident with reference to some easily defined geographical point, and latitude and longitude;

h) number of crew and passengers: aboard, killed and seriously injured; others: killed and seriously injured;

i) nature of the accident or serious incident, and the extent of damage to the aircraft so far as it is known;

j) an indication to what extent the investigation will be conducted or is proposed to be delegated by the State of Occurrence;

k) physical characteristics of the accident or serious incident area; and

l) identification of the originating authority (DGCA India)

1. It may be helpful to provide the elevation of the accident site, if it is known.
2. It is useful to first provide the number of persons aboard (crew, passengers) and then the injuries they sustained.

APPENDIX D

1. NOTIFICATION — ACCIDENTS AND SERIOUS INCIDENTS

International occurrences: accidents and serious incidents occurring in the Indian Territory to aircraft registered in another Contracting State. The Notification should be sent to:

State of Registry
State of the Operator
State of Design
State of Manufacture
ICAO (when aircraft over 2 250 kg)

Final report should also be sent to:

State having interest because of fatalities
State providing information, significant facilities or experts

Domestic occurrences: accidents and serious incidents occurring in the Indian Territory to civil aircraft registered in India. The Notification as well as the Final report should be sent to:

State of Design
State of Manufacture
ICAO (when aircraft over 5700 kg)

APPENDIX E

ADDRESSES OF ACCIDENT INVESTIGATION AUTHORITIES

AFGHANISTAN
President of Civil Aviation Operations
Ministry of Civil Aviation and Tourism
Ansari Watt, P.O. Box 165
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Fax: (873) 68 1280784
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Cable: CIVAVIA Kabul

ALBANIA
Ministry of Public Works and Transport
Directorate General of Civil Aviation
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Algérie
Tel.: (213) 2 74 06 81 (standard)
(213) 2 74 76 30 (ligne Directeur directe)
Fax: (213) 2 74 76 14
(213) 2 74 76 24
RSFTA: DAALYAYA
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Telex: 66 129

ANDORRA
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Département des Transports et de l'Énergie
Ministère de l'Économie
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Fax: (297) 823038
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Australian Transport Safety Bureau (ATSB)
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Australia
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Fax: (61) 2 6274-6474

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Web site: http://www.atsb.gov.au

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DOMINICA[2]
See Eastern Caribbean States

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Note.— The Directorate of Civil Aviation is perated in conjunction with States comprising the Organization of Eastern Caribbean States: Antigua and Barbuda, Dominica, Grenada, Montserrat, Saint Kitts and Nevis Saint Lucia, and Saint Vincent and the Grenadines
.

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1. Dependent territory
2. Non-Contracting State

APPENDIX F

PERSONAL AND CONFIDENTIAL

Dated the ----------

From:

Inspector of Accidents,
Civil Aviation Department,
---------- .

To,

(Blameworthy person)

Sub. Accident to aircraft, on at

Dear Sir,

The investigation conducted by me into the above accident is now nearing completion.

In accordance with the requirements of Rule 71(3) of Aircraft Rules 1937, I hereby give notice that some degree of responsibility for the accident may be attributed to you since it appears that

(State the specific charge, based on a finding and/or opinion as to the cause of the accident, for which the person is likely to be blamed.)

If you wish to attend this office for an interview to see the evidence, and if need be, to make a statement etc, an appointment shall be made on hearing from you. If you do not wish to avail yourself of this opportunity, you may please notify me accordingly.

If no reply is received from you within 10 days of the receipt of this notice, it will be presumed that you do not intend to avail yourself of this opportunity.

Yours faithfully,

Inspector of Accidents
Investigating into the accident to ,
Aircraft VT- at on ---------

APPENDIX G

GUIDANCE MATERIAL ON COMPLETING EACH SECTION OF THE FINAL REPORT

1. Factual Information

1.1 History of the flight:

A brief narrative giving the following information:

Flight No., type of operation, last point of departure, time of departure (GMT), point of intended landing.

Flight preparation, description of the flight and events leading to the accident, including reconstruction of the significant portion of the flight path, if appropriate.

Location (latitude, longitude, elevation), time of the accident (GMT), whether day or night.

1.2 Injuries to persons:

Completion of the following (in numbers)

Injuries	Crew	Passengers	Others
Fatal			
Serious			
Minor/none			

Note: Fatal injuries include all deaths determined to be a direct result of injuries sustained in the accident.

1.3 Damage to aircraft:

Brief statement of the damage sustained by aircraft in the accident (destroyed, substantially damaged, slightly damaged, no damage).

1.4 Other damage:

Brief description of damage sustained by objects other than the aircraft.

1.5 Personnel information:

a) Pertinent information concerning each of the flight crewmembers including: age, validity of licenses, ratings, mandatory checks, flying experience (total and on type) and relevant information on duty time.

b) Brief statement of qualification and experience of other crewmembers.

c) Pertinent information regarding other personnel such as air traffic services, maintenance etc., when relevant.

1.6 Aircraft information :

a) Brief statement on airworthiness and maintenance of the aircraft (indication of deficiencies known prior to and during the flight to be included, if having any bearing on the accident).

b) Brief statement on performance, if relevant, and whether the weight and center of gravity were within the prescribed limits during the phase of operation related to the accident. (If not and if of any bearing on the accident give details).

c) Type of fuel used.

1.7 Meteorological information:

a) Brief statement on the meteorological conditions appropriate to the circumstances including both forecast and actual conditions, and the availability of meteorological information to the crew.

b) Natural light conditions at the time of the accident (sunlight, moonlight, twilight, etc.)

1.8 Aids of navigation:

Pertinent information on navigational aids available, including landing aids such as PAR, ILS, Visual Ground Aids etc. and their effectiveness at the time.

1.9 Communication:

Pertinent information on aero mobile and aeronautical fixed service communications and their effectiveness.

1.10 Aerodrome information:

Pertinent information associated with the aerodrome, its facilities and condition, or with the take off or landing area if other than an aerodrome.

1.11 Flight recorders:

Location of the flight recorder installations in the aircraft, their condition on recovery and pertinent data available there from.

1.12 Wreckage and impact information:

General information on the site of the accident and the distribution pattern of the wreckage; detected material failure or component malfunctions. Details concerning the location and state of the different pieces of the wreckage are not normally required unless it is necessary to indicate a break up of the aircraft prior to impact. Diagrams, charts and photographs may be included in this section or attached in 5 – Appendices of the Summary.

1.13 Medical and pathological information:

Brief description of the results of the investigation undertaken and pertinent data available there from. (Note: Medical information

related to flight crew licenses should be included in 1.5 – Personnel information.

1.14 Fire:

If fire occurred, information on the nature of the occurrence, and of the fire fighting equipment used and its effectiveness.

1.15 Survival aspects:

Brief description of search, evacuation and rescue, location of crew and passengers in relation to injuries sustained, failure of structures such as seats and seat belt attachments.

1.16 Tests and research:

Brief statements regarding the results of tests and research.

1.17 Additional information:

Relevant information not already included in 1.1 to 1.16 above.

1.18 New investigation techniques:

When new investigation techniques have been used during the investigation, briefly indicate the reason for using the new techniques and refer here to the main features as well as describing the results under the appropriate sub-heading 1.1 to 1.17.

2. Analysis

Analysis as appropriate, only the information documented in 1.— factual information and which is relevant to the determination of conclusions and cause (s).

3. Conclusions

Reproduce in its entirety the text of the conclusions and Cause(s) of the final report on the investigation, or summarize.

4. Safety Recommendations

As appropriate, briefly state any recommendations made for the purpose of accident prevention and any resultant corrective action.

5. Appendices

Include, as appropriate any other pertinent information considered necessary for the understanding of the report.

APPENDIX H

PRELIMINARY REPORT ON ACCIDDENT TO (Type) ……..(REGISTRATION AT/ON/NEAR …….(PLACE) ON ……(DATE)

1. Aircraft
   Type
   Model
   Nationality
   Registration
2. Owner
3. Operator or hirer
4. Date of accident
5. Time (UTC)
6. Last point of departure
7. Point of intended landing
8. Geographical location of site of accident (LAT./LONG)
9. Type of Operation
10. Phase of Operation
11. Type of Accident
12. Injuries to persons:

Injuries	Crew	Passengers	Others
Fatal			
Serious			
Minor/None			

13. Damage to aircraft
14. Brief Description of the accident:
15. Progress of investigation and significant facts established during the investigation, particularly any lack of adequate piloting proficiency or any unwarranted disregard of Safety requirements by the pilot.
16. Precautionary actions taken or under consideration

APPENDIX I

FORMAT OF THE FINAL REPORT

Title. The Final Report begins with a title comprising: name of the operator; manufacturer, model, nationality and registration marks of the aircraft; place and date of the accident or incident.

Synopsis. Following the title is a synopsis describing briefly all relevant information regarding: notification of accident to national and foreign authorities; identification of the accident investigation authority and accredited representation; organization of the investigation; authority releasing the report and date of publication; and concluding with a brief résumé of the circumstances leading to the accident.

Body. The body of the Final Report comprises the following main headings:

1. Factual information
2. Analysis
3. Conclusions
4. Safety recommendations

each heading consisting of a number of sub-headings as outlined in the following.

Appendices: Include as appropriate.

Note:

In preparing a Final Report, using this format, ensure that:

a) All information relevant to an understanding of the factual information, analysis and conclusions is included under each appropriate heading;

b) where information in respect of any of the items in Factual information is not available, or is irrelevant to the circumstances leading to the accident, a note to this effect is included under the appropriate sub-headings.

1. FACTUAL INFORMATION

1.1 ***History of the flight.***

A brief narrative giving the following information:

- Flight number, type of operation, last point of departure, time of departure (local time or UTC), point of intended landing.
- Flight preparation, description of the flight and events leading to the accident, including reconstruction of the significant portion of the flight path, if appropriate.
- Location (latitude, longitude, elevation), time of the accident (local time or UTC), whether day or night.

1.2 ***Injuries to persons.***

Completion of the following (in numbers):

Injuries	*Crew*	*Passengers*	*Others*
Fatal			
Serious			
Minor/None			

Note. — Fatal injuries include all deaths determined to be a direct result of injuries sustained in the accident. Serious injury is defined in Chapter 1 of the Annex 13.

1.3 ***Damage to aircraft.***

Brief statement of the damage sustained by aircraft in the accident (destroyed, substantially damaged, slightly damaged, no damage).

1.4 ***Other damage.***

Brief description of damage sustained by objects other than the aircraft.

1.5 ***Personnel information:***

a) Pertinent information concerning each of the flight crew members including:

age, validity of licences, ratings, mandatory checks, flying experience (total and on type) and relevant information on duty time.

b) Brief statement of qualifications and experience of other crew members.

c) Pertinent information regarding other personnel, such as air traffic services, maintenance, etc., when relevant.

1.6 ***Aircraft information:***

a) Brief statement on airworthiness and maintenance of the aircraft (indication of deficiencies known prior to and during the flight to be included, if having any bearing on the accident).

b) Brief statement on performance, if relevant, and whether the mass and centre of gravity were within the prescribed limits during the phase of operation related to the accident. (If not and if of any bearing on the accident give details.)
c) Type of fuel used.

1.7 ***Meteorological information:***

a) Brief statement on the meteorological conditions appropriate to the circumstances including both forecast and actual conditions, and the availability of meteorological information to the crew.

b) Natural light conditions at the time of the accident (sunlight, moonlight, twilight, etc.)

.

1.8 ***Aids to navigation.***

Pertinent information on navigation aids available, including landing aids such as ILS, MLS, NDB, PAR, VOR, visual ground aids, etc., and their effectiveness at the time.

1.9 ***Communications.***

Pertinent information on aeronautical mobile and fixed service communications and their effectiveness.

1.10 ***Aerodrome information.***

Pertinent information associated with the aerodrome, its facilities and condition, or with the take-off or landing area if other than an aerodrome.

1.11 ***Flight recorders.***

Location of the flight recorder installations in the aircraft, their

condition on recovery and pertinent data available there from.

1.12 ***Wreckage and impact information.***

General information on the site of the accident and the distribution pattern of the wreckage; detected material failures or component malfunctions. Details concerning the location and state of the different pieces of the wreckage are not normally required unless it is necessary to indicate a break-up of the aircraft prior to impact. Diagrams, charts and photographs may be included in this section or attached in the Appendices.

1.13 ***Medical and pathological Information.***

Brief description of the results of the investigation undertaken and pertinent data available there from.

Note. — Medical information related to flight crew licenses should be included in 1.5 — Personnel information.

1.14 ***Fire.***

If fire occurred, information on the nature of the occurrence, and of the fire fighting equipment used and its effectiveness.

1.15 ***Survival aspects.***

Brief description of search, evacuation and rescue, location of crew and passengers in relation to injuries sustained, failure of structures such as seats and seatbelt attachments.

1.16 ***Tests and research.***

Brief statements regarding the results of tests and research.

1.17 ***Organizational and management information.***

Pertinent information concerning the organizations and their management involved in influencing the operation of the aircraft. The organizations include, for example, the operator; the air traffic services, airway, aerodrome and weather service agencies; and the regulatory authority. The information could include, but not be limited to, organizational structure and functions, resources, economic status, management policies and practices, and regulatory framework.

1.18 ***Additional information.***

Relevant information not already included in 1.1 to 1.17.

1.19 ***Useful or effective investigation techniques.***

When useful or effective investigation techniques have been used during the investigation, briefly indicate the reason for using these techniques and refer here to the main features as well as describing the results under the appropriate sub-headings 1.1 to 1.18.

2. ANALYSIS

Analyse, as appropriate, only the information documented in 1. — Factual information and which is relevant to the determination of conclusions and causes.

3. CONCLUSIONS

List the findings and causes established in the investigation. The list of causes should include both the immediate and the deeper systemic causes.

4. SAFETY RECOMMENDATIONS

As appropriate, briefly state any recommendations made for the purpose of accident prevention and any resultant corrective action.

APPENDICES

Include, as appropriate, any other pertinent information considered necessary for the understanding of the report

APPENDIX J

INVESTIGATION FIELD KIT

GENERAL

- Identification papers,
- Investigator's official tag,
- High-visibility jacket,
- Relevant documentation (regulations, accident investigation manual, checklists, report forms, etc.)
- Appropriate aircraft manuals and parts catalogues
- Emergency funds

SURVEY EQUIPMENT

- Large-scale maps of the accident area
- Magnetic compass
- Global Positioning System
- Laser surveying equipment
- Clinometer
- Navigational computer,
- Protractor and dividers
- Measuring tape, at least 20 m long,
- a 30-cm-long ruler
- Reel of cord, 50 to 300 m long

MARKING EQUIPMENT

- Labels,
- tie-on tags and adhesive tags
- Flag markers and stakes Writing material,
- graph paper,
- waterproof notebooks and clipboards Pens, pencils,
- grease pencils,
- indelible marking crayons and
- permanent markers

TOOLS AND SAMPLING MATERIALS

- Tool kit
- Waterproof flashlight with spare batteries and bulbs
- Small magnet
- Multi-purpose knife
- Inspection mirror
- Magnifying glass (10 x)
- Assorted antistatic containers (for electronic components with non-volatile memory)
- Sterile bottles (for aircraft fuel, oil and fluid samples, as well as for pathological fluid and tissue samples)
- Siphons Plastic bags (assorted) and
- plastic sheets Masking tape

MISCELLANEOUS ITEMS

- First-aid kit
- Heavy gloves,
- Protective overalls and other protective equipment, such as hard hats, goggles and face masks
- Protective clothing and equipment to protect against biological hazards
- Photographic equipment for colour prints/slides
- Video camera
- Binoculars with integrated compass
- Small tape recorder,
- Spare cassettes and batteries
- Portable means of on-site communication, e.g. cellular telephone or walkie-talkie, spare batteries

Investigators should bring to the accident site those items, which they expect to use. Usually, there is no need for each investigator to bring all the items in the list. List of personal equipments against biological hazards is also enclosed.

PERSONAL PROTECTIVE EQUIPMENT AGAINST BIOLOGICAL HAZARDS

The following provides general guidelines on the personal protective equipment to be used by accident investigators at the accident site. The protective equipment may also be required when performing off-site examinations and tests on wreckage parts.

Disposable latex gloves Latex gloves should be durable even though they are to be worn under work gloves. All latex gloves should be properly disposed of prior to leaving the accident site.

Work gloves Work gloves should be as durable as practical and provide the hand, wrist and forearm with puncture and abrasion protection. Leather, nitrile and Kevlar gloves are commonly used. All three types should be disinfected or properly disposed of prior to leaving the accident site.

***Face mask*s**. Face masks should cover the nose and mouth. Masks come in disposable and reusable configurations and should be disinfected or properly disposed of prior to leaving the accident site.

Protective goggles. Protective goggles should enclose the eyes by sealing around the top, bottom and sides. Common safety glasses are not acceptable. Goggles should be fitted with one-way check valves or vents to prevent fogging and should be disinfected or properly disposed of prior to leaving the accident site.

Disposable protective suits. Protective suits should be durable and liquid-resistant and should fit properly. If possible, they should have elastic-type hoods and elastic pant cuffs. Duct tape can be used to alter the suits and to patch tears. Protective suits should be properly disposed of prior to leaving the accident site.

Disposable shoe covers and protective boots Disposable shoe covers made of polyvinyl chloride (PVC) or butyl rubber are recommended. Leather, rubber or Gortex work boots are also acceptable. Disposable shoe covers and protective boots should be disinfected or properly disposed of prior to leaving the accident site.

Disinfection chemicals Two chemical types are commonly used to disinfect personal protective equipment. Rubbing alcohol of 70 per cent strength is effective and is available in towelettes, as well as in large hand towels. The most effective disinfectant solution is a mixture of common household bleach and water, with one part bleach to ten parts of water. **Never mix alcohol and bleach**.

Biological hazard disposal bags Biological hazard disposal bags must be used for disposal of contaminated personal protective equipment. The bags are red or orange and are labelled “Biological hazard”. For transport, the disposed material should be double bagged.