



Aircraft
ACCIDENT /INCIDENT
INVESTIGATION

DEFINITIONS : *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.

DEFINITIONS : *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**.

DEFINITIONS : ***Incident***

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

Serius Incident

- ***Near collisions requiring an avoidance manoeuvre 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, on a taxiway or unassigned runway.***
- ***Take-offs from a closed or engaged runway, from a taxiway or unassigned runway.***
- ***Landings or attempted landings on a closed or engaged runway, on a taxiway or unassigned 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.***

Serius Incident

- *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.*
- *Runway incursions classified with severity A. The Manual on the Prevention of Runway Incursions (Doc 9870) contains information on the severity classifications.*
- *Take-off or landing incidents. Incidents such as under-shooting, 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.*

DEFINITIONS : *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**.

OBJECTIVE OF THE INVESTIGATION

- prevention of accidents and incidents.
- It is not the purpose of this activity to apportion blame or liability
- *separate from any judicial or administrative proceedings to apportion blame or liability.*
- The State conducting the investigation shall recognize the need for coordination between the investigator-incharge and the judicial authorities

NOTIFICATION

ACCIDENTS OR SERIOUS INCIDENTS IN THE TERRITORY OF OF A CONTRACTING STATE TO AIRCRAFT OF ANOTHER CONTRACTING STATE:

The State of Occurrence shall forward a notification of an accident or serious incident to:

- A) the State of Registry;
 - b) the State of the Operator;
 - c) the State of Design;
 - d) the State of Manufacture; and
 - e) the International Civil Aviation Organization, when the aircraft involved is of a maximum mass of over 2 250 kg or is a turbojet-powered aeroplane.
- However, when the State of Occurrence is not aware of a serious incident, the State of Registry or the State of the Operator, as appropriate, shall forward a notification of such an incident to the State of Design, the State of Manufacture and the State of Occurrence.

NOTIFICATION

- ACCIDENTS OR SERIOUS INCIDENTS IN THE TERRITORY OF THE STATE OF **REGISTRY**, IN A **NON-CONTRACTING** STATE OR **OUTSIDE** THE TERRITORY OF ANY STATE:

When the State of **Registry** institutes the investigation of an accident or serious incident, that State shall forward a notification.

NOTIFICATION: *Format and content*

- a) for accidents the identifying 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, and nationality of crew and passengers;
- 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) position of the aircraft 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;

NOTIFICATION: *Format and content*

- i) description of the accident or serious incident and the extent of damage to the aircraft so far as 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, as well as an indication of access difficulties or special requirements to reach the site;
- l) identification of the originating authority and means to contact the investigator-in-charge and the accident investigation authority of the State of Occurrence at any time; and
- m) presence and description of dangerous goods on board the aircraft.

RESPONSIBILITY FOR INSTITUTING AND CONDUCTING THE INVESTIGATION

ACCIDENTS OR INCIDENTS

- **IN THE TERRITORY OF A CONTRACTING STATE**
- **IN THE TERRITORY OF A NON-CONTRACTING STATE**
- **OUTSIDE THE TERRITORY OF ANY STATE**

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

- **The accident investigation authority 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**.**

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

Flight recorders — Accidents and incidents:

- Effective use of flight recorders
- arrangement for the read-out of the flight recorders without delay.
- *In the event that the State conducting the investigation of an accident or an incident does not have adequate facilities to read out the flight recorders, it should use the facilities made available to it by other States, 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*

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

- Autopsy examinations
- Medical examinations
- Coordination- judicial authorities
- Information aviation security authorities
- Non- disclosure of records
- Reopening of investigation

PARTICIPATION IN THE INVESTIGATION

- The State of **Registry**, the State of the **Operator**, the State of **Design** and the State of **Manufacture** shall each be **entitled** to appoint an **accredited representative** to participate in the investigation.
- **Any State** which on request provides **information, facilities or experts** to the State conducting the investigation shall be **entitled** to appoint an accredited representative to participate in the investigation

PARTICIPATION IN THE INVESTIGATION

Participation in the investigation shall confer **entitlement** to participate in all aspects of the **investigation, under the control of the investigator-in-change**, 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;

PARTICIPATION IN THE INVESTIGATION

- 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.

PARTICIPATION OF STATES HAVING SUFFERED FATALITIES OR SERIOUS INJURIES TO ITS CITIZENS

- 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.

FINAL REPORT

- RESPONSIBILITY OF ANY STATE:

Release of information — Consent

- RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

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.

FINAL REPORT

- ***Recipient States:***

- a) the State that instituted the investigation;
- b) the State of Registry;
- c) the State of the 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.

ACCIDENT PREVENTION MEASURES

- *Incident reporting systems*
- *Database systems*
- *Analysis of data*
- *Exchange of safety information*

INVESTIGATION FIELD KIT

- SURVEY EQUIPMENT
 - MARKING EQUIPMENT
 - TOOLS AND SAMPLING MATERIALS
 - MISCELLANEOUS ITEMS
-
- *ICAO Circular 315, Hazards at Accident Sites*

The investigation shall normally include:

- a) the gathering, recording and analysis of all relevant information on that accident or incident;
- b) if appropriate, the issuance of safety recommendations;
- c) if possible, the determination of the causes and/or contributing factors; and
- d) the completion of the Final Report.

extent of the investigation

The **scope** and **complexity** of the **investigation** and the **size** and **composition** of the **investigation team** would be influenced by the following factors, among others:

- a) injuries, deaths and damage to equipment, third parties and the environment;
- b) identified and potential safety issues underlying the accident/incident;
- c) the likelihood of recurrence, the probability of adverse consequences, and the severity of adverse consequences;
- d) accident and incident history related to the type of operation, size and type of aircraft, the operator, manufacturer, and regulator; and
- e) actual and potential deviations from industry safety and operational regulations, standards, procedures and practices.

ORGANIZATIONAL READINESS

the investigation authority should have:

- a) appropriate **legislation** that defines the **rights and responsibilities** of the aircraft accident investigation authority;
- b) ready access to **sufficient funds**;
- c) **investigators** who have the appropriate **experience, training, clothing and equipment**;
- d) **State regulations** that provide for the accident investigation authority to be immediately notified of any accident or incident in its territory;
- e) **policies, plans, procedures and checklists** required for investigations; and
- f) **an organization** that ensures that accident and incident notifications are received and acted upon on a **twenty-four-hour** basis.

ICAO Circular 298: Training Guidelines for Aircraft Accident Investigators

The investigation authority's plans for responding to notifications should consider the following:

- a) an **immediate review** of the information in the notification to ensure that all the required information has been provided
- b) the **collection** of missing or additional **information**, as soon as possible;
- c) the **validation** of the **information** collected, to the degree possible;
- d) an **assessment** of the **information** received and the circumstances of the occurrence to determine the classification of the occurrence (accident, serious incident or incident) and the **scope and size** of the investigation to be conducted;
- e) the **appointment** of an Investigator-in-charge;
- f) the **notification** of national authorities, local authorities, States and other organizations that may be involved in or have an interest in the occurrence; and
- g) the **allotment of resources** (financial, equipment and personnel) to the investigation.

Coordinators

Coordinators who could be involved in a major investigation include:

- the deputy Investigator-in-charge
- head office coordinator
- administration coordinator
- Public relations coordinator
- site safety coordinator.

INVESTIGATION GROUPS

operational category

technical category

INVESTIGATION GROUPS

operational category :

1. **Operations;**
2. **Aircraft Performance;**
3. **Medical/Human Factors;**
4. **Witness;**
5. **Flight Recorders;**
6. **Meteorology;**
7. **Air Traffic Services/Airport;**
8. **Survivability;**
9. **Cabin Safety.**

INVESTIGATION GROUPS

technical category:

1. Maintenance and Records;
2. Systems;
3. Structures;
4. Power plants;
5. Site Survey;
6. Crashworthiness;
7. Photo/Video.

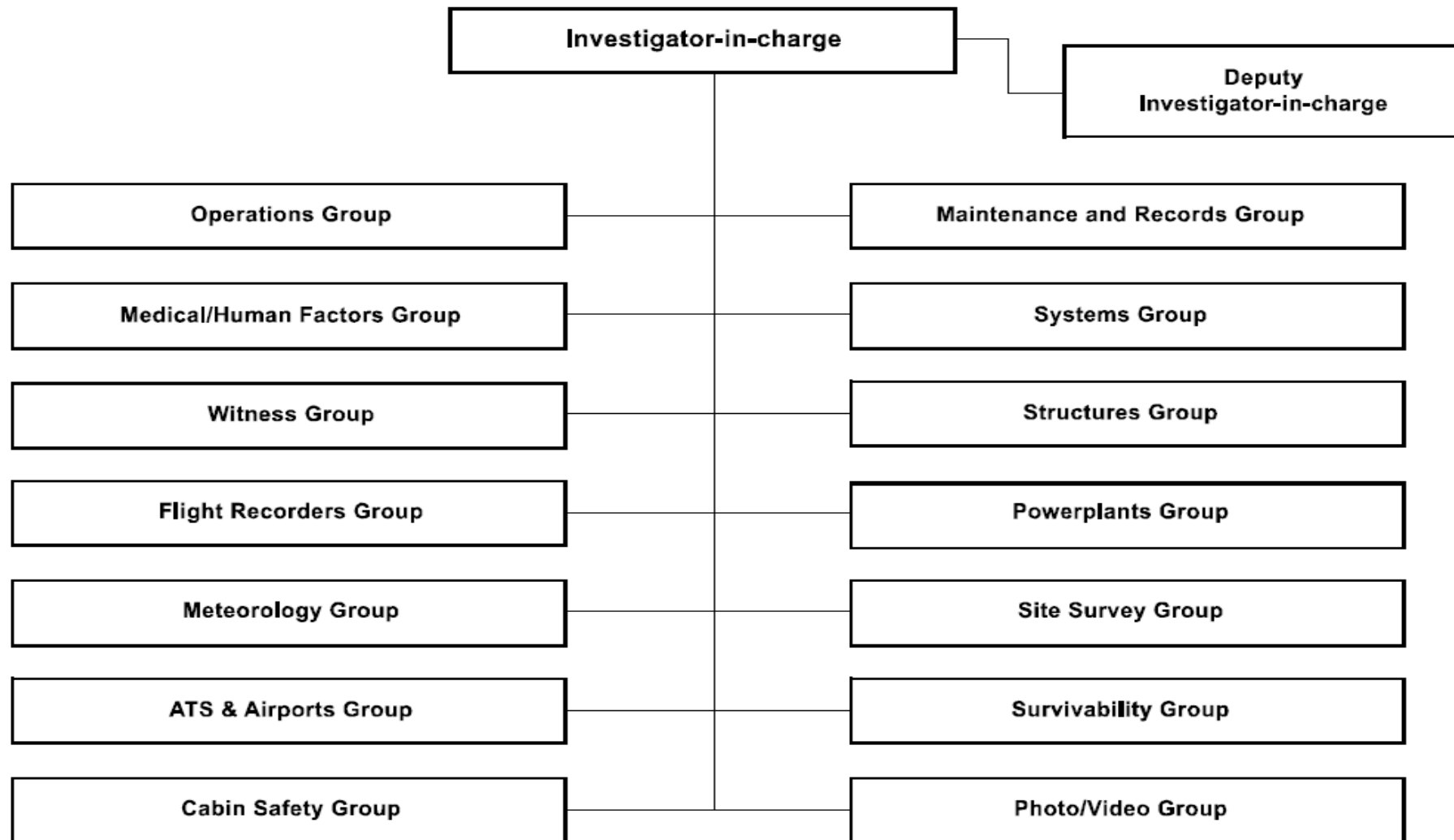


Figure A1-1. Major Accident Investigation Team Organization — A

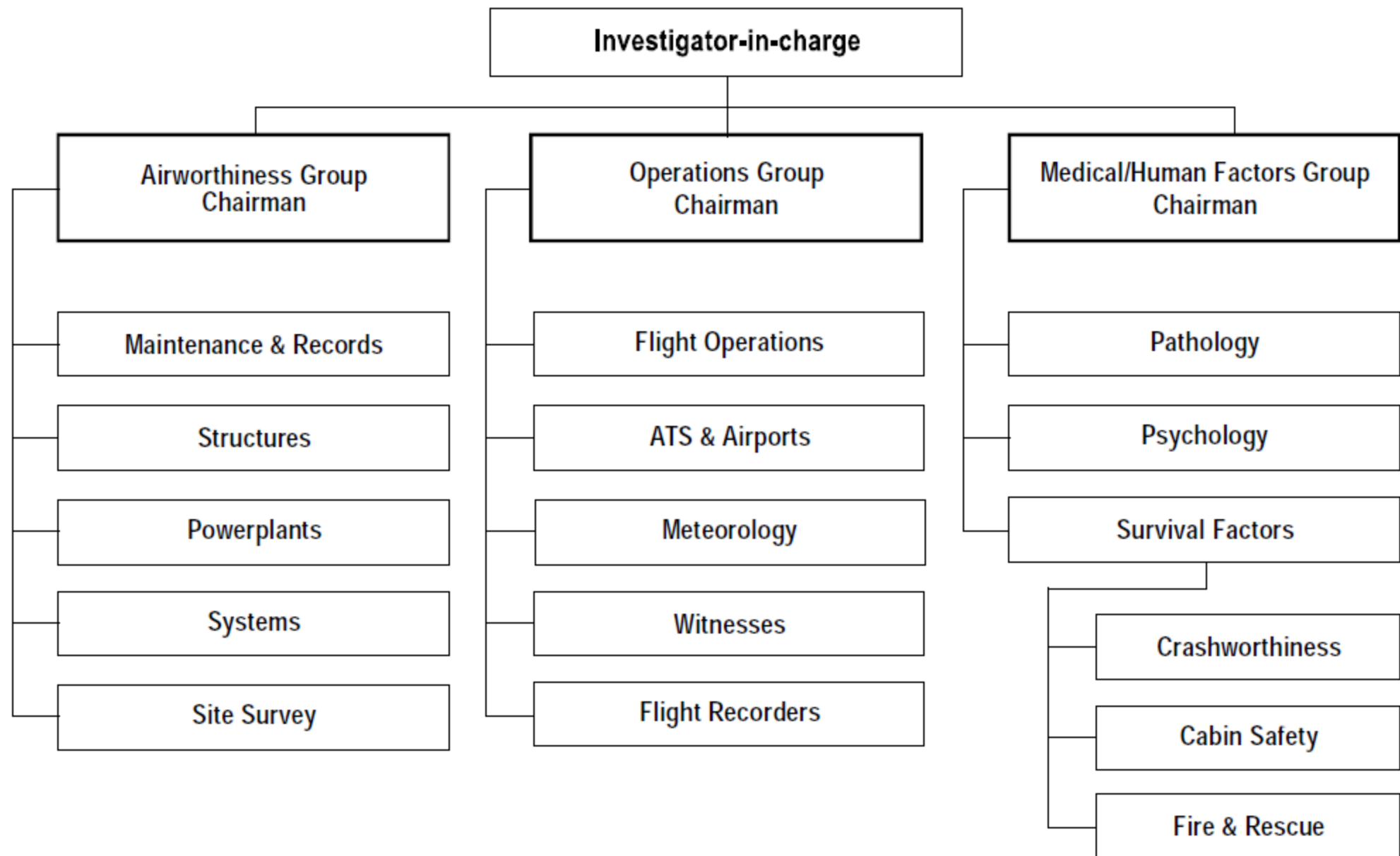


Figure A1-2. Major Investigation Team Organization — B

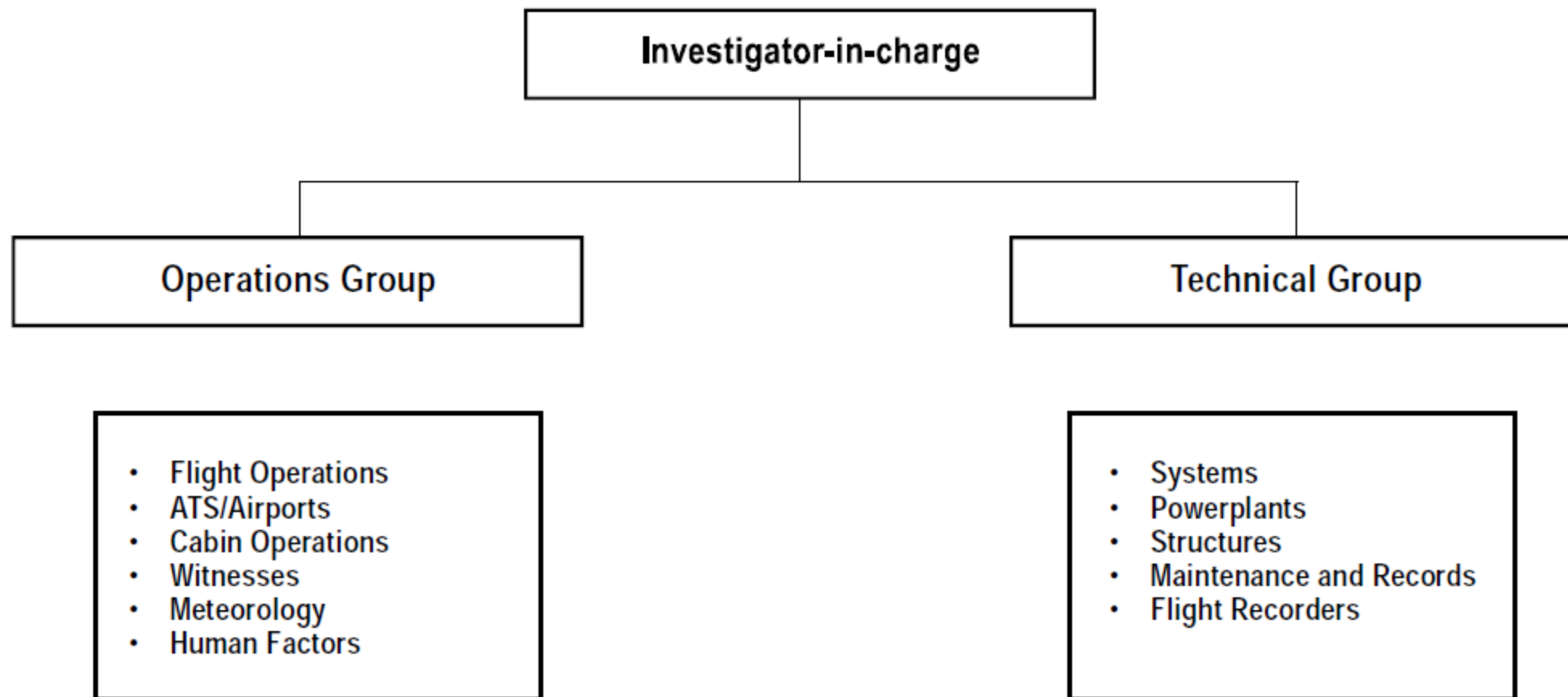


Figure A1-3. Smaller Investigation Team Organization — A

INVESTIGATION GROUPS:

Operations Group

The Operations Group is responsible for collecting the facts concerning

- the history of the flight
- The flight crew activities before, during and after the accident/incident.
- the man-machine relationship
- the actions or inactions present in the events surrounding the accident
- flight planning, dispatch, mass and balance
- weather and weather briefing,
- radio communications, air traffic services, navigation facilities, en-route stops,
- refuelling, flight experience, flight checks and general information concerning the flight crew
- all aspects of training received and an assessment of the adequacy of this training;
- the level of supervision, including orders, regulations and manuals;
- the performance of supervisors, instructors and company management.

INVESTIGATION GROUPS:

Aircraft Performance Group

This group will gather the information on aircraft performance for the particular phases of flight and complete a scientific/mathematical analysis. This group will coordinate with most of the operational and technical groups to gather the basic information and will determine if there is a need to conduct performance-related flight tests or simulator tests.

INVESTIGATION GROUPS:

Medical/Human Factors Group

- A separate Medical/Human Factors Group would only be formed when there is a requirement to conduct an in-depth examination of the aero medical, crash injury, and/or human performance issues.
- For human factors issues, this group would be responsible for gathering and analyzing evidence on the general physical, physiological and psychological conditions, the environmental factors, and the organizational and management factors that might have adversely affected the crew or other individuals in the performance of their duties.
- The investigation of human factors should be conducted whenever human performance may have contributed to the occurrence, which could include the performance of, among others, cabin crew, air traffic controllers, maintenance crew, engineers, regulatory officials, decision-makers and management.

INVESTIGATION GROUPS:

Medical/Human Factors Group

- For medical issues, this group would be responsible for gathering and analyzing evidence associated with the pathological, aviation-medical and crash-injury aspects of the investigation, including the identification of the crew, their location at the time of the accident, and by reviewing their injuries, their position and their activity in the cockpit at the time of the impact.
- The functions of the Medical/Human Factors group must be closely coordinated with the Operations Group ,Air Traffic Services/Airports Group, Witness Group, Recorders Group, Maintenance and Records Group, Structures Group and Crashworthiness Group.

INVESTIGATION GROUPS:

Witness Group

The Witness Group is responsible for contacting and interviewing all survivors of the flight, and all persons who may have seen or heard some portion of the flight, or who may have knowledge concerning the flight or of the weather conditions at the time of the accident

INVESTIGATION GROUPS:

Flight Recorders Group

- The Flight Recorders Group is responsible for examining and analyzing the on-board and ground-based flight recorders, including the flight data recorders, cockpit voice recorder(s), and cockpit airborne image recorders.
- The Group will arrange through the Investigator-in-charge for their read-out.
- The results of the read-outs must be closely coordinated with the Operations Group and such other groups as the circumstances indicate.

INVESTIGATION GROUPS:

Meteorology Group

- The Meteorology Group should be responsible for the collection and compilation of meteorological data pertinent to the accident, including both surface and upper air reports of actual conditions, pilot reports, recorded meteorological data, as well as forecasts of anticipated conditions prepared and issued by the agencies involved.
- This group would also be responsible for investigating the systems, sensors, equipment and processes used to generate and provide weather information.
- Of necessity, the Meteorology Group must maintain close coordination with other groups, particularly the Operations Group, the Air Traffic Services/Airports Group and the Witness Group.

INVESTIGATION GROUPS:

Air Traffic Services and Airport Group

This group should be responsible for the review of the records of the air traffic services units concerned, including radar screen recordings, the radio communication and telephone line voice recordings; and, for the verification that written transcripts of voice communications are consistent with the recordings. This group should provide, when appropriate, a reconstruction of the history of the flight based on air traffic services information. In addition, the Group should determine the operating status of pertinent navigation aids, communications equipment, radar, transponder equipment, computers, and other equipment; and, should provide technical data on all such equipment and its operation, whenever it is deemed necessary.

INVESTIGATION GROUPS:

Survivability Group

- When required, the Survivability Group will be established to investigate the evacuation, the crash response, the firefighting, the survival and the rescue issues. The activities of this group include an examination of the respective equipment and of the manner in which it was used.
- Close coordination with the Human Factors Group, Operations Group and Cabin Safety Group will be required. This group could also logically be a sub-group of the Medical/Human Factors Group.

INVESTIGATION GROUPS:

Cabin Safety Group

The Cabin Safety Group is responsible for thoroughly exploring all the aspects of the accident related to the actions of the passengers and cabin crew members. This will normally include the following aspects: passenger/crew member survivability factors; company policies and procedures as they relate to passenger/crew member safety; industry policies, procedures and regulations; and flight attendant training with respect to operational safety issues.

INVESTIGATION GROUPS:

Maintenance and Records Group

The Maintenance and Records Group is responsible for reviewing the maintenance records to ascertain the maintenance history of the aircraft regarding adequacy of inspection, malfunctions that might be related to the occurrence, flight time on the aircraft, engines and components, and the flight time since overhaul. These activities are normally performed at the maintenance base of the operator. The function of this group involves close coordination with the other technical investigation groups, the State of Registry and the operator. This group is also responsible for reviewing recovered technical flight documents. Close coordination with the Operations Group will be required.

INVESTIGATION GROUPS:

Systems Group

The Systems Group is responsible for the detailed examination of all systems and components, among others hydraulics, pneumatics, electrical and electronics, radio communication and navigation equipment, air conditioning and pressurization, ice and rain protection, cabin fire extinguishers, and oxygen. The examinations will include determination of the condition and operational capabilities of components. It is important that all system components be accounted for, within reason. The examination includes determination of the positions of associated controls and switches, as well as the identification and downloading of data contained in built-in test equipment. This group must coordinate its activities with the Flight Recorders, Operations, Site Survey, Maintenance and Records, Structures and Powerplants groups.

INVESTIGATION GROUPS:

Structures Group

The Structures Group is responsible for collecting and analysing the facts and evidence related to the airframe and flight controls. If the wreckage is scattered, the Group's first concern is to locate and identify as many sections, components and parts as possible and to plot their positions on a wreckage distribution chart.

A reconstruction of the aircraft structure may be necessary, and this task could vary from laying out various pieces of wreckage on a flat area to the more complicated re-assembly of all available pieces in position on a framework. This procedure is most often used for in-flight break-up, in-flight fire and explosion type accidents. The main purpose of such a reconstruction is to identify the point of initial failure and to establish the progression of the break-up pattern. Close cooperation with the Site Survey Group is usually required.

INVESTIGATION GROUPS:

Powerplants Group

The Powerplants Group is responsible for collecting and analysing the evidence related to the engine(s), including fuel and oil systems, propeller(s) and powerplant controls. The initial work of this group may be carried out in conjunction with the Structures Group and the Site Survey Group in the locating and plotting of wreckage. All powerplant fires should be investigated. This group is also responsible for determining the type of fuel used, the possibility of fuel contamination, and the effectiveness of the powerplant fire extinguisher system. The functions of this group must be coordinated with the Site Survey, Structures, Systems, Flight Recorders and Operations Groups.

INVESTIGATION GROUPS:

Site Survey Group

The Site Survey Group is responsible for producing, in pictorial and graphic format, a description of the accident site, showing the location and distribution of the wreckage, human remains and other associated items, such as impact marks. This group must establish a probable flight path, an impact angle and impact speed. The activities of this group are linked to the Aircraft Performance Group, Structures Group and Recorders Group.

INVESTIGATION GROUPS:

Crashworthiness Group

The Crashworthiness Group is responsible for determining the survivability issues for all aircraft occupants. The activities of this group will overlap with those of the Structures Group, Site Survey Group, Survivability Group, Flight Recorders Group and Witness Group. This group is often a sub-group of the Structures Group.

INVESTIGATION GROUPS:

Photo/Video Group

The Photo/Video Group is responsible for ensuring that a systematic photographic record of the accident is created. This group would also provide photo/video support to the other groups during the field phase and post-field phase, including the documentation of teardowns, examinations and testing of components, and the analysis of photo/video records. This group is often a sub-group of the Site Survey Group.

Reporting

Final Report on an accident must establish in detail :

- what happened;
- how it happened;

And

- why it happened.

CONTENT OF THE FINAL REPORT

- **FACTUAL INFORMATION:**

- 1.1- History of the flight;**

- In the history of the flight section, the objective is to enable the reader to understand how the accident happened but to avoid any analysis of why the accident occurred.

- 1.2 - Injuries to persons;**

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Total in the aircraft</i>	<i>Others</i>
Fatal				
Serious				
Minor				Not applicable
None				Not applicable
TOTAL				

CONTENT OF THE FINAL REPORT

1.3 -Damage to aircraft

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

1.4- Other damage

A brief statement of the damage sustained by buildings, vehicles, navigation facilities, aerodrome structures and installations, and any significant damage to the environment.

1.5- Personnel information

A brief description of the qualifications, experience and history for each flight crew member;

CONTENT OF THE FINAL REPORT

1.6- Aircraft information

a brief statement of the airworthiness and maintenance of the aircraft including:

General information -- Aircraft history – Helicopters -- Engines and propellers -- Fuel Accessories – Defects -- Aircraft load;

1.7 Meteorological information

1.8 Aids to navigation

1.9 Communications

1.10 Aerodrome information

1.11 Flight recorders

CONTENT OF THE FINAL REPORT

1.12 Wreckage and impact information

1.13 Medical and pathological information

1.14 Fire

1.15 Survival aspects

1.16 Tests and research

1.17 Organizational and management information

1.18 Additional information