

Doc 9756  
AN/965



# Manual of Aircraft Accident and Incident Investigation

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## Part I Organization and Planning

Approved by the Secretary General  
and published under his authority

Second Edition — 2015

International Civil Aviation Organization



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## FOREWORD

The purpose of this manual is to encourage the uniform application of the Standards and Recommended Practices contained in Annex 13 and to provide information and guidance to States on the procedures, practices and techniques that can be used in aircraft accident investigations. Since accident investigations vary in complexity, a document of this kind cannot cover all eventualities. The more common techniques and processes, however, have been included. Although this manual will be of use to experienced and inexperienced investigators alike, it is **not** a substitute for investigation training and experience.

This manual is issued in four separate parts as follows:

- Part I — Organization and Planning;
- Part II — Procedures and Checklists;
- Part III — Investigation; and
- Part IV — Reporting.

Because this manual deals with both accident and incident investigations and, for reasons of brevity, the term “accident investigation”, as used herein, applies equally to “incident investigation”.

The following ICAO documents provide additional information and guidance material on related subjects:

- Annex 13 — *Aircraft Accident and Incident Investigation*;
- Annex 9 — *Facilitation*
- *Manual on Accident and Incident Investigation Policies and Procedures* (Doc 9962);
- *Manual on Regional Accident and Incident Investigation Organization* (Doc 9946);
- *Human Factors Training Manual* (Doc 9683);
- *Manual of Civil Aviation Medicine* (Doc 8984);
- *Hazards at Aircraft Accident Sites* (Circular 315);
- *Training Guidelines for Aircraft Accident Investigators* (Circular 298); and
- *Human Factors Digest No. 7 — Investigation of Human Factors in Accidents and Incidents* (Circular 240).

This manual, which supersedes the *Manual of Aircraft Accident Investigation* (Doc 6920) in its entirety, will be amended periodically as new investigation techniques are developed and new information becomes available.

The content of the manual was reviewed over a period of 2 years with input from many groups of experts related to aircraft accident and incident investigation authorities, civil aviation authorities, training organizations, etc., and was thereafter submitted for an extensive peer review to collect and take into account comments from the expert community. It is based upon the latest technology available at the time of its publication. As such, it will be subject to a revision process that will be governed in large part by changing dynamics within the industry. Comments on this manual, particularly with respect to its application, usefulness and scope of coverage, would be appreciated. These will be taken into consideration in the preparation of subsequent editions. Comments concerning the manual should be addressed to:

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## Chapter 1

# THE OBJECTIVE OF AN AIRCRAFT ACCIDENT INVESTIGATION

### 1.1 GENERAL

1.1.1 The sole objective of an investigation into an aircraft accident or incident conducted under the provisions of Annex 13 shall be the prevention of accidents and incidents. Annex 13 also states that it is not the purpose of an investigation to apportion blame or liability. Any judicial or administrative proceedings to apportion blame or liability shall be separate from any investigation conducted under the provisions of Annex 13.

1.1.2 An aircraft accident or incident provides evidence of hazards or deficiencies within the aviation system. A well-conducted investigation should identify all immediate and underlying systemic causes and/or contributing factors of the accident or incident. The investigation may also reveal other hazards or deficiencies within the aviation system not directly connected with the causes of the accident. The emphasis of an aircraft accident or incident investigation shall be on determining why the accident or incident happened and on recommending appropriate safety actions aimed at avoiding the hazards or eliminating the deficiencies. A properly conducted accident investigation is an important method of accident prevention.

1.1.3 An investigation shall also determine the facts, conditions and circumstances pertaining to the survival or non-survival of the occupants of the aircraft. Recommendations for improvements to the crashworthiness of the aircraft are aimed at preventing or minimizing injuries to aircraft occupants in future accidents.

1.1.4 The Final Report, which is produced at the completion of an investigation, constitutes the official conclusions and record of the accident or incident.

### 1.2 DEFINITIONS

In addition to the definitions contained in Chapter 1 of Annex 13, the following definitions apply to this manual:

**Occurrence.** Any accident or incident associated with the operation of an aircraft.

**Major accident investigation.** An investigation into an accident involving a large aircraft and usually involving fatalities.

**Smaller investigation.** An investigation into an incident involving any aircraft or into an accident involving a small aircraft.



## Chapter 2

# THE ACCIDENT INVESTIGATION AUTHORITY

### 2.1 PRIMARY LEGISLATION AND STRUCTURE

2.1.1 In conformity with Article 26 of the Convention on International Civil Aviation, it is incumbent on the State in which an aircraft accident occurs to institute an inquiry into the circumstances of the accident. This obligation can be met only when appropriate legislation on aircraft accident investigation is in place. Such legislation shall make provision for the establishment and organizational structure of an accident investigation authority (or commission, board or other body) for the investigation of aircraft accidents and incidents that is independent from State aviation authorities and other entities that could interfere with the conduct or objectivity of an investigation.

2.1.2 During the early development of international civil aviation, accident investigations were most often conducted by the same officials that were responsible for safety oversight of civil aviation. In some cases, an office of accident investigation was created within the civil aviation authority. Over the years, this arrangement has proven to be inadequate, because conflicts arose when the investigation findings identified deficiencies in the performance of the safety oversight functions. Therefore, Annex 13 requirements in paragraphs 3.2, 5.4 and 5.4.1 regarding the establishment of an independent accident investigation authority and the conducting of the investigation were developed to ensure the independence, objectivity and effectiveness of investigations.

2.1.3 Paragraph 3.2 of Annex 13 specifies that: “A State shall establish an accident investigation authority that is independent from State aviation authorities and other entities that could interfere with the conduct or objectivity of an investigation.”

2.1.4 Paragraph 5.4 specifies that: “The accident investigation authority shall have independence in the conduct of the investigation and have unrestricted authority over its conduct, consistent with the provisions of this Annex”; and paragraph 5.4.1 specifies that: “Any investigation conducted in accordance with the provisions of this Annex shall be separate from any judicial or administrative proceedings to apportion blame or liability.”

2.1.5 The above Annex 13 Standards make it clear that the accident investigation authority shall be established and be legislatively, organizationally and operationally independent from any outside influences, including judicial authorities and civil aviation authorities. Appendix A of the *Manual on Accident and Incident Investigation Policies and Procedures* (Doc 9962) contains model legislation that may be used by States to develop their own legislation that would meet the intent of the above Annex 13 provisions.

2.1.6 As an illustration, *Article 4* of the European Union (EU) Regulation No 996/2010 states in its paragraph 1: “Each Member State shall ensure that safety investigations are conducted or supervised, without external interference, by a permanent national civil aviation safety investigation authority (safety investigation authority) capable of independently conducting a full safety investigation, either on its own or through agreements with other safety investigation authorities.” Paragraph 2 states that: “The safety investigation authority shall be functionally independent in particular of aviation authorities responsible for airworthiness, certification, flight operation, maintenance, licensing, air traffic control or aerodrome operation and, in general, of any other party or entity the interests or missions of which could conflict with the task entrusted to the safety investigation authority or influence its objectivity.” This EU regulation is in compliance with the intent of the aforementioned Annex 13 provisions.

2.1.7 The accident investigation authority must be strictly objective and totally impartial and must also be perceived to be so. The authority should be established legislatively in such a manner that it can withstand political or other interference or pressure from other government organizations, as well as from industry. Many States have achieved this objective by setting up their accident investigation authority as an independent statutory body or by establishing an accident investigation organization that is separate from the civil aviation administration. In these States, the accident investigation authority reports directly to Congress, Parliament or a ministerial level of government that is different than the Ministry which also oversees State aviation authorities; in general, the Ministry of Transport (see Figure I-2-1 and Figure I-2-2 as examples).

2.1.8 The above arrangements provide the ideal structure regarding the legislative basis of the investigation authority, i.e. the investigation authority is fully separate from any connection with the Ministry of Transport, or any other State civil aviation authority which regulates and oversees civil aviation.

2.1.9 When States' resources for aircraft accident and incident investigations are limited, ICAO encourages States to foster regional accident and incident investigation organizations (RAIOs) and regional aviation safety groups. Regional arrangements may include aircraft accident and incident investigation matters, such as the delegation of investigations or parts thereof, or enlisting the mutual assistance and cooperation of States in an investigation. The *ICAO Manual on Regional Accident and Incident Investigation Organization* (Doc 9946) provides guidance on the establishment and management of a regional accident and incident investigation organization. The manual also outlines the duties and responsibilities of ICAO Member States, individually and/or collectively, with respect to the establishment and management of a regional accident and incident investigation system.

2.1.10 When a State delegates the conduct of all investigations under its responsibility to another State or an RAIO, that State would still need to have an accident investigation authority established, in accordance with Standard 3.2 of Annex 13. In this case, the accident investigation authority could be composed of a skeleton staff (e.g. one to three persons) necessary to run the function and services of the authority. Some of the roles of the delegating State's accident investigation authority would be to institute the investigation as per Standard 5.1 of Annex 13; and to ensure that the wreckage is properly protected awaiting the arrival of the investigation team as required in Standard 3.3, which reads: "The State of Occurrence 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. Protection of evidence shall include the preservation, by photographic or other means, of any evidence which might be removed, effaced, lost or destroyed. Safe custody shall include protection against further damage, access by unauthorized persons, pilfering and deterioration." Should the accident investigation authority be required to undertake concurrently another function, due to limited resources in the State, there must be no organizational and/or operational connection with other entities that could interfere with the conduct and objectivity of investigations, including judicial authorities and civil aviation authorities.

2.1.11 For some States, there is a history of examples of undue influence and conflicts of interest that led to legislative changes and the establishment of an accident investigation authority that is structurally, organizationally and operationally independent from the Ministry of Transport and other State civil aviation authorities (e.g. Canada, New Zealand, United States). In those States, some investigative findings have identified deficiencies in the effectiveness of the safety oversight functions of the civil aviation authorities, and undue pressures were brought to bear on the investigation authorities. These actions resulted in legislative amendments to provide for the independence of the accident investigation authority.

2.1.12 Some States have different arrangements in which the investigation authority is directly or indirectly connected to the ministry that is also responsible for the State civil aviation authority. This is not an ideal structure, and functional independence of the investigation authority must be demonstrated. Those States have maintained this arrangement for many years, and relevant investigation authorities are perceived as operationally and functionally independent. In those States, there are legislative and organizational provisions that prevent influence, interference and real or perceived conflict of interest with the investigation authorities' duties. In those States, the head of the investigation authority has legislative and regulatory authority to conduct investigations, publish findings and the Final

Report without any influence from the ministry. Moreover, it has been demonstrated over time that no efforts have been undertaken to influence the investigation and/or diminish findings that could reflect adversely on the State civil aviation authority. The legislative and regulatory provisions in those States provide for the necessary independence of the accident investigation authority.

2.1.13 The ICAO Universal Safety Oversight Audit Programme (USOAP) findings have identified that many States are not in compliance with Annex 13 provisions for functional independence of the accident investigation authority and the independence of the investigation process. In those States, the arrangements are such that the accident investigation authority is structurally part of the Ministry of Transport, or is directly tied to the State civil aviation authority responsible for safety oversight functions. If the investigation authority is within the same ministry responsible for safety oversight of civil aviation, obvious conflicts may arise when the findings of the investigation identify deficiencies in the effectiveness of the State civil aviation authority. In effect, the investigation authority could identify deficiencies that would directly compromise the effectiveness of the leadership of its own organization.

2.1.14 In some States, the head of the accident investigation authority is appointed by the same minister that is responsible for the State civil aviation authority. This creates an obvious potential for conflict of interest and possible influence on the independence of an investigation. In other States, the head of the accident investigation authority is appointed by the Director General of Civil Aviation; another clear conflict of interest that does not demonstrate functional independence of the investigation authority.

2.1.15 One of the key premises for demonstrating the functional independence of the accident investigation authority is that the authority shall not seek nor take instructions from other authorities regarding its investigation. To do so would show real or perceived conflict of interest with the independence of the investigation.

2.1.16 A review of differences filed by States regarding compliance with Annex 13 revealed that several States did not have the legislative and organizational structure to ensure the functional independence of the investigation authority, nor the means to separate safety investigations from judicial or administrative proceedings to apportion blame or liability. In some States that do not have a standing accident investigation authority, an ad hoc committee is appointed to conduct investigations. The ad hoc committee is often appointed by the minister responsible for the State civil aviation authority. Similarly, the investigators seconded to the ad hoc investigation team are from the State civil aviation authority. Such provisions do not meet the requirements regarding functional independence. Adoption of legislative and regulatory amendments is the best means to meet the requirements of Annex 13, paragraphs 3.2, 5.4 and 5.4.1.

2.1.17 In summary, in order for an accident investigation authority to be considered functionally independent, in particular, while organizationally connected to the ministry which also oversees the State civil aviation authority, the following criteria must be met:

1. Functional independence

It must be demonstrated that there are no real or perceived examples of influence by the ministry concerned on the conduct of the accident investigation authority's investigations, the issuance of findings, safety recommendations, interim report(s) and the Final Report. In other words, the ministry must not have the organizational means to influence the conduct of the investigation and its results, nor can it demand access, or give judgement about the investigation's source materials.

2. Autonomous investigation

It must be demonstrated that the accident investigation authority, during the conduct of its investigations, neither seeks nor takes instructions from other authorities and has unrestricted authority over the conduct of investigations.

3. Unrestricted authority to publish information

It must be demonstrated that the accident investigation authority can issue interim statements or report(s), findings, safety recommendations and the Final Report under its signature, without having to obtain approval from any outside authority. Of course, this does not affect the accident investigation authority's routine consultation during the course of the investigation with team members as part of the investigation party system, nor the consultation on the draft Final Report with participating States in accordance with Annex 13.

4. Independent funding and staffing

It must be demonstrated that funding and staffing of the accident investigation authority cannot be influenced by the ministry concerned or any other organizations. This includes the alleviation of any retribution of seconded personnel when they return to their regular duties.

5. Critical elements embedded in legislation

The criteria listed above need to be outlined in legislation and need to be apparent in the operation of the accident investigation authority in order for it to be considered functionally independent.

2.1.18 The best means to achieve the conditions laid out in paragraph 2.1.17, especially when the accident investigation authority is not organizationally separate from the minister responsible for the State civil aviation authority, is for the State's legislation to be clear about the responsibilities and authority of the State's accident investigation authority to operate functionally independent. The criteria listed in paragraph 2.1.17 need to be outlined in legislation and need to be apparent in the operation of the investigation authority in order for it to be considered functionally independent.

## 2.2 SPECIFIC OPERATING REGULATIONS

2.2.1 Model operating regulations are contained in Appendix B of the *Manual on Accident and Incident Investigation Policies and Procedures* (Doc 9962) for the purpose of providing States with guidance on operating regulations that would meet the provisions of Annex 13 regarding accident and incident investigation.

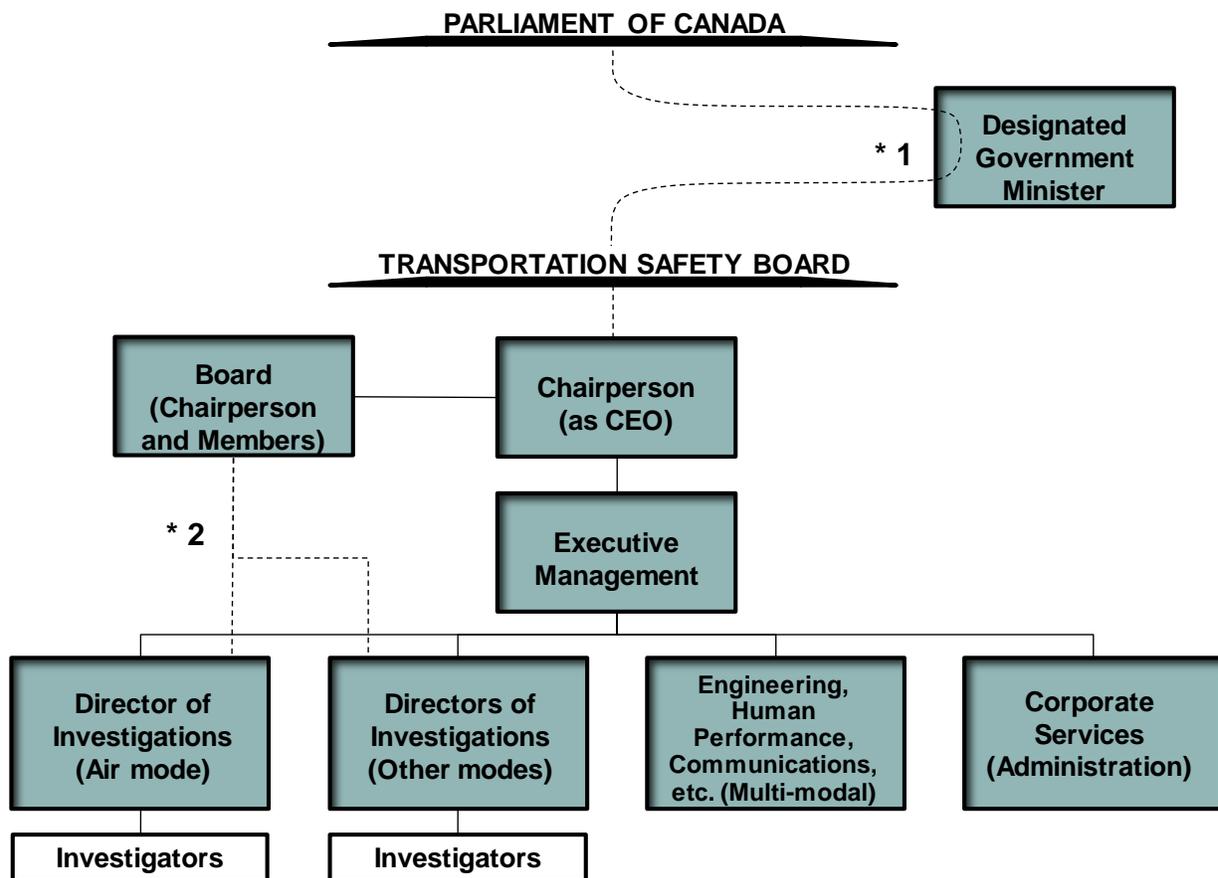
2.2.2 The operating regulations should address, at a minimum, the national requirements emanating from the legislation pertaining to accident and incident investigation, and should provide standardized investigation processes in conformance with the SARPs contained in Annex 13, as well as guidance contained in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756), Parts I, II, III and IV. Some States promulgate regulations regarding accident and incident investigation virtually verbatim to the SARPs contained in Annex 13 and Doc 9756. Promulgation of regulations may take on different forms, depending on the preferences of States. In some cases, regulations are promulgated and published by Presidential Decree, or similar government action. In other cases, the regulations may be promulgated by the independent accident investigation authority, after appropriate approval within the government. Regardless of the means of promulgation, the regulations need to ensure compliance with Annex 13 and associated guidance material, including the functional independence of the accident investigation authority.

2.2.3 In accordance with Annex 13, the State conducting the investigation shall designate the investigator-in-charge of the investigation, who will be responsible for the organization, conduct and control of the investigation. The investigator-in-charge would preferably come from the accident investigation authority. Notwithstanding, nothing precludes the assignment of the functions of the investigator-in-charge to a commission or other body.

2.2.4 In some States there might be a need for the accident investigation commission to be composed of members seconded from the civil aviation authority. It is essential that such a commission report directly to a ministerial level of government so that the findings and safety recommendations of the investigation are not diluted during passage through regular administrative channels.

2.2.5 Experts seconded from the civil aviation authority must be responsible to the investigator-in-charge for the duration of an investigation. This is not an ideal arrangement, in particular because seconded personnel may fear retribution when they return to their regular duties should the civil aviation authority react unfavourably to the findings in the Final Report of the investigation. States should take steps to alleviate any possibility of retribution and to maintain the required functional independence of the accident investigation authority from the civil aviation authority. These provisions must be clearly outlined in the operating regulations of the accident investigation authority.

2.2.6 The accident investigation authority is required to determine the causes and/or contributing factors of an accident or incident and to make safety recommendations. However, responsibility for the implementation of safety recommendations should normally rest with the civil aviation authority. This division of responsibility is appropriate since the civil aviation authority has overall responsibility for the safety oversight of civil aviation and its development.



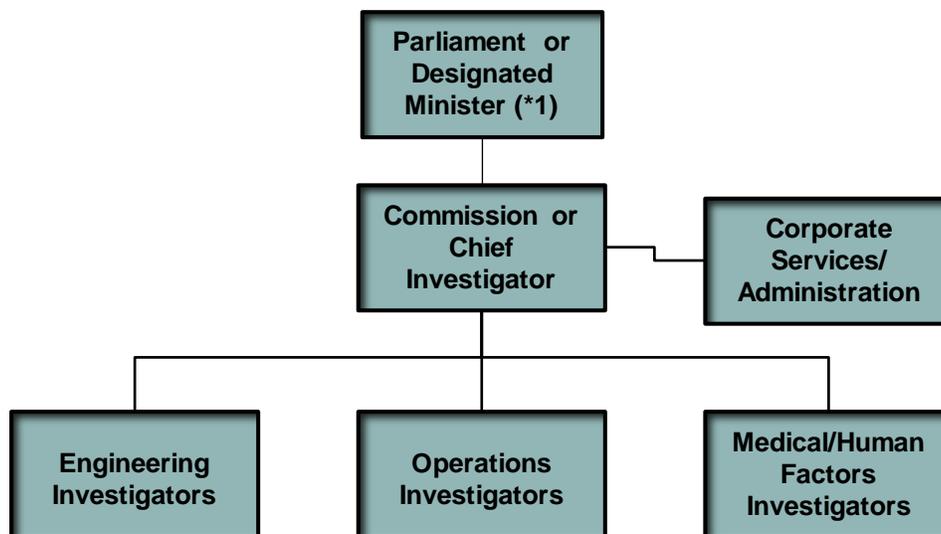
Notes

- \*1 The Board reports annually to Parliament through a Minister who tables the Board's annual report and audited financial statements. The Minister's responsibilities are not related to transportation or the legal system.
- \*2 The Directors have legislative authority to conduct investigations in accordance with Board policies and to report to the Board with respect to their investigations.

Figure I-2-1. Structure of the Transportation Safety Board of Canada

### 2.3 LEGISLATION REGARDING THE CONDUCT OF INVESTIGATIONS

2.3.1 Appropriate legislation that defines the rights and responsibilities of the aircraft accident investigation authority is required. The accident investigation authority should, through legislation, have immediate and unrestricted access to all relevant evidence without requiring prior consent from judicial bodies or other authorities. Accident investigators should be aware that aircraft accidents may be subject not only to a technical investigation but also to some form of judicial, regulatory, labour, occupational health and safety, environmental protection, administrative and/or disciplinary inquiries. However, accident investigation procedures should not be constrained by these types of processes, and national legislation, regulations, and perhaps MOUs, should specify the procedures to be followed in order to keep the technical investigation separate from these other proceedings. The legislation shall make it clear that accident prevention is the sole objective of the investigation and shall emphasize that it is not the role of the accident investigation authority to apportion blame or liability.



*Note*

\*1 The investigation authority should not report to the same Minister responsible for the regulation and/or safety oversight of civil aviation in the State or to a judicial authority.

**Figure I-2-2. Example of a streamlined organizational structure**

2.3.2 The legislation should also protect certain documents and information obtained in the course of an investigation from public disclosure. To provide further safeguards in this respect, Annex 13, Chapter 5, states that the following records shall not be made available for purposes other than accident or incident investigation, unless the competent authority designated by the State conducting the investigation determines that their disclosure or use outweighs the likely adverse domestic and international impact such action may have on that or any future investigations:

- a) cockpit voice recordings and airborne image recordings and any transcripts from such recordings; and
- b) records in the custody or control of the accident investigation authority being:
  - 1) all statements taken from persons by the accident investigation authority in the course of their investigation;
  - 2) all communications between persons having been involved in the operation of the aircraft;
  - 3) medical or private information regarding persons involved in the accident or incident;
  - 4) recordings and transcripts of recordings from air traffic control units;
  - 5) analysis of and opinions about information, including flight recorder information, made by the accident investigation authority and accredited representatives in relation to the accident or incident; and
  - 6) the draft Final Report of an accident or incident investigation.

2.3.3 These records shall be included in the Final Report or its appendices only when pertinent to the analysis of the accident or incident, and those parts of the records not relevant to the analysis shall not be disclosed. This is essential since information contained in these records, which includes information given voluntarily by persons interviewed during the investigation, could be utilized inappropriately for subsequent disciplinary, civil, administrative and criminal proceedings. If such were the case, people would, in future, be reluctant to openly disclose information to investigators, which would impede the investigation process and seriously affect flight safety.

## 2.4 FUNDING

The accident investigation authority should have ready access to sufficient funds to enable it to properly investigate those accidents and incidents which fall within its area of responsibility. Since it is impossible to accurately forecast annual budget requirements for accident investigation, provisions should be made for supplementary funding as required. As described in 2.1.17 above, the accident investigation authority shall be granted sufficient funding from the government to enable it to perform its tasks in a functionally independent manner. Therefore, funding for the accident investigation authority must not be influenced nor determined by the minister responsible for the State civil aviation authority. Funding for the investigation authority must be clearly laid out in the State's legislative and regulatory provisions, including provisions for emergency supplemental funding as necessary.

## 2.5 PERSONNEL

2.5.1 Aircraft accident investigation is a specialized task, which should be undertaken only by qualified investigators. However, many States may not have personnel dedicated solely to accident investigation. In these States, appropriately qualified personnel should be identified and trained in accident investigation techniques prior to being assigned to accident investigation duties. When assigned to an accident investigation, such personnel should be relieved of their regular duties. If investigators assigned to the investigation are not employees of the independent accident investigation authority (e.g. temporary seconded investigators), provisions must be in place to ensure that the seconded investigators are able to operate with full independence in the conduct of the investigation and the publication of findings, recommendations and the Final Report, and that they are alleviated of any potential retribution when they return to their regular duties.

2.5.2 The investigation of an aircraft accident is a daunting task that could be almost unlimited in scope. The more often investigators participate in investigations, the more experienced they become. As they gain experience, they soon realize that the need to increase their knowledge and upgrade their skills is never-ending. While training is essential, improvement in an investigator's capabilities generally results from a personal commitment to excellence. Since the outcome of an accident investigation is largely dependent on the skill and experience of the investigators assigned to it, at least one experienced investigator should be assigned to each investigation to ensure an adequate level of experience.

*Note.— ICAO Circular 298, Training Guidelines for Aircraft Accident Investigators, discusses the experience and employment background required for training as an aircraft accident investigator. It also outlines the progressive training that is considered necessary to qualify a person for the various investigation roles, including appointment as the investigator-in-charge of an investigation into a major accident involving a large transport category aircraft.*

2.5.3 It is essential that accident investigators have a practical background in aviation as a foundation on which to develop investigation skills. This experience can be acquired by working as a professional pilot, as an aeronautical engineer or as an aircraft maintenance engineer. Other specialized areas of aviation which could also provide useful experience include management, operations, airworthiness, air traffic services, meteorology and human factors. Since accident investigations will often involve all of these specialized areas, it is important that investigators understand the aviation infrastructure and are able to relate to each of these different areas. It is also beneficial for investigators to have some piloting experience in addition to their other expertise.

2.5.4 In addition to technical skills, an accident investigator requires certain personal attributes. These include integrity and impartiality in the recording of facts; analytical ability; perseverance in pursuing inquiries, often under difficult or trying conditions; and tact in dealing with a wide range of people who have been involved in the traumatic experience of an aircraft accident. An accident investigator also needs specific skills to effectively manage the various experts on the team as part of the party system.

2.5.5 To effectively discharge their duties, accident investigators shall be granted suitable statutory powers, including authority over an accident site, possession of evidence, the right to test anything seized and the right to obtain relevant documents. These powers should, however, be used only when necessary and with the utmost discretion. Investigators should realize that during the initial part of an investigation their task is essentially one of gathering information which is best undertaken in an atmosphere of cooperation.

2.5.6 Some persons may be reluctant to cooperate with the investigation because of a natural desire not to become involved. Often this resistance will disappear when it is explained that their assistance may help to eliminate similar accidents in future. An investigator relies extensively on other people as a source of information and, thus, should be able to relate well to people in any situation.

## 2.6 EQUIPMENT

2.6.1 Proper planning and preparedness are essential in facilitating the prompt arrival of investigators at an accident site and have considerable bearing on the efficiency of the investigation. In this regard, accident investigators should have their investigation field kits and essential personal items packed and ready so that they can proceed without delay to the accident site. Advance consideration should also be given to such details as inoculations, passport requirements and travel facilities. To protect against biological hazards such as blood-borne pathogens, investigators who work amongst wreckage are advised to have tetanus and Hepatitis B vaccinations (and any recommended boosters to maintain immunity) and to wear the necessary personal protective equipment.

*Note.— ICAO Circular 315, Hazards at Aircraft Accident Sites, was produced to assist individuals to consider and apply effective occupational safety management practices at accident sites, both to their own activities and to the activities of the teams that they work with, or for which they are responsible. The circular also discusses the nature and variety of occupational hazards and the management of risk associated with exposure to these hazards.*

2.6.2 Accidents and incidents are apt to occur anywhere: at airports, in mountains, swamps, deeply wooded areas, deserts, etc. Hardships are often encountered in reaching accident sites in remote areas, and it is therefore important that investigators be physically fit and that working gear be selected with due consideration to terrain and weather.

2.6.3 Clothing should be comfortable and afford protection against the conditions or elements that may be encountered. Spare clothing may also be required. The most essential items of personal clothing are good footwear, a windproof and waterproof jacket and trousers, and appropriate headgear. The investigator should wear suitable boots which provide protection against the hazards at the accident site. Specifically, the boots should provide protection against crushing and piercing injuries and should be waterproof and oil and acid resistant. A “paratroop” type of boot with a heavy moulded sole gives good service as general-purpose footwear in difficult terrain and, “desert” boots have been found suitable in dry, broken ground. Protective items, such as sun block, anti-glare spectacles and insect repellent, should also be available.

2.6.4 Before proceeding to the accident site, investigators should have adequate supplies and equipment most appropriate to the territory to be covered (food, water, first-aid kit, camping gear, communication equipment, etc.) and should have a competent guide if it is necessary to enter wild or rugged terrain. They should anticipate the need for special equipment (i.e. snowmobiles and skis) and have ready access to this type of equipment so that there is no delay in procuring it. They should also be familiar with the use of such equipment.

2.6.5 The investigation field kit should contain sufficient equipment to enable examination of the wreckage, the plotting of impact points and wreckage patterns, parts identification and the recording of observations. The list of items in Appendix 1 to this chapter provides guidance on the type of equipment which might be selected for the investigation field kit.

## 2.7 OTHER INVESTIGATION READINESS ISSUES

### 2.7.1 Investigation authority readiness

2.7.1.1 The readiness of an investigation authority does not only rely on it having appropriate legislation, regulations, ready access to sufficient funds, and sufficient experienced and equipped investigators, but also on it having documented policies, plans, procedures and checklists required for investigations. Notwithstanding the above, investigation authorities will rarely, if ever, have sufficient internal resources and competencies for all eventualities, such as for a major/complex accident investigation. Therefore, it is imperative that the investigation authority determine its internal competencies and have plans to acquire additional resources to fill any competency gaps.

2.7.1.2 In the event of a major accident, most of these competency gaps would normally be filled by using investigators and equipment from the State investigation authorities involved in the occurrence investigation, as well as subject-matter experts from the involved civil aviation authorities, operators and manufacturers. Without adequate planning there is a risk that these resources might not be immediately available for the investigation. In this regard, each State investigation authority should consider establishing working relationships with the investigation authorities of those States wherein their State-manufactured products are operated, with other States wherein their State airlines operate, with States whose airlines or products operate in the State, and with any other State investigation authority that has the expertise and equipment required for investigations.

2.7.1.3 To better ensure the availability of external resources, the State investigation authority should establish working arrangements and/or memoranda of understanding with other States, government departments and other organizations that would likely be used to support its investigations. It would be prudent to document these arrangements/agreements and to have them readily accessible in the event of an accident/incident investigation. Appendix 2 to this chapter documents criteria that should be considered when developing a State-to-State investigation authority memorandum of understanding (MoU); Appendix 3 is a model State-to-State MoU; and Appendix 4 is a sample MoU with a State investigation authority.

2.7.1.4 Article 3 a) of the *Convention on International Civil Aviation* (Doc 7300), signed at Chicago on 7 December 1944 and amended by the ICAO Assembly, states: "This Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft." Furthermore, Article 3 b) states that "Aircraft used in military, customs and police services shall be deemed to be state aircraft." Thus, the State accident investigation authority should establish working arrangements (e.g. memoranda of understanding) with government agencies and organizations which operate State aircraft. These arrangements should address, as appropriate, the participation of the accident investigation authority and government agencies/organizations during investigations of accidents and incidents involving both civil aircraft and State aircraft (e.g. a collision between a civil and a State aircraft). Some States already have joint investigation authorities to carry out such investigations, and it is recommended that relevant working arrangements be timely documented and readily accessible.

2.7.1.5 The State accident investigation authority would also benefit from undertaking a similar approach with authorities that have first-responder responsibilities (such as police, firefighters, and search and rescue), with organizations that may become involved in or that might provide support to the safety investigation (such as government departments and the military); and with other authorities that have investigation mandates related to the aircraft accident or incident (such as judiciaries, police, coroners and civil aviation authorities). Appendix 5 to this chapter is a sample MoU with a police force; Appendix 6 is a sample MoU with a coroner; and Appendix 7 is a sample MoU with a civil aviation authority.

## 2.7.2 Checklist on assistance

Some States have found that a checklist-style tool could further assist a State to determine its readiness, its competency gaps and its assistance needs related to the conduct of investigations. Appendix 8 to this chapter is a sample checklist on assistance.

## 2.7.3 Delegation of investigations

2.7.3.1 In accordance with Annex 13, the State of Occurrence is responsible for instituting an investigation, but it may delegate the whole or any part of the conducting of such investigation to another State or an RAIO by mutual arrangement and consent.

2.7.3.2 When the accident or the serious incident has occurred in the territory of a non-Contracting State which does not intend to conduct an investigation in accordance with Annex 13, the State of Registry, or failing that, the State of the Operator, the State of Design or State of Manufacture should endeavour to institute and conduct an investigation in cooperation with the State of Occurrence but, failing such cooperation, should itself conduct the investigation with such information as is available.

2.7.3.3 When the location of the accident or serious incident cannot definitely be established as being in the territory of any State, the State of Registry shall institute and conduct any necessary investigation of the accident or serious incident. However, it may delegate the whole or any part of the conducting of such investigation to another State or an RAIO by mutual consent and arrangement.

2.7.3.4 Factors that may suggest the delegation of an investigation to another State or to an RAIO may include but are not limited to the following situations:

- The State of Occurrence may consider delegating the investigation to the State of Registry, the State of the Operator, the State of Design, the State of Manufacture, or an RAIO, in particular for those situations when it might be beneficial or more practical for one of these States or organizations to conduct the investigation; and
- The State of Occurrence lacks the resources or capability to investigate the occurrence in accordance with Annex 13.

2.7.3.5 Depending on the parties involved in the investigation, the scope of the investigation to be conducted by another State or RAIO would determine whether a formal investigation delegation agreement is required or if a mutual understanding would suffice. In general, delegation of the whole investigation requires a formal investigation delegation agreement. In case of delegation of part of the investigation, the need for a formal delegation agreement would be at the discretion of the parties involved.

2.7.3.6 When the whole investigation is delegated to another State or an RAIO, such State or RAIO is expected to be responsible for the conduct of the investigation, including the issuance of the Final Report and the ADREP reporting. When a part of the investigation is delegated, the delegating State usually retains the responsibility for the conduct of the investigation, including the issuance of the Final Report and the ADREP reporting. In any event, the delegating State shall use every means to facilitate the investigation in terms of protection of the evidence and maintaining safe custody of the aircraft and its contents for such a period as may be necessary for the purpose of the investigation, the issuance of travel visas, access to the site of the occurrence, evidence collection, witnesses' interviews, etc. Likewise, the delegation agreement should identify the responsibilities of each party and list all deliverables.

2.7.3.7 It is important to differentiate between the institution and the conduct of an investigation in terms of the triggering and terminating events of each function. *Instituting* the investigation begins from the time the accident investigation authority is informed about the accident or incident and forwards the official notification of the occurrence to concerned States and to ICAO as required in paragraph 4.1 of Annex 13. *Conducting* the investigation is the function of performing an investigation in accordance with Annex 13 and issuing reports including the Final Report.

2.7.3.8 The State that *institutes* an investigation is the one required to commence the investigation, in accordance with Annex 13, finding facts to assist in classifying the occurrence, notifying other States and organizations, and deciding whether its accident investigation authority would conduct the investigation. The State that *conducts* an investigation is the one responsible for performing the investigation, or the State that is delegated by another State to carry out the whole investigation. The State conducting the investigation issues the Final Report. Similarly, in case the whole investigation is delegated to an RAIO, the organization is responsible for the conduct of the investigation and issuance of the Final Report.

2.7.3.9 Each investigation delegation must be conducted in the framework of a protocol specific to the investigation, making clear the respective responsibilities of the delegating State and the delegated State or RAIO. This protocol should be made through an official document.

2.7.3.10 The investigation delegation agreement should be legally binding on the parties to the agreement. The deliverables of the agreement (e.g. the Final Report in case of a whole investigation delegation, or a factual/examination report in case of delegation of part of the investigation) are to be documented in the agreement.

2.7.3.11 Depending on the scope of the delegation, the investigation delegation agreement should include all or part of the following sections:

*Introduction.* This section should contain a short description of the accident or serious incident; identification of the involved accident investigation authorities; the scope of the delegation (whole investigation or part of the investigation); and verification of conformity with Annex 13.

*Terminology.* This section defines specific terms used in the agreement, as applicable, and indicates that words and phrases used in the agreement have the same meaning as that ascribed to them in Annex 13 — *Aircraft Accident and Incident Investigation*.

*Objective of the investigation.* This section should contain the following statement: “In accordance with Annex 13, the sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.”

*Conduct of the investigation.* This section should contain the following statement: “This Agreement serves to foster cooperation and mutual assistance between the parties in implementing the provisions of Annex 13. Each party shall strive to overcome difficulties that may arise due to differences in language, national culture, legislative system or geographic location.” This section also addresses the protection of investigation records and terms where an investigation may need to be reopened due to the emergence of new and significant evidence.

*Participation of other States.* This section should describe the States entitled to appoint an accredited representative to participate in the investigation. The State of Occurrence is entitled to appoint an accredited representative when it delegates the whole investigation.

*Scope of the investigation and reporting responsibilities.* This section should mention the scope of the investigation delegation, stating whether the investigation is delegated in whole, or in part, and the responsibilities for the reporting requirements prescribed in Annex 13. When the investigation is delegated in part, the delegated parts should be listed.

*Miscellaneous.* This section should contain procedures to be followed by both parties, such as: means of exchanging records, evidence and information; managing post-accident communication; provision of assistance to accident victims and their families; and tracking of safety recommendations stemming from Final Reports.

*Financial considerations.* This section should mention the party or parties responsible for covering the costs and expenses associated with the investigation.

*Coordination.* This section should provide a contact person in each party for coordination of investigation issues.

*Dispute.* This section should contain the following statement: “If any dispute arises in respect of the interpretation or execution of the terms of this Agreement, such dispute should be settled mutually by the parties.”

*Entry into force, termination and reactivation.* This section should state the agreement effectivity terms such as the dates in which the agreement comes into effect and its termination; conditions of termination; and reactivation of the agreement when the investigation needs to be reopened.

*Notification of the agreement to ICAO.* This section should require both parties to inform the ICAO headquarters of the investigation delegation agreement.

*Signatories.* This section should contain the signatories of the authorized personnel in both parties.

Appendix 9 to Chapter 2 contains a *Model Delegation Agreement in Respect of Aircraft Accident and Incident Investigation*.

#### 2.7.4 Facilitation

ICAO Annex 9 — *Facilitation*, Chapter 8, Section B, contains the Standards and Recommended Practices related to the facilitation of search, rescue, accident investigation and salvage. The following, in part, are the facilitation provisions that are pertinent to the conduct of accident investigations, subject to any conditions imposed by Annex 13:

- a) States shall make arrangements to ensure entry, without delay, into their territories on a temporary basis of qualified personnel required for accident investigation;
- b) States shall not require any other travel document than a passport;
- c) in cases where a State continues to require entrance visas for the personnel referred to in a) above, States should issue such visas on arrival or otherwise facilitate the admission of personnel;
- d) States should ensure that their authorities are adequately informed of the provisions of Annex 13 relating to the facilitation of aircraft accident and incident investigations;
- e) States should help to arrange transport to the site of the accident or incident without delay;
- f) States shall facilitate the temporary entry into their territory of all aircraft, tools and equipment required in the accident investigation; and
- g) States shall ensure, without delay, the movement of a part or parts for technical examination or testing to another Contracting State.

*Note.— Annex 9, Chapter 8, Section I, contains the Standards and Recommended Practices related to the facilitation of assistance to aircraft accident victims and their families.*

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## Appendix 1 to Chapter 2

### INVESTIGATION FIELD KIT

*Note 1.— 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 following list.*

*Note 2.— For a list of personal protective equipment against biological hazards, see Appendix 1 to Chapter 5.*

#### GENERAL

Identification papers, investigator's official tag, armband or 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 receiver  
Laser surveying equipment  
Clinometer  
Navigational computer, protractor and dividers  
Measuring tape, at least 20 m long, and 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

Toolkit with wrenches, screw drivers and drills (hand- and battery-powered)  
Waterproof flashlight with spare batteries and bulbs  
Small magnet  
Multi-purpose knife  
Inspection mirror  
Magnifying glass (10 x to 30 x)

Assorted antistatic containers (for electronic components with non-volatile memory) and sterile bottles (for aircraft fuel, oil and fluid samples, as well as for pathological fluid and tissue samples)  
Siphons and syringes  
Plastic bags (assorted) and plastic sheets  
Masking tape and duct tape

### MISCELLANEOUS ITEMS

First-aid kit  
Recording equipment, such as cameras (digital and/or conventional film), video cameras, audio recorders (digital or conventional tape), and spare batteries, cassettes, film and digital memory devices)  
Miscellaneous photographic equipment, such as a zoom lens, macro lens, wide-angle lens and an electronic flash unit  
Model aircraft  
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 (see Appendix 1 to Chapter 5)  
Binoculars with an integrated compass and distance measuring capability  
Portable means of on-site communication, such as a cellular telephone and/or walkie-talkie, spare batteries and charging units  
Notebook computer with high-speed Internet and wireless capability  
Facsimile machine

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## Appendix 2 to Chapter 2

# PRINCIPLES FOR A STATE-TO-STATE INVESTIGATION AUTHORITY MEMORANDUM OF UNDERSTANDING

*Note.— A State-to-State investigation-authority memorandum of understanding could contain, but not be limited to, the following information.*

### INTRODUCTION

This section should cover the following:

- identification of the involved investigation authorities and their governing legislations;
- confirmation of commitment to the International Standards and Recommended Practices contained in ICAO Annex 13; and
- documentation of the definitions and terminology that are used in the MoU.

### PURPOSE

This section should cover the purpose of the MoU, such as to:

- advance aviation safety through the investigation of accidents and incidents in accordance with Annex 13 (and national legislation) in order to prevent accidents and incidents;
- foster cooperation and mutual assistance;
- support each other's investigations; and
- confirm that it is not the purpose of the investigation to apportion blame or liability.

### AREAS OF MUTUAL SUPPORT

This section should cover the following:

- when assistance is requested, the response will be coordinated between the two authorities;
- if conditions permit, the requested assistance will be provided;
- when information on an ongoing investigation is requested, all information will be provided in accordance with Annex 13 and national legislations;
- information received will be protected as per the provisions of Annex 13 and national legislations;

- experience and training opportunities will be shared so as to enhance investigation standards, policies, guidelines and procedures of both authorities.

### **FINANCIAL CONSIDERATIONS**

The MoU should specify agreements regarding financial and resource issues on the understanding that:

- human and financial resources and workload may limit the ability to provide mutual support;
- each authority would be expected to bear its own costs, in particular when fulfilling the provisions of Annex 13; and
- the authority requesting supplemental support would be expected to bear the incremental costs.

### **COORDINATION**

This section of the MoU should include:

- the point-of-contact person in each investigation authority for day-to-day investigation operations issues;
- the point-of-contact person in each authority for legislation and policy issues; and
- the MOU should also state provisions for resolving disputes.

### **VALIDITY TIME FRAME**

The MoU should state the time-related issues:

- the date that the MoU comes into effect;
- the validity time frame — this would normally be for a medium term, such as 3 to 5 years; and
- the termination time frame could be either termination by a specific date, by written notice, by remaining in force unless otherwise notified or by remaining in force on condition of an annual review.

### **SIGNATORIES**

This section of the MoU should include:

- the signatories to the State-to-State investigation authority MoU, which would be the head officials of the involved investigation authorities.

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## Appendix 3 to Chapter 2

# ICAO MEMORANDUM OF UNDERSTANDING IN RESPECT OF AIRCRAFT ACCIDENT AND SERIOUS INCIDENT INVESTIGATION

MEMORANDUM OF UNDERSTANDING (MOU)

BETWEEN

..... (Agency/Authority)

of

..... (State)

AND

..... (Agency/Authority)

of

..... (State)

REGARDING

COOPERATION AND ASSISTANCE

IN THE FIELD OF

CIVIL AIRCRAFT ACCIDENT AND SERIOUS INCIDENT INVESTIGATION

## 1. INTRODUCTION

1.1 This Memorandum of Understanding (MoU) expresses the understanding of the ..... (Agency/Authority) of ..... (State) and the ..... (Agency/Authority) of ..... (State), hereafter referred to as the parties to this MoU, concerning cooperation and assistance in the field of civil aircraft accident and serious incident investigations.

1.2 It is recognized that both ..... (State) and ..... (State) are parties to the Convention on International Civil Aviation (The Chicago Convention) and that they are therefore bound by the Standards contained in Annex 13 — *Aircraft Accident and Incident Investigation*.

*Note.— Both States shall advise each other of their respective existing differences that have been filed or that will be filed against the Standards of Annex 13.*

1.3 Both parties to this MoU are authorized by their respective Governments to act as the national authority representing ..... (State) and ..... (State) in respect of aircraft accident and serious incident investigation matters.

1.4 This MoU defines the procedural arrangements for cooperation and assistance between the parties pursuant to Annex 13 to the Chicago Convention.

## 2. TERMINOLOGY

2.1 The words and phrases used in this document have the same meaning as that ascribed to them in Annex 13 — *Aircraft Accident and Incident Investigation*.

## 3. THE PURPOSE OF INVESTIGATIONS

3.1 The purpose of investigating accidents or incidents in accordance with Annex 13 is the prevention of accidents and incidents. It is not the purpose of such an investigation to apportion blame or liability.

## 4. CODE OF CONDUCT

4.1 This MoU serves to foster cooperation and mutual assistance between the parties in implementing the provisions of Annex 13. Each party shall strive to overcome difficulties that may arise due to differences in languages, national cultures, legislative systems or geographic locations.

## 5. EXCHANGE OF INFORMATION

5.1 Each party shall establish a working group of specialists to plan and implement technical exchanges and cooperation between the parties in the field of aircraft accident and serious incident investigations. These technical exchanges will include discussions aimed at improving the understanding of the investigation capabilities of the respective organizations, as well as the scope and extent of any assistance that could be provided under given conditions.

5.2 The exchanges and cooperation between the parties should also cover appropriate training for investigative staff, including attendance at training courses.

**6. ASSISTANCE TO THE STATE OF OCCURRENCE**

6.1 When one party, acting as the State of Occurrence, requests the other party for technical assistance for an investigation being conducted under the provisions of Annex 13, the response to the request shall be coordinated between both parties. The two parties should work together to ensure that a competent investigation is conducted in accordance with the procedures and intent of Annex 13.

6.2 Either party may request information on the progress of an investigation being carried out by the other party. All possible efforts will be made to provide the requested information. In accordance with the relevant laws of the respective States, any such information provided should be treated with at least the same rules with respect to confidentiality as those to which the providing party is bound.

**7. COORDINATION**

7.1 The contact person in ..... (Agency/Authority) of ..... (State) for the implementation of this MoU is:

..... (Title)  
..... (Agency/Authority)  
..... (Address)  
Tel.: ..... (Office) ..... (Mobile)  
Fax: .....  
E-mail: .....

7.2 The contact person in .....(Agency/Authority) of .....(State) for the implementation of this MoU is:

..... (Title)  
..... (Agency/Authority)  
..... (Address)  
Tel.: ..... (Office) ..... (Mobile)  
Fax: .....  
E-mail: .....

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## Appendix 4 to Chapter 2

### SAMPLE MOU WITH A STATE INVESTIGATION AUTHORITY

#### Memorandum of Understanding

BETWEEN THE

**Air Accident Investigation Bureau of Singapore**

AND THE

**Transportation Safety Board of Canada**

ON COOPERATION RELATING TO AIRCRAFT ACCIDENT AND INCIDENT  
INVESTIGATION

May 2006

AAIB Singapore-TSB Canada MOU

**MEMORANDUM OF UNDERSTANDING****BETWEEN****THE AIR ACCIDENT INVESTIGATION BUREAU OF SINGAPORE AND  
THE TRANSPORTATION SAFETY BOARD OF CANADA****ON COOPERATION RELATING TO AIRCRAFT ACCIDENT AND  
INCIDENT INVESTIGATION**

The Air Accident Investigation Bureau of Singapore (AAIB Singapore) and the Transportation Safety Board of Canada (TSB Canada), hereinafter referred to collectively as "the Parties" or individually as "the Party",

*Reaffirming* the objective enshrined in Annex 13 to the Convention on International Civil Aviation ("the Chicago Convention") that the sole objective of the investigation of an aircraft accident or incident shall be the prevention of accidents and incidents and that it is not the purpose of the investigation activity to apportion blame or provide a means of determining liability;

*Committed* to enhancing the capabilities and professionalism of their respective aircraft accident investigators;

*Desiring* to share expertise and experience relating to aviation investigation;

*Recognising* their common interest in establishing a lasting framework for cooperation in the area of aviation investigation;

**HAVE REACHED THE FOLLOWING UNDERSTANDING:****Objective and Areas of Cooperation**

1. The sole objective of both Parties in entering into this Memorandum of Understanding is the enhancement of aviation safety.
2. The Parties will cooperate in aircraft accident and incident investigation, investigation training and sharing of information and expertise, consistent with the Standards and Recommended Practices of Annex 13 to the Chicago Convention. The areas of cooperation are as follows:
  - (a) Each Party will offer assistance and the use of air safety investigation facilities and equipment to the other Party as it deems appropriate and as resources permit. Such assistance may include expertise in the fields of air traffic services, engineering, operations, flight recorders, human performance and management organisation.
  - (b) Each Party will, where practicable, invite the other Party's investigators to attend its general and specialist investigation courses and training.

- (c) Each Party will to the extent permitted by its laws and regulations facilitate the attachment of the other Party's investigators as observers to its investigation of aircraft accidents and serious incidents, with a view to enhancing the other Party's understanding of its investigation requirements and procedures. This will serve to develop effective cooperation between the Parties in any investigation of aircraft accidents or serious incidents it conducts pursuant to Annex 13 to the Chicago Convention involving an aircraft of which the State of the other Party is the State of Registry, State of the Operator, State of Design or State of Manufacture.
  - (d) The Parties will maintain regular contact and each Party may organise visits to or meetings with the other Party with the aim of exchanging experiences, skills and technical knowledge.
  - (e) Each Party will to the extent permitted by its laws and regulations endeavour to share with the other Party relevant information about an investigation it is conducting in which the other Party has expressed an interest. This information, consistent with Annex 13, will not be released by the other Party without the express consent of the Party conducting the investigation.
3. The Parties may develop additional areas of cooperation to widen the scope of this Memorandum of Understanding.

#### **Coordination**

4. The contact person in the TSB Canada for the implementation of this Memorandum of Understanding is:

Director  
Air Investigations Branch  
Transportation Safety Board of Canada  
200 Promenade du Portage  
Gatineau, Quebec K1A 1H3  
Canada

Tel.: 613-994-3813  
Fax: 613-953-9586  
E-mail: [Nick.Stoss@tsb.gc.ca](mailto:Nick.Stoss@tsb.gc.ca) or [AirOps@tsb.gc.ca](mailto:AirOps@tsb.gc.ca)

5. The contact person in the AAIB Singapore for the implementation of this Memorandum of Understanding is:

Director  
Air Accident Investigation Bureau of Singapore  
Changi Airport Post Office  
P.O. Box 1005 Singapore 918155  
Republic of Singapore

Tel.: 65 6541 2800  
Fax: 65 6542 2394  
E-mail: [chan\\_wing\\_keong@mot.gov.sg](mailto:chan_wing_keong@mot.gov.sg)

**Financial Matters**

6. Unless otherwise agreed, each Party shall bear its own cost for the implementation of the matters set out in this Memorandum of Understanding.

**Amendment**

7. This Memorandum of Understanding may be amended in writing at any time by mutual consent of the Parties.

**Commencement and Duration**

8. This Memorandum of Understanding will come into effect on the date of signing and will remain in effect unless it is terminated by either Party giving one month's notice in writing to the other Party.

9. The Parties may, by mutual agreement, provide for the continuance of any arrangement entered into under this Memorandum of Understanding but not fully performed prior to the termination of this Memorandum of Understanding.

IN WITNESS WHEREOF, the undersigned, being duly authorised by the Parties, have signed this Memorandum of Understanding.

Signed in duplicate,

\_\_\_\_\_  
DIRECTOR  
AIR ACCIDENT INVESTIGATION BUREAU  
OF SINGAPORE

\_\_\_\_\_  
EXECUTIVE DIRECTOR  
TRANSPORTATION SAFETY BOARD  
OF CANADA

At: \_\_\_\_\_

At: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

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## Appendix 5 to Chapter 2

### SAMPLE MOU WITH A POLICE FORCE

**Memorandum of Understanding**

*between*

The Air Accidents Investigation Branch,

The Marine Accident Investigation Branch,

The Crown Office and Procurator Fiscal Service

*and*

The Association of Chief Police Officers (Scotland)

**For the Investigation of Air and Marine  
Accidents and Incidents in Scotland**

Date: \_\_\_\_\_

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Air Accidents Investigation Branch  
Marine Accident Investigation Branch  
Crown Office and Procurator Fiscal Service  
Association of Chief Police Officers (Scotland)

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#### Roles and responsibilities

Air Accidents Investigation Branch  
Marine Accident Investigation Branch  
The Lord Advocate, COPFS & the police in Scotland  
Body recovery and identification  
Interface between investigations carried out by the AIBs,  
COPFS and the police in Scotland

#### Management of the investigation

Accident site  
Accident site safety

#### Collection and use of evidence

Sharing of evidence

#### Interviews and declarations

#### Other coordination

Contact with the injured, bereaved and next of kin  
Employing third parties  
Public Statements / Media Coverage  
AIB reports and recommendations / Potential criminal  
prosecution / FAI  
Training/awareness

## **Contact Details**

### **AIR ACCIDENTS INVESTIGATION BRANCH**

**Address:**

Air Accidents Investigation Branch  
Farnborough House  
Berkshire Copse Road  
Aldershot  
Hampshire  
GU11 2HH

**Telephone numbers:**

Accident Reporting Line: 01252 512299 (24 hr)  
General use: 01252 510300  
DfT Duty Officer (out of hours): 020 7944 5999

**Other contact details:**

Fax: 01252 376999  
e-mail: [enquiries@aaib.gov.uk](mailto:enquiries@aaib.gov.uk)  
Website: [www.aaib.gov.uk](http://www.aaib.gov.uk)

### **MARINE ACCIDENT INVESTIGATION BRANCH**

**Address:**

Marine Accident Investigation Branch  
Carlton House  
Carlton Place  
Southampton  
SO15 2DZ

**Telephone numbers:**

Accident Reporting Line: 023 8023 2527  
General use: 023 8039 5500  
OfT Duty Officer (out of hours): 020 7944 5999

**Other contact details:**

Fax: 023 8023 2459  
e-mail: [maib@dft.gsi.gov.uk](mailto:maib@dft.gsi.gov.uk)  
Website: [www.maib.gov.uk](http://www.maib.gov.uk)

**CROWN OFFICE AND PROCURATOR FISCAL SERVICE:****Address:**

Crown Office (Head Office)  
25 Chambers Street  
Edinburgh  
EH1 1LA

**Telephone number:**

Reception: 0131 226 2626

**Other contact details:**

e-mail: [PS/COPFS@scotland.gsi.gov.uk](mailto:PS/COPFS@scotland.gsi.gov.uk)  
Website: [www.crownoffice.gov.uk](http://www.crownoffice.gov.uk)

**ASSOCIATION OF CHIEF POLICE OFFICERS (SCOTLAND)****Address:**

Association of Chief Police Officers in Scotland  
Police Headquarters  
173 Pitt Street,  
Glasgow  
G24JS

**Telephone number:**

General use: 0141 532 2052

**Other contact details:**

e-mail: [acpos.secretariat@strathclyde.pnn.police.uk](mailto:acpos.secretariat@strathclyde.pnn.police.uk)  
Website: [www.acpos.police.uk](http://www.acpos.police.uk)

## INTRODUCTION

1. This Memorandum of Understanding (MoU) has been agreed between the Air Accidents Investigation Branch (AAIB), the Marine Accident Investigation Branch (MAIB),<sup>1</sup> the Crown Office and Procurator Fiscal Service (COPFS), and the Association of Chief Police Officers in Scotland (ACPOS).
2. It sets out the principles for effective liaison, communication and co-operation between these parties so that air and marine accidents, and related criminal incidents and deaths, can be independently investigated, as necessary, by each party, in parallel with each other, whilst also ensuring that legitimate public expectations are met.
3. The MoU recognises that all parties have duties to perform in relation to investigating air and marine accidents and incidents, and that each party, in discharging these, should take into account the roles and responsibilities of the other parties, ensuring that independent parallel investigations proceed in cooperation with each other, as appropriate, and in accordance with the public interest.
4. In practice, this will mean that, where possible, parties will exchange factual information about the details of an accident or incident in a timely manner, as their respective investigations proceed in parallel.
5. Successful implementation of this protocol in relation to any air or marine accident or incident will be significantly enhanced by:
  - The senior representatives of each organisation at the scene of the incident taking personal responsibility for setting and delivering clear standards of communication and co-operation;
  - All representatives of each organisation at the scene of the incident having an understanding and respect for each organisation's interests, professionalism and expertise.
6. All parties agree to keep this MoU under review as appropriate.

## ROLES & RESPONSIBILITIES

### Air Accidents Investigation Branch

7. The Air Accidents Investigation Branch (AAIB) has a heritage dating back to 1915. The AAIB discharges the United Kingdom's obligations under Annex 13 to the Convention on International Civil Aviation and the European Council Directive 94/56/EC. Its legislative powers are defined by the Civil Aviation Act 1982 and the associated secondary legislation, The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996. (SI 1996/2798).

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<sup>1</sup> For the purposes of this MOU, the term "AIB" refers to the MAIB or the AAIB and "AIBs" refers to both the MAIB and AAIB.

8. The AAIB investigates aircraft accidents and serious incidents that occur in the UK or involve UK registered or manufactured aircraft overseas. It also participates in accident investigations worldwide where there is a specific UK interest. The AAIB also provides technical assistance to the Ministry of Defence in support of Boards of Inquiry investigating military aircraft accidents.

9. AAIB Inspectors have powers to investigate all civil aviation accidents and incidents within the UK. They are appointed under section 8(1) of the Regulations and have the powers under section 9 to have free access to the accident site; the aircraft, its contents or its wreckage; witnesses; the contents of flight recorders; the results of examination of bodies; the results of examinations or tests made on samples from persons involved in the aircraft's operation and relevant information or records. They also have the power to control the removal of debris or components; examine all persons as they think fit; take statements; enter any place, building or aircraft; remove and test components as necessary and take measures for the preservation of evidence.

10. The AAIB is independent of the Civil Aviation Authority and the European Aviation Safety Agency.

#### **Marine Accident Investigation Branch**

11. The Marine Accident Investigation Branch (MAIB) was set up in 1989 with responsibility for investigating accidents to determine their circumstances and causes. Its legislative powers are primarily contained in Part XI of the Merchant Shipping Act 1995 and associated secondary legislation with the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 (SI 2005/881) putting the framework into effect.

12. These regulations are the foundation of the MAIB's work. They apply to merchant ships, fishing vessels and (with some exceptions) pleasure craft. They define accidents, set out the purpose of investigations, and lay down the requirements for reporting accidents. They make provision for the ordering, notification, and conduct of investigations, but allow inspectors the necessary discretion, given the wide variety of cases.

13. Prior to deciding whether to conduct a full investigation, the MAIB will conduct a Preliminary Examination. Only those accidents/incidents which are considered could influence future safety are taken forward as a full investigation, leading to a published report. A short summary of investigations that remain as Preliminary Examinations will be posted on MAIB's website.

14. The MAIB inspectors have powers to investigate accidents involving or occurring on board UK ships anywhere in the world, and any ships in UK territorial waters including accidents that occur on UK inland waterways. They are appointed under section 267 of the Merchant Shipping Act 1995 and have the power under section 259 to enter any premises in the UK or board any UK ship wherever it may be in the world and any other ship which is present in the UK or in UK waters for the purposes of making such examination or inspection as the inspector considers necessary. They also have the power to require any person to attend for interview, obtain documents, information and records

relating to any investigation and prohibit persons from gaining access to, or interfering with any ship, ship's boat or other equipment involved in an accident. Additionally, the MAIB Chief Inspector may require a ship to remain accessible within United Kingdom waters until the process of collecting or preserving the evidence has been completed.

15. The MAIB is independent of the Maritime and Coastguard Agency (MCA) and the European Maritime and Safety Agency.

#### **The Lord Advocate, COPFS & the police in Scotland**

16. The Lord Advocate has primary responsibility, under the Fatal Accidents and Sudden Deaths Inquiry (Scotland) Act 1976, for the investigation of sudden deaths in Scotland, and at common law for the investigation and prosecution of criminal offences. The Lord Advocate's position in relation to these matters is specifically recognised and preserved by section 48 of the Scotland Act 1998.

17. The Lord Advocate and procurators fiscal, who hold commissions from the Lord Advocate, have a statutory power to instruct the police in their investigation and reporting of crime and all suspicious, sudden and unexplained deaths.

#### **Body recovery and identification**

18. The Police are entrusted with the recovery and subsequent identification of human remains, where it is practicable to do so, following an event that results in a death. The processes and procedures utilised during this phase of the investigation will be scrutinised routinely and closely at any subsequent legal proceedings. This key area of an investigation will form part of the early discussion aimed at agreeing a joint strategy to move the investigation forward.

#### **Interface between investigations carried out by the AIBs, COPFS and the police in Scotland**

19. The purpose behind the respective investigations carried out by the AIBs, and the police and procurators fiscal is very different.

20. The police, under the instruction of procurators fiscal, investigate potential criminal activity and deaths that may arise out of an air or marine accident or incident. The police investigation is concerned with the cause of the accident to the extent that it is important evidence in any criminal and/or deaths investigation. The focus of their investigation is to gather evidence about the commission of a crime(s), or which points to or helps to explain the circumstances which contributed to, or caused a death(s), with a view to assessing whether there should be a criminal prosecution and/or a Fatal Accident Inquiry.

21. The AIBs have a statutory responsibility independently to investigate air or marine accidents and incidents, including those which may involve the commission of a criminal offence or where deaths may have occurred, and to establish the surrounding circumstances, and all the causal factors of the accident or incident. Their prime concern is to ensure that safety lessons are identified and promulgated; they do not apportion blame or determine liability.

22. The police, procurators fiscal and AIB inspectors, in carrying out their respective investigations, will take account of the roles and responsibilities of the other parties, and cooperate with one another to ensure the legal requirements of all parties are met. This is particularly important in respect of the collection and preservation of evidence from the accident site, the subsequent examination and analysis of items of evidence, and the interviewing of witnesses.

23. It is essential for the AIBs, the police and procurators fiscal that the highest standard of expertise is employed in an investigation. Generally the police will not be trained to carry out such a technical investigation as members of the AIBs into air or marine accidents, but the police, in working with an AIB in carrying out a criminal and/or deaths investigation, may contribute specialist forensic skills, including examination and analysis of prints and samples. Therefore, in establishing the causes, or reasons for severity of consequences of an accident or incident, the necessary technical expertise<sup>2</sup> will normally lie within the relevant AIB.

24. The police will, in most instances, be first in attendance at the scene of an accident and will make contact, and establish early and good communication with the relevant AIB, discuss any subsequent rescue operation, and the collection and preservation of evidence prior to the arrival of the AIB team.

## **MANAGEMENT OF THE INVESTIGATION**

25. All parties will make every effort to establish and maintain good liaison, communication and cooperation with one another throughout their respective investigations, and to work together as appropriate to achieve the best outcome for all. The responsibility for achieving this lies with the senior representative of each party at the scene of the accident or incident. Where it is not clear initially whether another party has an interest in carrying out an investigation, the potential involvement of the other parties should be borne in mind in the conduct of any investigation.

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2. Technical expertise refers to all aspects of construction and operation of aircraft or marine craft including human factors in aviation and marine operations.

### **Accident site**

26. Parties must have a clear understanding of their respective duties and responsibilities on the accident site to ensure preservation of the best evidence.

#### Prior to the arrival of the AIB

27. Where any party is made aware of an accident or incident likely to require the attendance of the police or one of the AIBs, that party will contact the other parties as soon as possible to inform them of the accident.

28. The AIBs each have a duty co-ordinator available 24 hours a day who will decide whether the AIB is to undertake an immediate investigation and the form that any such investigation should take. Where appropriate, the AIB duty co-ordinator will mobilise an AIB investigation team to attend the accident site.

29. The AIB duty co-ordinator will provide the police with information about:

- the intended AIB response and estimated time of arrival;
- contact details for the AIB investigation team;
- advice on technical issues that may require urgent attention.

30. The priority should be to arrange appropriate medical attention for, and the removal of any casualties, and to identify and secure the accident site. Once cordoned/secured, the police should maintain the security of the site until the arrival of the AIB.

31. The site should be preserved as closely as possible in its state immediately after the accident. If it is considered necessary, for the security of evidence, to move items or in any way affect the site, the police should, where practicable, notify the AIB and agree the steps they intend to take. If it is not possible to discuss such action with the AIB, the police should inform the AIB as soon as practicable of any action taken.

32. The police may compile an initial list of witnesses and their contact details which can be shared with the AIB team on arrival.

#### After the arrival of the AIB

33. AIB staff will identify themselves on arrival and the police should brief them as to actions taken prior to their attendance. The AIB lead inspector will discuss and devise with the police a plan of action for carrying out an investigation of the accident site.

34. The AIB inspectors will need to access the site without delay to allow identification and securing of perishable evidence. As an expert in their field, AIB inspectors will recognise evidence crucial to an air or marine accident investigation that may not be needed for a police investigation. AIB inspectors will also have the expertise necessary to collect and remove evidence expeditiously with the minimum amount of necessary damage.

35. It is important that the AIB and the police review the level of scene preservation and site security throughout the investigation. If any party intends to withdraw from the site they will inform the other parties. This is particularly important where the police wish to withdraw, so that the AIB can make alternative security arrangements before their departure.

36. The AIB may be able to release parts of the site from its investigation in a phased manner, as evidence is gathered and the investigation becomes more focused. In such cases this will be only after consultation with the COPFS and the police to ensure that any hand-over/hand-back is done in a controlled manner, taking account of the interests of all parties.

### **Accident Site Safety**

37. Parties will retain primary responsibility for the safety of both their own staff and those working under their direction, but it is important for all parties to co-operate, and to co-ordinate their activities in order to maintain the safety of the accident site.

### **COLLECTION AND USE OF EVIDENCE**

38. References to evidence in this section relate to evidence in which the AIB, police and COPFS have an interest. Each party should liaise and agree the overall plan for gathering evidence to ensure all parties remain informed. Steps should be taken by all parties to clarify their respective interests in a piece of evidence.

39. In this regard, the police and AIB agree to keep a record of any evidence collected and significant steps<sup>3</sup> taken in the course of their investigation which can be shared at any time with the other party, subject to legal restrictions on disclosure.

40. It is essential that the AIBs and the police and procurators fiscal take account of their respective interests in the gathering and preservation of evidence from the accident site, and in any subsequent examination or analysis of items of evidence.

41. In this regard, it is essential for the police and procurators fiscal that the manner in which evidence is gathered in the course of any investigation into an air or marine accident or incident takes account of the evidential requirements of Scots law, in particular those relating to the admissibility of evidence and the need for corroboration of each essential fact in a criminal case.

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3. "Significant steps" include actions taken which may impact on the evidence gathering process, e.g. moving a piece of wreckage as part of the rescue operation. It is not intended that parties will note down every minor action taken on the accident site or otherwise in connection with their investigation, but the record of evidence gathered should contain necessary information about actions taken as part of the evidence collection process, which have been essential for the securing of best evidence.

42. Any evidence gathered by the police or the AIB inspectors should be properly preserved so that the other parties can access it if required, and if it is within their power to do so. Where one party wishes to dispose of evidence in their possession, and it is unclear whether another party has an interest in retaining that item, parties should consult with each other prior to its disposal to agree the best course of action.

43. As a general rule, technical evidence gathered by AIB inspectors which requires further examination will be held by the AIB, who will maintain the necessary evidential trail. However, where the police do not, or it appears that they will not require to carry out an investigation into an air or marine accident or incident, it may not be necessary for the same detailed evidential trail to be maintained.

44. Where documentary evidence is collected and retained by the police, normally copies of these documents will suffice for purposes of the AIBs. Where the AIB take possession of documentary evidence, the necessary evidential trail will be maintained.

45. Scottish criminal law requires that all essential facts in the commission of a crime are corroborated, i.e. the prosecution must present corroborated evidence to the court to establish that a crime was committed and who is responsible. This means that there must be evidence of each essential fact from two independent sources.

46. This evidential standard must be taken account of when evidence is being gathered, passed on to any third party, examined or analysed. Therefore, for example, when pieces of evidence are gathered from the accident site this must be done by one person in the presence of another. Both of these people should be able to speak about the evidence gathering process and the record of the collection of evidence must be maintained by two people. For this purpose AIB inspectors may provide mutual assistance, or require police assistance.

47. These evidential standards are equally important with regard to the examination or analysis of a piece of evidence. This is particularly important where the examination or analysis could result in the controlled destruction of the item; in this event other parties will not have an opportunity to instruct an independent analysis. If this is contemplated then all parties must be consulted, and given the opportunity to be represented during the examination or analysis.

### **Sharing of Evidence**

48. Subject to any legal restrictions on disclosure, the AIBs will make available to COPFS or the police, evidence, including any factual information, with the exception of: witness statements, witness details, medical records, and inspector's working notes or working documents.

49. The COPFS or the police will make available relevant evidence and findings to the AIBs. This applies even where the AIB has not initially attended at the accident site but subsequently decides to commence an investigation.

## **INTERVIEWS AND DECLARATIONS**

50. Both AAIB and MAIB take evidence from witnesses on the basis that it is confidential and will not be disclosed unless either AIB is required to do so in the public interest by the relevant court. Both AIBs are subject to a statutory prohibition on disclosing witness statements or declarations.

51. The police may assist their own and/or the AIB investigation by compiling a list of persons who have witnessed the accident or incident and their contact details.

52. The AIB must carry out its own separate interviews of those persons as appropriate. The police will also carry out their own separate interviews of witnesses. The AIB will normally interview persons before the police do so, in order to obtain the fullest and most frank account of events. Parties will liaise, as appropriate, to co-ordinate witness interviews.

53. In exceptional circumstances, where a person is suspected of committing an imprisonable offence, and following discussion with the AIB, the police may require to exercise their power under section 14 of the Criminal Procedure (Scotland) Act 1995 to detain the suspect for a period of up to six hours as part of the criminal investigation.

## **OTHER COORDINATION**

### **Contact with the injured, bereaved and next of kin**

54. When accidents result in serious injuries and fatalities, it is important that all the investigating bodies liaise and agree arrangements for keeping the injured and bereaved informed regarding the progress of the investigations. In the first instance the police Family Liaison Officer (FLO) will be the main channel for this process and as far as possible all contact with the bereaved and injured will be co-ordinated through the FLO. It is helpful if the FLO explains to the bereaved the respective roles of the police and the AIB, and the fact that the AIB investigation is independent of any criminal investigation. The AIBs can supply brochures to assist with this process.

### **Employing third parties**

55. As far as is practical parties should consult with one another on the employment and remit of third parties to be contracted in relation to their investigation to ensure their remit meets the needs of all parties.

### **Public Statements / Media Coverage**

56. In the event of a need to make a public statement, the AIB, the police and COPFS will consult one another to ensure the factual accuracy of any media release and as far as possible to co-ordinate activities.

**AIB reports and recommendations /  
Potential criminal prosecution / FAI**

57. The AIB is required to publish reports on the accidents and incidents it investigates as early as possible so safety lessons can be learned and recommendations made known as soon as possible. Subject to the normal provisions of contempt of court, reports may be published whether or not civil or criminal proceedings are in progress or may be instituted. The AIB may also issue a special bulletin, interim report or immediate safety advice if appropriate.

58. Where a prosecution and/or a fatal accident inquiry is under consideration, the COPFS shall notify the AIB of its interest in their investigation. In this instance, the AIB will make available to the COPFS a pre-publication copy of the finalised report at the earliest opportunity. This will be treated as confidential and not disclosed before the date of publication.

59. The COPFS will keep the AIB informed as to the possible timing of any prosecution or fatal accident inquiry related to an accident which the COPFS is aware the AIB is investigating and will make every effort to give as much notice as possible.

60. The COPFS may comment on the finalised report and any comments made will be considered by the AIB before the report is published, but the AIB is not obliged to take any action as a result. Information given to the AIB by the COPFS will be treated as confidential.

61. If a report has been produced, the AIB will, if required, provide an inspector to a FAI to speak to that report. In the case of a fatal marine accident where the Preliminary Examination (see paragraph 13) is complete and it has been decided that a full investigation will not be conducted, the Chief Inspector of the MAIB will contact the Procurator Fiscal at an early stage to advise of this decision and to outline any safety issues he believes could be considered at a FAI.

62. However, in any criminal proceedings AIB inspectors should only be cited by the Prosecution as witnesses where the evidence which they are able to give could not be made available from any other source.

**Training/awareness**

63. COPFS/APCOS will arrange and conduct initial and refresher training for AIBs in evidential requirements in Scotland. The Chief Inspectors of the AIBs will undertake appropriate briefings/training for COPFS and APCOS personnel on the roles and procedures of the AIBs.

On behalf of AAIB \_\_\_\_\_  
Chief Inspector of Air Accidents

On behalf of MAIB \_\_\_\_\_  
Chief Inspector of Marine Accidents

On behalf of COPFS \_\_\_\_\_  
Crown Agent

On behalf of ACPOS \_\_\_\_\_  
Chief Constable Fife Constabulary

Date: \_\_\_\_\_

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## Appendix 6 to Chapter 2

### SAMPLE MOU WITH A CORONER

#### MEMORANDUM OF UNDERSTANDING

BETWEEN: The **Government of Manitoba** represented by the Minister of Justice, being the Minister responsible for the administration of *The Fatality Inquiries Act*, R.S.M. 1990, c. F-52 in the Province, hereinafter referred to **Manitoba**.

AND: The **Canadian Transportation Accident Investigation and Safety Board** represented by its Chairperson, hereinafter referred to as the **TSB**.

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**Whereas** the Minister of Justice of Manitoba is the Minister responsible for the administration of *The Fatality Inquiries Act* (the “*FIA*”), which confers the jurisdiction and obligation to inquire into the cause of sudden and unexpected deaths within the territorial limits of the Province, and make relevant recommendations about any matter arising out of an inquiry or an inquest.

**And whereas** the *Canadian Transportation Accident Investigation and Safety Board Act*, R.S.C. (1985) c. C-23.4 (the “*CTAISB Act*”) establishes the TSB with the mandate to advance transportation safety; its mandate being carried out by investigating transportation occurrences to make findings as to their causes and contributing factors and by making recommendations in order to eliminate or reduce safety deficiencies as evidenced by transportation occurrences.

**And whereas** Manitoba has the knowledge, experience, skills, and resources to conduct investigations into the causes and circumstances of death of a person, including in any transportation occurrence.

**And whereas** the TSB has the knowledge, experience, skills and resources to conduct investigations into transportation occurrences to identify safety deficiencies and make findings as to their causes and contributing factors.

**And whereas** it is in the public interest that, during the investigation of a fatal accident, Manitoba and the TSB coordinate their activities so that each can fulfil its obligations while optimizing the use of resources.

**And whereas** the parties recognize the desirability of cooperation through the exchange of information and services without compromising their respective independence.

**And whereas** the parties recognize the desirability of operating with minimal adverse effect on the other’s investigations.

**And whereas** section 16 of the *CTA/ISB Act* requires the TSB to make all reasonable efforts to enter into agreements with the governments of the provinces in order to ensure that its investigation procedures and practices are as compatible as possible with those followed by Medical Examiners in the provinces.

**THE PARTIES HERETO MUTUALLY AGREE AS FOLLOWS:**

**1. DEFINITIONS**

1.1 In this Memorandum of Understanding, hereinafter referred to as the Memorandum, the following words, unless a contrary intention appears, have the following meanings:

“**APPENDIX**” means the Appendix attached to, and forming an integral part of, this Memorandum, as may be amended from time to time by the parties in accordance with this Memorandum.

“**MEDICAL EXAMINER**” means the “chief medical examiner” and all “medical examiners” appointed under the *FIA*, as well as any person acting under the direction of the chief medical examiner or other medical examiner appointed under the *FIA*, with respect to a **FATAL ACCIDENT**.

“**FATAL ACCIDENT**” means an occurrence in Manitoba associated with the operation of a ship, aircraft, railway rolling stock or pipeline (as those terms are defined in the *CTA/ISB Act*) resulting in a fatality.

“**HUMAN REMAINS**” means the body of a deceased person and any parts of that body.

“**TSB**” means the Canadian Transportation Accident Investigation and Safety Board and includes each of the TSB investigators and any other person acting for, or on behalf of, the TSB during the investigation of a transportation occurrence.

1.2 In this Memorandum, the references to “party” or “parties” include the TSB and the **MEDICAL EXAMINER**, as applicable, it being the intention that this Memorandum will govern their interaction.

**2. APPLICATION**

2.1 Except as may be otherwise agreed by the parties in specific circumstances, this Memorandum applies to all **FATAL ACCIDENTS**.

**3. MANAGEMENT OF THE OCCURRENCE SITE**

3.1 The TSB recognizes that the **MEDICAL EXAMINER** has certain duties and responsibilities under the *FIA*. The **MEDICAL EXAMINER**’s responsibilities under this Part are, therefore, subject to his obligations pursuant to the *FIA*.

3.2 The party hereto first informed of a **FATAL ACCIDENT** will forthwith notify the other and provide information on the location and the circumstances of the occurrence.

- 3.3 The party first informed of a FATAL ACCIDENT will, if such party deems it necessary or advisable, request the services of the police force having jurisdiction over the occurrence, in order to assist in ensuring the protection and preservation of the occurrence site.
- 3.4 Notwithstanding 3.3, the TSB acknowledges that the MEDICAL EXAMINER shall, pursuant to its obligations under the *FIA*, notify police of the occurrence notwithstanding that the TSB may not deem police assistance necessary or advisable in the circumstances.
- 3.5 The parties will, subject to their respective statutory duties and responsibilities, have joint management of the occurrence site, and priority will be given to the taking of emergency and remedial measures necessary to ensure the protection of life, health, property and the environment.
- 3.6 Recognizing that the investigation of FATAL ACCIDENTS involves various activities, each party will endeavour to accommodate the needs of the other whatever the activity taking place.
- 3.7 The parties will endeavour to accommodate the needs of the police having regard to the circumstances surrounding the FATAL ACCIDENT.

#### **4. IDENTIFICATION OF THE HUMAN REMAINS AND RETRIEVAL PROCESS**

- 4.1 Subject to 4.4 and the MEDICAL EXAMINER's duties under the *F/A*, the parties will be jointly responsible for the protection of information and objects at the site that may be required by either party.
- 4.2 Recognizing the importance, for investigative purposes, of the location of HUMAN REMAINS and the preservation of information and objects within the occurrence site, the parties, unless otherwise agreed, will coordinate their activities to ensure that no HUMAN REMAINS are disturbed before each has had an opportunity to attend at the site. Each of the parties agrees that it will attend the site at its earliest possible opportunity following the occurrence and ensure that the site or wreckage is not disturbed beyond the extent necessary to extricate the HUMAN REMAINS.
- 4.3 In the absence of other arrangements acceptable to both parties, the TSB will ensure that the conditions of the occurrence site and whatever is therein are recorded through the best means available before the displacement or removal of the HUMAN REMAINS.
- 4.4 The MEDICAL EXAMINER will have the responsibility for the retrieval and transportation of the HUMAN REMAINS, for the purposes of identification and subsequent examinations, to a facility provided by a sanitary, health or municipal authority for use as a morgue, or to such other facility as may be acceptable to both parties.
- 4.5 During the retrieval of the HUMAN REMAINS, the MEDICAL EXAMINER will not disturb the wreckage or other evidence beyond the extent necessary to extricate the HUMAN REMAINS.

- 4.6 During the recovery of the wreckage and other evidence, the TSB will not disturb the HUMAN REMAINS without the agreement of the MEDICAL EXAMINER.
- 4.7 The MEDICAL EXAMINER will have the responsibility for the identification of the HUMAN REMAINS and the TSB will provide the MEDICAL EXAMINER with any available information useful to the identification process.
- 4.8 The TSB will assist the MEDICAL EXAMINER as much as possible with the retrieval of the HUMAN REMAINS and will provide direct assistance or expertise at its disposal, when requested.
- 4.9 Where a FATAL ACCIDENT is not investigated by the TSB, the TSB will, on request by the MEDICAL EXAMINER, and to the extent practicable:
  - (a) provide technical assistance including any relevant records; and
  - (b) attend the site.

## **5. ACCESS TO INFORMATION**

- 5.1 The MEDICAL EXAMINER will coordinate with the police regarding notification of the next-of-kin of a deceased person. The MEDICAL EXAMINER will inform the TSB when such notification has been completed.
- 5.2 Subject to 5.3, 5.6 and 5.7, the parties will provide to one another, on an informal and continuing basis, complete information concerning the investigation of a FATAL ACCIDENT.
- 5.3 To enable the parties to carry out their investigative and administrative duties, each of the parties shall be entitled to request, from the other, personal information (including personal health information) related to persons involved in the FATAL ACCIDENT as it becomes available. The parties agree that requests for personal information shall be set out in writing and shall include the following:
  - (a) the exact nature and extent of the personal information being requested; and
  - (b) a statement that the requesting party believes, on reasonable grounds, that the personal information being requested is relevant to and required for its investigation or other duties under the CTAISB Act or the FIA, whichever is applicable to it, and that it has lawful authority to request and obtain such information.

Upon receipt of a written request containing the foregoing information and statements, the party receiving the request will, unless it believes on reasonable grounds that the party requesting the personal information does not have lawful authority to request it or that it does not have lawful authority to provide it, deliver the personal information requested to the other party.

- 5.4 The TSB will provide the MEDICAL EXAMINER, on a confidential basis, with an interim report, which can be oral or in writing, containing information on the progress and findings of the investigation when significant progress has been made therein.

- 5.5 The TSB recognizes that the information provided to the MEDICAL EXAMINER may, subject to 5.6, be used during a MEDICAL EXAMINER's inquiry or investigation, or for the purposes of an inquest directed under the *FIA*.
- 5.6 The parties agree that the MEDICAL EXAMINER will recognize the privilege status of the information referred to in sections 24, 25, 28 and 30 of the *CTA/ISB Act* and will use the information only in accordance with those provisions.
- 5.7 The parties will coordinate the release of information to the public, as appropriate and in accordance with all relevant legislation to which the parties are subject.

## **6. PROTOCOL FOR CONDUCTING AUTOPSIES AND OTHER POST MORTEM EXAMINATIONS**

- 6.1 Recognizing the prime importance of specialized autopsies and post mortem examinations in the investigation of FATAL ACCIDENTS, the parties will ensure that such examinations are performed in accordance with the standards spelled out in the APPENDIX.
- 6.2 Subject to section 7, the MEDICAL EXAMINER will have the responsibility for the performance of any autopsies during the investigation of a FATAL ACCIDENT, following consultation with the TSB as to the type, number and scope of examinations and autopsies required, given the nature of the occurrence.
- 6.3 In the event of a major FATAL ACCIDENT resulting in autopsy and other post mortem examination requirements exceeding the means, facilities or staffing resources of the Province of Manitoba, the parties will contract with other sources, as agreed upon, for the performance of the autopsies or other post mortem examinations.
- 6.4 The TSB may attend any part of an autopsy or other post mortem examination; but, unless otherwise agreed, no records, other than the provincial autopsy records, will be established.
- 6.5 Upon completing any autopsy or post mortem examination or making significant progress therein, the MEDICAL EXAMINER will, on a confidential basis and subject to any applicable statutory restrictions, provide a report on the findings and conclusions to the TSB Investigator-in-charge.

## **7. COSTS**

- 7.1 Each party agrees to pay the cost of services provided by or through the other where the services are in excess of those normally required by the other party for the purpose of carrying out its own investigation functions.
- 7.2 The services to be provided and the amount to be paid for services referred to in subsection 7.1 will be discussed and agreed upon by the parties before such services are rendered.

## **8. INQUEST/INQUIRY PROCESS**

- 8.1 (a) The MEDICAL EXAMINER will notify the TSB, as soon as practicable, if Manitoba's Chief Medical Examiner directs an inquest under the *FIA*.

(b) The TSB will notify the MEDICAL EXAMINER, as soon as practicable, if the TSB intends to conduct a public inquiry.

- 8.2 Upon completion of an investigation, the TSB will provide the MEDICAL EXAMINER with a final report in writing on its findings and recommendations.
- 8.3 Upon the MEDICAL EXAMINER receiving a copy of the presiding provincial judge's written report in connection with an inquest; the MEDICAL EXAMINER will provide the TSB with a copy of the written report and any recommendations.

## **9. DISSEMINATION OF INFORMATION**

- 9.1 Manitoba will ensure that this Memorandum is disseminated to all MEDICAL EXAMINERS, police forces and police services within the Province of Manitoba.
- 9.2 The TSB will ensure that this Memorandum is disseminated to all TSB investigation staff located in the Province of Manitoba.

## **10. COMMUNICATIONS**

- 10.1 Except as may be otherwise expressly set out in this Memorandum, all communications by the TSB with Manitoba concerning FATAL ACCIDENTS will be directed to the Office of the MEDICAL EXAMINER.
- 10.2 Except as may be otherwise expressly set out in this Memorandum, all communications by Manitoba with the TSB concerning FATAL ACCIDENTS will be directed to the Regional Manager of the TSB.

## **11. RESOLUTION OF ISSUES**

- 11.1 In the event that an issue arising out of this Memorandum cannot be resolved at the staff level, it will be referred to the Minister of Justice for Manitoba and the Chairperson of the TSB, or their respective delegate(s), for resolution.

## **12. CONSULTATION**

- 12.1 Unless otherwise agreed, the parties will meet annually to discuss their working relationship, investigations in progress and any need to amend this Memorandum or the APPENDIX.

## **13. APPENDIX**

- 13.1 The APPENDIX will be initialled by each of the parties at the time of signing the Memorandum.

## **14. AMENDMENTS**

- 14.1 Proposals for changes to either the Memorandum or the APPENDIX may be made at any time by either party. Amendments agreed upon shall be in writing and signed by both parties.

**15. TERMINATION**

15.1 Either party may terminate this Memorandum on a written three-month notice to the other.

**16. NON-BINDING EFFECT**

16.1 It is understood by the parties that this Memorandum is an expression of the parties' mutual intent and is executed as a matter of convenience to ensure that their practices and procedures are consistent and compatible. While the parties intend to cooperate fully with respect to the subject matter hereof, nothing in this Memorandum is, or is intended to be, binding. This Memorandum does not affect, amend, limit, increase or in any other way change, any legal duties, powers or obligations of the parties.

IN WITNESS WHEREOF the parties hereto have executed this Memorandum of Understanding

The Government of Manitoba

Canadian Transportation Accident  
Investigation and Safety Board

\_\_\_\_\_  
Minister of Justice

\_\_\_\_\_  
Chairperson

\_\_\_\_\_  
City of Winnipeg, Manitoba

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City of Gatineau, Quebec

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This Appendix forms part of a Memorandum of Understanding between The Government of Manitoba, as represented by the Minister of Justice (“Manitoba”), and the Canadian Transportation Accident Investigation and Safety Board, as represented by its Chairperson (the “TSB”).

## A-P-P-E-N-D-I-X

### **A) POST MORTEM REQUIREMENTS**

#### **I. INTRODUCTION**

The parties recognize that the investigation of fatal transportation occurrences involves some shared responsibilities and more specifically requires the performance of certain post mortem work in order to make findings as to the causes and contributing factors of such occurrences. It is also recognized that the TSB has neither pathological nor toxicological facilities and therefore relies on provincial organizations and personnel to accomplish work in this area. However, the TSB has other unique facilities and its personnel have accrued experience in operational and investigative aspects of transportation occurrence analysis.

Therefore, it is in the interest of both parties to produce, document, and share information and analyses regarding the causal and survival aspects of such occurrences and to agree that all transportation post mortem examinations will be performed in accordance with the following standards or recommendations.

#### **II. SCOPE OF POST MORTEM ACTIVITIES**

Physiological and pathological conditions may influence performance of crew members or those in safety sensitive positions, through incapacitation or sudden death. Information on external causal events may also be reflected in human remains. Post mortem procedures must therefore be in place to screen for a wide variety of physical conditions and also to detect and document information on structural or other external factors.

Similarly there exists a need to define conditions responsible for lack of survival of crew and passengers. Information on restraint systems function and post-occurrence environment habitation factors are critical in survival analysis, as is information as to the efficiency of crash fire rescue services. Finally it is also necessary to perform work to detect a wide variety of drugs, metabolites and environmental toxins which could indicate disease or degrade performance. In the light of these requirements, the following scope of post mortem work is required:

##### **1. Identification of remains**

The identification of the deceased person is of prime importance for a variety of reasons including the determination of medical fitness for duty of those individuals in safety sensitive positions. Where pre-occurrence position is known, identification of victims also supports the analysis of deceleration and impact kinetics and factors peculiar to locations within the wreckage. Post mortem work will also reveal which, if any, remains may not be of human origin.

## **2. Detection of factors affecting cause and survivability**

The presence of pre-existing disease may indicate causal or contributory factors capable of inducing subtle incapacitation or sudden death or accidental illness. Ante-mortem performance may also be influenced by the presence of intoxication from ethanol or environmental contaminants such as carbon monoxide, or from the use of illicit, over-the-counter or a wide variety of prescription drugs.

## **3. Determination of sequence and impact kinematics**

It is important to determine not only the presence of events, but also their sequence in the occurrence scenario. Trauma may occur throughout an occurrence sequence and have differing significance depending on whether it was, for example, sustained due to an en route act of terrorism; from failure of a restraint system; from impact with flying baggage or improperly secured items; or due to impact with or crushing from the cabin structure. A fire on board a moving vessel, train or aircraft might result in death due to the inhalation of products of combustion without, or prior to, impact trauma. If such trauma was deemed non-survivable, the inhalation of products of combustion would be evidence of the occurrence of a possibly causal fire prior to impact. Remains may also be altered by a variety of post-impact events and such artifactual conditions need to be documented to avoid confounding the occurrence analysis.

### **III. POST MORTEM EXAMINATION PROCEDURES**

In all likelihood, any currently used current post mortem examination procedure approved by the province or territory will be acceptable as long as the peculiarities of transportation occurrences and investigations are borne in mind. It is also recognized that changes in routine procedures may result in an increased error rate. This would be especially so in the event of a mass casualty situation. It is further noted that the collected remains may be insufficient for all the procedures and analyses desired and that local resources may require augmentation.

Detailed examination and recording of findings in a written report and labelled and scaled drawings/photographs and x-rays will be required. The routine procedure should also include the gathering of all information needed for identification, examination of all body cavities and major organs, description of injuries sustained and if possible, their sequence. Organs should be weighed and measured. Pre-existing disease capable of causing incapacitation or sudden death should be thoroughly investigated and documented.

Specific samples should be submitted for toxicological analyses to the provincial laboratories normally used for Medical Examiners or forensic work. From time to time, the Transportation Safety Board may request samples be taken for additional laboratory work. With prior consent, the TSB is prepared to compensate for costs incurred in performing work considered beyond the normal scope of duties.

### **IV. SPECIFIC ELEMENTS OF POST MORTEM WORK**

#### **1. Provision of information from the occurrence scene**

It is recognized that the pathologist is at a decided disadvantage in responding to TSB requirements in performing autopsies of transportation occurrence victims without full knowledge of the circumstances of the occurrence. To provide such information, the TSB

will endeavour to convey information regarding the occurrence scenario and site prior to the commencement of autopsies. Any findings subsequently deemed relevant will be conveyed as soon as possible.

## **2. Autopsy**

A standard post mortem examination of a transportation occurrence comprises a variety of activities including:

### **a) Clothing, equipment and wreckage**

Examination and documentation of clothing and personal survival equipment such as personal flotation devices must be performed. Items should be evaluated for appropriateness for their task and their influence on survivability, as well as for any indications of the manner and cause of death. Articles such as parts of the seat belt, embedded wreckage or information on terrorist device may be sent to the pathologist and should be evaluated and brought to the attention of the Transportation Safety Board and other authorities.

### **b) Gross procedures**

#### **i. External examination**

Signs of pre-existing disease, signs of trauma induced in the occurrence including physical injuries such as lacerations, contusions, amputations, burns, chemical and corrosive injuries, and injuries reflecting the ambient environment including exposures to a wide variety of dangerous commodities, immersion, freezing, etc. should be noted and documented with diagrams and photographs.

#### **ii. Internal examination**

The contents of all body cavities should be examined to determine the appearance of major organs and the existence of pre-existing causal and contributory pathology and injuries resulting from the occurrence and evidence of transient survival. Both internal and external examination should also delineate artifactual pathology to avoid confusion with findings of causal significance. The documentation of findings with photographs and labelled drawings is extremely important.

### **c) Histology**

Additional post mortem work should include microscopic examination of selected tissue specimens from major organ systems. Evidence of conditions capable of affecting performance by altering perception, cognition, or psychomotor control, or causing pain, incapacitating illness or even sudden death, might only be seen with the application of special stains and magnification.

### **d) Radiographs**

Radiographs are essential to document evidence of attempts at control, pre-existing skeletal deformities or orthopaedic work, maturation, spinal injuries and the exact nature of other fractures sustained in the occurrence. Specific fractures might also reveal injury patterns occurring as a result of deficiencies in restraints or vehicle design. Radiographs

will be taken for the above noted reasons. Reports of findings and analysis will be made available to the TSB and copies of the films may be requested.

#### **e) Toxicology**

Toxicological analyses are required to detect the presence of ethanol, over-the-counter, prescription and illicit drugs and metabolites, environmental contaminants and fire byproducts such as carbon monoxide and cyanide, exposure to occupationally encountered substances including dangerous commodities, agriculturally used herbicides and pesticides, etc. Therefore, adequate tissue and fluid specimens from the deceased should be obtained at autopsy to support such analyses. Careful attention should be paid to the documentation of method of sampling, sites, amount, preservation, storage and custody. In addition to specimens routinely collected such as blood, urine and liver, others such as vitreous humour, bile, bone marrow and tissues from major organs including skeletal muscle should be preserved for possible analysis.

#### **f) Interpretation of injury patterns**

A wide variety of control or passenger environment design deficiencies may influence both occurrence cause and survivability. These may be determined through the analysis of patterns of injury. The pathologist should use all of the information gathered in the previously noted procedures, to deduce the significance of the injuries detected. For example, restraint systems may leave evidence of their efficacy or lack thereof, in the form of strap marks or internal injury if improperly fitted. Flail injuries may occur when the limbs or the head of properly restrained victims impacts on improperly placed structures within their strike zone. Direction and the magnitude of decelerative forces may be seen through the similarity of injuries to co-located victims. Detonations, whether by failure of a pressurized vessel, a pipeline or as an act of terrorism will provide a variety of findings including blunt or penetrating injuries produced by objects propelled by a blast wave.

### **B) QUALITY ASSURANCE**

#### **1. Pathology**

The TSB may, from time to time, require consultation with the Medical Examiner concerning the results of pathological examinations. The TSB will also be advised in a timely fashion if the diagnosis or any pathological finding or interpretation made by a regional pathologist is altered after submission to the TSB.

#### **2. Toxicology**

In lieu of splitting samples at the time of autopsy for submission to an independent laboratory, the TSB will rely on provincial laboratory toxicology findings. The TSB requests that the scope of toxicology work performed on samples submitted from transportation occurrence cases be sufficient to detect drugs or toxins capable of affecting performance, drugs and metabolites whose presence is evidence of treatment of medical or self diagnosed conditions and compounds capable of influencing survival. Written reports of results and methods used should be provided to the Medical Review Officer of the TSB in a timely fashion to ensure appropriate use of the interpretation of findings in the investigation.

The TSB also requests that provincial toxicology laboratories submit a written report of standard laboratory procedures and methods and notify the TSB of changes which may occur from time to time. The TSB may also require, from time to time, consultations concerning the results of toxicological examinations.

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## Appendix 7 to Chapter 2

# SAMPLE MOU WITH A CIVIL AVIATION AUTHORITY

### MEMORANDUM OF UNDERSTANDING

#### BETWEEN

THE CANADIAN TRANSPORTATION ACCIDENT INVESTIGATION AND  
SAFETY BOARD (“TSB”)

#### AND

TRANSPORT CANADA (“TC”)

RESPECTING THE COORDINATION OF ACTIVITIES WITH REGARD TO  
TRANSPORTATION OCCURRENCES

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#### 1.0 PURPOSE

- 1.1 The purpose of this Memorandum of Understanding (“MOU”) is to provide for the coordination of the activities of TC and TSB with respect to transportation occurrences, as contemplated by section 17 of the *Canadian Transportation Accident Investigation and Safety Board Act*.

#### 2.0 PRINCIPLES

- 2.1 TSB and TC recognize the desirability of cooperation through:
- (a) positive working relationships;
  - (b) the effective and efficient exchange of information and data;
  - (c) clear and open communication;
  - (d) respect for the mandate and responsibilities of each organization; and
  - (e) the prompt resolution of any conflicts which arise, including by referring them to more senior levels within each organization, including where appropriate or required to the Minister of Transport and the Chairman of the TSB.

#### 3.0 AUTHORITIES AND RESPONSIBILITIES

- 3.1 The Chairman of TSB is responsible for the administration of the *Canadian Transportation Accident Investigation and Safety Board Act, R.S.C.* (CTAISB Act).
- 3.2 For the purpose of this document, the Minister of Transport is responsible for the administration of:
- (a) the *Aeronautics Act, R.S.C. 1985, C. A-2* (as amended);
  - (b) the *Canada Shipping Act*;

- (c) the *Railway Safety Act*; and
- (d) the *Transportation of Dangerous Goods Act, 1992*.

- 3.3 The TSB is an independent body with the mandate to advance transportation safety by conducting independent investigations of selected occurrences in the aviation, rail and marine modes, in order to make findings as to their causes and contributing factors, to identify safety deficiencies, to make recommendations to eliminate or reduce such safety deficiencies, and by reporting publicly on its investigations and its findings.
- 3.4 Transport Canada delivers various programmes and services to regulate and oversee transportation safety and security.

#### **4.0 NOTIFICATION OF OCCURRENCES**

- 4.1 The party first informed of an occurrence will notify the other party as soon as practicable, in accordance with the procedure set out in Section 2 of the Schedule to this MOU.

#### **5.0 NOTICE OF SIGNIFICANT STUDIES AND OTHER INVESTIGATIONS**

- 5.1 Each party will advise the other of significant studies or investigations they plan to conduct that may be of interest to the other.

#### **6.0 INTERNATIONAL RELATIONS**

- 6.1 Both parties will work cooperatively to develop coordinated Canadian positions as well as to coordinate their representation and participation at international meetings and events, such as meetings of IMO and ICAO.

#### **7.0 MEDIA RELATIONS**

- 7.1 The parties acknowledge that the TSB is to be the official spokesperson regarding any accident investigation that the TSB undertakes.
- 7.2 Each party may respond to requests for information from the media concerning its mandate and activities. Each party will endeavor to provide notice and details to the other party in advance of the release of formal communiques or press releases, which may be of interest to, or impact on, the mandate or activities of the other party.

#### **8.0 COST SHARING AND COST RECOVERY**

- 8.1 Except as otherwise agreed to in advance, normal provision of services by one party to the other will be without charge.
- 8.2 In instances where one party requests that the other conduct special projects or significant studies, or provide other services, costs incurred will be reimbursed in accordance with Treasury Board Policies.

#### **9.0 CONSULTATION**

- 9.1 Each party will consult with and involve the other on matters which may be of interest, including regulatory changes or initiatives. Each party will endeavor to accommodate the requirements of

the other party with respect to regulatory development. Such involvement should include where appropriate, the provision of technical information and participation in consultations with industry during the development of regulatory proposals.

**10.0 REVIEW**

10.1 This MOU and its implementation will be reviewed by the parties annually or at the request of either party.

**11.0 SCHEDULE**

11.1 The attached Schedule forms part of this MOU and may be amended from time to time on the written agreement of the Assistant Deputy Minister, Safety and Security, Transport Canada and the Executive Director of the TSB.

**12.0 AMENDMENTS AND TERMINATION**

12.1 This MOU may be amended in writing by the written agreement of the parties and may be terminated by either party on 180 days written notice.

The Canadian Transportation  
Accident Investigation and  
Safety Board

Transport Canada

\_\_\_\_\_  
Chairperson

\_\_\_\_\_  
Minister of Transport

Date signed: \_\_\_\_\_

Date signed: \_\_\_\_\_

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## SCHEDULE

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### 1.0 **PURPOSE**

- 1.1 The purpose of this schedule is to outline the specific responsibilities of TC and the TSB regarding the implementation of the Memorandum of Understanding (MOU).

### 2.0 **NOTIFICATION OF OCCURRENCES**

- 2.1 For immediate notification of reportable occurrences, as defined in the TSB Regulations:
- (a) TC, Civil Aviation will notify the appropriate TSB office of any reportable aviation occurrence as soon as practicable.
  - (b) The TSB will notify the Civil Aviation Contingency Operations (CACO) Centre of any aviation occurrence as soon as practicable.
  - (c) For marine occurrences, initial notifications are not required from either party as occurrence notifications are provided to both parties by the Department of Fisheries and Oceans (DFO), Canadian Coast Guard (CCG). Should TC or TSB obtain initial notification from another source, outside DFO/CCG, they will contact the other. (TC's contact point is CANUTEC).
  - (d) TC, Rail Safety will notify the appropriate TSB office of any reportable railway occurrence as soon as practicable
  - (e) The TSB will notify CANUTEC of any railway occurrence as soon as practicable.
- 2.2 Formal notification of TSB investigations:
- (a) The TSB will inform TC within 48 hours of learning of an occurrence what action the TSB intends to take, including the class of investigation. This information shall normally be provided in the TSB Daily Notification Logs.
  - (b) The TSB will report aviation occurrences, indicating aircraft type and registration, location, date and time of the occurrence, number of injuries and fatalities, particulars relating to involvement of dangerous goods, brief description of the circumstances and the action planned by the TSB.
  - (c) The TSB will report rail occurrences indicating the train number, subdivision name and mileage, date and time of the occurrence, number of injuries and fatalities, particulars relating to involvement of dangerous goods, brief description of the circumstances and the action planned by the TSB.
  - (d) The TSB will report marine occurrences, indicating the name, type, flag, gross tonnage and cargo of the vessel, location, date and time of the occurrence, number of injuries and fatalities, particulars relating to involvement of dangerous goods, the degree of damage and pollution, a brief description of the circumstances and the action planned by the TSB.

- 2.3 If TC believes an investigation is required of an occurrence to determine findings as to causes and contributing factors, where the TSB has decided not to investigate, TC may request that the TSB conduct an investigation.
- 2.4 If TC conducts an occurrence investigation, within its legislative authority, it will inform the TSB.
- 2.5 Where the TSB is assessing the need to conduct an investigation into an occurrence, TC may decide to conduct its own investigation where it is empowered to do so. TC will inform the TSB of its decision to conduct an investigation, as soon as practicable.

### **3.0 COORDINATION OF INVESTIGATIVE ACTIVITIES**

- 3.1 With respect to occurrences that the TSB is investigating, TC will make available on request as soon as practicable, subject to any Act of Parliament and any agreements with other government departments or agencies, the information contained in their files, libraries, reporting systems and databases.
- 3.2 In the event TC is investigating the same occurrence as the TSB, TC and the TSB will ensure that each other's mandate is respected.
- 3.3 Should TC send a representative to the site of an occurrence in order to evaluate TC's responsibilities or to determine if any immediate corrective or remedial measures are required, that representative will endeavor to make contact with any TSB investigator on site.
- 3.4 In any activity undertaken by TC, the interests of the TSB with regard to evidence preservation will be respected. However, this will not be an impediment to TC taking whatever action is deemed necessary in fulfillment of their obligations relating to immediate corrective action or remedial measures.

### **4.0 MINISTER'S OBSERVER**

- 4.1 It is TC's policy to appoint a Minister's Observer upon being notified by the TSB that it is investigating an occurrence. TC will provide the name of the Minister's Observer to the TSB as soon as practicable.
- 4.2 The Minister's Observer will obtain timely information relevant to the Minister's responsibilities and coordinate TC involvement and resources required for the investigation in accordance with the TC Minister's Observer Manual of Policies and Procedures.
- 4.3 If TC does not designate a Minister's Observer, the Department may appoint a Coordinator to act as a point of contact with the TSB for the purpose of exchanging information, subject to the same restrictions as those of the Minister's Observer.

- 4.4 The TSB will provide the Minister's Observer or, where an Observer is not designated, TC's Coordinator with a summary of factual information derived from any type of recorder in order to convey relevant safety concerns to TC, as soon as practicable, for the purpose of conducting risk assessments and/or for overseeing safety. This information will be used and treated in accordance with procedures set out in TC's Minister's Observer Manual of Policies and under the requirements of the Privacy Act, the Access to Information Act and the CTAISB Act.

## **5.0 EXCHANGE OF SERVICES DURING INVESTIGATIONS**

- 5.1 TC will facilitate and support the investigation of transportation occurrences, particularly at remote sites, by providing living and office accommodation, transportation services, removal equipment, accident site surveys, dangerous goods detection equipment, etc., to the extent practical and feasible, within available resources, and when owned and operated by TC.
- 5.2 TSB will facilitate and support TC's Minister's Observer role during the investigation of occurrences by providing protective equipment and clothing, where TC cannot immediately obtain protective equipment or clothing that is compliant with TSB requirements. Equipment provided in such cases must meet or exceed TC's requirements under the Canada Labour Code, Part II.

## **6.0 INTERNATIONAL RELATIONS**

- 6.1 The roles of the TSB and TC will be respected in assigning representatives to ICAO and other international meetings, task forces and other working groups involving transportation safety matters. Prior to attendance, the TSB and TC will consult and agree on appropriate representation, while recognizing that for ICAO Accident Investigation Group divisional meetings and for Flight Recorder Panel meetings, the official technical expert will normally come from the TSB, in coordination with TC.
- 6.2 TC will provide International Civil Aviation Organization (ICAO) coordination services to other departments and agencies. The Canadian position involving aviation occurrence investigations will be that of the TSB while the Canadian position regarding on-board recorders will take into consideration the views or proposals of the TSB.
- 6.3 Each party will inform the other of an occurrence outside of Canada, as soon as practicable. These include occurrences involving:
- Canadian registered and/or built ship, or component thereof, operated by a foreign or Canadian operator;
  - Canadian registered and/or manufactured aircraft, or component thereof, operated by a foreign or Canadian operator; and
  - Canadian owned and/or manufactured railway rolling stock.
- 6.4 Under ICAO Annex 13, the responsibility for appointing a Canadian Accredited Representative to an investigation of an aviation occurrence outside Canada conducted by another state lies with the TSB. The decision to provide a TC Advisor to the Canadian Accredited Representative is at the discretion of TC, Safety and Security. If the TSB decides not to assign an Accredited Representative, TC may assign someone to that position.
- 6.5 In fulfilling the obligations of IMO Resolution A.449(XI), the Assistant Deputy Minister, Safety and Security, or his delegate, as the Head of the Canadian Delegation to IMO's General Assembly sessions and the elected Council's bi-annual sessions, is the Canadian focal point for

communication with the Secretary-General of IMO. The TSB may name a representative or submit documentation to IMO Technical Committees with respect to marine investigation activities related to the mandate of the TSB, in coordination with the Head of the Canadian Delegation or his delegate.

- 6.6 TC, as the Head of the Canadian Delegation will, with the Department of Foreign Affairs and International Trade, develop the Canadian position on IMO applicable sessional items in coordination with the TSB. The TSB will be responsible for the reporting of occurrences and the submission of reports, in accordance with Resolution A849(20) and A884(21) and MSC Circular 827 in conformity with SOLAS 74 Chapter 1 and MARPOL 73/78 Article 12.

The Canadian Transportation  
Accident Investigation and  
Safety Board

Transport Canada

\_\_\_\_\_  
Executive Director

\_\_\_\_\_  
Deputy Minister, Safety and Security

Date signed: \_\_\_\_\_

Date signed: \_\_\_\_\_

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## Appendix 8 to Chapter 2

### CHECKLIST ON ASSISTANCE TO INVESTIGATIONS

#### INVESTIGATION AUTHORITY READINESS REQUIREMENTS

1. Is there State legislation that establishes an independent accident investigation authority responsible for the conduct of safety investigations?
  - **If not**, the State should establish an independent accident investigation authority that is separate from the civil aviation authority or legal authority; that has rights, responsibilities, suitable statutory powers to conduct the investigation; and that has the required financial, human and technical resources. As an alternative, the State could establish or join an existing regional accident investigation organization.
2. Is there State legislation that specifies the powers of the accident investigation authority and how investigations are conducted?
  - **If not**, the State should direct that the investigation be conducted in accordance with Annex 13 and the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756).
3. Does the accident investigation authority have State policies, plans, standards, procedures and checklists for the conduct of accident/incident investigations?
  - **If not**, the State should use some or all of the provisions in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756) and/or in the documents used by other accident investigation authorities.
4. Does the accident investigation authority have sufficient technical and human resources with the competencies required to conduct a credible investigation?
  - **If not**, the State should have plans to acquire equipment and human resources from, in part, other accident investigation authorities, regional accident investigation organizations, national government departments and authorities, aircraft operators and manufacturers.
5. Does the State legislation provide for immediate and unrestricted access to all relevant evidence without requiring prior consent from judicial bodies or other authorities?
  - **If not**, the accident investigation authority should establish a documented agreement with judicial/police departments, an agreement that ensures the data collection and custody needs of both the accident investigation authority and the judicial/police authorities.
6. Does the State legislation specify the procedures to be followed in order to keep accident/incident investigations separate from judicial or administrative proceedings?
  - **If not**, the accident investigation authority should establish documented agreements with judicial, police, and other departments, agreements that ensure the separation of the safety investigation from other investigations.

7. Do the State legislation and regulations specify the protection of certain documents and information obtained in the course of an accident/incident investigation from public disclosure?
  - **If not**, in the short term, the accident investigation authority should document the State's commitment to achieve the provisions of Annex 13 regarding the "Non-disclosure of records" and, in the long term, to adjust its laws, regulations and policies to protect accident and incident records in compliance with paragraph 5.12 of Annex 13.
8. Does the State accident investigation authority have a communications policy/plan and procedures to notify and then to deal with the involved States, judicial/police authorities, departments, operators, the media and many other parties that have an interest in the investigation?
  - **If not**, the accident investigation authority should enter into agreements with these entities to ensure that communications are coordinated and timely.
9. Does the accident investigation authority have a need for advice on the organization and management of the investigation?
  - **If yes**, the accident investigation authority should acquire such expertise from other accident investigation authorities or from a safety consultant with the required expertise.
10. Does the State have arrangements to ensure entry without delay into their territories on a temporary basis of qualified personnel required for accident investigation?
  - **If not**, the accident investigation authority should establish a process and/or agreement with the State department(s) responsible for such facilitation matters based on the provisions of Annex 9, Chapter 8, Part B.

#### FIELD PHASE INVESTIGATION ASSISTANCE

1. Does the State investigation authority have regulations and procedures to ensure that all documents, records, recordings and other evidence associated with the flight are secured and placed in safe keeping until further instructions are received from the accident investigation authority?
  - **If not**, the accident investigation authority, without delay, should notify all the involved entities to secure these types of evidence.
2. Does the accident investigation authority have enough investigators with adequate skills and experience to manage and conduct a major investigation?
  - **If not**, the State should contact the States involved in the investigation and other States to acquire additional investigators with specific or general skills and experience.
3. Does the accident investigation authority have a communication policy and plan for the investigation and have procedures regarding the release of investigation information, including a skilled spokesperson?
  - **If not**, the accident investigation authority should solicit advice and support from other government departments and/or the States involved in the investigation.
4. Do all the investigators assigned to the investigation have the required training, skills, knowledge and equipment for the conduct of investigation operations at the accident site, in part including, a field-investigation kit, passport, protective inoculations, clothing, supplies, etc.?

- **If not**, the accident investigation authority should limit the activities of untrained, ill-equipped investigators to operations in safe areas.
5. Does the accident investigation authority have procedures with operators to identify hazardous materials on the crash site, as provisioned in Annex 13, subparagraph 4.2 m)?
- **If not**, the accident investigation authority should, without delay, contact the involved operator to acquire that information and to solicit advice and support from other government departments and/or the States involved in the investigation.
6. Are there means of transportation to/from the accident site and adequate equipment facilities in the immediate vicinity of the accident site?
- **If not**, the accident investigation authority should seek assistance from other State civil and military organizations to provide facilities, equipment and additional personnel.
7. Does the accident investigation authority have access to all the facilities required to read out flight recorders?
- **If not**, the accident investigation authority should acquire the needed expertise and facilities from the States involved in the accident investigation, other States or a commercial engineering company.
8. Does the accident investigation authority have ready access to medical expertise to carry out medical and pathological examinations?
- **If not**, the accident investigation authority should establish agreement(s) with a coroner/medical examiner to provide these services.
9. Does the accident investigation authority have the required knowledge and capacity to guard and protect the accident scene?
- **If not**, the accident investigation authority should establish working agreements with the national/local police or the military to provide security resources.
10. Does the accident investigation authority have the required knowledge and capacity to establish and maintain the safety of investigation operations at a hazardous site?
- **If not**, the accident investigation authority should establish working agreements with the military, the national/local police or firefighters, crash rescue responders, other government departments or commercial firms who have the required certification/expertise.
11. Does the accident investigation authority have processes and facilities for collecting, identifying, cataloguing, storing and safe-guarding evidence acquired by the investigation?
- **If not**, the accident investigation authority should establish working agreements with government departments, police and/or other State investigation authorities to obtain administrative resources for this function, including advice, expertise, processes and database systems.

#### POST-FIELD PHASE INVESTIGATION ASSISTANCE

1. Does the accident investigation authority have the expertise and facilities for the detailed examination of systems, parts or components?

- **If not**, the accident investigation authority should acquire the needed expertise and resources from government departments, States involved in the accident investigation, other States, commercial engineering companies and/or the relevant manufacturer.
2. Does the accident investigation authority have appropriate facilities for additional specialized examinations and research, such as numerical computation, spectral analysis?
    - **If not**, the accident investigation authority should acquire the needed expertise and resources from government departments, States involved in the accident investigation, other States and commercial engineering companies.
  3. Does the accident investigation authority have a methodology, processes and other tools to analyse factual information and to determine safety issues, causes and contributing factors?
    - **If not**, the accident investigation authority should acquire the needed expertise and resources from States involved in the accident investigation, other State investigation authorities and/or safety consultation firms.
  4. Does the accident investigation authority have all the expertise for writing reports and safety recommendations?
    - **If not**, the accident investigation authority should acquire the needed expertise and resources from States involved in the accident investigation and/or other State investigation authorities and/or safety consultation firms.
  5. Does the accident investigation authority have investigators who are skilled in specialized areas involved in the accident investigation, such as interviewing, human factors, management factors, safety deficiency analysis, helicopter operations, airports, air traffic control, general aviation operations, weather analysis, survival factors and taking fluid samples?
    - **If not**, the accident investigation authority should acquire the needed expertise and resources from States involved in the accident investigation, other States and service providers.

#### POSSIBLE OBSTACLES TO INVESTIGATIONS

1. Has the State responsible for the investigation determined which organization(s) is (are) responsible for communicating information relating to an accident/incident and to the investigation?
2. Has the State responsible for the investigation established policies and/or procedures regarding the release and/or use of investigation information?
3. Are there organized protocols and processes established for communication between the various parties involved in the occurrence investigation?
4. Has a procedure been set up or contacts been made to facilitate the arrival of assisting investigators?
5. Are there any specific local constraints, such as geographical constraints, that might hamper the success of the assistance provided by another State?
6. Is there rapid transportation available to reach the accident site and are suitable accommodations available near the accident site, or will it be necessary to call upon a third party to make these arrangements?

7. Are there any provisions under national laws or regulations that prohibit accredited representatives and their advisers from accessing the accident site or gaining access to any data relevant to the investigation, as provisioned in Annex 13, paragraphs 5.12 and 5.25?
8. Are there any provisions under national laws or regulations that allow for the release of sensitive information provisioned in Annex 13, paragraph 5.12?
9. Are there any provisions under national laws or regulations that prohibit sending or carrying aircraft parts or components abroad for examination?
10. Are there any provisions under national laws or regulations that limit the entitlement of a foreign technical expert, as provisioned in Annex 13, paragraph 5.27?
11. Are there any requirements for having translation services for foreign investigators?

## Appendix 9 to Chapter 2

# MODEL DELEGATION AGREEMENT IN RESPECT OF AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION

### AGREEMENT BETWEEN

..... (Authority)

of

..... (Delegating State)

AND

..... (Authority/RAIO)

of

..... (Delegated State)

### REGARDING DELEGATION OF INVESTIGATION

### IN RESPECT OF

**AIRCRAFT ACCIDENT/SERIOUS INCIDENT INVOLVING**

**MAKE/MODEL, REGISTRATION: XX-XXX**

**XXX AIRLINES, FLIGHT XX**

## 1. DELEGATION

1.1 On ..... (date), the ..... (Operator) ..... (flight number), ..... (aircraft type and model), ..... (aircraft registration mark), was involved in an accident/serious incident in the territory of .....(State).

1.2 The flight originated from ..... (State of departure airport) to ..... (State of destination airport) with ..... (number of persons onboard). The accident caused ..... (number of fatal and serious injuries).

1.3 This Agreement documents the delegation of ..... (the whole/part) of the investigation of the subject accident/serious incident by the ..... (Authority) of ..... (State) to the ..... (Authority/regional accident and incident investigation organization (RAIO)) of ..... (State), hereafter collectively referred to as "the Parties".

*(when the investigation is delegated to an authority of a State)*

1.4 It is recognized that both ..... (Delegating State) and ..... (Delegated State) are Parties to the 1944 Convention on International Civil Aviation (the Chicago Convention) and are therefore bound by the Standards contained in Annex 13 — *Aircraft Accident and Incident Investigation* to the Chicago Convention.

*Note.— Both States shall advise each other of their respective existing differences that have been filed or that will be filed against the Standards of Annex 13.*

*(or when the investigation is delegated to an RAIO)*

It is recognized that ..... (delegating State) is a Party to the Convention on International Civil Aviation (the Chicago Convention) and the ..... (RAIO) is established for conducting investigations under the provisions of Annex 13 — *Aircraft Accident and Incident Investigation*. Both Parties shall be bound by the Standards contained in Annex 13 to the Chicago Convention.

*(when the investigation is delegated to an authority of a State)*

1.5 Both Parties to this Agreement are authorized by their respective laws and Governments to act as the national authority representing ..... (Delegating State) and ..... (Delegated State) in respect of aircraft accident and incident investigation in accordance with Annex 13 provisions.

*(or when the investigation is delegated to an RAIO)*

Both Parties to this Agreement are authorized by their respective laws and Governments to act as the national authority representing ..... (Delegating State) and the regional accident and incident investigation organization representing ..... (Delegated State) in respect of aircraft accident and incident investigation in accordance with Annex 13 provisions.

1.6 This Agreement is in accordance with Annex 13 to the Chicago Convention, Standard 5.1, which states: "The State of Occurrence shall institute an investigation into the circumstances of the accident and be responsible for the conduct of the investigation, but it may delegate the whole or any part of the conducting of such investigation to another State or a regional accident and incident investigation organization (RAIO) by mutual arrangement and consent. In any event, the State of Occurrence shall use every means to facilitate the investigation." (Standard 5.1.2 of Annex 13 refers to delegation of investigation of serious incidents.)

## 2. TERMINOLOGY

2.1 Unless otherwise mentioned, the words and phrases used in this Agreement have the same meaning as that ascribed to them in Annex 13 — *Aircraft Accident and Incident Investigation*.

## 3. OBJECTIVE OF THE INVESTIGATION

3.1 In accordance with Annex 13, the sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

## 4. CONDUCT OF THE INVESTIGATION

4.1 This Agreement serves to foster cooperation and mutual assistance between the Parties in implementing the provisions of Annex 13. Each Party shall strive to overcome difficulties that may arise due to differences in languages, national cultures, legislative systems or geographic locations.

4.2 The Parties agree to work together to ensure that a competent investigation is conducted in accordance with Annex 13, with due account to the protection of accident and incident investigation records afforded in Standard 5.12 of Annex 13.

4.3 When the investigation is delegated in whole, the delegating State shall consent, in accordance with Standard 5.13 of Annex 13, that the delegated State/RAIO reopens the investigation if new and significant evidence becomes available after the investigation has been closed.

## 5. PARTICIPATION OF OTHER STATES

5.1 In accordance with Annex 13, Standard 5.18, 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. Additionally, in accordance with Annex 13, Standard 5.23, 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.

## 6. SCOPE OF THE INVESTIGATION AND REPORTING RESPONSIBILITIES

*(when the whole investigation is delegated)*

6.1 It is recognized that ..... (*Delegated Authority/RAIO*) is responsible for the conduct of the whole investigation, including the issuance of the Final Report and other reporting requirements prescribed in Annex 13.

*(or when only part of an investigation is delegated)*

It is recognized that ..... (*Delegated Authority/RAIO*) is responsible for the conduct of the investigation related to ..... (*specify the part(s) being delegated*), including a report on its findings

to the investigator-in-charge. Notwithstanding this delegation, ultimate responsibility for the conduct of the investigation remains with ..... (*Delegating State*), including the issuance of the Final Report and other reporting requirements prescribed in Annex 13.

Examples of parts of the investigation that can be delegated include:

- a) Recovery of the underwater wreckage and flight recorders;
- b) Readout and analysis of flight recorders;
- c) Autopsy on the bodies of crew members;
- d) Analysis of aircraft records and aircraft performance;
- e) Analysis of crew training records and their performance; and
- f) Human factors analysis of flight and cabin crew, maintenance personnel and ATC personnel.

## 7. MISCELLANEOUS

7.1 The exchange of records, evidence and information relevant to the accident/serious incident subject to this Agreement, shall be by protected means of communication as agreed by the Parties.

7.2 Both Parties agree that ..... (*either Party*) shall be responsible for coordinating the post-accident/serious incident communications including media and press releases.

7.3 Both Parties agree that procedures related to the provision of assistance to accident victims and their families shall be the responsibility of ..... (*either Party*).

7.4 When the investigation is delegated in whole, and in accordance with Standard 6.11 of Annex 13, the tracking of safety recommendations issued in the Final Report shall be the responsibility of the delegated authority/RAIO.

7.5 Both Parties agree that ..... (*list the parts of this Agreement*) shall be disclosed to the public.

## 8. FINANCIAL CONSIDERATIONS

8.1 Both Parties agree that the ..... (*Delegating Authority/Delegated Authority or RAIO*) shall be responsible for ..... (*specify percentage*) of the expenses relevant to the investigation subject to this Agreement.

**9. COORDINATION**

9.1 The contact person in ..... (*Delegating State*) for the implementation of this Agreement is:

..... (*Title*)  
..... (*Authority*)  
..... (*Address*)

Tel.: ..... (*Office*) ..... (*Mobile*)  
Fax: .....  
E-mail: .....

9.2 The contact person in ..... (*Delegated State/RAIO*) for the implementation of this Agreement is:

..... (*Title*)  
..... (*Authority/RAIO*)  
..... (*Address*)

Tel.: ..... (*Office*) ..... (*Mobile*)  
Fax: .....  
E-mail: .....

**10. DISPUTES**

10.1 If any dispute arises in respect of the interpretation or execution of the terms of this Agreement, such dispute shall be settled mutually by the Parties.

**11. ENTRY INTO FORCE, TERMINATION AND REACTIVATION**

11.1 This Agreement shall come into effect on the date of the last signature by the Parties hereto.

11.2 This Agreement may be terminated by mutual consent of the Parties.

*(when only part of an investigation is delegated)*

This Agreement shall remain in effect until the delegated parts of the investigation and the deliverables are fulfilled, unless it is terminated by mutual consent of the Parties.

*(or when the whole investigation is delegated)*

This Agreement shall remain in effect until the Final Report is made publicly available, unless it is terminated by mutual consent of the Parties.

11.3 In observance of Standard 5.13 of Annex 13 addressing the reopening of the investigation, both Parties agree that this Agreement shall be reactivated, as appropriate, in case new and significant evidence becomes available to either Party after the investigation has been closed with the issuance of the Final Report, and that evidence requires the investigation to be reopened.

**12. NOTIFICATION OF THE AGREEMENT TO ICAO**

12.1 This Agreement and any amendment hereto shall be registered upon its signature with the International Civil Aviation Organization (ICAO).

12.2 The notification of termination/reactivation of this Agreement shall be sent to ICAO.

**13. SIGNATORIES**

IN WITNESS WHEREOF, the undersigned, being duly authorized by the Parties, have signed this Agreement.

Signed in duplicate

\_\_\_\_\_  
(Title)  
(Delegating State Authority)  
At (Time) \_\_\_\_\_  
Date (dd/mm/yyyy)

\_\_\_\_\_  
(Title)  
(Delegated State Authority/RAIO)  
At (Time) \_\_\_\_\_  
Date (dd/mm/yyyy)

\_\_\_\_\_

## Chapter 3

### PLANNING THE INVESTIGATION

#### 3.1 ACCIDENT INVESTIGATION MANAGEMENT

3.1.1 This section provides a synopsis of the planning for management of the investigation. Detailed information on the Investigation Management System can be found in Part II of this manual.

3.1.2 It is essential that the magnitude of the tasks and the scope of the investigation be assessed at an early stage so that the size of the investigation team can be planned and the appropriate resources and expertise can be acquired for the investigation. To achieve its purpose, an investigation must be properly organized, carried out, coordinated and supervised by qualified technical personnel. The investigation plan must recognize that the investigator-in-charge is directly responsible for organizing the investigation team, for assigning responsibilities to the team members and for managing the progress of the investigation. The investigation plan should also include detailed investigation checklists.

3.1.3 In a major accident investigation, a substantial team of investigators, set up in specialized groups, is necessary to properly cover all aspects of the investigation. In some investigations, the apparent causes/contributing factors may become evident early in the investigation. In such situations, the subsequent, prime investigation effort may then be effectively channelled to good effect into relatively narrow but specialized areas. Nevertheless, it will still be necessary to investigate all factors that might have contributed to the accident and to eliminate those factors that did not. Whether or not the causes are apparent, the investigation should determine any underlying systemic factors that may have contributed to the accident as well as any non-causal deficiencies that could contribute to future accidents.

3.1.4 In the case of incidents and non-major accidents, the investigation effort in terms of manpower and resources required may be proportionately smaller. The functions are still the same but the work is undertaken by one or two investigators or, alternatively, by an investigator and a specialist qualified in a particular aspect that requires expert examination. Even in small investigations, pre-investigation planning is essential and the degree of individual effort and diligence in accurately recording the facts and developing the analysis and conclusions must be of the same high standards as for major accident investigations.

#### 3.2 THE INVESTIGATION MANAGEMENT SYSTEM

3.2.1 This section provides a synopsis of the Investigation Management System.

3.2.2 In the case of an accident investigation involving a large or complex aircraft, a large team of investigators is usually required to conduct the investigation in the most effective and expeditious way. The effective management of a major investigation requires a management system based on a comprehensive plan, checklists, and a method and flow charts to track the progress of the investigation. In effect, a major investigation is a project that must be managed. This section of the manual presents one such project management system, entitled the "Investigation Management System". This system divides the investigation activities into functional events. Each event is numbered with a corresponding descriptive phrase. The list of Investigation Management System events is contained in Part II of this manual.

3.2.3 To assist in the management of the investigation and the monitoring of the workload, each event should be assigned to a group within the investigation team. These assignments should be documented. An example of the investigation event task-assignment chart is contained in Part II of this manual.

3.2.4 The Investigation Management System flow chart, which consists of a set of events, should be completed sequentially in the course of an investigation. The flow chart allows the investigators to ensure that the essential sequence of events is followed and, as well, provides an up-to-date picture of what has been completed to date. An example of the Investigation Management System event flow chart is contained in Part II of this manual.

3.2.5 A checklist is provided for each Investigation Management System event. The checklists may differ somewhat from one State to another due to local conditions and procedures. The checklists should be reviewed to ensure that the tasks are appropriate to the organization and conduct of accident investigations and are in line with the procedures of the State. The breakdown of activities and tasks into checklists allows the investigator-in-charge to clearly indicate what is to be accomplished by the investigators and by the groups during an investigation.

3.2.6 Use of the task-assignment flow chart, the event flow chart and checklists also allows the investigator-in-charge to provide direction and guidance to persons who are participating in an investigation for the first time and who may require specific advice. The checklists, aside from being part of the Investigation Management System, provide for some order in what is sometimes a confusing situation. The Investigations Management System event checklist is contained in Part II of this manual.

3.2.7 The investigation team members should be familiar with the Investigation Management System. The group chairpersons must be knowledgeable about this system and the tasks that their groups will be required to carry out. Group chairpersons should be well aware that the tasks listed for each event may not be complete and that particular circumstances may require additional tasks. When using the checklists, it is desirable that the investigators make notes of the date of completion of each task. They should also make notes when further action is required and note things of significance associated with a particular task. Regardless of how much planning goes into the provision of this type of checklist, there will be cases in which the outlined tasks have to be adapted to the special circumstances of the investigation.

3.2.8 The event flow chart and the checklists provide tools for the group chairpersons to organize the work of their groups. The flow chart also provides the investigator-in-charge with a tool to monitor progress. At the daily progress meetings, the investigators should report the particular tasks in their checklists that have been completed since their last report, and the investigator-in-charge should note the progress on the event flow chart. Another advantage of using this chart is the ease with which progress of the investigation can be reported to the headquarters office from the investigation site.

3.2.9 The Investigation Management System is one of the tools that an investigator should be called upon to use. The effectiveness of the Investigation Management System is directly related to the adherence to the flow chart and the checklists. An investigator likely to be appointed investigator-in-charge or group chairperson in a major investigation should be familiar with this system prior to attempting to use it in the field.

### **3.3 LIAISON WITH OTHER AUTHORITIES**

3.3.1 The readiness of the State accident investigation authority would benefit from establishing working arrangements and/or memoranda of understanding with authorities that have first-responder responsibilities (such as police, firefighters and search and rescue), with organizations that may become involved in or that might provide support to the safety investigation (such as government departments and the military) and with other authorities that have investigation mandates related to the aircraft accident or incident (such as judiciaries, police, coroners, and the civil aviation authority). Of importance is that emergency plans are in place. Specifically, the accident investigation authority

must be aware of the mandates and emergency plans of local authorities, and the local authorities must be aware of the mandates, authorities and plans of the investigation authority. (Chapter 2 of this manual contains more information on the issues of establishing relationships with national and local authorities.)

3.3.2 Cooperation with the police can usually be obtained through liaison with police headquarters. Suitable items can then be included in the police training syllabus and the official police handbook to ensure that members of the police force are informed, in advance, of what is expected of them in the event of an aircraft accident.

3.3.3 Cooperation with air traffic services providers and airport authorities is important, in particular because these entities are usually the first to become aware of and respond to occurrences on or adjacent to airports. The *Airport Services Manual* (Doc 9137), Part 7 — *Airport Emergency Planning* and the airport emergency plan identify and set forth the procedures for coordinating the response of different airport agencies (or services) and those agencies in the surrounding community that could be of assistance in responding to the emergency.

3.3.4 Victim identification is usually the responsibility of the coroner's office, the police department and the disaster victim identification team. Medical personnel, such as pathologists and forensic dentists, should be aware of what is expected of them in the event of an aircraft accident.

3.3.5 Notification of next of kin is a sensitive task that must be planned and undertaken with great care in order to avoid anomalies, such as multiple or erroneous notifications. In many States, the notification of next of kin is a police task.

3.3.6 The accident investigation authority may have to rely on assistance from other civil and military organizations to provide facilities, equipment and additional manpower, i.e. helicopters, heavy lifting and moving gear, metal detectors, Geiger counters, communication equipment and divers. It is important that heavy salvage equipment, such as cranes, bulldozers or lifting helicopters, are readily available. When an extensive wreckage plot is required, it may also be necessary to obtain the services of professional surveyors through liaison with appropriate government agencies. In some cases, a full-scale expedition may have to be mounted to reach the occurrence site, requiring additional transportation, food, lodging and/or other services.

## 3.4 COOPERATION WITH THE MEDIA

3.4.1 Most major accidents generate a high degree of interest from both the public and the media, and a good rapport with the media is usually an asset to the investigation. It may be necessary to enlist the cooperation of the local media to withhold precise details of the location of an aircraft accident until adequate crowd-control measures can be implemented. It may also be necessary to enlist their aid in obtaining further information about the local area and the names of possible witnesses or when seeking the public's assistance in recovering missing pieces of the wreckage.

3.4.2 Policies should be adopted regarding the release of information to the media about the accident or the progress of the investigation. To promote dissemination of factual information and to minimize speculation and rumours about the accident, the media should be provided, on a regular basis, with all those facts which can be released without prejudice to the investigation. For this reason, the accident investigation authority should consider establishing a single point of contact for media inquiries. This contact is usually the investigator-in-charge or a designate. The media contact, in consultation with the accredited representatives, should provide non-prejudicial facts and circumstances to the media. Nevertheless, it is necessary to ensure that the needs of the media do not interfere with the proper conduct of the investigation.

3.4.3 Other organizations involved or affected by the accident (such as airlines, airport authorities, emergency services and aircraft manufacturers) may also be required to release information to the media, and such efforts should be coordinated, to the extent possible, amongst the organizations and agencies involved.

3.4.4 The accident investigation authorities and the accredited representatives and their advisers participating in an investigation shall not give the media or the public access to any documents obtained during the investigation without the express consent of the State conducting the investigation. The release of such information by a participating State, without the consent of the State conducting the investigation, would undermine the mutual confidence and cooperation amongst the States involved and must therefore be avoided.

### **3.5 SECURING OF RECORDS, RECORDINGS AND SAMPLES**

Regulations and procedures should be in place to ensure that, in the event of an accident, all air traffic services communication recordings and documents deemed to be associated with the flight are secured and placed in safe keeping until further instructions are received from the accident investigation authority. Prior arrangements should also be made to immediately obtain and place in safe keeping all of the aircraft operator's documentation associated with the aircraft, the flight crew and the flight operation. Arrangements should be made with the aviation meteorology authorities to obtain a special weather report as soon as they become aware of an aircraft accident. Similar arrangements should be made with fuel companies to obtain fuel samples from stocks or refuelling points.

### **3.6 REMOVAL OF DISABLED AIRCRAFT**

Detailed information concerning planning, equipment and procedures for the removal of disabled aircraft at airports is contained in the *Airport Services Manual* (Doc 9137), Part 5 — *Removal of Disabled Aircraft*.

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## **Chapter 4**

# **NOTIFICATION OF ACCIDENTS AND INCIDENTS**

### **4.1 GENERAL**

Immediate notification of accidents and incidents to the accident investigation authority is essential because the proper conduct of an investigation requires the prompt arrival of investigators at the accident site. Any delay in their arrival may well result in the deterioration or disappearance of essential evidence due to theft, displacement or improper handling of the wreckage, adverse weather, corrosion of the wreckage, obliteration of ground scars or contamination of witness accounts through discussion among themselves.

### **4.2 NOTIFICATION WITHIN A STATE**

4.2.1 State regulations should provide for the accident investigation authority to be immediately notified of any accident or incident in its territory. Since accident investigation procedures differ from one State to another, it is not possible to define in detail a standard procedure for the notification of accidents and incidents. However, the following points may serve as a basis for the establishment of a timely notification procedure.

4.2.2 The first persons to know about an accident are any survivors or witnesses. Surviving crew members are likely to know what immediate actions to take, and witnesses or surviving passengers will usually inform the local police, the airport authorities or military personnel, who should immediately notify the accident investigation authority in accordance with a prearranged procedure. Sometimes air traffic services personnel are the first to know that an accident or incident has occurred and they will initiate the notification procedure.

4.2.3 The notification procedure should be simple and effective, using the most rapid means of communication (telephone, facsimile or electronic mail). A list of State authorities to be notified should be available at all air traffic services facilities, airport authorities and police departments. The list should be arranged in order of priority and should include the names and telephone numbers of the appropriate authorities and their alternates, if appropriate. A record should be kept of the persons and organizations notified.

4.2.4 More than one local authority may be responsible for alerting other authorities of an accident or incident. For instance, local airport personnel are usually required to notify the accident investigation authority and the local police. The local police are usually also required to notify the accident investigation authority, as well as the judicial authorities. A check system should be established to ensure that each of the appropriate authorities has been notified.

4.2.5 In the case of reportable incidents, notification to the accident investigation authority is usually initiated by air traffic services or the aircraft operator.

4.2.6 The accident investigation authority should be organized in such a way that accident or incident notifications are received and acted upon on a 24-hour basis.

### **4.3 RESPONSIBILITIES OF THE STATE OF OCCURRENCE**

4.3.1 Annex 13, Chapter 4, contains provisions for the notification of accidents and serious incidents.

4.3.2 When an accident or serious incident occurs in the territory of a Contracting State to an aircraft registered in another Contracting State, the State in which the accident or serious incident occurred (State of Occurrence) shall send a notification with a minimum of delay to the State of Registry, the State of the Operator, the State of Design and the State of Manufacture of the aircraft.

4.3.3 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.

4.3.4 When an accident or serious incident occurs in the territory of the State in which the aircraft is registered (State of Registry), in a non-Contracting State, or outside the territory of any State, then the State of Registry shall send a notification with a minimum of delay to the State of the Operator, the State of Design and the State of Manufacture of the aircraft.

4.3.5 For accidents or serious incidents involving aircraft of a maximum certificated take-off mass of over 2 250 kg or a turbojet-powered aeroplane, the notification shall also be sent to ICAO.

4.3.6 The State of Occurrence should also notify States which have a special interest in an accident by virtue of fatalities or serious injuries to its citizens. Those States shall be permitted by the State conducting the investigation to appoint an expert who shall be entitled to visit the scene of the accident, to have access to the relevant factual information approved for public release by the State conducting the investigation and information on the progress of the investigation, and to receive a copy of the Final Report. This will not preclude the State from also assisting in the identification of the victims and in meetings with survivors from that State.

4.3.7 The State of Occurrence may also wish to send a notification to those States which may be requested to provide information to the investigation authority conducting the investigation, i.e. the State(s) whose air traffic services had the aircraft under control prior to the accident or serious incident.

4.3.8 Each State shall have appropriate regulations and procedures in place to ensure that its accident investigation authority sends the notification to the accident investigation authorities of the other States concerned with a minimum of delay. Instructions regarding the preparation and dispatch of notifications should be readily available to the investigator(s) on call.

4.3.9 The accident investigation authority should be organized in such a way that accident investigators are available on a 24-hour basis. This will reduce notification delays and will allow the investigation to begin promptly.

4.3.10 Where possible, the notification should be addressed to the accident investigation authorities in the State of Registry, the State of the Operator, the State of Design and the State of Manufacture, as appropriate.

#### **4.4 FORMAT AND CONTENT OF THE NOTIFICATION**

4.4.1 The notification shall be in plain language and contain as much of the information in the example at Appendix 1 to Chapter 4 as is available. Its dispatch shall not be delayed due to the lack of complete information. If it has not been possible to provide complete information in the notification, the State of Occurrence shall forward the omitted details as soon as they become available.

4.4.2 Whenever it is possible to do so without causing undue delay, the notification shall be prepared in one of the working languages of ICAO, taking into account the language(s) of the recipients.

#### 4.5 DISPATCH OF THE NOTIFICATION TO OTHER STATES

4.5.1 The notification shall be sent with a minimum of delay and by the most suitable and quickest means available (i.e. telephone, facsimile or electronic mail).

4.5.2 Appendix 2 to Chapter 4 lists the addresses and contact numbers of State accident and incident investigation authorities, as reported to ICAO prior to May 2015. An up-to-date list can be found at the AIG website which is accessible through the ICAO public website.

#### 4.6 RECEIPT OF THE NOTIFICATION

Arrangements should be made in each State to ensure prompt delivery of accident and incident notifications to the accident investigation authority on a 24-hour basis. If notifications cannot be delivered directly to the accident investigation authority, the number of intermediaries should be kept to a minimum.

#### 4.7 RESPONSIBILITY OF THE STATE RECEIVING THE NOTIFICATION

4.7.1 The accident investigation authority in each State receiving the notification shall, as soon as possible and usually by the same means of communication:

- a) acknowledge receipt of the notification;
- b) provide the State of Occurrence with the available relevant information requested;
- c) inform the State of Occurrence whether or not it intends to be present at the investigation; and
- d) provide the names and titles of the accredited representative and technical advisers and the expected date of their arrival at the accident site or at the headquarters of the accident investigation authority in the State of Occurrence.

4.7.2 Since the State of Registry, the State of the Operator, the State of Design and the State of Manufacture maintain the right to be represented at the investigation, they may, in the case of a delay in the receipt of the notification, supply the above information on their own initiative. If these States consider it unnecessary to be present at the investigation, each State should so advise the State of Occurrence with a minimum of delay. The attention of the State of Registry, the State of the Operator, the State of Design and the State of Manufacture is drawn to their obligation to appoint accredited representatives, when specifically requested to do so, for accidents involving aircraft over 2 250 kg. Their attention is also drawn to the usefulness of their participation in the investigation and the fact that it is highly desirable that they participate when requested to do so by the State conducting the investigation. In any case, the State of Design and the State of Manufacture shall supply the State conducting the investigation with any information it may request.

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## Appendix 1 to Chapter 4

### EXAMPLE OF A NOTIFICATION

<i>Information required (see Annex 13, 4.2)</i>	<i>Example</i>
a) for accidents the abbreviation ACCID, for serious incidents INCID;	a) ACCID;
b) manufacturer, model, nationality and registration marks, and serial number of the aircraft;	b) Boeing 737-200, United Kingdom, G-AMSW, serial no. 20280;
c) name of owner, operator and hirer, if any, of the aircraft;	c) Derby aviation;
d) qualification of the pilot-in-command, and nationality of crew and passengers;	d) Airline transport licence; crew — British; passengers — British, French, German and others;
e) date and time (local time or UTC) of the accident or serious incident;	e) 7 October 1983 at 1314 hours local time;
f) last point of departure and point of intended landing of the aircraft;	f) London/Heathrow-Perpignan/Riversaltes;
g) position of the aircraft with reference to some easily defined geographical point, and latitude and longitude; <sup>1</sup>	g) 12 km south of Prades, 4233 N, 02-26 W, elevation 2 200 m;
h) number of crew and passengers: aboard, killed and seriously injured; others: killed and seriously injured; <sup>2</sup>	h) 6 crew and 57 passengers aboard, all fatally injured; others: none;
i) description of the accident or serious incident, and the extent of damage to the aircraft so far as it is known;	i) aircraft collided with a mountainside in the Canigou Massif. Aircraft destroyed by post-impact fire;
j) an indication to what extent the investigation will be conducted or is proposed to be delegated by the State of Occurrence;	j) investigation by the French accident investigation authorities;
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;	k) mountainous area, difficult access, perpetual snow;
l) identification of the originating authority; and	l) Bureau Enquêtes-Accidents, Paris, France. For additional information, contact Mr. X at (telephone and facsimile numbers and e-mail address); and
m) presence and description of dangerous goods on board the aircraft.	m) bio-hazardous materials in the forward hold.

1. It may be helpful to provide the location of the accident or incident as well as 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 2 to Chapter 4

### ADDRESSES OF ACCIDENT INVESTIGATION AUTHORITIES

*Note.— A list of current addresses of accident investigation authorities can be found at the AIG website which is accessible through the ICAO public website (<http://www.icao.int/safety/AIA/Pages/default.aspx>).*

#### **AFGHANISTAN**

President of Civil Aviation Operations  
Ministry of Civil Aviation and Tourism  
Ansari Watt, P.O. Box 165  
Kabul  
Afghanistan

Tel.: (873) 68-234-1450 / 49  
Fax: (873) 68-128-0784

#### **ALBANIA**

Ministry of Public Works, Transport and  
Telecommunication  
Directorate General of Civil Aviation  
Rruga Muhamet Gjollësja  
Parku 1 Delegacioneve  
P.O.B. 205, Tirana  
Albania

Tel.: (355) 42-251-220  
(355) 68-212-1493 (outside office hours)  
(355) 42-343-487 (24 hours)  
Fax: (355) 42-226232  
E-mail: [genci.resuli@dgca.gov.al](mailto:genci.resuli@dgca.gov.al)

#### **ALGERIA**

Ministère des Transports  
Direction de l'Aviation Civile et de la Météorologie  
119, rue Didouche Mourad  
Alger  
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

#### **ANDORRA**

National Civil Aviation Administration  
Département des Transports et de l'Énergie  
Ministère de l'Économie  
Carrer Prat de la Creu, 62-64  
Andorra la Vella  
Andorra

Tel.: (376) 875-700  
Fax: (376) 861-519

#### **ANGOLA**

Instituto Nacional de Aviação Civil  
Rua Miguel de Melo No. 96, 6º Andar  
Caixa Postal 569  
Luanda  
Angola

Tel.: (244) 9232-49760 (Director General)  
(244) 9199-11200 / 9299-87740  
(24 hours)  
Fax: (244) 2 39 05 29

#### **ANTIGUA AND BARBUDA**

See Eastern Caribbean States

#### **ARGENTINA**

Junta de Investigaciones de Accidentes de  
Aviación Civil (JIAAC)  
Avenida Belgrano 1370 – Piso 11  
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## Chapter 5

### ACTIONS AT THE ACCIDENT SITE

#### 5.1 INITIAL ACTIONS

5.1.1 Local fire and police departments will probably be the first officials to arrive at an aircraft accident site, and it is therefore important to enlist their cooperation to ensure that vital evidence is not lost through interference with the wreckage. Such cooperation is usually best achieved through liaison at the headquarters level, the initial liaison having been effected during the planning associated with the possibility of an aircraft accident. The fire and police departments should be aware of what is expected of them in the event of an aircraft accident, and plans and arrangements for the following essential tasks should be in place so that they can be accomplished without delay:

- a) notifying the rescue coordination centre;
- b) notifying the aircraft accident investigation authority and other authorities as necessary;
- c) securing the wreckage from fire hazards and further damage;
- d) checking for the presence of dangerous goods, such as radioactive consignments or poisons being carried as freight, and taking appropriate action;
- e) placing guards to ensure that the wreckage is not tampered with or disturbed;
- f) taking steps to preserve, through photography or other appropriate means, any evidence of a transitory nature, such as ice or soot deposits; and
- g) obtaining the names and addresses of all witnesses whose testimony may aid in the investigation of the accident.

5.1.2 Apart from these arrangements, the wreckage should be left undisturbed until the arrival of the investigation team. It should be emphasized to the police and rescue services that the bodies of persons killed in an accident involving a large aircraft should, where practicable, be left *in situ* for examination and recording by the disaster victim identification team, as well as by the investigation team. Similarly, personal belongings should remain untouched as their location may assist in the identification of the victims. In general, disturbance of the wreckage shall be limited to that necessary to rescue survivors, extinguish fires and protect the public.

5.1.3 The cooperation of airport personnel is normally ensured through an appropriate standing instruction which shall also ensure the safe keeping of air traffic services recordings and documents.

#### 5.2 RESCUE OPERATIONS

5.2.1 The primary concern of the first persons to arrive at the site of an aircraft accident is the rescue and aiding of survivors and the protection of property within the means available. Persons who are involved with the extrication of victims from aircraft wreckage should, at the earliest opportunity, record their observations regarding the location in the aircraft where the survivors were found and what portions of the wreckage had to be moved during the rescue. If

circumstances permit, the bodies of persons killed in the accident should be left as found until their location and condition are recorded, photographs are taken and a chart is made indicating their location in the wreckage. If bodies are located outside the wreckage, their location should be marked by a stake with an identifying number. A corresponding label should be attached to each body stating where it was found. The careful recording of this data is essential to the identification of bodies and also provides information which may assist in the accident investigation.

5.2.2 In the event that bodies have been removed from the aircraft wreckage before the arrival of investigators, it is important to establish whether or not a record, as set out above, has been maintained. If not, the rescue personnel should be interviewed in order to establish such a record.

5.2.3 Investigators should determine if there has been any disturbance of the wreckage during the rescue operations and should record any such disturbance.

5.2.4 Upon completion of the initial rescue operation, rescue personnel should exercise as much care as possible to ensure that their movements do not destroy evidence which may be of value to the investigation. For example, once the survivors have been rescued and the fire risk has been eliminated as far as practicable, movement of ambulances and fire vehicles should not be permitted along the wreckage trail.

### 5.3 SECURITY

5.3.1 When notified of an accident, the investigator-in-charge shall immediately verify that arrangements have been made to ensure the security of the wreckage. This is usually arranged through the police, but in some cases, military personnel or specially recruited civilians may be employed.

5.3.2 When it is suspected that the aircraft may have carried dangerous cargo such as radioactive consignments, explosives, ammunition, corrosive liquids, liquid or solid poisons or bacterial cultures, special precautions should be taken to station the guards at a safe distance from the wreckage. This is particularly important if a fire has occurred because it tends to disperse the contaminants. Signs indicating a potentially dangerous area should be posted until experts have thoroughly evaluated the danger involved.

5.3.3 Upon arrival at the accident site, one of the first tasks of the investigators should be to review the security arrangements. The guards should be thoroughly conversant with their duties, which are to:

- a) protect the public from the hazards in the wreckage;
- b) prevent disturbance of the wreckage (including bodies and contents of the aircraft);
- c) protect property;
- d) admit to the accident site only persons authorized by the aircraft accident investigation authority; and
- e) protect and preserve, where possible, any ground marks made by the aircraft.

5.3.4 Clear and specific instructions should be given to those guarding the wreckage site on the need for authorized persons to have proper identification. In the case of major investigations, this can be accomplished through the issuance of badges or some form of security pass to all authorized persons. The use of armbands or jackets that show affiliation and duty has also proven to be effective.

5.3.5 If the wreckage has not been scattered, effective security can be achieved by roping off the area (see Figure I-5-1). However, if there is a long wreckage trail, the task of securing the site may be formidable and many guards will be required.



**Figure I-5-1. An accident site roped off**

5.3.6 The police can be of considerable assistance in liaising with the local population, particularly with regard to locating outlying pieces of wreckage. While persons living in the neighbourhood should be encouraged to report the discovery of pieces of aircraft wreckage, the importance of leaving these pieces undisturbed should also be impressed upon them. Collecting outlying pieces of wreckage and arranging them into neat piles alongside the main wreckage are sometimes done with good, but misguided, intentions. With no record of where such pieces were found, their value to the investigation is diminished. Similarly, the removal of pieces of wreckage by souvenir hunters must be prevented.

5.3.7 The wreckage should be guarded until the investigator-in-charge is satisfied that all evidence at the site has been gathered. The investigator-in-charge should review the situation periodically and arrange for the progressive release of guards as appropriate.

## **5.4 SAFETY AT THE ACCIDENT SITE**

### **5.4.1 General**

Investigators should be aware of the potential hazards at an accident site and what precautions to take. For this reason, some States designate a site safety coordinator. The investigator-in-charge or the site safety coordinator should brief the investigation team on all known and potential hazards and should establish safety practices. The support of the fire department and the dangerous goods specialists should be enlisted, as necessary, to evaluate existing and potential hazards and to brief the investigation team, as appropriate. It should be noted that the role of investigators is to investigate the accident, not to fight fires or remove hazardous materials.

### 5.4.2 Urban accident sites

Accident hazards in an urban area may include downed power lines, leaking natural gas, propane, heating oil or other flammable liquids or gases, and buildings that have become structurally unsound from fire or impact damage. An evaluation of the hazards by experts may be required before accessing the area or buildings.

### 5.4.3 Precautions to be taken against fire

There is a high fire risk associated with most aircraft wreckage and precautions should be taken to ensure the safety of all personnel as well as to protect the wreckage. Firefighting equipment should be readily available while a high fire risk remains, and there should be no smoking permitted within the guarded area (see Figure I-5-2). Aircraft batteries should be disconnected as soon as possible and if aircraft fuel tanks are still intact, they should be emptied. The quantity of fuel removed from each tank should be measured and recorded. If there has been a large spillage of fuel, the investigators must control any activity that could increase the possibility of ignition, such as the moving of parts of the wreckage. Care should be exercised to control possible sources of ignition, such as static electricity. Likewise, the operation of radio or electrical equipment or the use of salvage equipment should be avoided until the fire risk has been assessed and eliminated.



Figure I-5-2. Firefighters ensuring safety

### 5.4.4 Precautions to be taken with dangerous cargo

5.4.4.1 The accident investigation authority should ascertain whether or not dangerous goods were carried aboard the aircraft. A preliminary check of the freight manifest and an inquiry to the operator should resolve this question. Dangerous goods may include such items as radioactive consignments, explosives, ammunition, corrosive liquids, liquid or solid poisons or bacterial cultures.

5.4.4.2 With increasing frequency, radioactive materials are being carried as aircraft freight. If such materials are carried, steps must immediately be taken to have them removed by qualified personnel before any harm is caused to persons working in close proximity to the wreckage. Limitations on the quantity of radioactive material authorized to be carried on-board an aircraft and the strength of its packaging and shielding will minimize the possibility of container damage in an aircraft accident. As long as the packaging and shielding remain intact, there is likely to be little danger from radiation. However, a post-impact fire could damage the packaging and shielding, and the ensuing heat may cause the radioactive material to change into gaseous form, in which case radiation may spread. In such cases, all participants in the rescue and firefighting operations should be checked, decontaminated and placed under medical observation, as necessary. No examination of the wreckage should be initiated until the level of radiation has been measured and the site declared safe.

5.4.4.3 Accidents involving aerial spraying have the potential to expose investigators to hazardous materials in the form of pesticides and insecticides. With a few exceptions, these chemicals are toxic, even in small quantities. At the accident site, personal protective equipment must be used, and face masks equipped with appropriate filters should be worn.

### 5.4.5 Wreckage hazards

5.4.5.1 The handling of wreckage is inherently hazardous and requires the use of protective clothing and appropriate equipment. Wreckage may shift, roll over or be suspended in trees and may need to be secured. The moving of large parts of wreckage should be supervised by investigators and carried out by professional operators using appropriate equipment. This applies in particular when cranes are used. In such instances it is advisable for investigators to remain upwind of the wreckage so as to limit their exposure to soot, dust and other airborne substances. If, for some reason, a part of the wreckage is left suspended, no work should take place underneath it or nearby, in case the cables and chains should fail or the wreckage shift.

5.4.5.2 There are many hazards specific to a wreckage such as pressure containers, flares, generators and accumulators. Pressure containers include oxygen bottles, evacuation slide inflation bottles, fire extinguishers and protective breathing equipment. Solid-state chemical oxygen generators can reach temperatures of 400 degrees Celsius when they are activated. All such items should be rendered safe and removed from the site.

5.4.5.3 Other hazards include:

*Tires.* Tires may be damaged on impact or in a hard landing and thus could explode at any time. Tires should be approached from the front or the rear and should be deflated as soon as possible.

*Propellers.* Some propellers have feathering springs, and if the hub is cracked, it can come apart forcefully. Investigators should not attempt to take apart a propeller assembly. Disassembly and inspection is best done at a properly equipped facility.

*Batteries.* Batteries should be disconnected and removed from the site. Caution should be exercised when disconnecting and removing batteries because sparks could ignite spilled fuel and other flammable materials. Also, battery acid is extremely corrosive.

*Flammable liquids and gases.* Flammable liquids and gases can ignite or explode. The inhalation of fuel vapours or the direct contact of fuel with the skin is harmful. The aircraft should be defuelled and the amount of fuel removed should be recorded. Smoking should not be permitted at the accident site.

*Firearms/ammunition.* Such items might be aboard the aircraft and should be removed by experts.

*Military and ex-military aircraft and associated equipment.* Military aircraft may have ejection seats, armaments, pyrotechnics or munitions. They may also contain exotic or heavy metals, hydrazine or other substances that may be hazardous when burned. Munitions experts should deactivate and remove such equipment from the accident site.

*Recent safety equipment.* Other safety equipment is being introduced into civil aircraft, for example, rocket-deployed emergency parachute systems and airbag restraint systems are being installed across a range of aircraft. Often these systems are not clearly marked and may not be marked at all. The armed and unfired rocket of a rocket-deployed recovery parachute system may pose a potential hazard to investigators and rescue personnel.

*Depleted uranium.* This material is sometimes used in counter-balance weights in larger aircraft. It can be hazardous if the outer protective coating is breached.

*Radioactive materials.* Such materials may be carried as cargo or used in aircraft components, such as in the engine ice-detection or ignition system of some aircraft.

*Soot and insulation materials.* Soot and insulation materials are hazardous in confined spaces, such as the cabin or cargo bins. Face masks and eye protection should be worn when working in such spaces.

5.4.5.4 Composite materials typically consist of carbon/graphite or boron/tungsten and are found in many parts of an aircraft, including the structural skin, control surfaces, access panels, cabin materials, cabin seats, rotor blades and propeller blades. In fact, some aircraft are built entirely of composite materials. Fibreglass is found in soundproofing blankets, cockpit and cabin panels, cargo bin liners and other aircraft furnishings. Composite materials and fibreglass may be hazardous to the eyes, skin and respiratory system, especially if the wreckage has been damaged by fire.

5.4.5.5 When dealing with composites and fibreglass in the wreckage, the following safety precautions apply:

- a) when handling these materials, investigators should avoid the fibre dust by remaining upwind and wearing goggles and face masks;
- b) disposable coveralls may be needed and contaminated clothing should be washed separately;
- c) splinters from fractured fibreglass panels and composites may cause injuries and should be handled with gloves; and
- d) if composite and fibreglass materials have been damaged by fire, they should be sprayed with water or preferably with a fifty-fifty solution of acrylic floor wax and water before handling.

*Note.— ICAO Circular 315, Hazards at Accident Sites, was produced to assist individuals to consider and apply effective occupational safety management practices at accident sites, both to their own activities and to the activities of the teams that they work with, or for which they are responsible. The circular also discusses the nature and variety of occupational hazards and the management of risk associated with exposure to these hazards.*

## 5.4.6 Biological hazards

5.4.6.1 Accident investigators are at risk of exposure to biological hazards, including blood-borne pathogens such as the human immunodeficiency virus (HIV) and the hepatitis B virus (HBV). Biological hazards may be present in the cockpit and cabin wreckage as well as on the ground where bodies and survivors have lain. Since it is not possible to readily identify contaminated blood and other commingled bodily fluids, it is prudent to take precautions when working around and in the wreckage, when handling the wreckage at the site and when performing off-site examinations and tests on wreckage parts.

5.4.6.2 Precautions must be taken to prevent the viruses from entering mucous membranes (such as the eyes, nose and mouth) or non-intact skin such as open cuts or rashes. The accident site may contain liquid, semi-liquid and dried blood, other bodily fluids, fragmented bones, tissues and internal organs. In the dried state, particles of these substances may become airborne and come into contact with the unprotected eyes, nose and mouth.

5.4.6.3 As part of the investigation-planning process, appropriate precautionary measures should be taken. Investigators and others who work on-site or carry out off-site examinations and tests of wreckage parts should take a biological hazard precaution course, and they should also be inoculated against the hepatitis B virus. The following procedures should be developed and implemented:

- a) a system to maintain records of training and vaccinations;
- b) procedures to ensure that the biological hazard area is identified and those precautions are maintained throughout an investigation;
- c) procedures for the maintenance of a personal protective equipment inventory;
- d) proper methods for donning, removing and disposing of contaminated personal protective equipment;
- e) work practices to minimize exposure;
- f) procedures for decontaminating investigation equipment and wreckage parts;
- g) procedures for shipment of contaminated wreckage parts to off-site examination and test facilities; and
- h) procedures to follow when exposure to biological hazards has occurred.

5.4.6.4 General guidelines on personal protective equipment are contained in the appendix to this chapter. A kit containing personal protective equipment should be made available to each investigator. The kit should include a full-cover protective suit, several pairs of latex gloves, work gloves, face masks, goggles, shoe covers and protective boots, disinfection chemicals and a biological hazard disposal bag (see Figure I-5-3).

5.4.6.5 Procedures to be followed at the accident site should include an initial survey for biological hazards in the form of visible blood or other bodily fluids. When there are serious injuries or fatalities, there will often be bodily fluids remaining after the dead and injured are removed. Areas contaminated by spilled blood or bodily fluids should be identified and roped off and have only one single point of entry/exit. Only persons using personal protective equipment should be allowed access to the contaminated areas. Any components that are removed from the accident site for examination and testing should be treated with the same care as exercised at the accident site.

5.4.6.6 Investigators should always assume that human tissue and bodily fluids are contaminated, and as a minimum precaution, they should don a face mask and wear latex gloves under their work gloves when examining wreckage known to contain blood or other fluids. The most common contaminated items include all cabin interior materials, i.e. seat belts/shoulder harnesses, seat cushions, other upholstery and trim materials, and instrument panels. While wearing personal protective equipment in the biological hazard area, investigators should not eat, drink or smoke, apply cosmetics, lip balm or sun block, touch the face, eyes, nose or mouth, or handle contact lenses.

5.4.6.7 Biological hazard waste, such as clothing and contaminated personal protective equipment, should be disposed of. Investigators should carefully pull off the outer work gloves first, then peel off the latex gloves and drop both pairs into a biological hazard disposal bag. Contaminated personal protective equipment should **never** be reused. Exposed skin should be wiped immediately with moist towelettes, and then washed with soap and water or a solution of one part chlorine bleach to ten parts of water. A new bottle of bleach solution should be mixed every day. Contaminated eyes should be flushed with fresh water. Special attention should be given to thorough hand washing after removing latex gloves and before eating, drinking, smoking, or handling contact lenses.

5.4.6.8 Investigators should be aware that wearing personal protective equipment in hot and humid climates may result in heat stroke unless precautions are taken to minimize heat stress. Thus, before donning personal protective equipment, a litre or more of water should be consumed. Depending upon the heat and the humidity, and on the amount of physical exertion required, it may be necessary to limit the amount of time that investigators can wear personal protective equipment. Once they have left the biological hazard area, removed and disposed of their personal protective equipment and disinfected their hands, investigators should rest in the shade and consume at least a litre of water. It may be necessary to have medical personnel assess the condition of investigators who have experienced heat stress.

5.4.6.9 Since it is important to minimize the number of investigators, tools and equipment that could come into direct contact with contaminated materials, only a selected number of investigators should be assigned to handle wreckage and disassemble components. Other investigators could be assigned to take notes, draw diagrams, take photographs or use the manuals and engineering drawings.

5.4.6.10 Contaminated investigation equipment, such as tools, flashlights and tape measures, should be cleaned with soap and water, disinfected and allowed to dry. Personnel, when leaving the area, should place in biological hazard disposal bags any equipment that cannot be readily disinfected. The disposal bags and their contents are usually incinerated at appropriate facilities, such as hospitals.

#### **5.4.7 Psychological stress**

An accident may cause serious stress to persons involved in the work at the accident site. In particular, major accidents with a large number of fatalities may induce psychological stress, not only in investigators, but also in persons involved in the search for and identification of bodies. The accident investigation authority should have procedures and personnel in place to identify and aid those who show symptoms of stress.

#### **5.4.8 Helicopter operations**

5.4.8.1 Helicopters are often used to reach accident sites in rugged terrain and remote areas as well as for:

- a) travelling to and from the accident site;
- b) searching for and removing bodies and wreckage;
- c) aerial photography; and
- d) flying the flight path of the accident aircraft.

5.4.8.2 All persons associated with helicopter operations should be briefed on proper safety procedures, including the use of exits, headsets, restraint systems, emergency equipment and, if involved in over-water operations, the flotation gear. The safety briefing should also address how to approach the helicopter, the main and tail rotor hazards, and the effects of rotor wash.

### **5.5 ENVIRONMENTAL AND NATURAL HAZARDS**

#### **5.5.1 General**

Environmental and natural hazards include extreme climate, mountainous terrain, deserts, jungles, swamps, poisonous plants, dangerous animals and insects. In environments such as these, investigators should work in pairs, carry a first-aid kit and have a means of communication.



**Figure I-5-3. Personal protective equipment used when examining wreckage debris**

## 5.5.2 Extreme climate

5.5.2.1 Investigators may be faced with extremes of heat and cold depending on the terrain and the time of year. Investigators expecting to spend a few hours at a remote site could find themselves spending the night if their transportation is unable to return for them. Before departure, the current and forecast weather conditions should be checked.

5.5.2.2 In *cold weather*, the following precautions should be taken:

- a) wear sufficient protection to prevent frostbite and hypothermia;
- b) wear layered clothing that will absorb perspiration;
- c) be aware of white-out conditions;
- d) disorientation can occur in uniformly bright and white surroundings;
- e) wear sunglasses and sun block; and
- f) drink liquids to prevent dehydration.

5.5.2.3 In *hot weather*, the following precautions should be taken:

- a) bring sufficient liquids for personal drinking needs;

- b) in situations involving high temperatures and humidity, combined with heavy exertion, drink at least half a litre of water or juice per hour;
- c) be aware of symptoms of heat stress and heat stroke;
- d) wear a wide-brimmed hat and loose-fitting clothing; and
- e) wear sun block.

### 5.5.3 Mountainous terrain

The main concern with working at high elevations is altitude sickness which is characterized by dizziness, headaches, loss of appetite, difficulty sleeping, aches and pains, a pale complexion and loss of energy. Activities should be paced to conserve energy. If altitude sickness is suspected, the person should sit or lie down. In severe cases, the person should descend immediately to a lower altitude. The following precautions are recommended for working in mountainous terrain:

- a) limit physical exertion above 8 000 feet above sea level;
- b) keep hands free on steep climbs;
- c) rest frequently;
- d) have oxygen available at high altitudes;
- e) drink water or juice often to avoid dehydration;
- f) wear sun block, sunglasses and a hat; and
- g) seek advice from the local guides who should, ideally, be accompanying the investigation team.

### 5.5.4 Deserts, jungles and swamps

If the accident site is located in a desert, jungle or swamp environment, the following safety precautions should be taken:

#### *Deserts:*

- a) wear a wide-brimmed hat, loose-fitting clothing, sunglasses, sun block, and goggles;
- b) bring plenty of drinking water;
- c) limit activities during the heat of the day and set up open-sided sun shelters;
- d) employ local drivers; navigating on sand dunes and unmarked roads can be hazardous even in a four-wheel drive vehicle; and
- e) ensure that appropriate clothing and shelter suitable for temperature decreases at night are available.

*Jungles:*

- a) secure trouser legs and the tops of boots with rubber bands, strings or duct tape to protect against leeches, insects and crawlers;
- b) bring plenty of drinking water;
- c) compensate for the heat and humidity by reducing activities; and
- d) maintain communications with others in the party.

*Swamps:*

- a) if swamp boats are used as a means of transportation, wear a life jacket and ear plugs;
- b) if walking in water, wear chest waders and use a tall walking stick to find level footing and to determine water depth;
- c) prevent swamp water from coming into contact with open cuts and sores, since swamp water may be contaminated;
- d) avoid travel or work at night;
- e) wear clothing that covers the skin and a wide-brimmed hat with a mosquito net; and
- f) protect against insects and leeches, as well as snakes, alligators and crocodiles.

### **5.5.5 Poisonous plants, dangerous animals and insects**

5.5.5.1 The danger from plants, animals and insects varies with location, weather, elevation, time of year, etc., and the advice of local experts should be obtained.

5.5.5.2 Although most wild animals will avoid contact with humans, there are some species that are dangerous, and investigators should take precautions on the basis of advice from local experts. Poisonous snakes are prevalent in many areas and snake bite serums should be included in the investigator's first-aid kit.

5.5.5.3 In many areas, mosquitoes transmit malaria and yellow fever. Any protective product that contains "DEET" in a 25 to 30 per cent solution should be an effective mosquito repellent. Concentrations of "DEET" higher than 30 per cent may, however, irritate the skin. It should be noted that mosquito repellents of this type contain a solvent that may melt plastics found on cameras, watches, small tools, etc. Anyone working in areas where malaria and yellow fever are prevalent should take anti-malarial drugs and be inoculated against yellow fever.

5.5.5.4 Ticks, which inhabit fields and forests, may carry bacterial diseases, such as Lyme disease, a bacterial infection caused by the bite of an infected tick. The following precautions should be taken when working in areas that may be infested with ticks:

- a) wear long pants and long sleeves and secure pant legs with duct tape or rubber bands;
- b) spray a permethrin-type tick repellent on clothing;
- c) use a repellent containing the compound DEET on exposed skin areas, except for the face;

- d) check the entire body for ticks daily; and
- e) immediately remove ticks from the skin.

## **5.6 WRECKAGE IN WATER**

### **5.6.1 Locating the wreckage**

5.6.1.1 As soon as it has been determined that the wreckage is in water, efforts must be made to obtain the best technical expertise available. Naval authorities, marine salvage services and accident investigation authorities of other States known to have experience in this field should be consulted. Advice may also be obtained from fishermen and oceanographers whose knowledge of local conditions, such as configuration of lakes, sea beds and local currents, is often extensive. The first step is to ascertain the most probable point of impact based on floating wreckage, witness reports, search and rescue reports and radar recordings. Buoys should be positioned at the estimated point of impact.

5.6.1.2 If the water is shallow (less than 60 m), search methods using divers can be effective. If the wreckage is located in deeper water, or conditions make it difficult to use divers, use of the following equipment should be considered (see Figure I-5-4):

- a) underwater equipment used to locate the underwater locating devices on the flight recorders;
- b) underwater videos and cameras;
- c) side-scan sonar equipment; and
- d) manned or unmanned submersibles.

### **5.6.2 Decision to recover the wreckage**

5.6.2.1 The circumstances and location of an accident will determine whether salvage of the wreckage is practicable. In most cases, wreckage should be recovered if it is considered that the evidence it might provide would justify the expense and effort of a salvage operation. If the wreckage is likely to contain evidence significant to air safety, the accident investigation authority must provide the impetus needed to ensure that action is promptly taken to recover the wreckage.

5.6.2.2 There have been several instances where aircraft wreckage has been successfully recovered from deep water. Major parts of the wreckage of an Airbus A330 were located at a depth of 3 900 m in the Atlantic Ocean, the CVR (see Figure I-5-5) was recovered after 23 months; of a Boeing 737 were recovered from approximately 1 000 m in the Red Sea (see Figure I-5-6); and of a Boeing 747 Combi were recovered from approximately 4 500 m in the Indian Ocean (see Figures I-5-7 and I-5-8). Such recoveries necessitated expensive salvage operations lasting several months but the results exceeded expectations, and the evidence obtained from the wreckage established the causes of the accidents.

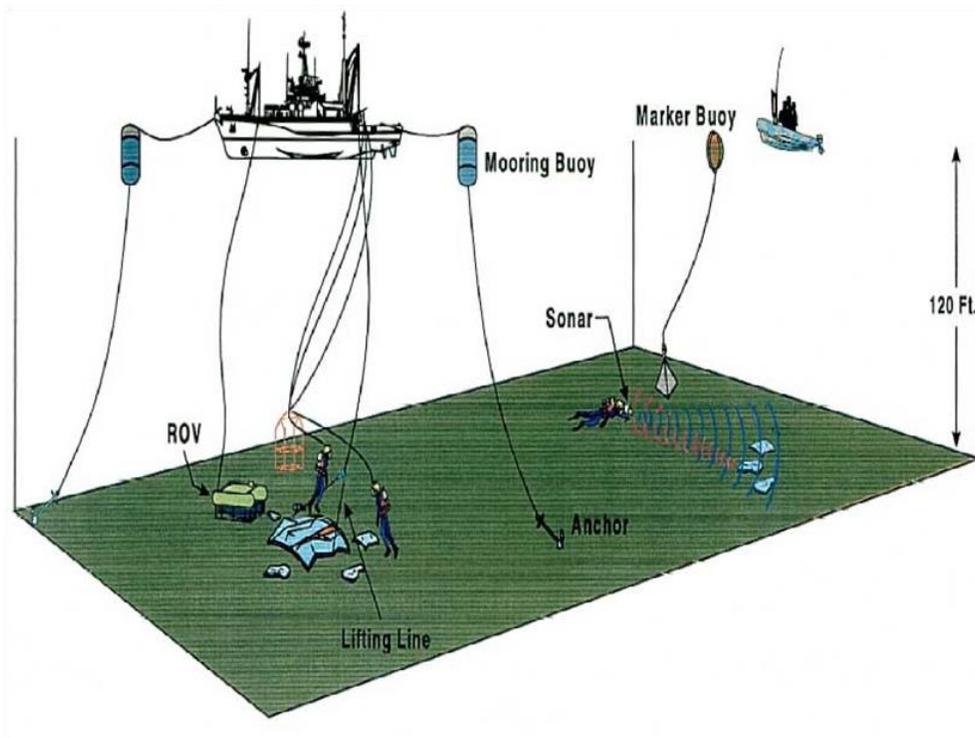


Figure I-5-4. Locating and plotting the wreckage



Figure I-5-5. The flight data recorder (FDR) of an Airbus A330 photographed at a depth of 3 900 m in the Atlantic Ocean (2009 accident)

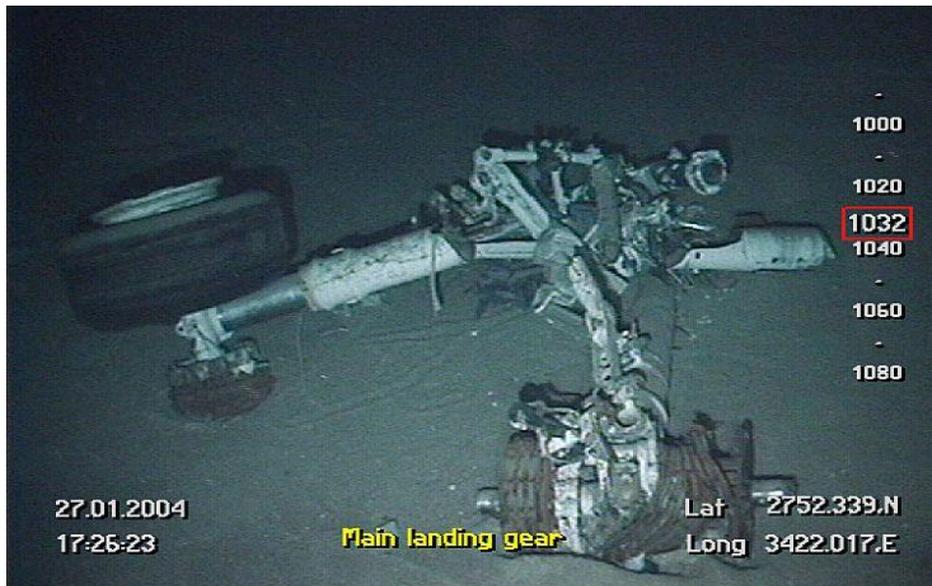
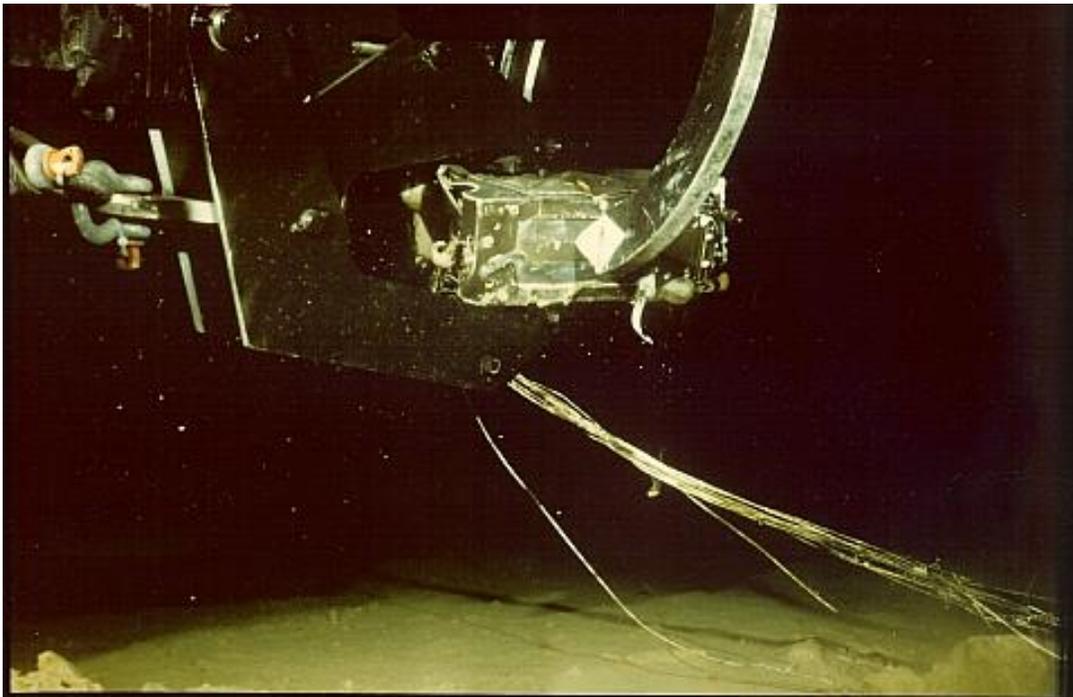


Figure I-5-6. The main landing gear of a Boeing 737 photographed at a depth of 1 000 m in the Red Sea (2004 accident)



Figure I-5-7. The cockpit voice recorder of a Boeing 747 Combi photographed at a depth of approximately 4 500 m in the Indian Ocean (1987 accident)



**Figure I-5-8. A remotely operated vehicle (ROV) recovers the cockpit voice recorder at a depth of approximately 4 500 m (1987 accident)**

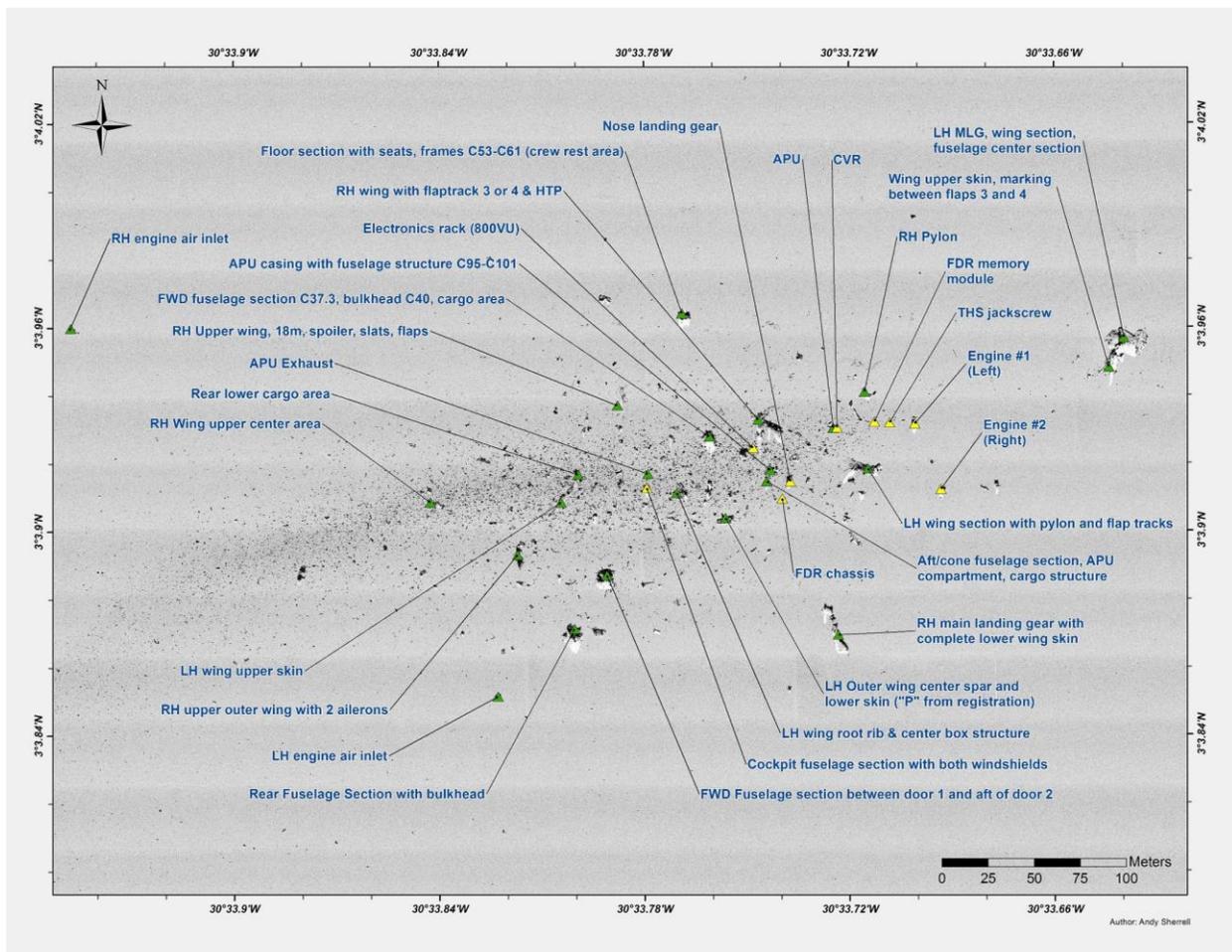
### **5.6.3 Wreckage distribution**

Once the wreckage has been located, a chart plotting the wreckage distribution should be prepared. In shallow waters, this can be achieved by divers. In deep waters, underwater video cameras from remotely controlled submersibles may be used. The state of the various pieces of wreckage, their connection by cables or pipes, the cutting of these connections for the salvage operations, etc., should be recorded before lifting the various pieces of wreckage from the bottom. Usually the divers and operators of the remotely operated vehicles will not be experienced in aircraft accident investigation and, therefore, detailed briefings will be necessary. See Figure I-5-9, showing the underwater wreckage cartography of an Airbus A330 at 3 900 m below the surface of the Atlantic Ocean (2009 accident).

### **5.6.4 Preservation of the wreckage**

5.6.4.1 The rates at which various metals react with salt water vary considerably. Magnesium components react quite violently and, unless recovered within the first few days, may be completely dissolved. Aluminium and most other metals are less affected by immersion in salt water. For example, the flight data recorder (FDR) of a DC-9 that was recovered from a depth of 3 500 m showed little corrosion after having been submerged for 12 years (Figure I-5-10 refers). However, corrosion will rapidly accelerate once the component is removed from the water, unless steps are taken to prevent it.

5.6.4.2 Once the wreckage has been recovered, its components should be thoroughly rinsed with fresh water. It may be convenient to hose the wreckage as it is raised out of the sea prior to it being lowered onto the salvage vessel. Freshwater rinsing does not stop all corrosive action. When large aircraft are involved, it may not be practicable to take further anti-corrosion action on large structural parts. However, all components that require metallurgical examination will require further preservation. The application of a water-displacing fluid will provide additional corrosion protection. Fracture surfaces should then be given a coat of corrosion preventives such as oil or inhibited lanolin.



**Figure I-5-9. Underwater wreckage cartography**

5.6.4.3 When organic deposits, such as soot deposits or stains, require analysis, organic protective substances should not be used. Freshwater rinsing should be employed followed by air drying. When the component is completely dry, it should be sealed in a plastic bag with an inert desiccant such as silica gel.

5.6.4.4 Flight recorders should not be dried but should be kept immersed in fresh water until the assigned flight recorder specialist assumes responsibility for them.

### 5.6.5 Precautionary measures

5.6.5.1 Safety precautions must be taken when recovering the wreckage. In particular, consideration should be given to deflating tires and pressure containers as early as possible. Corrosion of magnesium wheel assemblies can progress rapidly to the extent that the wheel assemblies become safety hazards. Other pressure containers should be discharged as soon as their contents have been evaluated.

5.6.5.2 The operation of recovery equipment and the supervision of salvage personnel should be left to the salvage contractor. If necessary, the investigator should provide advice on how to attach cables, hooks, etc., to the wreckage to ensure that it is not unnecessarily damaged during the recovery.



**Figure I-5-10. The FDR of a DC-9 showed little corrosion after being submerged for 12 years in the Mediterranean Sea (1980 accident)**

5.6.5.3 When salvage barges, which are equipped with large machinery, hoists, cables, nets, rigging equipment, etc., are used, investigators should exercise caution and, in particular, should remain clear of equipment and sling loads.

### 5.6.6 Additional guidance

Appendix 2 to this chapter is a document entitled “Guidance on the Underwater Location and Recovery of Aircraft Wreckage and Flight Recorders”, which was prepared by the Aircraft Accident and Incident Investigation Expert Group of the European Civil Aviation Conference (ECAC). The guidance provides an overview of the issues peculiar to underwater location and recovery operations, and of the expertise, procedures and equipment needed to mount an effective response to such an accident. It is intended for use by all who might find it helpful, in Europe and beyond, and in particular of course by aircraft accident investigation authorities who might at any moment find themselves faced with the task of investigating the loss of an aircraft in these very challenging circumstances.<sup>1</sup>

## 5.7 PLANNING FOR SPECIALIST EXAMINATIONS

### 5.7.1 General

5.7.1.1 If the investigator-in-charge determines that specialist examination or testing of specific components is required, it should be borne in mind that the national legislation of some States may forbid the removal of any part of the

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wreckage without the agreement of the judicial authorities. For components requiring destructive testing, it may be advisable to obtain written authorization from both the owner of the aircraft and the insurance company.

5.7.1.2 Sometimes it is necessary to send a part, or parts, of a damaged aircraft to another State for technical examination or testing. In accordance with Annex 9 — *Facilitation*, each State concerned shall ensure that the movement of such part, or parts, is effected without delay. The States concerned shall likewise facilitate the return of such part, or parts, to the State conducting the investigation.

5.7.1.3 Specialist examinations may range from a scanning electron microscope examination of a failed part to chemical analysis, systems testing or flight testing. Laboratory examination and testing generally entail the use of specialized equipment not available in the field and often beyond the capability of an aircraft maintenance facility. Consideration should be given to using the component manufacturer's facilities where specialized equipment and trained personnel are readily available.

5.7.1.4 Laboratory testing should not be limited to standard tests. In addition to testing for compliance with appropriate specifications, it is sometimes necessary to determine the actual properties of the specimen (such as metal, material, fuel and oil). Occasionally it is necessary to devise special tests that will fully exploit the component's capabilities. A wide range of specialized testing equipment will permit simulation of a variety of malfunctions, the only limitation being the ingenuity of the investigators.

5.7.1.5 When investigators forward failed parts or components for laboratory testing, they should provide as much information as possible relative to the circumstances contributing to the failure of such parts or components, including their own suspicions. The information provided by the investigator is intended only as a guideline to the specialist who should, nevertheless, explore all relevant aspects. It is not sufficient for an investigator to forward parts for specialist examination with the innocuous instructions "for testing". The investigator should provide a detailed history of the part or component, covering such items as:

- a) the date it was installed on the aircraft;
- b) the total number of service hours;
- c) the total number of hours since last overhaul or inspection;
- d) previous difficulties reported; and
- e) any other pertinent data that might shed light on how and why the part or component failed.

5.7.1.6 In order to preserve evidence, it is essential that failed parts and components requiring specialist examination be extracted from the wreckage with care. Systems, whether mechanical, electrical, hydraulic or pneumatic, should be removed in sections as large as practicable. Relevant sections should preferably be dismantled rather than cut. Paint smears, which are often extremely important in collision accidents and in-flight failures, require protection. This also applies to smoke or soot smears.

## 5.7.2 Practical arrangements

5.7.2.1 The nature of the specialist examination and the type of components and systems to be tested will determine the facility to be chosen. The investigator must be confident that the facility chosen is capable of providing the required examination and testing. Prior arrangements should be made with the facility as far in advance as practicable so that the facility's management can plan the tests and assign personnel and equipment.

5.7.2.2 When choosing a system and components for specialist examination and testing, it is desirable to include as many components of the system as practicable, e.g. wiring harnesses, relays, control valves and regulators. Tests conducted on a single component will reveal information about the operation of that particular unit only, whereas the problem may actually have been in one of the related components. The most valid test results will be obtained by using as many of the original system components as possible.

5.7.2.3 Each component should be tagged with its name, part number, serial number and the accident identifier. The investigator should maintain a listing, descriptive notes and photographs of all components which are to be tested. The components themselves should be kept in protective storage until ready for shipping.

5.7.2.4 Components should be packed to minimize damage during transport. Particular care should be taken to ensure that fracture surfaces are protected by appropriate packing material so that they are not damaged by mating surfaces coming into contact with each other or with other parts.

5.7.2.5 Whenever possible, power plants should be shipped in their special stands and containers. Other heavy components, such as flight control power-units, stabilizer screw jack assemblies and actuators, should be packed in protective wrapping and placed in separate wooden containers. Blocks or bracing should be installed inside the containers to prevent any movement of the component during transport. Smaller and lighter components may be shipped in the same manner with more than one to a box but in a manner which will prevent them from coming into contact with one another. Very light units may be packaged in heavy corrugated pasteboard cartons with sufficient packing material to prevent damage from mishandling during transport. The investigators should label all boxes and cartons appropriately and should make an inventory list for each container.

### 5.7.3 Notes and test results

5.7.3.1 Notes concerning special examinations and testing should be kept by the facility personnel and the results should be recorded on the standard forms used by the facility for such work. The investigator supervising the work should also take notes.

5.7.3.2 Prior to conducting the examinations and tests, the investigator(s) and the facility personnel involved should be briefed on the type and extent of the tests to be carried out and should review the test procedures to ensure their adequacy.

5.7.3.3 Any discrepancies found during testing should be photographed and documented with an explanation as to their bearing on the operation of the system or component. It should be kept in mind that the tolerances called for in the test procedures may apply only to new or overhauled components and that components which have been in service for some time may have acceptable limits outside these tolerances. If the nature of the discrepancy so warrants, a component should be disassembled following completion of the tests to ascertain the cause of failure. Photographs should be taken of the parts prior to and during disassembly and the findings should be documented.

5.7.3.4 Following completion of the testing, the investigator(s) and facility personnel should review and discuss the results. When there is agreement that the data gathered present a true and factual picture of the component's condition and capabilities, the notes and test results should be reproduced to serve as a record of the examination and testing of the system or component.

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## Appendix 1 to Chapter 5

### 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 masks.* 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.

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## Appendix 2 to Chapter 5

# ECAC GUIDANCE ON UNDERWATER LOCATION AND RECOVERY OF AIRCRAFT WRECKAGE AND FLIGHT RECORDERS

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## FOREWORD

**BY THE CHAIRMAN OF THE AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION EXPERT GROUP OF THE EUROPEAN CIVIL AVIATION CONFERENCE, JURGEN WHYTE (HEAD OF THE IRISH AIR ACCIDENT INVESTIGATION UNIT)**

In June 2009 the Aircraft Accident and Incident Investigation Expert Group of the European Civil Aviation Conference (ECAC), with generous support from the Croatian aviation authorities, organised in Dubrovnik a workshop on the challenges associated with investigating accidents in which the aircraft is under water. The preparations for this workshop had begun a few months earlier, and the tragic loss in the mid-Atlantic of Air France 447, only 10 days prior to the workshop, was no more than a deeply unhappy coincidence.

Inevitably however, that accident lent the work of the Expert Group particular purpose and poignancy. The Dubrovnik workshop having focused mainly upon the location and recovery of aircraft wreckage and recorders in relatively shallow waters, it was followed in October 2010 by a second, hosted in Larnaca with equal generosity by the Cypriot aviation authorities, focused upon accidents in deeper waters. Full reports of the workshops, each of which was led by my distinguished predecessor as chairman of the Expert Group Paul-Louis Arslanian, were prepared and made available via the ECAC website.

This guidance distils out the learning shared at and won from the two workshops, which brought together experts from national safety investigation authorities and safety regulators (both European and other), and from providers of the specialised equipment and services needed for accident investigation in the underwater environment. All gave their time and expertise unsparingly and without charge, including in supporting the “live” location and recovery exercises at sea that were an important part of each workshop.

The ECAC Expert Group is immensely grateful to all who organised, participated in and supported the Dubrovnik and Larnaca workshops, and who contributed subsequently to the development of this guidance. Special thanks are owed to the French Bureau d’Enquêtes et d’Analyses pour la sécurité de l’aviation civile, which has taken especial care to ensure that the guidance reflects the learning hard-won from its investigation of the loss of Air France 447, always without compromising the integrity and confidentiality of that extraordinarily challenging mission.

The guidance provides an overview of the issues peculiar to underwater location and recovery operations, and of the expertise, procedures and equipment needed to mount an effective response to such an accident. It is intended for use by all who might find it helpful, in Europe and beyond, and in particular of course by air accident investigation authorities who might at any moment find themselves faced with the task of investigating the loss of an aircraft in these very challenging circumstances.

## 1. INTRODUCTION

1.1 Any State that has a coastline or internal body of water, or aircraft on its national register flying over international waters, may face the responsibility of having to conduct an investigation into the loss of an aircraft in its territorial waters or on the high seas. Fatal accidents with an underwater dimension occur regularly.

1.2 When an aircraft comes down in water, whether at sea or in a lake or river, the first need — access to the accident site — is problematic in itself. The problems become greater as the water becomes deeper.

1.3 Underwater location and recovery has extremely challenging characteristics, and requires a well-planned and timely response, coordinated amongst many parties.<sup>1</sup> Inadequate preparation or poor management of the initial investigative response has the potential to degenerate into a crisis, and can threaten crucial evidence. That risk increases where the accident site is problematic.

1.4 This guidance was developed following the organisation in 2009/10 of two workshops by ECAC's Expert Group on Aircraft Accident and Incident Investigation. It seeks to provide an overview of issues peculiar to underwater location and recovery operations, and of the expertise, procedures and equipment needed for an effective response. A draft of this guidance was presented and discussed during the 2011 underwater recovery workshop held in Singapore for the Asia Pacific region.

1.5 The guidance considers the preparations needed by States which may have to undertake an underwater location and recovery operation and then the onsite challenges of operations at sea: the working environment, decisions on what to recover, issues specific to location and recovery, and the management of human remains. The guidance also considers ancillary issues, including the costs of underwater operations, and sets out key points for those who may need to undertake operations in this difficult environment.

## 2. PREPARATION FOR UNDERWATER LOCATION AND RECOVERY OPERATIONS

### 2.1 Partnerships and Contacts

2.1.1 Safety investigation authorities will not generally be able to conduct an investigation having an underwater dimension without outside assistance. Relationships therefore need to be established in advance with potential partners and sources of assistance.

2.1.2 Within the State of the safety investigation authority, these partners should include Ministries with responsibilities for matters relating to the sea, the naval service and the diplomatic service. It is especially important to have a procedure to secure rapid access to bathymetric and bathythermographic data, at least for national waters.

2.1.3 Partnership relationships should also be established with colleagues in other national safety investigation authorities, as well as in relevant foreign military and diplomatic services.

2.1.4 Although advice should be taken from bodies such as the police, the navy and the coastguard, overall control of the operation should always be retained by the safety investigation authority. Assistance may usefully be sought from other national investigation authorities which have recent experience of mounting similar operations.

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1. Similar challenges arise when an aircraft comes down in other remote locations, such as desert, jungle, mountainous or arctic regions.

2.1.5 In the context of these contacts abroad, there is merit in establishing commonality in the technical specifications of equipment and software used by regional States, so that such resources may be shared and used with ease when needed.

2.1.6 It is also important to have information about where relevant equipment may be sourced. While it might be possible to borrow some equipment from partners, it may be necessary to enter into hire contracts for sea-going vessels, underwater craft and other specialised or expensive equipment. Contact details for suitable contractors, and an understanding of the kinds of equipment and expertise (for example, in diving) each can offer, should be part of the standing preparations for a possible underwater operation.

2.1.7 Check-lists for underwater operations are important for planning purposes. But no two accidents are the same and detailed planning will inevitably be event-specific.

2.1.8 Effective equipment and personnel may be expensive but they can reduce overall costs. "Employing an expert is expensive, but not as expensive as employing a non-expert".

## **2.2 Hiring Equipment and Vessels**

2.2.1 The key factor in the selection of the vessel and its on-board equipment is the nature of the location of the accident site: sea state conditions, probable depth and the seabed environment. Other important factors will be the proximity of the nearest useful port, and the availability of suitable vessels. Safety investigation authorities unused to underwater operations often underestimate the time it can take to get the necessary maritime assets into position to start work.

2.2.2 In considering the suitability of the vessels available, account should be taken of their capability to perform the required task in the time available, including their fitting out with specialised equipment such as acoustic devices for detecting 37.5 kHz signals and, when necessary, with a hull-mounted multibeam sonar for bathymetry of the seabed. Other considerations will be the vessel's present location and availability, transit time to the accident site, and the entire charter cost, including provision of equipment, and mobilisation/demobilisation.

2.2.3 Relatively small craft, for use in operations on lakes, rivers and close inshore, are unlikely to be difficult to secure. For operations at sea, it is necessary to know where to find the appropriate kind of larger vessel.

2.2.4 If no suitable State vessels are available an approach to the chartering market may be necessary, and consideration given to issuing a call for tenders or a "Statement of Requirements". Such a document should specify the size of the lost aircraft (this will dictate the lifting equipment and deck space needed), the depth of the site, any human remains issues and the expected duration of the operation. Ancillary issues may be the need for a heli-deck and any auditing or certification requirements. The deadline for responses should be indicated.

2.2.5 Many of the vessels suitable for aircraft salvage are employed in support of the offshore oil and gas sector, notably in the North Sea, the Arabian Gulf, the Gulf of Mexico and off West Africa. Few are designed to support operations in more than 2,000 metres of water and in those cases it may be necessary to charter the vessel and to hire separately the additional equipment. It will be important in those circumstances to establish the compatibility of the vessel and its systems with the equipment being brought aboard, for example in storage, lifting equipment, power supplies, and deck loadings and securings.

2.2.6 Experience shows that the mobilisation of large vessels with deep-water recovery capability can take time. There may be advantage in taking a two-stage approach, first employing a smaller vessel able to reach the location quickly and begin the task of locating the Underwater Locator Beacons (ULBs), pending the arrival of a recovery vessel.

The decision to dispatch the recovery vessel should only be made once the wreckage has been located, and the delay between its location and the departure of the vessel should be kept to a minimum. If the wreckage has not been located during the period in which the ULBs can be assumed to be transmitting, it will be necessary to proceed to another phase of location, using sonar equipment, which will normally correspond to different vessel requirements.

2.2.7 As “principal contractor” it is important to be aware of shared responsibilities which may have been assumed, for example for damage which might be done to sub-sea pipelines or other infrastructure during the operation. It is also important to establish that the vessel has the required certification from the Flag State and Classification Society, for example in relation to its safety equipment and maintenance, crew training and certification, pollution insurance, and health and safety management systems.

2.2.8 The BIMCO<sup>2</sup> charter agreement, “Time Charter Party for Offshore Service Vessels” (Supplytime 2005) is a standard contractual model with which ship owners are familiar. The settlement of disputes relating to the contract is subject to the arbitration procedure provided for and defined in Clause 34, Part II of Annex B to the agreement.

2.2.9 Once the vessel has been selected and contracted, it is important that a good working relationship is established and maintained between the investigation team and the captain of the vessel.

### 2.3 Other Special Equipment

2.3.1 The depth at which the aircraft wreckage and flight recorders are believed to be located will be the primary determinant of the recovery options.

2.3.2 Air diving is feasible at depths up to 40 metres, and saturation diving up to 500 metres. However, for deep water and sustained operations, the use of a Remotely Operated Vehicle (ROV) is generally the best option. These are connected to the parent vessel by an “umbilical” carrying power and navigational and imagery capabilities. They come in many forms and sizes, and may be equipped with one or more “manipulators” for working at the accident site. Use of an ROV permits the whole investigation team to view and exploit in real time the images transmitted from the ROV to the parent vessel. It also facilitates the mapping of the accident site.

2.3.3 A range of ROVs can be deployed in operations at up to 6,000 metres, and certain very specialised (and scarce) ROVs can be used below that depth. The supplier of an ROV can be expected to specify the dynamic positioning capability (e.g. ‘DP I’ or ‘DP II’) required of the vessel from which it will be operated. Such a capability is valuable when conducting sea searches, as knowledge of the exact position of the vessel, for example in relation to a search grid, is important and it may provide a stable working platform for operations in up to Force 7 sea state conditions.

2.3.4 Another type of unmanned vessel available for underwater operations is the Autonomous Underwater Vehicle (AUV), which is a ‘search’ (rather than ‘grapple-and-recover’) tool. AUVs are not tethered to a parent vessel but are battery-powered and programmed to follow a defined search programme, at the conclusion of which they surface and upload their findings to the control centre. This may be aboard a vessel or in a road vehicle parked at the lake or river side. The preparation and launching of an AUV will typically take only a few hours and its control team may number only three or four. The more sophisticated AUVs have hovering and automated obstacle avoidance capabilities. A number of sensors may be carried by the AUV, including sidescan sonar and cameras.

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2. Baltic and International Maritime Council, an international shipping association representing ship-owners controlling around 65 per cent of the world’s tonnage.

### 3. CHALLENGES AND PRIORITIES ON-SITE

#### 3.1 Working at Sea

3.1.1 Some challenges in operations at sea derive from the length of time which the investigation team may need to be out of physical contact with the shore. For any long voyage, there is a need to give careful thought in advance (even under time pressure) to all of the types of equipment which may be required and to the specialist personnel needed aboard.

3.1.2 Some of the equipment carried to the accident site (such as transponders and hand-held hydrophones) will prove unserviceable, so it is wise to build redundancy into what is carried and have some on-board capability for repair. For operations in water, more robust equipment is generally needed than at first seems likely.

3.1.3 At the accident site, simple manoeuvres (transiting across the search grid, despatching and recovering small craft and divers) takes considerably longer than those accustomed to working in aviation expect. The investigation team needs to be prepared for this.

3.1.4 Working vessels present particular health and safety issues for those not familiar with them. The investigation team should complete a risk assessment of the working environment in consultation with the vessel's health and safety officer, including the possibility of sea-sickness, with consideration of safe and appropriate medication. The planning process should include the configuration of accommodation and work spaces.

3.1.5 The noise and movement of the vessel, the confined and less than perfectly clean spaces probably available to the investigation team, the presence of seawater and damp, all make for a working environment which is hostile to individuals and to sensitive electronic equipment such as cameras and computers.

3.1.6 A particular problem in operations at sea is the moment when a large piece of debris is lifted out of the sea and Archimedes' principle is negated. This can lead to a sudden and dangerous increase in load, with potential to damage the wreckage and lose evidence. There may be a need to counter this risk by providing additional tethering to the wreckage (to take any additional loads at key points) and the use of netting is particularly useful. The use of an active 'heave-compensated' crane can help in alleviating load variations on the lift line. The condition of the wreckage should be recorded before any recovery attempt is made, and likewise any damage sustained during the lift.

#### 3.2 Location

3.2.1 An Underwater Location Beacon (ULB) fitted to an aircraft flight recorder is triggered by immersion in water. It will emit an ultrasonic pulse of 10 milliseconds, at 37.5 kHz and at one-second intervals. The present ICAO requirement is for ULBs ("pingers") to transmit for at least 30 days. They have a nominal audible range of 2 to 5 km, depending on parameters such as depth, water temperature and sea conditions.<sup>3</sup>

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3. An ICAO State letter of 4 April 2012 advised that Amendment 36 to ICAO Annex 6 had been adopted by the ICAO Council on 2 March 2012. This amendment includes (i) the extension of the operating period, to a minimum of 90 days, of the underwater locating beacons fitted to flight recorders, and (ii) the introduction of beacons operating for a minimum of 30 days at a frequency of 8.8 kHz, attached to the aircraft, with an increased propagation distance. Amendment 36 will become applicable on 15 November 2012. Both the extended duration ULB and the new low frequency ULB are mandated to be fitted at the earliest practicable date, and no later than 1 January 2018.

3.2.2 There is value in a search operation in deploying the most effective resources as early as possible, to minimise the risk of a protracted search and an even more expensive investigation. It is preferable to undertake a 'passive' acoustic sweep first (while the pingers can be expected to be still transmitting), with an 'active' side-scan sonar search next, taken under less time pressure.

3.2.3 There is benefit in beginning as soon as possible, using a small vessel to find the pinger(s), on the basis of a preliminary review of the 'loss' data such as radar and the Aircraft Communications Addressing and Reporting System (ACARS). The search area may be refined later, as more data become available. The sonar search will begin only after the end of the pinger's transmission period.

3.2.4 The 37.5 kHz frequency is outside the audible spectrum for the human ear. Acoustic hydrophones 'translate' the signal into the audible spectrum, a process which does not exactly reproduce the original emission, which can be 'polluted' by the water environment and thus misprocessed.

3.2.5 ULB signals can be picked up using acoustic hydrophones deployed singly, as a hand-held unit, or in an array (for example, in a flexible tube housing, towed behind and below a vessel). Digitalisation of the ULB signal by on-board software enables the 'listening' for the ULB to be done by a computer, rather than a human.

3.2.6 Such an array may be deployed to good effect even in difficult sea conditions. However in shallow waters the amount of background noise may lead to the signal 'spike', experienced when the 'ping' is detected, not being prominent, and perhaps missed. With such faint signals, difficulties may also be experienced when sounds emitted by the biological environment (e.g. whales) confuse the acoustic devices. Cetacean sound emissions typically take the form of swift 'chirps' over a wide spectrum of frequencies, which could at times be perceived as a short regular pinger signal, after being sampled and processed by acoustic devices.

3.2.7 Towing a hydrophone array at a speed of 4 knots on a search grid of parallel tracks one nautical mile apart will enable forty square miles of sea to be searched in a period of around 10 hours. Use of the vessel's autopilot (if fitted) while following the search grid is valuable in countering the effects of strong crosswinds and crosscurrents. Strong currents may also cause wreckage and recorders to drift from their original location.

3.2.8 Other systems for picking up and locating ULB signals may involve the repeated 'dipping' of a detector below the 'seasonal thermocline' (which separates the noisy mixed surface layer of water from the calm, relatively quiet, deeper water below), at different locations, to generate a triangulated homing point, or the deployment of acoustic listening buoys equipped with GPS and UHF radio.

3.2.9 Military submarine assets, if not set up and crewed by persons trained to search for 37.5 kHz signals, have not been found to be useful. If however the aircraft being sought is equipped with lower frequency ULBs, such as ones operating at 8.8 kHz, the situation would be different, as these can be picked up by many military assets — often the first on site — whether surface vessel or submarine. The nominal audible range of a ULB transmitting at 8.8 kHz could be in excess of 10 kilometres.

3.2.10 For searches in very shallow waters with poor visibility, for example in a river or lake, grapple dragging by surface vessels and the use of metal detectors mounted on inflatable craft are options.

### 3.3 What to Recover?

3.3.1 The priority targets for the investigation team during the recovery phase should be flight recorders, aircraft debris/parts (including avionics components which may contain non-volatile memory), any human remains<sup>4</sup> and personal effects. Wreckage observation and mapping are also important. When available, a photographic survey of the accident site enables its original state to be recorded before it is altered by diver or ROV interventions.

3.3.2 It is necessary to select carefully, with opinions from all investigation parties considered, the aircraft debris and parts to be recovered, and to prioritise them, with a view to the overall investigation. The initial analysis of the FDR and CVR may assist in this selection process.

3.3.3 There is a case for recovering only those parts of the aircraft judged to be relevant to the investigation, especially if the aircraft wreckage is very large or fragmented. Divers or ROV operators might be given a 'shopping list' of those parts of the aircraft most desirable to recover, based on preliminary information gathered from recorders, sea bed images and aircraft data (such as manufacturers' drawings, parts catalogues, wiring diagrams and manuals).

3.3.4 It is sometimes more straightforward to recover as much as possible, avoiding the difficulty of finding again particular items which may have been disturbed by underwater currents. The full wreckage may then be examined for its key elements in a more suitable environment. Storing wreckage on land can however pose a challenge, as hangar space is often scarce and in some jurisdictions long-term storage space may not be available.

### 3.4 Recovery

3.4.1 The recovery of aircraft wreckage is generally accomplished by the parts being rigged to a hoist and lifted by crane out of the water and onto the recovery vessel. Alternatively, the lift might in some cases be achieved by the attachment to the wreckage, by divers, of small 'parachutes', then inflated with compressed air by divers; care is needed to avoid inflatable items being punctured by sharp metallic edges on the wreckage. In at least one recovery operation, sealed buoyant metal tubular fabrications, inserted beneath the aircraft's wings, were used with success.

3.4.2 For ROV operations it may be useful for a steel basket to be lowered to the sea bed, into which debris may be placed by the ROV. Such a basket may also be used for the recovery of human remains, in what should be a separate operation.

3.4.3 When using an ROV, particularly where the wreckage is spread over a large area of the sea bed, it is important to identify clearly those locations which the ROV has visited. This may be achieved by dropping markers, carried down in the basket referred to in 3.4.2.

3.4.4 Where aircraft wreckage has rested for some time underwater, sediments may accumulate within it, increasing its weight and rendering its recovery more difficult. It may be necessary to remove at least some of this sediment before lifting, for example using suction tools. This possible complication is an argument for recovery action to be taken without unnecessary delay, and not to be paused, once begun.

3.4.5 The internal components of flight recorders recovered from underwater are vulnerable to corrosion, and should be kept in fresh water for transit and until they are opened. All wreckage recovered should be rinsed to remove salt water and further anti-corrosion application of specialised products can help in preserving evidence. Access to recovered wreckage should be limited.

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4. This is especially the case for bodies floating on the surface of the water. Section 3.5 below discusses the recovery of human remains still underwater with or in the aircraft wreckage.

3.4.6 It is important to re-stow all equipment in an orderly fashion after use, including the washing off of salt water, so that it is ready and fit for use on the next occasion.

3.4.7 Chapter 5 of the ICAO “Manual of Aircraft Accident and Incident Investigation” (Doc 9756, Part I) contains guidance on actions at the site of the accident, including dealing with wreckage in water, its preservation, decisions on what to recover, psychological stress and specialist examinations. Chapter 7.4 of ICAO Doc 9962, “Manual on Accident and Incident Investigation Policies and Procedures”, is also useful.

### **3.5 Human Remains**

3.5.1 In recovering an aircraft underwater there is frequently a need to deal with human remains. This poses special technical and psychological challenges beyond those associated with an accident site on land. This highlights the need to be prepared.

3.5.2 Unless autopsy is judged important for the safety investigation, there may be no perceived need for bodies to be recovered from an underwater site. Their recovery must nonetheless be considered, to meet the expectations of relatives and for safety reasons. There may be important legal reasons (such as passenger identification) for the recovery of bodies.

3.5.3 Historically, oceans have been considered an appropriate grave for those who perish at sea. A different view is now generally taken in respect to aircraft accident fatalities, but where bodies have been lost for a prolonged period not all relatives may agree about their recovery. These are delicate issues and need sensitive handling.

3.5.4 In fatal accidents on land, emergency service personnel will typically lead the recovery of bodies. At sea, it is likely that surface recovery of human remains will be conducted by search and rescue services, often military or Coast Guard. However, for human remains at deep water sites, deployment of an ROV may be the only means of gaining access and the ROV operator may be wholly inexperienced in encountering images of human remains. He or she will in that event need careful briefing and management.

3.5.5 The recovery of bodies is an operation that should not be improvised — material preparation, ample space, and good conditions are crucial. It is important to have available the necessary specialised equipment (such as refrigerated containers, and body bags) and any special expertise.

3.5.6 Medico-psychological support may be needed, to manage the psychological risks related to the recovery of human remains. This can be done through briefings during transit to site, ‘defusing’ moments on board and debriefing during the return transit.

3.5.7 It is important to control access to data, including photographs, relating to human remains. It may be desirable to establish a system to filter photographs of human remains from the general investigation data and store them separately.

3.5.8 In general, personal effects should be managed on board by police. Safety investigators should not bear the responsibility of dealing with these effects or of dealing directly with the recovery of human remains and the identification of victims.

## **4. OTHER ISSUES**

### **4.1 Wreckage Location, and Responsibilities**

4.1.1 In some cases of aircraft lost at sea, there have been difficulties in establishing definitively and in a timely manner exactly where the aircraft came down. Possible indicators will include the last radar report and floating wreckage, which may be in national or international waters.

4.1.2 To avoid a dispute which could compromise the investigation, it is advisable for the national investigation authorities concerned (State of (possible) Occurrence and State of Registry) to reach prompt agreement on their respective responsibilities.

## **4.2 Costs**

4.2.1 The costs of investigations increase quickly if the wreckage or flight recorders need to be recovered underwater, and they may exceed the normal budget of the safety investigation authority. It is important that politicians and other decision-makers are apprised of the international obligations which States have in relation to aviation accident investigation.

4.2.2 The costs of hiring specialist vessels and equipment, may be stated as 'mobilisation costs + (daily rate x duration) + demobilisation costs, plus — as a good "rule of thumb" — an additional 20 per cent as a budget for all consumables. It is important to obtain good information in advance about the accident site, and about the capabilities of the vessel intended to be hired, before chartering, and to understand the nature of task before selecting the other tools. The contract ("charter party") with the vessel provider should be checked for fairness and balance and the charterer should be aware of his full financial responsibilities for the ship and its crew. Liability issues should also be considered.

4.2.3 The investigating authority should be prepared for the possibility that the operation will not be completed quickly. If the site is far out at sea, or the vessel starting from a distant port, even reaching the accident site may take considerable time.

4.2.4 Decision-makers and politicians should be made aware of the cost and timeline realities, and the investigation authority should have a procedure for accessing emergency funds.

4.2.5 In many cases the commercial insurance carried on an aircraft may be used by the investigation to defray at least a part of the search and recovery costs. To achieve a successful outcome it is highly recommended that the safety investigation authority approach the aircraft's insurers at an early stage, probably through the insurers' Loss Adjuster.

4.2.6 In other cases, the costs of search and recovery operations have been shared with other parties involved with the aircraft, such as the operator, the manufacturer or the charterer. The level of involvement of these other parties should be determined by the safety investigation authority.

4.2.7 Alternatively, at least one safety investigation authority has purchased commercial insurance cover against undertaking an operation of this kind. Control of any investigation funded under such insurance should remain with the safety investigation authority and not be taken over by the insurer. Such an insurance policy might provide for a portion of the total costs to be borne by the claimant (to incentivise the claimant to incur only reasonable costs) and there might also be a deductible sum. The use of a brokerage company could be considered.

## **4.3 Data Handling**

4.3.1 Investigators can be faced with handling large amounts of data, in various formats and locations. Confidentiality issues should be considered, especially for data related to human remains.

4.3.2 Strict procedures need to be developed, and a means of secure transmission implemented, between the various entities involved in the search. In most cases, a database containing as a minimum pictures, coordinates and descriptions of debris will be needed.

4.3.3 Oceanographic data and sonar imagery pose additional challenges for storage, and video footage of all ROV dives may need to be duplicated in different formats. Having available high-capacity external hard drives (in Terabytes) will allow for the backup of relevant data.

4.3.4 It is recommended that high speed VSAT<sup>5</sup> connections be set up between vessels, using a secured File Transfer Protocol site to exchange data. To reinforce confidentiality, those involved in search and recovery operations are generally invited to sign a non-disclosure agreement.

#### **4.4 Training**

4.4.1 Where possible, the investigation authority's more experienced personnel should be used for underwater operations, given the special challenges they pose. They should have been trained to handle and monitor such operations, including familiarity with maritime agencies and national navies, participation in workshops and exercises, and involvement in underwater recovery operations. Investigators should receive training in survival procedures at sea (including helicopter underwater escape) and health and safety issues.

#### **4.5 Ecological Aspects**

4.5.1 The loss of an aircraft in water may be followed by the leakage into the water of fuel, oil and other noxious fluids. It may be possible to contain and recover these, in order to avoid ecological harm. In shallow waters it may be feasible to surround the wreckage with special protective curtains or booms during an operation to recover the liquids, and these curtains or booms may then be towed to land. Specialist assistance should be considered.

#### **4.6 Closing an Investigation**

4.6.1 An investigation involving underwater recovery should document the operations so that other investigation authorities may benefit from the lessons learned. A short report could accompany the safety investigation final report.

4.6.2 A decision to halt an underwater recovery operation should be the prerogative of the safety investigation authority, made after careful assessment of the possible safety benefits of continuing the operation, set against the expenditure of additional resources.

### **5. CONCLUSION**

5.1 The need to conduct an investigation into the loss of an aircraft in water is a real possibility for any State that has a coastline or internal body of water, or has aircraft on its register which fly over international waters. Given the number of parties that may become involved, the need to select the right equipment and expertise, the potential for spiralling costs, and the challenges posed by operations at sea, any such investigation will require a very well planned and timely response.

5.2 This guidance material provides advice on planning and preparing for such an investigation. It emphasises the importance of establishing in advance useful partnerships and contacts, the value of checklists, the need to identify and source the necessary funding and expertise, and more generally for the investigation authority to have a good understanding of the tools and assets required for successful search and recovery operations.

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5. Very Small Aperture Terminal (VSAT) is a two-way satellite data communication system between a stabilised maritime VSAT antenna set up on a vessel and a satellite in geosynchronous orbit.

5.3 The cost of these operations can be considerable and it is important that decision makers and politicians who control emergency funds are given realistic cost and time estimates, and that consideration has been given to some kind of insurance policy.

5.4 The challenges involved in conducting operations at sea should not be underestimated. There is often a thin line between success and failure and anything that can be done beforehand, in preparation and planning, will increase the chance of success.

— END —



