

Cir 315
AT/179



Hazards at Aircraft Accident Sites

Approved by the Secretary General
and published under his authority

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TABLE OF CONTENTS

	<i>Page</i>
Introduction	(v)
Chapter 1. Terminology	1
Chapter 2. Managing occupational health risks in aircraft accident investigation	2
Chapter 3. Hazards	5
Chapter 4. Generic operational safety planning guide	14
Appendix A — Operational safety plan/site assessment	15
Appendix B — Personal protective equipment	19
Chapter 5. Health and safety training	21

INTRODUCTION

1. During the Accident Investigation and Prevention (AIG) Divisional Meeting in September 1999, it was agreed that ICAO had a role to play in establishing and maintaining an inventory of hazards peculiar to aircraft accident sites and in the promulgation of related guidance material to States. The meeting noted that the development and updating on a regular basis, of a list of accident site hazards, was essential. The meeting also agreed it was necessary to specify the training required for accident investigators to enable them to avoid these hazards. Based on the meeting's discussion, ICAO developed a study group, to be known as the Hazards at Accident Sites Study Group (HASSG). The study group was to compile a list of hazards peculiar to aircraft accident sites, develop relevant guidance material and determine the associated training requirements for rescue personnel and accident investigators.
2. In response to the proposal, ICAO established the HASSG to develop the guidelines contained in this circular. ICAO acknowledges that these guidelines are evolutionary in nature and may need to be updated periodically. Working at aircraft accident sites has the potential to expose investigators, and search and rescue personnel, to a wide range of health and safety hazards. These hazards, generated by the damage to structures, systems, components and aircraft contents, will be variable in nature and will themselves be influenced by the factors associated with the accident scenario, e.g. location, weather conditions, environment, security, etc. To protect investigation and search and rescue personnel requires the application of a system of safety management that identifies the hazards present, determines levels of exposure, assesses the risks posed, and introduces effective measures to eliminate or control exposure. Given the unpredictable character of air accidents, the task of applying an effective safety management system can be both demanding and complex.
3. This circular is produced to assist individuals to consider and apply effective occupational safety management practices both to their own activities, and to the activities of the teams that they work with, or for which they are responsible. The circular discusses the nature and variety of occupational hazards, and the management of risk associated with exposure to these hazards.
4. Throughout this circular, with the exception of the definitions in Chapter 1, the use of the male gender should be understood to include male and female persons and the term "accident" should be understood to include "incident".
5. ICAO is grateful for the considerable assistance provided by members of the Hazards at Accident Sites Study Group in the preparation of this circular.
6. Links to web sites from aircraft manufacturers providing information on aircraft hazardous materials can be found on the ICAO Flight Safety Information Exchange website at www.icao.int/fsix/res_aig.cfm.

Chapter 1

TERMINOLOGY

The definitions below are given to ensure that the readers understand the intended meaning of the terms in the context of this circular.

Accident investigator. A person engaged in the investigation of aircraft accidents, incidents and other aviation safety hazards.

Asphyxia. Suffocation as a result of physical blockage of the airway or inhalation of toxic gases.

Dynamic assessment. Factors associated with the specific accident – accident location, specific details of damage sustained, occupants, cargo, fuel load, time of day, etc. that are used to generate an indication of the risk existing at a specific point in time.

Generic assessment. Background information available to all to assist with considering what hazards are likely to be present – aircraft type, age, modification standard, operating category, typical damage, pre-identified hazards, sampling and analysis data. Enables organizations to plan and prepare, train and establish levels of support equipment.

Hazard. Something that has the potential to cause adverse consequences in terms of harm and/or damage.

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

Investigator-in-charge. A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

Pathogen. An agent that can cause disease, such as a bacterium or a virus.

Pyrotechnics. The art of making and using fireworks.

Response personnel. Trained individuals responding to a distress by performing search and rescue functions, providing initial medical assistance, medical evacuation and recovery to a place of safety, through the use of public and private resources.

Rocket-deployed emergency parachute system. Whole-aeroplane emergency parachute systems.

Toxic. Relating to or containing a poison or toxin.

Vaccination. Inoculation with a vaccine to provide immunity against a disease.

Chapter 2

MANAGING OCCUPATIONAL HEALTH RISKS IN AIRCRAFT ACCIDENT INVESTIGATION

2.1 GENERAL

2.1.1 In the aviation industry, occupational health and safety systems have been developed over time to ensure that high standards of occupational safety are achieved for those involved in the manufacture, operation, servicing and maintenance of aircraft. These safety systems utilize well established processes to identify hazards, determine exposure, assess associated risks, and introduce effective measures to eliminate or mitigate these risks. The highly structured and repetitive nature of many aviation industry activities simplifies the task of safety management.

2.2 CHALLENGES

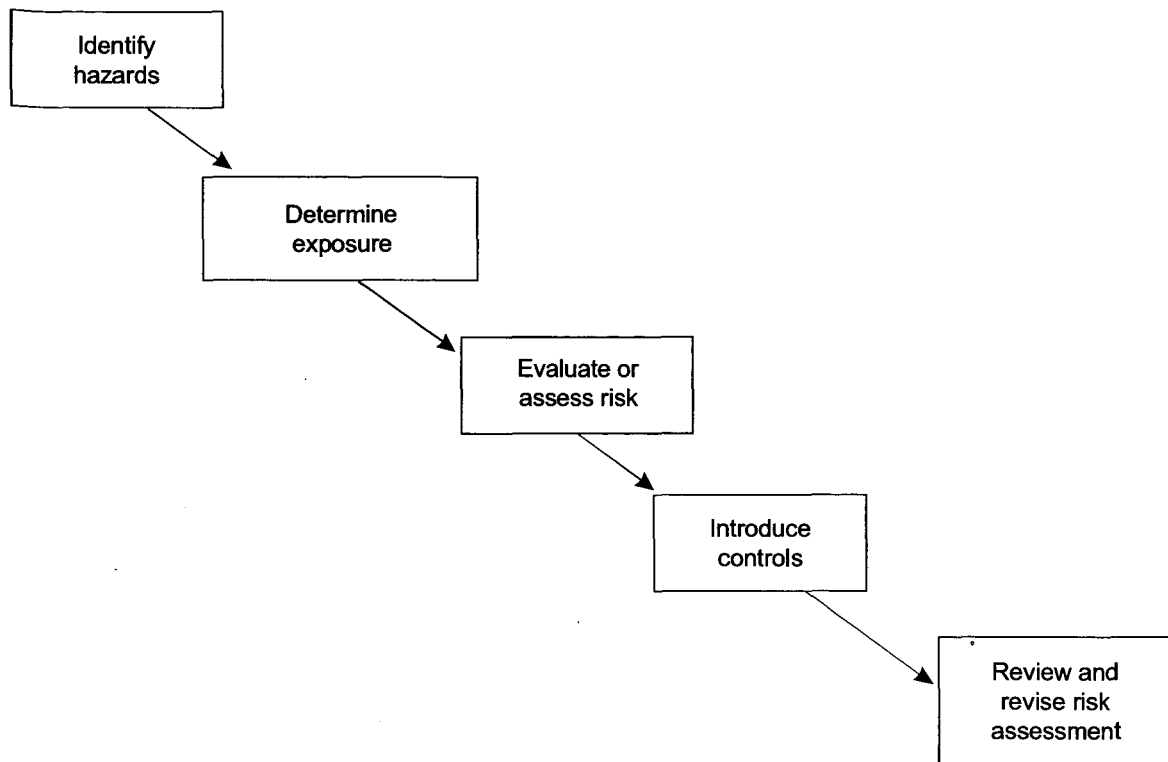
2.2.1 The application of safety management in the conduct of aircraft accident investigation operations is far more complex. There are a range of factors that have a significant effect on the safety management process. Unlike personnel involved in the more predictable domains within the aviation industry, investigators are required to respond to accident situations that are variable in nature, scale and environment. These factors make the identification of hazards and determination of exposure a more difficult exercise. Furthermore, given the relative infrequency of accidents, there are few opportunities for the scientific analysis of aircraft debris that is essential for accurate assessment of occupational health risks.

2.2.2 Many States have recognized the difficulties associated with managing occupational health and safety for accident investigators and have provided guidance for personnel in the form of documented policies and procedures. The guidance material provided varies between States, particularly in relation to the different legal systems in place internationally and in consideration of the varying range of research data available to organizations.

2.3 RISK MANAGEMENT AT AIRCRAFT ACCIDENT SITES

2.3.1 No activity can be absolutely free of risk, but activities can be controlled to ensure that risk is reduced to an acceptable level. If the risk remains unacceptably high, activities will have to be delayed or modified and a new risk assessment carried out. Often, a balance must be struck between the requirements of the task and the need to make the performance of the task safe for investigation and response personnel. This balance may sometimes be difficult to achieve but should always be biased towards safety.

2.3.2 The modern approach to the management of occupational health and safety recommends a process as follows:



2.3.3 This process appears rather simple in concept and, indeed, the process may actually be easily introduced for those process-based industries that benefit from sufficient knowledge, time and planning capacity and that have firm control over their operations. However, organizations with responsive roles, such as accident investigation bureaux, rarely have the opportunity to apply these resources even if they have access to them and this constraint, together with the variable nature and scale of aircraft accidents, frequently makes the management of risk a more complex process than this schematic model suggests.

2.3.4 Effective risk assessment first requires sound data to enable the **identification of hazards**. Chapter 3 provides details of some known hazards commonly associated with aircraft accident investigation. Sources of information such as maintenance manuals and hazard databases should also be used by investigation authorities in this process.

2.3.5 Identifying the groups of personnel who are likely to be exposed to hazards, the frequency of them being so, and the manner in which they will be exposed and, potentially, harmed is essential to properly **determine exposure**.

2.3.6 To evaluate and subsequently manage the risks inherent in accident investigation, there needs to be some degree of measurement applied in **assessing the risks**. For some activities, risks may be objectively measured, for example, in a situation in which exposure levels to chemicals are specified and exposure concentration is known. However, in other activities, including aircraft accident response, such measurements may not be possible, and there is no alternative to making subjective assessments of the level of risk. In any case, to make a reasonable assessment, response personnel need to determine specific information about the aircraft, its contents and the extent of damage. Equally important are environmental factors including weather, location and prevailing local conditions. A considered decision can then be made with respect to risk. If the task is considered too dangerous, it may be necessary to abandon the activity. Alternatively, the risk may be reduced by applying control measures.

2.3.7 **Chapter 4** suggests the use of an operational safety plan to assist with the management of activity at accident sites, including the assessment of hazards and risks and the application of control measures. It is important that organizations employ the services of suitably qualified/experienced persons for managing the occupational health and safety aspects of accident site operations. In addition, consideration should be given to providing access to qualified advisors to provide specialist guidance in high risk situations.

2.3.8 The need for prior planning and training cannot be overemphasised, especially during the initial investigation when critical accident information can be easily lost or contaminated. The collection of fluid samples from various systems is time critical, while haphazard collection of samples will cause contamination and provide misleading indication of system deficiencies. Flight control actuators, flap and control surface deflections and cockpit switch locations are all critical evidence that must be properly documented as rapidly as possible without causing additional hazards to the investigators.

2.3.9 A wide range of control measures can be applied to help reduce risks, including:

- a) stopping or delaying the task – where risk is shown to be excessive, this may be the only option until alternative methods of work are established;
- b) removal/isolation of hazards – components can be disconnected, made safe or removed from the site, hazardous materials can be neutralized or covered, dust and fibres can be suppressed with water or fluids, etc.;
- c) limiting exposure – reduce the numbers of personnel within hazardous areas or limit the length of time or frequency of exposure;
- d) modifying tasks or using alternative equipment or materials – this course of action can produce significant reductions in risk;
- e) employing specific work procedures (e.g. exposure control plans); and
- f) using protective clothing/equipment – see Chapter 4, Appendix B.

2.3.10 In addition to these on-site measures, effective organizations are likely to employ specially trained personnel who make good strategic use of information systems including medical and scientific networks and feedback systems.

2.3.11 Given the sometimes prolonged duration of accident site operations, assessments will need to be **reviewed and revised** frequently to take account of changes to weather, site operations, personnel, and other associated aspects.

2.3.12 Every opportunity should be provided to conduct training sessions and hazard analysis with air carrier operators and service providers in order to ensure the appropriate response to accidents and incidents. This relationship will enable the appropriate protection for emergency response personnel and accident investigators. The results and recommendations from these training sessions should be incorporated into inspector training and emergency response qualifications.