ICAO

Doc 10062

Manual on the Investigation of Cabin Safety Aspects in Accidents and Incidents

Second Edition, 2022

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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AMENDMENTS

Amendments are announced in the supplements to the *Products and Services Catalogue;* the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS		
No.	Date	Entered by

CORRIGENDA		
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FOREWORD

Findings from past accident investigations have led to significant improvements in the fields of cabin safety and aircraft manufacturing such as 16G seats, lavatory smoke detectors and fire extinguishers, floor proximity emergency escape path markings, new requirements for cabin and insulation materials and inclusion of human performance training for cabin crew members. These improvements have increased the survivability of occupants involved in later accidents and helped reduce fatalities among passengers and crew. Cabin safety aspects, including survival factors, should be addressed as part of the investigation process. However, these aspects are often overlooked. States and industry may be missing out, therefore, on opportunities for further safety enhancements.

ICAO developed the *Manual on the Investigation of Cabin Safety Aspects in Accidents and Incidents* (Doc 10062) to encourage the uniform application of the Standards and Recommended Practices contained in Annex 13 — *Aircraft Accident and Incident Investigation*, particularly in relation to survival aspects. This manual provides information and guidance to States on the procedures, practices and techniques that may be used when investigating the cabin safety aspects of an occurrence.

The second edition of this manual aligns its content with Amendment 5 to the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868), which contains the overarching provisions and principles for competency-based training and assessment, new definitions, new provisions for cabin investigator training and minor updates to existing provisions. It also contains guidance on examining information on brace positions to better understand injuries sustained during an accident. A new chapter provides guidelines for the reporting of cabin safety aspects in accidents and incidents, including the development of a survival factors group factual report and the survival factors portion of a final report of an accident.

This manual contains guidance for States to investigate specific types of occurrences, such as evacuations, and provides recommended qualifications and competencies for cabin investigators, thereby allowing the appropriate personnel to carry out the necessary functions during an investigation. This manual also provides guidance for States and operators when investigating incidents, such as mandatory reported events or events that do not require notification to the State of the Operator but may be a source of lessons learned. The content of this manual is consistent with guidance material contained in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756).

This manual was developed with input from experts from accident investigation authorities, civil aviation authorities, operators, aircraft manufacturers, training organizations and international organizations, and was thereafter submitted for an extensive peer review to take into account comments from the expert community. ICAO gratefully acknowledges the contributions of the International Society of Air Safety Investigators (ISASI), the ICAO Cabin Safety Group, the International Board for Research into Aircraft Crash Evaluation (IBRACE), and individual experts who provided support, advice and input for this manual.

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GLOSSARY

DEFINITIONS

Able-bodied passengers. Passengers who are clearly physically able and are willing to help cabin crew maintain good order and discipline on board the aircraft.

Accident. An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

a) a person is fatally or seriously injured as a result of:
   — being in the aircraft, or
   — direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
   — direct exposure to jet blast,
   except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:
   — adversely affects the structural strength, performance or flight characteristics of the aircraft, and
   — would normally require major repair or replacement of the affected component,
   except for engine failure or damage, when the damage is limited to a single engine, (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome); or

c) the aircraft is missing or is completely inaccessible.

Note 1.— For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified, by ICAO, as a fatal injury.

Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

Note 3.— The type of unmanned aircraft system to be investigated is addressed in Annex 13, paragraph 5.1.

Note 4.— Guidance for the determination of aircraft damage can be found in Annex 13, Attachment E.

Accident investigation authority. The authority designated by a State as responsible for aircraft accident and incident investigations within the context of Annex 13 — *Aircraft Accident and Incident Investigation*.

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

Adapted competency model. A group of competencies with their associated description and performance criteria adapted from an ICAO competency framework that an organization uses to develop competency-based training and assessment for a given role.

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

Approved training — Cabin crew. Training conducted under special curricula and supervision approved by a Member State that, where applicable, is conducted within an approved training organization.

Assessment. The determination by an instructor, assessor or evaluator as to whether a candidate meets a required competency standard under given conditions, by collecting evidence from observable behaviours. Assessment takes place during instruction and evaluation.

Baggage. Personal property of passengers or crew carried on an aircraft by agreement with the operator.

Cabin crew member. A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

Causes. Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident. The identification of causes does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

Child. A passenger who has reached their second birthday but not their twelfth birthday.

Child restraint system. Any device, other than a seat belt, that is designed specifically to protect and restrain an infant or child during all phases of flight. It typically has an internal harness and belt combination. The device needs to interface with the aircraft seat. This includes devices that are secured using the aircraft seat belt as well as systems that secure the device to the aircraft seat. The device needs to meet minimum performance standards, as specified by the State of the Operator.

Classroom training. In-person, instructor-led training, which may include group exercises and interactive instructional sessions.

Competency. A dimension of human performance that is used to reliably predict successful performance on the job. A competency is manifested and observed through behaviours that mobilize the relevant knowledge, skills and attitudes to carry out activities or tasks under specified conditions.

Competency-based training and assessment. Training and assessment that are characterized by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specified performance standards.

Competency standard. A level of performance that is defined as acceptable when assessing whether or not competency has been achieved.

Conditions. Anything that may qualify a specific environment in which performance will be demonstrated.

Computer-based training. Training involving instructional aids, such as computers and tablets. Computer-based training may encompass the use of data storage medium (such as CD-ROM or flash drive), as well as web-based training (commonly referred to as e-learning, distance learning and digital learning (such as virtual learning and gamification).

Contributing factors. Actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

Crashworthiness. The incorporation in basic design of considerations pertinent to the protection of aircraft occupants in a survivable crash environment. It represents the ability of a structure, and its interiors, to maintain integrity during impact in order to enhance survivability and enable the evacuation of an aircraft.

Crew member. A person assigned by an operator to duty on an aircraft during a flight duty period.

Dangerous goods. Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Direct access. A direct route or passage from a seat to an exit from which a passenger can proceed without entering an aisle or passing around an obstruction.

Disembarkation. The leaving of an aircraft after a landing, except by crew or passengers continuing on the next stage of the same through-flight.

Disruptive passenger. A passenger who fails to respect the rules of conduct at an airport or on board an aircraft or to follow the instructions of the airport staff or crew members and thereby disturbs the good order and discipline at an airport or on board the aircraft.

Ditching. The forced landing of an aircraft on water.

Emergency exit. Door, window exit, or any other type of exit (e.g. hatch in the flight deck, tail cone exit) used as an egress point to allow maximum opportunity for cabin evacuation within an appropriate time period.

Emergency exit row seating. Each seat in a row of seats located at an emergency exit, having direct access to the exit.

Emergency locator transmitter (ELT). A generic term describing equipment which broadcast distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated. An ELT may be any of the following:

Automatic fixed ELT (ELT(AF)). An automatically activated ELT which is permanently attached to an aircraft.

Automatic portable ELT (ELT(AP)). An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.

Automatic deployable ELT (ELT(AD)). An ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided.

Survival ELT (ELT(S)). An ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors

Expert/Specialist. A person invited to participate in an investigation, on the basis of his or her specialized knowledge, skills or experience.

Fatigue. A physiological state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, circadian phase, and/or workload (mental and/or physical activity) that can impair a person's alertness and ability to perform safety-related operational duties.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

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

Automatic deployable flight recorder (ADFR). A combination flight recorder installed on the aircraft which is capable of automatically deploying from the aircraft.

Note.— See Annex 6, Parts I, II and III, for specifications relating to flight recorders.

Forward-facing seats. Seats installed within eighteen degrees of the longitudinal axis of the aircraft.

Hands-on exercise. Exercise on the use of equipment or aircraft systems that is conducted without a specific context. Equipment that is removed from operation, or other representative training equipment considered acceptable by the State can be used for the purposes of this training.

Hard landing. A landing in which the vertical deceleration encountered required a hard landing check.

Hypoxia. A deficiency of oxygen in inspired gases, arterial blood or tissue, short of anoxia (almost complete absence of oxygen).

ICAO competency framework. A competency framework, developed by ICAO, is a selected group of competencies for a given aviation discipline. Each competency has an associated description and observable behaviours.

In-charge cabin crew member. Cabin crew leader who has overall responsibility for the conduct and coordination of cabin procedures applicable during normal operations and during abnormal and emergency situations.

In-flight. The period from the moment all external aircraft doors are closed following boarding through the moment when one external door is opened to allow passengers to leave the aircraft or until, if a forced landing, competent authorities take over responsibility for the aircraft and individuals and property on the aircraft. For the purpose of the Tokyo Convention an aircraft is considered to be in flight from the moment when power is applied for the purpose of take-off until the moment when the landing run ends.

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

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in Annex 13, Attachment C.

Infant. A passenger who has not reached their second birthday.

Investigation. A process conducted for the purpose of accident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and/or contributing factors and, when appropriate, 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.

Note.— Nothing in the above definition is intended to preclude the functions of an investigator-in-charge being assigned to a commission or other body.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures.

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL) established for the aircraft type.

Mock-up. A training device that is a partial, functional replica of an actual aircraft, without motion.

Oblique-facing seats. Seats installed in the aircraft where the occupant angle relative to the aircraft longitudinal axis is other than those described for forward-facing, rearward-facing or side-facing seats.

Observable behaviour (OB). A single role-related behaviour that can be observed and may or may not be measurable.

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

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

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

Passenger. A person who is not an operating crew member.

Performance criteria. Statements used to assess whether the required levels of performance have been achieved for a competency. A performance criterion consists of an observable behaviour, condition(s) and a competency standard.

Person with disabilities. Any person whose mobility is reduced due to a physical incapacity (sensory or locomotor), an intellectual deficiency, age, illness or any other cause of disability when using transport and whose situation needs special attention and the adaptation to the person's needs of the services made available to all passengers.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Portable electronic device (PED). Any lightweight, electrically-powered equipment. These devices are typically consumer electronic devices capable of communication, data processing and/or utility. Examples range from hand held, lightweight electronic devices such as tablets, e-readers, and smart phones to small devices such as MP3 players and electronic toys.

Note.— The definition of PED encompasses both transmitting and non-transmitting PEDs.

Protective breathing equipment (PBE). Breathing equipment providing full, sealed protection against smoke, fumes, etc., covering the head, the collar and upper shoulder area. Fifteen-minutes minimum oxygen supply per PBE is recommended.

Rearward-facing seats. Seats installed within eighteen degrees of the longitudinal axis of the aircraft, facing aft.

Restraint. A device designed to safely restrain an occupant in his/her seat to prevent injuries resulting from inertia forces or other in-flight forces such as turbulence. A restraint may be a seat belt, safety harness or approved child restraint system.

Safety. The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level.

Safety recommendation. A proposal of an accident investigation authority based on information derived from an investigation, made with the intention of preventing accidents or incidents and which in no case has the purpose of creating a presumption of blame or liability for an accident or incident. In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies.

Serious incident. An incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.

Note 1.— The difference between an accident and a serious incident lies only in the result.

Note 2.— Examples of serious incidents can be found in Annex 13, Attachment C.

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

a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or

b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or

c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or

d) involves injury to any internal organ; or

e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or

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

Side-facing seats. Seats installed into the aircraft where the occupant angle θ relative to the aircraft longitudinal axis is θ = 90.0 degrees, or θ = 270.0 degrees.[1]

Simulated exercise. Exercise representing a full context scenario (e.g. aircraft evacuation) where cabin crew apply the operator's procedures and associated crew responsibilities for dealing with the specific situation. This is typically conducted in a representative training device capable of reproducing the appropriate environment or equipment characteristics (e.g. cabin, flight deck, accessible cargo compartment, crew rest area, etc.), or on an actual aircraft.

1. SAE ARP6316 — Performance Standards for Oblique Facing Seats in Transport Aircraft

Special categories of passengers. Persons who need special conditions, assistance, or equipment when travelling by air. These may include but are not limited to:

a) infants;

b) unaccompanied children;

c) persons with disabilities;

d) persons with mobility impairments;

e) persons on stretchers; and

f) inadmissible passengers, deportees or persons in custody.

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

State of Manufacture. The State having jurisdiction over the organization responsible for the final assembly of the aircraft, engine or propeller.

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

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

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

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

Survivable crash environment. An environment that prevails when the cabin occupants are subjected to crash forces within human tolerance levels, and the structural integrity of the passenger space remains intact such that the occupants can rapidly evacuate an aircraft.

Survivor. A victim who is not fatally injured as a result of the aircraft accident.

Unstaffed exit. Emergency exit for which no cabin crew member has been positioned for the flight.

Victim. An occupant of the aircraft, or any person outside the aircraft, who is unintentionally directly involved in the aircraft accident. Victims may include the crew, revenue passengers, non-revenue passengers and third parties.

ABBREVIATIONS AND ACRONYMS

AAIB	Air Accidents Investigation Branch
AAIASB	Hellenic Air Accident Investigation and Aviation Safety Board
AAIS	Air Accident Investigation Sector
ABPs	Able-bodied passengers
ADH	Automatically disposable hatch

AED	Automated external defibrillator
ADFR	Automatic deployable flight recorder
ARFFS	Airport rescue, firefighting service
CCOM	Cabin crew operations manual
CI	Cabin investigator
CVR	Cockpit voice recorder
CRM	Crew resource management
CRS	Child restraint system
EASA	European Union Aviation Safety Agency
ELT	Emergency locator transmitter
FAA	Federal Aviation Administration
FAK	First-aid kit
IBRACE	International Board for Research into Aircraft Crash Evaluation
I/C	In-charge cabin crew member
ICAO	International Civil Aviation Organization
IFE	In-flight entertainment system
ISASI	International Society of Air Safety Investigators
LOPA/S	Location of Passenger Accommodations
MEL	Minimum equipment list
MPET	Metallized polyethylene terephthalate
MSN	Aircraft manufacturer's serial number
NTSB	National Transportation Safety Board
PBE	Protective breathing equipment
PED	Portable electronic device
PEMS	Passenger evacuation management system
PIC	Pilot-in-command
PA	Public address
PSU	Passenger service unit
RAIO	Regional Accident and Incident Investigation Organization
RFF	Rescue and firefighting
SARPs	Standards and Recommended Practices
TSB	Transportation Safety Board of Canada
TSO	Technical Standard Order

PUBLICATIONS

(Referred to in this document)

ICAO PUBLICATIONS

Annex 13 — *Aircraft Accident and Incident Investigation*

Annex 18 — *The Safe Transport of Dangerous Goods by Air*

Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284)

Manual of Aircraft Accident and Incident Investigation (Doc 9756)

Procedures for Air Navigation Services — Training (PANS-TRG, Doc 9868)

Manual on Accident and Incident Investigation Policies and Procedures (Doc 9962)

Manual on Assistance to Aircraft Accident Victims and their Families (Doc 9973)

ICAO Policy on Assistance to Aircraft Accident Victims and their Families (Doc 9998)

Cabin Crew Safety Training Manual (Doc 10002)

Manual on the Establishment of Minimum Cabin Crew Requirements (Doc 10072)

Manual on Information and Instructions for Passenger Safety (Doc 10086)

Human Factors Digest No. 7 — Investigation of Human Factors in Accidents and Incidents (Cir 240)

Training Guidelines for Aircraft Accident Investigators (Cir 298)

Hazards at Aircraft Accident Sites (Cir 315)

Guidelines on Education, Training and Reporting Practices related to Fume Events (Cir 344)

MISCELLANEOUS

EASA Safety Information Bulletin (EASA SIB No: 2009-33, *Amendment of Cabin Crew Procedures for the Deployment of Oxygen Masks in the Cabin*)

ISASI *Cabin Safety Investigation Guidelines* (www.icao.int/cabinsafety)

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Chapter 1

INTRODUCTION

1.1 ACCIDENT INVESTIGATION

1.1.1 Not all aircraft accidents are survivable. However, a review of ICAO accident data from 2009-2013 involving commercial scheduled air transport indicated that the majority of accidents (87.7 per cent) resulted in no fatalities. The fact that most occupants survive accidents can be linked to improvements made in occupant protection. These improvements result from survival factor investigations, which address cabin safety aspects during accident investigations. The following aspects of an accident investigation are referred to as “survival factors”:

a) injuries sustained by occupants of the aircraft or by other affected persons;

b) aircraft exterior and interior configuration and damage;

c) operator’s policies and procedures relevant to cabin safety;

d) aircraft search and rescue responses;

e) crashworthiness issues;

f) equipment location, operation and functionality;

g) emergency response and escape paths;

h) occupant and witness interviewing;

i) human performance (crew and passengers);

j) operator’s cabin crew normal, abnormal and emergency procedures training programme;

k) cabin crew training records; and

l) other records, as applicable, that could have affected occupant survivability (e.g. cabin crew scheduling records).

1.1.2 Cabin safety aspects should be addressed as part of the investigation process. The goal of a cabin safety investigation is to analyse all aspects of an accident or incident, in relation to the actions of cabin crew members and passengers, as well as the cabin environment and relevant systems and equipment on board, in order to identify safety deficiencies and lessons learned. The investigation may result in the development of recommendations related to operator procedures, fatigue (such as scheduling practices), training, safety and emergency equipment, aircraft systems, etc. Guidance on accident investigation may be found in Chapter 5 and on survival factors report writing in Chapter 7.

1.2 INCIDENT INVESTIGATION

1.2.1 As per ICAO definitions, accidents and incidents are differentiated by their outcomes. For example, an evacuation in which occupants sustain serious injuries is classified as an accident. An evacuation without injuries or aircraft damage is classified as an incident. However, the lack of a negative outcome (for example, serious injury) does not mean that lessons cannot be learned from the occurrence. Incidents may provide evidence of hazards or deficiencies within the aviation system. A well conducted incident investigation should identify all immediate and underlying systemic causes of an occurrence and subsequently recommend appropriate safety actions aimed at avoiding the hazards or eliminating the deficiencies.

1.2.2 With the goal of improving safety, the State and the operator should consider conducting in-depth investigations of mandatory reported events. Likewise, events not requiring notification to the State of the Operator may be a source of lessons learned and should be considered for investigation by the operator in its safety management system, taking into account available resources. Guidance on incident investigation is presented in Chapter 6.

1.3 PURPOSE

1.3.1 The purpose of this manual is to encourage the uniform application of the Standards and Recommended Practices (SARPs) contained in Annex 13 – *Accident and Incident Investigation*, and to provide information and guidance to States on the procedures, practices and techniques that may be used in aircraft accident investigations, specific to cabin safety. It is also intended to complement guidance presented in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756).

1.3.2 Furthermore, this manual provides guidance to help operators investigate incidents, which do not meet the ICAO definition of an accident, hence do not require an accident investigation by the State of Occurrence, but which may provide evidence of hazards or deficiencies within the aviation system.

1.4 SCOPE

This manual focuses specifically on cabin safety aspects that should be addressed as part of the investigation process. Other aspects required during an investigation are outside the scope of this manual. However, they should be included as part of the final report, which is produced at the completion of an investigation. Since accident investigations vary in complexity, a document of this kind cannot cover all eventualities. However, the most common techniques and processes are included herein. Although this manual is of use to both experienced and inexperienced investigators, it is not a substitute for investigation training. Guidance on cabin investigator training is presented in Chapter 4.

Chapter 2

OVERVIEW OF ICAO SARPs AND GUIDANCE MATERIAL

2.1 ICAO STANDARDS AND RECOMMENDED PRACTICES

2.1.1 Annex 13 — *Aircraft Accident and Incident Investigation* contains the Standards and Recommended Practices for aircraft accident and incident investigation. Annex 13, 3.1 defines the sole objective of the investigation of an aircraft accident or incident to be the prevention of future accidents and incidents. It also states that it is not the purpose of an investigation to apportion blame or liability.

2.1.2 The Annex addresses the following aspects:

a) definitions, including those that differentiate accidents from incidents;

b) applicability of the specifications in the Annex;

c) general aspects related to an investigation, such as the objective of the investigation, the protection of evidence, custody and removal of aircraft, and the responsibility of the State of Occurrence;

d) notification of accidents or serious incidents, including the responsibility of the State of Occurrence, the State of Registry, the State of the Operator, the State of Design, and the State of Manufacture;

e) investigation, including responsibilities, organization and conduct of, and participation therein;

f) final report, including the responsibility of a State receiving or issuing safety recommendations;

g) reporting of accidents to ICAO; and

h) accident prevention measures, such as incident reporting systems and exchange of safety information.

2.2 ICAO GUIDANCE MATERIAL

2.2.1 Aircraft accident and incident investigation

2.2.1.1 The *Manual of Aircraft Accident and Incident Investigation* (Doc 9756) was developed to encourage the uniform application of the SARPs contained in Annex 13 and to provide information and guidance to States on the procedures, practices and techniques that may be used in accident and incident investigations. It is issued in four parts and supersedes the *Manual of Aircraft Accident Investigation* (Doc 6920).

a) Part I — *Organization and Planning,* includes considerations for the establishment of an aircraft accident investigation authority in terms of its structure, legislation, funding and personnel. The planning of an investigation and the notification process for accidents and incidents are also addressed, as are the initial actions to be taken at an accident site, with particular emphasis on the safety of personnel. A directory of the accident investigation authorities in all States and their contact details is included.

b) Part II — *Procedures and Checklists* provides information on common techniques and procedures, as well as checklists to assist States in aircraft accident and incident investigations. The manual also provides guidelines on major investigations that may be used, particularly in the conduct of larger accident investigations.

c) Part III — *Investigation* provides guidance for the investigation of all technical areas that could be involved in an accident or incident. Guidance is also provided for the multiple phases of an investigation. The content includes wreckage investigation, structures and systems investigation, flight recorders, aircraft performance, survival factors, etc.

d) Part IV — *Reporting* provides guidance in developing the final reports as a result of the investigation of accidents and incidents, including comprehensive guidelines on the drafting and processing of safety recommendations. It outlines the format, content and the procedures for consultation, release, distribution and dissemination of the final report.

2.2.2 Accident investigator training

2.2.2.1 The *Training Guidelines for Aircraft Accident Investigators* (Cir 298) outlines the training requirements for aircraft accident investigators, including background experience, initial and on-the-job training and basic and advanced investigation courses. It also provides guidelines for accident investigation courses.

2.2.2.2 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 be influenced by the factors associated with the accident scenario (for example, location, weather conditions, environment, security). The *Hazards at Aircraft Accident Sites* (Cir 315) was produced to assist individuals in applying effective occupational safety management practices to both 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 risks associated with exposure to these hazards during the investigation of aircraft accidents.

2.2.3 Organizational aspects of an investigation

2.2.3.1 The *Manual on Regional Accident and Incident Investigation Organization* (Doc 9946) provides information and guidance on the establishment and management of a regional accident and incident investigation organization (RAIO) to assist States in fulfilling their obligations pertaining to accident and incident investigation. A regional investigation system may provide economies of scale by allowing for the sharing of required resources. The manual outlines the duties and responsibilities of States, individually and/or collectively, with respect to the establishment and management of a regional accident and incident investigation system.

2.2.3.2 The *Manual on Accident and Incident Investigation Policies and Procedures* (Doc 9962) is an implementation tool to assist States in developing a policies and procedures manual for accident and incident investigation. The manual provides a template for States to modify, as necessary, their accident investigation documentation in accordance with Annex 13 provisions and to standardize and harmonize accident investigation processes among States. The manual was developed in such a manner that States may adapt it by “filling in the blanks” with State-specific material, such as legislation and regulations.

2.2.4 Assistance to aircraft accident victims and their families

2.2.4.1 The *Manual on Assistance to Aircraft Accident Victims and their Families* (Doc 9973) provides guidance on the types of family assistance to aircraft accident victims and their families. The document updates and expands relevant

guidance by incorporating recent lessons learned and developments in the area of family assistance. It discusses the types of assistance that may be provided, as well as the providers and recipients of such assistance. Examples of several States' legislation or regulations for the provision of family assistance are also provided.

2.2.4.2 The *ICAO Policy on Assistance to Aircraft Accident Victims and their Families* (Doc 9998) sets out ICAO policies regarding the provision of assistance to aircraft accident victims and their families. States are encouraged to incorporate these policies when planning, developing and implementing their legislation, regulations, policies and procedures related to family assistance.

2.3 ADDITIONAL GUIDANCE MATERIAL

The *Cabin Safety Investigation Guidelines* of the International Society of Air Safety Investigators (ISASI) were developed to provide investigators and other operational personnel with the tools to investigate the survival aspects of incidents and accidents. Guidance is provided for documenting damage to the cabin interior and its equipment and conducting cabin crew and passenger interviews. The guidelines are adaptable to any type of occurrence (for example, turbulence). A copy of the ISASI guidelines may be obtained from the ICAO website in the Cabin Safety Library at: www.icao.int/cabinsafety.

Chapter 3

ACCIDENT INVESTIGATION AND CABIN SAFETY IMPROVEMENTS

3.1 GENERAL

This chapter presents a review of accidents with significant cabin safety components. Accident reports for each of the occurrences referenced in this chapter may be obtained from the ICAO website in the Cabin Safety Library at: www.icao.int/cabinsafety.

3.2 IN-FLIGHT FIRE

3.2.1 In June 1983, a DC-9-32 on a scheduled passenger flight from Dallas to Montréal via Toronto, with 41 passengers and five crew members on board, experienced a fire which was discovered by cabin crew members in the aft lavatory during cruise flight. The crew made an emergency descent and landed at the Greater Cincinnati International Airport. When the aircraft came to a stop, the cabin crew and passengers began to evacuate. Approximately 60 to 90 seconds after the exits were opened, a flash fire enveloped the aircraft interior. Twenty-three passengers were fatally injured; the aircraft was destroyed by fire.

3.2.2 The National Transportation Safety Board (NTSB) determined that the probable causes of the accident were a fire of undetermined origin, an underestimate of fire severity and misleading fire progress information provided to the captain. The report stated that it is likely that some of the fatally injured passengers had made their way aft in the cabin trying to locate the overwing exits. However, the visibility had deteriorated so badly that they were not able to locate them. Survivors also noted difficulties locating exits in the thick smoke.

3.2.3 Recommendations in the accident report included, but were not limited to:

a) requirements for smoke detectors in lavatories;

b) requirements for the installation of automatic fire extinguishers adjacent to and in lavatory waste receptacles;

c) the need for operator review of firefighting training and procedures to focus on: taking "aggressive actions" to determine the source and severity of suspected cabin fires, communication between flight and cabin crew and the need for hands-on training;

d) passenger instruction in how to open emergency exits to become standard practice within the airline industry; and

e) the need to install (or improve) in-cabin fire safety enhancements, including but not limited to:

1) fire-blocking seat materials to limit both the spread of fire and the generation of toxic chemicals through ignition;

2) emergency track lighting at or near the floor, strong enough to cut through heavy fuel-fire smoke;

3) raised markings on overhead bins indicating the location of exit rows to aid passengers in locating these rows in case of passenger visual impairment (either pre-existing or caused by emergency conditions); and

4) handheld fire extinguishers using advanced technology extinguishing agents such as Halon.

3.3 FIRE AND EVACUATION AFTER REJECTED TAKE-OFF

3.3.1 In August 1985, a B737-200 on a charter flight from Manchester to Corfu, with 131 passengers and six crew members on board, rejected its take-off following an uncontained engine failure which punctured the wing fuel tank access panel. A fire broke out in the left engine of the aircraft and the flight crew made a public address (PA) instructing occupants to evacuate via the right side. Fire spread to the cabin shortly after the aft right exit was opened. Fifty-three passengers and two crew members were fatally injured; the aircraft was damaged beyond repair.

3.3.2 The Air Accidents Investigation Branch (AAIB) cited the major cause of the fatalities as being rapid incapacitation due to the inhalation of the dense toxic/irritant smoke atmosphere within the cabin, aggravated by evacuation delays caused by a door malfunction and restricted access to exits. The report also cited issues related to the presentation of instructions in the safety briefing card, difficulties in operating overwing exits and congestion in the aisles and at exits.

3.3.3 Recommendations in the accident report included, but were not limited to:

a) consideration of the requirement for fitting an evacuation alarm permitting the flight crew to instruct the cabin crew to initiate an evacuation;

b) the need to stow emergency equipment used during an evacuation at cabin crew stations;

c) the review of cabin configuration approval, with reference to restrictions to overwing exit access;

d) the review of requirements related to “unobstructed access” to exits, taking into account high density seating configurations; and

e) the review of evacuation certification requirements to include aspects such as unusable exits, dense smoke, passenger aisle flow, the identification of exits and opening egress rate.

3.4 ENGINE FAILURE AND EMERGENCY LANDING (OCCURRENCE 1)

3.4.1 In January 1989, a B737-400 on a scheduled passenger flight from London to Belfast, with 118 passengers and eight crew members on board, experienced a fan blade fracture in the No. 1 engine. Believing that the No. 2 engine suffered the damage, the flight crew shut it down and diverted to East Midlands Airport. The No. 1 engine subsequently suffered a major thrust loss and the aircraft impacted a field near the embankment of a motorway. Forty-seven passengers were fatally injured and 74 occupants, including seven crew members and one infant, sustained serious injuries. The aircraft was destroyed.

3.4.2 According to the AAIB, one of the factors contributing to the incorrect response from the flight crew (that is, shutting down the wrong engine), was that they were not informed of the flames, which emanated from the No. 1 engine and were observed by many on board, including three cabin crew members in the aft cabin. The investigation noted that

noises, vibrations, odours, smoke and signs of fire were observed by passengers and cabin crew members; these were not relayed to the flight deck. During the diversion, the captain made a PA explaining to passengers that trouble with the right engine had produced smoke and it was shut down. The accident report noted that many passengers who saw the fire in the left engine were puzzled by the captain's reference to the right engine, but never brought the discrepancy to the attention of the cabin crew.

3.4.3 Following impact, the majority of passengers were trapped due to injury, seat failure or debris from overhead. Both flight crew members as well as two cabin crew were also trapped by seat failure or debris.

3.4.4 Among the recommendations, the report stated that training exercises for pilots and cabin crew should be introduced to improve coordination between flight and cabin crew in response to an emergency. Other recommendations included:

a) research into seat design with emphasis on effective upper torso restraint and aft-facing passenger seats;

b) modifications to certification requirements for cabin floors of new aircraft types;

c) the use of child seats as restraint systems for infants and children;

d) modifications to certification requirements for cabin stowage bins and other cabin items of mass; and

e) the introduction of training exercises for pilots and cabin crew to improve coordination in response to an emergency.

3.5 LOSS OF CONTROL AFTER TAKE-OFF

3.5.1 In March 1989**,** a Fokker F-28 Mk1000 on a scheduled passenger flight from Thunder Bay to Winnipeg via Dryden, with 65 passengers and four crew members on board, crashed off the end of the runway after take-off from the Dryden Municipal Airport. The aircraft failed to gain altitude after its attempted take-off and continued on a flat flight path, barely clearing a bluff approximately 700 metres from the end of the runway and crashing into a densely wooded area. Twenty-one passengers and three crew members, including the captain, the first officer, and one of the two cabin crew members, were fatally injured as a result of the crash and the accompanying fire. There was extensive physical and fire damage to the aircraft.

3.5.2 Contamination on the wings resulted in a loss of control of the aircraft. The final report issued by the Commission of Inquiry into the accident noted that one of the cabin crew members and several passengers noticed ice build-up on the wings but failed to transmit this information to the flight crew. Poor crew resource management and deficiencies in cabin crew training were also cited as contributing factors. Findings included, but were not limited to:

a) aircraft interior furnishings burned and gave off heavy, sooty smoke and toxic gases; and burning, molten-plastic-like material fell on passengers;

b) the clothing and slip-on shoes worn by the cabin crew member did not afford her adequate protection after the crash, since the weather was cold;

c) passenger seats were deformed and many were detached from the aircraft floor and bunched in the front of the cabin after impact;

d) overhead bins fell on several passengers; and

e) many survivors of the crash were hindered in their escape by debris in the aircraft, some of which was carry-on baggage from the overhead bins and from under the aircraft seats.

3.5.3 Recommendations included, but were not limited to:

a) the prohibition of refuelling an aircraft with an engine operating when passengers are on board, boarding, or deplaning;

b) the development and implementation of a mandatory and comprehensive education programme for all air crew engaged in commercial operations, including an integrated programme for flight crew members and cabin crew members, on the adverse effects of wing contamination on aircraft performance, with provision for knowledge verification;

c) the adoption of standards for aircraft interiors that would prevent the rapid spread of fire and emission of toxic fumes;

d) the requirement for each operator to provide the competent authority with an operator cabin crew manual for review and approval, either as part of the flight operations manual or as a separate manual;

e) the development and implementation of regulations, setting the training and competency requirements for cabin crew members;

f) that the competent authority monitor and periodically audit the cabin crew training programme of all operators to ensure that such training meets the standards set;

g) that the competent authority ensure that the intention of the "clean-wing" concept be incorporated into and given effect in the appropriate operational manuals of operators in the State;

h) the requirement to retrofit shoulder harnesses and other safety-enhancing features for cabin crew seats on older aircraft types such as the F-28 aircraft;

i) that the competent authority address the lack of maximum flight times and maximum flight duty times prescribed for cabin crew members;

j) the development and implementation of regulations requiring operators to provide approved crew resource management (CRM) training and standard operating procedures for all operators' flight crews and cabin crews. This training should be designed to coordinate the flight activities and information exchange of the entire air crew team (flight and cabin crew);

k) that the captain of an aircraft operating in adverse winter weather conditions be formally required to advise the in-charge cabin crew member, prior to departure from the gate, whether ground de-icing of the aircraft is to take place and, in order to eliminate potential apprehension on the part of passengers, that they be advised accordingly on the PA system of the aircraft; and

l) the development and implementation of a regulation requiring that, at any time prior to commencement of the take-off roll, in the absence of prior advice by the captain that ground de-icing of the aircraft in adverse winter weather conditions is to be conducted, the in-charge cabin crew member be required to report to the captain his or her own concerns, or any concerns conveyed to him or her by any cabin crew member or any passenger on board the aircraft, relating to wing contamination.

3.6 ENGINE FAILURE AND EMERGENCY LANDING (OCCURRENCE 2)

3.6.1 In July 1989, a DC-10-10 on a scheduled passenger flight from Denver to Philadelphia, with 285 passengers and 11 crew members on board, experienced a catastrophic failure of the No. 2 tail-mounted engine during cruise flight. The separation, fragmentation and forceful discharge of stage 1 fan rotor assembly parts from the No. 2 engine led to the loss of the three hydraulic systems that powered the aircraft's flight controls. The flight crew experienced severe difficulties controlling the aircraft, which subsequently crashed during an attempted landing at Sioux Gateway Airport, Iowa. One hundred and ten passengers and one cabin crew member were fatally injured. The aircraft was destroyed by impact and post-impact fire.

3.6.2 There were four lap-held infants on board. During the preparations for the emergency landing, parents were instructed to place their infants on the floor and to hold them there when the parent assumed the protective brace position. Two out of the four infants were projected through the cabin during the impact sequence. One infant was found by a passenger, the other fatally injured. A third infant became airborne but was caught by his mother. The NTSB's analysis of this accident included an evaluation of cabin survivability issues, including child (infant) seat restraints.

3.6.3 Some of the safety issues raised in the NTSB report related to cabin safety, including infant restraint systems, and airport rescue and firefighting facilities. The report urged that infants and small children be required to be restrained in child safety seats appropriate to their height and weight.

3.7 RUNWAY COLLISION

3.7.1 In February 1991, a B737-300 with 83 passengers and six crew members on board collided with a SA-227-AC (Metroliner) at Los Angeles International Airport. Upon landing, the B737 struck the Metroliner, continued down the runway with the SA-227 crushed beneath it, exited the runway, and caught fire. All 12 occupants on board the Metroliner, as well as 20 passengers and two crew members on board the Boeing were fatally injured. Both aircraft were destroyed by impact forces of the collision and a post-impact fire.

3.7.2 Four of the B737's six exits were used. The NTSB report noted congestion at the overwing exits, only one of which was usable. The majority of fatalities aboard the B737 were due to asphyxiation in the post-impact fire. Fifteen passengers seated aft of the overwing area who made their way to the rear of the cabin reported using emergency floor path lighting.

3.7.3 The NTSB accident report cited as a finding that the exit row briefing provided by the operator of the B737 increased the preparedness of passengers for the evacuation. It also noted that the delay in opening the right overwing exit, the partially blocked exit opening, and the reaction to stress, all caused delays in the egress of some passengers. Many of the fatally injured B737 passengers were found near the overwing exit. They did not proceed to another available exit in the rear of the aircraft and were overcome when the cabin fire intensified. The report noted that the lack of use of available aft exits may have been the result of smoke and limited visibility in the cabin.

3.7.4 Safety issues raised in the report included air transport accident survivability, evacuation standards and procedures, interior furnishing flammability standards and survival devices.

3.8 IN-FLIGHT FIRE AND IMPACT WITH TERRAIN

3.8.1 In May 1996, a DC-9-32 on a scheduled passenger flight from Miami to Atlanta, with 105 passengers and five crew members on board, experienced a loss of control caused by an uncontrolled fire which started in the aircraft's forward cargo compartment. The aircraft crashed while attempting to return to Miami. There were no survivors; the aircraft was destroyed.

3.8.2 The NTSB determined that the fire was initiated by the actuation of one or more chemical oxygen generators, which were being improperly carried as cargo on board the aircraft. The report stated that a smoke/fire warning device would have promptly alerted the flight crew to the fire and allowed them more time to land the aircraft. Had the aircraft been equipped with a fire suppression system, it might have suppressed the spread of the fire (although the intensity of the fire might have been so great that a suppression system would not have been sufficient to fully extinguish the fire). A fire suppression system would certainly have delayed the spread of the fire, however, and, in conjunction with an early warning, would likely have provided time to land the aircraft safely.

3.8.3 Recommendations in the accident report included, but were not limited to:

a) expediting final rulemaking by the competent authority to require smoke detection and fire suppression systems for all Class D cargo compartments;

b) research to develop technologies and methods for enhancing passenger respiratory protection from toxic atmospheres resulting from in-flight and post-crash fires involving transport-category aircraft; and

c) evaluating the usefulness and effectiveness of the Douglas DC-9 procedures involving the partial opening of cabin doors and similar procedures adopted by some operators of other transport-category aircraft for evacuating cabin smoke or fumes and, based on that evaluation, determining whether these or other procedures should be included in all manufacturers' aircraft flight manuals and operators' operating manuals.

3.9 IN-FLIGHT FIRE AND IMPACT WITH WATER

3.9.1 In September 1998, an MD-11 on a scheduled passenger flight from New York to Geneva, with 215 passengers and 14 crew members on board, experienced an in-flight fire. The aircraft crashed while attempting to divert to Halifax. There were no survivors; the aircraft was destroyed.

3.9.2 The accident report, issued by the Transportation Safety Board of Canada (TSB), stated that flammable material propagated a fire that started above the ceiling on the right side of the flight deck near its rear wall. The fire spread and intensified rapidly, thereby degrading aircraft systems and the flight deck environment, ultimately leading to the loss of control of the aircraft. The TSB concluded that aircraft certification standards for material flammability were inadequate, in that they allowed the use of materials that could be ignited and sustain or propagate fire.

3.9.3 The accident report stated that the metallized polyethylene terephthalate (MPET)-type cover material was most likely the first material to ignite and constituted the largest portion of the combustible materials that contributed to the propagation and intensity of the fire. The TSB recommended that competent authorities take action, on an urgent basis, to reduce or eliminate the risk associated with the use of MPET-type cover material on the thermal acoustic insulation blankets in aircraft.

3.9.4 The accident report also stated that, once ignited, other types of thermal acoustic insulation cover materials exhibit flame propagation characteristics similar to MPET-covered insulation blankets and do not meet the proposed revised flammability test criteria. Metallized polyvinyl fluoride-type cover material was installed in the accident aircraft and was involved in the in-flight fire. The TSB recommended that competent authorities test all thermal acoustic insulation materials against more rigorous test criteria, and that flammability standards for material used in the manufacture of any aeronautical product be revised, based on realistic ignition scenarios, to prevent the use of any material in the construction of aircraft that sustains or propagates fire.

3.10 RUNWAY OVERRUN AND FIRE

3.10.1 In August 2005, an A340-300 on a scheduled passenger flight from Paris to Toronto, with 297 passengers[1] and 12 crew members on board, overran the runway after landing at Toronto International Airport. The aircraft was not able to stop on the runway and departed the far end. It stopped in a ravine and caught fire. All passengers and crew members were able to evacuate the aircraft before the fire reached the escape routes. A total of 10 passengers and two crew members were seriously injured during the crash and the ensuing evacuation; the aircraft was destroyed by fire.

3.10.2 The TSB accident report included the following findings:

a) the emergency power for both the PA and evacuation alert systems are located in the avionics bay. A less vulnerable system and/or location would reduce the risk of these systems failing during a survivable crash;

b) brace commands were not given by the cabin crew during this unexpected emergency condition. Although it could not be determined if some passengers were injured as a result, research indicates that the risk of injury is reduced if passengers brace properly;

c) there are no clear visual cues to indicate that some dual-lane slides actually have two lanes. As a result, these slides were used mostly as single-lane slides. This likely slowed the evacuation, but this fact was not seen as a contributing factor to the injuries suffered by the passengers; and

d) although all passengers managed to evacuate, the evacuation was impeded because nearly 50 per cent of passengers retrieved carry-on baggage. It is estimated that the aircraft was evacuated in a little more than two minutes.

3.10.3 The report stated that the evacuation was successful due to the training and actions of the whole cabin crew. In general, the performance of the cabin crew was deemed exemplary and professional, and was a significant factor in the successful evacuation of the aircraft. The report cited effective communication between the flight crew and the cabin crew members. It noted that the cabin crew were advised of the possibility of a missed approach. Therefore, they were in a state of heightened awareness during the landing phase and were prepared to respond immediately in the event of an emergency.

3.11 FLIGHT CREW INCAPACITATION

3.11.1 In August 2005, a B737-300 on a scheduled passenger flight from Larnaca to Athens, with 115 passengers and six crew members on board, failed to pressurize due to the aft outflow valve being partially open. As the aircraft climbed, the cabin altitude warning horn sounded. The warning was misidentified by the flight crew as a take-off configuration warning. They attempted to troubleshoot with assistance from the operator's personnel on the ground. The oxygen masks in the passenger cabin automatically deployed. The aircraft continued to climb and both flight crew members succumbed to hypoxia. The aircraft continued on auto-pilot and entered the holding pattern near Athens International Airport. It remained in the holding pattern, under control of the auto-pilot, until it suffered from fuel exhaustion and crashed. There were no survivors; the aircraft was destroyed.

3.11.2 The Hellenic Air Accident Investigation and Aviation Safety Board (AAIASB) report stated that direct causes of the accident included the non-identification of warnings and reasons for the activation of such warnings, such as the deployment of passenger oxygen masks in the cabin. Latent causes included inadequate application of crew resource

1. Passengers included eight children and three infants; adult passengers included three wheelchair-using passengers and one blind passenger.

management principles. The AAIASB further concluded that one of the factors that could have contributed to the accident was the lack of cabin crew procedures (at an international level) to address events involving loss of pressurization and continuation of the climb despite passenger oxygen mask deployment.

3.11.3 In the accident report, the AAIASB recommended to amend cabin crew procedures, so that, when the oxygen masks deploy in the cabin due to loss of cabin pressure or insufficient cabin pressure and if the aircraft does not suspend climb, or level off or start a descent, the in-charge cabin crew member (or the cabin crew member situated closest to the flight deck) be required to immediately notify the flight crew of the oxygen mask deployment and to confirm that the flight crew have donned their oxygen masks.

3.11.4 As a follow up to the accident, the European Aviation Safety Agency (EASA) issued a Safety Information Bulletin (EASA SIB No: 2009-33), recommending that operations manuals should be reviewed and amended, where necessary, to address the following: “If the oxygen masks deploy in the cabin or there is any other sign of loss of or insufficient cabin pressure, in addition to the standard procedure (e.g. ensure their oxygen supply, secure themselves, etc.) the cabin crew should, as soon as practicable, inform, by the appropriate means, the flight crew of the situation and confirm that flight crew members wear their oxygen masks.”

3.11.5 A copy of the EASA SIB may be obtained from the ICAO website in the Cabin Safety Library at: www.icao.int/cabinsafety.

3.12 DITCHING

3.12.1 In January 2009, an A320-200 on a scheduled passenger flight from New York to Charlotte, with 150 passengers (including a lap-held infant) and five crew members, ditched on the Hudson River about 8.5 miles from LaGuardia Airport, New York City, after an almost complete loss of thrust in both engines following an encounter with a flock of birds. The event occurred about two minutes after take-off. All occupants evacuated the aircraft by the forward and overwing exits. Four passengers and one cabin crew member were seriously injured, and the aircraft was substantially damaged.

3.12.2 The report noted that the post-crash environment, which included a 41°F (5°C) water temperature and a 2°F (approximately -16°C) wind chill factor and a lack of sufficient slide-rafts (resulting from water entering the aft fuselage), posed an immediate threat to the occupants’ lives. Although the route did not require the aircraft to carry equipment mandatory for flights over water, the accident aircraft was equipped for an extended overwater flight, which included life jackets and slide-rafts.

3.12.3 The NTSB report discussed survival-related issues, including passenger brace positions; slide-raft stowage; passenger immersion protection; life line usage; life jacket stowage, retrieval, and donning; pre-flight safety briefings; and passenger education.

3.12.4 The information provided by passengers during the investigation indicated that the following occurred during the flight and evacuation:

a) seventeen per cent of passengers reported watching most of the pre-flight safety demonstration and an additional 13 per cent reported watching some of the demonstration;

b) eight per cent reported reading the safety information card before or during the flight;

c) fifty-three per cent retrieved seat cushions during the evacuation; and

d) three per cent reported retrieving life jackets from under their seats after impact. An additional three per cent reported retrieving a life jacket from under a different seat after impact. Passengers experienced difficulties retrieving and donning life jackets.

3.12.5 Of the four passengers who sustained serious injuries, three received their injuries during impact. The two passengers who sustained very similar shoulder fractures both described assuming similar brace positions. The NTSB concluded that the recommended brace positions did not take into account seats that did not have a breakover feature and that, in this accident, the recommended brace position might have contributed to the shoulder fractures of two passengers. The NTSB recommended that research be conducted to determine the most beneficial passenger brace position in aircraft with non-breakover seats installed. The report suggested that new guidance material on passenger brace positions may need to be issued based on research results.

3.12.6 The report cited the following factors, which contributed to the survivability of the accident:

a) the fortuitous use of an aircraft that was equipped for an extended overwater flight, including the availability of the forward slide-rafts, even though it was not required to be so equipped; and

b) the performance of the cabin crew members while expediting the evacuation of the aircraft.

3.13 TAIL STRIKE DURING LANDING

3.13.1 In July 2013, a B777-200ER on a scheduled passenger flight from Incheon to San Francisco, with 291 passengers and 16 crew members on board, struck the seawall short of runway 28L at San Francisco International Airport. Three passengers were fatally injured; 40 passengers, eight of the 12 cabin crew members, and one of the four flight crew members received serious injuries. The aircraft was destroyed by impact forces and fire.

3.13.2 The dynamics of the impact sequence in this accident were such that occupants were thrown forward and experienced a significant lateral force to the left, which resulted in serious passenger injuries. Two of the three fatally injured passengers were ejected from the aircraft during the impact sequence. The investigation concluded that these two passengers were not wearing their seat belts at the time of the accident. None of the passenger seat units were ejected from the aircraft. The report stated that, had the two ejected passengers been restrained, they likely would have survived the accident.

3.13.3 After the aircraft came to a stop, the in-charge cabin crew member came forward to the flight deck and asked if the cabin crew should evacuate the aircraft; the flight crew told her to wait. Once the pilot monitoring understood that emergency vehicles were responding, he issued the evacuation order. By this time, the cabin crew member at L2A had already commanded the evacuation after observing fire outside door 2R. Upon hearing his command, the in-charge cabin crew member began commanding passengers to evacuate. A review of video footage indicated the evacuation was initiated about 1 minute and 33 seconds after the aircraft came to a stop. The NTSB concluded that the cabin crew acted appropriately when they initiated an emergency evacuation upon determining there was a fire outside door 2R. Further, the delay of about 90 seconds in initiating an evacuation was likely due partly to the pilot monitoring's command not to begin an immediate evacuation, as well as disorientation and confusion. Due to injuries and unusable exits, the evacuation was accomplished by five of the 12 cabin crew members, using three out of the eight exits.

3.13.4 Two slide-rafts released and inflated inside the cabin. This was a result of the catastrophic nature of the crash, which produced loads far exceeding design certification limits. Given the critical nature of these evacuation devices and their proximity to essential crew members, the report noted that the data obtained during the accident investigation could prove useful for future slide-raft design.

3.13.5 The aircraft's structure and seats absorbed a tremendous amount of energy, which, despite multiple spinal fractures, resulted in a complete absence of passenger paralyses. Despite the catastrophic nature of the crash, the NTSB report noted that aircraft provided protection to the extent that 99 per cent of the occupants survived and 98 per cent of the passengers were able to self-evacuate.

3.14 RUNWAY EXCURSION DURING LANDING

3.14.1 In March 2015, an MD-88 on a scheduled passenger flight from Atlanta to New York, with 127 passengers and five crew members on board, departed the runway while landing at LaGuardia Airport. The aircraft contacted the airport perimeter fence and came to rest with its nose on an embankment next to a body of water. Twenty-nine passengers received minor injuries; the remaining passengers, the flight crew members, and the cabin crew members were not injured. The aircraft was substantially damaged.

3.14.2 Damage to the aircraft during the accident sequence resulted in the loss of the interphone and public address system. In order to communicate after the aircraft came to a stop, all cabin crew members left their assigned emergency exits to obtain information from the flight crew and to check on passengers. Time elapsed before the crew members decided to commence the evacuation. During the wait time, the crew members were unaware that the left wing was damaged and that there was a fuel leak. A total of 17 minutes elapsed between the time the aircraft came to a stop and when all the passengers were evacuated.

3.14.3 The NTSB report concluded that the flight and cabin crew members did not conduct a timely or an effective evacuation because of the flight crew's lack of assertiveness, prompt decision-making, and communication and the cabin crew members' failure to follow standard operating procedures once the captain commanded the evacuation. The NTSB cited that cabin crew members were not adequately trained by the operator for an emergency or unusual event that involved a loss of communications after landing. The report also noted that the cabin crew members' decision to leave their assigned exits unattended after the aircraft came to a stop resulted in reduced readiness for an evacuation. The report stated that this and other accidents demonstrate the need for improved decision-making and performance by flight and cabin crews when faced with an unplanned evacuation.

3.14.4 Recommendations in the accident report included, but were not limited to:

a) the need for operators to provide guidance that instructs cabin crew members to remain at their assigned exits and actively monitor exit availability in all abnormal situations in case an evacuation is necessary;

b) the review of cabin crew training programmes that include scenarios requiring crew coordination regarding active monitoring of exit availability and evacuating after a significant event that involves a loss of communications;

c) the need to develop best practices related to evacuation communication, coordination, and decision-making during emergencies to improve flight and cabin crew member performance during evacuations; and

d) the review of guidance from the competent authority to advise operators to reinforce the importance of having precise information about the number of passengers aboard an aircraft, including lap-held children, and making this information immediately available to emergency responders after an accident to facilitate timely search and rescue operations.

3.15 COLLISION WITH TERRAIN

3.15.1 In March 2015, an A320-200 on a scheduled passenger flight from Toronto to Halifax, with 133 passengers and five crew members on board, struck terrain while on approach to Halifax International Airport. The aircraft came to rest on the runway and was evacuated. One flight crew member was seriously injured, 20 passengers and four crew members received minor injuries; the aircraft was destroyed.

3.15.2 As a result of the accident, both flight crew members suffered head injuries and were disoriented when the aircraft came to rest. Therefore, they did not immediately communicate with the in-charge cabin crew member. When the

flight crew members regained their awareness, they attempted to contact the cabin crew but the PA and interphone systems were inoperative due to the loss of electrical power. At that time, the evacuation was already under way. The cabin crew instructed passengers to leave their carry-on baggage behind. In spite of these instructions as well as the instructions provided in the pre-departure briefing and the safety-features card, some passengers exited the aircraft with their carry-on baggage. All of the passengers had exited the aircraft within five minutes after it came to a stop. Many passengers were not wearing clothing appropriate for the adverse weather conditions at the time of the accident (such as open-toed shoes, shorts, and t-shirts).

3.15.3 Since no emergency was expected, the passengers and cabin crew members were not in a brace position at the time of the initial impact. The investigation concluded that most of the injuries sustained by the passengers were consistent with not adopting a brace position. A passenger travelling with an infant held the infant with both arms; both the passenger and the infant had injuries consistent with hitting the back of the seat in front. The TSB noted that no child restraint systems (CRS) were used on board the aircraft, nor was their use required by national regulation.

3.15.4 The TSB issued a series of "findings as to risk" in the accident report which included, but were not limited to:

a) if new regulations on the use of CRS are not implemented, lap-held infants and young children are exposed to undue risk and are not provided with a level of safety equivalent to that of adult passengers;

b) if passengers do not dress appropriately for safe travel, they risk being unprepared for adverse weather conditions during an emergency evacuation;

c) If the aircraft design does not incorporate a means of absorbing forces along their longitudinal axis, vertically mounted, non-structural beams (channels, tubes, etc.) in cargo compartments could penetrate the cabin floor when the fuselage strikes the water or ground, increasing the risk of aircraft occupants being injured or emergency egress being impaired;

d) if there is a complete loss of electrical and battery power and the public address system does not have an independent emergency power supply, the public address system will be inoperable, and the initial command to evacuate or to convey other emergency instructions may be delayed, putting the safety of passengers and crew at risk;

e) if passengers retrieve or attempt to retrieve their carry-on baggage during an evacuation, they are putting themselves and other passengers at a greater risk of injury or death; and

f) if passengers do not pay attention to the pre-departure safety briefings or review the safety-features cards, they may be unprepared to react appropriately in an accident, increasing their risk of injury or death.

3.16 RUNWAY IMPACT DURING ATTEMPTED GO-AROUND

3.16.1 In August 2016, a B777-300 on a scheduled passenger flight from Trivandrum to Dubai, with 282 passengers[2] and 18 crew members on board, impacted the runway during an attempted go-around. The aircraft came to rest on the runway and was evacuated. Four cabin crew members were seriously injured, 21 passengers, one flight crew member and six cabin crew members received minor injuries; the aircraft was destroyed by post-impact fire.

3.16.2 After impact, the aircraft slid along the runway. It came to a stop and the cabin filled with smoke. Approximately one minute after the aircraft came to rest, the captain ordered the evacuation. Cabin crew members

2. Passengers included 60 children (including one unaccompanied minor) and seven infants.

reported that when the aircraft impacted the runway and then slid along it, some passengers unfastened their seat belts and left their seats. Passengers were repeatedly instructed to remain seated by the cabin crew. When the aircraft came to a stop, prior to the evacuation order, some passengers retrieved their belongings and demanded that the cabin crew members open the doors. Only half of the aircraft's exits were usable during the entire evacuation; four exits were affected by the wind (two of them eventually became usable). Eighty-six per cent of occupants evacuated through exits in the rear section of the aircraft. All occupants evacuated in approximately six minutes and 40 seconds, except for the captain and the in-charge cabin crew member who evacuated after an explosion occurred in the centre wing tank.

3.16.3 The report issued by the Air Accident Investigation Sector (AAIS) of the United Arab Emirates, which conducted the investigation, analysed survival factors which included, but were not limited to:

a) several cabin crew members reporting difficulties opening the protective breathing equipment (PBE) plastic pouch, despite having been trained and deemed competent by the investigation;

b) several passengers evacuated with carry-on baggage despite being directed to leave their belongings on board. Cabin crew members decided to allow passengers to evacuate with carry-on baggage, to prevent further delays;

c) the cabin crew members were individually trained in several scenarios that may occur in an evacuation. However, the operator's training did not include a scenario where the slides were affected by wind; and

d) there was no direct communication between airport rescue, firefighting service (ARFFS) and the cabin crew members. In addition, the airport did not deploy a clear plan to manage the passenger evacuation. Passengers evacuating had to find a passage between the vehicles and firefighters to escape the accident site.

3.16.4 Recommendations in the accident report included, but were not limited to:

a) the review of requirements from the competent authority for the PBE manufacturer to evaluate the current design features of the PBE pouch and enable easy access;

b) the review of national regulations to include instructions and illustrations clearly indicating that passengers must leave their carry-on baggage behind in an evacuation, in the passenger safety briefing card, as well as the pre-departure and pre-landing passenger safety briefings, in line with guidance presented in the *Manual on Information and Instructions for Passenger Safety* (Doc 10086);

c) the review of cabin crew training programmes to include evacuation scenarios where slides are affected by wind; and

d) the need for the airport to periodically test its airport passenger evacuation management system (PEMS) by conducting exercises to verify that the system can effectively provide evacuees with a high level of safety until such time as they are assembled in the survivors' reception centre.

3.16.5 The report stated that the evacuation of 282 passengers, including 67 children and infants, presented a significant task for the cabin crew members. The investigation concluded that the cabin crew members successfully managed the evacuation, citing their highest professional standard, in line with their training, while taking into account that they were confronted with several challenges.

3.17 UNCONTAINED ENGINE FAILURE AND SUBSEQUENT FIRE

3.17.1 In October 2016, a B767-300ER on a scheduled passenger flight from Chicago to Miami, with 161 passengers and nine crew members on board, rejected its take-off following an uncontained engine failure in the right engine which punctured the main engine wing fuel feed line. A fire broke out and the cabin crew members made the decision to evacuate when the aircraft came to a stop. One passenger was seriously injured, 19 passengers and one cabin crew member received minor injuries; the aircraft was substantially damaged from the fire.

3.17.2 After the aircraft came to a stop, cabin crew members attempted to calm passengers while waiting for a communication from the flight crew members. The cabin began to fill with smoke, so one of the cabin crew members decided to initiate the evacuation by opening one of the left side overwing exits. Due to unusable exits, the evacuation was accomplished using only two floor level exits and one overwing exit. The evacuation was completed two minutes and 21 seconds after the aircraft came to a stop. Two cabin crew members reported passengers evacuated with carry-on baggage despite being directed to leave their belongings on board.

3.17.3 The investigation concluded that the one serious injury that resulted during the evacuation occurred after a passenger evacuated using the left overwing exit, before the left side engine was shutdown. The report stated that, once on the ground, the passenger stood up to get away from the aircraft but was knocked down by the jet blast coming from the engine.

3.17.4 The NTSB cited that cabin crew members made a good decision to begin the evacuation given the fire on the right side of the aircraft and the smoke-filled cabin, but noted that the left overwing exit should have been blocked while the left engine was still operating because of the increased risk of injury to passengers who evacuated from that exit. The report also cited issues related to the operator's cabin crew training programme, noting that cabin crew members were not adequately trained to effectively use different interphone system models installed on the same aircraft type. Coordination and communication issues between the flight crew and cabin crew members were noted in the report. Findings in the report cited that if the flight crew or the cabin crew members had communicated after the aircraft came to a stop, the flight crew members could have become aware of the severity of the fire on the right side of the aircraft and the need to expeditiously shut down the engines. The NTSB also noted the need for the competent authority to address the issue of passengers retrieving carry-on baggage during this and other recent emergency evacuations.

3.17.5 Recommendations in the accident report included, but were not limited to:

a) the need to develop and issue guidance regarding the discussion of this accident during recurrent cabin crew training to emphasize the importance of effectively assessing door and overwing exits during an unusual or emergency situation; and providing techniques for identifying conditions that would prevent opening exits, including an operating engine;

b) the review of cabin crew training programmes to ensure that they provide cabin crew and flight crew members with training aids and hands-on exercises that account for the different interphone systems that operators operate; and

c) the need to conduct research to evaluate the effects of carry-on baggage on safety and passenger disembarkation times during an evacuation; and identify effective countermeasures to reduce any determined risks.

3.18 GROUND COLLISION AND EVACUATION

3.18.1 In May 2019, a de Havilland DHC-8-300 on a scheduled passenger flight from Toronto to Sudbury, with 52 passengers, three crew members and one additional flight deck occupant on board, collided on the apron with a fuel tanker after returning to the Toronto International Airport. The aircraft was evacuated. One crew member and 14 passengers, including one lap-held infant, received minor injuries; the aircraft was damaged beyond repair.

3.18.2 One passenger unfastened her seatbelt and was thrown to the floor by the impact. Following the collision, the cabin crew commanded the passengers to remain seated. Despite the command, some passengers unfastened their seat belts and stood up. While the propellers were still turning, two passengers opened window exits. After shutting down the engines, the captain gave an evacuation order over the PA system, but neither the cabin crew members nor passengers noted hearing the announcement.

3.18.3 The cabin crew noted increasing pressure and verbal threats from passengers to open the emergency door. When opening the main door, and upon smelling fuel the cabin crew decided to proceed with an evacuation and began shouting evacuation commands. Many passengers ignored commands to leave their belongings behind. Two of the passenger injuries occurred as a result of jumping out of the rear window exit.

3.18.4 Of the three infants on board the aircraft, two were being held on the lap of a family member, and one was being held in a soft-structured baby carrier attached to the mother. Both unrestrained infants were ejected from the arms of the adults carrying them. One infant hit the seat in front before falling into the aisle, receiving substantial bruising. The other infant collided with the neighbouring passenger but was not injured. The infant held in the carrier was not injured but the adult received injuries to the back and ribcage due to twisting forces from the momentum of the infant in the carrier.

3.18.5 The TSB issued a series of “findings as to risk” in the accident report which included, but were not limited to:

a) if passengers open emergency exits before the evacuation order is given, the suitability of the exit may not be assessed and a premature evacuation could occur, increasing the risk of passenger being exposed to hazardous conditions;

b) passengers attempting to retrieve personal belongings during and evacuation will impede or delay passengers and crew exiting the aircraft, increasing the risk of injury or death;

c) if passengers remove their seat belts while the aircraft is in motion, or while the seat belt sign is illuminated, they put themselves and others at risk of injury; and

d) if new regulations on the use of CRS are not implemented, lap-held infants and young children are exposed to undue risk and are not provided with a level of safety equivalent to that of adult passengers. The TSB has made recommendations in previous accident reports regarding CRS on commercial aircraft (refer to 3.15.4 a)).

3.19 CABIN SAFETY IMPROVEMENTS

3.19.1 The findings from past accident investigations (including those cited in this chapter) have led to significant improvements in the fields of cabin safety and aircraft manufacturing. These include, but are not limited to, the following aspects:

a) 16G seats;

b) fire retardant materials;

c) floor proximity emergency escape path marking;

d) lavatory smoke detectors and fire extinguishers;

e) the low heat/smoke release tests;

f) radiant heat resistant evacuation slide;

g) exit design;

h) distances between emergency exits;

i) cargo compartment fire detection/suppression; and

j) thermal/acoustic insulation.

3.19.2 Detailed information on each of these improvements is presented in 3.20 to 3.29.

3.20 16G SEATS

In 1988, 16G dynamic standards for all passenger and cabin crew seats became applicable. These standards improved protection against serious head injury (where head contact with seats or other structures occurred). The 16G seats also protect crew members from serious chest injury when upper-torso restraints are used, and prevent occupants from being trapped in their seats due to excessive seat deformation.

3.21 FIRE RETARDANT MATERIALS

Improved standards in resistance to flammability for passenger and cabin crew seat cushions were established in 1984. Cushion material now provides 40 to 60 seconds of additional time for aircraft evacuation compared to the previously used cushions. Improved test standards for large surface area panels (for example, ceilings, walls, galleys, overhead bins, and partitions) have been implemented since 1985 to delay the onset of a cabin flashover (flash fire) event. The improved standards give passengers and crew members more time to evacuate the aircraft after an accident. This improvement in cabin material flammability was demonstrated to delay flashover in the cabin.

3.22 FLOOR PROXIMITY EMERGENCY ESCAPE PATH MARKING

In 1986, floor proximity emergency escape path marking became a requirement to aid passengers by marking evacuation paths and identifying exits utilizing illumination sources close to the floor. This system is aimed at improving the evacuation rate under significant smoke conditions in the cabin.

3.23 LAVATORY SMOKE DETECTORS AND FIRE EXTINGUISHERS

Since 1986, all aircraft lavatories are required to be equipped with smoke detectors and, since 1987, automatic fire extinguishers in the waste paper bin in all aircraft lavatories.

3.24 LOW HEAT/SMOKE RELEASE TESTS

The requirement for aircraft cabin materials (for example, ceiling, sidewall, stowage bins, partitions) to meet low heat/smoke release tests help reduce heat and smoke in the aircraft.

3.25 RADIANT HEAT RESISTANT EVACUATION SLIDE

In 1983, changes made to Technical Standard Order (TSO) for emergency evacuation slides to incorporate a radiant heat test for slide material improved the ability of a slide to resist heat from a large fuel fire nearby.

3.26 EXIT DESIGN

The minimum width specified for the passageway from the aisle to the exit for aircraft with 60 or more passengers was modified to improve access to Type III exits. Egress rates through the exits were found to be faster than previous narrower passageways. Use of an Automatically Disposable Hatch (ADH), instead of the conventional Type III exit for new aircraft types, removes manual intervention to ensure that the hatch's final location after opening does not impede the evacuation path inside or outside the aircraft.

3.27 DISTANCES BETWEEN EMERGENCY EXITS

Since 1989, for aircraft with more than one passenger emergency exit on each side of the fuselage, no passenger emergency exit must be more than 60 feet from any adjacent passenger emergency exit on the same side of the same deck of the fuselage. This is meant to ensure adequate exits for passengers' use in an emergency. Exits are required to be distributed as uniformly as practicable, since this is considered to provide a reasonable seat-to-exit and exit-to-exit distance.

3.28 CARGO COMPARTMENT FIRE DETECTION/SUPPRESSION

In 1998, the Federal Aviation Administration (FAA) required that all large passenger aircraft have fire detection and suppression systems installed in all cargo compartments by March 2001. All existing Class D cargo compartments required an upgrade to Class C or Class E and all existing cargo smoke or fire detection systems required an update to meet the more stringent requirements (detection to occur within one minute). This rule affected aircraft in service and all newly manufactured aircraft.

3.29 THERMAL/ACOUSTIC INSULATION

New regulations on thermal/acoustic insulation were adopted following the accident described in 3.9. These regulations provide specific flammability standards for thermal/acoustic insulation materials typically installed on the fuselage of transport-category aircraft. These standards included the adoption of flammability test methods and criteria that specifically address flame propagation and entry of an external fire into the aircraft (burn through) under realistic fire scenarios. All aircraft manufactured after September 2005 had to install thermal/acoustic insulation materials complying with this rule. The new regulation also affected refurbishment and/or replacement of thermal/acoustic insulation materials in aircraft manufactured prior to September 2005.

Chapter 4

CABIN INVESTIGATOR

4.1 CABIN INVESTIGATOR QUALIFICATIONS AND RESPONSIBILITIES

4.1.1 The cabin investigator (CI) is a person responsible for examining and documenting the factors that affect the survival of occupants involved in accidents, incidents and occurrences involving safety violations. In addition to survival factors, the CI is responsible for determining factors that affect the safety of flight and contribute to an occurrence and its outcomes (such as change in an operator policy or procedure that is not supported by training). In the context of an accident or incident investigation, these factors are collectively referred to as "contributing factors".

4.1.2 The CI may be employed by a State, an operator, or an independent accident investigation authority. The content of this chapter can be adapted to any of these roles and/or capacities.

4.1.3 Recommended qualifications of the CI should include, but are not limited to:

a) ability to investigate, document and analyse issues pertaining to contributing factors in aircraft accidents and incidents;

b) current knowledge of, and experience in, evaluating:

1) aircraft cabin interior configuration and certification;

2) emergency equipment requirements, design and certification;

3) cabin crew safety and emergency procedures and related training;

4) cabin safety; and

5) occupant protection;

c) knowledge of:

1) survivability principles;

2) seats and restraint systems performance;

3) crashworthiness principles (e.g. structural integrity, impact energy absorption);

4) emergency response;

5) assisting evacuation means;

6) interior materials and flammability;

7) biomechanics and human tolerances;

8) factors that affect performance (e.g. behavioural, medical, operational, equipment design, or environmental);

9) current research on crashworthiness (e.g. research studies);

10) national regulations and international standards applicable to cabin safety subject areas; and

11) legislation from States regarding aviation disaster family assistance;

d) ability to:

1) collate, organize, write, edit and review detailed and comprehensive technical reports;

2) initiate special research projects, studies, and investigations concerning aviation safety;

3) identify safety issues and develop them into safety recommendations to promote aviation safety;

4) research and develop comprehensive, technical, and accurate position statements and responses to inquiries regarding contributing factors and aviation safety;

5) effectively motivate, challenge and direct others, and adapt leadership style to a variety of situations;

6) organize work, set priorities, determine resource requirements and determine short-term and long-term goals and strategies to achieve them;

7) provide effective leadership and manage a team; and

8) work effectively alone or as part of a team environment;

e) proficiency in using word processing software;

f) experience and ability to research, develop and conduct formal, technical briefings to a wide range of audiences including senior government officials; and

g) general fitness to meet the physical demands associated with the possible rigours of field work.

4.1.4 The CI's responsibilities may include, but are not limited to:

a) act as cabin safety expert during aircraft accident or incident investigations with special emphasis on cabin interior and emergency equipment design, safety and emergency procedures, cabin safety, occupant protection and related issues;

b) act as a resource for investigations into other survival factor issues that may be outside the area of primary expertise;

c) conduct surveys, special studies and investigations and develop proposed safety recommendations and testimony;

d) document, analyse and evaluate survival factors including, but not limited to, cabin safety and cabin crew training, occupant protection, airport operations and airport and community emergency management factors that may arise during an investigation;

e) determine requirements for special tests, studies and technical assistance that may be necessary in one or more aspects of a given investigation. Direct and monitor these special activities and evaluate their findings in terms of relevancy to contributing factors and occupant survivability;

f) develop a formal report including significant findings from the investigation in relation to cabin safety and survivability, together with the development of supporting documentation such as photographs, records, charts and diagrams;

g) ensure the report is timely, complete, logically presented and technically correct and accurately reflects the findings;

h) identify pertinent safety recommendations and contributing factors determinations;

i) participate as a member on technical panels in investigations involving survival issues;

j) prepare, or direct the preparation of, hearing exhibits and examine witnesses, if applicable; and

k) liaise with the appropriate authorities, as applicable.

4.2 CI TRAINING

4.2.1 CI training programmes should focus on the execution of tasks and the development of competencies listed in Appendix A and Appendix B, respectively, to this chapter. The ICAO competency framework consists of competencies, their description and observable behaviours. The CI task list is based on:

a) preparing for the investigation;

b) collecting data;

c) analysing data; and

d) presenting findings and recommendations.

4.2.2 Prior to the issuance of a CI qualification, all candidates should successfully complete a formal competency assessment in the role. The final assessment of CI competence should be made using an adapted competency model based on the ICAO competency framework presented in Appendix B to this chapter.

4.2.3 This chapter is written in the same format as the existing ICAO guidance material which addresses specific competency-based training and assessments. The CI tasks can be used in combination with the ICAO competency framework for CIs, to train and assess investigators through a competency-based approach. The following information is included for each task list in this chapter:

a) the recommended knowledge that the trainees should possess to conduct a specific task;

b) the reference material that is relevant during the training;

c) the training media under which the training should be conducted (e.g. classroom-based training versus simulated exercises);

d) the task list standards associated with the task to be performed. These are statements used to assess whether the required levels of performance have been achieved for a task; and

e) the competencies needed to support the task (defined in the appendix to this chapter).

4.2.4 General provisions for competency-based training and assessment, as well as a detailed description of the ICAO course development methodology, may be found in the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868). Additional guidance on accident investigator training may be found in the *Training Guidelines for Aircraft Accident Investigators* (Cir 298).

4.2.5 Sections 4.3 to 4.7 provide detailed guidance for the development of competency-based training and assessment for CIs.

4.3 AREA 1 — PREPARE FOR THE INVESTIGATION

4.3.1 Preparing for departure

Task 1.1: Conduct departure preparations

Sub-tasks:

1.1.1 Gather launch information.

1.1.2 Verify that the necessary documents are available and valid.

1.1.3 Verify that the required clothing is available and suitable for the physical environment.

1.1.4 Verify that all required inoculations and vaccinations are valid.

1.1.5 Verify that the investigation field kit is available, accessible and functional.

1.1.6 Verify that the necessary funds for the mission are available.

1.1.7 Follow a quick reference checklist, if applicable.

4.3.1.1 *Knowledge:*

a) the required launch information;

b) the documentation requirements for travel;

c) the clothing for the physical environment;

d) the required inoculations and vaccinations and their validity;

e) the investigation field kit (see Appendix C to this chapter);

f) funds for the mission; and

g) the quick reference checklist, if applicable (see Appendix D to this chapter).

4.3.1.2 *Reference material:* policies and procedures.

4.3.1.3 *Training media:*

a) classroom and/or computer-based training (including, for example, a role-playing exercise on conducting departure preparations); and

b) hands-on exercise on verifying documentation.

4.3.1.4 *Task list standards:*

a) describe how to gather launch information (e.g. number of occupants involved in the accident, aircraft status);

b) identify and list the necessary documents for travel and explain the method to validate necessary documents (e.g. passport, required travel documents, manual);

c) identify and list the clothing that is most suitable for the physical environment (e.g. hot or cold weather);

d) explain how to determine which inoculations and vaccinations are necessary;

e) identify how and where to obtain the required inoculations and vaccinations for the investigation site;

f) identify the location of the investigation field kit and explain the process to ensure its availability, accessibility and functionality;

g) explain the travel expense policy as applicable to the mission; and

h) explain where to obtain and demonstrate use of a quick reference checklist, if applicable.

4.3.1.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) leadership and teamwork;

d) problem solving and decision-making;

e) situation awareness and management of information; and

f) workload management.

4.3.2 Gathering documentation

Task 1.2: Gather documentation
Sub-tasks: 1.2.1 Establish a method of data collection. 1.2.2 Collect relevant operator records. 1.2.3 Collect relevant operator documentation. 1.2.4 Collect documentation relevant to the occurrence. 1.2.5 Collect other relevant documentation.

4.3.2.1 *Knowledge:*

a) method of data collection;

b) types of operator records;

c) types of operator documentation; and

d) what information other relevant documentation entails.

4.3.2.2 *Reference material:* policies and procedures.

4.3.2.3 *Training media:*

a) classroom and/or computer-based training (including, for example, a role-playing exercise on gathering documentation); and

b) hands-on exercise on verifying documentation.

4.3.2.4 *Task list standards:*

a) describe how to establish the method(s) of data collection (e.g. a formal request);

b) explain and identify which relevant operator records are needed for collection (e.g. cabin crew training records, minimum equipment list, cabin defect log, crew reports);

c) explain and identify which relevant operator documentation is needed for collection (e.g. operations manual, training programme content, aircraft specifications);

d) explain and identify which documentation is relevant to the occurrence (e.g. crew list, passenger manifest, cargo manifest); and

e) explain and identify how to collect other relevant documentation (e.g. State regulations and oversight of cabin records).

4.3.2.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) leadership and teamwork;

d) problem solving and decision-making;

e) situation awareness and management of information; and

f) workload management.

4.4 AREA 2 — COLLECT DATA

4.4.1 Self-protection

Task 2.1: Protect self while on site

Sub-tasks:

2.1.1 Use appropriate protective equipment, as required.

2.1.2 Follow the exposure control plan, as required.

2.1.3 Identify hazards and manage associated risks.

2.1.4 Communicate any concerns regarding the investigation site to the investigator-in-charge.

2.1.5 Clean and decontaminate equipment and materials, as appropriate.

2.1.6 Apply procedures for the containment and disposal of regulated waste.

2.1.7 Apply procedures for exposure incident, as required.

2.1.8 Apply procedures for critical incident stress response, if needed.

4.4.1.1 *Knowledge:*

a) protective equipment;

b) exposure control plan;

c) accident site hazard identification and risk management;

d) communication protocols of the investigation site;

e) process of cleaning and decontaminating equipment and materials;

f) containment and disposal of regulated waste;

g) procedures for exposure incident; and

h) procedures for critical incident stress response.

4.4.1.2 *Reference material:* policies and procedures.

4.4.1.3 *Training media:*

a) classroom and/or computer-based training; and

b) hands-on exercise on donning, using and removing appropriate protective equipment.

4.4.1.4 *Task list standards:*

a) identify and demonstrate how to use appropriate protective equipment;

b) describe the exposure control plan;

c) describe and demonstrate the applicable procedures to minimize and manage risks associated with hazards found on an accident site (e.g. blood-borne pathogens);

d) demonstrate the ability to communicate any concerns regarding the investigation site to the investigator-in-charge;

e) describe the procedures to clean and decontaminate equipment and materials;

f) describe how to apply procedures for the containment and disposal of regulated waste;

g) describe how to apply procedures for an exposure incident; and

h) describe how to apply procedures for critical incident stress response.

4.4.1.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) leadership and teamwork ;

d) problem solving and decision-making;

e) self-assessment;

f) situation awareness and management of information; and

g) workload management.

4.4.2 Documenting the cabin

Task 2.2: Document the cabin
Sub-tasks: 2.2.1 Establish methods of evidence documentation. 2.2.2 Examine evidence of damage, malfunctions and failures. 2.2.3 Examine evidence of utilization of systems and equipment in the cabin. 2.2.4 Inspect items and document with photographs, aircraft layout diagrams and notes. 2.2.5 Record findings/wreckage, as per established procedures.

4.4.2.1 *Knowledge:*

a) methods of evidence documentation;

b) damage, malfunctions and failures;

c) utilization of systems and equipment in the cabin; and

d) inspection and documentation protocols.

4.4.2.2 *Reference material:* policies and procedures.

4.4.2.3 *Training media:*

a) classroom and/or computer-based training; and

b) simulated exercise on documenting the cabin in a mock-up in a simulated crash site.

4.4.2.4 *Task list standards:*

a) describe how to establish the methods of evidence documentation (e.g. team allocation, camera and/or tools utilized, specific area delegation);

b) demonstrate the ability to identify and examine evidence of damage, malfunctions and failures;

c) demonstrate the ability to identify and examine evidence of utilization of systems and equipment in the cabin;

d) demonstrate the ability to inspect items and document with photographs, aircraft layout diagrams and notes (e.g. interior damage to the cabin); and

e) demonstrate and/or describe the procedures to identify and record findings/wreckage.

4.4.2.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) ethics and values;

d) leadership and teamwork;

e) problem solving and decision-making;

f) self-assessment; and

g) situation awareness and management of information

4.4.3 Conducting interviews

Task 2.3: Conduct the interview

Sub-tasks:

2.3.1 Gather and review the information related to events prior to, during, and following the occurrence.

2.3.2 Set a clear objective for the interview.

2.3.3 Determine a series of basic questions.

2.3.4 Coordinate the roles of other investigators in the interview, if applicable.

2.3.5 Verify that all required documentation and equipment are available.

2.3.6 Apply interview protocol.

2.3.7 Obtain permission from the hospital, if applicable.

2.3.8 State clear objectives and clarify roles for the investigation being undertaken.

2.3.9 Establish and maintain an atmosphere of open communication and mutual respect.

2.3.10 Recognize and be flexible and supportive to the interviewee's needs.

2.3.11 Demonstrate effective facilitation.

2.3.12 Document information in an accurate, complete and detailed manner.

2.3.13 Manage time.

2.3.14 Prepare and facilitate the distribution of passenger questionnaires to gather information remotely.

4.4.3.1 *Knowledge:*

a) effective communication, both verbal and non-verbal;

b) basic questioning techniques;

c) the roles of other investigators during an interview;

d) required documentation and equipment for interviews; and

e) interview and facilitation protocol (e.g. active listening, generate content by questioning, provide structure by paraphrasing).

4.4.3.2 *Reference material*: policies and procedures.

4.4.3.3 *Training media:*

a) classroom and/or computer-based training; and

b) simulated exercise on preparing an interview and interviewing witnesses.

4.4.3.4 *Task list standards:*

a) identify how to gather and review the information related to events prior to, during, and following an occurrence, in preparation for an interview;

b) describe how to set a clear objective for an interview;

c) describe the method to determine and demonstrate the ability to develop a series of basic questions;

d) demonstrate the ability to delegate and/or coordinate roles of other investigators in an interview, if applicable (e.g. who will ask questions or take notes?);

e) explain how to determine that all required documentation and equipment are available for an interview (e.g. cabin layout diagram, voice recorder);

f) demonstrate the ability to apply the interview protocol;

g) describe procedures for obtaining permission from the hospital(s) to visit and interview witnesses;

h) demonstrate the ability to communicate the objectives, as established, including the clarification of roles for the investigation being undertaken;

i) describe how to establish and maintain an atmosphere of open communication and mutual respect during an interview;

j) demonstrate the ability to recognize and maintain appropriate interaction with the interviewee;

k) demonstrate the ability to document information from an interview in an accurate, complete and detailed manner;

l) demonstrate time management skills during an interview; and

m) demonstrate the ability to prepare and facilitate the distribution of passenger questionnaires to gather information remotely.

4.4.3.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) ethics and values;

d) leadership and teamwork;

e) problem solving and decision-making;

f) self-assessment;

g) situation awareness and management of information; and

h) workload management.

4.5 AREA 3 — ANALYSE DATA

4.5.1 Conducting an analysis

Task 3.1: Conduct analysis

Sub-tasks:

3.1.1 Establish a method for data entry, reporting and analysis.

3.1.2 Conduct a preliminary analysis.

3.1.3 Compare performance to defined regulations, standards and procedures.

3.1.4 Conduct an in-depth analysis.

3.1.5 Make a decision on the results of the analysis (that is, determine/identify contributing factors).

3.1.6 Verify that analysis techniques are sufficient, valid, and reliable.

3.1.7 Develop findings.

3.1.8 Develop recommendations.

3.1.9 Maintain confidentiality of the investigation.

4.5.1.1 *Knowledge:*

a) methods for reporting and analysis of preliminary and in-depth data;

b) comparison of performance to defined regulations, standards and procedures;

c) develop findings and recommendations based on determining and identifying contributing factors;

d) analysis techniques; and

e) confidentiality of the investigation.

4.5.1.2 *Reference material:* policies and procedures.

4.5.1.3 *Training media:*

a) classroom and/or computer-based training; and

b) hands-on exercise on conducting an analysis.

4.5.1.4 *Task list standards:*

a) describe how to establish a method for documenting and analysing data;

b) demonstrate the ability to conduct a preliminary and an in-depth analysis adhering to defined regulations, standards and procedures;

c) describe the method to verify that analysis techniques are sufficient, valid, and reliable;

d) demonstrate how to develop findings based on determining and identifying contributing factors; and

e) demonstrate how to develop recommendations (e.g. improvements to procedures or equipment).

4.5.1.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) ethics and values;

d) leadership and teamwork;

e) problem solving and decision-making;

f) self-assessment; and

g) workload management.

4.6 AREA 4 — PRESENT FINDINGS AND RECOMMENDATIONS

4.6.1 Producing reports on findings and recommendations

Task 4.1: Produce a report on the findings and recommendations

Sub-tasks:

4.1.1 Gather all the relevant information on the findings and recommendations.

4.1.2 Prepare a written report.

4.1.3 Communicate the findings and recommendations to relevant stakeholders, as per established procedures.

4.6.1.1 *Knowledge:*

a) information on findings and recommendations of investigations;

b) format of investigations' written reports; and

c) communication and dissemination procedures.

4.6.1.2 *Reference material:* policies and procedures.

4.6.1.3 *Training media:*

a) classroom and/or computer-based training; and

b) hands-on exercise on preparing a written report.

4.6.1.4 *Task list standards:*

a) describe the method of gathering information on an investigation's findings and recommendations;

b) demonstrate the ability to prepare a written report on an investigation; and

c) identify the process to disseminate the investigation's findings and recommendations to relevant stakeholders.

4.6.1.5 *Competencies:*

a) application of policies and procedures;

b) communication;

c) ethics and values;

d) leadership and teamwork;

e) problem solving and decision-making;

f) self-assessment; and

g) workload management.

Appendix A to Chapter 4

CABIN INVESTIGATOR TASKS

Area 1 — Prepare for the investigation	
The investigator should be prepared to conduct a thorough investigation.	
Task	*Sub-task*
1.1 Conduct departure preparations	1.1.1 Gather launch information.
	1.1.2 Verify that the necessary documents are available and valid.
	1.1.3 Verify that the required clothing is available and suitable for the physical environment.
	1.1.4 Verify that all required inoculations and vaccinations are valid.
	1.1.5 Verify that the investigation field kit is available, accessible and functional.
	1.1.6 Verify that the necessary funds for the mission are available.
	1.1.7 Follow a quick reference checklist, if applicable.
1.2 Gather documentation	1.2.1 Establish a method of data collection.
	1.2.2 Collect relevant operator records.
	1.2.3 Collect relevant operator documentation.
	1.2.4 Collect documentation relevant to the occurrence.
	1.2.5 Collect other relevant documentation.

Area 2 — Collect data	
The investigators should gather all the necessary data enabling them to analyse the occurrence.	
Task	*Sub-task*
2.1 Protect self while on site	2.1.1 Use appropriate protective equipment, as required.
	2.1.2 Follow the exposure control plan, as required.
	2.1.3 Identify hazards and manage associated risks.

	2.1.4 Communicate any concerns regarding the investigation site to the investigator-in-charge.
	2.1.5 Clean and decontaminate equipment and materials, as appropriate.
	2.1.6 Apply procedures for the containment and disposal of regulated waste.
	2.1.7 Apply procedures for exposure incident, as required.
	2.1.8 Apply procedures for critical incident stress response, if needed.
2.2 Document the cabin	2.2.1 Establish methods of evidence documentation.
	2.2.2 Examine evidence of damage, malfunctions and failures.
	2.2.3 Examine evidence of utilization of systems and equipment in the cabin.
	2.2.4 Inspect items and document with photographs, aircraft layout diagrams and notes.
	2.2.5 Record findings/wreckage, as per established procedures.
2.3 Conduct the interview	2.3.1 Gather and review the information related to events prior to, during, and following the occurrence.
	2.3.2 Set a clear objective for the interview.
	2.3.3 Determine a series of basic questions.
	2.3.4 Coordinate the roles of other investigators in the interview, if applicable.
	2.3.5 Verify that all required documentation and equipment are available.
	2.3.6 Apply interview protocol.
	2.3.7 Obtain permission from the hospital, if applicable.
	2.3.8 State clear objectives and clarify roles for the investigation being undertaken.
	2.3.9 Establish and maintain an atmosphere of open communication and mutual respect.
	2.3.10 Recognize and be flexible and supportive to the interviewee’s needs.
	2.3.11 Demonstrate effective facilitation.
	2.3.12 Document information in an accurate, complete and detailed manner.
	2.3.13 Manage time.
	2.3.14 Prepare and facilitate the distribution of passenger questionnaires, to gather information remotely.

Area 3 — Analyse data	
The investigator should analyse the data collected to determine the factors affecting the safety of flight and survival of persons involved in the occurrence, including the causes of injuries sustained by occupants of the aircraft involved (or by other affected persons) and damage sustained by the aircraft, as well as examine operator procedures, search and rescue, crashworthiness, equipment design, emergency response and escape, and training.	
Task	*Sub-task*
3.1 Conduct analysis	3.1.1 Establish a method for data entry, reporting and analysis.
	3.1.2 Conduct a preliminary analysis.
	3.1.3 Compare performance to defined regulations, standards and procedures.
	3.1.4 Conduct an in-depth analysis.
	3.1.5 Make a decision on the results of the analysis (that is, determine/identify contributing factors).
	3.1.6 Verify that analysis techniques are sufficient, valid and reliable.
	3.1.7 Develop findings.
	3.1.8 Develop recommendations.
	3.1.9 Maintain confidentiality of the investigation.

Area 4 — Present findings and recommendations	
The investigator should verify that findings are communicated appropriately, to meet the needs of the investigation.	
Task	*Sub-task*
4.1 Produce a report on the findings and recommendations	4.1.1 Gather all the relevant information on the findings and recommendations.
	4.1.2 Prepare a written report.
	4.1.3 Communicate the findings and recommendations to relevant stakeholders, as per established procedures.

Appendix B to Chapter 4

ICAO COMPETENCY FRAMEWORK FOR CABIN INVESTIGATORS

Note 1.— The competencies and observable behaviours in the table are not listed according to any pre-defined priority. Observable behaviours may include but are not limited to the observable behaviours listed in the table below.

Note 2.— Observable behaviours are performed to a criterion, e.g. accurately or correctly, generally not stated.

Competency	*Description*	*Observable behaviours (OB)*
Application of policies and procedures	Identifies and applies appropriate policies and procedures in accordance with published instructions and applicable regulations.	OB 1.1 Identifies where to find policies and procedures OB 1.2 Applies relevant policies and procedures OB 1.3 Applies procedures or adapts them to ensure a safe work environment OB 1.4 Operates tools and equipment OB 1.5 Complies with applicable policies and procedures
Communication	Effectively conveys, receives and understands information in oral, written and non-verbal modes.	OB 2.1 Verifies that the recipient is prepared to receive information OB 2.2 Confirms that the information conveyed was received and accurately understood OB 2.3 Listens actively and objectively without interrupting OB 2.4 Checks own understanding of communication (e.g. repeats or paraphrases, asks additional questions) OB 2.5 Presents appropriate and accurate information in a clear, concise and compelling manner in all media OB 2.6 Ensures information is fact-based and not based on opinion OB 2.7 Adapts content, style, tone and media of communication to suit the target audience, including cultural considerations and to promote dialogue OB 2.7 Understands concerns of stakeholders OB 2.8 Maintains open lines of communication with management, stakeholders and colleagues OB 2.9 Communicates complex issues clearly and credibly with diverse audiences OB 2.10 Delivers difficult or unpopular messages with clarity, tact and diplomacy
Ethics and values	Demonstrates integrity, transparency, openness, respect and fairness and considers the consequences when	OB 3.1 Treats others respectfully, fairly and objectively regardless of differences OB 3.2 Answers questions truthfully without embellishment or attempt to cover up a lack of knowledge

Competency	*Description*	*Observable behaviours (OB)*
	making a decision or taking action. Acts consistently in accordance with fundamental values of the organization.	OB 3.3 Maintains privacy and confidentiality when appropriate OB 3.4 Manages professional relationships with appropriate role boundaries OB 3.5 Adheres to professional codes of conduct when taking action and making decisions OB 3.6 Takes responsibility for own actions OB 3.7 Identifies and mitigates conflict of interest situations OB 3.8 Acts with integrity OB 3.9 Uses resources of the organization and aviation entities in a cost-conscious manner OB 3.10 Demonstrates the values of the organization
Leadership and teamwork	Collaborates up, down and across the organization to foster and promote a clear vision and common goals. Energizes others to achieve goals and positive results.	OB 4.1 Encourages team participation and open communication OB 4.2 Demonstrates initiative and provides direction when required OB 4.3 Engages others in planning OB 4.4 Considers inputs from others OB 4.5 Gives and receives feedback constructively OB 4.6 Addresses and resolves conflicts and disagreements in a constructive manner OB 4.7 Exercises decisive leadership when required OB 4.8 Accepts responsibility for decisions and actions OB 4.9 Carries out instructions when directed OB 4.10 Identifies deviations and hazards and applies effective intervention strategies OB 4.11 Manages cultural and language challenges OB 4.12 Liaises with the appropriate authority
Problem solving and decision-making	Solves issues of varied levels of complexity, ambiguity and risk. Makes timely decisions that take into account relevant facts, tasks, goals, constraints, risks and conflicting points of view.	OB 5.1 Seeks accurate and adequate information from appropriate sources OB 5.2 Identifies and verifies what and why things have gone wrong, if appropriate OB 5.3 Perseveres in working through problems OB 5.4 Identifies and considers appropriate options OB 5.5 Applies appropriate and timely decision-making techniques OB 5.6 Monitors, reviews and adapts decisions as required OB 5.7 Adapts when faced with situations where no guidance or procedure exists OB 5.8 Demonstrates resilience when encountering an unexpected event
Self-assessment	Evaluates self-effectiveness and sustains personal development to continuously improve performance.	OB 6.1 Remains open to feedback OB 6.2 Seeks feedback on the investigation and their own performance from peers OB 6.3 Improves performance based on accurate and balanced feedback OB 6.4 Improves performance through self-evaluation of the effectiveness of actions

Competency	*Description*	*Observable behaviours (OB)*
		OB 6.5 Maintains self-control in challenging situations OB 6.6 Responds as needed to deal with the demands of challenging situations
Situation awareness and management of information	Perceives, comprehends and manages information and anticipates its effect on the situation.	OB 7.1 Monitors and assesses the general environment as it may affect the situation OB 7.2 Validates the accuracy of information and checks for errors OB 7.3 Maintains awareness of the people involved in or affected by the situation and their capacity to perform as expected OB 7.4 Develops effective contingency plans based upon risks associated with threats and errors OB 7.5 Responds to indications of reduced personal situation awareness
Workload management	Maintains available workload capacity by prioritizing and distributing tasks using appropriate resources	OB 8.1 Plans, prioritizes and monitors tasks through the utilization of all available resources OB 8.2 Manages time efficiently when carrying out tasks OB 8.3 Offers and gives assistance OB 8.4 Delegates tasks OB 8.5 Seeks and accepts assistance, when appropriate OB 8.6 Monitors, reviews and cross-checks actions OB 8.7 Verifies that tasks are completed to the expected outcome OB 8.8 Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks

Appendix C to Chapter 4

INVESTIGATION FIELD KIT

The investigation field kit should contain sufficient equipment to enable an examination of the wreckage, the plotting of impact points and wreckage patterns, parts identification and the recording of observations. The list of items in this appendix provides guidance on the type of equipment which may be selected for the investigation field kit, specific to the tasks of a cabin investigator (CI). The CI should pre-pack an accident investigation field kit and some essential personal items. Some suggested items for inclusion in the CI's investigation field kit are listed in this appendix.

1. GENERAL

a) State/operator/airport personnel identification;

b) necessary travel documents such as passports, visas and inoculation records, if applicable;

c) current phone numbers for the event notification contact list;

d) relevant documentation (e.g. regulations, accident/incident investigation manual, checklists, report forms);

e) relevant operator documentation (e.g. the operator's current aircraft interior diagrams and the current safety briefing card for the affected aircraft, an up-to-date operations manual/cabin crew portion or stand-alone cabin crew operations manual (CCOM), copies of the operator's safety announcements, copies of the operator's current emergency procedures and other relevant forms such as operator accident report forms); and

f) emergency funds.

2. DOCUMENTATION EQUIPMENT

a) General map of the accident area;

b) measuring tape;

c) thumb tacks and adhesive tags; and

d) paper, pens, pencils, permanent markers, highlighters and clipboards.

3. TOOLS AND SAMPLING MATERIALS

a) Multi-purpose knife;

b) resealable plastic bags (multiple sizes) for collecting samples or for personal use; and

c) waterproof flashlight and spare batteries.

4. MISCELLANEOUS ITEMS

a) A pair of utility gloves, such as leather or Kevlar, and a pair of lighter gloves;

b) suitable boots providing protection against crushing and piercing injuries;

c) personal protective equipment against blood-borne pathogens until on-site supplies can be utilized (e.g. dust/mist respirator or mask, goggles, impervious jumpsuit, exam gloves, anti-microbial wipes or antiseptic gels);

d) the appropriate type (cold or hot) and amount (7-10 days) of clothing for the accident site terrain and weather (both for on-site investigation and/or witness interviews). Head protection for cold or hot weather is also important;

e) a camera with flash, film or multiple memory cards and batteries; appropriate cables for transferring photos from the camera;

f) an audio recording device and spare batteries;

g) a laptop computer, all associated cables, plug adaptors and a memory stick for information sharing;

h) a mobile phone with international calling capability and all associated cables;

i) universal chargers and adapters;

j) personal toiletries and any necessary medication/prescriptions, ear plugs, extra prescription glasses, backup supplies of feminine hygiene products, etc.;

k) perishables shopping list: healthy snacks, hand/foot warmers, sunscreen, insect repellent, wipes, etc.; and

l) first-aid kit (FAK).

Note.— For a list of personal protective equipment against biological hazards, refer to the Manual of Aircraft Accident and Incident Investigation *(Doc 9756), Part I —* Organization and Planning*, Appendix to Chapter 5.*

Appendix D to Chapter 4

QUICK REFERENCE CHECKLIST

As part of the departure preparations, the cabin investigator (CI) should follow a quick reference checklist. Below is an example of such a checklist.

Have you:

a) applied the appropriate chain of command, as part of the emergency notification procedure or process?

b) received authorization to participate in the accident investigation from the appropriate authority/operator?

c) obtained access to cash and/or a major credit card?

d) arranged to be released from your regular duties (e.g. out of office or flight duty)?

e) arranged for travel to the accident location?

f) arranged for hotel accommodations?

g) verified the on-site operational base location?

h) packed your investigation field kit?

i) gathered event notification details?

j) verified the location of survivors for possible interviews?

Chapter 5

ACCIDENT INVESTIGATION

5.1 CABIN SAFETY ASPECTS IN ACCIDENT INVESTIGATION

5.1.1 This chapter addresses specific points that should be covered when investigating cabin safety aspects in different types of occurrences. The cabin safety aspects of an investigation include the following:

a) survival of occupants, including damage to the aircraft cabin and other factors that played a role in the occurrence;

b) national regulations relevant to cabin safety;

c) operator policies and procedures relevant to cabin safety;

d) cabin crew safety training;

e) aircraft systems and equipment relevant to cabin crew duties (this may include aircraft design and manufacturing aspects, crashworthiness, and survivability); and

f) human performance (related to cabin crew members and passengers).

5.1.2 The effectiveness of an investigation is dependent on close collaboration with other investigator groups. For example, the Survival Factors Group, which looks at cabin safety, may consult with the Structures Group, which looks at the airframe wreckage and the accident scene, when looking at the survival of occupants.

5.1.3 General guidance on survival factors, as well as the investigation of accidents, is presented in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756), Part III — *Investigation*.

5.2 ANALYSIS OF INFORMATION SPECIFIC TO CABIN SAFETY

5.2.1 Upon receiving notification of an accident (whether by the State, the operator, or the media), the cabin investigator (CI) should obtain as many preliminary details as possible. This preliminary information should be captured in an occurrence summary. Any information available at the time of the preliminary report may change as more details become available. A sample occurrence summary template for use by the CI is presented in Appendix A to this chapter.

5.2.2 Information specific to cabin safety should be gathered and analysed in preparation for the drafting of the final report. This information includes:

a) general information related to the accident flight;

b) relevant documentation (from the operator, the State of the Operator and other sources);

c) aircraft (cabin specific) information;

d) human performance;

e) additional information; and

f) interviews.

5.2.3 Detailed guidance on each of these points is presented in 5.3 to 5.8. Additional information on writing the final report is presented in Chapter 7, Section 7.12.

5.3 GENERAL INFORMATION

The CI should gather general information related to the accident flight. General information includes the following categories:

a) flight information (such as date and time of the occurrence, flight number and location);

b) injuries to persons; and

c) meteorological conditions.

5.4 DOCUMENTATION

5.4.1 The CI should gather documentation from the following sources:

a) the operator;

b) the State of the Operator; and

c) other sources, such as the aerodrome where the accident occurred.

5.4.2 As part of the analysis, the CI should evaluate the operator's policies and procedures, relevant to the occurrence, and the actions expected of cabin crew members. Similarly, the operator's training programme should be evaluated to assess its content and adequacy in preparing cabin crew to respond to the occurrence. Additional operator documentation, such as training records for the personnel involved in the occurrence, rostered duties leading up to the accident flight (for at least the 72 hours prior to the accident), and log books related to the accident aircraft, may also provide insight into organizational factors that may have contributed to the occurrence and/or its outcome.

5.4.3 The investigation should expand beyond the operator and also examine the role of the State of the Operator. The CI should review pertinent regulatory requirements and oversight documentation, such as surveillance reports, to determine the adequacy of existing regulations and the effectiveness of the State's oversight activities over the operator prior to the accident. These include: the approval of manuals and training content, exemptions issued, inspections conducted and any relevant findings/observations.

5.4.4 In addition, the CI should review other documents, such as the aerodrome certification manual (which typically includes the aerodrome emergency response plan), if the accident occurred at or in the vicinity of an aerodrome, and medical and pathological records (which provide factual information such as cause of occupant's death).

5.5 AIRCRAFT (CABIN SPECIFIC) INFORMATION

5.5.1 Documenting the cabin of the accident aircraft is a key part of the investigation process. The CI should examine and record the condition of relevant aircraft systems, safety and emergency equipment (including if the required equipment was available, accessible and functional), and of the cabin in general (floor, ceiling panels, seats, etc.).

5.5.2 The analysis should focus on the reasons for failure, damage or malfunction of structures, systems/equipment, or their components, and evaluate how they affected the ability of cabin crew members to carry out their duties and responsibilities, and the survivability of occupants involved in the occurrence. This process may require the testing of parts. Cabin documentation should include pertinent manufacturer information and model/part numbers for components (for example, seats, seat belts, slides). The CI should use tables to facilitate the on-site tabulation of systems or equipment-related data, which may be included in the report. Table 5-1 presents an example of such a table for aircraft components' data.

Table 5-1. Example of exit and slide data tabulation (courtesy of Boeing)

Door	*Exit condition*	*Girt bar*	*Slide condition*	*Slide inflation*	*Power assist*	*Other*
1 Right	Found open. Burn damage on bustle. Handle position 11:00.	Attached to door. Handle position 11:00.	Found partially deployed. Burn damage to slide skirt near girt bar. Inflator baffles closed.	Gauge indicated pressure bottle was low or discharged (red).	Gauge indicated pressure bottle was low or discharged (red).	Exit area burned out. Sill height 7'11". Aircraft leaning approx. 7 degrees to right
1 Left	…					

5.6 HUMAN PERFORMANCE

5.6.1 As part of the analysis, the CI should evaluate how cabin crew members performed during the occurrence. The human performance analysis focuses on pertinent factors, which may be grouped as follows:

a) operational factors, including aspects such as: cabin crew member's knowledge of systems and equipment, their experience level and proficiency, crew compatibility, supervision/command and control relationships, operational pressure, etc.;

b) organizational factors, including aspects such as: crew selection, aircraft qualifications (how many aircraft model qualifications a cabin crew member may hold at one time), training, operator procedures and processes (including scheduling and reporting of fatigue risk), etc.;

c) task-related factors, including aspects such as: task components (number, duration, etc.), workload tempo/saturation, judgment and decision-making, situation awareness, distractions, etc.; and

d) system and equipment factors, including aspects such as: design and location of equipment, lighting, inadvertent operation, confusion of controls/switches, suitability of cabin crew clothing, etc.

5.6.2 The analysis should also evaluate how passengers performed during the occurrence. The CI should focus on:

a) passengers' actions and responses during pre-flight activities (e.g. listening to safety briefings, reading the safety briefing card);

b) passengers' behaviour and reactions during the occurrence (e.g. their understanding of crew member instructions during an emergency, difficulties experienced, assisting crew in opening exits); and

c) post-accident actions, including responses to instructions from personnel such as rescue and firefighting (RFF) and actions taken to increase survivability (e.g. seeking assistance or helping other survivors).

5.6.3 Information regarding human performance is typically gathered from interviews with crew members, passengers or other witnesses. During the interview process, the CI should attempt to confirm what actions and conditions the crew members and passengers were experiencing during the occurrence. In fatal accidents, autopsies and reconstruction of crew actions from cockpit voice recordings and air traffic control tapes may provide indicators to flight and cabin crew actions.

5.6.4 Detailed guidance on human performance analysis is presented in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756), Part III – *Investigation*, Chapter 16 – *Investigating Human Factors*.

5.7 ADDITIONAL INFORMATION

5.7.1 The analysis should address additional information that can provide insight into cabin safety aspects or survival factors. The CI should gather information regarding post-accident activities, such as emergency response and search and rescue. The analysis should examine how RFF responded to, and managed, the occurrence. If search and rescue operations were undertaken following the accident, the analysis should also focus on how the operations responded to, and managed, the occurrence.

5.7.2 Other pertinent information that may be gathered includes characteristics of the crash site, which may have affected survivability (such as mountainous terrain, remote area). If the occurrence took place at an aerodrome, additional information concerning the aerodrome, its characteristics or any special features may also be useful in evaluating the event (for example, the presence of arresting systems, which reduce the damage to the aircraft during a runway excursion and help increase survivability).

5.8 INTERVIEWS

5.8.1 Interviewing witnesses assists the CI with the following:

a) gaining an understanding of what occurred;

b) developing recommendations related to operator procedures, fatigue management (e.g. scheduling practices), training, safety and emergency equipment, aircraft systems; and

c) confirming, clarifying or supplementing information obtained from other sources.

5.8.2 Objectives of the interview include:

a) learning what happened to the person(s) being interviewed;

b) gathering information regarding the accident sequence; and

c) learning about the actions of the crew members and passengers involved in the occurrence.

5.8.3 The CI conducting the interview should gather information which is accurate, complete and as detailed as possible. Guidelines on interview techniques are contained in Appendix 2 of Human Factors Digest No. 7 (Cir 240), *Investigation of Human Factors in Accidents and Incidents*.

5.8.4 Cabin crew should be interviewed as soon as possible after the occurrence. They should also provide a written statement to the CI. Crew members may be reinterviewed at a later date, if deemed necessary. It is important that the cabin crew be provided with an environment where they may provide information freely and without coercion. The cabin crew member interview should address the following points:

a) general information;

b) pre-flight/in-flight activities;

c) occurrence information;

d) training;

e) information specific to the type of occurrence (e.g. evacuation); and

f) any additional comments that the cabin crew member may wish to make, such as further information that he/she thinks may assist in the investigation.

5.8.5 Passengers should be interviewed as soon as possible after the occurrence. They may be reinterviewed at a later date, if deemed necessary. Questionnaires may be developed and sent to passengers as a means to gather information remotely. The passenger interview should address the following points:

a) personal data;

b) pre-flight preparations;

c) occurrence information;

d) information specific to the type of occurrence; and

e) any additional comments that the passenger may wish to make, such as further information that he/she thinks may assist in the investigation.

5.8.6 Systems failures may require interviews with maintenance and ground service personnel. The CI may also consider interviewing flight crew members, deadheading and other off-duty crew, cabin crew supervisors, instructors, RFF personnel, witnesses, next of kin, etc., to gather additional pertinent information.

5.8.7 Detailed guidance on cabin crew member and passenger interviews, developed in collaboration with ISASI, is presented in Appendix B to this chapter. Not all items listed in the guidance may need to be covered during an interview. The CI may use the guidance presented in the appendix to ensure all the relevant items are addressed during the interview process, but may choose to omit certain questions, based on the nature of the occurrence and the complexity of the investigation.

5.8.8 An example of a questionnaire to assist in assessing passenger brace positions and potential correlations to injuries, developed in collaboration with IBRACE, is presented in Appendix H to this chapter.

5.9 TYPES OF OCCURRENCES

5.9.1 Events which are classified as accidents, as per ICAO's definition, may involve the following types of occurrences:

a) evacuation;

b) ditching or inadvertent water contact;

c) fire, smoke, and/or fumes;

d) turbulence;

e) decompression;

f) aircraft damage; and

g) fatal or serious injuries (miscellaneous).

5.9.2 When the injuries to persons are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew, these occurrences are not considered accidents, as per the ICAO definition, for the purpose of an accident investigation.

5.9.3 Sections 5.10 to 5.16 present detailed guidance on the investigation of cabin safety aspects, specific to the types of occurrences noted in 5.9.1. Not all items listed in the guidance may need to be covered during an investigation. The CI may use the guidance presented in this chapter to ensure all the relevant items are addressed but may choose to omit certain parts, based on the nature of the occurrence and the complexity of the investigation. Detailed guidance on the content of cabin crew training for the types of occurrences presented in 5.9.1 may be found in the *Cabin Crew Safety Training Manual* (Doc 10002).

Note.— If an occurrence involves an aircraft operated without cabin crew, the investigation should address flight crew procedures and performance in regards to cabin safety aspects (e.g. pilots' role during the passenger evacuation).

5.10 EVACUATION

5.10.1 An evacuation is an occurrence where passengers and/or crew leave an aircraft via slides, emergency exits, or gaps in the fuselage, usually initiated in life threatening or catastrophic events. An evacuation is classified as an accident if any passengers and/or crew members sustain fatal or serious injury as a result of the occurrence. Factors that influence an evacuation include, but are not limited to:

a) actions by flight and cabin crew members;

b) aircraft systems and equipment;

c) environmental conditions; and

d) post-accident response.

5.10.2 The investigation of an evacuation should reconstruct the sequence of events while focusing on the following aspects, in as much detail as possible:

a) pre-flight activities — any pre-flight activity which is related to minimizing the risk of injuries in the event of an evacuation. This includes information provided to passengers needing special attention, passenger safety briefings and the safety briefing card, as well as the assignment of emergency exit row seats;

b) pre-evacuation actions and cabin preparation:

1) how and when occupants (crew members and/or passengers) became aware of an abnormal or emergency situation;

2) in the event of an anticipated emergency, how the cabin crew prepared the passengers and the cabin for landing/impact and how passengers responded; and

3) any preparation taken by passengers related to increasing survivability in the event of an evacuation (e.g. identifying the closest exits);

c) during the evacuation sequence (from the moment the aircraft comes to a halt until all occupants exit the aircraft, if possible):

1) damage sustained by the aircraft/in the cabin which affected the evacuation;

2) functionality and effectiveness of exits, assisting evacuation means, systems, and equipment used by cabin crew to assist in the evacuation;

3) crew member and passenger actions;

4) internal and external environmental conditions or obstacles experienced by occupants trying to escape the aircraft; and

5) injuries to crew members or passengers and impact on the evacuation;

d) post-evacuation actions (once the evacuation has ended; this generally involves responses by persons outside the aircraft, such as firefighters extracting occupants trapped in the wreckage):

1) crew member and passenger actions;

2) emergency response;

3) search and rescue; and

4) survival; and

e) unanticipated emergency (e.g. runway excursion following a rejected take-off) – the information collected would be similar to that above but may not include anticipated pre-evacuation actions or cabin preparations. The information should still be collected to document procedures, equipment and actions.

5.10.3 As part of the investigation, it should be determined if the cabin crew members acted in accordance with their operator’s policies, procedures and approved training programmes. The CI should capture if these policies and procedures were followed and if they were effective in the preparation of the cabin crew to respond appropriately to the situation. Additionally, the cabin crew safety training programme content, regarding abnormal and emergency procedures, specific to anticipated/unanticipated emergency landing and evacuation, should also be reviewed including any specific hands-on and simulated exercises. Other sources of information, such as operator records, may also be analysed to determine contributing factors (for example, the cabin defect log).

5.10.4 Appendix C to this chapter presents guidance on the aspects that should be analysed when investigating an accident involving an evacuation.

5.11 DITCHING OR INADVERTENT WATER CONTACT

5.11.1 A ditching is a planned event in which flight crew knowingly make an emergency landing on water (excluding float plane landings in normal water landing). An inadvertent water contact occurrence involves an unintentional landing on a body of water.

5.11.2 The investigation of a ditching or inadvertent water contact is similar to that of an evacuation. In addition to the points covered in 5.10, the investigation should focus on water survival aspects, including but not limited to, the following:

a) aircraft integrity, buoyancy and availability of exits (including damage sustained during water contact and aircraft flotation time);

b) environmental characteristics (e.g. water temperature and the amount of time survivors spent in it);

c) whether the aircraft was equipped for extended overwater flight;

d) availability of equipment required for flights over water and appropriateness for the end-user (e.g. infant life jacket);

e) use of life jackets (including difficulties in retrieving, donning and inflation) or other means of flotation;

f) availability and operation of life-rafts/slide-rafts; and

g) review of the cabin crew safety training programme content, regarding abnormal and emergency procedures, specific to anticipated/unanticipated ditching and evacuation on water, including any specific exercises related to such training.

5.11.3 Appendix D to this chapter presents guidance on the aspects that should be analysed when investigating an accident involving a ditching or inadvertent water contact.

5.12 FIRE/SMOKE/FUMES

5.12.1 This category of occurrence involves on-board fire, smoke and/or fumes, in flight or on the ground, which are not the result of impact. The fire/smoke/fumes category includes:

a) fire/smoke/fumes due to a combustive explosion from an ignition source (including from dangerous goods in the cabin or the cargo hold);

b) fire/smoke/fumes from system/component failures/malfunctions in the flight deck, cabin or cargo area; and

c) fumes contaminating the outside air fraction of the ventilation air supplied to the cabin and/or flight deck.

5.12.2 A fire, smoke and/or fumes event is classified as an accident if:

a) any passengers and/or crew members sustain fatal or serious injury as a result of fire/smoke/fumes; and/or

b) the aircraft sustains damage or structural failure which meets ICAO's definition of an accident.

5.12.3 The investigation of a fire/smoke/fumes event should reconstruct the sequence of events while focusing on the following aspects in as much detail as possible:

a) pre-flight activities and pre-fire/smoke/fumes actions — tasks conducted by the cabin crew prior to/during the flight to detect and eliminate fire hazards (e.g. cabin surveillance to identify/monitor potential sources of fire);

b) during the fire/smoke/fumes:

1) how and when occupants became aware of the fire/smoke/fumes, including who first became aware of the situation (that is, a passenger or crew member);

2) what activities were taking place in the cabin at the time (e.g. meal service, clean up, rest);

3) what occupants witnessed or smelled, such as description of visible flames (colour and height), characteristics of the smoke (density and size) and odours in the cabin;

4) immediate cabin crew actions when they became aware of the fire/smoke/fumes;

5) suspected source of the fire/smoke/fumes at the time;

6) functionality and effectiveness of systems and equipment used by cabin crew to fight the fire and manage the situation (including accessibility of equipment, equipment used by cabin crew, and inoperative equipment);

7) flight crew and cabin crew actions (including firefighting procedures and communications procedures applied by the crew), as well as passenger actions;

8) any actions which are related to minimizing the risk of injuries in the event of fire/smoke/fumes (e.g. relocating equipment, such as oxygen bottles, alcoholic beverages and passenger baggage from the vicinity of the fire; relocating passengers; instructing passengers to breathe into a cloth; crowd control);

9) effect of fire/smoke/fumes on occupants (burns, difficulties seeing or breathing, other injuries) and their reactions;

10) injuries, including how and when they were treated;

11) increase, decrease or change in conditions in the cabin/flight deck as the occurrence progressed (e.g. locations in the cabin where smoke became more dense; level of visibility in the cabin or flight deck);

12) damage sustained by the aircraft/in the cabin, which affected the safety of occupants/flight; and

13) difficulties experienced during the occurrence (e.g. locating the source of the fire); and

c) post-fire/smoke/fumes actions:

1) crew members and passenger actions; and

2) emergency response upon landing (e.g. firefighting and medical services at the airport).

Note.— If the accident involved an anticipated emergency landing or ditching and/or an evacuation (on land or water), the investigation should address the aspects covered in 5.10 or 5.11 respectively.

5.12.4 As part of the investigation, it should be determined if the cabin crew members acted in accordance with their operator's policies, procedures, and approved training programmes. This includes managing the cabin/passengers and interacting with other flight and cabin crew members. The CI should capture if the operator's policies and procedures were followed and if they were effective in the preparation of the cabin crew to respond appropriately to the situation. Additionally, the cabin crew safety training programme content, particularly regarding firefighting, should also be reviewed, including any specific hands-on and simulated exercises. Other sources of information, such as operator records, may also be analysed to determine contributing factors (for example, the cabin defect log).

5.12.5 Appendix E to this chapter presents guidance on the aspects that should be analysed when investigating an accident involving fire/smoke/fumes.

5.12.6 Detailed guidance on analysing fires is presented in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756), Part III – *Investigation*, Chapter 11 – *Fire Pattern Investigation*. Detailed guidance on investigating fume events is presented in the *Guidelines on Education, Training and Reporting Practices related to Fume Events* (Cir 344).

5.13 TURBULENCE

5.13.1 This category of occurrence involves encounters with clear air, mountain wave, wave vortex, mechanical, and/or cloud-associated turbulence as well as turbulence encountered by aircraft when operating around or at buildings, structures and objects. A turbulence encounter is classified as an accident if:

a) any passengers and/or crew members sustain fatal or serious injury as a result of turbulence; and/or

b) the aircraft sustains damage or structural failure which meets ICAO's definition of an accident.

5.13.2 The investigation of a turbulence encounter should reconstruct the sequence of events while focusing on the following aspects, in as much detail as possible:

a) pre-flight/in-flight activities — any activity (pre-flight and/or during the flight) related to minimizing the risk of injuries in the event of a turbulence encounter. These include information provided to passengers via the safety briefing card and the safety demonstration, and safety announcements throughout the flight;

b) pre-turbulence actions:

1) if/how and when the cabin crew were notified of turbulence (e.g. call from the flight deck, seat belt sign being illuminated) and the extent of information given to them (e.g. time remaining until the turbulence encounter, anticipated intensity, need to interrupt or delay service);

2) how the cabin crew prepared the passengers and the cabin once they were advised or became aware of anticipated turbulence, and how passengers responded;

3) tasks conducted by the cabin crew prior to/during the flight, which are related to minimizing the risk of injuries in the event of a turbulence encounter (e.g. securing service equipment); and

4) tasks conducted by the flight crew prior to/during the flight, which are related to minimizing the risk of injuries in the event of a turbulence encounter (e.g. announcements regarding the use of seat belts and use of the fasten seat belt signs);

c) during the turbulence encounter:

1) when the aircraft encountered turbulence (including time, phase of flight and flight level);

2) what activities were taking place in the cabin at the time (e.g. meal service, clean up, rest);

3) location of each cabin crew member at the time of the encounter, including their activities immediately prior to the turbulence;

4) whether the seat belt sign was illuminated at the time the aircraft encountered turbulence;

5) the location of passengers who were not in their seats when turbulence began;

6) what announcements were made regarding the turbulence;

7) cabin crew and passenger actions;

8) the functionality of systems and equipment used by cabin crew to assist in minimizing the risk of injuries or damage (e.g. how audible was the PA instructing occupants to take their seats?);

9) the effect of turbulence on occupants and their reactions (including injuries and difficulties experienced by occupants trying to restrain themselves);

10) the effect of turbulence on items in the cabin/galley/lavatory/other, including damage caused by loose items; and

11) the damage sustained by the aircraft/in the cabin; and

d) post-turbulence actions:

1) crew member and passenger actions; and

2) emergency response upon landing (e.g. medical services at the airport).

5.13.3 As part of the investigation, it should be determined if the cabin crew members acted in accordance with their operator's policies, procedures and approved training programmes. This includes managing the cabin/passengers and interacting with other flight and cabin crew members. The CI should capture if the operator's policies and procedures were followed and if they were effective in the preparation of the cabin crew to respond appropriately to the situation. Additionally, the cabin crew safety training programme content, particularly regarding turbulence management, should also be reviewed. Other sources of information such as operator records and any related documents may also be examined to determine contributing factors. For example, flight data recorder (FDR) data may be analysed to study the motions of the aircraft and to estimate the loads exerted on occupants during the turbulence upset.

5.13.4 Appendix F to Chapter 5 presents guidance on the aspects that should be analysed when investigating an accident involving a turbulence encounter.

5.14 DECOMPRESSION

5.14.1 A decompression is an unplanned drop in the pressure of an aircraft cabin. This type of occurrence covers rapid and slow decompressions, as well as pressurization problems which may result in a failure to pressurize the cabin. A decompression is classified as an accident if:

a) any passengers and/or crew members sustain fatal or serious injury as a result of the decompression; and/or

b) the aircraft sustains damage or structural failure which meets ICAO's definition of an accident.

5.14.2 The investigation of a decompression should reconstruct the sequence of events while focusing on the following aspects, in as much detail as possible:

a) pre-flight activities — any pre-flight activities which are related to minimizing the risk of injuries in the event of a decompression. These include information provided to passengers via the safety briefing card and the safety demonstration;

b) during the decompression:

1) what activities were taking place in the cabin at the time (e.g. meal service, clean up, rest);

2) whether the fasten seat belt sign was illuminated at the time the decompression occurred;

3) how the cabin crew became aware of the decompression (e.g. PA from the flight deck, recognizing signs and symptoms of a decompression) and the extent of information given to them (e.g. instructions from the flight crew);

4) location and activities, including actions, of each cabin crew member at the time of the decompression;

5) location of any passengers who were not at their seats when the decompression occurred;

6) effect of the decompression on occupants (including injuries caused by loose items in the cabin, galley, lavatories and other areas) and their reactions;

7) cabin crew and passenger actions;

8) damage sustained by the aircraft/in the cabin;

9) occupants use of oxygen masks (e.g. correct position); and

10) functionality of systems and equipment used by cabin crew to assist in minimizing the risk of injuries (e.g. how audible was the PA due to high ambient noise?); and

c) post-decompression actions:

1) crew member and passenger actions;

2) functionality of systems and equipment used by cabin crew to assist in minimizing the risk of injuries (e.g. how audible was the PA due to high ambient noise?);

3) functionality of equipment used by the passengers; and

4) emergency response upon landing (e.g. medical services at the airport).

Note.— If the accident involved an anticipated emergency landing or ditching and/or an evacuation (on land or water), the investigation should address the aspects covered in 5.10 or 5.11 respectively.

5.14.3 As part of the investigation, it should be determined if the cabin crew members acted in accordance with their operator's policies, procedures and approved training programmes. This includes managing the cabin/passengers and interacting with other flight and cabin crew members. The CI should capture if the operator's policies and procedures were followed and if they were effective in the preparation of the cabin crew to respond appropriately to the situation. Additionally, the cabin crew safety training programme content, particularly regarding decompression, should be reviewed including any specific hands-on and simulated exercises. Other sources of information, such as operator records, may be used to create a timeline of the occurrence. For example, audio from the cockpit voice recorder (CVR) may be analysed to detect sounds consistent with the increased wind heard on the flight deck which may accompany a rapid decompression.

5.14.4 Appendix G to this chapter presents guidance on the aspects that should be analysed when investigating an accident involving a decompression.

5.14.5 Detailed guidance on analysing structures and pressurization systems is presented in the *Manual of Aircraft Accident and Incident Investigation* (Doc 9756), Part III — *Investigation*, Chapter 9 — *Structures Investigation*, and Chapter 13 — *Systems Investigation*.

5.15 AIRCRAFT DAMAGE

5.15.1 Aircraft damage involves occurrences while the aircraft is in flight or on the ground. In-flight aircraft damage may be the result of meteorological conditions (for example, hail, lighting), technical or structural failures (such as gear up landing), or bird strikes. Aircraft damage on ground may result from collisions, foreign objects or ground handling operations. This type of occurrence excludes damage sustained as a result of:

a) fire, smoke and/or fumes (refer to 5.12);

b) turbulence (refer to 5.13); or

c) decompression (refer to 5.14).

5.15.2 An aircraft damage event is classified as an accident if:

a) any passengers and/or crew members sustain fatal or serious injury as a result of aircraft damage; and

b) the aircraft sustains damage or structural failure which meets ICAO's definition of an accident.

5.15.3 The investigation of this type of occurrence should reconstruct the sequence of events while focusing on the following aspects, in as much detail as possible:

a) how and when the damage occurred (including time and phase of flight);

b) what activities were taking place in the cabin at the time (e.g. meal service, clean up, rest);

c) the location of each cabin crew member at the time of the accident, including their activities just prior to the occurrence;

d) the location of passengers, including those who were not at their seats, when the occurrence took place;

e) the sequence of events and outcome of the occurrence, including injuries to occupants and damage in the cabin (e.g. debris penetrating the cabin due to an uncontained engine failure) and crew members' responses; and

f) post-occurrence actions, including those of crew members and others such as medical practitioners called to assist with injured occupants.

Note.— If the accident involved an anticipated emergency landing or ditching and/or an evacuation (on land or water), the investigation should address the aspects covered in 5.10 or 5.11, respectively. Due to the variety of scenarios covered under this type of occurrence, specific guidance cannot be developed. Guidance presented in the other appendices to this chapter may be used as guidelines to investigate cabin safety aspects for this type of occurrence, based on the specific scenario.

5.16 FATAL OR SERIOUS INJURIES (MISCELLANEOUS)

5.16.1 This type of occurrence involves any event resulting in injuries to persons, as per the ICAO definition of an accident, while in the aircraft or from direct contact with any part of the aircraft, but in which the aircraft is undamaged (for example, a crew member or passenger falling from an aircraft while it is on the ground). This type of occurrence excludes injuries sustained as a result of:

a) turbulence (refer to 5.13);

b) intentional acts (suicide, homicide, acts of violence, self-inflicted injury or laser attacks); or

c) illnesses or non-injury medical emergencies.

5.16.2 The investigation of this type of occurrence should reconstruct the sequence of events while focusing on the following aspects, in as much detail as possible:

a) how and when the injury occurred (including time and phase of flight);

b) what activities were taking place in the cabin and on the ground at the time (e.g. passenger boarding);

c) the location of each cabin crew member at the time of the accident, including their activities just prior to the occurrence;

d) the location of passengers when the occurrence took place;

e) the sequence of events and outcome of the occurrence, including injuries to occupants and crew members' responses (including ground crew); and

f) post-occurrence actions, including those of crew members (including ground crew) and others such as medical personnel.

Note.— Due to the variety of scenarios covered under this type of occurrence, specific guidance cannot be developed. Guidance presented in the other appendices to this chapter may be used as guidelines to investigate cabin safety aspects for this type of occurrence, based on the specific scenario.

Appendix A to Chapter 5

OCCURRENCE SUMMARY

Time of notification (UTC and LMT):_____

Time of occurrence (UTC and LMT): _____

Date of occurrence: _____

Notified by: _____

Operator name:_____

Aircraft type:_____ Flight No.:_____

Departure point:_____ Destination point: _____

Location of accident:_____

	Total number	*Fatalities*	*Injuries (approximate number)*
Passengers			
Cabin crew			
Flight crew			
Other			

Damage to aircraft (destroyed, substantial, minor or no damage): _____

Other damage (other than to aircraft): _____

General description of the accident: _____

_____

_____

_____

Location of survivors: _____

Hazardous materials on board: yes / no

_____

Appendix B to Chapter 5

GUIDANCE ON CABIN CREW MEMBER AND PASSENGER INTERVIEWS

1. NARRATIVE

The aim of the interview is not to apportion blame; it is to enhance cabin safety and survivability. The interviewer should give each person an opportunity to describe in his/her own words, without interruption or coercion, what happened to him/her (that is, a narrative). After the narrative is completed, the interviewer should ask follow-up questions to determine additional information as required. An aircraft diagram (with seat rows, exits, galleys, and lavatories) is a useful tool to orient a person during an interview.

2. CABIN CREW MEMBER INTERVIEW

2.1 General information

a) Name, business address, business email and business phone number;

b) gender, age, height and weight;

c) operational experience on the accident aircraft model in hours or years, including the last time that the crew member operated the accident aircraft model;

d) experience as a cabin crew member (in years) with current operator and previous operators;

e) work category: cabin crew member, in-charge cabin crew member (I/C), etc.;

f) number of different aircraft models and series that the cabin crew member is qualified on;

g) any other special qualifications or roles (e.g. cabin crew instructor, union safety representative);

h) any previous accident/incident investigation experience;

i) nationalities of the crew members and working language among the crew, including mother tongue of the individual crew members;

j) medical history and medication taken at the time of the occurrence;

k) current medical condition and medication taken at time of the interview;

l) flight and duty schedule for the 7-day period preceding the occurrence;

m) sleep/wake cycle for the 7-day period preceding the occurrence;

n) food and beverages consumed during the 24-hour period preceding the occurrence;

o) commute time to airport, mode of travel and time at base before check-in;

p) conditions during the commute;

q) Were you injured as a result of the occurrence? Describe your injuries. When and how were you injured? Have you received medical attention?

r) Did you complete an occurrence report?

2.2 Pre-flight/in-flight activities

a) Describe the pre-flight cabin crew briefing. What was covered? Was the entire crew present? Who conducted the briefing? Where was the briefing conducted? Were there any difficulties in understanding the briefing? Did you obtain the information you needed?

b) Describe any briefing conducted by the pilot-in-command (PIC). To whom was it directed? If the PIC briefing was with the I/C only, was the information passed on to the rest of the cabin crew?

c) Were you aware of any unserviceable cabin system(s) at the beginning of, or during the flight? Was that information relayed to the entire crew?

d) Were pre-flight safety and security checks conducted and, if so, was a checklist or the operations manual used? Were there any abnormalities found?

e) Describe observations of, or interaction with, passenger agents, aircraft maintenance technicians, ground service personnel, in-bound crew members, other cabin crew, and/or flight crew that may be pertinent to the investigation.

f) Describe the location of special categories of passengers, including passengers with disabilities.

g) Describe the location of infants and how they were restrained.

h) Describe the location and use of child restraint systems, if any.

i) Describe the passenger safety briefing. Was it a video or a ‘live’ briefing? Were there any issues during the briefing? Were passengers attentive to the briefing? Were they able to understand the briefing?

j) Describe any briefing provided to emergency exit row passengers. Were passengers attentive to the briefing?

k) Were the passengers willing and qualified to sit in an emergency exit row? Was there a need to relocate anyone?

l) Describe the briefing given to special categories of passengers. Were the passengers attentive to the briefing?

m) Describe the amount and stowage of carry-on baggage. Were you able to accommodate all of the baggage that came on board in an approved stowage location?

n) Describe your pre-departure cabin activities. Was the workload appropriate for the numbers of crew members in the cabin?

o) Was alcohol served before/during the flight? If yes, was there anyone who appeared to be intoxicated/impaired?

p) Did you hear the command to arm your emergency exit(s) for departure? Did you arm your own exit? Was your exit armed in accordance with the operator's procedures?

q) Describe your final cabin safety checks. Were the passengers compliant?

r) What was your emergency station for take-off and landing and was it in the same cabin as your work station?

s) Were you seated for take-off and landing? If not, why not?

t) Where were you seated for take-off and landing? Please describe your seat (e.g. cabin crew seat/jump seat, passenger seat, single or double crew station, forward or aft-facing seat).

u) Describe the type of seat restraint system used at your cabin crew seat. How did you secure it? Was it effective?

2.3 Occurrence information

a) Describe if and how you became aware or were informed of a problem. If briefed by the captain, what information were you given? If briefed by another crew member, what information were you given?

b) Describe your location during the occurrence notification and what you were doing.

c) Describe if and how the passengers were informed of a problem. What was their reaction?

d) Describe the pre-occurrence preparations (that is, type of warning, cabin preparation).

e) Were the passengers attentive or were there any distractions?

f) Did you use any able-bodied passengers (ABPs)? Explain.

g) Describe the occurrence.

h) Describe the crash sequence.

i) Did the flight crew give the "brace for impact" position command and was it in accordance with the operator's procedures? What language was it given in? Was it interpreted into other languages? Did the passengers understand the command?

j) Describe the brace commands you used, if any.

k) Describe the passenger reaction to the brace commands.

l) Describe the passengers' brace position.

m) Describe your brace position.

n) Describe the condition of cabin furnishings in your area (e.g. curtains, galley compartments, overhead bins). Did they remain secured after impact?

o) Describe any difficulties you may have had with your seat belt/shoulder harness.

p) Did your cabin crew seat operate as required?

q) Describe any safety or emergency equipment you used. Why and how did you use it? Was it effective? Were you able to locate and access it easily?

r) Describe your view of the cabin. If your view was obstructed, please explain.

s) Describe the conditions of the cabin.

t) Describe conditions of the galley.

2.4 Training

a) Describe your initial and recurrent safety training. Was it computer-based or in a classroom? How much time was provided for practical training?

b) Where and when was your initial and recurrent safety training conducted?

c) When was your last simulated exercise of an aircraft evacuation? Describe the simulated exercise. How often is the simulated exercise conducted?

d) When was your last hands-on exercise on exit operation and assisting evacuation means for the accident aircraft model? Describe the hands-on exercise. How often is the hands-on exercise conducted?

e) Describe your firefighting training.

f) Describe your initial and recurrent ditching training.

g) Did you participate in a wet drill for water survival? Describe the exercise. Do operator policies require you to know how to swim?

h) Describe your practical training with respect to the use of safety and emergency equipment. Are the training devices representative of the actual equipment found on board the aircraft in the fleet?

i) Describe your first-aid training or any other pertinent training.

j) Did you participate in crew resource management (CRM) training with flight crew members or other staff from your operator? Explain.

k) Does your operator offer on-the-job training and, if so, was it helpful? Explain.

l) Do you feel that your training was realistic? Explain (e.g. emergency equipment, simulated exercises).

m) Did your training prepare you for what happened? Explain.

n) Did you feel confident in your abilities based on your training? Explain.

2.5 Information to document in specific types of occurrences

2.5.1 Evacuation

a) How did you decide to evacuate?

   1) Captain's order?

   2) Personal judgment?

   3) Another cabin crew member?

   4) Announcement made via the public address (PA) system?

   5) Firefighter's order?

   6) Passenger-initiated action?

   7) Was the evacuation alarm/signalling system activated? Who activated it?

b) Did you clearly understand the order to evacuate?

c) Describe the evacuation.

d) Which exit(s) did you open?

e) Were any exits opened by passengers? Explain.

f) What was your assigned exit(s)?

g) If you did not open an exit, explain why.

h) Did you have a direct view of your primary/secondary exits from your cabin crew seat?

i) Did you assess the conditions? How? Were there any difficulties assessing outside conditions?

j) Describe opening the exit(s). Did it remain usable throughout the evacuation? Describe any exit blocking or redirecting actions you might have taken and why.

k) Describe the deployment and inflation of the slide(s). Were there any difficulties? If yes, describe.

l) Did the emergency lights operate? Which emergency lights did you observe?

m) Describe the illumination inside and outside the aircraft.

n) Describe the reactions of other crew members during the evacuation.

o) Describe passenger reactions during the evacuation (calm, panic, etc.).

p) Did the passengers attempt to take carry-on baggage during the evacuation? If yes, how did you react? Describe the effect on the evacuation.

q) Did you have passenger assistance at your exit? How did passengers assist?

r) Describe any problems with the passengers during the evacuation.

s) Describe any specifics with special categories of passengers.

t) Approximately how long did the evacuation take? What is the estimate based on? *(Note.— Time estimates are unreliable if the estimate cannot be verified by empirical data.)*

u) Describe the cabin or flight deck search.

v) Did you see other cabin crew members evacuate the aircraft? Which exits did they use?

w) Did you take emergency equipment with you? Which equipment? How was it used?

x) Describe the flight crew's activities inside and outside the aircraft.

y) Describe the effectiveness of the rescue and firefighting activities.

z) Describe your clothing (that is, uniform). Was it suitable for the evacuation? Explain.

2.5.2 Turbulence

a) Describe any information you received regarding potential weather en route. Was it communicated to the entire crew?

b) What are your operator's procedures in the event of anticipated and unanticipated turbulence encounters? Describe your operator's procedures for communication among crew members (or established advisory signal) and with passengers in the event of anticipated and unanticipated turbulence. Were you able to apply them and were they effective?

c) Describe the crew communication procedure used in this occurrence. Was it in accordance with your operator's procedures?

d) Were you warned before you experienced the turbulence encounter? How?

e) Was the seat belt sign illuminated? If yes, for how long?

f) Were passengers seated when the seat belt sign was illuminated?

g) Were passengers properly restrained, including infants?

h) Were there any unrestrained personal items and did they cause a problem (e.g. portable electronic devices, cabin baggage, service items)?

i) Were you seated at your assigned cabin crew seat? If so, were you properly restrained?

j) If you were not in your assigned cabin crew seat, where were you? Were you able to properly restrain yourself?

k) Where were you when the turbulence occurred? Describe what actions were taken.

l) What announcements were made regarding turbulence? Were passengers instructed to remain seated? When were the announcements made? Were any shouted commands used?

m) Were there any carts or other service equipment in the cabin at the time of the turbulence encounter?

n) Describe what you did with the service equipment during or after the turbulence encounter.

o) Were you injured? Describe your injuries.

p) Were you able to assist others following the turbulence encounter?

q) Describe injuries that you observed in other crew members or passengers. Did you administer first aid?

r) Describe the condition of the cabin and the galleys after the occurrence.

s) Does your operator have post-turbulence procedures and, if so, did you use them? Explain.

2.5.3 Fire/smoke/fumes

a) When and how did you become aware of fire, smoke and/or fumes?

b) Where did you first observe fire, smoke and/or fumes? Describe what you saw and/or smelled (colour, density and odour).

c) Where were you when you first became aware of fire, smoke and/or fumes?

d) What role did you play, if any, during the firefighting?

e) Did the conditions (e.g. amount/density of smoke) increase, decrease or change during the occurrence?

f) Did you have difficulty breathing? Did you use protective breathing equipment (PBE) or other protection?

g) Did you have problems communicating with other crew members or passengers? If yes, describe the problems.

h) Describe any communication with the flight crew.

i) Which firefighting equipment did you use, if any? Describe the actions taken to fight the fire.

j) Describe any actions taken to assist the passengers (e.g. distribution of wet cloths, relocation of passengers, relocation of equipment such as oxygen bottles, which may fuel the fire).

k) Did any passengers or crew require first aid?

l) Did you receive training on fighting a lithium-battery fire? Was it effective? Explain.

m) Did any passengers assist in the firefighting? Explain.

2.5.4 Ditching or inadvertent water contact

a) Were you advised to prepare for a ditching?

b) Were there any problems deploying, inflating, boarding or disconnecting the slide-rafts or life-rafts?

c) Did you move a slide-raft or life-raft from one location to another? Describe any difficulties.

d) What type of personal flotation device did you use? From where did you obtain it? Did you have any problems obtaining it or using it?

e) What personal flotation devices did passengers use?

f) Did passengers have any problems obtaining or donning life jackets (adults/infants/children)?

g) Did any of the passengers inflate their life jackets inside the aircraft?

h) Who commanded the slide-raft or life-raft that you boarded? Were there other crew members in that raft?

i) Describe the rescue operation.

j) Describe the sea survival procedures used.

k) Did you retrieve any emergency equipment? If yes, from where?

l) Was the emergency locator transmitter (ELT) used?

m) Did you take the survival kit with you?

2.6 Additional Comments

a) Based on your experience, can you suggest any improvements to passenger safety briefings, procedures, training or equipment?

b) Do you have any further information that you think may assist in the investigation of this occurrence?

3. PASSENGER INTERVIEW

3.1 Personal data

a) Name, gender, age, height and weight.

b) Address.

c) Phone number.

d) Email.

e) Occupation.

f) Seat number and location.

g) Travelling alone or with relatives, friends, business associates, etc.

h) Special categories of passengers (e.g. infants, persons with mobility impairments).

i) Any disability that could impair egress from the aircraft.

j) Aviation experience.

k) Any additional skills that were used during the occurrence.

l) Previous accident experience.

m) Languages spoken.

n) Were you injured? Describe your injuries. When and how were you injured?

o) Did you receive medical attention?

3.2 Pre-flight preparations

a) Describe the weight, size and stowage location of your carry-on baggage.

b) Describe the clothing and footwear that you were wearing when the accident occurred.

c) Was there a pre-flight safety briefing? How was it provided (that is, pilot, cabin crew member, video or other means)? What information do you recall? Did you understand the safety briefing? Was it helpful?

d) Did you read the passenger safety briefing card? Did you understand the information on the passenger safety briefing card? What information do you recall?

e) Did you note the locations of more than one exit near your seat?

f) Were you seated adjacent to an emergency exit?

g) Were you briefed prior to departure on the operation of the emergency exit? If yes, by whom?

h) Describe any observations of maintenance, ground service personnel (e.g. de-icing the aircraft), or flight crew that might be pertinent to the investigation.

3.3 Occurrence information

a) How and when did you first become aware of a problem? Where were you when you first became aware of a problem?

b) How did the crew prepare you for the emergency? Were you given instructions over the PA system? By an individual crew member? Shouted instructions?

c) Did you hear any shouted commands? If yes, what did you hear? Did the information help you?

d) Did you brace for impact? Describe your brace position.

e) Were you traveling with infants or other special categories of passengers? How were they restrained? Were there any problems?

f) How tightly was your seat belt fastened? Did you have any problems releasing your seat belt? If yes, describe.

g) Did you remove your shoes? Why? If you did not remove them, did they stay on during the impact and evacuation?

h) Describe the impact sequence. What happened to you during the impact sequence?

i) Did anything happen to your seat during impact?

j) Did you remain seated until the aircraft stopped?

k) Did you encounter any difficulties? Explain.

3.4 Information to document in specific types of occurrences

3.4.1 *Evacuation*

a) How did you know when to evacuate? Were any commands clear and audible?

b) Describe the conditions in the cabin prior to and during the evacuation.

c) Describe the actions of the cabin crew during the occurrence.

d) Which exit did you use? Why?

e) Did you encounter problems reaching the exit? If yes, describe.

f) Did you attempt to take anything with you when you left the aircraft? If yes, what did you take?

g) Did you assist anyone during the evacuation?

h) Did anyone assist you?

i) Were you responsible for evacuating with an infant, child or any other passenger needing assistance?

j) Did you open an exit? If so, which one? Did you experience difficulty operating or using the exit? If you opened an overwing exit what did you do with the hatch?

k) What actions did you take after you opened the exit?

l) Did you notice any lights illuminated in the cabin? Where?

m) Approximately how long did it take you to evacuate the aircraft? What is your estimate based on?

n) What did you see when you got out of the aircraft?

o) Did help arrive quickly? Describe the rescue efforts.

p) Did a rescuer assist you? How?

q) Did you sustain an injury? If yes, please describe your injury and, if known, its cause.

3.4.2 *Turbulence*

a) Where were you when the turbulence occurred?

b) Was your seat belt fastened? If not, why not?

c) Was the seat belt sign illuminated?

d) Did you observe the crew checking seat belts?

e) Did you hear any announcement regarding seat belts? If yes, describe what you heard.

f) Who do you think made the announcement(s)? Flight crew and/or cabin crew member(s)?

g) Were you injured? If yes, describe your injuries. Were you given first aid by a cabin crew member or passenger?

h) If you were traveling with an infant, child or any other passenger needing assistance, what happened to that (those) passenger(s)? How were they restrained?

3.4.3 *Fire/smoke/fumes*

a) When and how did you become aware of fire, smoke and/or fumes?

b) Where did you first observe fire, smoke and/or fumes? Describe what you saw and/or smelled (colour, density and odour).

c) Where were you when you first became aware of fire, smoke and/or fumes?

d) Did the conditions (e.g. amount/density of smoke) increase, decrease or change during the occurrence?

e) Did you have difficulty breathing? If yes, what action did you take to protect yourself?

f) If you were traveling with an infant, child or any other passenger needing assistance, what happened to that (those) passenger(s)? Did you do anything to protect them from smoke/fumes?

g) Did you observe firefighting procedures? Describe.

3.4.4 *Ditching or inadvertent water contact*

a) What types of flotation devices were available?

b) Was the information contained in the passenger safety briefing card and in the safety demonstration useful? Explain.

c) Did you obtain a life jacket?

   1) Where was it stored?

   2) Did you have a problem retrieving, opening the pouch or putting on the life jacket?

   3) Did you put it on or just take it with you?

   4) When did you inflate it?

   5) Did it work properly?

   6) If you were travelling with an infant, was an infant life jacket/infant survival cot provided for the infant?

d) Did you use the seat bottom cushion as a flotation device? Describe how the cushion was used and its effectiveness.

e) Were you responsible for evacuating with an infant, child or any other passenger needing assistance?

f) Did you board a life-raft or slide-raft or exit onto another surface (e.g. the wing). Were there any difficulties?

g) Describe the type of raft you boarded.

h) What equipment in the life-raft or slide-raft was used?

i) How many people were in the raft?

j) Describe the water conditions.

k) Describe the weather conditions.

l) Describe any sea survival procedures that were used.

m) Describe the rescue effort.

3.5 Additional comments

a) Based on your experience, can you suggest any improvements to passenger briefings, procedures, cabin crew training or equipment?

b) Do you have any further information that you think may assist in the investigation of this occurrence?

c) Did you fully understand information provided to you (e.g. language)? If not, describe.

Appendix C to Chapter 5

GUIDANCE FOR INVESTIGATING AN EVACUATION

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the accident:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) location: 1) general location; 2) grid reference/coordinates; 3) elevation and topography; g) departure point; h) phase of flight and flight level;	*The objective is to provide factual information regarding the accident.*

Type of information	*Specific information*	*Objective of the analysis*
	i) destination and intermediate stops (with ETAs and ETDs) and radar tracks; j) total number of crew members: 1) flight crew; 2) cabin crew; k) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and l) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor; 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor; 4) none;	*The objective is to determine the number of casualties/survivors and the extent of injuries.* It is imperative to collect the information related to death and injuries, as there is a correlation between occupant injury and death and the aircraft structure and environment. *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	c) total in the aircraft: 1) fatal; 2) serious; 3) minor; 4) none; and d) injuries (other, such as persons on the ground): 1) fatal; 2) serious; 3) minor; and 4) none.	
Meteorological conditions	*Review the meteorological conditions, which may include:* a) atmospheric conditions (e.g. snow, rain, fog); b) wind; and c) any unusual considerations such as: volcanic ash, visual illusions or icing.	*The objective is to review the meteorological conditions and to evaluate if/how they effected the evacuation. For example:* a) difficulties in evacuating the aircraft (e.g. strong winds twisting a slide); b) difficulties in locating the aircraft and/or occupants (e.g. heavy snow or rain); and c) hindering survival of occupants (e.g. cold temperature).

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) cabin crew requirements; b) pre-flight checks; c) crew and passenger briefings; d) anticipated emergency landing and related checklist, if applicable; e) unanticipated emergency landing; f) aircraft evacuation; and g) post-evacuation duties and responsibilities.	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) normal operations procedures, focusing on: 1) minimum cabin crew requirements, including exceptions; 2) briefings for both crew and passengers, including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; 3) pre-flight checks of safety and emergency equipment; 4) emergency exit row seating policy; b) emergency landing procedures, focusing on: 1) crew communication/signals; 2) briefings for both crew and passengers; 3) assignment, relocation and briefing of able-bodied passengers (ABPs); 4) securing and checking cabin, galleys, etc.; 5) use of checklists by cabin crew, if applicable; 6) silent review; 7) brace commands; 8) brace positions for crew and passengers; and

Type of information	*Specific information*	*Objective of the analysis*
		c) evacuation procedures (on land), focusing on: 1) decision to evacuate/order; 2) cabin crew authority to initiate evacuation; 3) evacuation commands; 4) operation of emergency lighting; 5) assessing inside/outside conditions; 6) emergency operation of exits; 7) operation of slides, if applicable; 8) blocked/unusable exits; 9) primary/secondary exits depending on aircraft model, based on certification; 10) protective positions for crew members and passengers; 11) crowd control/managing the cabin (e.g. flow control); 12) cabin/flight deck search; 13) survival equipment that crew must take prior to exiting the aircraft; and 14) post-evacuation cabin crew duties and survival procedures.

Type of information	*Specific information*	*Objective of the analysis*
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding abnormal and emergency procedures, specific to anticipated/unanticipated emergency landing and evacuation; b) human performance training, including CRM and joint flight/cabin crew CRM; c) aircraft type specific training (for the aircraft model involved in the accident); d) training specific to safety and emergency equipment; and e) training facilities and devices. *Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty free representatives, interpreters, other service personnel).*	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) minimum cabin crew requirements, including exceptions; 2) briefings for both crew and passengers including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; 3) emergency exit row seating policy; 4) anticipated/unanticipated emergency landing procedures; 5) aircraft evacuation procedures; 6) hands-on and simulated exercises on relevant safety and emergency equipment and aircraft systems, such as exits (specific to the aircraft model involved in the accident); 7) simulated exercises on preparing the cabin for an anticipated/unanticipated emergency landing and evacuation; 8) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities;

Type of information	*Specific information*	*Objective of the analysis*
		2) safety and emergency equipment used for training; 3) cabin training devices; 4) emergency exit trainers (specific to the aircraft model involved in the accident); and 5) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the evacuation process or created confusion to occupants.*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule; 5) personnel files (including date of hire); 6) any other relevant experience; b) other personnel records, if applicable; and	*The objective is to review the operator's records related to the operating crew and aircraft involved in the accident and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the emergency situation, including any language qualifications relevant to the accident flight; 2) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence); 3) factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator);

Type of information	*Specific information*	*Objective of the analysis*
	c) accident aircraft: 1) aircraft journey log; 2) cabin defect log book; 3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) departure report, if applicable; 6) CVR transcripts, where applicable; 7) FDR readouts, where applicable; 8) diagram of galley(s) and stowage; 9) dispatch log; 10) flight crew flight log; 11) flight deck log book; 12) maintenance logs/release forms; 13) MEL; 14) other crew documents (e.g. equipment checklists, crew briefing sheets); and 15) passenger manifest and seat chart (including addresses and telephone numbers).	4) factors that may affect performance, such as fatigue (derived from their flying schedule prior to the accident, layover rest or in-flight rest); and b) accident aircraft: 1) layout of the cabin and galley(s) and any features which may have hindered the evacuation (e.g. partitions/obstructions); 2) similarities and differences between other aircraft models, including documenting configuration differences in the operator's fleet; 3) location of passengers and crew in the cabin, which may be linked to their survival/death (e.g. if seated in an area that received extensive damage); 4) technical malfunctions which may have affected the performance of aircraft systems (e.g. inoperable exit due to slide inflation malfunction). These may be traced through maintenance or cabin-defect logs; 5) MELs for inoperative items such as cabin crew jump seats, PA system, aircraft and emergency equipment and systems, that hindered the evacuation; and 6) discussions between flight and cabin crew regarding the emergency situation, based on CVR transcripts.

Type of information	*Specific information*	*Objective of the analysis*
Other	*Review other operator documentation and determine pertinent references to:* a) cabin crew recruitment criteria; b) safety and emergency announcements; c) pre-flight passenger safety briefings; d) safety demonstration video, if applicable; e) safety briefing card; f) operator bulletins and notices to cabin crew; g) aircraft maintenance manual; h) component maintenance manual (from manufacturer); and i) maintenance control manual.	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) minimum qualifications required for recruitment of new cabin crew members; b) standard safety information provided to passengers via different means, specific to the aircraft model involved in the accident (e.g. content of safety demonstration, safety briefing cards); c) determine if the information matched that which was provided during the accident flight: 1) safety briefing cards on board the accident aircraft vs. the correct ones for that aircraft; 2) required pre-flight passenger safety briefings vs. those conducted on the accident flight; 3) approved safety announcements vs. those conducted on the accident flight; 4) safety demonstration vs. the one shown/conducted on the accident flight; 5) languages in which the briefing must be conducted vs. those used on the accident flight; d) safety information transmitted to cabin crew members, via internal operator communications (e.g. bulletins) which is required for them to carry out duties and responsibilities, as per operator policies and procedures (e.g. update of procedures); e) cabin-related information from the component maintenance manual (e.g. slide assembly); and

Type of information	*Specific information*	*Objective of the analysis*
		f) cabin-related information from the aircraft maintenance manual: 1) communication systems (PA/interphone); 2) emergency equipment; 3) emergency lighting; and 4) exits and evacuation-assisting means (e.g. slides).

3. DOCUMENTATION (STATE OF THE OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
National regulations	*Review regulatory requirements and determine pertinent references to:* a) number of cabin crew members on board; b) number of aircraft type qualifications permitted for a cabin crew member (endorsements); c) number, location and design of emergency exits; d) placards near each exit; e) instructions on the operation of exits; f) cabin crew safety training;	*The objective is to review the State's existing regulations and to evaluate the content and adequacy of the following:* a) minimum cabin crew requirements; b) number of aircraft type qualifications that a cabin crew member may hold at any one time; c) regulatory requirements related to emergency exits and related signs/placards; d) restrictions for exit row seating; e) regulatory requirements related to approved cabin crew safety training;

Type of information	*Specific information*	*Objective of the analysis*
	g) safety and emergency equipment; and h) emergency evacuation design standards.	f) regulatory requirements for the equipment required in the cabin; and g) conduct of an evacuation demonstration on the aircraft model (e.g. by the manufacturer and the operator).
Oversight	*Review, for cabin safety-related information, the State oversight documentation of the operator involved in the accident and determine pertinent references to:* a) approved aircraft flight manual; b) approved operations manual; c) approved MEL; d) approved cabin crew training manual; e) last surveillance activity by the State; f) cabin crew check ride reports; and g) any exemptions, deviations or policy letters to the operator.	*The objective is to review the State's approvals and ongoing surveillance of the operator involved in the accident and to evaluate the following:* a) content of the approved aircraft flight manual, in relation to an aircraft evacuation; b) content of the approved operations manual, in relation to: 1) safety briefings and exit row seating; 2) anticipated (or unanticipated) emergency landing; 3) evacuation; c) cabin-related equipment in the approved MEL; d) content of the approved cabin crew training curriculum, in relation to: 1) safety briefings and exit row seating; 2) anticipated (or unanticipated) emergency landing; 3) evacuation; e) last surveillance activity by the State, including any findings related to: 1) cabin-related policies and procedures;

Type of information	*Specific information*	*Objective of the analysis*
		2) training; 3) cabin crew qualifications and competencies; 4) violations (e.g. flight and duty time violations); 5) systemic issues; f) findings resulting from cabin crew check ride reports, including: 1) cabin crew performance; 2) deficiencies related to aircraft cabin conditions; 3) missing or inoperative safety and emergency equipment or aircraft (cabin) systems (e.g. missing megaphone on board); and g) any exemptions, deviations or policy letters issued by the State to the operator, which may be relevant to the accident: 1) authorization to reduce the number of crew members on board; and 2) exemption/deviation from regulatory requirements.

4. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Aerodrome	*Review documentation of the aerodrome where the accident occurred (if applicable) and determine pertinent references to:* a) aerodrome diagram; and b) aerodrome operations manual.	*The objective is to evaluate the content and adequacy of the following:* a) aerodrome emergency plan, including procedures, responsibilities and duties of participating organizations in order to facilitate the following points during an emergency at the aerodrome: 1) efficient rescue; 2) medical care; 3) firefighting operations; 4) aircraft rescue and firefighting; and 5) date of last emergency exercise. *Note.— A diagram of the aerodrome may be useful when analysing the emergency response (e.g. difficulties in reaching the accident location due to the layout of runways/taxiways).*
Medical and pathological records	*Review medical and pathological records and determine pertinent references to:* a) medical reports; b) autopsy reports; c) toxicology reports; and d) crew medical certification-related files, if appropriate.	*The objective is to provide factual information regarding the accident:* a) cause of occupant's death or injury; b) pre-existing medical conditions that may have affected the cabin crew member's performance during the accident; and c) any specific issues related to special categories of passengers.

Type of information	*Specific information*	*Objective of the analysis*
Other sources of information	*Collect and review any visual, audio or other "recorded" information from multiple sources:* a) airport cameras; b) portable electronic devices (PEDs); c) news media reports; and d) social media.	*The objective is to gather any information available to assist with the investigation.*

5. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Exits, assisting-evacuation means, aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally), and part/serial number of the following systems, as applicable:* a) exits and assisting-evacuation means (slide, rope, etc.): 1) location of all; 2) for deployable hatches, location inside or outside aircraft; 3) condition as found (e.g. open or closed); 4) damage; 5) location in wreckage; 6) operational check, if possible;	*The objective is to evaluate if the systems were useful in managing the evacuation or increasing the survivability of occupants. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) exits that were not used or that hindered the evacuation: 1) interior/exterior conditions that prevented use (e.g. fire); 2) malfunction (e.g. airframe deformation, slide failed to inflate); 3) mode of operation (door found in armed or disarmed mode); 4) sill heights at exits (e.g. too high due to unusual attitude); 5) damage to exit and surrounding fuselage;

Type of information	*Specific information*	*Objective of the analysis*
	7) height of exit sill above terrain (if unusual attitude); 8) position of the door arming mechanism/indicator; 9) position of exit opening handle; 10) condition of power assist mechanism (if present), including gauge indicating pressure; 11) slide inflation mechanism and components; 12) condition of the slide bustle; and 13) deployment of ropes, tapes or inertia reels; b) evacuation alarm system, if applicable; c) communication systems and associated signalling panels; d) lighting systems (interior, exterior and emergency lighting); and e) installed/portable emergency signalling system.	b) assisting evacuation means that were not used or that hindered the evacuation: 1) slide failed to inflate/partially inflated; 2) slide malfunctioned following inflation (e.g. punctured); 3) unusual attitude rendered slide unusable (e.g. too steep or too shallow); 4) slide inflated inside the cabin; and 5) girt bar malfunctioned; c) the use of the evacuation alarm as a means to signal the evacuation order and its effectiveness, if applicable; d) the use of PA/interphone to communicate with passengers and crew. If these failed, presence of backup systems or equipment (e.g. megaphones); e) the use of emergency lighting to facilitate the location of exits by occupants. If these failed, presence and use of other equipment (e.g. flashlights); and f) the use of emergency signalling systems (e.g. ELT) to send distress signal.
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) portable fire extinguishers; b) axe; c) pry bar;	*The objective is to evaluate the type of equipment that was available and to assess if it was useful in increasing the survivability of occupants or a hindrance in managing the evacuation. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use equipment were effective; and

Type of information	*Specific information*	*Objective of the analysis*
	d) protective gloves; e) smoke goggles; f) protective breathing equipment; g) portable oxygen equipment; h) emergency flashlight; i) megaphone; j) survival kit; k) child restraint systems; l) extension seat belt; m) automated external defibrillator (AED) and associated equipment (CPR masks, shields, resuscitator bags, etc.); n) FAK; o) universal precaution kit; p) medical kit; q) high visibility vests for the cabin crew; r) additional equipment used; and s) other equipment suited to the likely environment (e.g. arctic gear).	c) additional equipment, not found on board, would have been helpful.

Type of information	*Specific information*	*Objective of the analysis*
Conditions of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following, as applicable:* a) floor structure and floor panels; b) carpets; c) insulation; d) ceiling and sidewall panels; e) PSUs, including oxygen mask assemblies; f) overhead bins and closets; g) latching mechanisms; h) bulkheads and class dividers; i) tray tables; j) passenger seats, including floor fittings and seat tracks; k) passenger restraints; l) cabin crew seats; m) cabin crew restraints; n) carry-on baggage; o) galleys, including restraints (latches, brakes); p) lavatories (ceiling panel/PSU, door); q) flight deck door;	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted on the survival of occupants (including injuries sustained) and affected their ability to evacuate the aircraft:* a) deformation/breaches in cabin structure; b) floor disruptions; c) evidence of thermal damage; d) evidence of injuries, such as blood stains, dents or cracks resulting from occupants impacting side panels, ceiling or other parts of the cabin; e) damage or stains on carpets, such as bodily fluids which may indicate injuries; f) seat and restraint mechanism failure, including seat track attachment; g) location of upset/damaged seats; h) seat belts (frayed or damaged); i) tray table deployment (deployed or not deployed per seat number); j) condition of stowage bin (including door condition, latching mechanism, content containment, failure to remain attached to fuselage). Empty bins may indicate passengers evacuated with personal items; k) evidence of any stowage or overhead compartment overloading; l) signs of flame propagation on insulation materials;

Type of information	*Specific information*	*Objective of the analysis*
	r) window shade positions; s) corded devices (e.g. IFE remote controls, headsets); t) crew rest areas, if applicable; u) cabin control panel(s); v) seat electronics and IFE under-seat fittings; and w) other internal structures or monuments.	m) oxygen mask assemblies deployed (due to impact forces); n) evidence of garbage bag stowage in the lavatories; o) evidence of cabin baggage stowage in non-secure locations (e.g. unsecured behind last row of seats); p) damage in the galleys, including carts and other equipment becoming dislodged and blocking evacuation routes/exits or causing injuries; q) damage resulting from the accident (e.g. impact with terrain) vs. that which resulted from emergency response (e.g. emergency/RFF personnel removing slides during firefighting); r) flight deck door: 1) locked or unlocked, including condition of locks/electronic access panels or keypads; 2) direction of opening and measurements of deformation; 3) thermal damage; 4) operable/jammed escape panels; s) position of window shades (open or closed) and view from inside the cabin; t) corded devices retracted (stowed) or cords extended over seats or passageways; u) condition of crew rest areas, including damage; and v) condition of control panel(s) used by cabin crew, including damage.

6. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on cabin crew performance in pre-flight activities:* a) crew check-in process; b) conducting or participating in crew briefings (including joint briefings, if applicable); c) conducting pre-flight check of safety and emergency equipment; d) conducting passenger safety briefings; e) conducting briefings for special categories of passengers; and f) applying exit row seating restrictions.	*The objective is to evaluate how the cabin crew performed pre-flight duties and responsibilities. The analysis should determine:* a) the method used for timely distribution of safety-related information and whether it was read/reviewed by the crew; b) if the crew members participated in a pre-flight briefing and, if so, what was the content (MEL, etc.); c) if a pre-flight check of safety and emergency equipment was completed, as per operator procedures, and if any discrepancies were noted; d) what safety information was given to passengers prior to departure (e.g. through a safety demonstration and briefings at exits); e) what safety information was given to special categories of passengers (e.g. passengers travelling with infants, persons with disabilities); and f) if exit row seating restrictions were respected. If not, what did the cabin crew members do to rectify the situation (that is, move passengers).
Pre-evacuation actions	*Review the information on cabin crew performance in preparing passengers/cabin for an emergency landing, if applicable:* a) recognizing the emergency situation (e.g. signal from flight crew, cabin conditions, passenger observation/remarks); b) applying pre-landing emergency procedures; c) disseminating/sharing information between flight and cabin crew;	*The objective is to evaluate how the cabin crew prepared for the evacuation. The analysis should determine:* a) how the cabin crew members obtained information on the emergency situation, including content, completeness, and effectiveness of information given by flight crew members or I/C; b) if the crew members reacted in accordance with operator procedures and if any procedures were adapted to the situation (if so, what were they and why?);

Type of information	*Specific information*	*Objective of the analysis*
	d) CRM among the cabin crew and with flight crew; e) identifying and recruiting ABPs; f) instructions given to passengers (including ABPs and special categories of passengers); g) securing the cabin/galley(s); h) conducting cabin checks; i) confirming “cabin readiness” to the flight crew; j) complying with signal from the flight crew; k) taking assigned station/seat; l) checking door status, if applicable; m) conducting silent review; n) hearing and complying with flight crew emergency communication; o) taking the brace position; and p) shouting brace commands.	c) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. difficulties in understanding instructions, high workload positions versus low/shared workload positions); d) what information was given to passengers (including ABPs and special categories of passengers) to prepare them for the emergency landing/evacuation, including: instructions not to take carry-on baggage, brace position, nearest and alternate exits, review of exit operation and if/when to remove high-heeled shoes; e) language(s) used to communicate with passengers – any language issues should be noted (e.g. passengers and crew did not speak the same language); f) if the crew members secured, prepared and checked the cabin, galley(s) and other areas to prevent/minimize injuries; g) if the cabin crew confirmed “cabin readiness” to the flight crew; h) if the cabin crew received and adhered to advisory to occupy station/seat in preparation for landing; i) if the cabin crew checked door status, if applicable, to verify that doors were armed; j) if the cabin crew members conducted a silent review; and k) if the cabin crew braced for impact (if so, what position was taken?) and shouted commands instructing passengers to brace.

Type of information	*Specific information*	*Objective of the analysis*
Actions during the evacuation	*Review the information on cabin crew performance in conducting the evacuation:* a) initiating/reacting to signal to initiate the evacuation; b) operating systems (e.g. emergency lighting, PA and evacuation alarm system); c) operation of exits and evacuation devices; d) shouting evacuation commands to passengers (including ABPs and special categories of passengers); e) managing passengers (carry-on baggage, slowed flow rate at exits, panicked passengers, etc.); f) managing evacuation (blocked exit); g) conducting a cabin and flight deck search; h) taking survival equipment, if applicable; and i) difficulties encountered during the occurrence.	*The objective is to evaluate how the cabin crew managed the evacuation. The analysis should determine:* a) how cabin crew obtained the order to evacuate; b) if the crew members reacted in accordance with operator procedures, were any procedures adapted to the situation (if so, what were they and why?); c) if there was a delay in initiating the evacuation, the analysis should focus on the reason; d) if applicable, the analysis should focus on why the cabin crew took the decision to evacuate (e.g. fire in the cabin); e) if the cabin crew had difficulties opening the exits and/or operating the evacuation devices, the analysis should focus on the possible reasons (e.g. deformation of fuselage made it impossible to open an exit; unusual attitude of the aircraft rendered some slides unusable); f) if exits and/or evacuation devices were inoperable, the analysis should focus on the crew's reaction (e.g. blocking an exit and redirecting passengers); g) if cabin crew chose not to use certain exits, the analysis should focus on the reasons (e.g. directed by flight crew, crew observed fire, debris); h) information given to passengers during the evacuation, including: instructions not to take carry-on baggage, nearest and alternate exits, and if/when to remove high-heeled shoes; i) equipment used by the crew during the evacuation (e.g. flashlights, PBE) and its effectiveness;

Type of information	*Specific information*	*Objective of the analysis*
		j) if the crew experienced difficulties locating and/or operating equipment, the analysis should focus on the possible reasons (e.g. if crew fly many models of aircraft or multiple configurations of the same aircraft model); k) if the cabin crew had any difficulties operating systems (e.g. PA), the analysis should focus on the possible reasons; l) how cabin crew managed any failure of systems such as emergency lighting; m) if applicable, how cabin crew managed the failure of the PA system and whether they used alternate means to communicate (e.g. megaphone); n) how the cabin crew managed passenger reactions (e.g. if panic or attempting to take carry-on baggage delayed the evacuation flow) and any issues with passengers not following instructions; o) the impact of the number of cabin crew members on board, with regards to the actions taken; p) if the cabin crew conducted a cabin and flight deck search prior to leaving the aircraft; and q) if the cabin crew took any survival equipment when they evacuated and any difficulties encountered in accessing or retrieving and using the equipment.
Post-evacuation actions	*Review the information on cabin crew performance in managing the situation after the evacuation:* a) gathering passengers away from the aircraft; b) performing post-evacuation duties; and	*The objective is to evaluate how the cabin crew managed the post-evacuation situation, until such time as the emergency services took over. The analysis should determine:* a) if crew members managed the crowd following the evacuation;

Type of information	*Specific information*	*Objective of the analysis*
	c) applying survival procedures, if applicable.	b) if they administered first aid while waiting for medical assistance; and c) if they applied any survival procedures, such as signalling for help.

7. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on passenger action/response to pre-flight activities:* a) review of the safety briefing card; b) watching/listening to the passenger safety briefing/demonstration; c) briefing of special categories of passengers; d) briefing of exit row occupants; e) stowing of carry-on baggage; and f) use of restraints.	*The objective is to evaluate what information passengers received prior to departure. The analysis should determine:* a) if passengers reviewed the content of the safety briefing card; b) if passengers paid attention to the safety briefing/demonstration; c) if special categories of passengers received a safety briefing (e.g. passengers travelling with infants); d) if passengers seated at an exit row received/paid attention to a briefing regarding the operation of unstaffed exits (e.g. overwing exits); e) if passengers stowed and secured their carry-on baggage properly (where and how many articles) including portable electronic devices; and f) if passengers properly used their restraint systems. *Note.— For all of the above, it should be noted if passengers understood the content of the briefings and can*

Type of information	*Specific information*	*Objective of the analysis*
		recall it. The analysis should focus on how helpful the passengers think it was. If passengers did not pay attention, the analysis should focus on the reason (e.g. frequent flyers).
Pre-evacuation actions	*Review the information on passenger recognition and response to the preparation for an emergency landing, if applicable:* a) recognising the emergency situation; b) information given to passengers; c) instructions given to passengers (including ABPs and special categories of passengers); d) reacting to brace command; and e) taking the brace position.	*The objective is to evaluate how the passengers recognized and responded to the preparation for an emergency landing. The analysis should determine:* a) if/how the passengers became aware of the emergency situation (e.g. PA from the flight crew); b) passenger response to information given by the crew regarding the situation (including their understanding, reaction and any issues or concerns raised by the passengers); c) passenger response to and understanding of the instructions given by the crew (e.g. placed seats upright, removed shoes, stowed baggage); d) how passengers reacted to brace commands, and if the reaction was as intended; and e) if passengers braced for impact (if so, what position was taken?).
Actions during the evacuation	*Review the information to assess passenger performance during the evacuation:* a) reacting to command to evacuate; b) taking/leaving carry-on baggage; c) debris/obstructions in the cabin that impeded egress; d) location of the passengers during the occurrence and subsequent actions;	*The objective is to evaluate how the passengers behaved/reacted during evacuation. The analysis should determine:* a) passenger response to evacuation commands or recognition of need to evacuate; b) if passengers experienced any difficulties with their restraint system;

Type of information	*Specific information*	*Objective of the analysis*
	e) difficulties locating an exit; f) operation of exits and evacuation devices (including overwing exits); g) assistance provided (ABPs); and h) other passengers' reactions.	c) if passengers took/attempted to take carry-on baggage and if this hindered the evacuation (how did other passengers react to this?); d) any other conditions that hindered the evacuation (e.g. debris, fallen ceiling panels, baggage); e) if passengers experienced difficulties locating exits, the analysis should focus on the possible reasons (e.g. disorientation due to darkness in the cabin) and describe the passengers' actions; f) if the passengers had difficulties opening the exits and/or operating the evacuation devices (e.g. at unstaffed exits), the analysis should focus on the possible reasons (e.g. clarity of placards and written instructions); g) if exits and/or evacuation devices were inoperable, the analysis should focus on the passengers' reaction (e.g. moving to the closest exit); h) if passengers chose not to use certain exits, the analysis should focus on the reasons (e.g. noticed exit was crowded vs. less crowded exit nearby); i) if assistance was given/received by/from other passengers. If a passenger was traveling with another person who needed assistance; if yes, whether he/she was able to assist the other person; j) if assistance was provided by a passenger to an injured/trapped crew member; and k) if they noticed other passengers' reactions (e.g. passengers in panic).

Type of information	*Specific information*	*Objective of the analysis*
Post-accident evacuation	*Review the information on passenger performance after the evacuation:* a) moving away from the aircraft; b) responding to crew/other personnel's instructions; c) seeking assistance; and d) survival aspects.	*The objective is to evaluate how passengers reacted following the evacuation. The analysis should determine:* a) if passengers moved away from aircraft and why (e.g. fear of explosion); b) estimated time passengers stayed in the vicinity of the accident until response arrived; c) if passengers re-entered the aircraft and the reason why; d) if they received and responded to instructions from cabin crew, flight crew, rescue and firefighting (RFF) or other personnel present at the scene; e) if they received medical assistance, such as first aid, and who administered it; f) if other passengers were injured around them and how they reacted (e.g. assisted others); and g) if they applied any survival techniques, such as signalling for help.

8. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-accident information	*Review the information to assess the following activities, if applicable:* a) emergency response; and b) search and rescue (SAR).	*The objective is to evaluate how RFF responded to and managed the evacuation. The analysis should determine:* a) how/when the emergency alert notification was activated; b) when ATC/RFF or others received the call regarding the accident;

Type of information	*Specific information*	*Objective of the analysis*
		c) the time needed to respond, and reasons for delays, if any; d) the quantity and type of vehicles and equipment available/used; e) the challenges in relation to the aircraft model involved in the accident (e.g. double-decker aircraft); f) the type, quantity and rate of extinguishing agents, including their effectiveness; g) communications with aircraft, including difficulties encountered; and h) any other difficulties encountered. *The objective is to evaluate how the search and rescue operation responded to and managed the accident. The analysis should determine:* a) factual information on the SAR (who, how and when); b) units and agencies involved — means and methods used; c) any factors which facilitated or hindered the search; and d) content and adequacy of procedures.
Other pertinent information specific to the accident/crash site location	*Review the information to assess the following, if applicable:* a) aerodrome/runway overrun area; and b) crash site location/characteristics.	*The objective is to review the accident site conditions and to evaluate if/how they played a role in the accident. For example:* a) aerodrome: 1) obstructed view prevented the tower from locating the aircraft's final position; 2) layout of aerodrome made it difficult for RFF to reach the accident site;

Type of information	*Specific information*	*Objective of the analysis*
		b) runway overrun area: 1) installation of arresting systems that can minimize the damage from a runway excursion; 2) obstacles/structures that contributed to the extent of the damage (e.g. aircraft collided with a concrete fence during the accident sequence); and c) crash site: 1) mountainous terrain; and 2) remote area.

9. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.
Passengers	Refer to Appendices B and H to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the passenger's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.

Appendix D to Chapter 5

GUIDANCE FOR INVESTIGATING A DITCHING OR INADVERTENT WATER CONTACT

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the accident:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) location: 1) general location; 2) grid reference/coordinates; 3) elevation and topography; g) departure point; h) phase of flight and flight level; i) destination and intermediate stops (with ETAs and ETDs), and radar tracks;	*The objective is to provide factual information regarding the accident.*

Type of information	*Specific information*	*Objective of the analysis*
	j) total number of crew members: 1) flight crew; 2) cabin crew; k) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and l) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor: 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor: 4) none; c) total in the aircraft: 1) fatal;	*The objective is to determine the number of casualties/survivors and the extent of injuries.* It is imperative to collect the information related to death and injuries, as there is a correlation between occupant injury and death and the aircraft structure and environment. *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	2) serious; 3) minor: 4) none; and d) Injuries (other): 1) fatal; 2) serious; 3) minor; and 4) none.	
Meteorological conditions	*Review the meteorological conditions, which may include:* a) atmospheric conditions (e.g. snow, rain, fog); b) wind; and c) any unusual considerations such as: volcanic ash, visual illusions or icing.	*The objective is to review the meteorological conditions and to evaluate if/how they effected the evacuation on water. For example:* a) difficulties in evacuating the aircraft; b) difficulties in locating the aircraft and/or occupants (e.g. heavy snow or rain, currents, swells); and c) hindering survival of occupants (e.g. water temperature).

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) cabin crew requirements; b) pre-flight checks; c) crew and passenger briefings; d) anticipated ditching and related checklist, if applicable; e) unanticipated ditching; f) aircraft evacuation on water; g) distribution of infant life jackets or other infant flotation devices, if applicable; and h) post-evacuation duties and responsibilities.	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) normal operations procedures, focusing on: 1) minimum cabin crew requirements, including exceptions; 2) briefings for both crew and passengers, including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; 3) pre-flight checks of safety and emergency equipment; 4) emergency exit row seating policy; b) ditching procedures, focusing on: 1) crew communication/signals; 2) briefings for both crew and passengers; 3) donning life jackets/use of other flotation devices; 4) assignment, relocation and briefing of able-bodied passengers; 5) securing and checking cabin, galleys, etc.; 6) use of checklists by cabin crew, if applicable; 7) silent review; 8) brace commands;

Type of information	*Specific information*	*Objective of the analysis*
		9) brace positions for crew and passengers; c) evacuation procedures (on water), focusing on: 1) decision to evacuate/order; 2) cabin crew authority to initiate evacuation; 3) evacuation commands; 4) operation of emergency lighting; 5) donning life jackets/use of other flotation devices (in case of unanticipated ditching); 6) assessing inside/outside conditions; 7) emergency operation of exits; 8) operation of slides, if applicable; 9) blocked/unusable exits; 10) primary/secondary exits depending on aircraft model, based on certification; 11) protective positions for crew members and passengers; 12) crowd control/managing the cabin (e.g. flow control); 13) cabin/flight deck search; 14) survival equipment that crew must take prior to exiting the aircraft; 15) retrieval of life-rafts from stowage locations (e.g. overhead bins, ceiling compartments) and operation;

Type of information	*Specific information*	*Objective of the analysis*
		16) operation of slide-rafts, if applicable; 17) other associated ditching equipment (e.g. ELT), if applicable; and 18) post-evacuation cabin crew duties and survival procedures.
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding abnormal and emergency procedures, specific to anticipated/unanticipated ditching and evacuation on water; b) human performance training, including CRM and joint flight/cabin crew CRM; c) aircraft type specific training (for the aircraft model involved in the accident); d) training specific to safety and emergency equipment; and e) training facilities and devices. *Note.— If applicable, review training for other personnel assigned to non-safety and emergency duties in the cabin by the operator (e.g. duty-free representatives, interpreters, other service personnel).*	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) minimum cabin crew requirements, including exceptions; 2) briefings for both crew and passengers including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; 3) emergency exit row seating policy; 4) anticipated/unanticipated ditching procedures; 5) aircraft evacuation procedures (on water); 6) hands-on and simulated exercises on relevant safety and emergency equipment and aircraft systems, such as slide-rafts and life jackets or other flotation equipment (specific to the aircraft model involved in the accident); 7) simulated exercises on preparing the cabin for an anticipated/unanticipated ditching and evacuation on water (including wet drills, if applicable);

Type of information	*Specific information*	*Objective of the analysis*
		8) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities; 2) safety and emergency equipment used for training; 3) cabin training devices; 4) emergency exit trainers (specific to the aircraft model involved in the accident); and 5) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned to non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the evacuation process or created confusion to occupants.*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the accident and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the emergency situation, including any language qualifications relevant to the accident flight; 2) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence);

Type of information	*Specific information*	*Objective of the analysis*
	5) personnel files (including date of hire); 6) any other relevant experience; b) other personnel records, if applicable; and c) accident aircraft: 1) aircraft journey log; 2) cabin defect log book; 3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) departure report, if applicable; 6) CVR transcripts, where applicable; 7) FDR readouts, where applicable; 8) diagram of galley(s) and stowage; 9) dispatch log; 10) flight crew flight log; 11) flight deck log book; 12) maintenance logs/release forms; 13) MEL; 14) other crew documents (e.g. equipment checklists, crew briefing sheets); and 15) passenger manifest and seat chart (including addresses and telephone numbers).	3) factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator); 4) factors that may affect performance, such as fatigue (derived from their flying schedule prior to the accident, layover rest or in-flight rest); and b) accident aircraft: 1) layout of the cabin and galley(s) and any features which may have hindered the evacuation (e.g. partitions/obstructions); 2) similarities and differences between other aircraft models, including documenting configuration differences in the operator's fleet; 3) location of passengers and crew in the cabin, which may be linked to their survival/death (e.g. if seated in an area subject to water flooding); 4) technical malfunctions which may have affected the performance of aircraft systems (e.g. inoperable exit due to slide-raft inflation malfunction). These may be traced through maintenance- or cabin-defect logs; 5) MELs for inoperative items such as cabin crew jump seats, PA system, aircraft and emergency equipment and systems, that hindered the evacuation; and 6) discussions between flight and cabin crew regarding the emergency situation, based on CVR transcripts.

Type of information	*Specific information*	*Objective of the analysis*
Other	*Review other operator documentation and determine pertinent references to:* a) cabin crew recruitment criteria; b) safety and emergency announcements; c) pre-flight passenger safety briefings; d) safety demonstration video, if applicable; e) safety briefing card; f) operator bulletins and notices to cabin crew; g) aircraft maintenance manual; h) component maintenance manual (from manufacturer); and i) maintenance control manual.	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) minimum qualifications required for recruitment of new cabin crew members; b) standard safety information provided to passengers via different means, specific to the aircraft model involved in the accident (e.g. content of safety demonstration, safety briefing cards); c) determining if the information matched that which was provided during the accident flight: 1) safety briefing cards on board the accident aircraft vs. the correct ones for that aircraft; 2) required pre-flight passenger safety briefings vs. those conducted on the accident flight; 3) approved safety announcements vs. those conducted on the accident flight; 4) safety demonstration vs. the one shown/conducted on the accident flight; 5) languages in which the briefing must be conducted vs. those used on the accident flight; d) safety information transmitted to cabin crew members, via internal operator communications (e.g. bulletins) which is required for them to carry out duties and responsibilities, as per operator policies and procedures (e.g. update of procedures); e) cabin-related information from the component maintenance manual (e.g. slide assembly); and

Type of information	*Specific information*	*Objective of the analysis*
		f) cabin-related information from the aircraft maintenance manual: 1) communication systems (PA/interphone); 2) emergency equipment; 3) emergency lighting; and 4) exits and evacuation-assisting means (e.g. slide-rafts).

3. DOCUMENTATION (STATE OF THE OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
National regulations	*Review regulatory requirements and determine pertinent references to:* a) number of cabin crew members on board; b) number of aircraft model qualifications permitted for a cabin crew member (endorsements); c) number, location and design of emergency exits; d) placards near each exit; e) instructions on the operation of exits; f) cabin crew safety training;	*The objective is to review the State's existing regulations and to evaluate the content and adequacy of the following:* a) minimum cabin crew requirements; b) number of aircraft model qualifications that a cabin crew member may hold at any one time; c) regulatory requirements related to emergency exits and related signs/placards; d) restrictions for exit row seating; e) regulatory requirements related to approved cabin crew safety training;

Type of information	*Specific information*	*Objective of the analysis*
	g) safety and emergency equipment, including equipment specifically required for flights over water; and h) ditching design standards.	f) regulatory requirements for the equipment required in the cabin, including those specific to flights over water (e.g. life jackets, life-rafts or slide-rafts); and g) conduct of a ditching demonstration on the aircraft model (e.g. by the manufacturer and the operator).
Oversight	*Review, for cabin safety-related information, the State oversight documentation of the operator involved in the accident and determine pertinent references to:* a) approved aircraft flight manual; b) approved operations manual; c) approved MEL; d) approved cabin crew training manual; e) last surveillance activity by the State; f) cabin crew check ride reports; and g) any exemptions, deviations or policy letters to the operator.	*The objective is to review the State's approvals and ongoing surveillance of the operator involved in the accident and to evaluate the following:* a) content of the approved aircraft flight manual, in relation to aircraft ditching; b) content of the approved operations manual, in relation to: 1) safety briefings and exit row seating; 2) anticipated (or unanticipated) ditching; 3) evacuation on water; c) cabin-related equipment in the approved MEL; d) content of the approved cabin crew training curriculum, in relation to: 1) safety briefings and exit row seating; 2) anticipated (or unanticipated) ditching; 3) evacuation on water;

Type of information	*Specific information*	*Objective of the analysis*
		e) last surveillance activity by the State, including any findings related to: 1) cabin-related policies and procedures; 2) training; 3) cabin crew qualifications and competencies; 4) violations (e.g. flight and duty time violations); 5) systemic issues; f) findings resulting from cabin crew check ride reports, including: 1) cabin crew performance; 2) deficiencies related to aircraft cabin conditions; 3) missing or inoperative safety and emergency equipment or aircraft (cabin) systems (e.g. missing life jackets); and g) any exemptions, deviations or policy letters issued by the State to the operator, which may be relevant to the accident: 1) authorization to reduce the number of crew members on board; and 2) exemption/deviation from regulatory requirements.

4. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Aerodrome	*Review documentation of the aerodrome where the accident occurred (if applicable) and determine pertinent references to:* a) aerodrome diagram; and b) aerodrome operations manual.	*The objective is to evaluate the content and adequacy of the following:* Aerodrome emergency plan, including procedures, responsibilities and duties of participating organizations in order to facilitate the following points during an emergency at the aerodrome: a) efficient rescue; b) medical care; c) firefighting operations; d) aircraft rescue and firefighting; and e) date of last emergency exercise *Note.— A diagram of the aerodrome may be useful when analysing the emergency response (e.g. difficulties in reaching the accident location due to the layout of runways/taxiways).*
Medical and pathological records	*Review medical and pathological records and determine pertinent references to:* a) medical reports; b) autopsy reports; c) toxicology reports; and d) crew medical certification-related files, if appropriate.	*The objective is to provide factual information regarding the accident:* a) cause of occupant's death or injury; b) pre-existing medical conditions that may have affected the cabin crew member's performance during the accident; and c) any specific issues related to special categories of passengers.

Type of information	*Specific information*	*Objective of the analysis*
Other sources of information	*Collect and review any visual, audio or other "recorded" information from multiple sources:* a) airport cameras; b) portable electronic devices (PEDs); c) news media reports; and d) social media.	*The objective is to gather any information available to assist with the investigation.*

5. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Exits, assisting-evacuation means, aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the following systems, as applicable:* a) exits and assisting-evacuation means: 1) location of all; 2) for deployable hatches, location inside or outside aircraft; 3) condition as found (e.g. open or closed); 4) damage; 5) location in wreckage; 6) operational check, if possible;	*The objective is to evaluate if the systems were useful in managing the ditching or increasing the survivability of occupants. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) exits that were not used or hindered the evacuation on water: 1) interior/exterior conditions that prevented use (e.g. water level at exits); 2) malfunction (e.g. airframe deformation, slide-raft failed to inflate); 3) mode of operation (door found in armed or disarmed mode); 4) damage to exit and surrounding fuselage (including water intrusion);

Type of information	*Specific information*	*Objective of the analysis*
	7) water level at exits; 8) position of the door-arming mechanism/indicator; 9) position of exit-opening handle; 10) condition of power-assist mechanism (if present), including gauge indicating pressure; 11) life-raft or slide-raft inflation mechanism and components; 12) condition of the slide bustle; 13) evacuation ropes (life lines), deployment of ropes, tapes or inertia reels; b) evacuation alarm system, if applicable; c) communication systems and associated signalling panels; d) lighting systems (interior, exterior and emergency lighting); and e) installed/portable emergency signalling system.	b) assisting-evacuation means that were not used or hindered the evacuation on water: 1) life-raft or slide-raft failed to inflate/partially inflated; 2) life-raft or slide-raft malfunctioned following inflation (e.g. punctured); 3) water level at exits; 4) life-raft or slide-raft inflated inside the cabin; 5) girt bar malfunctioned; c) the use of the evacuation alarm as a means to signal the evacuation order and its effectiveness, if applicable; d) the use of PA/interphone to communicate with passengers and crew. If these failed, presence of backup systems or equipment (e.g. megaphones); e) the use of emergency lighting to facilitate the location of exits by occupants. If these failed, presence and use of other equipment (e.g. flashlights); and f) the use of emergency signalling systems (e.g. ELT) to send distress signal.
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) portable fire extinguishers; b) axe; c) pry bar;	*The objective is to evaluate the type of equipment that was available and to assess if it was useful or a hindrance in managing the ditching or increasing the survivability of occupants. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use equipment were effective; and

Type of information	*Specific information*	*Objective of the analysis*
	d) protective gloves; e) smoke goggles; f) protective breathing equipment; g) portable oxygen equipment; h) emergency flashlight; i) megaphone; j) survival kit; k) child restraint systems; l) extension seat belt; m) AED and associated equipment (CPR masks, shields, resuscitator bags, etc.); n) FAK; o) universal precaution kit; p) medical kit; q) life jackets; r) infant life jackets; s) infant survival cots; t) flotation seat cushions; u) high visibility vests for the cabin crew;	c) additional equipment, not found on board, would have been helpful.

Type of information	*Specific information*	*Objective of the analysis*
	v) additional equipment used; and w) other equipment suited to the likely environment.	
Conditions of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following, as applicable:* a) floor structure and floor panels; b) carpets; c) insulation; d) ceiling and sidewall panels; e) PSUs, including oxygen mask assemblies; f) overhead bins and closets; g) latching mechanisms; h) bulkheads and class dividers; i) tray tables; j) passenger seats, including floor fittings and seat tracks; k) passenger restraints; l) cabin crew seats; m) cabin crew restraints; n) carry-on baggage; o) galleys, including restraints (latches, brakes);	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted on the survival of occupants (including injuries sustained) and affected their ability to evacuate the aircraft on water:* a) deformation/breaches in cabin structure, including evidence of water entry and aircraft flotation time; b) floor disruptions; c) evidence of thermal damage; d) evidence of injuries, such as blood stains, dents or cracks resulting from occupants impacting side panels, ceiling or other parts of the cabin; e) damage or stains on carpets, such as bodily fluids which may indicate injuries; f) seat and restraint mechanism failure, including seat track attachment; g) location of upset/damaged seats; h) seat belts (frayed or damaged); i) tray table deployment (deployed or not deployed per seat number); j) condition of stowage bin (including door condition, latching mechanism, content containment, failure to remain attached to fuselage). Empty bins may indicate passengers evacuated with personal items;

Type of information	*Specific information*	*Objective of the analysis*
	p) lavatories (ceiling panel/PSU, door); q) flight deck door; r) window shade positions; s) corded devices (e.g. IFE remote controls, headsets); t) crew rest areas, if applicable; u) cabin control panel(s); v) seat electronics and IFE under-seat fittings; and w) other internal structures or monuments.	k) condition of life jackets and flotation seat cushions (still under/on seat, still in pouch, pouch empty). This may indicate passengers evacuated with or without a life jacket or flotation device; l) evidence of overloading of any stowage or overhead compartments; m) signs of flame propagation on insulation materials; n) oxygen mask assemblies deployed (due to impact forces); o) evidence of stowage of garbage bags in the lavatories; p) evidence of stowage of cabin baggage in non-secure locations (e.g. unsecured behind last row of seats); q) damage in the galleys, including carts and other equipment becoming dislodged and blocking evacuation routes/exits or causing injuries; r) damage resulting from the accident (e.g. impact with water) vs. that which resulted from emergency response or post-accident activities (e.g. recovery of the wreckage); s) flight deck door: 1) locked or unlocked, including condition of locks/electronic access panels or keypads; 2) direction of opening and measurements of deformation; 3) thermal damage; 4) operable/jammed escape panels;

Type of information	*Specific information*	*Objective of the analysis*
		t) position of window shades (open or closed) and view from inside the cabin; u) corded devices retracted (stowed) or cords extended over seats or passageways; v) condition of crew rest areas, including damage; and w) condition of control panel(s) used by cabin crew, including damage.

6. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on cabin crew performance in pre-flight activities:* a) crew check-in process; b) conducting or participating in crew briefings (including joint briefings, if applicable); c) conducting pre-flight check of safety and emergency equipment; d) conducting passenger safety briefings; e) conducting briefings for special categories of passengers; and f) applying exit row seating restrictions.	*The objective is to evaluate how the cabin crew performed pre-flight duties and responsibilities. The analysis should determine:* a) the method used for timely distribution of safety-related information and whether it was read/reviewed by the crew; b) if the crew members participated in a pre-flight briefing and if so, what was the content (MEL, etc.); c) if a pre-flight check of safety and emergency equipment was completed, as per operator procedures, and if any discrepancies were noted; d) what safety information was given to passengers prior to departure (e.g. through a safety demonstration and briefings at exits); e) what safety information was given to special categories of passengers (e.g. passengers travelling with infants, persons with disabilities); and

Type of information	*Specific information*	*Objective of the analysis*
		f) if exit row seating restrictions were respected. If not, what did the cabin crew members do to rectify the situation (that is, move passengers);
Pre-ditching actions	*Review the information on cabin crew performance in preparing passengers/cabin for a ditching, if applicable:* a) recognizing the emergency situation (e.g. signal from flight crew, cabin conditions, passenger observation/remarks); and b) applying pre-ditching emergency procedures such as: 1) disseminating/sharing of information between flight and cabin crew; 2) CRM among the cabin crew and with flight crew; 3) identifying and recruiting ABPs; 4) instructions to passengers (including ABPs and special categories of passengers); 5) distributing infant life jackets, if applicable; 6) donning life jackets; 7) securing the cabin/galley(s); 8) relocating emergency equipment, as necessary (survival kits, beacons); 9) conducting cabin checks; 10) confirming “cabin readiness” to the flight crew; 11) complying with signals from the flight crew;	*The objective is to evaluate how the cabin crew prepared for the ditching. The analysis should determine:* a) how the cabin crew members obtained information on the emergency situation, including content, completeness, and effectiveness of information given by flight crew members or I/C; b) if the crew members reacted in accordance with operator procedures and if any procedures were adapted to the situation (if so, what were they and why?); c) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. difficulties in understanding instructions, high workload positions versus low/shared workload positions); d) what information was given to passengers (including ABPs and special categories of passengers) to prepare them for the ditching, including: instructions not to take carry-on baggage, brace position, nearest and alternate exits, not to inflate life jackets inside the aircraft, retrieval and use of ditching specific equipment (life-rafts) and if/when to remove high-heeled shoes; e) language(s) used to communicate with passengers – any language issues should be noted (e.g. passengers and crew did not speak the same language);

Type of information	*Specific information*	*Objective of the analysis*
	12) taking assigned station/seat; 13) checking door status, if applicable; 14) conducting silent review; 15) hearing and complying with flight crew emergency communication; 16) taking the brace position; and 17) shouting brace commands.	f) if cabin crew members distributed infant life jackets/infant survival cots or verified that they had been distributed (if the operator provides them ahead of time) and appropriately briefed passengers on any specific use of the device (e.g. operator may suggest one chamber on the infant flotation device be inflated); g) if crew members donned life jackets, including difficulties in locating, retrieving and donning them; h) if the crew members secured, prepared and checked the cabin, galley(s) and other areas to prevent/minimize injuries. This includes whether they verified that passengers had donned their life jackets and provided any assistance to those experiencing difficulties retrieving/donning them; i) if the cabin crew confirmed “cabin readiness” to the flight crew; j) if the cabin crew received and adhered to advisory to occupy station/seat in preparation for ditching; k) if the cabin crew checked door status, if applicable, to verify that doors were armed; l) if the cabin crew members conducted a silent review; and m) if the cabin crew braced for impact (if so, what position was taken?) and shouted commands instructing passengers to brace.
Actions during the ditching	*Review the information on cabin crew performance in conducting the evacuation on water:* a) initiating/reacting to signal to initiate the evacuation;	*The objective is to evaluate how the cabin crew managed the evacuation on water. The analysis should determine:* a) how cabin crew obtained the order to evacuate;

Type of information	*Specific information*	*Objective of the analysis*
	b) operating systems such as emergency lighting, PA and evacuation alarm system; c) donning life jackets (in case of unanticipated ditching); d) operation of exits and evacuation devices (capture sequence of opening if possible); e) shouting evacuation commands to passengers (including ABPs and special categories of passengers); f) managing passengers (carry-on baggage, slowed flow rate at exits, panicked passengers, etc.); g) managing evacuation (blocked exit); h) directing passengers to retrieve life-rafts from stowage locations (e.g. overhead bins, ceiling compartments); i) conducting a cabin and flight deck search; j) taking survival equipment, if applicable; k) operating life-rafts or slide-rafts; and l) difficulties encountered during the occurrence.	b) if the crew members reacted in accordance with operator procedures, were any procedures adapted to the situation (if so, what were they and why?); c) if there was a delay in initiating the evacuation, the analysis should focus on the reason; d) if applicable, the analysis should focus on why the cabin crew took the decision to evacuate (e.g. flooding in the cabin); e) if cabin crew members donned life jackets (in case of unanticipated ditching), including difficulties in locating, retrieving and donning them; f) if the cabin crew had difficulties opening the exits and/or operating the evacuation devices, the analysis should focus on the possible reasons (e.g. deformation of fuselage made it impossible to open an exit; water level at exits rendered some slide-rafts unusable); g) if exits and/or evacuation devices were inoperable, the analysis should focus on the crew's reaction (e.g. blocking an exit and redirecting passengers); h) if cabin crew chose not to use certain exits, the analysis should focus on the reasons (e.g. directed by flight crew, crew observed rapid cabin flooding in the area); i) information given to passengers during the ditching, including: instructions not to take carry-on baggage, nearest and alternate exits, not to inflate life jackets inside the aircraft, how to board rafts, whether to jump directly into the water and if/when to remove high-heeled shoes; j) equipment used by the crew during the evacuation on water (e.g. flashlights) and its effectiveness;

Type of information	*Specific information*	*Objective of the analysis*
		k) if the crew experienced difficulties locating and/or operating equipment, the analysis should focus on the possible reasons (e.g. if crew fly many models of aircraft or multiple configurations of the same aircraft model); l) if the cabin crew had any difficulties operating systems (e.g. PA), the analysis should focus on the possible reasons; m) how cabin crew managed any failure of systems such as emergency lighting; n) if applicable, how cabin crew managed the failure of the PA system and whether they used alternate means to communicate (e.g. megaphone); o) how the cabin crew managed passenger reactions (if panic or attempting to take carry-on baggage delayed the evacuation flow) and any issues with passengers not following instructions; p) the impact of the number of cabin crew members on board, with regards to the actions taken; q) if the cabin crew conducted a cabin and flight deck search prior to leaving the aircraft; r) if the cabin crew took any survival equipment when they evacuated and any difficulties encountered in accessing or retrieving and using the equipment; and s) if cabin crew experienced difficulties operating life-rafts or slide-rafts or detaching the equipment from the aircraft. In the case of life-rafts, the analysis should focus on any difficulties experienced in retrieving and positioning the life-rafts at exits.

Type of information	*Specific information*	*Objective of the analysis*
Post-ditching actions	*Review the information on cabin crew performance in managing the situation after the ditching:* a) gathering passengers onto rafts and away from the aircraft; b) performing post-evacuation duties; and c) applying survival procedures, if applicable.	*The objective is to evaluate how the cabin crew managed the post-ditching situation, until such time as the emergency services took over. The analysis should determine:* a) if crew members managed the crowd following the evacuation; b) if they administered first aid while waiting for medical assistance; and c) If they applied any survival procedures, such as signalling for help.

7. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on passenger action/response to pre-flight activities:* a) review of the safety briefing card; b) watching/listening to the passenger safety briefing/demonstration; c) briefing of special categories of passengers; d) briefing of exit row occupants; e) stowing of carry-on baggage; and f) use of restraints.	*The objective is to evaluate what information passengers received prior to departure. The analysis should determine:* a) if passengers reviewed the content of the safety briefing card; b) if passengers paid attention to the safety briefing/demonstration; c) if special categories of passengers received a safety briefing (e.g. passengers travelling with infants); d) if passengers seated at an exit row received/paid attention to a briefing regarding the operation of unstaffed exits (e.g. overwing exits);

Type of information	*Specific information*	*Objective of the analysis*
		e) if passengers stowed and secured their carry-on baggage properly (where and how many articles) including portable electronic devices; and f) if passengers properly used their restraint systems. *Note.— For all of the above, it should be noted if passengers understood the content of the briefings and can recall it. The analysis should focus on how helpful the passengers think it was. If passengers did not pay attention, the analysis should focus on the reason (e.g. frequent flyers).*
Pre-ditching actions	*Review the information on passenger recognition and response to the preparation for a ditching, if applicable:* a) recognizing the emergency situation; b) information given to passengers; c) instructions given to passengers (including ABPs and special categories of passengers); d) donning life jackets; e) reacting to brace command; and f) taking the brace position.	*The objective is to evaluate how the passengers recognized and responded to the preparation for the ditching. The analysis should determine:* a) if/how the passengers became aware of the emergency situation (e.g. PA from the flight crew); b) passengers' response to information given by the crew regarding the situation (including their understanding, reaction and any issues or concerns raised by the passengers); c) passengers' response and understanding to the instructions given by the crew (e.g. placed seats upright, removed shoes, stowed baggage, refrained from inflating life jackets inside the aircraft); d) if passengers donned life jackets, including difficulties in locating, retrieving and donning them; e) if passengers travelling with infants received infant life jackets/infant survival cots; f) how passengers reacted to brace commands and if the reaction was as intended; and g) if passengers braced for impact (if so, what position was taken?).

Type of information	*Specific information*	*Objective of the analysis*
Actions during the ditching	*Review the information to assess passenger performance during the evacuation on water:* a) reacting to the command to evacuate; b) donning life jackets (in case of unanticipated ditching); c) taking/leaving carry-on baggage; d) debris/obstructions in the cabin that impeded egress; e) location of the passengers during the occurrence and subsequent actions; f) difficulties locating an exit; g) operation of exits and evacuation devices (including overwing exits); h) assistance provided (ABPs); and i) other passengers' reactions.	*The objective is to evaluate how the passengers behaved/reacted during an evacuation on water. The analysis should determine:* a) passenger response to evacuation commands or recognition of need to evacuate; b) if passengers experienced any difficulties with their restraint system; c) if passengers donned life jackets (in case of unanticipated ditching), including difficulties in locating, retrieving and donning them; d) if passengers took/attempted to take carry-on baggage and if this hindered the evacuation (how did other passengers react to this?); e) any other conditions that hindered the evacuation (e.g. debris, fallen ceiling panels, baggage, flooding in the cabin); f) if passengers experienced difficulties locating exits, the analysis should focus on the possible reasons (e.g. disorientation due to darkness in the cabin) and describe the passengers' actions; g) if the passengers had difficulties opening the exits and/or operating the evacuation devices (e.g. at unstaffed exits), the analysis should focus on the possible reasons (e.g. clarity of placards and written instructions); h) if exits and/or evacuation devices were inoperable, the analysis should focus on the passengers' reaction (e.g. moving to the closest exit); i) if passengers chose not to use certain exits, the analysis should focus on the reasons (e.g. noticed exit was crowded vs. less crowded exit nearby);

Type of information	*Specific information*	*Objective of the analysis*
		j) if assistance was given/received by/from other passengers or if a passenger was traveling with another person that needed assistance; if yes, if he/she was able to assist the other person; k) if assistance was provided by a passenger to an injured/trapped crew member; l) if passengers were instructed to remove life-rafts from stowage areas and position them at exits, any difficulties encountered; m) when passengers inflated life jackets (before or after exiting the aircraft); and n) if they noticed other passengers' reactions (e.g. passengers in panic);
Post-accident ditching	*Review the information on passenger performance after the ditching:* a) the location where the passengers evacuated to, after leaving the aircraft; b) moving onto slide-rafts or life-rafts; c) moving away from the aircraft; d) responding to crew/other personnel's instructions; e) seeking assistance; and f) survival aspects, including in a scenario where the aircraft was not equipped for over-water flights.	*The objective is to evaluate how passengers reacted following the ditching. The analysis should determine:* a) the sequence in which the passengers exited the aircraft (e.g. into the water first, then swam to the overwing); b) if passengers moved away from aircraft and why (e.g. aircraft was sinking); c) estimated times that passengers stayed in the vicinity of the accident site until response arrived; d) if passengers re-entered the aircraft and the reason why; e) if they received and responded to instructions from cabin crew, flight crew, rescue and firefighting (RFF), coast guard or other personnel present at the scene;

Type of information	*Specific information*	*Objective of the analysis*
		f) if they received medical assistance, such as first aid, and who administered it; g) if other passengers around them were injured and how they reacted (e.g. assisted others); h) if they applied any survival techniques, such as signalling for help; and i) means passengers used to stay afloat if the accident aircraft was not equipped for over-water flights (that is, no life jackets or rafts).

8. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-accident information	*Review the information to assess the following activities, if applicable:* a) emergency response; and b) search and rescue (SAR).	*The objective is to evaluate how RFF or first responders responded to and managed the ditching. The analysis should determine:* a) how/when the emergency alert notification was activated; b) when ATC/RFF or others received the call regarding the accident; c) the time needed to respond, and reasons for delays, if any; d) the quantity and type of vehicles/vessels and equipment available/used; e) the challenges in relation to the aircraft model involved in the accident;

Type of information	*Specific information*	*Objective of the analysis*
		f) communications with aircraft, including difficulties encountered; and g) any other difficulties encountered. *The objective is to evaluate how the search and rescue operation responded to and managed the accident. The analysis should determine:* a) factual information on the SAR (who, how and when); b) units and agencies involved – means and methods used; c) any factors which facilitated or hindered the search; and d) content and adequacy of procedures.
Other pertinent information specific to the accident/crash site location	*Review the information to assess the following, if applicable:* a) aerodrome/runway overrun area; and b) crash site location/characteristics.	*The objective is to review the accident site conditions and to evaluate if/how they played a role in the accident. For example:* a) aerodrome: 1) obstructed view prevented the tower from locating the aircraft's final position; 2) layout of aerodrome made it difficult for RFF to reach the accident site; b) runway overrun area: 1) characteristics that contributed to the extent of the damage (e.g. aircraft overran into a body of water at the end of the runway); and

Type of information	*Specific information*	*Objective of the analysis*
		c) post-crash environment: 1) water temperature (and time survivors were in it); 2) water conditions (e.g. waves); 3) wind chill factor; and 4) remote area.

9. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.
Passengers	Refer to Appendices B and H to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the passenger's point of view, and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.

Appendix E to Chapter 5

GUIDANCE FOR INVESTIGATING ON-BOARD FIRE/SMOKE/FUMES

Note.— If an evacuation was necessary, refer to Appendix C to Chapter 5 for evacuation specific aspects.

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the accident:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) location: 1) general location; 2) grid reference/coordinates; 3) elevation and topography; g) departure point;	*The objective is to provide factual information regarding the accident.*

Type of information	*Specific information*	*Objective of the analysis*
	h) phase of flight and flight level; i) destination and intermediate stops (with ETAs and ETDs), and radar tracks; j) total number of crew members: 1) flight crew; 2) cabin crew; k) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and l) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor; 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor;	*The objective is to determine the number of casualties/survivors and the extent of injuries.* It is imperative to collect the information related to death and injuries, as there is a correlation between occupant injury and death and the aircraft structure and environment. *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	4) none; c) total in the aircraft: 1) fatal; 2) serious; 3) minor; 4) none; and d) injuries (other): 1) fatal; 2) serious; 3) minor; and 4) none.	
Meteorological conditions	*Review the meteorological conditions, which may include:* a) atmospheric conditions; b) wind; and c) any unusual considerations such as volcanic ash or smoke.	*The objective is to review the meteorological conditions and to evaluate if/how they played a role in the accident. For example:* a) external sources that may be considered in a fume event (e.g. did the flight path go over a forest fire or other source of odour?); and b) meteorological conditions that impacted the efficiency of firefighting after landing (e.g. wind, heavy rainfall).

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) pre-flight checks; b) firefighting; c) smoke removal; d) the management of on-board medical events; and e) crew member incapacitation, including those specific to single cabin crew member operations, if applicable.	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) pre-flight checks of safety and emergency equipment, focusing on: 1) firefighting equipment and relevant systems (e.g. lavatory smoke detectors); b) firefighting and/or smoke-removal procedures, focusing on: 1) fire prevention; 2) means to locate source and identify type of fire/smoke/fumes; 3) communication with other crew members and passengers; 4) use of firefighting and protective equipment; 5) firefighting and/or smoke-removal technique; 6) managing the cabin; 7) post-firefighting and/or smoke-removal procedures; c) procedures for the management of on-board medical events, focusing on: 1) recognizing, prioritizing, and responding to injured occupants; 2) administering first aid;

Type of information	*Specific information*	*Objective of the analysis*
		3) communication procedures; 4) procedures for seeking ground-based medical assistance and/or voluntary assistance from an on-board health professional; 5) use of first aid and safety and emergency equipment, as appropriate; 6) managing the voluntary assistance from, and providing support to, an on-board health professional, if available; d) procedures in the event of flight or cabin crew member incapacitation, focusing on: 1) administering first aid; 2) moving/securing the incapacitated crew member; 3) informing or assisting flight crew member(s); 4) reassigning required cabin crew stations and duties, if applicable; and e) procedures in the event of single cabin crew member incapacitation, focusing on: 1) notifying the flight crew; 2) securing the incapacitated cabin crew member; 3) administering first aid; and 4) assigning an able-bodied passenger (ABP) to care for the cabin crew member.

Type of information	*Specific information*	*Objective of the analysis*
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding abnormal and emergency procedures, specific to firefighting and/or smoke removal; b) training content regarding the management of on-board medical events; c) training content regarding crew member incapacitation; d) human performance training, including CRM and joint flight/cabin crew CRM; e) aircraft type specific training (for the aircraft model involved in the accident); f) training specific to safety and emergency equipment; and g) training facilities and devices. *Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty free representatives, interpreters, other service personnel).*	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) firefighting procedures; 2) smoke-removal procedures; 3) first aid and responding to on-board medical events; 4) flight and cabin crew member incapacitation; 5) hands-on and simulated exercises on relevant safety and emergency equipment and aircraft systems, such as fire extinguisher and protective breathing equipment (PBE) (specific to the aircraft model involved in the accident); 6) simulated firefighting exercise; 7) live firefighting exercise; 8) hands-on exercise on demonstrating cardiopulmonary resuscitation (CPR); 9) simulated exercises on responding to an in-flight medical event; 10) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities;

Type of information	*Specific information*	*Objective of the analysis*
		2) safety and emergency equipment used for training; 3) cabin training devices; and 4) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the management of the occurrence.*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule; 5) personnel files (including date of hire); 6) any other relevant experience; b) other personnel records, if applicable; and c) accident aircraft: 1) aircraft journey log; 2) cabin defect log book;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the accident and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the emergency situation, including any language qualifications relevant to the accident flight; 2) similarities and differences between other aircraft models, including documenting configuration differences in the operator's fleet; 3) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence); 4) factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator);

Type of information	*Specific information*	*Objective of the analysis*
	3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) departure report, if applicable; 6) CVR transcripts, where applicable; 7) diagram of galley(s) and stowage; 8) dispatch log; 9) flight crew flight log; 10) flight deck log book; 11) maintenance logs/release forms; 12) MEL; 13) other crew documents (e.g. equipment checklists, crew briefing sheets); and 14) passenger manifest and seat chart (including addresses and telephone numbers).	5) factors that may affect performance, such as fatigue (derived from their flying schedule prior to the accident, layover rest or in-flight rest); and b) accident aircraft: 1) layout of the cabin and galley(s) and any features which may have hindered firefighting (e.g. wiring inside a bulkhead); 2) location of passengers and crew in the cabin, which may be linked to their survival/death (e.g. if seated in an area that received extensive fire damage); 3) technical malfunctions which may have affected the performance of aircraft systems (e.g. overheating of wiring). These may be traced through maintenance or cabin-defect logs; 4) MELs for inoperative items such as emergency equipment and systems that hindered firefighting; and 5) discussions between flight and cabin crew regarding the emergency situation, based on CVR transcripts.
Other	*Review other operator documentation and determine pertinent references to:* a) cabin crew recruitment criteria; b) operator bulletins and notices to cabin crew; c) aircraft maintenance manual; and d) maintenance control manual.	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) minimum qualifications required for recruitment of new cabin crew members; b) changes in firefighting/smoke-removal procedures (e.g. in the event of a lithium battery fire); c) safety information transmitted to cabin crew members, via internal operator communications (e.g. bulletins) which is

Type of information	*Specific information*	*Objective of the analysis*
		required for them to carry out duties and responsibilities, as per operator policies and procedures (e.g. update of procedures); and d) cabin-related information from the aircraft maintenance manual: 1) communication systems (PA/interphone).

3. DOCUMENTATION (STATE OF THE OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
National regulations	*Review regulatory requirements and determine pertinent references to:* a) number of cabin crew members on board; b) number of aircraft type qualifications permitted for a cabin crew member (endorsements); c) cabin crew safety training; and d) safety and emergency equipment.	*The objective is to review the State's existing regulations and to evaluate the content and adequacy of the following:* a) minimum cabin crew requirements; b) number of aircraft type qualifications that a cabin crew member may hold at any one time; c) regulatory requirements related to approved cabin crew safety training; and d) regulatory requirements for the equipment required in the cabin.
Oversight	*Review, for cabin safety-related information, the State oversight documentation of the operator involved in the accident and determine pertinent references to:* a) approved aircraft flight manual; b) approved operations manual;	*The objective is to review the State's approvals and ongoing surveillance of the operator involved in the accident and to evaluate the following:* a) content of the approved aircraft flight manual, in relation to fire/smoke/fumes;

Type of information	*Specific information*	*Objective of the analysis*
	c) approved MEL; d) approved cabin crew training manual; e) last surveillance activity by the State; f) cabin crew check ride reports; and g) any exemptions, deviations or policy letters to the operator.	b) content of the approved operations manual, in relation to: 1) firefighting; 2) smoke removal; 3) on-board medical events; 4) flight and cabin crew member incapacitation; c) cabin-related equipment in the approved MEL; d) content of the approved cabin crew training curriculum, in relation to: 1) firefighting; 2) smoke removal; 3) on-board medical events; 4) flight and cabin crew member incapacitation; e) last surveillance activity by the State, including any findings related to: 1) cabin-related policies and procedures; 2) training; 3) cabin crew qualifications and competencies; 4) violations (e.g. flight and duty time violations); 5) systemic issues; f) findings resulting from cabin crew check ride reports, including:

Type of information	*Specific information*	*Objective of the analysis*
		1) cabin crew performance; 2) deficiencies related to aircraft cabin conditions; 3) missing or inoperative safety and emergency equipment or aircraft (cabin) systems (e.g. missing PBE); and g) any exemptions, deviations or policy letters issued by the State to the operator, which may be relevant to the accident: 1) exemption/deviation from regulatory requirements.

4. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Aerodrome	*Review documentation of the aerodrome where the accident occurred (if applicable) and determine pertinent references to:* a) aerodrome diagram; and b) aerodrome operations manual.	*The objective is to evaluate the content and adequacy of the following, if applicable:* a) aerodrome emergency plan, including procedures, responsibilities and duties of participating organizations in order to facilitate the following points during an emergency at the aerodrome: 1) efficient rescue; 2) medical care; 3) firefighting operations; 4) aircraft rescue and firefighting; and 5) date of last emergency exercise. *Note.— A diagram of the aerodrome may be useful when analysing the emergency response (e.g. difficulties in reaching the accident location due to the layout of runways/taxiways).*

Type of information	*Specific information*	*Objective of the analysis*
Medical and pathological records	*Review medical and pathological records and determine pertinent references to:* a) medical reports; b) autopsy reports; c) toxicology reports; and d) cabin crew's medical certification-related files, if appropriate.	*The objective is to provide factual information regarding the accident:* a) cause of occupant's death or injury; b) pre-existing medical conditions that may have affected the cabin crew member's performance during the accident; and c) any specific issues related to special categories of passengers.
Other sources of information	*Collect and review any visual, audio, or other "recorded" information from multiple sources:* a) airport cameras; b) portable electronic devices (PEDs); c) news media reports; and d) social media.	*The objective is to gather any information available to assist with the investigation.*

5. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the following systems, as applicable:* a) air conditioning, ventilation and pressurisation systems; b) communication systems and associated signalling panels;	*The objective is to evaluate if the systems were useful in managing the fire/smoke/fumes or increasing the survivability of occupants. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) the use of PA/interphone to communicate with passengers and crew. If these failed, presence of backup systems or equipment (e.g. megaphones);

Type of information	*Specific information*	*Objective of the analysis*
	c) lighting systems (interior, exterior and emergency lighting); d) control panels; e) electrical systems (e.g. galley, IFE, in-seat, circuit breakers); f) oxygen system (cabin and flight deck); g) fire prevention system; h) smoke detection system and smoke removal; and i) water and waste systems.	b) the use of lighting to facilitate the location of fire/smoke/fumes. If these failed, presence and use of other equipment (e.g. flashlights); c) electrical systems, including the position of circuit breakers (e.g. tripped); d) effectiveness of fire prevention system and/or smoke detection system in alerting occupants; and e) the use of control panels to manage systems (e.g. to shut down the IFE). If these failed, presence of backup systems or equipment (e.g. if systems can be overridden from the flight deck).
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) portable fire extinguishers; b) axe; c) pry bar; d) protective gloves; e) smoke goggles; f) protective breathing equipment; g) portable oxygen equipment; h) emergency flashlight; i) megaphone;	*The objective is to evaluate the type of equipment that was available and to assess if it was useful or a hindrance in managing the fire/smoke/fumes or increasing the survivability of occupants. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use equipment were effective; and c) additional equipment, not found on board, that would have been helpful.

Type of information	*Specific information*	*Objective of the analysis*
	j) AED and associated equipment (CPR masks, shields, resuscitator bags, etc.); k) FAK; l) universal precaution kit; m) medical kit; n) smoke barriers; and o) additional equipment used.	
Conditions of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following, as applicable:* a) exits; b) floor structure and floor panels; c) insulation; d) ceiling and sidewall panels; e) PSUs, including oxygen mask assemblies; f) overhead bins and closets; g) bulkheads and class dividers; h) tray tables; i) passenger seats, including floor fittings and seat tracks; j) passenger restraints; k) cabin crew seats;	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted on the survival of occupants (including injuries sustained):* a) deformation/breaches in cabin structure; b) evidence of thermal damage (e.g. melted components); c) evidence of burn damage (e.g. cracks, fuselage skin wrinkle, charred material); d) location of upset/damaged seats, exits, panels, etc.; e) seat belts (frayed or damaged); f) signs of flame propagation on insulation materials; g) damage resulting from the accident vs. that which resulted from emergency response (e.g. emergency/RFF personnel removing slides during firefighting); h) corded devices retracted (stowed) or cords extended, as well as evidence of damage;

Type of information	*Specific information*	*Objective of the analysis*
	l) cabin crew restraints; m) galleys, including restraints (latches, brakes); n) lavatories; o) carpets; p) flight deck, including door; q) corded devices (e.g. IFE remote controls, headsets); r) crew rest areas, if applicable; s) cabin control panel(s); t) seat electronics and IFE under-seat fittings; and u) other internal structures or monuments.	i) condition of crew rest areas, including damage; and j) condition of control panel(s) used by cabin crew, including damage.

6. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on cabin crew performance in pre-flight activities prior to the fire/smoke/fumes:* a) crew check-in process; b) conducting or participating in crew briefings (including joint briefings, if applicable); and c) conducting pre-flight check of safety and emergency equipment.	*The objective is to evaluate how the cabin crew performed their pre-flight duties and responsibilities. The analysis should determine:* a) the method used for timely distribution of safety-related information and whether it was read/reviewed by the crew; b) if the crew members participated in a pre-flight briefing and, if so, what was the content, including firefighting and related cabin crew actions; and c) if a pre-flight check of safety and emergency equipment was completed, as per operator procedures, and if any discrepancies were noted.

Type of information	*Specific information*	*Objective of the analysis*
Pre-fire/smoke/fumes actions	*Review the information on cabin crew performance during in-flight activities prior to the fire/smoke/fumes:* a) detecting and eliminating fire hazards.	*The objective is to evaluate how the cabin crew performed their in-flight duties and responsibilities. The analysis should determine:* a) if the crew members conducted cabin surveillance to identify/monitor potential sources of fire and, if so, which areas on board (e.g. lavatories, cargo areas if accessible from the cargo compartment during flight) and at what frequency; and b) if fire hazard was suspected, actions taken by the crew: 1) investigating abnormal smells; and 2) detecting smoke (e.g. coming from panels, due to electrical systems).
Actions during the fire/smoke/fumes	*Review the information on cabin crew performance in firefighting:* a) cabin activities at the time the fire/smoke/fumes became apparent; b) recognizing/reacting to information regarding fire/smoke/fumes; c) actions to locate the source of fire/smoke/fumes and to identify the type of fire/smoke/fumes; d) CRM among cabin crew and with flight crew; e) operating systems (e.g. PA); f) operating firefighting and protective equipment;	*The objective is to evaluate how the cabin crew managed the firefighting. The analysis should determine:* a) activities being undertaken in the cabin at the time the fire/smoke/fumes first became apparent; b) how the cabin crew became aware of the fire/smoke/fumes (e.g. passenger alerting crew members of unusual odour) and their response; c) how crew members attempted to locate the source of fire, including use of visual, audio and physical clues (e.g. using hands to feel if panels are hot) and what they saw (e.g. flames); d) actions taken if the location/source of fire could not be identified (hidden fire);

Type of information	*Specific information*	*Objective of the analysis*
	g) difficulties encountered during the occurrence, including difficulties due to the physical effects of fire/smoke/fumes; h) providing instructions to passengers; and i) managing passengers and cabin.	e) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to cabin crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. miscommunications, delays in relaying information); f) description of equipment used or not used (e.g. Halon extinguisher, PBE, axe) and reasons for using or not using a specific piece of equipment; g) number of extinguishers used during firefighting and their stowage location in the cabin; h) description of firefighting technique (e.g. did the cabin crew aim for the base of the visible flames?); i) if the cabin crew had any difficulties operating systems or equipment (e.g. PA, PBE, removing fire extinguisher from brackets), the analysis should focus on the possible reasons; j) if the cabin crew experienced physical effects (e.g. irritated eyes, coughing) during the occurrence and how these impacted on performance (e.g. difficulty seeing in dense smoke); k) if instructions were given to passengers to minimize the effects of fire/smoke/fumes (e.g. instructing them to breathe into cloths), and by whom; l) if ABPs were requested by the crew and what instructions were given to them;

Type of information	*Specific information*	*Objective of the analysis*
		m) how cabin crew managed passengers and cabin (e.g. relocating passengers and flammable equipment such as oxygen bottles from the vicinity of the fire); and n) the impact of the number of cabin crew members on board, with regards to the actions taken.
Post-fire/smoke/fumes actions	*Review the information on cabin crew performance in managing the situation after the fire was extinguished or smoke/fumes dissipated:* a) performing post-firefighting duties; b) managing crew/passenger injuries; and c) performing landing duties, if a diversion is necessary.	*The objective is to evaluate how the cabin crew managed the post fire/smoke/fumes situation, until such time as the aircraft landed and emergency services took over. The analysis should determine:* a) if cabin crew performed post-firefighting duties, such as monitoring the area for reignition/reappearance and maintaining continued communication with flight crew, other cabin crew members and passengers; b) if they applied procedures for managing on-board medical events, such as administering first aid to injured passengers and/or seeking voluntary medical assistance from an on-board health professional; c) if they applied crew member incapacitation procedures (including those specific to single cabin crew member operations). The analysis should focus on actions taken to respond to incapacitated crew members who could not continue their duties (e.g. reassigning cabin crew stations so that all exits are staffed for landing); and d) if the cabin crew had any difficulty operating systems or equipment (e.g. FAK, AED), the analysis should focus on the possible reasons.

7. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-fire/smoke/fumes actions	*Review the information on passenger action/response prior to the fire/smoke/fumes:* a) detecting fire hazards.	*The objective is to evaluate how the passengers recognized and responded to the potential signs of fire/smoke/fumes. The analysis should determine:* a) if passengers noticed unusual odours, other signs of a fire (haze, smoke, etc.), whether this information was relayed to crew members and how (including details of information transmitted to crew members).
Actions during the fire/smoke/fumes	*Review the information on passenger recognition and response to fire/smoke/fumes:* a) recognizing the situation; b) information given to passengers; c) instructions given to passengers; d) reacting to the information/instructions; and e) other passengers' reactions.	*The objective is to evaluate how the passengers recognized and responded to the fire/smoke/fumes. The analysis should determine:* a) if/how the passengers became aware of the fire/smoke/fumes (e.g. PA from the flight crew, visible signs in the cabin), including any physical effects (e.g. irritated eyes, coughing); b) how passengers understood and responded to the information given by the crew regarding the situation (e.g. breathing into a cloth); c) how passengers understood and responded to the instructions given by the crew (e.g. relocating seats); and d) if they noticed other passengers' reactions (e.g. passengers in panic).
Post-fire/smoke/fumes actions	*Review the information on passenger performance after the fire/smoke/*fumes*:* a) communicating with cabin crew; b) interacting with other passengers/crew;	*The objective is to evaluate how passengers reacted following the fire/smoke/fumes. The analysis should determine:* a) if passengers requested assistance due to injuries or communicated information to the cabin crew about conditions in the cabin (e.g. notifying crew of damage or reappearance of odours) and the crew's response;

Type of information	*Specific information*	*Objective of the analysis*
	c) information given to passengers; d) instructions given to passengers; and e) reacting to the information/instructions.	b) if other passengers or crew members were injured around them and how they reacted (e.g. assisted others); c) how passengers understood and responded to the information given by the crew regarding the situation (e.g. an emergency landing was needed); and d) how passengers understood and responded to the instructions given by the crew (e.g. instructing passengers to prepare for an emergency landing).

8. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-accident information	*Review the information to assess the following activities, if applicable:* a) emergency response.	*The objective is to evaluate how rescue and firefighting (RFF) responded to and managed the occurrence after landing. The analysis should determine:* a) how/when the emergency alert notification was activated; b) when ATC/RFF or others received the call regarding the accident; c) the time needed to respond and reasons for delays, if any; d) the quantity and type of vehicles and equipment available/used; e) the challenges in relation to the aircraft model involved in the accident (e.g. double-decker aircraft); f) the type, quantity, rate of extinguishing agents, including their effectiveness;

		g) communications with aircraft, including difficulties encountered; and h) any other difficulties encountered.
Other pertinent information to the accident/crash site location	*Review the information to assess the following, if applicable:* a) aerodrome; and b) crash site location/characteristics.	*The objective is to review the accident site conditions and to evaluate if/how they played a role in the accident. For example:* a) aerodrome: 1) obstructed view prevented the tower from locating the aircraft's final position; or 2) layout of aerodrome made it difficult for RFF to reach the accident site; and b) crash site: 1) mountainous terrain; or 2) remote area.

9. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.
Passengers	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the passenger's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.

Appendix F to Chapter 5

GUIDANCE FOR INVESTIGATING A TURBULENCE ENCOUNTER

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information* pertaining *to the accident:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) location: 1) general location; 2) grid reference/coordinates; 3) elevation and topography; g) departure point; h) phase of flight and flight level;	*The objective is to provide factual information regarding the accident.*

Type of information	*Specific information*	*Objective of the analysis*
	i) destination and intermediate stops (with ETAs and ETDs), and radar tracks; j) total number of crew members: 1) flight crew; 2) cabin crew; k) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and l) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor; 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor; 4) none;	*The objective is to determine the number of casualties/survivors and the extent of injuries.* It is imperative to collect the information related to death and injuries as there is a correlation between occupant injury and death and the aircraft structure and environment. *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	c) total in the aircraft: 1) fatal; 2) serious; 3) minor; 4) none; and d) injuries (other): 1) fatal; 2) serious; 3) minor; and 4) none.	
Meteorological conditions	*Review the meteorological conditions, which may include:* a) atmospheric conditions, including: 1) clear air turbulence; 2) mountain wave turbulence; 3) wake vortex; 4) cloud associated turbulence; 5) turbulence and thunderstorms; and 6) severe or extreme turbulence.	*The objective is to review the meteorological conditions and to evaluate how they played a role in the accident. For example:* a) turbulence was forecasted and crew were aware (anticipated); b) turbulence was not forecasted or crew were unaware (unanticipated); and c) crew were aware but turbulence severity was greater than anticipated.

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) pre-flight checks; b) crew and passenger briefings; c) the safe use of service equipment; d) turbulence; e) lap-held infants and child restraint systems (CRS); f) the management of on-board medical events; and g) cabin crew member incapacitation, including those specific to single cabin crew member operations, if applicable.	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) normal operations procedures, focusing on: 1) pre-flight briefing for crew, including joint flight and cabin crew briefing or stand-alone cabin crew briefing; 2) pre-flight checks of safety and emergency equipment; 3) safety demonstration; 4) safety-related announcements during the flight; b) procedures for the safe use of service equipment, focusing on: 1) pre-flight checks for carts; 2) stowing/latching of equipment; 3) applying brakes on service carts; 4) securing pots of hot beverages; c) procedures in the event of turbulence, focusing on: 1) crew communication/signals; 2) communication with passengers; 3) seat belt sign usage; 4) lap-held infants/CRS;

Type of information	*Specific information*	*Objective of the analysis*
		5) securing the cabin/galley; 6) discontinuing the serving of hot beverages, if in progress; 7) taking assigned cabin crew seat and cabin crew member securing self; 8) resuming service and duties; 9) post-turbulence procedure; d) procedures for the management of on-board medical events, focusing on: 1) recognizing, prioritizing and responding to injured occupants; 2) administering first aid; 3) communication procedures; 4) procedures for seeking ground-based medical assistance and/or voluntary assistance from an on-board health professional; 5) use of first-aid and medical equipment, as appropriate; 6) managing the voluntary assistance from, and providing support to, an on-board health professional, if available; 7) operator policy on “Do Not Resuscitate” (DNR), if appropriate; 8) managing a death or a presumed death on board;

Type of information	*Specific information*	*Objective of the analysis*
		e) procedures in the event of cabin crew member incapacitation, focusing on: 1) administering first aid; 2) securing the incapacitated cabin crew member; 3) informing the flight crew; 4) reassigning required cabin crew stations and duties, if applicable; and f) procedures in the event of single cabin crew member operation incapacitation, focusing on: 1) notifying the flight crew; 2) securing the incapacitated cabin crew member; 3) administering first aid; and 4) assigning an able-bodied passenger (ABP) to care for the cabin crew member.
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding the safe use of service equipment; b) training content regarding procedures in the event of turbulence; c) training content regarding the management of on-board medical events; d) training content regarding cabin crew member incapacitation;	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) briefings for both crew and passengers (including infants/children and use of CRS); 2) the safe use of service equipment; 3) turbulence management;

Type of information	*Specific information*	*Objective of the analysis*
	e) human performance training, including CRM and joint flight/cabin crew CRM; f) aircraft type specific training (for the aircraft model involved in the accident); g) training specific to safety and emergency equipment; and h) training facilities and devices. *Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty-free representatives, interpreters, other service personnel)*	4) first aid and responding to on-board medical events; 5) cabin crew member incapacitation; 6) hands-on exercise on demonstrating CPR; 7) hands-on and simulated exercises on relevant safety and emergency equipment and aircraft systems, such as FAK and PA system (specific to the aircraft model involved in the accident); 8) simulated exercises on responding to an in-flight medical event; 9) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities; 2) safety and emergency equipment used for training; 3) cabin training devices; and 4) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the management of the occurrence.*

Type of information	*Specific information*	*Objective of the analysis*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule; 5) personnel files (including date of hire); 6) any other relevant experience; and b) other personnel records, if applicable; and c) accident aircraft: 1) aircraft journey log; 2) cabin defect log book; 3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) CVR transcripts, where applicable; 6) FDR readouts, where applicable; 7) departure report, if applicable; 8) diagram of galley(s) and stowage;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the accident and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the emergency situation, including any language qualifications relevant to the accident flight; 2) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence); 3) factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator); 4) factors that may affect performance; such as fatigue (derived from their flying schedule prior to the accident, layover rest or in-flight rest); and b) accident aircraft: 1) layout of the cabin and galley(s) and any features which may have played a contributing role in injuries sustained during turbulence (e.g. location of cabin crew seats and emergency equipment); 2) location of passengers and crew in the cabin, which may be linked to their injuries (e.g. if seated in an area that experienced higher load factor);

Type of information	*Specific information*	*Objective of the analysis*
	9) dispatch log; 10) flight crew flight log; 11) flight deck log book; 12) maintenance logs/release forms; 13) MEL; 14) other crew documents (e.g. equipment checklists, crew briefing sheets); and 15) passenger manifest and seat chart (including addresses and telephone numbers).	3) technical malfunctions which may have affected the performance of aircraft systems (e.g. low volume of PA or failure of ordinance signs to illuminate). These may be traced through maintenance or cabin-defect logs; 4) MELs for inoperative items such as cabin crew seats, PA system, aircraft and emergency equipment and systems, that hindered crew actions or contributed to injuries; 5) discussions between flight and cabin crew related to turbulence encounter, based on CVR transcripts; and 6) loads (G-forces) upon the occupants during the turbulence upset (e.g. due to turbulence severity and aircraft manoeuvres) based on FDR readout.
Other	*Review other operator documentation and determine pertinent references to:* a) cabin crew recruitment criteria; b) safety announcements; c) pre-flight passenger safety briefings; d) safety demonstration video, if applicable; e) safety briefing card; f) operator bulletins and notices to cabin crew; and g) aircraft maintenance manual.	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) minimum qualifications required for recruitment of new cabin crew members; b) standard safety information provided to passengers via different means, specific to the aircraft model involved in the accident (e.g. content of safety demonstration, safety briefing cards); c) determining if the information matched that which was provided during the accident flight; 1) safety briefing cards on board the accident aircraft vs. the correct ones for that aircraft; 2) required pre-flight passenger safety briefings vs. those conducted on the accident flight;

Type of information	*Specific information*	*Objective of the analysis*
		3) approved safety announcements vs. those conducted on the accident flight; 4) safety demonstration vs. the one shown/conducted on the accident flight; 5) languages in which the briefing and safety announcements must be conducted vs. those used on the accident flight; d) safety information transmitted to cabin crew members, via internal operator communications (e.g. bulletins) which is required for them to carry out duties and responsibilities, as per operator policies and procedures (e.g. update of procedures); and e) cabin-related information from the aircraft maintenance manual: 1) communication systems (PA/interphone); and 2) ordinance signs.

3. DOCUMENTATION (STATE OF THE OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
National regulations	*Review regulatory requirements and determine pertinent references to:* a) number of cabin crew members on board;	*The objective is to review the State's existing regulations and to evaluate the content and adequacy of the following:* a) minimum cabin crew requirements;

Type of information	*Specific information*	*Objective of the analysis*
	b) cabin crew safety training; and c) safety and emergency equipment.	b) regulatory requirements related to approved cabin crew safety training; and c) regulatory requirements for the equipment required in the cabin.
Oversight	*Review, for cabin safety-related information, the State oversight documentation of the operator involved in the accident and determine pertinent references to:* a) approved aircraft flight manual; b) approved operations manual; c) approved MEL; d) approved cabin crew training manual; e) last surveillance activity by the State; f) cabin crew check ride reports; and g) any exemptions, deviations or policy letters to the operator.	*The objective is to review the State's approvals and ongoing surveillance of the operator involved in the accident and to evaluate the following:* a) content of the approved aircraft flight manual, in relation to turbulence; b) content of the approved operations manual, in relation to: 1) safety briefings; 2) safe use of service equipment; 3) turbulence; 4) on-board medical events; 5) cabin crew member incapacitation; c) cabin-related equipment in the approved MEL; d) content of the approved cabin crew training curriculum, in relation to: 1) safety briefings; 2) safe use of service equipment; 3) turbulence;

Type of information	*Specific information*	*Objective of the analysis*
		4) on-board medical events; 5) cabin crew member incapacitation; e) last surveillance activity by the State, including any findings related to: 1) cabin-related policies and procedures; 2) training; 3) cabin crew qualifications and competencies; 4) violations (e.g. flight and duty time violations); 5) systemic issues; f) findings resulting from cabin crew check ride reports, including: 1) cabin crew performance; 2) deficiencies related to aircraft cabin conditions; 3) missing or inoperative safety and emergency equipment or aircraft (cabin) systems (e.g. missing FAK); and g) any exemptions, deviations or policy letters issued by the State to the operator, which may be relevant to the accident: 1) exemption/deviation from regulatory requirements.

4. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Medical and pathological records	*Review medical and pathological records and determine pertinent references to:* a) medical reports; b) autopsy reports; c) toxicology reports; and d) crew medical certification-related files, if appropriate.	*The objective is to provide factual information regarding the accident:* a) cause of occupant's death or injury; b) pre-existing medical conditions that may have affected the cabin crew member's performance during the accident; and c) any specific issues related to special categories of passengers.
Other sources of information	*Collect and review any visual, audio, or other "recorded" information from multiple sources:* a) portable electronic devices (PEDs); b) news media reports; and c) social media.	*The objective is to gather any information available to assist with the investigation.*

5. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally), and part/serial number of the following systems, as applicable:* a) communication systems and associated signalling panels.	*The objective is to evaluate if the systems were useful in minimizing the risk of injury to occupants. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) the use of PA/interphone to communicate with passengers and crew (e.g. how audible was the PA instructing occupants to take their seats?). If these failed, presence of backup systems or equipment (e.g. megaphones); and

Type of information	*Specific information*	*Objective of the analysis*
		b) signalling panels, including: 1) cabin “fasten seat belt” ordinance sign illumination; 2) lavatory “return to seat” ordinance sign illumination; 3) crew rest area “fasten seat belt” ordinance sign illumination; and 4) associated chimes.
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally), and part/serial number of the following equipment, as applicable:* a) portable oxygen equipment; b) child restraint systems (CRS); c) extension seat belt; d) AED and associated equipment (CPR masks, shields, resuscitator bags, etc.); e) FAK; f) universal precaution kit; g) medical kit; and h) additional equipment used.	*The objective is to evaluate the type of equipment that was available and to assess if it was useful or a hindrance in responding to the turbulence encounter and/or injuries sustained by occupants. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use equipment were effective; c) additional equipment, not found on board, would have been helpful; and d) use and effectiveness of CRS (was the infant/child in the CRS, was the infant/child properly restrained?).
Conditions of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally), and part/serial number of the following, as applicable:* a) floor structure and floor panels;	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted on the survival of occupants (including injuries sustained):* a) damage, deformation/breaches in cabin structure (e.g. cracks or creases in ceiling panels, broken light fixture pans, dents, distorted panels);

Type of information	*Specific information*	*Objective of the analysis*
	b) ceiling and sidewall panels; c) lighting covers; d) PSUs, including oxygen mask assemblies; e) overhead bins and closets; f) latching mechanisms; g) bulkheads and class dividers; h) tray tables; i) passenger seats, including floor fittings and seat tracks; j) passenger restraints; k) cabin crew seats; l) cabin crew restraints; m) carry-on baggage; n) galleys, including restraints (latches, brakes); o) lavatories; p) exits, including components (e.g. slide bustle); q) carpets; r) flight deck, including door; s) crew rest areas, if applicable; and t) other internal structures or monuments.	b) floor disruptions; c) seat and restraint failure, including seat track attachment; d) damage to armrests; e) location of upset/damaged seats; f) seat belts (frayed or damaged); g) damage to overhead bins and condition following the turbulence encounter (open or closed); h) oxygen mask assemblies deployed (due to load factor/G-forces); i) failure of latching mechanisms and results (e.g. content of overhead bins falling out); j) damage in the galleys, including carts and other equipment falling or tipping over and causing injuries; k) damage in lavatories, including door and fallen ceiling panels; l) damage to exits resulting from impact with service equipment or load factor/G-forces, including damage to components such as: 1) gaps in slide bustle; 2) slide dropping out of slide bustle assembly; 3) damage to door recess light housing; 4) damage to slide bustle locking mechanism;

Type of information	*Specific information*	*Objective of the analysis*
		m) evidence of injuries, such as blood stains, dents or cracks resulting from occupants impacting side panels, ceiling or other parts of the cabin; n) damage or stains on carpets, such as bodily fluids, which may indicate injuries; and o) condition of flight deck, crew rest areas, internal structures and monuments including damage.

6. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on cabin crew performance in pre-flight activities:* a) crew check-in process; b) conducting or participating in crew briefings (including joint briefings, if applicable); c) conducting pre-flight check of safety and emergency equipment; d) conducting passenger safety briefings/announcements; and e) conducting briefings for special categories of passengers.	*The objective is to evaluate how the cabin crew performed pre-flight duties and responsibilities. The analysis should determine:* a) the method used for timely distribution of safety-related information and whether it was read/reviewed by the crew; b) if the crew members participated in a pre-flight briefing and, if so, what was the content, including: information regarding weather, possible turbulence, when it would be expected and related cabin crew actions; c) if a pre-flight check of safety and emergency equipment was completed and if any discrepancies were noted; d) what safety information was given to passengers prior to departure (through a safety demonstration or briefings); and e) what safety information was given to special categories of passengers (e.g. passengers travelling with infants).

Type of information	*Specific information*	*Objective of the analysis*
Pre-turbulence encounter actions	*Review the information on cabin crew performance during in-flight activities prior to the turbulence encounter:* a) conducting announcements; and b) applying procedures for the safe use of service equipment. *Review the information on cabin crew performance in preparing passengers/cabin for the turbulence encounter, if anticipated:* a) Disseminating information between flight and cabin crew; b) CRM among the cabin crew and with flight crew; c) giving instructions to passengers (e.g. via announcements); d) securing the cabin/galley(s) and service equipment; and e) conducting cabin checks.	*The objective is to evaluate how the cabin crew performed in-flight duties and responsibilities. The analysis should determine:* a) what safety information was given to passengers throughout the flight (e.g. announcements on the use of seat belts); and b) if procedures for the safe use of service equipment were applied. If not, actions taken by the cabin crew members to rectify the situation (e.g. securing carts when turbulence was encountered). *The objective is to evaluate how the cabin crew prepared for the anticipated turbulence encounter. The analysis should determine:* a) how the cabin crew members obtained information on anticipated turbulence, including content/completeness of information given by flight crew members or the in-charge cabin crew member (I/C); b) cabin crew actions in response to the information received (e.g. delay meal service); c) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to cabin crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. miscommunications, delays in relaying information); d) information given to passengers to prepare them for the turbulence encounter (e.g. instructions to fasten seat belt at all times when seated), and by whom; e) language(s) used to communicate with passengers – any language issues should be noted (e.g. passengers and crew did not speak the same language);

Type of information	*Specific information*	*Objective of the analysis*
		f) if the cabin crew members secured and checked the cabin, galley(s) and other areas prior to the turbulence encounter, to prevent/minimize injuries; and g) if the cabin crew members conducted cabin checks to verify seat belt or CRS compliance and collected any loose items that could cause injury. *Note.— The analysis should also look at flight crew actions, related to minimizing the risk of injuries in the event of a turbulence encounter (e.g. announcements regarding the use of seat belts and use of the fasten seat belt signs).*
Actions during the turbulence encounter	*Review the information on cabin crew performance during the turbulence encounter:* a) cabin activities at the time of the turbulence encounter; b) initiating/reacting to crew communication/signals; c) CRM among cabin crew and with flight crew; d) operating systems (e.g. PA); e) providing instructions to passengers; f) managing passengers; g) securing the cabin/galley; h) conducting a cabin check; i) securing self; and j) difficulties encountered during the occurrence.	*The objective is to evaluate how the cabin crew managed the cabin during the turbulence encounter. The analysis should determine:* a) activities being undertaken in the cabin at the time of the turbulence encounter (e.g. meal service, crew rest) and location of each cabin crew member; b) how cabin crew obtained the information regarding turbulence (e.g. PA from flight crew or other cabin crew, illumination of ordinance sign/chime) and their response (e.g. complying with advisory signal). The analysis should note whether the seat belt sign was illuminated at the time; c) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to cabin crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. miscommunications, delays in relaying information); d) if the cabin crew member initiated the communication, the analysis should determine the reasons why (e.g. severity of turbulence experienced at the rear of the aircraft);

Type of information	*Specific information*	*Objective of the analysis*
		e) if there was a delay in securing the cabin/galley, the analysis should focus on the reason (e.g. PA not clearly audible in certain parts of the aircraft); f) if the cabin crew had any difficulty operating systems or equipment (e.g. PA, restraints), the analysis should focus on the possible reasons; g) information given to passengers to prepare them for the turbulence encounter, and by whom; h) how cabin crew managed passengers' reactions (e.g. those who did not comply with instructions) and any issues with passengers not following instructions; i) how the crew secured the cabin/galley, including discontinuing the serving of hot beverages, if in progress, returning service carts to the galley or securing them in the aisles if turbulence became too severe, as well as any difficulties encountered when manipulating service equipment; j) if instructions were given to passengers travelling with infants/children (e.g. ensuring infants/children are appropriately restrained); k) if the cabin crew conducted a cabin check prior to taking their seats, including lavatories; l) if cabin crew took their assigned seats and secured themselves or if they sat in passenger seats and the possible reason (e.g. turbulence was too severe to return to cabin crew seat); m) if cabin crew left their seats during the turbulence encounter, the analysis should focus on the possible reasons (e.g. attend to passengers, secure unrestrained equipment); and n) the impact of the number of cabin crew members on board, with regards to the actions taken.

Type of information	*Specific information*	*Objective of the analysis*
Post-turbulence encounter actions	*Review the information on cabin crew performance in managing the situation after the turbulence encounter:* a) performing post-turbulence duties; b) managing crew/passenger injuries; c) applying crew member incapacitation procedures; and d) performing landing duties, if diversion is necessary.	*The objective is to evaluate how the cabin crew managed the post-turbulence situation, until such time as the aircraft reached its next destination. The analysis should determine:* a) if cabin crew remained seated and secured until the signal to resume duties was given. If not, the analysis should focus on the possible reasons (e.g. injured passenger); b) if cabin crew performed post-turbulence duties, such as contacting the flight crew and checking the cabin, lavatories, passengers and other crew members, cleaning up debris, etc.; c) if cabin crew applied procedures for managing on-board medical events, such as administering first aid to injured passengers and/or seeking voluntary medical assistance from an on-board health professional; d) if cabin crew applied crew member incapacitation procedures (including those specific to single cabin crew member operations). The analysis should focus on actions taken to respond to incapacitated crew members who could not continue their duties (e.g. reassigning cabin crew stations so that all exits are staffed for landing); and e) if the cabin crew had any difficulties operating systems or equipment (e.g. FAK, AED), the analysis should focus on the possible reasons.

7. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on passenger action/response to pre-flight/in-flight activities:* a) review of the safety briefing card; b) watching/listening to the passenger safety briefings/demonstrations; c) briefing of special categories of passengers; d) safety-related announcements; e) information/instructions given to passengers; f) stowing of carry-on baggage; and g) use of restraints.	*The objective is to evaluate what information passengers received prior to departure or during the flight. The analysis should determine:* a) if passengers reviewed the content of the safety briefing card; b) if passengers paid attention to the safety briefing/demonstration; c) if special categories of passengers received a safety briefing (e.g. passengers travelling with infants, passengers with disabilities); d) if passengers paid attention to safety-related announcements during the flight; e) if passengers stowed and secured their carry-on baggage properly (where and how many articles) including portable electronic devices; and f) if passengers properly used their restraint systems. *Note.— For all of the above, it should be noted if passengers understood the content of the briefings/announcements and can recall it. The analysis should focus on how helpful the passengers think it was. If passengers did not pay attention, the analysis should focus on the reason (e.g. frequent flyers).*

Type of information	*Specific information*	*Objective of the analysis*
Pre-turbulence encounter actions	*Review the information on passenger performance in preparing for the turbulence encounter (if anticipated):* a) reacting to the information/instructions.	*The objective is to evaluate how the passengers prepared for the anticipated turbulence encounter. The analysis should determine:* a) how passengers understood and responded to the information/instructions given by the crew regarding the anticipated turbulence encounter.
Actions during the turbulence encounter	*Review the information on passenger recognition and response to the turbulence encounter:* a) recognizing the situation; b) information given to passengers; c) instructions given to passengers (including those travelling with infants/children); d) reacting to the information/instructions; e) other passengers' reactions; and f) location of the passengers during the occurrence and subsequent actions.	*The objective is to evaluate how the passengers recognized and responded to the turbulence encounter. The analysis should determine:* a) if/how the passengers became aware of the turbulence encounter (e.g. PA from the flight crew, illumination of the seat belt sign); b) how passengers understood and responded to the information given by the crew regarding the situation (e.g. fastening seat belt, stowing baggage); c) how passengers understood and responded to the instructions given by the crew (e.g. returning to seat, placing infants in CRS); d) if they noticed other passengers' reactions (e.g. passengers in panic); e) if the passengers had any difficulties trying to restrain themselves or items in the cabin, the analysis should describe their actions; f) where the passengers were located during the occurrence, if not in their seat, and actions until the passengers were able to secure themselves; and g) if a passenger was traveling with another person that needed assistance; if yes, if he/she was able to assist the other person.

Type of information	*Specific information*	*Objective of the analysis*
Post-turbulence encounter actions	*Review the information on passenger performance after the turbulence encounter:* a) communicating with cabin crew; b) interacting with other passengers/crew; c) information given to passengers; d) instructions given to passengers; and e) reacting to the information/instructions.	*The objective is to evaluate how passengers reacted following the turbulence encounter. The analysis should determine:* a) if passengers requested assistance due to injuries or communicated information to cabin crew about conditions in the cabin (notifying crew of damage) and the crew response received; b) if other passengers or crew members were injured around them and how they reacted (e.g. assisted others); c) how passengers understood and responded to the information given by the crew regarding the situation; and d) how passengers understood and responded to the instructions given by the crew (e.g. instructing passengers to remain in their seats when the aircraft arrives at the gate to allow injured occupants to disembark first).

8. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-accident information	*Review the information to assess the following activities, if applicable:* a) medical assistance on arrival.	*The objective is to evaluate how the operator/aerodrome/medical personnel responded to and managed the injured occupants once the aircraft landed. The analysis should determine:* a) how/when the emergency alert notification was activated; b) when ATC/RFF, the operator or others received the call regarding the accident; c) the time needed to respond, and reasons for delays, if any;

Type of information	*Specific information*	*Objective of the analysis*
		d) the quantity and type of vehicles and equipment available/used; e) the challenges in relation to the aircraft model involved in the accident (e.g. difficulty moving stretcher down the aisle); f) the actions by operator's personnel (e.g. station manager), aerodrome personnel and medical personnel (e.g. paramedics, staff at hospital); g) communications with aircraft, including difficulties encountered; and h) any other difficulties encountered (up-line disruption such as incapacitated crew member).

9. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.
Passengers	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the passenger's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.

Appendix G to Chapter 5

GUIDANCE FOR INVESTIGATING A DECOMPRESSION

Note.— If an evacuation was necessary, refer to Appendix C to Chapter 5 for evacuation specific aspects.

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the accident:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) location: 1) general location; 2) grid reference/coordinates; 3) elevation and topography; g) departure point;	*The objective is to provide factual information regarding the accident.*

Type of information	*Specific information*	*Objective of the analysis*
	h) phase of flight and flight level; i) destination and intermediate stops (with ETAs and ETDs), and radar tracks; j) total number of crew members: 1) flight crew; 2) cabin crew; k) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and l) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor; 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor;	*The objective is to determine the number of casualties/survivors and the extent of injuries.* It is imperative to collect the information related to death and injuries, as there is a correlation between occupant injury and death and the aircraft structure and environment. *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	4) none; c) total in the aircraft: 1) fatal; 2) serious; 3) minor; 4) none; and d) injuries (other): 1) fatal; 2) serious; 3) minor; and 4) none.	

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to the following, if applicable:* a) pre-flight checks; b) crew and passenger briefings; c) cabin pressurization problem/decompression;	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following, if applicable:* a) normal operations procedures, focusing on: 1) pre-flight briefing for crew, including joint flight and cabin crew briefing or stand-alone cabin crew briefing;

Type of information	*Specific information*	*Objective of the analysis*
	d) the management of on-board medical events; and e) crew member incapacitation, including those specific to single cabin crew member operations, if applicable.	2) pre-flight checks of safety and emergency equipment; 3) briefings for passengers, including safety demonstration and for special categories of passengers; b) procedures in the event of cabin pressurization problem/decompression, focusing on: 1) recognizing the signs and symptoms of cabin pressurization problem/decompression; 2) donning the nearest oxygen mask and securing self; 3) communication with crew and passengers; 4) post-decompression actions; c) procedures for the management of on-board medical events, focusing on: 1) recognizing, prioritizing, and responding to injured occupants; 2) administering first aid; 3) communication procedures; 4) procedures for seeking ground-based medical assistance and/or voluntary assistance from an on-board health professional; 5) use of first-aid and safety and emergency equipment, as appropriate; 6) managing the voluntary assistance from, and providing support to, an on-board health professional, if available;

Type of information	*Specific information*	*Objective of the analysis*
		d) procedures in the event of flight crew member incapacitation, focusing on: 1) responding to the call from the flight crew; 2) moving incapacitated crew member away from the controls; 3) securing the incapacitated crew member; 4) administering first aid; 5) assisting remaining flight crew member(s); e) procedures in the event of cabin crew member incapacitation, focusing on: 1) administering first aid; 2) securing the incapacitated cabin crew member; 3) informing the flight crew; 4) reassigning required cabin crew stations and duties, if applicable; and f) procedures in the event of single cabin crew member operation incapacitation, focusing on: 1) notifying the flight crew; 2) securing the incapacitated cabin crew member; 3) administering first aid; and 4) assigning an able-bodied passenger (ABP) to care for the cabin crew member.

Type of information	*Specific information*	*Objective of the analysis*
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding abnormal and emergency procedures, specific to cabin pressurization problem/decompression; b) training content regarding the management of on-board medical events; c) training content regarding crew member incapacitation; d) human performance training, including CRM and joint flight/cabin crew CRM; e) aircraft type specific training (for the aircraft model involved in the accident); f) training specific to safety and emergency equipment; and g) training facilities and devices. *Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty free representatives, interpreters, other service personnel).*	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following, if applicable:* a) training content and crew assessment methods, focusing on: 1) briefings for both crew and passengers; 2) decompression; 3) first aid and responding to on-board medical events; 4) flight and cabin crew member incapacitation; 5) hands-on exercise for CPR demonstration; 6) hands-on and simulated exercises on relevant safety and emergency equipment and aircraft systems, such as portable oxygen devices (specific to the aircraft model involved in the accident); 7) hands-on exercises on the operation of the flight deck seat, harness and flight deck oxygen; 8) simulated decompression exercises; 9) simulated exercises on responding to an in-flight medical event; 10) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities;

Type of information	*Specific information*	*Objective of the analysis*
		2) safety and emergency equipment used for training; 3) cabin training devices; and 4) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the evacuation process or created confusion for occupants.*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule; 5) personnel files (including date of hire); 6) any other relevant experience; b) other personnel records, if applicable; and c) accident aircraft: 1) aircraft journey log; 2) cabin defect log book;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the accident and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the emergency situation, including any language qualifications relevant to the accident flight; 2) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence); 3) factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator); 4) factors that may affect performance, such as fatigue (derived from their flying schedule prior to the accident, layover rest or in-flight rest); and

Type of information	*Specific information*	*Objective of the analysis*
	3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) departure report, if applicable; 6) CVR transcripts, where applicable; 7) diagram of galley(s) and stowage; 8) dispatch log; 9) flight crew flight log; 10) flight deck log book; 11) maintenance logs/release forms; 12) MEL; 13) other crew documents (e.g. equipment checklists, crew briefing sheets); and 14) passenger manifest and seat chart (including addresses and telephone numbers).	b) accident aircraft: 1) layout of the cabin and any features which may have played a contributing role in injuries sustained (e.g. location of portable oxygen bottles); 2) location of passengers and crew in the cabin, which may be linked to their injuries (e.g. if seated in an area where the fuselage structure failed); 3) technical malfunctions which may have affected the performance of aircraft systems (e.g. low volume of PA). These may be traced through maintenance or cabin-defect logs; 4) MELs for inoperative items such as cabin crew seats, PA system, aircraft and emergency equipment and systems, that hindered crew actions or contributed to injuries; 5) discussions between flight and cabin crew related to the decompression, based on CVR transcripts; and 6) sounds which may be consistent with a rapid decompression, based on the CVR.
Other	*Review other operator documentation and determine pertinent references to:* a) cabin crew recruitment criteria; b) pre-flight passenger safety briefings; c) safety demonstration video, if applicable; d) safety briefing card;	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) minimum qualifications required for recruitment of new cabin crew members; b) standard safety information provided to passengers via different means, specific to the aircraft model involved in the accident (e.g. content of safety demonstration, safety briefing cards);

Type of information	*Specific information*	*Objective of the analysis*
	e) safety and emergency announcements; f) operator bulletins and notices to cabin crew; and g) aircraft maintenance manual.	c) determining if the information matched that which was provided during the accident flight; 1) safety briefing cards on board the accident aircraft vs. the correct ones for that aircraft; 2) required pre-flight passenger safety briefings vs. those conducted on the accident flight; 3) safety demonstration vs. the one shown/conducted on the accident flight; 4) languages in which the briefing and safety announcements must be conducted vs. those used on the accident flight; d) safety information transmitted to cabin crew members, via internal operator communications (e.g. bulletins) which is required for them to carry out duties and responsibilities, as per operator policies and procedures (e.g. update of procedures); and e) cabin-related information from the aircraft maintenance manual: 1) pressurization systems; and 2) communication systems (PA/interphone).

3. DOCUMENTATION (STATE OF THE OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
National regulations	*Review regulatory requirements and determine pertinent references to:* a) number of cabin crew members on board; b) cabin crew safety training; and c) safety and emergency equipment.	*The objective is to review the State's existing regulations and to evaluate the content and adequacy of the following:* a) minimum cabin crew requirements; b) regulatory requirements related to approved cabin crew safety training; and c) regulatory requirements for the equipment required in the cabin.
Oversight	*Review, for cabin safety-related information, the State oversight documentation of the operator involved in the accident and determine pertinent references to:* a) approved aircraft flight manual; b) approved operations manual; c) approved MEL; d) approved cabin crew training curriculum; e) last surveillance activity by the State; f) cabin crew check ride reports; and g) any exemptions, deviations or policy letters to the operator.	*The objective is to review the State's approvals and ongoing surveillance of the operator involved in the accident and to evaluate the following:* a) content of the approved aircraft flight manual, in relation to decompression; b) content of the approved operations manual, in relation to: 1) safety briefings; 2) decompression; 3) on-board medical events; 4) flight and cabin crew member incapacitation; c) cabin-related equipment in the approved MEL; d) content of the approved cabin crew training curriculum, in relation to: 1) safety briefings;

Type of information	*Specific information*	*Objective of the analysis*
		2) decompression; 3) on-board medical events; 4) flight and cabin crew member incapacitation; e) last surveillance activity by the State, including any findings related to: 1) cabin-related policies and procedures; 2) training; 3) cabin crew qualifications and competencies; 4) violations (e.g. flight and duty time violations); 5) systemic issues; f) findings resulting from cabin crew check ride reports, including: 1) cabin crew performance; 2) deficiencies related to aircraft cabin conditions; 3) missing or inoperative safety and emergency equipment or aircraft (cabin) systems (e.g. missing oxygen bottle); and g) any exemptions, deviations or policy letters issued by the State to the operator, which may be relevant to the accident: 1) exemption/deviation from regulatory requirements.

4. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Medical and pathological records	*Review medical and pathological records and determine pertinent references to:* a) medical reports; b) autopsy reports; c) toxicology reports; and d) crew's medical certification-related files, if appropriate.	*The objective is to provide factual information regarding the accident:* a) cause of occupant's death or injury; b) pre-existing medical conditions that may have affected the cabin crew member's performance during the accident; and c) any specific issues related to special categories of passengers.
Other sources of information	*Collect and review any visual, audio or other "recorded" information from multiple sources:* a) PEDs; b) news media reports; and c) social media.	*The objective is to gather any information available to assist with the investigation.*

5. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the following systems, as applicable:* a) pressurization systems; b) deployable oxygen masks and related components; and c) communication systems.	*The objective is to evaluate if the systems were useful in minimizing the risk of injury to occupants. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) the use of deployable oxygen masks, including reasons for failure to deploy/supply oxygen as intended (noting all locations in the cabin, lavatories, crew rest and galleys, etc.);

Type of information	*Specific information*	*Objective of the analysis*
		b) the use of PA/interphone to communicate with passengers and crew. If these failed, presence of backup systems or equipment (e.g. megaphones); and c) during use of PA system, note passenger ability to hear communications (volume, interference) and difficulties experienced in communicating (e.g. due to high ambient noise associated with the decompression).
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) portable oxygen equipment (bottles, passenger mask, full face mask, flight deck oxygen mask); b) megaphone; c) AED and associated equipment (CPR masks, shields, resuscitator bags, etc.); d) FAK; e) universal precaution kit; f) medical kit; and g) additional equipment used.	*The objective is to evaluate the type of equipment that was available and to assess if it was useful or a hindrance in reacting to the decompression and/or responding to injuries sustained by occupants. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) the instructions on how to use equipment were effective; and c) any additional equipment, not found on board, would have been helpful.
Conditions of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following, as applicable:* a) fuselage structure; b) floor structure and floor panels;	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted the survival of occupants (including injuries sustained):* a) damage, deformation/breaches in the structure (e.g. fractured fuselage skin); b) floor, ceiling or sidewall disruptions;

Type of information	*Specific information*	*Objective of the analysis*
	c) ceiling and sidewall panels; d) PSUs, including oxygen mask assemblies; e) lavatories; f) overhead bins and closets; g) latching mechanisms; h) passenger seats, including floor fittings and seat tracks; i) passenger restraints; j) cabin crew seats; k) cabin crew restraints; l) carry-on baggage; m) exits; n) flight deck, including door; o) crew rest areas, if applicable; and p) other internal structures or monuments.	c) oxygen mask assemblies deployed (or stowed); d) failure of latching mechanisms and results (e.g. content of overhead bins swept out during decompression); e) seat and restraint failure, including seat track attachment; f) location of upset/damaged seats; g) seat belts (frayed or damaged); h) debris from carry-on baggage/loose items in the cabin; i) damage to exits resulting from structural failure or debris; and j) condition of flight deck, crew rest areas, internal structures and monuments, including damage.

6. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on cabin crew performance in pre-flight activities:* a) crew check-in process; b) conducting or participating in crew briefings (including joint briefings, if applicable); c) conducting passenger safety briefings; d) conducting briefings for special categories of passengers; and e) conducting pre-flight check of safety and emergency equipment.	*The objective is to evaluate how the cabin crew performed pre-flight duties and responsibilities. The analysis should determine:* a) the method used for timely distribution of safety-related information and whether it was read/reviewed by the crew; b) if the crew members participated in a pre-flight briefing and, if so, what was the content; c) what safety information was given to passengers prior to departure (through a safety demonstration or briefings); d) what safety information was given to special categories of passengers (e.g. passengers travelling with infants, persons with disabilities); and e) if a pre-flight check of safety and emergency equipment was completed, as per operator procedures, and if any discrepancies were noted.
Actions during the decompression	*Review the information on cabin crew performance during the decompression:* a) cabin activities at the time of the decompression; b) recognizing/reacting to the decompression; c) donning oxygen mask and securing self; d) communicating with other crew members; e) operating systems (e.g. PA); f) providing instructions to passengers; and	*The objective is to evaluate how the cabin crew reacted during the decompression. The analysis should determine:* a) the activities being undertaken in the cabin at the time of the decompression (e.g. meal service) and location of each cabin crew member. The analysis should note whether the seat belt sign was illuminated at the time of the decompression; b) how the cabin crew members became aware of the decompression (e.g. PA from the flight deck, recognizing signs and symptoms of a decompression) and the extent of information given to them (e.g. instructions from the flight crew);

Type of information	*Specific information*	*Objective of the analysis*
	g) difficulties encountered during the occurrence.	c) cabin crew members' immediate actions in response to the information received (e.g. donning oxygen mask, securing self); d) if there was a delay in cabin crew donning oxygen masks or securing themselves, the analysis should focus on the possible reasons (e.g. assisting passengers); e) whether the cabin crew attempted to contact the flight crew (to ascertain their knowledge of the situation and verify that they had donned their oxygen masks); f) if the cabin crew had any difficulty operating systems or equipment (e.g. PA, oxygen masks and bottles), the analysis should focus on the possible reasons; g) if information was given to passengers (e.g. instructions to use oxygen masks); h) the language(s) used to communicate with passengers; any language issues should be noted (e.g. passengers and crew did not speak the same language); i) the location of any passengers who were not at their seats when the decompression occurred and crew response; j) difficulties experienced in communicating (e.g. due to high ambient noise associated with the decompression); and k) the impact of the number of cabin crew members on board, with regards to the actions taken.
Post-decompression actions	*Review the information on cabin crew performance in managing the situation after the decompression:* a) performing post-decompression duties; b) managing crew/passenger injuries;	*The objective is to evaluate how the cabin crew managed the post-decompression situation, until such time as the aircraft reached its next destination. The analysis should determine:* a) the estimated time cabin crew remained seated and secured until the signal to resume duties was given;

Type of information	*Specific information*	*Objective of the analysis*
	c) applying crew member incapacitation procedures; and d) CRM among the cabin crew and with flight crew.	b) if the cabin crew members did not remain seated, the analysis should focus on the possible reasons (e.g. injured passenger); c) if cabin crew performed post-decompression duties, such as contacting the flight crew and checking the cabin, lavatories, passengers and other crew members; d) if they applied procedures for managing on-board medical events, such as administering first aid to injured passengers and/or seeking voluntary medical assistance from an on-board health professional; e) if they applied crew member incapacitation procedures (including those specific to single cabin crew member operations). The analysis should focus on actions taken to respond to the incapacitated crew members who could not continue their duties (e.g. reassigning cabin crew stations so that all exits are staffed for landing); f) if the cabin crew had any difficulty operating systems or equipment (e.g. FAK, AED), the analysis should focus on the possible reasons; and g) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. difficulties in understanding instructions, high workload positions versus low/shared workload positions).

7. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-flight actions	*Review the information on passenger action/response to pre-flight activities:* a) review of the safety briefing card; b) watching/listening to the passenger safety briefings/demonstrations; c) briefing of special categories of passengers; d) information/instructions given to passengers; and e) use of restraints.	*The objective is to evaluate what information passengers received prior to departure. The analysis should determine:* a) if passengers reviewed the content of the safety briefing card; b) if passengers paid attention to the safety briefing/demonstration; c) if special categories of passengers received a safety briefing (e.g. exit row briefings; passengers travelling with infants); and d) if passengers properly used their restraint systems. *Note.— For all of the above, it should be noted if passengers understood the content of the briefings/announcements and can recall it. The analysis should focus on how helpful the passengers think it was. If passengers did not pay attention, the analysis should focus on the reason (e.g. frequent flyers*).
Actions during the decompression	*Review the information on passenger recognition and response to the decompression:* a) recognizing the situation; b) instructions given to passengers; c) reacting to instructions; d) other passengers' reactions; and e) location of the passengers during the occurrence and subsequent actions.	*The objective is to evaluate how the passengers recognized and responded to the decompression. The analysis should determine:* a) how the passengers became aware of the decompression (e.g. PA from the flight crew, signs and symptoms experienced); b) how passengers understood and responded to the instructions given by the crew (e.g. donning oxygen masks); c) if the passengers had any difficulties/concerns using the emergency equipment (e.g. oxygen masks), the analysis should describe their actions;

Type of information	*Specific information*	*Objective of the analysis*
		d) where the passengers were located during the occurrence; if not in their seat, the analysis should describe the actions until the passengers were able to use the oxygen masks; e) if a passenger was traveling with another person that needed assistance; if yes, if he/she was able to assist the other person; and f) if they noticed other passengers' reactions (e.g. passengers in panic).
Post-decompression actions	*Review the information on passenger performance after the decompression:* a) communicating with cabin crew; b) interacting with other passengers/crew; c) information given to passengers; d) instructions given to passengers; and e) reacting to the information/instructions.	*The objective is to evaluate how passengers reacted following the decompression. The analysis should determine:* a) if passengers requested assistance due to injuries or communicated information to cabin crew about conditions in the cabin (notifying crew of damage) and the crew response received; b) if other passengers or crew members were injured around them and how they reacted (e.g. assisted others); c) how passengers understood and responded to the information given by the crew regarding the situation (e.g. if a diversion was needed); and d) how passengers understood and responded to the instructions given by the crew (e.g. instructing passengers to remain in their seats when the aircraft arrived at the gate to allow injured occupants to disembark first).

8. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-accident information	*Review the information to assess the following activities, if applicable:* a) medical assistance on arrival.	*The objective is to evaluate how the operator/aerodrome/medical personnel responded to and managed the injured occupants once the aircraft landed. The analysis should determine:* a) how/when the emergency alert notification was activated; b) when ATC/RFF, the operator or others received the call regarding the accident; c) the time needed to respond and reasons for delays, if any; d) the quantity and type of vehicles and equipment available/used; e) the challenges in relation to the aircraft model involved in the accident (e.g. difficulty moving a stretcher down the aisle); f) the actions by operator's personnel (e.g. station manager), aerodrome personnel and medical personnel (e.g. paramedics, staff at hospital); g) communications with aircraft, including difficulties encountered; and h) any other difficulties encountered.

9. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.
Passengers	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the passenger's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.
Other personnel	a) Others that had contact with the aircraft accident; and b) refer to Chapter 5, 5.8.	a) Evaluate if the personnel noticed anything unusual prior to the flight or had any prior issues with the accident aircraft: 1) flight crew members; 2) station manager, ground personnel, maintenance technicians, etc. who had contact with the aircraft prior to the accident; and b) collect any suggestions for safety improvements.

Appendix H to Chapter 5

EXAMPLE OF PASSENGER QUESTIONNAIRE ON BRACE POSITIONS AND INJURIES

Flight # _____ Passenger's Name _____

Date of accident YYYY/MM/DD: _ _ _ _ / _ _ / _ _ **Date form completed** YYYY/MM/DD: _ _ _ _ / _ _ / _ _

Name of person completing form and relationship to passenger _____

1. Your details	**A.** Sex	**a.** Male **b.** Female
	B. Age	**a.** Years **b.** Months
	C. Height	**a.** Cm _____ **b.** Feet/inches _____
	D. Weight	**a.** Kg _____ **b.** Pounds _____
	E. Pregnant	**a.** Yes **b.** No **c.** If Yes, # of months _____ / weeks _____
	F. Mobility issues (or those related to special categories of passengers)	**a.** Yes **b.** No **c.** If Yes, please describe _____
2. Where were you sitting at the time of the accident?	Passenger Seat # _____	Class: **a.** First **b.** Business **c.** Economy
3. In which direction did your seat face?	**A.** Forward-facing seat 	**B.** Rearward-facing seat 
	Other seat directions:	**A.** Oblique-facing seat **B.** Side-facing seat

4. What was your seat belt type?	**A.** Lap belt only (2-point) **B.** Lap & diagonal (3-point) **C.** Harness (4-point) **D.** Harness (5-point)	 **A B C D**
5. Did your seatbelt have an airbag?	**A.** Yes **B.** No **C.** Unknown	
6. Was your seatbelt fastened?	**A.** Yes **B.** No	 **A B**
7. Seatbelt tightness	**A.** Tight **B.** Loose **C.** Unknown	 **A B**
8. Position of torso	**A.** Upright **B.** Bent forwards no head contact with seat in front **C.** Bent forwards head in contact with seat in front **D.** Bent forwards and curled up **E.** Unknown **F.** Other (describe):_____	 **A B C D**
9. Position of feet	**A.** On floor **B.** Off floor **C.** Unknown **D.** Other (describe):_____	 **A B**
10. Position of feet (if on the floor)	**A.** Behind knees **B.** In line with knees **C.** In front of knees **D.** Unknown **E.** Other (describe):_____	 **A B C**

11. Position of arms and hands	**A.** Against seat in front with arms parallel and head on seat in front **B.** Against seat in front with arms parallel and face on hands **C.** Against seat in front with arms crossed and head on arms **D.** Hands on top of head **E.** Arms and hands hanging down by side **F.** Hands placed under thighs behind knees **G.** Arms down with hands holding lower legs **H.** Unknown **I.** Other (describe):_____	
12. Were you travelling with an infant or a child?	**A.** Did the infant or child share your seat?	**a.** Yes **b.** No
	B. Did you use a child restraint?	**a.** Yes **b.** No
	C. If Yes, was it:	**a.** Supplemental loop belt **b.** Child restraint system (CRS) **c.** Other (describe):_____
13. Did you assist another person/child?	**A.** Yes **B.** No	
14. Did you come into contact with the passenger(s) next to you?	**A.** Yes **B.** No **C.** Unknown **D.** Any other obstacle (describe):_____	
	If Yes, on which side?	**a.** Right **b.** Left **c.** Both right and left
15. Were you able to evacuate from the aircraft?	**A.** Yes **B.** No	
16. What injuries did you sustain?	**A. Head, neck and spine**	**a.** Brain injury (including loss of consciousness) **b.** Fracture of skull **c.** Fracture of facial bone(s) **d.** Cuts to the head, face or neck **e.** Broken neck **f.** Broken back (upper, mid, lower) **g.** Spinal cord injury

	B. Chest, abdomen & pelvis (lower abdomen)	**a.** Internal or external (cuts, bruises) of the chest **b.** Internal or external (cuts, bruises) injury of the abdomen **c.** Internal or external (cuts, bruises) injury of the pelvis
	C. Limbs	**a.** Amputation **b.** Fracture **c.** Cuts, bruises
	D. Burns	**a.** Degree of burns **i.** First **ii.** Second **iii.** Third **b.** Percent of body burned: _____%
17. All and other injuries	Please attach any official descriptions. where available	*Note.— please annotate a diagram of the human body*

Chapter 6

INCIDENT INVESTIGATION

6.1 GENERAL

6.1.1 This chapter focuses on the investigation of incidents which do not meet the ICAO definition of an accident and do not require a formal investigation by the State of Occurrence. Incidents can provide evidence of hazards or deficiencies within the aviation system and should not be overlooked. A well conducted incident investigation should identify all immediate and underlying systemic causes of an occurrence and recommend appropriate safety actions aimed at avoiding the hazards or eliminating the deficiencies.

6.1.2 Incident investigations are performed by the operator for events occurring within its organization that are not required to be reported to the State of the Operator or investigated by the State of Occurrence. In certain cases, the State may delegate the investigation of an occurrence to the operator and request that it provide the results. The operator should have documented policies, procedures and guidelines for the conduct of incident investigations. The policies should define the duties and responsibilities of the cabin investigators (CI) that may be associated with any cabin safety incident. The operator should have cabin safety experts to carry out the cabin investigations. These experts should possess the qualifications, competencies and skills relevant to a CI, as defined in Chapter 4.

6.1.3 Upon completion of an incident investigation, the operator should produce a report, which presents factual information, analysis, conclusions and safety recommendations, to affect safety changes as part of its safety management system (see Chapter 5, 5.2).

6.2 MANDATORY OCCURRENCE REPORTING

The State of the Operator should define occurrences that must be reported by the operator. With the goal of improving safety, the State and the operator should consider conducting in-depth investigations of mandatory reported occurrences. These may include but are not limited to:

a) the evacuation of crew and/or passengers;

b) the use of fire extinguishing or suppression agents;

c) fire and smoke occurrences, including those where the fires were extinguished;

d) occurrences requiring the use of oxygen;

e) anticipated emergency landing (that is, preparation for emergency evacuation on land or on water);

f) unanticipated emergency landing;

g) significant safety- and security-related occurrences, including, for example: bomb threats, hijack or similar occurrences, security breaches, stowaways and severe turbulence;

h) cabin crew member incapacitation that renders the crew member unable to perform safety duties;

i) spillage, leakage or any occurrence related to the transport of dangerous goods; carriage of dangerous goods in a manner that does not conform with the provisions of Annex 18 — *The Safe Transport of Dangerous Goods by Air* and *Technical Instructions for the Safe Transport of Dangerous Goods by* Air (Doc 9284); and

j) any other occurrence that endangers or may endanger the operation of an aircraft or which causes or may cause a danger to persons or property.

6.3 TYPES OF OCCURRENCES

6.3.1 The operator should consider investigating occurrences that do not require notification to the State of the Operator but which can be a source of lessons learned. The decision as to which occurrences should be investigated should be defined in the operator's established safety risk management processes and take into account available resources.

6.3.2 Examples of occurrences that should be investigated include, but are not limited to:

a) cabin baggage incidents;

b) cabin damage;

c) false alarms (e.g. smoke detection system);

d) hard landings;

e) inadvertent slide deployments;

f) malfunction of aircraft systems or safety and emergency equipment;

g) medical events involving a crew member or passenger;

h) suspected or confirmed portable electronic device (PED) interference;

i) moderate to severe turbulence encounters (regardless of serious injury or damage sustained); and

j) unruly passengers.

6.3.3 With the goal of enhancing safety, the operator may wish to share the findings from the investigations of occurrences, such as those listed in 6.3.2, with the State, regional and international organizations, original equipment manufacturers or other stakeholders, at its discretion.

6.4 INCIDENT REPORT AND INFORMATION SPECIFIC TO CABIN SAFETY

Information that should be collected and included in an incident report should reflect that which is incorporated into a final report of an accident (refer to Chapter 7, Section 7.12). Based on the type and severity of the incident, not all the aspects covered in an accident investigation may be addressed. For example, investigators may review photographs of the incident, taken by the crew members, rather than travel to the site of the occurrence to document the cabin.

6.5 EXAMPLES OF INCIDENT INVESTIGATIONS

Sections 6.6 to 6.8 present detailed guidance on the investigation of cabin safety aspects specific to some types of occurrences. Not all items listed in the guidance may need to be covered during an investigation. The CI may use the guidance presented in this chapter to ensure that all the relevant items are addressed, but may choose to omit certain parts, based on the nature of the occurrence and the complexity of the investigation. Detailed guidance on the content of cabin crew training for several types of occurrences presented in 6.3.2, may be found in the *Cabin Crew Safety Training Manual* (Doc 10002).

Note.— Based on the outcome of the occurrence, some of the incidents presented in this section may be classified as accidents (e.g. if a person is fatally injured as a result of an inadvertent slide deployment), and thus be subject to an investigation as per Annex 13 — Aircraft Accident and Incident Investigation *requirements.*

6.6 INADVERTENT SLIDE DEPLOYMENT

6.6.1 An inadvertent slide deployment is an occurrence which involves the unintentional deployment (full or partial) of an aircraft emergency evacuation slide (or slide-raft). This type of occurrence includes, but is not limited to, events where the slide inflation mechanism is activated (if present) and/or the slide is dislodged from its container. This type of occurrence excludes events where a slide is deliberately deployed during an emergency evacuation, for the purpose of maintenance activities, tests or evacuation demonstrations. It also excludes cases where the slide container may become loose/be damaged by ground service vehicles while the aircraft is parked.

6.6.2 The investigation of the occurrence should reconstruct the sequence of events while focusing on the following aspects in as much detail as possible:

a) pre-occurrence activities:

   1) pre-flight tasks conducted by the cabin crew which are related to reducing the probability of the occurrence taking place, such as pre-flight briefings, assignment of duties and assignment of doors to cabin crew members (including number of doors assigned to a single crew member); and

   2) activities taking place in the cabin/around the aircraft at the time (such as pre-departure/arrival duties), including any activities prior to the occurrence which may have increased workload (including late arrival of a passenger, short turnaround time) and activities/actions of other personnel involved in the occurrence (for example, ground crew);

b) during the occurrence:

   1) when the inadvertent slide deployment occurred (including time and phase of flight);

   2) what activities were taking place in the cabin at the time;

   3) the location of each cabin crew member at the time of the occurrence, including activities just prior to the occurrence;

   4) actions of the cabin crew member operating the door which suffered the inadvertent slide deployment, if applicable;

   5) the location and actions of other personnel involved in the occurrence (e.g. ground crew members, aircraft maintenance technicians);

6) the location and actions of passengers, including those who were not at their seats, when the occurrence took place;

7) internal and external environmental conditions;

8) the functionality of the slide (that is, fully inflated, partially inflated, failed to inflate) and condition of the mode of operation (that is, door found in armed or disarmed mode);

9) injuries to flight crew members, cabin crew members, passengers, ground crew members or others and impact of injuries on the operation;

10) the damage sustained by the aircraft/in the cabin which affected the operation as well as ground vehicles/equipment; and

11) the impact of the occurrence on the operation (e.g. delay, offloading passengers); and

c) post-occurrence actions:

1) flight crew, cabin crew and passenger actions; and

2) subsequent actions by other personnel (e.g. maintenance, ground crew).

6.6.3 In addition, the CI should capture the operator policy and procedures for door opening/closing responsibilities, if assigned to individuals other than cabin crew members. Other factors that may have contributed to the occurrence should also be analysed (for example scheduling practices). Appendix A to Chapter 6 presents guidance for the aspects that should be analysed when investigating an incident involving an inadvertent slide deployment.

6.7 MEDICAL EVENT

6.7.1 A medical event is an occurrence involving cabin crew members and/or a health professional volunteer and/or ground medical support providing medical assistance/advice and/or first aid to an aircraft occupant, while in-flight or on the ground. This type of occurrence includes, but is not limited to:

a) events that are life-threatening;

b) occupants presenting signs and/or symptoms of illness, which required intervention by ground medical support and/or on-board volunteers and/or emergency medical services and/or had an impact on the aircraft operation (e.g. diversion);

c) cases of potential communicable disease; and

d) death or presumed death on board.

6.7.2 The investigation of the occurrence should reconstruct the sequence of events while focusing on the following aspects in as much detail as possible:

a) pre-occurrence activities — pre-flight tasks conducted by the cabin crew related to identifying and managing a possible medical event, such as pre-flight briefings and safety and emergency equipment checks;

b) during the occurrence:

1) when the medical event occurred (including time and phase of flight);

2) how/when occupants became aware of the situation;

3) information regarding the passenger or crew member suffering the medical event;

4) what activities were taking place in the cabin at the time (e.g. meal service);

5) actions of flight and cabin crew members;

6) actions of others, including those of ground medical support and/or on-board health professional volunteers;

7) functionality and effectiveness of equipment used by cabin crew or others to assist in the situation;

8) injuries to crew members, passengers or others; and

9) the impact on the operation (e.g. diversion); and

c) post-occurrence actions:

1) flight crew, cabin crew and passenger actions; and

2) subsequent actions by other personnel (e.g. medical services at the airport).

6.7.3 Appendix B to Chapter 6 presents guidance for the aspects that should be analysed when investigating an incident involving a medical event.

6.8 UNRULY PASSENGER EVENT

6.8.1 An unruly passenger event (also referred to as a disruptive passenger event) is an occurrence where a passenger(s) fails to respect the rules of conduct or to follow the instructions of crew members and thereby disturbs the good order and discipline on board the aircraft. This involves various types of offences, violations of regulations, and reprehensible acts, including: assault on crew members or passengers; disruptive/inappropriate behaviour linked to alcohol consumption; fights among passengers; child molestation, sexual harassment and assault; illegal consumption of drugs on board; refusal to stop smoking or consuming alcohol (including cases where passenger consumes own alcohol); vandalizing of aircraft seats and cabin interior; unauthorized use of portable electronic devices (PEDs); tampering with, theft and/or destruction of, safety and emergency equipment on board; and other disorderly or riotous conduct. Unruly passenger events encompass all levels of disturbance, as per a four-tiered scheme of threat levels.

6.8.2 The investigation of this occurrence should reconstruct the sequence of events while focusing on the following aspects, in as much detail as possible:

a) pre-occurrence activities:

1) pre-flight tasks conducted by the cabin crew related to preventing a possible unruly passenger event from occurring, such as pre-flight briefings and monitoring cabin for security-related issues; and

2) unruly passenger’s pre-boarding/post-boarding/in-flight activities – surrounding circumstances that affected the unruly passenger(s), such as flight delays, gate changes, missed connections, etc.;

b) during the occurrence:

1) when the unruly passenger event occurred (including time and phase of flight);

2) how/when occupants became aware of the situation;

3) what activities were taking place in the cabin at the time (e.g. boarding, meal service);

4) actions by cabin crew members, including actions taken if the passenger could not be handled/managed/restrained;

5) actions by others, including those of other passengers or law enforcement personnel on board;

6) functionality and effectiveness of equipment used by cabin crew or others to assist in the situation (e.g. plastic flex cuffs);

7) injuries to crew members, passengers or others;

8) damage sustained by the aircraft/in the cabin which affected the operation; and

9) impact on the operation (e.g. diversion); and

c) post-occurrence actions:

1) flight crew, cabin crew and passenger actions; and

2) subsequent actions by other personnel (e.g. law enforcement personnel at the airport).

6.8.3 Appendix C to Chapter 6 presents guidance for the aspects that should be analysed when investigating an incident involving an unruly passenger.

Appendix A to Chapter 6

GUIDANCE FOR INVESTIGATING AN INADVERTENT SLIDE DEPLOYMENT

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the occurrence:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) location: 1) airport; 2) hangar; g) departure point; h) phase of flight; i) destination and intermediate stops (with ETAs and ETDs); j) total number of crew members:	*The objective is to provide factual information regarding the occurrence.*

Type of information	*Specific information*	*Objective of the analysis*
	1) flight crew; 2) cabin crew; k) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and l) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor; 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor; 4) none; c) total in the aircraft: 1) fatal; 2) serious;	*The objective is to determine the number and the extent of injuries and to evaluate the following:* It is imperative to collect the information related to death and injuries, as there is a correlation between occupant injury and death and the aircraft structure and environment. *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	3) minor; 4) none; and d) injuries (other): 1) fatal; 2) serious; 3) minor; and 4) none.	
Meteorological conditions	*Review the meteorological conditions, which may include:* a) atmospheric conditions including but not limited to high wind conditions, icing, snow, rain or other.	*The objective is to review the meteorological conditions and to evaluate if/how they played a role in the occurrence. For example:* a) if weather contributed to the occurrence (e.g. return to gate for weather delay).

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) door opening/closing; b) door arming/disarming; c) cabin crew requirements; d) pre-flight checks;	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) door opening/closing procedures, focusing on: 1) any required in-charge cabin crew member (I/C) briefings; 2) any different policy or procedure at a specific airport location or one that differs from the norm;

Type of information	*Specific information*	*Objective of the analysis*
	e) crew and passenger briefings; and f) situations at the gate with doors armed.	3) a new/modified policy or procedure regarding door operation (which may have contributed to the occurrence); b) door arming/disarming procedures, focusing on: 1) signals for door arming/disarming; 2) specific task sequence for door operation; 3) verification of door status/post-operation tasks; 4) crew communication/signals regarding door status; c) normal operations procedures, focusing on: 1) minimum cabin crew requirements, including exceptions; 2) pre-flight checks of safety and emergency equipment and systems; 3) briefings for both crew and passengers, including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration and briefings at exits; and d) procedures for situations at the gate with doors armed, focusing on: 1) any specific procedures to deal with a type of scenario (e.g. door arming during refuelling operation with passengers on board). *Note.— Any difference between the manufacturer's recommended procedures and those of the operator should be recorded.*

Type of information	*Specific information*	*Objective of the analysis*
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) aircraft type specific training (for the aircraft model involved in the occurrence); b) training regarding door operation procedures; c) human performance training, including CRM and joint flight/cabin crew CRM; and d) training facilities and devices. *Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty-free representatives, translators, other service personnel).*	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) minimum cabin crew requirements, including exceptions; 2) briefings for both crew and passengers including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; 3) emergency exit row seating policy; 4) hands-on exercises on door operation specific to the aircraft model involved in the occurrence; 5) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities; 2) safety and emergency equipment used for training; 3) cabin training devices (realistic, time allotted on device); 4) emergency exit trainers (specific to the aircraft model involved in the occurrence); and 5) trainee-to-instructor ratios.

Type of information	*Specific information*	*Objective of the analysis*
		Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the management of the occurrence.
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including date of initial, last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule; 5) personnel files (including date of hire); b) other records, if applicable (e.g. previous occurrence reports); and c) accident aircraft: 1) aircraft journey log; 2) cabin defect log book; 3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) dispatch log;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the occurrence and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities; 2) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence). This includes the experience and knowledge of the cabin crew on the aircraft model and at the assigned position (door); 3) factors that may affect their performance, such as experience (based on date of hire or previous flying experience with another operator); 4) factors that may affect performance, such as fatigue (derived from their flying schedule prior to the occurrence, layover rest or in-flight rest); 5) aircraft type qualifications, to evaluate if multiple qualifications had an effect on the occurrence; and b) accident aircraft: 1) similarities and differences between other aircraft models, including documenting configuration differences in the operator's fleet; and

Type of information	*Specific information*	*Objective of the analysis*
	6) flight crew flight log; 7) flight deck log book; 8) maintenance logs/release forms; and 9) MEL.	2) MELs for inoperative items such as cabin crew seats, PA system, aircraft and emergency equipment and systems.
Other	*Review other operator documentation and determine pertinent references to:* a) other personnel training syllabus for door procedures (e.g. ground crew); b) any operator issues which may contribute to the occurrence; c) operational impacts from the occurrence; and d) occurrence reports filed by the crew members.	*The objective is to review the operator's documentation and to evaluate the following:* a) training content of other personnel roles in door procedures (that is, ground personnel, catering, and maintenance) including a review of their procedures; b) mergers, bankruptcies, cost factors that could result in changes to policies or procedures, training schedules and/or staffing requirements; and c) operational impacts that resulted from the occurrence (that is, delays/cancellations, slide maintenance).

3. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Medical records	*Review medical records and determine pertinent references to:* a) medical reports.	*The objective is to provide factual information regarding the occurrence:* a) cause of injury (was the actual inadvertent slide deployment the cause of the injury?); and b) drug and alcohol testing results, if applicable.

Type of information	*Specific information*	*Objective of the analysis*
Manufacturer and maintenance records	*Collect information related to the specific equipment and systems involved in the inadvertent slide deployment.*	*The objective is to provide factual information regarding:* a) packing procedures for the slide (including any recent revisions issued by the manufacturer); and b) maintenance activities conducted on the slide and related parts.

4. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Exits, assisting evacuation means, aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the following systems, as applicable:* a) exit and assisting evacuation means: 1) position of the door arming mechanism/indicator; 2) position of exit opening handle; 3) condition of power assist mechanism (if present), including gauge indicating pressure; 4) slide inflation mechanism and components; and b) communication systems and associated signalling panels.	*The objective is to evaluate if the systems were useful in managing the occurrence. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) exit where the slide was deployed: 1) interior/exterior conditions that prevented proper use (e.g. low lighting or cabin management system malfunction); 2) malfunction (e.g. slide failed to inflate); 3) malfunction of door warning light (if installed); 4) mode of operation (door found in armed or disarmed mode); 5) damage to exit and surrounding fuselage; 6) condition of slide bustle; b) assisting evacuation means:

Type of information	*Specific information*	*Objective of the analysis*
		1) slide failed to inflate/partially inflated; 2) slide malfunctioned following inflation (e.g. punctured); 3) slide inflated inside the cabin; 4) girt bar malfunctioned; and c) the use of PA/interphone to communicate with passengers and crew. If these failed, presence of backup systems or equipment.
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) any safety and emergency equipment used to respond to the occurrence.	*The objective is to evaluate the type of equipment that was available and to assess if it was useful or a hindrance in managing the occurrence. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use equipment were effective; and c) additional equipment, not found on board, that would have been helpful.
Conditions of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following, as applicable:* a) any structural damage inside the aircraft as a result of the inadvertent slide deployment.	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted on injuries sustained:* a) evidence of damage to any interior structure.

5. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-occurrence actions	*Review the information on cabin crew performance in pre-flight and in-flight activities:* a) crew check-in process; b) conducting or participating in crew briefings (including joint briefings, if applicable); and c) cabin activities prior to the occurrence.	*The objective is to evaluate how the cabin crew performed pre-flight and in-flight duties and responsibilities. The analysis should determine:* a) the method used for timely distribution of safety-related information and whether it was read/reviewed by the crew; b) if the crew members participated in a pre-flight briefing, and if so, what was the content (MEL, etc.); c) the total number of door assignments (two or more) for the cabin crew member assigned to the door which suffered the inadvertent slide deployment; d) the phase/moment of operation (e.g. at the gate, end of day); status of the flight (on time, delayed, change of aircraft); sector for the crew (first, last?); e) the workload prior to the occurrence (any distractions?); f) activities being undertaken/occurring in the cabin prior to the occurrence; and g) if other employees were involved prior to the occurrence, the analysis should focus on their actions.
Actions during the occurrence	*Review the information on cabin crew performance in managing the occurrence:* a) cabin activities at the time of the occurrence; b) initiating/reacting to crew communication/signals; c) operating systems and equipment;	*The objective is to evaluate how the cabin crew managed the occurrence. The analysis should determine:* a) activities being undertaken/occurring in the cabin at the time of the occurrence (e.g. passengers getting up while the aircraft is in movement) and location of each cabin crew member. If an unusual situation occurred (e.g. return to gate), the analysis should determine if this played a contributing role in the occurrence;

Type of information	*Specific information*	*Objective of the analysis*
	d) applying door operating procedures; e) managing passengers; and f) difficulties encountered during the occurrence.	b) how cabin crew obtained the information about opening/closing and arming/disarming doors (e.g. PA from flight crew or other cabin crew, illumination/extinguishing of ordinance sign/chime) and their response (e.g. complying with advisory signal). The analysis should note whether the means used to communicate complied with operator procedures; c) if the cabin crew member initiated the communication, the analysis should determine the reasons why (e.g. did not receive advisory signal from flight crew, as per operator procedures); d) if the cabin crew had any difficulty operating systems or equipment (e.g. PA), the analysis should focus on the possible reasons; e) if there was a delay in completing the required door operation (e.g. disarming), the analysis should focus on the reason (e.g. PA not clearly audible in certain parts of the aircraft, high workload); f) analysis of door operating procedures should focus on whether cabin crew followed the operator procedures. In the event of non-compliance with procedures, the analysis should focus on the reasons for cabin crew not following the procedures (e.g. was there a specific reason/need to deviate from the established procedures related to door opening or closing procedures?); g) if a new, or change to, a policy or procedure was recently implemented regarding door operation, the analysis should assess if that contributed to the occurrence; h) if other employees were involved, the analysis should focus on whether their involvement played a role in the inadvertent slide deployment (e.g. did other employees follow procedures?);

Type of information	*Specific information*	*Objective of the analysis*
		i) the analysis should review if there is a systemic issue with that specific door (e.g. were automation or door design a contributing factor?); j) if the cabin crew attempted to stop the inadvertent slide deployment, the analysis should focus on any attempt to stop the occurrence or inflation process once it started (after firing mechanism was triggered); k) if workload was a distraction during the boarding/disembarkation process, the analysis should focus on cabin crew actions in response to the distraction and how they managed passengers (e.g. those who did not comply with instructions to remain seated during taxiing); and l) the impact of the number of cabin crew members on board, with regards to the actions taken.
Post-occurrence actions	*Review the information on cabin crew performance in managing the situation after the occurrence:* a) immediate occurrence responses; and b) later notification of the occurrence (completing applicable documentation).	*The objective is to evaluate how the cabin crew managed the post-occurrence situation:* a) if the occurrence just took place: 1) what immediate actions were taken by the crew? 2) how well did the crew work together to respond to the occurrence? b) if the crew member in question did not witness the occurrence, but was notified of it at a later time, information on actions should be collected; and c) if cabin crew applied the procedures for completing the applicable documentation, such as an incident report form.

6. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-occurrence actions	*Review the information on passenger action/response to pre-flight activities:* a) review of the safety briefing card; b) watching/listening to the passenger safety briefings/demonstrations; c) listening to safety-related announcements; d) information/instructions given to passengers; e) reacting to the information/instructions; and f) cabin activities prior to the occurrence.	*The objective is to evaluate what information passengers received prior to departure or before the occurrence. The analysis should determine:* a) if passengers reviewed the content of the safety briefing card; b) if passengers paid attention to the safety briefing/demonstration; c) how passengers understood and responded to the information/instructions given by the crew; d) activities being undertaken/occurring in the cabin prior to the occurrence; and e) if any passengers displayed signs of anxiety/unruly behaviour.
Actions during the occurrence	*Review the information to assess passenger performance during the occurrence:* a) cabin activities at the time of the occurrence; and b) passenger actions at the time of the occurrence.	*The objective is to evaluate how the passengers behaved/reacted during the occurrence. The analysis should determine:* a) the activities being undertaken/occurring in the cabin at the time of the occurrence and if an unusual situation took place; b) if a passenger(s) caused or contributed to the occurrence, his/her actions should be evaluated to help determine the reason for such actions (accidental or deliberate?); and c) if passengers observed the occurrence, the analysis should gather their observations.

Post-occurrence actions	*Review the information on passenger performance after the occurrence:* a) interacting with other passengers/crew; b) communicating with cabin crew; c) instructions given to passengers; and d) reacting to the instructions.	*The objective is to evaluate how passengers reacted following the occurrence. The analysis should determine:* a) if injured, whether the passenger(s) received appropriate medical attention; b) if passengers communicated information to cabin crew about the occurrence (notifying crew of damage) and the crew response received; and c) how passengers understood and responded to the instructions given by the crew (e.g. remain on board).

7. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-occurrence information	*Review the information to assess the following activities, if applicable:* a) maintenance actions after the occurrence.	*The objective is to evaluate how others responded to and managed the occurrence. The analysis should determine:* a) subsequent maintenance actions: 1) if the slide was repacked or replaced; 2) if a maintenance review showed equipment failure or malfunction (attention should be paid to the arming/disarming mechanism); 3) any past maintenance reports on the equipment and systems involved; and 4) if the exit was declared unserviceable and the flight operated under MEL.

Other pertinent information	*Review the information to assess the following, if applicable:* a) if applicable, review video and/or audio evidence; and b) reports from ground crew members.	*The objective is to review the occurrence site conditions and to evaluate if/how they played a role in the occurrence. For example:* a) review video/audio evidence to validate reports or accounts of the occurrence to assess the deployment of the slide; and b) collaborate with ground crew to validate information.

8. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning/trigger of the occurrence, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements. *Note.— All employees that have a role in the door arming/disarming procedure and/or door opening process should be interviewed (I/C, cross-checking cabin crew member, if applicable).*
Passengers	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning/trigger of the occurrence, from the passenger's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements. *Note.— If passengers were the cause or contributed to the occurrence, interviews would be necessary.*

Other personnel	a) Other persons that had contact with the aircraft; b) other persons that may have contributed to the occurrence; c) other persons that witnessed the occurrence and/or can validate the information; and d) refer to Chapter 5, 5.8	a) Evaluate if personnel noticed anything unusual prior to, during or after the occurrence: 1) flight crew interviews should be conducted; 2) station manager, ground personnel, maintenance technicians, etc. who had contact with the aircraft prior to the occurrence; 3) other persons, as necessary; and b) collect any suggestions for safety improvements.

Appendix B to Chapter 6

GUIDANCE FOR INVESTIGATING A MEDICAL EVENT

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the occurrence:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) general location; g) departure point; h) phase of flight and flight level; i) destination and intermediate stops (with ETAs and ETDs), and radar tracks; j) diversion location, if applicable; k) total number of crew members:	*The objective is to provide factual information regarding the occurrence.*

Type of information	*Specific information*	*Objective of the analysis*
	1) flight crew; 2) cabin crew; l) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and m) total number of passengers, including lap-held infants and other special categories of passengers.	
Passenger/crew member information	*Obtain the following information from the passenger or crew member suffering the medical event:* a) name; b) age; c) height; d) weight; e) gender; f) nationality; g) seat location; h) travel companions, if applicable; i) known medical conditions; j) any medication (prescribed or not); k) events prior to the flight/medical event; l) medical evaluation; and m) other information.	*The objective is to provide factual information about the passenger or crew member suffering the medical event and to evaluate the following:* a) any known medical conditions (e.g. diabetes, heart condition, condition requiring a stretcher); b) any known disabilities; c) any known medication; and d) any information given by ground crew to the flight/cabin crew regarding the passenger.

Type of information	*Specific information*	*Objective of the analysis*
Meteorological conditions	*Review the meteorological conditions, which may include:* a) atmospheric conditions; and b) cabin altitude.	*The objective is to review the meteorological conditions and to evaluate if/how they played a role in the occurrence. For example:* a) if cabin altitude contributed to the passenger feeling ill.

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) pre-flight checks; b) crew and passenger briefings; c) the safe use of safety and emergency equipment; d) the management of on-board medical events; and e) flight and cabin crew member incapacitation, including those specific to single cabin crew member operations, if applicable.	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) pre-flight checks of safety and emergency equipment; b) briefings for both crew and passengers, including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; c) procedures for the safe use of safety and emergency equipment.(e.g. AED, portable oxygen, medical kits); d) procedures for the management of on-board medical events, focusing on: 1) recognizing, prioritizing and responding to injured occupants; 2) administering first aid; 3) communication procedures;

Type of information	*Specific information*	*Objective of the analysis*
		4) procedures for seeking ground-based medical assistance and/or voluntary assistance from an on-board health professional; 5) use of first-aid and safety and emergency equipment, as appropriate; 6) managing the voluntary assistance from, and providing support to, an on-board health professional, if available; 7) operator policy on “Do Not Resuscitate” (DNR), if appropriate; 8) managing a death or presumed death on board; e) procedures in the event of flight crew member incapacitation, focusing on: 1) responding to call from the flight crew; 2) moving the incapacitated flight crew member away from the controls; 3) securing the incapacitated flight crew member; 4) administering first aid; 5) assisting the remaining flight crew member (pilot-in-command), as instructed; f) procedures in the event of cabin crew member incapacitation, focusing on: 1) administering first aid; 2) securing the incapacitated cabin crew member;

Type of information	*Specific information*	*Objective of the analysis*
		3) informing the flight crew; 4) reassigning required cabin crew stations and duties, if applicable; and g) procedures in the event of single cabin crew member operation incapacitation, focusing on: 1) notifying the flight crew; 2) securing the incapacitated cabin crew member; 3) administering first aid; and 4) assigning an able-bodied passenger (ABP) to care for the cabin crew member and/or passenger.
Training Programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding the safe use of safety and emergency equipment; b) training content regarding the management of on-board medical events; c) training content regarding crew member incapacitation; d) human performance training, including CRM and joint flight/cabin crew CRM; e) aircraft type specific training (for the aircraft model involved in the occurrence); f) training specific to safety and emergency equipment; and g) training facilities and devices.	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) briefings for both crew and passengers including: flight crew to cabin crew briefing, cabin crew briefing, safety demonstration, briefings at exits and for special categories of passengers; 2) the safe use of safety and emergency equipment; 3) first aid and responding to on-board medical events; 4) flight and cabin crew member incapacitation; 5) hands-on exercise on the operation of the flight deck seat, harness and flight deck oxygen system with a representative training device;

Type of information	*Specific information*	*Objective of the analysis*
	Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty-free representatives, translators, other service personnel).	6) hands-on exercise on demonstrating CPR; 7) hands-on and simulated exercises on relevant safety and emergency equipment and aircraft systems, such as first-aid kit and PA system (specific to the aircraft model involved in the occurrence); 8) simulated exercise on responding to an in-flight medical event; 9) simulated exercise of an incapacitated cabin crew member; 10) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities; 2) safety and emergency equipment used for training; 3) cabin training devices; and 4) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the management of the occurrence.*

Type of information	*Specific information*	*Objective of the analysis*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule; 5) personnel files (including date of hire); 6) any other relevant experience; b) other personnel records, if applicable; and c) occurrence aircraft: 1) aircraft journey log; 2) cabin defect log book; 3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) departure report, if applicable; 6) diagram of applicable areas, such as galley(s); 7) dispatch log; 8) flight crew flight log;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the occurrence and to evaluate the following:* a) cabin crew members: 1) the cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the medical situation, including any language qualifications relevant to dealing with the medical event; 2) the validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence); 3) the factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator); 4) the factors that may affect performance such as fatigue (derived from their flying schedule prior to the occurrence, layover rest or in-flight rest); and b) aircraft: 1) the layout of the cabin and galley(s), which can affect where the passenger/crew member was moved and positioned during CPR, for example; 2) the location of passengers and crew in the cabin; 3) the technical malfunctions that may be traced through maintenance- or cabin-defect logs; and

Type of information	*Specific information*	*Objective of the analysis*
	9) flight deck log book; 10) maintenance logs/release forms; 11) MEL; 12) other crew documents (e.g. equipment checklists, crew briefing sheets); and 13) passenger manifest and seat chart (including addresses and telephone numbers).	4) MELs for inoperative items such as cabin crew seats, PA system, aircraft and emergency equipment and systems.
Other	*Review other operator documentation and determine pertinent references to:* a) cabin crew recruitment criteria; b) operator bulletins and notices to cabin crew; c) aircraft maintenance manual; and d) occurrence reports filed by the crew members.	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) minimum qualifications required for recruitment of new cabin crew members; b) the safety information transmitted to cabin crew members, via internal operator communications (e.g. bulletins) which is required for them to carry out duties and responsibilities, as per operator policies and procedures (e.g. update of procedures); and c) the cabin-related information from the aircraft maintenance manual: 1) communication systems (PA/interphone).

3. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Medical records	*Review medical records and determine pertinent references to:* a) crew report (first aid); b) medical report from health professional volunteer; c) technical log book report; and d) ground service provider reports.	*The objective is to provide factual information regarding the occurrence:* a) review all available documentation from crew and other personnel (e.g. doctor, ground crew) and gather information.
Other sources of information	*Collect and review any visual, audio, or other "recorded" information from multiple sources:* a) airport cameras; b) portable electronic devices (PEDs); c) news media reports; and d) social media.	*The objective is to gather any information available to assist with the investigation.*
Information from other parties	*Review the documentation of the aerodrome where the occurrence took place (if applicable) and determine pertinent references to:* a) other parties involved in the occurrence.	*The objective is to review the following reports, if applicable:* a) emergency medical services involvement/onsite medical care.

4. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the following systems, as applicable:* a) communication systems and associated signalling panels.	*The objective is to evaluate if the systems were useful in managing the occurrence or increasing the survivability of occupants. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) the use of PA/interphone to communicate with passengers and crew; and b) signalling panels, including associated chimes.
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) portable oxygen equipment; b) AED and associated equipment (CPR masks, shields, resuscitator bags, etc.); c) FAK; d) universal precaution kit; e) medical kit; and f) any additional equipment used, if applicable.	*The objective is to evaluate the type of equipment that was available and to assess if it was useful in managing the occurrence or increasing the survivability of occupants. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use equipment were effective; and c) additional equipment, not found on board, would have been helpful.
Condition of the cabin	*Record the condition of the cabin, as it relates to the medical event:* a) conditions related to cabin environment.	*The objective is to evaluate the reason for the medical event, if applicable, and how cabin conditions may have impacted or contributed to the occurrence.*

5. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-occurrence actions	*Review the information on cabin crew performance in pre-flight and in-flight activities:* a) conducting or participating in crew briefings (including joint briefings, if applicable); b) conducting passenger briefings, to be updated on passengers with special medical needs; c) disseminating information between ground, flight and cabin crew; d) CRM among the cabin crew and with flight crew; e) conducting cabin checks; and f) applying procedures for the safe use of safety and emergency equipment.	*The objective is to evaluate how the cabin crew performed pre-flight and in-flight duties and responsibilities. The analysis should determine:* a) if the crew members participated in a pre-flight briefing, and if so, what was the content, including information regarding passengers with special medical needs; b) what safety information was given to passengers prior to departure (e.g. briefings on portable oxygen concentrators), as well as throughout the flight; c) how the cabin crew members obtained information regarding passengers with special medical needs (if any), including: content/completeness of information given by flight crew members, I/C or ground crew members; d) cabin crew actions in response to the information received; e) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to cabin crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. miscommunications, delays in relaying information); f) if the crew members secured, prepared and checked the cabin, galley(s) and other areas to prevent/minimize injuries; g) if cabin crew members were present in the cabin (that is, cabin walk through); and h) if procedures for the safe use of safety and emergency equipment were applied. If not, what did the cabin crew members do to rectify the situation?

Type of information	*Specific information*	*Objective of the analysis*
Actions during the occurrence	*Review the information on cabin crew performance during the occurrence:* a) cabin activities at the time of the medical event; b) initiating/reacting to crew communication/signals; c) operating systems and equipment; d) providing instructions to passengers; e) managing passengers; f) CRM among the cabin crew and with flight crew; and g) difficulties encountered during the occurrence.	*The objective is to evaluate how the cabin crew managed the occurrence. The analysis should determine:* a) activities being undertaken in the cabin at the time of the medical event; b) how cabin crew obtained the information about the medical event (e.g. from passenger and/or crew); c) if/how cabin crew obtained information regarding the person's symptoms; d) if they applied procedures for managing on-board medical events, such as administering first aid to injured passengers and/or seeking voluntary medical assistance from an on-board health professional or ground medical support. The analysis should also look at actions taken by the flight crew in relation to the medical event; e) if they experienced difficulties communicating with ground medical support, the analysis should focus on the possible reasons; f) if the cabin crew had any difficulty operating systems or equipment (e.g. PA, AED), the analysis should focus on the possible reasons; g) how cabin crew managed passengers (e.g. those who did not comply with instructions); h) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. difficulties in understanding instructions, high workload positions versus low/shared workload positions);

Type of information	*Specific information*	*Objective of the analysis*
		i) if instructions were given to passengers, and by whom; j) the language(s) used to communicate with passengers – any language barrier issues among the passengers, crew, and medical personnel should be noted (e.g. passengers and crew did not speak the same language); and k) the impact of the number of cabin crew members on board, with regards to the actions taken.
Post-occurrence actions	*Review the information on cabin crew performance in managing the situation after the occurrence:* a) performing post-event duties; b) applying crew member incapacitation procedures; c) performing landing duties, if a diversion is necessary; and d) completing applicable documentation.	*The objective is to evaluate how the cabin crew managed the post-medical event situation, until such time as the aircraft reached its next destination or emergency medical services on ground attended to occupants. The analysis should determine:* a) if cabin crew performed post-medical event duties, such as contacting the flight crew; b) if cabin crew applied crew member incapacitation procedures (including those specific to single cabin crew member operations). The analysis should focus on actions taken to respond to incapacitated crew members who could not continue their duties (e.g. reassigning cabin crew stations so that all exits are staffed for landing); c) if cabin crew had any difficulty operating systems or equipment (e.g. portable oxygen, FAK, AED), the analysis should focus on the possible reasons; and d) if cabin crew applied the procedures for completing the applicable documentation, such as an incident report form.

6. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-occurrence information	*Review the information to assess the following activities, if applicable:* a) medical assistance upon arrival.	*The objective is to evaluate how the operator/aerodrome/medical personnel responded to and managed the situation once the aircraft landed. The analysis should determine:* a) when ATC/RFF, the operator or others received the call regarding the occurrence; b) the time needed to respond, and reasons for delays, if any; c) the quantity and type of vehicles and equipment available/used; d) the challenges in relation to the aircraft model involved in the occurrence (e.g. difficulty moving stretcher down the aisle); e) the actions by operator's personnel (e.g. station manager), aerodrome personnel and medical personnel (e.g. paramedics, staff at hospital); f) communications with aircraft, including difficulties encountered; and g) any other difficulties encountered or any operational disruption (e.g. incapacitated crew member).

7. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view, and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety improvements.

Appendix C to Chapter 6

GUIDANCE FOR INVESTIGATING AN UNRULY PASSENGER EVENT

1. GENERAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Flight information	*Obtain the following information pertaining to the occurrence:* a) date of occurrence (UTC and LMT); b) time of occurrence (UTC and LMT); c) operator name; d) flight number; e) aircraft manufacturer's serial number (MSN), make/model/series, registration and date entered into service; f) general location; g) departure point; h) phase of flight and flight level; i) destination and intermediate stops (with ETAs and ETDs); j) diversion location, if applicable; k) total number of crew members: 1) flight crew;	*The objective is to provide factual information regarding the occurrence.*

Type of information	*Specific information*	*Objective of the analysis*
	2) cabin crew; l) total number of additional personnel assigned non-safety and emergency duties in the cabin by the operator; and m) total number of passengers, including lap-held infants and other special categories of passengers.	
Injuries to persons	*Obtain the following for the crew, passengers and other:* a) injuries (crew): 1) fatal; 2) serious; 3) minor; 4) none; b) injuries (passengers): 1) fatal; 2) serious; 3) minor; 4) none; c) total in the aircraft: 1) fatal; 2) serious; 3) minor;	*The objective is to determine the number and the extent of injuries.* *Note.— The causal/contributing factors may be addressed in a different section of the report (e.g. human performance).*

Type of information	*Specific information*	*Objective of the analysis*
	4) none; and d) injuries (other): 1) fatal; 2) serious; 3) minor; and 4) none.	

2. DOCUMENTATION (OPERATOR)

Type of information	*Specific information*	*Objective of the analysis*
Policies and procedures	*Review the operations manual and determine pertinent references to:* a) unruly passengers; b) alcohol consumption on board; c) smoking on board; d) carry-on baggage policy; e) seating restrictions; f) the management of on-board medical events; and g) cabin crew member incapacitation, including those specific to single cabin crew member operations, if applicable.	*The objective is to review the operator's policies and procedures and to evaluate the content and adequacy of the following:* a) policy and procedures regarding unruly passengers, focusing on: 1) content of the policy; 2) means by which the policy is communicated to employees and passengers; 3) unruly passenger procedures for ground crew, flight crew and cabin crew, including the use of non-lethal protective devices, such as plastic flex cuffs; b) policy regarding alcohol consumption, smoking, carry-on baggage and seating restrictions on board:

Type of information	*Specific information*	*Objective of the analysis*
		1) content of the policy; 2) means by which the policy is communicated to employees and passengers; c) procedures for the management of on-board medical events, focusing on: 1) recognizing, prioritizing, and responding to injured occupants; 2) administering first aid; 3) communication procedures; 4) procedures for seeking ground-based medical assistance and/or voluntary assistance from an on-board health professional; 5) use of first-aid and safety and emergency equipment, as appropriate; 6) managing the voluntary assistance from, and providing support to, an on-board health professional, if available; d) procedures in the event of cabin crew member incapacitation, focusing on: 1) administering first aid; 2) securing the incapacitated cabin crew member; 3) informing the flight crew; 4) reassigning required cabin crew stations and duties, if applicable; and

Type of information	*Specific information*	*Objective of the analysis*
		e) procedures in the event of single cabin crew member operation incapacitation, focusing on: 1) notifying the flight crew; 2) securing the incapacitated cabin crew member; 3) administering first aid; and 4) assigning an able-bodied passenger (ABP) to care for the cabin crew member.
Training programmes	*Review the approved cabin crew safety training programmes (e.g. initial and recurrent) and determine pertinent references to:* a) training content regarding unruly passengers; b) training content regarding the management of on-board medical events; c) training content regarding crew member incapacitation; d) human performance training, including CRM and joint flight/cabin crew CRM; e) training specific to safety and emergency equipment; and f) training facilities and devices. *Note.— If applicable, review training for other personnel assigned non-safety and emergency duties in the cabin by the operator (e.g. duty-free representatives, interpreters, other service personnel*).	*The objective is to review the operator's training programmes (e.g. initial and recurrent) and to evaluate the content and adequacy of the following:* a) training content and crew assessment methods, focusing on: 1) assessment of the situation's threat level; 2) application of procedures according to the level of threat; 3) communication of relevant information to the flight crew and other cabin crew, as applicable; 4) coordination with the flight crew and other cabin crew, as applicable; 5) administration of first aid and response to on-board medical events; 6) flight and cabin crew member incapacitation; 7) hands-on and simulated exercises on relevant safety and emergency equipment (e.g. plastic flex cuffs);

Type of information	*Specific information*	*Objective of the analysis*
		8) simulated exercises on managing unruly passengers; 9) simulated exercises on responding to an in-flight medical event; 10) human performance, including joint CRM sessions with flight crew members; and b) training facilities, focusing on the availability and suitability of: 1) classroom facilities; 2) safety and emergency equipment used for training; 3) cabin training devices; and 4) trainee-to-instructor ratios. *Note.— If the operator employs personnel assigned non-safety and emergency duties in the cabin, the training programme content and staffing practices should be reviewed to assess if this personnel's activities contributed to or hindered the management of the occurrence.*
Records	*Review operator records and determine pertinent references to:* a) cabin crew members: 1) licence or certification, if applicable; 2) training records (including initial, date of last recurrent and line check); 3) aircraft type qualifications, including how many at any one time; 4) roster/schedule;	*The objective is to review the operator's records related to the operating crew and aircraft involved in the occurrence and to evaluate the following:* a) cabin crew members: 1) cabin crew members' qualifications and competencies to perform the required duties and responsibilities in the emergency situation; 2) validity of the qualifications/competencies (e.g. based on the last date the crew members successfully completed required training and/or validity of their licence);

Type of information	*Specific information*	*Objective of the analysis*
	5) personnel files (including date of hire); 6) any other relevant experience; b) other personnel records, if applicable; and c) occurrence aircraft: 1) aircraft technical log; 2) cabin defect log book; 3) cabin interior configuration diagram (LOPA/S); 4) crew list and crew assignment; 5) dispatch log; 6) MEL; and 7) passenger manifest and seat chart (including addresses and telephone numbers).	3) factors that may affect their performance in a positive or negative manner, such as experience (based on date of hire or previous flying experience with another operator); 4) factors that may affect performance; such as fatigue (derived from their flying schedule prior to the occurrence, layover rest or in-flight rest); and b) occurrence aircraft: 1) the location of passengers and crew in the cabin; 2) technical malfunctions which may have affected the performance of aircraft systems. These may be traced through maintenance- or cabin-defect logs; 3) MELs for inoperative items such as emergency equipment and systems; and 4) damaged or unserviceable equipment or systems, such as in-flight entertainment system (IFE) or smoke detector.
Other	*Review other operator documentation and determine pertinent references to:* a) operator bulletins and notices to cabin crew; and b) occurrence reports filed by the crew members.	*The objective is to review the operator's documentation and to evaluate the content and adequacy of the following:* a) changes in unruly passenger/passenger handling procedures and means of disseminating the information to crew members.

3. DOCUMENTATION (OTHER SOURCES)

Type of information	*Specific information*	*Objective of the analysis*
Medical records	*Review medical records and determine pertinent references to:* a) crew report (first aid); b) medical report from doctor or nurse (e.g. if EMK used); c) technical log book report; and d) ground service provider reports.	*The objective is to provide factual information regarding the occurrence.* a) Review all available documentation from crew and other personnel (e.g. doctor) and gather information.
Other sources of information	*Collect and review any visual, audio, or other "recorded" information from multiple sources:* a) airport cameras; b) portable electronic devices (PEDs); c) news media reports; and d) social media	*The objective is to gather any information available to assist with the investigation.*
Information from other parties	*Review documentation of the aerodrome where the occurrence occurred (if applicable) and determine pertinent references to:* a) other parties involved in the occurrence.	*The objective is to review the following reports, if applicable:* a) law enforcement personnel involvement (e.g. police); b) emergency medical services involvement/onsite medical care; and c) RFF involvement.

4. AIRCRAFT (CABIN SPECIFIC)

Type of information	*Specific information*	*Objective of the analysis*
Aircraft/cabin systems	*Record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the following systems, as applicable:* a) smoke detection system; b) air conditioning, ventilation, and pressurization systems; c) exits and assisting evacuation means; and d) other systems.	*The objective is to evaluate if the systems played a role in the occurrence, were useful in managing the occurrence or were damaged during the occurrence. The analysis should determine if systems worked as intended and, if not, determine the reason:* a) effectiveness of smoke detection system in alerting occupants; b) effectiveness in managing the cabin environment (e.g. heating, cooling); c) exit operation/slide activation; and d) systems damaged. The analysis should focus on whether the damage was done by passengers (e.g. tampering with the lavatory smoke detector).
Safety and emergency equipment	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following equipment, as applicable:* a) portable fire extinguishers; b) non-lethal protective devices (e.g. plastic flex cuffs); and c) other equipment.	*The objective is to evaluate the type of equipment that was available and to assess if it was useful or a hindrance in managing the occurrence or if the removal/use/theft of equipment played a role in the occurrence. The analysis should determine if:* a) the required equipment was available, accessible and functional; b) instructions on how to use the equipment were effective; c) additional equipment, not found on board, would have been helpful; and d) equipment removed/damaged. The analysis should focus on whether the removal/use of emergency equipment was done by the crew or by passengers (including theft).

Type of information	*Specific information*	*Objective of the analysis*
Condition of the cabin	*Record the presence, condition (failed or damaged or serviceable and/or worked normally) and part/serial number of the following, as applicable:* a) IFE and corded devices (e.g. IFE remote controls, headsets); b) smoke detection system; c) passenger seat damage or malfunction; d) air conditioning, ventilation and pressurization systems; e) passenger seats; f) overhead bins; g) reading lights; h) tray tables; i) lavatories; j) carpets; and k) any other furnishing.	*The objective is to evaluate the reason for failures/damage, if applicable, and how this may have impacted the injuries sustained:* a) IFE/devices damage or malfunction; b) evidence of smoke detector tampering, malfunction, or damage; c) location and evidence of damaged seats, overhead bins, lavatory interiors, etc.; and d) environmental conditions in the cabin at the time of the occurrence (e.g. heat, humidity, cold, odour).

5. HUMAN PERFORMANCE (CABIN CREW)

Type of information	*Specific information*	*Objective of the analysis*
Pre-occurrence actions	*Review the information on cabin crew performance in pre-flight and in-flight activities prior to the occurrence:* a) conducting or participating in crew briefings (including joint briefings, if applicable); b) conducting passenger safety briefings; c) monitoring the cabin for security-related issues; and d) managing passengers and cabin.	*The objective is to evaluate how the cabin crew performed pre-flight and in-flight duties and responsibilities. The analysis should determine:* a) if the crew members participated in a pre-flight briefing and, if so, what was the content; b) what safety information was given to passengers prior to departure (e.g. through a safety demonstration); c) if the crew members conducted cabin surveillance to identify/monitor potential sources of problems and, if so, which areas on board were monitored (e.g. lavatories, cargo areas if accessible during flight) and at what frequency; d) if a potential situation was suspected, actions taken by the crew (e.g. investigating abnormal behaviours or cabin conditions); and e) how cabin crew managed situations such as delays, system malfunctions, etc.
Actions during the occurrence	*Review the information on cabin crew performance in managing the occurrence:* a) cabin activities at the time the unruly passenger's behaviour became apparent; b) recognizing/reacting to information regarding handling the unruly passenger; c) actions to handle the unruly passenger; d) difficulties encountered during the occurrence;	*The objective is to evaluate how the cabin crew managed the occurrence. The analysis should determine:* a) activities being undertaken in the cabin at the time the occurrence first became apparent; b) how the cabin crew became aware of the unruly passenger (on ground or in-flight) and their response; c) if alcohol played a role in the occurrence. If so, the analysis should describe consumption and why excess consumption was not detected or why it was permitted;

Type of information	*Specific information*	*Objective of the analysis*
	e) CRM among cabin crew and with flight crew; f) operating systems and equipment; g) providing instructions to passengers; and h) managing passengers and cabin.	d) how crew members attempted to manage the passenger (per operator procedures for each level of threat); e) actions taken if the passenger could not be handled/managed/restrained; f) difficulties reaching the passenger due to seating location (e.g. middle seat of five-abreast row); g) the impact of the number of cabin crew members on board, with regards to the actions taken; h) how CRM aspects were managed (communication, cooperation, coordination), including how tasks were assigned to crew members and how they managed the workload and time constraints. This should include both positive and negative CRM aspects (e.g. difficulties in understanding instructions, high workload positions versus low/shared workload positions); i) a description of any equipment used (e.g. plastic flex cuffs); j) any difficulty in operating systems or using equipment (e.g. IFE, cabin environmental controls, PSU switches). The analysis should focus on the possible reasons; k) if instructions were given to passengers to minimize the effects of the unruly passenger's behaviour, and by whom; l) if able bodied-passengers (ABPs) were requested by the crew and what instructions were given to them; m) how cabin crew managed passengers and cabin (e.g. relocating passengers); and n) other activities performed in response to the occurrence (e.g. flight deck lock down).

Type of information	*Specific information*	*Objective of the analysis*
Post-occurrence actions	*Review the information on cabin crew performance in managing the situation after the occurrence:* a) managing passengers post-occurrence; b) managing crew/passenger injuries; c) operating systems and equipment; d) monitoring the cabin; e) continued communication with flight crew; and f) completing applicable documentation.	*The objective is to evaluate how the cabin crew managed the post-occurrence situation:* a) if cabin crew applied security procedures (restraints) for continued monitoring of the unruly passenger; b) if cabin crew applied procedures for managing on-board medical events, such as administering first aid to injured passengers and/or seeking voluntary medical assistance from an on-board health professional; c) if cabin crew applied crew member incapacitation procedures (including those specific to single cabin crew member operations). The analysis should focus on actions taken to respond to incapacitated crew members who could not continue their duties (e.g. reassigning cabin crew stations so that all exits are staffed for landing); d) if cabin crew had any difficulty operating systems or equipment (e.g. portable oxygen, FAK, AED), the analysis should focus on the possible reasons; e) if cabin crew monitored the “clear zone” outside the flight deck, cabin, galley, lavatories, remote areas, crew rest areas and cargo areas, if accessible from the passenger compartment, during the remainder of flight for security-related issues; f) if cabin crew applied cabin/flight crew communication procedures; and g) if cabin crew completed appropriate documentation, including notification cards to unruly passengers, if applicable.

6. HUMAN PERFORMANCE (PASSENGERS)

Type of information	*Specific information*	*Objective of the analysis*
Pre-occurrence actions	*Review the information on passenger action/response to pre-boarding/post boarding/in-flight activities:* a) travel itinerary (e.g. traffic problems, prior flight/connecting flight); b) conditions prior to boarding (flight delays, gate changes, information to passengers, identification of potential problem passengers); c) fees (baggage, amenities, etc.); d) delays at security screening or customs; e) delay or loss of transit passenger baggage; f) alcohol consumption prior to/during flight; and g) any unusual behaviour noticed by ground crew or other passengers.	*The objective is to evaluate what surrounding circumstances affected passengers and what information passengers received. The analysis should determine contributing factors to the occurrence:* a) if the communication of information to passengers was timely and effective; b) if the information provided to passengers was clearly understood; c) if passengers or ground crew who noticed anything unusual communicated it to the appropriate ground authorities or to the crew. If not, why not; d) if there were problems during boarding (e.g. seat assignments, inefficient, slow or delayed boarding, baggage issues); e) if there were seat pitch or personal space incursion issues; f) inappropriate touching or overt sexual behaviour/abuse or harassment; g) conditions in the cabin (noise levels, temperature, unserviceable systems); and h) service or comfort issues (e.g. level of service, disruption of service, incorrect or missing meals, aisle/lavatory access blocked for long periods, blankets, pillows).
Actions during the occurrence	*Review the information to assess passenger performance during the occurrence:* a) recognizing the situation;	*The objective is to evaluate how the passengers behaved/reacted during occurrence. The analysis should determine:* a) if/how the passengers became aware of the occurrence.

Type of information	*Specific information*	*Objective of the analysis*
	b) information given to passengers; c) instructions given to passengers; d) reacting to the information/instructions; and e) other passengers' reactions.	b) how passengers understood and responded to the information given by the crew regarding the situation; c) how passengers understood and responded to the instructions given by the crew (e.g. relocating seats); d) any other passenger intervention during the occurrence; and e) if they noticed other passengers' reactions (e.g. passengers in panic).
Post-occurrence actions	*Review the information on passenger performance after the occurrence:* a) communicating with cabin crew; b) interaction with other passengers/crew; c) information given to passengers; d) instructions given to passengers; and e) reacting to the information/instructions.	*The objective is to evaluate how passengers reacted following the occurrence. The analysis should determine:* a) if passengers requested assistance due to injuries or communicated information to cabin crew about conditions in the cabin and the crew's response; b) if other passengers or crew members were injured around them and how they reacted (e.g. assisted others); c) how passengers understood and responded to the information given by the crew regarding the situation (e.g. aircraft diversion, ATC hold); and d) how passengers reacted to law enforcement or other personnel's intervention.

7. ADDITIONAL INFORMATION

Type of information	*Specific information*	*Objective of the analysis*
Post-occurrence information	*Review the information to assess the following activities, if applicable:* a) assistance on arrival.	*The objective is to evaluate how the operator/law enforcement personnel/others responded to and managed the unruly passenger once the aircraft landed. The analysis should determine:* a) when ATC, law enforcement, the operator or others received the call regarding the occurrence; b) the time needed to respond and reasons for delays, if any; c) the quantity and type of vehicles and equipment available/used; d) the challenges in relation to the aircraft model involved in the occurrence (e.g. difficulty moving down the aisle); e) the actions by operator's personnel (e.g. station manager), aerodrome personnel and law enforcement personnel (e.g. police); f) communications with aircraft, including difficulties encountered; and g) any other difficulty encountered (operational disruption due to diversion).

8. INTERVIEWS

Type of information	*Specific information*	*Objective of the analysis*
Cabin crew member(s)	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the cabin crew member's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety or security improvements.
Passengers	Refer to Appendix B to Chapter 5.	a) Understand the occurrence from the beginning of the flight, from the passenger's point of view and gain insight into the sequence of events and difficulties encountered; and b) collect any suggestions for safety or security improvements.

Chapter 7

REPORTS ON SURVIVAL FACTORS

7.1 SURVIVAL FACTORS GROUP FACTUAL REPORT

7.1.1 As part of the investigation, the accident investigation authority should appoint a survival factors group and staff it with cabin investigators (CIs) who meet the qualifications and possess the competencies outlined in Chapter 4. When sufficient information has been gathered, this group should produce a survival factors group factual report, containing in-depth information on cabin safety and survival factors. A survival factors group factual report should only contain documented factual information, without conclusions or recommendations. The content of this chapter complements the guidance material in the appendices to Chapter 5. Those appendices can help the CI gather information that will be included in the survival factors group report.

7.1.2 Upon completion of the accident investigation, the investigation authority must publish a final report on the accident. To address the importance of occupant survivability, all final reports should contain a condensed version of the survival factors factual report.

7.1.3 A survival factors group factual report should contain the following information:

a) general information regarding the accident flight (operator, aircraft type, location, time, record number);

b) survival factors group names (e.g. names of chairperson and members, and their employers);

c) summary of the occurrence;

d) details of the investigation (refer to 7.1.4); and

e) attachments (photos, statements, translations, interview summaries, test reports, etc.).

7.1.4 The portion of the survival factors group factual report on “details of the investigation” (7.1.3 d) above) should include the following topic areas or sub headings:

a) aircraft configuration;

b) cabin crew information and training;

c) summary of the occurrence, specifically addressing survival factors;

d) passenger information (including behaviour, evacuation routes or issues, as applicable);

e) on-scene documentation (such as impediments to occupant evacuation and survivability);

f) additional documentation and testing;

g) emergency response (such as search and rescue, and post evacuation);

h) medical and pathological information (such as injuries and survivability);

i) aerodrome information; and

j) crash site information.

7.1.5 Detailed guidance on each of these points is presented in Sections 7.2 to 7.11.

7.2 AIRCRAFT CONFIGURATION

This section should include a description of:

a) the number of passenger seats fitted in the cabin, per class of service (e.g. first, business, economy);

b) the number of cabin crew seats fitted in the cabin;

c) the number of flight crew seats and observer seats fitted on the flight deck; and

d) the number and types of emergency exits.

Note.— A diagram representation is a useful way to present the aircraft configuration in the report, as illustrated in Figure 7-1.

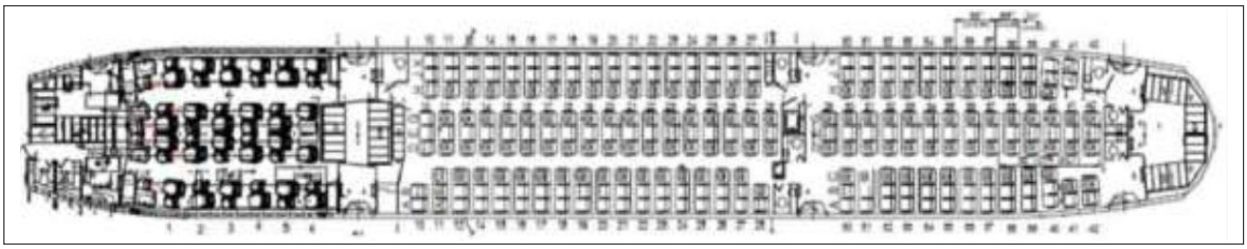

Figure 7-1. Example of an aircraft configuration diagram (Source: NTSB)

7.3 CABIN CREW INFORMATION AND TRAINING

This section should include a description of:

a) training of cabin crew members involved in the occurrence (this may be presented in tabular form, as illustrated in Table 7-1)

b) any additional relevant training of cabin crew members involved in the occurrence (e.g. in-charge cabin crew member, cabin crew instructor or evaluator);

c) the operator's approved cabin crew training programme content (initial, recurrent, aircraft type and differences training, or other relevant training);

d) relevant portions from the operator's operations manual, cabin crew operations manual (refer to Figure 7-2), or other relevant manuals; and

e) cabin crew interviews and statements (refer to Appendix B to Chapter 5).

Table 7-1. Example of cabin crew members training data tabulation

Position on board	*Initial training completion*	*Last recurrent training*
1L (I/C)	15/04/1998	25/03/2020
1-R	20/05/2005	25/05/2020
2-L	10/04/2003	01/08/2020
2-R	15/06/2012	01/06/2020
3-L	11/10/2007	23/08/2020
3-R	18/03/2016	02/03/2020
4-L	08/03/2018	01/03/2020
4-R	01/06/2019	03/06/2020

1. *Rejected Take-off*

A rejected take-off is any take-off that is stopped on the runway after the take-off roll has commenced. When a take-off has been rejected, and there is no apparent life threatening danger evident, the cabin crew must wait for the captain's announcement over the PA system or interphone call. The I/C follows the captain's order and manages the cabin.

2. *Captain announcement*

Situation	*Command*
Evacuation not needed	*"Crew and passengers, remain seated."*
	After the flight crew announcement, cabin crew shall notify passengers the emergency situation ended, attempt to keep passengers calm, and discuss procedures with the captain.
Immediate evacuation anticipated	*"Attention, crew at stations."*
	After the flight crew announcement, cabin crew shall stand by and be ready for the evacuation.
Announcement for evacuation	*"Evacuate, evacuate!"*
	After the flight crew announcement, cabin crew shall carry out the evacuation according to the standard operating procedures.

Figure 7-2. Example of a relevant portion from the operator's cabin crew operations manual (for an evacuation)

7.4 SUMMARY OF THE OCCURRENCE

The summary of the occurrence is a factual description of the events leading up to, and immediately following, the accident. It may include testimonials from the operating cabin crew members, passengers and other witnesses, and a description of their perception of the events. It is important that text be written in a factual manner. The CI should not include opinions or potential conclusions regarding the occurrence or any other aspects related to the accident (such as assessment of the adequacy of procedures, training, or crew actions). Figure 7-3 presents an example of text summarizing the moments leading up to an accident on landing.

> "The cabin crew described a normal flight until the final approach for landing. They reported securing the cabin for landing and at least two cabin crew members checked the economy class cabin. Several cabin crew members reported a sensation that the aircraft was descending too quickly. The cabin crew member stationed at door 1-L was able to see out a window and felt the aircraft was going to collide with the water and yelled for passengers to brace for impact. Some of the cabin crew members reported that the aircraft pitched up prior to impact. The cabin crew generally described the first impact as similar to a hard landing. One cabin crew member reported a crushing sensation after the first impact."

Figure 7-3. Example of a summary

7.5 PASSENGER INFORMATION

This section should include a description of the total number of passengers on board the aircraft, including lap-held infants, and special category passengers, if applicable. If the CI conducted passenger interviews, interview summaries may be included as an attachment to the report. Passenger actions, behaviours or responses (human performance) should be captured in this section; such as, asking the passengers about their understanding of any instructions they received before, during or after the occurrence. If available, their evacuation route, including any difficulties encountered, should be documented. Appendix B to Chapter 5 provides an extensive list of questions that the CI can use during a passenger interview. This information will ensure a better understanding of the human performance aspect of occupants.

7.6 ON-SCENE DOCUMENTATION

7.6.1 The on-scene documentation section of the survival factors group report should address the condition of relevant aircraft systems, safety and emergency equipment, and the cabin in general after the occurrence.

7.6.2 This section should include a summary of data collected as part of the cabin documentation portion of the investigation, as presented in Chapter 5, including the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of any systems, equipment, or furnishings, as applicable. The following points should be covered:

a) exits and assisting evacuation means;

b) safety and emergency equipment;

c) cabin crew seats;

d) flight crew seats;

e) passenger seats;

f) galleys and lavatories (any other areas such as crew rest areas, if applicable);

g) overhead bins;

h) passenger service units; and

i) aircraft exterior.

7.6.3 Exits and assisting evacuation means

Detailed exit and slide data may be presented in tabular form, as presented in Chapter 5, Section 5.5. Information may also be presented as simple text, as illustrated in Table 7-2. The CI should use the documentation details, as noted in Appendix C to Chapter 5, as a guideline to record the presence, condition (failed or damaged, serviceable and/or worked normally), and part/serial number of exits and assisting evacuation means.

Table 7-2. Example of slide data tabulation

Door 1-L slide/raft • Type A with dual lane slide • Part number: XXXXXX-000 • Serial number: 0000 • Date of manufacture: 01/01 “Mod per XXX SB XXX-XX-XX”

7.6.4 Safety and emergency equipment

This section should include a description of the safety and emergency equipment on board the occurrence aircraft, including the designated stowage location. The CI should use the documentation details, as noted in Appendix C to Chapter 5, as a guideline to record the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of the equipment, as well as information on any tests performed on the equipment. The objective is to evaluate the type of equipment that was available and/or used during the event; and to assess if it was useful or a hindrance in managing the evacuation or increasing the survivability of occupants (refer to example in Table 7-3).

Table 7-3. Example of equipment data tabulation

1L Forward storage • [name of manufacturer] portable ELT (P/N 0000000-0) Exp. 01/01/20XX • 124-minute portable oxygen bottle (2) (P/N 0000000) (unused but found outside aircraft) • [name of manufacturer] megaphones (2) (P/N X00XX) • First aid kit (P/N 0000) • [name of manufacturer] water fire extinguisher (P/N 000000, S/N 00000) Exp. 01/01/20XX 2L Storage • All contents destroyed by fire

Note.— A diagram representation is a useful way to present the designated stowage location of safety and emergency equipment on board the accident aircraft in the report, as illustrated in Figure 7-4.

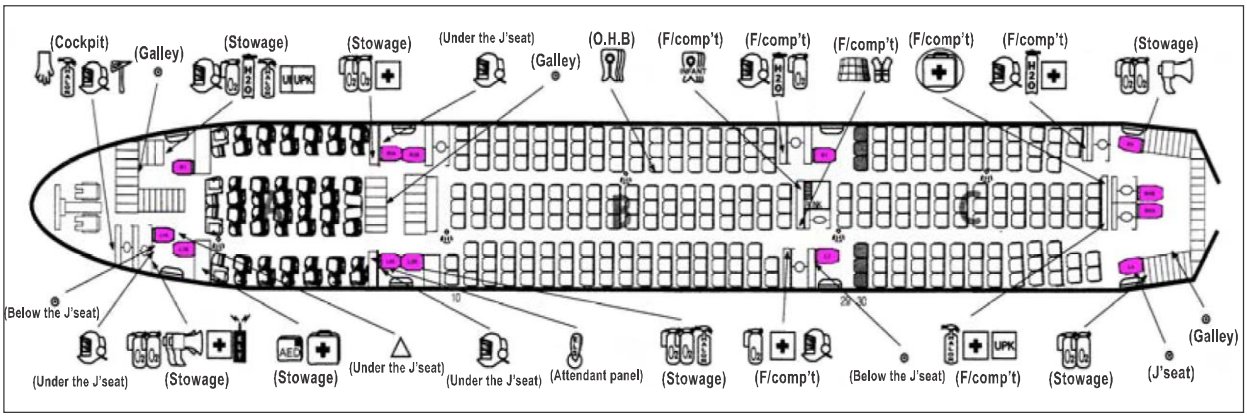

Figure 7-4. Example of safety and emergency equipment location diagram (Source: NTSB)

7.6.5 Cabin crew, flight crew and passenger seats

7.6.5.1 Aircraft seats are designed to protect the occupant's body and limit injuries from crash loads that can be generated during a crash sequence, ultimately allowing the occupant to egress the aircraft. Documentation of seat conditions, whether effective or failed/damaged, if applicable, is important as seats can have a major effect on the survival of occupants (including injuries sustained) and can affect their ability to evacuate the aircraft.

7.6.5.2 The section addressing seats should include a description of the condition of the different seats, including any unique configurations such as herringbone layout, cabin suites, or other unique design features (for example, shoulder straps or inflatable restraint systems). This may be done by individual seat, rows of seats, or portions of the cabin, depending on the situation (such as, if a portion of the cabin was consumed by fire). Other items for possible documentation include: seat and restraint mechanism failure; seat track attachment issues; deformation of the seat structure; location of upset/damaged seats; seat belts (frayed or damaged); tray tables (deployed or not deployed by seat number).

7.6.5.3 Seat data may be presented in tabular form, as presented in Table 7-4 or as simple text, for each of the different models of cabin crew, flight crew and passenger seats.

Table 7-4. Example of cabin crew and passenger seat data tabulation

1-R Forward-facing CC seat	[name of manufacturer] P/N XXX-000XXLL S/N 0000-0000 DOM: 01/01/01
Restraint	[name of manufacturer] 4-point P/N XXX-000XXLL S/N 0000-0000 DOM: 01/01/01
Damage or unique attributes	Seat pan broken
"The 5A seat had severe fire damage. The seat structure was consumed by the fire […]. The 6DG seats had severe fire damage with most the damage to the 6D seat."	

7.6.6 Galleys and lavatories

Items of mass such as galleys and their components (for example, carts/trolleys), lavatories with hinged doors, and overhead bins (as noted below) are designed to remain in place during a deceleration to avoid injuring occupants or creating obstructions during an evacuation. Documentation of these interior monuments or components should include the presence, condition (failed or damaged, serviceable and/or worked normally) and part/serial number of any systems, equipment, or furnishings, as applicable. The section addressing galleys, lavatories and other areas should include a description of the condition of the different areas, and may be done by individual galley, lavatory, etc., or by portions of the cabin, depending on the situation, as presented in Figure 7-5.

> "The forward galley at door 1-R had all of the galley bins secured with quarter turns and the two refrigerator units were secured. The galley cart at position XX-XX had its quarter turns engaged, door secured, and foot brake locked."

Figure 7-5. Example of a galley description

7.6.7 Overhead bins

This section should include a description of the overhead bins, including the bin type (opening direction, placarded weight, any unique features such as internal netting) and the condition found after the occurrence. Documenting the presence and weight of carry-on baggage found on board is also important. Data may be presented in tabular form, as presented in Table 7-5. Refer to the appendices in Chapter 5 for additional guidance.

Table 7-5. Example of overhead bin data tabulation

Row	*Left aisle outboard*	*Left aisle inboard*	*right aisle inboard*	*Right aisle outboard*
15	Consumed by fire	Consumed by fire	Consumed by fire	Bin open (empty)
16	Consumed by fire	Consumed by fire	Consumed by fire	Bin open (empty)
17	Bin open (empty)	Bin open 1 bag (18 lbs)	Bin open (empty)	Bin closed 3 bags (45 lbs*)

**Combined weight of the 3 bags*

7.6.8 Passenger service units

This section should include a description of the condition of passenger service units (PSU), as well as a description of the presence of their components. This includes the condition of the oxygen mask door, drop-down oxygen masks, and oxygen generators. Data may be presented in tabular form, as presented in Table 7-6.

Table 7-6. Example of PSU data tabulation

Passenger service units – Seats ABC					
Row	O2 door deployed	O2 door stowed	Missing	Oxygen generators	
				Activated	Not activated
21	X			X	
22	X			X	
23		X			X
24			X		

7.6.9 Aircraft exterior

This section should contain a description of the condition of the aircraft's exterior, as pertinent to survival factors. This includes holes in the fuselage of the aircraft, their location, shape and size, and the presence or failure of any exterior emergency lights.

7.7 ADDITIONAL DOCUMENTATION AND TESTING

7.7.1 This section should contain a description of any additional tests or reviews conducted, for example, slide-raft teardown examinations in evacuations where slides malfunctioned. Such testing is typically conducted by the original equipment manufacturer and the results are transmitted to the survival factors group.

7.7.2 The proliferation of electronic devices being carried on the aircraft and some exterior area surveillance systems can offer other forms of documentation either inside, outside or along the path of the flight.

7.8 EMERGENCY RESPONSE

7.8.1 This section should contain a description of any emergency response such as, search and rescue, police, medical, community/airport disaster, and firefighting. This description should include a timeline of the emergency response sequence, beginning when the appropriate authorities were notified of the occurrence (how/when the emergency alert notification was activated) and all subsequent actions taken.

7.8.2 Aspects to be incorporated include, but are not limited to:

a) the time needed to respond to the occurrence, and reasons for delays, if any;

b) the challenges in relation to the aircraft model involved in the occurrence;

c) communications between aircraft occupants and emergency response personnel; and

d) difficulties encountered (e.g. terrain, strong winds, heavy rain).

7.8.3 Refer to Chapter 5, Appendix C for additional guidance.

7.9 MEDICAL AND PATHOLOGICAL INFORMATION

7.9.1 This section should present a summary of occupants' injuries, classified by severity, and a description of how the injuries were sustained. This section should also present the total number of fatalities and the cause of death, if applicable. Medical and pathological information is typically provided to the survival factors group by the coroner, medical examiner, or other medical specialist conducting the post-mortem examination, or by a pathologist, preferably one experienced in accident investigation. Data may be presented in tabular form (refer to Table 7-7) and supported in a diagram format (refer to Figure 7-6). Data should include injuries to flight crew, cabin crew, passengers, and others, such as RFF/ground personnel or bystanders.

Table 7-7. Example of occupant injury data tabulation

Injuries	*Flight crew*	*Cabin crew*	*Passengers*	*Other*	*Total*
Fatal	0	0	0	0	**0**
Serious	0	1	0	0	**1**
Minor	0	0	19	0	**19**
None	3	9	138	0	**150**
Total	**3**	**10**	**157**	**0**	**170**

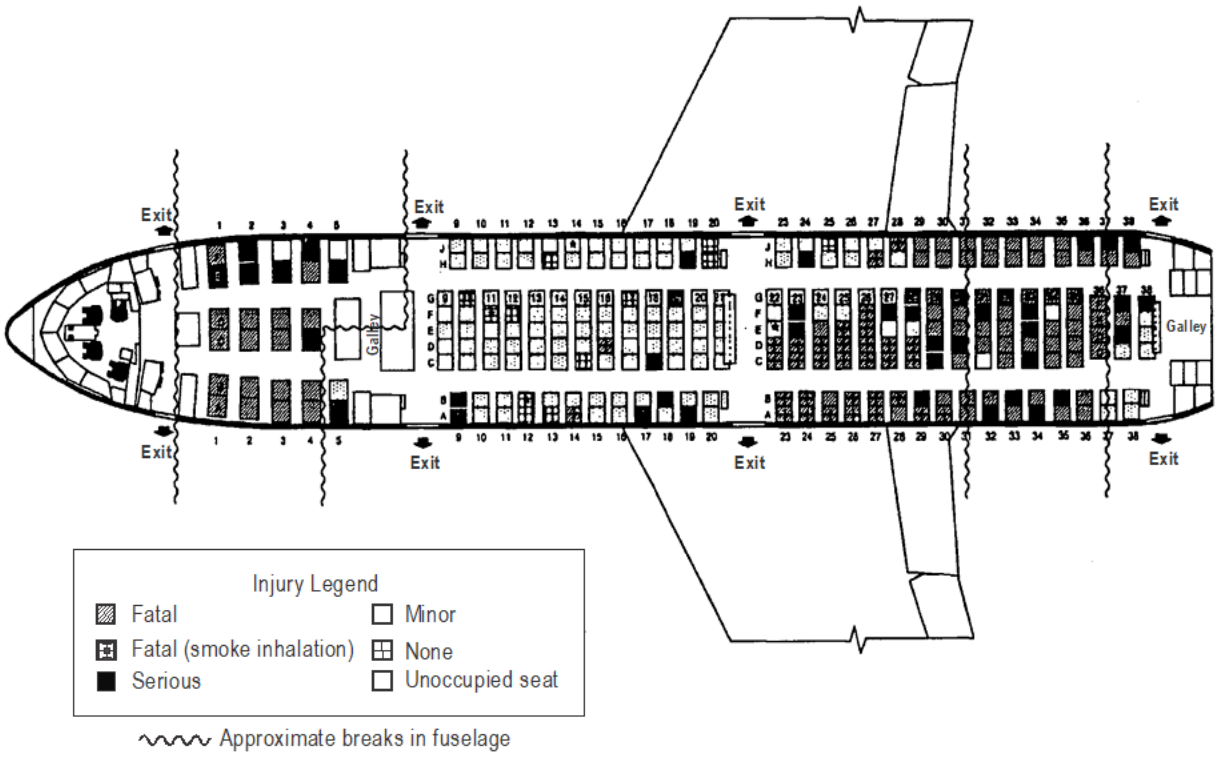

Figure 7-6. Example of an occupant injury diagram (Source: NTSB)

7.9.2 Several factors can contribute to occupant injuries. This information assists the CI to establish correlations between occupants' injuries and the specifics of the occurrence, and to develop recommendations to improve occupant survivability. The CI should consider the following factors when analysing injuries to occupants:

a) occupant information: e.g. sex; age; physiological factors; activities at the time of the occurrence; and a detailed description of the specific injuries sustained;

b) aircraft design, structure and cabin configuration: e.g. cabin dividers;

c) restraints and brace positions: e.g. restraint type (two-, three- or four-point), whether restraint was fastened and how tightly, brace position taken, if any;

d) energy absorption: e.g. aircraft structure and seats, including construction of seat-backs; the presence of energy absorbing materials (foam, fabric or malleable aluminium) or rigid ones (plastic or metal); and items such as monitors, tray tables and PED holders;

e) cabin environment: e.g. overhead bins and restraining devices for their contents; sharp edges on seats, galley and toilet fixtures; and moveable objects such as trolleys; and

f) post-occurrence actions: e.g. provision of first-aid by other passengers, cabin crew, ground crew and rescue services.

7.9.3 The accident investigation authority should share pertinent information regarding occupant injuries with all relevant stakeholders, such as the appropriate State entity (e.g. the civil aviation authority), the equipment manufacturer, or operator, to recommend focus areas of research or further investigation in order to enhance survivability.

7.10 AERODROME INFORMATION

This section should contain information regarding the aerodrome where the accident occurred. This includes the layout (for example, runways, taxiways, location of passenger terminal), its characteristics (such as close proximity to water), and any special features that may have affected the accident's outcome in a positive or negative manner (for example, arresting systems to slow down an aircraft following a runway excursion; proximity of structures at the end of the runway which damaged the fuselage). Refer to the appendices in Chapter 5 for additional guidance.

7.11 CRASH SITE INFORMATION

If the accident did not occur at an aerodrome, the report should address other pertinent information regarding the crash site. This includes characteristics of the crash site that affected survivability (e.g. remote areas that make search and rescue operations difficult).

7.12 FINAL REPORT

7.12.1 Following the completion of the accident investigation, the accident investigation authority must publish a final report, in accordance with Annex 13 provisions. To address the importance of occupant survivability, all final reports should contain a condensed version of the survival factors group factual report. The body of a final report must include the following headings:

a) factual information record;

b) analysis of the relevant facts;

c) conclusions in the form of findings, causes and/or contributing factors; and

d) safety recommendations.

Note.— Detailed guidance on completing each section of the final report is found in the Manual of Aircraft Accident and Incident Investigation *(Doc 9756), Part IV* – Reporting.

7.12.2 The final report is derived from all relevant aspects of the accident investigation, including information from the various groups formed during the investigation. It should include a section on survival aspects, containing the following subheadings:

a) general information related to accident survivability;

b) occurrence description (e.g. evacuation);

c) specific issues (e.g. passengers taking carry-on baggage in an evacuation);

d) injuries (fatal, serious or minor/none);

e) cabin damage, including failure of structures;

f) exits and assisting evacuation means, when applicable;

g) emergency response; and

h) tests and research including results (may be presented separately).

7.13 CONCLUSIONS AND RECOMMENDATIONS

7.13.1 The final report of an accident includes conclusions, and when appropriate, safety recommendations issued by the State conducting the investigation of the accident (or incident). Conclusions and safety recommendations must not be used for apportioning blame or liability. Unlike the survival factors group factual report, which only contains factual information, a survival factors analysis report can be helpful to determine any actual or potential safety deficiencies.

7.13.2 Analysis of documented information

7.13.2.1 Following the collection of the factual information included in the survival factors group factual report, an analysis can assist the CI in determining any actual or potential safety deficiencies to facilitate the development of any conclusions or recommendations. The analysis should be supported by factual information (that is, free from subjective comments). Details of the information should be clearly stated in the report. Figure 7-7 presents an example of the process that the CI can use when analysing an occurrence in preparation for writing the report.

This analysis will address the following issues:

a) cabin crew evacuation training;

b) evacuation procedures;

c) communication and decision-making; and

d) passenger manifests.

The following are example of the wording of the analysis for one of the issues listed above (passenger manifests). The first example is vague (undesired) and the second is concise (desired):

— “The Investigative Authority is concerned that the internal processes and procedures are inaccurate.”

Versus

— “The Investigative Authority concludes internal processes and procedures for providing an accurate number of passengers on board, including infants, to emergency responders were inadequate because they did not include infants in the total passenger count provided to emergency responders by the crew.”

Figure 7-7. Example of the process for analysing an evacuation

7.13.2.2 The CI should anticipate that other stakeholders will scrutinize and will challenge the report's content during the investigation process. The following points can assist the CI in presenting a strong report:

a) revise the report to find any omissions/inaccuracies before other readers do;

b) read the document from the perspective of an uninformed, but interested, reader — are there gaps in the reasoning, issues not dealt with, or extraneous information; and

c) acknowledge and respond to inconsistent facts or opposing points of view (if there are any).

7.13.2.3 The CI's analysis should provide the following information, which may be presented in bullet point form:

a) what safety issues can be ruled out based on the CI's work on this investigation? This may involve multiple issues;

b) what safety issues were discovered as a result of the CI's part of the investigation? This may involve multiple issues;

c) identify specifically why each issue is deemed a safety concern, giving as many details as possible. The CI should repeat this step for every identified safety issue, as follows:

1) identify the root cause/contributing factors for the issue;

2) provide any other factual support for the issue;

3) propose a conclusion that states why the identified issue is a safety concern;

4) indicate whether preventive actions have been taken or are planned to resolve this issue;

5) state whether any recommendation(s) is/are needed in this area. If not, state why; if so, provide proposed wording for the recommendation(s), including the agency or organization to which the recommendation(s) would be addressed.

7.13.3 Conclusions

Conclusions are a list of findings, causes and/or contributing factors established in the investigation. The list of causes and/or contributing factors should include both immediate and deeper systemic causes and/or contributing factors. Conclusions should be written as objective, factual statements. They should be free from subjective comments, as presented in Figure 7-8.

> "The dynamics of the impact sequence in this accident were such that occupants were thrown forward and experienced a significant lateral force to the left, which resulted in serious passenger injuries that included numerous left-sided rib fractures and one left-sided head injury." (Source: NTSB)

Figure 7-8. Example of a conclusion

7.13.4 Safety recommendations

7.13.4.1 As appropriate, the final report should state any recommendations made for the purpose of accident prevention and identify safety actions already implemented. These are suggestions or proposals as to the best course of action to address identified deficiencies. Safety recommendations should be clear, concise and action oriented, as presented in Figure 7-9.

> "Conduct research that examines the injury potential to occupants in accidents with significant lateral forces, and if the research deems it necessary, implement regulations to mitigate the hazards identified." (Source: NTSB)

Figure 7-9. Example of a safety recommendation

7.13.4.2 Safety recommendations may be addressed to one or more of the following entities:

a) State's competent authority (e.g. the civil aviation authority);

b) operator (involved in the occurrence or to operators in general);

c) equipment manufacturer (airframe, components, etc.);

d) aerodrome or other service provider; and

e) other specific stakeholders (e.g. industry group, firefighting, medical services).

7.13.4.3 A State that receives safety recommendations must inform the proposing State of the preventive action taken or under consideration, or the reasons why no action will be taken to address the safety recommendations issued by the accident investigation authority of the State conducting the investigation.

— END —

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