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# ICAO Safety Management Manual

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**Part 1**

**INTRODUCTION TO SAFETY MANAGEMENT**

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## **Chapter 1**

### **OVERVIEW**

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## Chapter 1

### OVERVIEW

#### GENERAL

Aviation is remarkable for the giant technological leaps it has made over the last century. This progress would not have been possible without parallel achievements in the control and reduction of aviation's safety hazards. Given the many ways that aviation can result in injury or harm, those involved with aviation have been pre-occupied with preventing accidents since the earliest days of flying. Through the disciplined application of best safety management practices, the frequency and severity of aviation occurrences have declined significantly.

#### CONCEPT OF SAFETY

In order to understand safety management, it is necessary to consider what is meant by "safety". Depending on one's perspective, the concept of aviation safety may have different connotations, such as:

- a) Zero accidents (or serious incidents), a view widely held by the travelling public;
- b) Freedom from danger or risks; i.e. those factors which cause or are likely to cause harm;
- c) Attitude towards unsafe acts and conditions by employees (reflecting a "safe" corporate culture);
- d) Degree to which the inherent risks in aviation are '*acceptable*';
- e) Process of hazard identification and risk management; and
- f) Control of accidental loss (of persons, property or damage to the environment).

While the elimination of accidents (and serious incidents) would be desirable, a hundred percent safety is an unachievable goal. Failures and errors will occur, in spite of the best efforts to avoid them. No human activity or human-made system can be guaranteed to be absolutely safe, i.e. free from risk. Safety is a relative notion, whereby inherent risks are acceptable in a "safe" system.

Safety is increasingly viewed as the management of risk. Thus, for the purposes of this Manual safety is considered to be:

**Safety** is the state in which the risk of harm to persons or property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management.

## NEED FOR SAFETY MANAGEMENT

Although major air disasters are rare events, less catastrophic accidents and a whole range of incidents occur more frequently. These lesser safety events may be harbingers of underlying safety problems. Ignoring these underlying safety hazards could pave the way for an increase in the number of more serious accidents.

Accidents (and incidents) cost money. Although purchasing “insurance” can spread the costs of an accident, accidents make bad business sense. While insurance may cover specified risks, there are many uninsured costs. In addition, there are less tangible costs such as the loss of confidence of the travelling public. An understanding of the total costs of an accident is fundamental to understanding the economics of safety.

The air transportation industry’s future viability may well be predicated on its ability to sustain the public’s perceived comfort regarding their safety while travelling. The management of safety is therefore a prerequisite for a sustainable aviation business.

## ICAO REQUIREMENTS

Safety has always been the overriding consideration in aviation activities. This is reflected in the aims and objectives of ICAO as stated in Article 44 of the *Convention on International Civil Aviation* (Doc 7300), commonly known as the Chicago Convention, which charges ICAO with ensuring the safe and orderly growth of international civil aviation throughout the world.

In establishing State’s requirements for the management of safety, ICAO differentiates between safety programmes and safety management systems. Specifically:

- a) A **safety programme** is an integrated set of regulations and activities aimed at improving safety.
- b) A **safety management system** is an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

ICAO’s Standards and Recommended Practices (SARPs)<sup>1</sup> require that States establish a **safety programme** to achieve an acceptable level of safety in aviation operations. The acceptable level of safety shall be established by the State(s) concerned. While the concept of safety programmes and safety management systems is restricted to Annexes 6, 11 and 14 at present, it is possible that the concept will be expanded to include additional operational Annexes in future.

A safety programme will be broad in scope, including many safety activities aimed at fulfilling the programme’s objectives. A State’s safety programme embraces those regulations and directives for the conduct of safe operations from the perspective of aircraft operators and those providing air traffic services, aerodromes and aircraft maintenance. The safety programme may include provisions for such diverse activities as incident reporting, safety investigations, safety audits, safety promotion, etc. To implement such safety activities in an integrated manner requires a coherent safety management system.

Therefore, in accordance with the Annex provisions, States shall require that individual operators, maintenance organizations, air traffic service providers and certified aerodrome operators implement

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<sup>1</sup> See ICAO Annex 6 — *Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes* and Part III — *International Operations — Helicopters*; Annex 11 — *Air Traffic Services*; and Annex 14 — *Aerodromes* .

*safety management systems* approved by the State. As a minimum, such safety management systems shall:

- a) Identify actual and potential safety hazards;
- b) Ensure that remedial action necessary to maintain an acceptable level of safety is implemented; and
- c) Provide for continuous monitoring and regular assessment of the safety level achieved.

An organization's safety management system approved by the State shall also clearly define lines of safety accountability, including a direct accountability for safety on the part of senior management.

ICAO provides specialized guidance material for the fulfilment of the SARPs, including this manual on safety management. This manual includes a conceptual framework for managing safety and establishing a safety management system as well as some of the systemic processes and activities used to meet the objectives of the State's safety programme.

### **Acceptable level of safety**

In any system, it is necessary to set and measure performance outcomes in order to determine whether the system is operating in accordance with expectations and to identify where action may be required to enhance performance levels to meet these expectations.

As previously discussed, the term acceptable level of safety is a concept used by ICAO to express the safety management expectations of a regulatory oversight authority, aircraft operator, or service provider. In effect it is an agreement on the safety performance that operators and service providers should achieve while conducting their core business. In determining an acceptable level of safety, it is necessary to consider such factors as the level of risk that applies, the cost/benefits of improvements to the system and public expectations on the safety of the aviation industry. The acceptable level of safety, therefore, becomes the reference against which the oversight authority, the aviation industry and the public can determine the safety performance of the aviation system

In practice, the concept of acceptable level of safety is expressed by two measures, or metrics (safety performance indicators and safety performance targets), and implemented through various safety requirements. The following explains the use of these terms in this manual:

*Safety performance indicators* are a measure of the safety performance of an aviation organization, or sector of the industry. Safety indicators should be easy to measure and be linked to the major components of a State safety programme, or an operator/service provider's safety management system (SMS). Safety indicators will therefore differ between different segments of the aviation industry, such as aircraft operators, aerodrome operators, or ATS providers

*Safety performance targets* (sometimes referred to as goals or objectives) are determined by considering what safety performance levels are desirable and realistic for individual operator/services providers. Safety targets should be measurable, acceptable to stakeholders, and consistent with the State safety programme.

*Safety requirements* are needed to achieve the safety performance targets and safety performance indicators. They include the operational procedures, technology, systems, or programmes, to which measures of reliability, availability, performance and/or accuracy can be specified.

A range of different safety performance indicators and targets will provide a better insight of the acceptable level of safety of an organization, or sector of the industry, than the use of a single indicator or target.

The relationship between acceptable level of safety, safety performance indicators, safety performance targets and safety requirements is as follows. The acceptable level of safety is the overarching concept. Safety performance indicators and safety performance targets are the measures, or metrics, used to determine if the acceptable level of safety has been achieved. Safety requirements are the means to achieve the safety targets and safety indicators. This manual focuses on safety requirements i.e., the means to achieve acceptable levels of safety.

There will seldom be a national acceptable level of safety. More frequently, within each State there will be different acceptable levels of safety that will be agreed between the regulatory oversight authority and individual operators/services providers. Each agreed acceptable level of safety should be commensurate with the complexity of the individual operator/service provider's operational context.

Establishing acceptable level(s) of safety for its safety programme does not relieve a State from compliance with ICAO Standards and Recommended Practices. Likewise, establishing acceptable level(s) of safety for its safety management system does not relieve an operator or service provider from compliance with applicable Standards and Recommended Practices and/or national regulations and requirements.

Chapter 5 contains further information on safety performance targets and safety performance indicators.

### **STAKEHOLDERS IN SAFETY**

Given the total costs of aviation accidents, many diverse groups have a stake in improving the management of safety. Following are the principal stakeholders in safety:

- a) Aviation professionals (e.g. flight crew, cabin crews, ATCO, mechanics);
- b) Aircraft owners and operators;
- c) Manufacturers, (especially airframe and engine manufacturers);
- d) Aviation regulatory authorities (e.g. CAA, FAA, EASA);
- e) Industry trade associations (e.g. IATA, ATA, ACI);
- f) Regional air traffic service providers (e.g. EUROCONTROL);
- g) Professional associations and unions (e.g. IFALPA, IFATCA);
- h) International aviation organizations (e.g. ICAO);
- i) Investigative agencies (e.g. US NTSB); and
- j) The flying public.

Major aviation safety occurrences invariably involve additional groups who may not always share a

common objective in advancing aviation safety. For example:

- a) Next of kin, victims, or persons injured in an accident;
- b) Insurance companies;
- c) Travel industry;
- d) Safety training and educational institutions (e.g. Flight Safety Foundation);
- e) Other government departments and agencies;
- f) Elected government officials (i.e. politicians);
- g) Investors;
- h) Coroners and police;
- i) Media;
- j) General public;
- k) Lawyers and consultants; and
- l) Diverse special interest groups.

### APPROACHES TO SAFETY MANAGEMENT

With global aviation activity forecast to continue to rise, there is concern that traditional methods for reducing risks to an acceptable level may not be sufficient. New methods for understanding and managing safety are therefore evolving.

Safety management may therefore be considered from two different perspectives.

**Traditional.** Historically, aviation safety focused on compliance with increasingly complex regulatory requirements. This approach worked well up until the late 1970s when the accident rate levelled off. Accidents continued to occur in spite of all the rules and regulations.

This approach to safety **reacted** to undesirable events by prescribing measures to prevent recurrence. Rather than defining best practices or desired standards, such an approach aimed at ensuring minimum standards were met.

With an overall fatal accident rate in the vicinity of  $10^{-6}$  (i.e. one fatal accident per million flights) further safety improvements were becoming increasingly difficult to achieve using this approach.

**Modern.** In order to keep safety risks to an acceptable level with the increasing levels of activity, modern safety management practices are shifting from a purely reactive to a more **proactive** mode. In addition to a solid framework of legislation and regulatory requirements, based on ICAO SARPs, and the enforcement of those requirements, a number of other factors some of which are listed below, are considered to be effective in managing safety. It must be emphasized that this approach complements,

or is in addition to the obligations of States and other organizations to comply with ICAO SARPs and/or national regulations.

- a) Application of scientifically-based, risk management methods;
- b) Senior management's commitment to the management of safety;
- c) A corporate safety culture that fosters safe practices, encourages safety communications and actively manages safety with the same attention to results as financial management;
- d) Effective implementation of Standard Operating Procedures (SOPs), including the use of checklists and briefings;
- e) A non-punitive environment (or just culture) to foster effective incident and hazard reporting;
- f) Systems to collect, analyse, and share safety-related data arising from normal operations;
- g) Competent investigation of accidents and serious incidents, identifying systemic safety deficiencies (rather than just targets for blame);
- h) Integration of safety training (including Human Factors) for operational personnel;
- i) Sharing safety lessons learned and best practices through the active exchange of safety information (among companies and States); and
- j) Systematic safety oversight and performance monitoring aimed at assessing safety performance and reducing or eliminating emerging problem areas.

No single element will meet today's expectations for risk management. Rather, an integrated application of most of these elements will increase the aviation system's resistance to unsafe acts and conditions. However, even with effective safety management processes, there are no guarantees that all accidents can be prevented.

## USING THIS MANUAL

### Purpose

The purpose of this manual is to assist States in implementing the provisions of Annex 6 — *Operation of Aircraft*, Annex 11 — *Air Traffic Services* and Annex 14 — *Aerodromes* with respect to the implementation of safety management systems by operators and service providers.

### Target audience

The methods and procedures described in this manual have been compiled from experience gained in the successful development and management of aviation safety activities by aviation operators, ATS providers, aerodrome, and maintenance organizations. In addition, the manual embodies best practices from sources such as governments, manufacturers and other reputable aviation organizations.

Application of the guidance material herein is not limited to operational personnel. Rather it should be relevant to the full spectrum of stakeholders in safety, including senior management.

In particular, this manual is aimed at those personnel who are responsible for designing, implementing and managing effective safety activities. Specifically:

- a) Government officials with responsibilities for regulating the aviation system;
- b) Management of operational organizations, such as operators, ATS providers, aerodromes and maintenance; and
- c) Safety practitioners, such as safety managers and advisers.

Users should find sufficient information to guide the justification for, initiation and operation of a viable safety management system.

The manual is not prescriptive. However, based on an understanding of the philosophy, principles and practices discussed herein, organizations should be able to develop an approach to safety management suited to their local conditions.

### **Manual contents**

This manual targets a wide audience, ranging from State aviation regulators, to operators and service providers. It also aims to address all levels of personnel in these organizations, from senior management to front line workers. As such, it contains a considerable amount of material. For ease of reference the manual is divided into four parts covering: Introduction to safety management, The management of safety, Safety management systems and Applied safety management.

The manual is not designed to be read from start to finish. Rather users are encouraged to focus on their areas of interest, depending on their level of knowledge and experience in the area of aviation safety management.

Notwithstanding any references to the male gender, this manual is gender neutral.

### **Acknowledgements**

In developing this manual, ICAO has drawn heavily on the work, writing and best practices of many organizations and individuals. In a number of places the basic source of the material is referenced in footnotes. In many other areas the source material has been woven into the text of the manual. While the source of all such material can not be identified, ICAO would like to acknowledge, in particular, inputs from the following States: Australia, Canada, New Zealand, United Kingdom and United States; manufacturers: Airbus Industrie and The Boeing Company; consultants: Integra; service providers: European Organisation for the Safety of Air Navigation (EUROCONTROL) and the Airports Council International (ACI); private authors: Richard W. Wood; others: Global Aviation Information Network (GAIN) and Flight Safety Foundation (FSF).

### **Relationship to other ICAO documents**

This Safety Management Manual provides guidance for fulfilling the requirements of the SARPs of Annexes 6, 11, and 14 with respect to the implementation of safety programmes and safety management systems. Some of these requirements are expanded upon in the ICAO Procedures for Air Navigation Services — *Aircraft Operations* (Doc 8168) and *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444).

The manual should also assist States in the fulfilment of the SARPs of Annex 13 with respect to the investigation of accidents and incidents, including recommendations to States for the promotion of safety by the analysis of accident and incident data and by the prompt exchange of safety information.

This Safety Management Manual should also serve as a companion document for other ICAO documents, including:

- a) *Preparation of an Operations Manual* (Doc 9376) which provides detailed guidance to operators in such areas as training and the supervision of operations, and includes direction on the need to maintain an accident prevention programme;
- b) *Airworthiness Manual* (Doc 9760) which provides guidance for the conduct of a continuing airworthiness programme;
- c) *Manual on Certification of Aerodromes* (Doc 9774) which describes the salient features of a safety management system to be included in the aerodromes manual for certified aerodromes;
- d) *Human Factors Training Manual* (Doc 9683) which describes in greater detail much of the underlying approach to the human performance aspects of safety management in this manual;
- e) *Human Factors Guidelines for Safety Audits Manual* (Doc 9806) which provides guidelines for preparing for, or conducting, a safety oversight audit which includes consideration of human performance and limitations;
- f) *Manual of Aircraft Accident and Incident Investigation* (Doc 9756) which provides information and guidance to States on the procedures, practices and techniques that can be used in aircraft accident investigations;
- g) *Cabin Attendants' Safety Training* (Doc 7192) which provides for the training for cabin attendants required by Annex 6;
- h) *Human Factors Guidelines for Air Traffic Management (ATM) Systems* (Doc 9758);
- i) *Human Factors Guidelines for Aircraft Maintenance Manual* (Doc 9824);
- j) *Line Operations Safety Audit (LOSA) Manual* (Doc 9803); and
- k) *Human Factors Digest No. 16 — Cross-Cultural Factors in Aviation Safety* (Circ 302).

## **Chapter 2**

# **RESPONSIBILITY FOR MANAGING SAFETY**

### **Outline**

#### **Responsibilities for managing safety**

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- States
- Civil aviation administrations (CAAs)
- Manufacturers
- Aircraft operators
- Service providers
- Third party contractors
- Business and professional associations

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#### **Global cooperation**

## Chapter 2

### RESPONSIBILITY FOR MANAGING SAFETY

The responsibility for safety and effective safety management is a shared responsibility involving a wide spectrum of organizations and institutions, including international organizations, State regulatory authorities for civil aviation, owners and operators, service providers for air navigation services and aerodromes, major aircraft and power plant manufacturers, maintenance organizations, industry and professional associations, aviation education and training institutions, etc. In addition, third parties that provide aviation support services (including contracted services) also share in the responsibility for managing safety. Generally, these responsibilities fall into the following areas:

- a) Defining policies and standards affecting safety;
- b) Allocating resources to sustain risk management activities;
- c) Identifying and evaluating safety hazards;
- d) Taking action to eliminate hazards or reduce the associated level of risk to what has been decided is an acceptable level of risk;
- e) Incorporating technical advances in the design and maintenance of equipment;
- f) Conducting safety oversight and safety programme evaluation;
- g) Investigating accidents and serious incidents;
- h) Adopting the most appropriate best industry practices;
- i) Promoting aviation safety (including the exchange of safety-related information); and
- j) Updating regulations governing civil aviation safety.

The systematic procedures and practices for the management of safety are generally referred to collectively as a safety management system.

### ICAO

From a regulatory perspective, ICAO's role is to provide procedures and guidance for the safe conduct of international aircraft operations and to foster the planning and development of air transport. This is largely achieved by developing Standards and Recommended Practices (SARPs), which are contained in Annexes to the Chicago Convention and reflect the best operational experience of States. Procedures for Air Navigation Services (PANS) contain practices beyond the scope of SARPs, where a measure of international uniformity is desirable for safety and efficiency. Regional Air Navigation Plans detail requirements for facilities and services specific to ICAO regions. In essence, these documents define the international framework for promoting safety and efficiency in aviation.

In addition to this regulatory framework, ICAO contributes to safety management by promoting the best safety practices of States. More specifically, ICAO:

- a) Provides guidance material for States and operators covering most aspects of aviation safety, (including flight operations, airworthiness, air traffic services, aerodromes and airport security). Generally this guidance material is in the form of Manuals or circulars;
- b) Developed this manual which outlines the principles of safety management and provides guidance for the conduct of effective safety management programmes;
- c) Defines international procedures for accident and incident investigation and reporting<sup>2</sup>.
- d) Promotes aviation safety by:
  - 1) disseminating accident and incident information through the ADREP system and by other means;
  - 2) disseminating aviation safety information in publications, and more recently in electronic formats; and
  - 3) participating in conferences and seminars, etc. addressing specific aspects of aviation safety (i.e. accident investigation, accident prevention and human factors); and
- e) Conducts audits under the Universal Safety Oversight Audit Programme (USOAP).

### States

States bear significant responsibility for establishing an environment conducive to safe and efficient flight operations. Irrespective of any risk management methods it may employ, such as those described in this manual, the State, as the signatory to the Chicago Convention, has an obligation to implement ICAO SARPs. To do this, States must:

- a) Provide the legislative and regulatory provisions needed to govern the State's aeronautics system. Some of the areas requiring a legal framework for effective safety management include:
  - 1) Aeronautics law establishes a State's objectives for aviation — both commercial and private. Typically, this legislation includes the State's vision for aviation safety and delineates the broad responsibilities, accountabilities and authorities for fulfilling those objectives;
  - 2) Manufacturing and Trade laws govern the production and sale of safe aeronautic equipment and services;
  - 3) Labour laws (including Occupational Safety and Health (OSH) laws) set the rules for the work environment in which aviation employees are expected to perform their duties safely;

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<sup>2</sup> These are contained in Annex 13 — *Aircraft Accident and Incident Investigation, the Manual of Aircraft Accident and Incident Investigation* (Doc 9756) and the *Accident/Incident Reporting (ADREP) Manual* (Doc 9156);

- 4) Security laws contribute to safety in the workplace; for example, they govern who may enter into operational areas and under what terms. Also they may protect sources of safety information; and
  - 5) Environmental laws affecting the siting of airports and navigation aids, impact on flight operations (such as noise abatement procedures).
- b) Establish an appropriate State body, usually referred to as the Civil Aviation Administration (CAA), with the necessary powers to ensure compliance with the regulations. This responsibility includes:
- 1) Establishing the necessary statutory authority and delegations to regulate the aviation industry;
  - 2) Ensuring it is adequately staffed with competent, technical officials; and
  - 3) Maintaining an effective system of safety oversight to assess how well regulatory requirements are being met.
- c) Establish appropriate safety oversight mechanisms to ensure that operators and service providers maintain an acceptable level of safety in their operations.

Safe and efficient aviation requires significant infrastructure and aeronautic services, including airports, navigation aids, air traffic management, meteorological services, flight information services, etc. Some States own and operate their own air navigation services and major airports; others own and operate their own national airline. However, many States have corporatized these operations, operating under the oversight of the State. Regardless of the approach taken, States must ensure that the infrastructure and services in support of aviation are maintained to meet international obligations and the needs of the State.

Where the regulatory function and the provision of particular services are both under the direct control of the one State body (such as the CAA) a clear distinction must be maintained between these two functions, i.e. service provider and regulator.

Finally, States have a responsibility to be “good citizens” in the international aviation community. They can best do this by ensuring conformity with the Chicago Convention and ICAO SARPs. When a State cannot adapt their national legislation and regulations to ICAO SARPs they are required to file a “difference”. ICAO publishes these differences so that other States may be aware of departures from internationally agreed standards. The ICAO USOAP programme is used to determine States compliance with safety critical SARPs.

### **Civil Aviation Administrations (CAAs)**

Having developed appropriate legislation governing aeronautics, a State must implement a CAA to establish the rules, regulations and procedures by which the State implements its safety programme. Chapter 3 (State Safety Programme) outlines the principal function and activities of the CAA for delivering an effective safety programme. Basically, the CAA provides the necessary oversight for compliance with the State’s laws and regulations for air safety and for the fulfillment of the State’s safety goals.

### **Manufacturers**

Each new generation of equipment incorporates improvements based on the latest “*state of the art*” and operational experience. Manufacturers produce equipment that complies with the airworthiness and other standards of domestic and foreign governments, and meet the economic and performance requirements of purchasers.

Manufacturers also produce manuals and other documentation to support their products. In some States these may be the only guidance material available for the operation of a specific aircraft type or piece of equipment. Thus the standard of documentation provided by the manufacturer is important. Additionally, through their responsibilities for providing product support, training, etc. manufacturers can provide the safety record of a particular piece of equipment, or the in-service record of a component.

In addition, the major aircraft manufacturers have active safety departments whose roles include, monitoring in-service experience, providing feedback to the manufacturing process and disseminating safety information to customer airlines.

### **Aircraft operators**

Major airlines usually employ many of the safety management activities outlined in this manual. Such activities are often carried out by a safety office which monitors overall operating experience and provides independent advice to company management on the action needed to eliminate or avoid identified hazards, or reduce the associated risk to an acceptable level.

The safety management concepts outlined in this manual are in addition to existing requirements to comply with ICAO SARPs and/or national regulations.

### **Service providers**

Safe and efficient flight operations depend on the effective delivery of a variety of services, separate from the aircraft operators. For example:

- a) Air traffic management;
- b) Aerodrome operations, including airport emergency services;
- c) Airport security; and
- d) Navigation and communication aids.

Traditionally, such services have been provided by the State — usually through their civil or military aviation authorities. However, civil aviation authorities in some States have discovered the potential conflicts of interests in the dual roles of the State as both a regulator and as a service provider. Moreover, some States believe that there are operational efficiencies and economies to be gained from the corporatization of many of these services, particularly ATS and aerodrome operations. As a result, a growing number of States have delegated responsibility for the provision of many of these services.

Regardless of the ownership or management structure of any aviation services, responsible managers are expected to develop and implement safety management systems within their areas of expertise. The guidance material provided in this manual applies equally to flight operations and the provision of aviation services, regardless of whether they are governed by the State or corporate management.

### **Third party contractors**

The provision of services supporting flight operations often involves private contractors in such areas as refuelling; catering and other aircraft ground services; aircraft maintenance and overhaul; runway and taxiway construction and repair; crew training; flight planning, flight dispatch and flight following; etc.

Whether a large corporate contractor or small entrepreneur, the contracting authority holds overall responsibility for managing the safety risks taken by the contractor. The contract must specify safety standards to be met. The contracting authority then has the responsibility of ensuring the contractor complies with the safety standards prescribed in the contract.

A safety management system must ensure that the level of safety of an organization is not eroded by the inputs and supplies provided by external organizations.

### **Business and professional associations**

Business and professional associations also play a vital role in safety management.

International, national, and regional stakeholder associations are usually formed to advance commercial interests; however, stakeholders increasingly recognize the strong links between aviation safety and profitability. Stakeholders see that an accident by one airline can compromise their own business. Thus, for example, airline associations maintain an active watch of industry developments in technology, procedures and practices. Their members collaborate in the identification of safety hazards and in the advocacy required for reducing or eliminating those deficiencies. Through such associations, many airlines are now sharing safety-related data with a view to enhancing safety management.

In a similar manner, professional associations representing the interests of various professional groups (e.g. pilots, air traffic controllers, flight attendants, etc.) are active in the pursuit of safety management. Through studies, analysis and advocacy, such groups provide subject matter expertise for identifying and ameliorating safety hazards.

Increasingly, airlines are joining partnerships or alliances with other airlines to extend their effective route structure through code-sharing agreements. This can result in a flight segment being operated by an airline other than that expected by the passenger. These arrangements can have safety implications. No airline wants to be tied to an unsafe partner. To protect their own interests, the alliance partners conduct mutual safety audits — thereby enhancing airline safety.

The general aviation community have a system of national and international associations that have been formed to further safety and the interests of their section of the aviation community. The business aviation sector is also active in safety management systems and in pursuing safety issues for their members.

### MANAGEMENT'S SPECIAL RESPONSIBILITY FOR SAFETY<sup>3</sup>

The management teams of operators and service providers bear a special responsibility for safety management. In a major study of airlines around the world, it was found that the safest airlines had a clear safety mission, starting at the top of the organization and guiding actions right down to the operational level<sup>4</sup>. Lautman and Gallimore found that in the safest airlines:

*“...Flight operations and training managers recognize their responsibility to flight safety and are dedicated to creating and enforcing safety oriented policies...There is a method of getting information to the flight crews expeditiously and a policy that encourages confidential feedback from pilots to management...The management attitude, ...is a dynamic force that sets the stage for the standardization and discipline in the cockpit brought about by a training programme oriented to safety issues.”*

The safest organizations are often the most efficient. Although trade-offs between safety risk management and costs may occur, management need to recognize the hidden costs of accidents and that safety is good for business. By taking a systematic approach to corporate decision-making and risk management, they reduce their accidental losses.

Management has the authority and the responsibility to manage safety risks in the company. It achieves this by establishing a systematic method for identifying hazards, assessing risks, assigning priorities to these risks and then by reducing or eliminating those hazards which pose the greatest potential loss. It alone has the ability to introduce changes in the organization, its structure, its staffing, its equipment, policies and procedures.

Above all, management sets the organizational climate for safety. Without management's wholehearted commitment to safety, safety management will be largely ineffective. In positively reinforcing safety actions, management sends the message to all staff that it really cares about safety and they had better too.

Management need to establish safety as a core value of the organization. They can accomplish this by setting objectives and safety goals, then holding managers and employees accountable for achieving those goals. Staff, then look to management for:

- a) **Clear direction** in the form of credible policies, objectives, goals, standards, etc.;
- b) **Adequate resources**, including sufficient time, to fulfill assigned tasks safely and efficiently; and
- c) **Expertise** in terms of access to experience through safety literature, training, seminars, etc.

This onus on management for safety management applies, regardless of the size or type of organization providing the aviation service. The role of management in safety management is a recurring theme throughout this manual.

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<sup>3</sup> *Human Factors Training Manual* (Doc 9683) Part 1 Ch 2 further addresses the importance of management in the establishment of a positive safety culture. Also see *TC TP 12883 Nov 96: Human Factors: Management & Organization: Management's Role in Safety*.

<sup>4</sup> See *Control of Crew-Caused Accidents* by L.G. Lautman and P.L. Gallimore (both of the Boeing Commercial Airplane Company) reproduced in Flight Safety Foundation: Flight Safety Digest, October 1989.

## RESPONSIBILITIES AND ACCOUNTABILITIES

Responsibility and accountability are closely related concepts. While individual staff members are responsible for their actions, each is accountable to his or her supervisor or manager for the safe performance of their functions and may be called on to justify their actions. Although individuals must be accountable for their own actions, managers and supervisors are accountable for the overall performance of the group that reports to them. Accountability is a two-way street. Individuals are accountable to some higher authority for their own actions; however, managers are also accountable for ensuring that their subordinates have the resources, training, experience, etc. for the safe completion of their assigned duties.

A formal statement of responsibilities and accountabilities is advisable, even in small organizations. This statement clarifies the formal and informal reporting lines on the organizational chart and specifies accountabilities for particular activities with no overlap or omission. The contents of the statement will vary depending on organizational size, complexity, and relationships

## GLOBAL COOPERATION

Although the organizational elements described above have specific roles and responsibilities for safety management, the international nature of aviation demands that their individual efforts be integrated into a coherent, global aviation safety system, requiring cooperation and collaboration at all levels.

Global collaboration occurs in international fora such as:

- a) Corporate associations (such as IATA, ACI, ATA, CANSO);
- b) National and international aviation associations (such as NBAA, EBAA, IBAC);
- c) International federations of national associations (such as IFALPA, IFATCA);
- d) International safety bodies (such as the Flight Safety Foundation, ISASI); and
- e) Industry/government groups (such as CAST, GAIN);
- f) Major manufacturers' safety forums.

Such organizations are able to provide 'subject matter experts' for meetings and studies. For example, manufacturers may invite input through "user" groups, and the users themselves may invite manufacturer's input to better understand particular operating practices. As a result, there is a healthy cross-pollination of safety-related information and knowledge. Such collaborative efforts are not based solely on noble intentions; they make good business sense for the following reasons:

- a) The air transport industry is strongly interdependent. The consequences of a major air disaster can affect many of the stakeholders. Mutual concern over damage to the industry's reputation, goodwill and public confidence tends to promote collective action over the parochial pursuit of special interests;
- b) There is strength in collective action; and
- c) Globalization of markets has diminished the significance of State borders and authority.

Examples of the ways in which such global collaboration improves the efficiency and effectiveness of safety management efforts include:

- a) Harmonization, coherence and interoperability through universal design standards, standard operating procedures, terminology, etc.;

- b) Global sharing of safety-related information;
- c) Earlier identification and resolution of global systemic hazards; and
- d) Back-up and mutual reinforcement through overlapping effort and sharing of specialist resources, etc.

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## **Chapter 3**

# **STATE SAFETY PROGRAMME**

**General**

**Regulatory responsibilities**

**Civil aviation administrations (CAAs)**

**State safety performance**

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## Chapter 3

# STATE SAFETY PROGRAMME

### GENERAL

As discussed in the last chapter, States bear significant responsibility for establishing an environment conducive to safe and efficient aviation operations. The State, as the signatory to the Chicago Convention, is responsible for implementation of ICAO SARPs affecting flight operations, airspace and navigation services, and aerodromes for which it has responsibility. Generally, these responsibilities include both regulatory functions (licensing, certification, etc.) and safety oversight, to ensure compliance with regulatory requirements.

Each State must make provisions for the safety of the aeronautic system within its jurisdiction. However, each State is but one component of the larger global aviation system. In that sense, States also have responsibility for meeting the requirements of the larger international system.

The State safety system approach advocated in this manual encompasses all organizational levels, all disciplines, and all system life-cycle phases. A State's aviation system extends well beyond the scope of any one ICAO Annex. Factors related to, *inter alia*, meteorology, aeronautical charts, aircraft operations, airworthiness, aeronautical information and the transport of dangerous goods, could all have an impact on total system safety. To fulfill its diverse safety responsibilities effectively, a State requires a "safety programme" to integrate its multi-disciplinary safety activities into a coherent whole.

A State's safety management responsibilities may extend beyond regulatory and oversight functions. In many States, the State is both the safety regulator and a service provider. Notwithstanding the trend in many States towards privatization and corporatization, many States still deliver services for air traffic management and airports. Where a State is both the regulatory authority and a provider of operational services, a clear distinction must be made between the two functions.

ICAO requires that operators and service providers implement a safety management system to achieve acceptable levels of safety within their operations. Generally, a State does not require a safety management system for its regulatory and oversight functions. However, those States conducting flight operations, or providing operational services (like ATS) will require a safety management system that is quite distinct from the safety programme implemented for the regulatory side of the CAA. The relationship between the regulatory authority and the regulated entity should be the same whether the regulated body is an external entity or part of the State organization.

### REGULATORY RESPONSIBILITIES

Through their actions as the regulatory authority, States set the tone for safe and efficient aviation operations conducted within their jurisdiction. For example:

- a) **SARPs**. The State, as the signatory to the Chicago Convention, is responsible for implementation of ICAO SARPs within the airspace and at aerodromes for which it has responsibility.

- b) **Civil Aviation Administration (CAA)**. States must establish an appropriate body, often referred to as the Civil Aviation Administration (CAA), with the necessary powers to ensure compliance with the aviation regulations.
- c) **Safety oversight**. States must establish appropriate safety oversight mechanisms to ensure that operators and service providers maintain an acceptable level of safety in their operations.

In the discharge of the State's regulatory responsibilities, the Regulatory Authority may adopt either an active role, involving close supervision of the functioning of all aviation-related activities, or a passive role, whereby greater responsibility is delegated to the operators and service providers.

Many States are moving away from a very active role in the supervision of aviation activities. The reasons for this include, the large number of inspectors required to perform this function, confusion over safety responsibilities and the need for a large enforcement organization, factors which contradict the safety culture that modern safety management practices promote.

In a more passive role, the State leaves the interpretation and the implementation of the regulations to the operator or service provider, relying upon their technical competence and encouraging compliance through the threat of enforcement action. This might place an unreasonable burden on the operator or service provider for the interpretation of and compliance with the regulations. In addition, the State would not be well placed to assess the adherence to the regulations other than by knowledge acquired by chance, or in the course of accident or incident investigations.

Considerable merit exists in a State regulatory system which falls between the active and passive extremes and which should:

- a) Represent a well-balanced allocation of responsibility between the State and the operator or service provider for safety;
- b) Be capable of economic justification within the resources of the State;
- c) Enable the State to maintain continuing regulation and supervision of the activities of the operator or service provider without unduly inhibiting their effective direction and control of the organization; and
- d) Result in the cultivation and maintenance of harmonious relationships between the State and the operators and service providers.

### **CIVIL AVIATION ADMINISTRATIONS (CAAs)**

The Civil Aviation Administration is the State's agent for implementing the legislative and regulatory provisions for aviation safety. In effect, the CAA develops and delivers the State's safety programme. In doing so, effective State civil aviation administrations are guided by:

- a) A clear statement of their vision and mission (regarding safety);
- b) A well understood and accepted set of:
  - 1) Operating principles, such as delivering safe and efficient service consistent with public expectations and at reasonable cost; treating regulated entities (clients) and employees

with respect, etc.; and

- 2) Corporate values such as competence, openness, fairness, integrity, respect, responsiveness to client needs, etc.;
- c) A statement of the Administration's safety objectives; for example, reduce the probability and consequences of unsafe aviation occurrences, improve understanding throughout the aviation industry and general public of the State's actual safety performance; and
- d) Strategies for fulfilling their objectives; for example, reduction of safety risks to aviation through the identification of those operations that fall below accepted levels, encouraging their return to an acceptable level of safety or, if necessary, rescinding their certification.

Based on such broad direction, State administrations typically have responsibilities for some or all of the following:

- a) Establishing and implementing the rules, regulations and procedures for safe and efficient aviation. For example:
  - 1) Personnel licensing;
  - 2) Procedures for obtaining and renewing:
    - Operating Certificates;
    - Airworthiness Certificates;
    - Airport Certification, etc.;
  - 3) Operation of Air Traffic Services;
  - 4) (In many States) conduct of accident and incident investigations, etc.
- b) Implementing a system for safety oversight of the entire civil aviation system by surveillance, inspections and safety audits, etc.;
- c) Carrying out enforcement actions as necessary;
- d) Monitoring technological developments and best industry practices with a view to improving the State's aviation system performance;
- e) Maintaining a system of aviation records, including licenses and certificates, infractions, reported accidents and incidents, etc.;
- f) Conducting analyses of safety trends, including accident/incident data, service difficulty reports, etc.; and
- g) Promoting safety through the dissemination of specific safety materials, conducting safety seminars, etc.

Many States delegate responsibility for the investigation of accidents and serious incidents (pursuant to Annex 13) to their CAAs. However, this practice raises a potential conflict of interest whereby the investigators may be required to report on shortcomings in the State's safety oversight performance (perhaps even their own performance as regulators). Increasingly, States are creating specialist investigative agencies, independent of the regulatory authorities.

### STATE SAFETY PERFORMANCE

ICAO's Universal Safety Oversight Programme has identified fundamental weaknesses in the safety programmes of many States, resulting in significant differences in safety standards around the globe. Notwithstanding the obligations of contracting States to fulfil the requirements of ICAO's SARPs, States ought to be concerned with the safety performance of their national aviation system. Following are some indicators that a State's safety programme may be failing to perform as required.

- a) Inadequate governing legislation and regulations (incomplete, out of date, etc.);
- b) Potential conflicts of interest (regulator vs. a service provider, educator vs. enforcer, regulator investigating occurrences involving failures by the regulator, etc.);
- c) Inadequate civil aviation infrastructure and systems (navigation and communication aids, aerodromes, airspace management, etc.);
- d) Inadequate (incomplete, out of date, inconsistent) fulfilment of regulatory functions such as licensing, surveillance and enforcement (due to resource limitations, political situation, state of national emergency, etc.);
- e) Inadequate resources and organization for the magnitude and complexity of regulatory requirements (shortages in trained and competent personnel, administrative capacity, information technology, etc.);
- f) Instability and uncertainty within the CAA, compromising quality and timeliness of regulatory performance (staff morale, political interference, resource limitations, etc.);
- g) Absence of formal safety programmes (voluntary incident reporting programme, regulatory safety audits, etc.); and
- h) Stagnation in safety thinking (rising occurrence rates, weak national safety culture, reluctance to embrace proven best practices, etc.).

On the other hand, the following factors suggest that a State's safety programme is providing a sound basis for preserving the desired margins of safety.

- a) Administrative machinery for coordinating and integrating all aspects of the State's safety programme into a coherent whole;
- b) Performance monitoring for all State safety functions (licensing, certification, enforcement, etc.);
- c) Provision of State hazard identification programmes (mandatory occurrence reporting, voluntary (non-punitive) incident reporting, service difficulty reporting, etc.);

- d) Competent accident and incident investigation capabilities (independent from regulatory authority);
  - e) Risk-based resource allocations for all regulatory functions (proactively targeting regulatory attention on known areas of high risk);
  - f) Active and passive safety promotion programmes to assist operators and to make safety information broadly accessible (including safety databases, trend analysis, monitoring of best industry practices etc.);
  - g) National safety monitoring programmes (trend monitoring and analysis, safety inspections, incident investigations, safety surveillance); and
  - h) Regular regulatory safety audits to ensure compliance by all operators and service providers.
-