交　通　部　民　用　航　空　局

民　　航　　通　　告

主旨：安全管理系統（Safety Management System）		
發行日期：2014.10.20	編號：AC 120-032D	發行單位：飛航標準組

一、目的：

本通告旨在介紹安全管理系統(Safety Management System, SMS)之概念，並提供航空服務提供者建構安全管理系統之指引。安全管理系統為我國 07-02A「航空器飛航作業管理規則」第 9 條、06-02A「航空產品與其各項裝備及零組件維修廠設立檢定管理規則」第 27 條及 06-07A「航空產品與其各項裝備及零組件適航檢定管理規則」第 3 條之一之需求，航空器使用人、維修廠、航空器型別檢定證及製造許可證持有人，依據本通告建構之安全管理系統及據此規範所實施之安全管理作為，可滿足前揭法規之需求。

本通告亦適用於飛航管制服務組織，航空站及航空器駕駛員訓練機構，建置及實施安全管理系統之指引。

二、修正說明：

（一）本通告依據 ICAO Annex 19 及 Doc 9859 Safety Management Manual（SMM）3rd 訂定。

（二）取代民國 100 年 1 月 25 日訂定之 AC 120-32C。

三、背景說明：

現代之航空事業為富有更具多變性及複雜商業網路之特殊管理機

構，在快速變遷之航空營運環境中，此等機構仍必須持續適應以保持生存。雖極少數之商業個體、市場、供應網及其作業仍僅限於本國內，惟航空事業更趨向於全球化已是無法避免之事實，亦因此該等複雜、多元及改變之特性更突顯了良好的安全管理之重要性。截至目前為止，致力於航空安全方面之努力還算相當成功，然在航空市場營運量及種類快速增加之趨勢下，現有之安全策略及作為仍有必要繼續提升。在此趨勢下，業者及政府機構可使用之資源將顯不足，因此尋求未來之安全策略至為重要。在增加航空活動及減少資源問題中最佳的解決方法是，將安全管理融入飛航作業之正常管理架構中，以達到應有之安全成效。政府及業者必須將其作有效之管理，以完成其使命並達成事業永續經營之目標。『安全管理系統』為創新之名詞，係政府及業者在監理與事業管理上最佳溝通語言，亦為提升安全最有效之方法。

（一）安全管理系統之安全效益：安全管理系統為高品質及控制風險管理之必要措施，其組織架構得以提供支援良好之安全文化，可為公司安全管理之主軸，亦為與民航局之有效溝通介面，同時提供公司管理階層監控安全相關流程之詳細路徑。

（二）安全管理系統之商業效益：建構及實施安全管理系統使航空業者符合法規需求之安全管理架構；藉由安全管理系統融合內部評鑑及品質保證理念，形成更佳之管理結構及持續改善作業流程，可獲得明顯之商業效益。本通告所提出之理念已將各種安全努力融合於航空業者之商業模式中，且融合現行航空業者已具備或正在建立之品管、職場安全及環境控制系統中。

四、需求說明：

ICAO Annex 19 Safety Management

07-02A「航空器飛航作業管理規則」第 9 條『航空器使用人應建立安全管理系統並經報請民航局備查後，於中華民國 98 年 1 月 1 日前實施』。

06-02A「航空產品與其各項裝備及零組件維修廠設立檢定管理規則」第 27 條『維修廠應建立安全管理系統並經報請民航局備查後，

於中華民國 98 年 1 月 1 日前實施』。

06-07A「航空產品與其各項裝備及零組件適航檢定管理規則」第 3 條之 1 『航空器型別檢定證及製造許可證持有人應建立安全管理系統，並報請民航局備查後，於中華民國一百零二年十一月十四日起實施』。

五、執行要點說明：

航空器使用人及維修廠必須依據本通告之規範於 2016 年 12 月 31 日前完成安全管理系統(SMS)第 1 至 4 階段建置，安全績效指標必須依據實際運作之安全績效訂定，並配合「國家民用航空安全計畫」每年定期報局備查。有關安全管理系統之建構及實施規範，詳如附錄。

新成立之航空公司(航空器使用人)及維修廠得依本附錄之 ATTACHMENT 2 SMS PHASED IMPLEMENTATION APPROACH 內所列之時程完成各階段建置。

六、相關規定及參考文件：

（一）ICAO Doc 9859「Safety Management Manual（SMM)」及後續更新版本。

（二）Safety Management International Collaboration Group 相關安全管理系統文件。

（三）國家民用航空安全計畫。

簽署：林俊良

飛航標準組組長林俊良

附錄

安全管理系統之建構及施行說明

AC 120-32D　Safety Management System

20 October, 2014

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1. GENERAL

1.1 Purpose

This AC has been developed to give sufficient understanding on Safety Management Systems (SMS) concepts and the development of management policies and processes to implement and maintain an SMS that meets ICAO and CAA requirements. This AC presents an acceptable means, but not the only means, to show compliance with Article 9 of "Aircraft Flight Operation Regulations", Article 27 of "Regulations for Repair Station Certification and Management" or Article 3-1 of "Regulations Governing the Certification for Aviation Products, Appliances and Parts" for establishing and implementing a safety management system.

This AC applies to organization responsible for the type design or manufacture of aircraft, Air Operator's Certificate (AOC) holders and repair station certificate holders of CAA, Taiwan. It also provide guidance on the implementation of safety management systems for Air Navigation Service Providers, Aerodromes or Approved Training Organizations.

1.2 Requirements and References

- 01-01A Civil Aviation Act
- 06-02A Regulations for Repair Station Certification and Management
- 06-07A Regulations Governing the Certification for Aviation Products, Appliances and Parts
- 07-02A Aircraft Flight Operation Regulations
- CAA State Safety Program, SSP
- CAA AC 00-001D
- ICAO Safety Management Manual (Doc 9859 3rd edition)
- ICAO Annex 19

1.3 Definitions

The following definitions are used in this document:

Acceptable level of safety performance (ALoSP). The minimum level of safety performance of a service provider, as defined in its safety management system, expressed in terms of safety performance targets and safety performance indicators.

Accountable executive. A single, identifiable person having responsibility for the effective and efficient performance of the service provider's SMS.

Change management. A formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes.

Defences. Specific mitigating actions, preventive controls or recovery measures put in place to prevent the realization of a hazard or its escalation into an undesirable consequence.

Errors. An action or inaction by an operational person that leads to

deviations from organizational or the operational person's intentions or expectations.

Hazard is defined as a condition or an object with the potential to cause injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

High-consequence indicators. Safety performance indicators pertaining to the monitoring and measurement of high consequence occurrences, such as accidents or serious incidents. High-consequence indicators are sometimes referred to as reactive indicators.

Lower-consequence indicators. Safety performance indicators pertaining to the monitoring and measurement of lower-consequence occurrences, events or activities such as incidents, non-conformance findings or deviations. Lower-consequence indicators are sometimes referred to as proactive/predictive indicators.

Organization when used alone means all functions of service provision of the air operator's certificate holder, repair station certificate holders, air navigation service providers, aerodromes, approved training organizations, organization responsible for the type design or manufacture of aircraft.

Risk mitigation. The process of incorporating defences or preventive controls to lower the severity and/or likelihood of a hazard's projected consequence.

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 Assurance means a process of examining an organization's SMS and evaluating its effectiveness, based on the SMS components and elements. This extends from an evaluation for regulatory compliance;

Safety management system. A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Safety performance. A service provider´s safety achievement as defined by its safety performance targets and safety performance indicators.

Safety performance indicator. A data-based safety parameter used for monitoring and assessing safety performance.

Safety performance target. The planned or intended objective for safety performance indicator(s) over a given period.

Safety risk. The predicted probability and severity of the consequences or outcomes of a hazard.

State safety programme. An integrated set of regulations and activities aimed at improving safety.

Violations a deliberate act of wilful misconduct or omission resulting in a deviation from established regulations, procedures, norms or practices

1.4 Introduction

1.4.1 Safety Management Systems

An SMS is a system to assure the safe operation of aircraft through effective management of safety risk. This system is designed to continuously improve safety by identifying hazards, collecting and analysing data and continuously assessing safety risks. Safety management goes beyond the traditional approach of compliance with prescriptive regulations to a systematic approach to managing safety where potential safety risks are identified and managed before they result in aviation accidents and incidents. SMS adopts a business-like approach to safety, similar to the way that finances are managed, with safety plans, safety performance indicators and targets and continuous monitoring of the safety performance of the organization. It provides for effective risk based decision making processes across the business.

SMS is necessary for an aviation organization to identify hazards and manage safety risks encountered during the delivery of its products or services. An SMS includes key elements that are essential for hazard identification and safety risk management by ensuring that:

(a) the necessary information is available;

(b) the appropriate tools are available for the organization's use;

(c) the tools are appropriate to the task;

(d) the tools are commensurate with the needs and constraints of the organization; and

(e) decisions are made based on full consideration of the safety risk.

1.4.2 System description

A system review and description of the SMS elements and their interface with existing systems and processes is the first step in defining the scope and applicability of the SMS. This exercise provides an opportunity to identify any gaps related to the service provider's SMS components and elements. The system description includes the SMS interfaces within the organization, as well as pertinent interfaces with other external organizations such as subcontractors. An overview of the system description and its accountability and reporting structure should be included in the SMS documentation. For large and complex organizations, details of basic systems and organizational procedures are addressed in the service provider's relevant exposition or administrative manuals. In such cases, a brief outline together with an organizational chart with appropriate cross references may be adequate for the purpose of the system description.

1.4.3 Integration of Management Systems

Aviation organizations are required to develop, implement and operate a number of different management systems to achieve their production goals through the delivery of services. Aviation organizations vary greatly in terms of overall size and complexity. Each organization has a layered management system that is composed of multiple subsystems given direction through some type of governance system.

The organization should integrate organizational management systems designed to achieve specific organizational goals, i.e. provide products and services to customers. A holistic organizational management system has often been referred to as an integrated management system or simply the organizational "management system".

Typical management systems an aviation organization might need to operate include

quality management system (QMS), safety management system (SMS), environment management system (EMS), occupational health and safety management system (OHSMS), security management system (SeMS), financial management system (FMS) and documentation management system (DMS).

Each management system is monitored by an "accountable leader". Complex product or service provider organizations may have thirty-plus management systems that must be integrated into the enterprise. Examples of these systems include:

(a) a supplier management system;

(b) a marketing management system;

(c) a personnel management system;

(d) a facilities management system;

(e) a ground equipment management system;

(f) a production management system;

(g) a training management system;

(h) a flight operations management system;

(i) a cargo operations management system;

(j) an aircraft maintenance management system;

(k) a dispatch management system; and

(l) a fatigue risk management system (FRMS).

There is a developing tendency in civil aviation to integrate all of these management systems as functional components of the overarching enterprise management system. There are a number of clear benefits to such integration:

(a) reduction of duplication and therefore of costs;

(b) reduction of overall organizational risks and an increase in profitability;

(c) balance of potentially conflicting objectives; and

(d) elimination of potentially conflicting responsibilities and relationships.

1.4.4 SMS and QMS integration

Aviation organizations typically implement enterprise-wide management systems. Organizational safety performance is dependent on the effective integration of these systems to support the delivery of products and services.

In the context of SMS, the most significant aspect of integration is with the service provider's quality management system (QMS). QMS is generally defined as the organizational structure and associated accountabilities, resources, processes and procedures necessary to establish and promote a system of continuous quality assurance and improvement while delivering a product or service. QMS is an existing aviation regulatory requirement for most service providers including production approval, maintenance organizations.

The QMS and SMS are complementary. QMS is focused on compliance with prescriptive regulations and requirements to meet customer expectations and contractual obligations while the SMS is focused on safety performance. The objectives of an SMS are to identify safety-related hazards, assess the associated risk and implement effective risk controls. In contrast, the QMS focuses on the consistent delivery of products and services that meet relevant specifications. Nonetheless, both the SMS and QMS:

(a) must be planned and managed;

(b) depend upon measurement and monitoring of performance indicators;

(c) involve all organizational functions related to the delivery of aviation products and services; and

(d) strive for continuous improvement.

SMS and QMS utilize similar risk management and assurance processes. The objective of the SMS is to identify safety-related hazards the organization must confront and to control the associated risks. SMS is designed to manage safety risk and measure safety performance during delivery of products and services. The safety risk management process eliminates hazards or provides effective controls to mitigate safety risks by maintaining an appropriate resource allocation balance between production and protection to meet safety performance requirements.

A QMS provides consistency in the delivery of products and services to meet performance standards as well as customer expectations. The QMS also has an independent assurance function that utilizes a feedback loop to assure delivery of products and services that are "fit for purpose" and free of defects or errors. The quality assurance function identifies ineffective processes and procedures that must be redesigned for efficiency and effectiveness.

Furthermore, SMS and QMS utilize similar tools. Safety and quality practitioners are essentially focused on the same goal of providing safe and reliable products and services to customers. Both quality and safety practitioners are trained on various analysis methods including root-cause analysis and statistical trending analysis.

Given the complementary aspects of SMS and QMS, it is possible to establish a synergistic relationship between both systems that can be summarized as follows:

(a) an SMS is supported by QMS processes such as auditing, inspection, investigation, root cause analysis, process design, statistical analysis and preventive measures;

(b) a QMS may anticipate safety issues that exist despite the organization's compliance with standards and specifications; and

(c) quality principles, policies and practices are linked to the objectives of safety management.

The relationship between SMS and QMS leads to the complementary contributions of each system to the attainment of the organization's safety and quality goals. A summary comparison of the two systems is provided in Table 1-1.

Comparison	
QMS	SMS
Quality	Safety
Quality Assurance	Safety Assurance
Quality Control	Hazard Identification & Risk Control
Quality Culture	Safety Culture
Compliance to Requirements	Acceptable level of safety performance
Prescriptive	Performance-based
Standards & Specifications	Organizational & human factors
Reactive > Proactive	Proactive > Predictive

Table 1-1. Summary comparison of QMS and SMS

1.4.5 Gap analysis

It is apparent that organizations would need to conduct a gap analysis of their system(s) to determine which components and elements of a safety management system are currently in place and which components or elements must be added or modified to meet SMS framework as well as regulatory requirements. The review may include comparison of the SMS elements found in this AC against the existing systems in your organization.

Attachment 1 to this AC provides a list of gap analysis questions to facilitate service providers in systematically assessing their existing processes. From an objective response to each gap analysis question, it will be apparent what enhancements or actions are required. Remarks for partial compliance or deviations should be made as well as actions required in order to meet the criteria. There should be a column for annotating existing company documentation where the requirement is addressed.

Once the gap analysis is complete and fully documented, the items you have identified as missing or deficient will form the basis of your SMS implementation plan. The first target of the plan should be compilation of the organization's SMS manual.

1.4.6 Scope

SMS addresses the aviation activities of an aviation service provider that are related to the safe operation of aircraft. The scope of an SMS may indirectly include other organizational activities that support operational or product development, such as finance, human resources and legal. It is therefore essential to involve all internal and external aviation system stakeholders having a potential impact on the organization's safety performance. Furthermore, any potential inputs should be taken into consideration at an early stage of SMS implementation and throughout future internal evaluations of the SMS.

1.4.7 SMS implementation plan

An SMS implementation plan is developed in consultation with the accountable executive and managers responsible for the delivery of products and services related to, or in support of, the safe operation of aircraft. Once completed, the accountable executive endorses the plan. The SMS implementation plan includes timelines and milestones consistent with the requirements identified in the gap analysis process, the size of the service provider and the complexity of its products or services. The plan should address coordination with external organizations or contractors where applicable.

The service provider's implementation plan may be documented in different forms, varying from a simple spreadsheet to specialized project management software. The implementation plan should address gaps through completion of specific actions and milestones according to the stated timeline. Assignment of each task assures accountability throughout the implementation process. The plan should be reviewed regularly and updated as necessary.

Full implementation of all components and elements of the SMS framework may take up to five years, depending on an organization's maturity and complexity.

SMS implementation, including guidance for a phased approach and a format example of an SMS implementation plan/schedule is discussed in Attachment 2 to this AC.

2. SAFETY POLICY AND OBJECTIVES

Safety policy outlines the principles, processes and methods of the organization's SMS to achieve the desired safety outcomes. The policy establishes senior management's commitment to incorporate and continually improve safety in all aspects of its activities. Senior management develops measureable and attainable organization wide safety objectives to be achieved.

2.1 Management commitment and responsibility

2.1.1 Regulatory Requirements:

The service provider shall define its safety policy in accordance with international and national requirements. The safety policy shall:

(a) reflect organizational commitment regarding safety;

(b) include a clear statement about the provision of the necessary resources for the implementation of the safety policy;

(c) include safety reporting procedures;

(d) clearly indicate which types of behaviours are unacceptable related to the service provider's aviation activities and include the circumstances under which disciplinary action would not apply;

(e) be signed by the accountable executive of the organization;

(f) be communicated, with visible endorsement, throughout the organization; and

(g) be periodically reviewed to ensure it remains relevant and appropriate to the service provider.

2.1.2 General Guidance

In any organization, management controls the activities of personnel and the use of resources for the delivery of a product or service. The organization's exposure to safety hazards is a consequence of these activities. Management mitigates the related safety risks by:

(a) setting the organizational priorities and tasking;

(b) prescribing procedures on how to perform activities or processes;

(c) hiring, training and supervising employees;

(d) procuring equipment to support the service-delivery activities;

(e) using the skills of its personnel; and

(f) allocating the necessary resources.

Management should ensure that:

(a) safety directives and controls are embedded in standard operating procedures (SOPs);

(b) employees adhere to SOPs and safety directives; and

(c) equipment remains in a serviceable condition.

Management's primary responsibility for ensuring a safe and efficient operation is discharged through ensuring adherence to SOPs (safety compliance) and establishment and maintenance of a dedicated SMS that establishes the necessary

safety risk controls (safety performance).

2.1.3 Implementation Guidance

In preparing a safety policy, senior management should consult widely with key staff members in charge of safety-critical areas. Consultation ensures that the document is relevant to staff and encourages buy-in to the safety policy.

Senior management develops and endorses the safety policy, which describe the organization's intentions, management principles and commitment to improving aviation safety in terms of the product or service provider. A safety policy should be a short description similar to a mission statement. The safety policy must be signed by the accountable executive. An example of a safety policy statement is included in Figure 2-1.

Once the safety policy has been developed senior management should:

(a) visibly endorse the policy;
(b) communicate the policy to all appropriate staff;
(c) establish safety performance targets for the SMS and the organization; and
(d) establish safety objectives that identify what the organization intends to achieve in terms of safety management.

The safety policy must include a commitment to:

(a) achieve the highest safety standards;
(b) comply with all applicable regulatory requirements;
(c) comply with international standards;
(d) adopt proven best practices appropriate to the activity;
(e) provide all the necessary resources;
(f) ensure safety is a primary responsibility of all managers;
(g) follow the disciplinary policy; and
(h) ensure that the safety policy is understood, implemented and maintained at all levels.

In conjunction with an organization's overall safety policy statement, there should be a set of underlying tangible safety objectives. The safety objectives must identify what the organization wants to achieve, in terms of the management of safety, and lay out the steps the organization needs to take to achieve the objectives.

Examples of such safety objectives are listed below:

(a) To identify and eliminate hazardous conditions within our aviation related processes and operations.
(b) To perform hazard and risk assessment for all proposed new equipment acquisitions, facilities, operations and procedures.
(c) To promulgate an ongoing systematic hazard and risk assessment plan.
(d) To provide relevant SMS training/ education to all personnel.
(e) To provide a safe, healthy work environment for all personnel.
(f) To minimize accidents/incidents that is attributable to organizational factors.
(g) To prevent damage and injury to property and people resulting from our operations.
(h) To improve the effectiveness of the safety management system through a yearly safety audit that reviews all aspects of the SMS.

The safety standards achieved are an indication of organizational behaviour and are also a measure of SMS performance. Furthermore, safety objectives and the safety performance standards must be linked to:

(a) safety performance indicators;

(b) safety performance targets; and

(c) SMS mitigation actions.

Effective SMS implementation is dependent upon a clear, mutual understanding of errors and violations and the differentiation between the two. The difference between errors and violations lies in intent. While an error is unintentional, a violation is a deliberate act or omission to deviate from established procedures, protocols, norms or practices.

Errors or violations may result in non-compliance with regulations or approved operating procedures. Punitive measures taken in response to acts of non-compliance may lead to a reduction in the reporting of errors in the absence of other processes. Accordingly, the service provider must consider whether acts of non-compliance are the result of a violation or inadvertent error when determining whether punitive action is appropriate, with the criteria normally being whether non-compliance is the result of wilful misconduct or gross negligence.

The disciplinary policy is used to determine whether a violation has occurred requiring action beyond the analysis requirements of the risk management systems. Therefore, it is essential to assure that persons responsible for making that determination have the necessary technical expertise to fully consider the context related to the report, thereby diminishing the likelihood that such personnel and the service provider itself may be exposed to unfair or inappropriate "disciplinary/judicial" proceedings. One approach to be used in making this determination is James Reason's unsafe acts algorithm to help front-line managers determine the accountability of person(s) involved in an incident. [1] Another resource in this regard is Sidney Dekker's book entitled *Just Culture: Balancing Safety and Accountability.*[2]

A policy to appropriately protect safety data, as well as the reporters of such data, can have a significant positive effect on the reporting culture. Once it is clear that a report does not involve a violation, the service provider and the State should allow for the de-identification and aggregation of reports so as to conduct meaningful safety analysis without implicating personnel or specific service providers. Because major occurrences may invoke processes and procedures outside of the service provider's SMS, the relevant State authority may not permit the early de-identification of reports in all circumstances. Nonetheless, a policy allowing for the appropriate de-identification of reports can dramatically improve the quality of data collected.

1. James Reason, *Managing the Risks of Organizational Accidents*, 1997.

2. Sidney Dekker, *Just Culture: Balancing Safety and Accountability*, Second Edition, 2012.

SAFETY POLICY STATEMENT

Safety is one of our core business functions. We are committed to developing, implementing, maintaining and constantly improving strategies and processes to ensure that all our aviation activities take place under a balanced allocation of organizational resources, aimed at achieving the highest level of safety performance and meeting national and international standards, while delivering our services.

All levels of management and all employees are accountable for the delivery of this highest level of safety performance, starting with the [chief executive officer (CEO)/managing director/or as appropriate to the organization].

Our commitment is to:

- ***Support*** the management of safety through the provision of all appropriate resources, that will result in an organizational culture that fosters safe practices, encourages effective safety reporting and communication, and actively manages safety with the same attention to results as the attention to the results of the other management systems of the organization;
- ***Enforce*** the management of safety as a primary responsibility of all managers and employees;
- ***Clearly*** define for all staff, managers and employees alike, their accountabilities and responsibilities for the delivery of the organization's safety performance and the performance of our safety management system;
- ***Establish and operate*** hazard identification and risk management processes, including a hazard reporting system, in order to eliminate or mitigate the safety risks of the consequences of hazards resulting from our operations or activities to a point which is as low as reasonably practicable (ALARP);
- ***Ensure*** that no action will be taken against any employee who discloses a safety concern through the hazard reporting system, unless such disclosure indicates, beyond any reasonable doubt, an illegal act, gross negligence, or a deliberate or willful disregard of regulations or procedures;
- ***Comply*** with and, wherever possible, exceed, legislative and regulatory requirements and standards;
- ***Ensure*** that sufficient skilled and trained human resources are available to implement safety strategies and processes;
- ***Ensure*** that all staff are provided with adequate and appropriate aviation safety information and training, are competent in safety matters, and are allocated only tasks commensurate with their skills;
- ***Establish and measure*** our safety performance against realistic safety performance indicators and safety performance targets;
- ***Continually improve*** our safety performance through management processes that ensure that relevant safety action is taken and is effective; and
- ***Ensure*** externally supplied systems and services to support our operations are delivered meeting our safety performance standards.

(Signed) _____

CEO/Managing Director/or as appropriate

Figure 2-1 An example of a safety policy

2.2 Safety Accountabilities

2.2.1 Regulatory Requirements:

The service provider shall:

(a) identify the accountable executive who, irrespective of other functions, has ultimate responsibility and accountability, on behalf of the organization, for the implementation and maintenance of the SMS;

(b) clearly define lines of safety accountability throughout the organization, including a direct accountability for safety on the part of senior management;

(c) identify the accountabilities of all members of management, irrespective of other functions, as well as of employees, with respect to the safety performance of the SMS;

(d) document and communicate safety responsibilities, accountabilities and authorities throughout the organization; and

(e) define the levels of management with authority to make decisions regarding safety risk tolerability.

2.2.2 General Guidance

In the SMS context accountability means being ultimately responsible for safety performance, whether at the overall SMS level (accountable executive) or specific product/process levels (members of the management team).

This includes being responsible for ensuring appropriate corrective actions are taken to address hazards and errors reported, as well as responding to accidents and incidents.

Historically, in most organizations the safety office managed the entire safety process within the organization.

The safety officer was the person in charge of identifying the safety issues, proposing solutions, participating in the implementation of the solutions, and monitoring the effectiveness of the solutions. This practice placed ownership of the safety process entirely in the safety office, thereby removing executives and line managers from the safety decision-making process. This created the perception that safety issues were not the line manager's responsibility; safety problems were considered the responsibility of the safety office and the safety officer. Additionally, this approach neglected the valuable input that the production and operational units could bring to the organizational safety decision-making process.

By requiring that the service provider identify the accountable executive, the responsibility for the overall safety performance is placed at a level in the organization having the authority to take action to ensure that the SMS is effective. Defining the specific safety accountabilities of all members of the management team clarifies the accountability framework throughout the organization. These accountability frameworks need to include accountability for the safety performance of the subproduct or subcontracted service providers that do not separately require safety certification or approval. These safety responsibilities, accountabilities and authorities must be documented and communicated throughout the organization, and they need to identify the levels of management with authority to make decisions regarding safety risk tolerability. Additionally, the safety accountabilities of managers should include the allocation of the human, technical, financial or other

resources necessary for the effective and efficient performance of the SMS.

2.2.3 Implementation Guidance

Safety management should be a core function for any aviation service provider. The definition of accountabilities for all personnel involved in safety-related duties will serve to ensure the delivery of safe products and operations, as well as an appropriately balanced allocation of resources.

The accountable executive identified by the service provider is the single person having ultimate responsibility for the SMS, including responsibility to provide the resources essential to its implementation and maintenance. The accountable executive's authorities and responsibilities include, but are not limited to:

(a) provision and allocation of human, technical, financial or other resources necessary for the effective and efficient performance of SMS;
(b) direct responsibility for the conduct of the organization's affairs;
(c) final authority over operations under the certificate/approval of the organization;
(d) establishment and promotion of the safety policy;
(e) establishment of the organization's safety objectives and safety targets;
(f) acting as the organization's safety champion;
(g) having final responsibility for the resolution of all safety issues; and
(h) establishing and maintaining the organization's competence to learn from the analysis of data collected through its safety reporting system.

Note.— The responsibilities outlined above should not be delegated.

Depending on the size, structure and complexity of the organization, the accountable executive may be:

(a) the chief executive officer (CEO) of the service provider organization;
(b) the chairperson of the board of directors;
(c) a partner; or
(d) the proprietor.

Additionally, the appointment of an accountable executive who is given the required authorities and responsibilities requires that the individual has the necessary attributes to fulfil the role. The accountable executive will have many functions in the organization. Nonetheless, the accountable executive's role is to instil safety as a core organizational value and to ensure that the SMS is properly implemented and maintained through the allocation of resources and tasks.

All aviation safety-related positions, responsibilities and authorities should be defined, documented and communicated throughout the organization. The safety accountabilities of each senior manager (departmental head or person responsible for a functional unit) are integral components of their job descriptions. Given that the management of safety is a core business function, every senior manager has a degree of involvement in the operation of the SMS. This involvement is certainly deeper for those managers directly responsible for functional units that deliver the organization's products or services (operations, manufacturing, maintenance, engineering, training and dispatch, hereafter referred to by the generic term "line managers") than for those responsible for support functions (human resources, administration, legal and financial).

A service provider is responsible for the safety performance of products or services provided by subcontractors that do not separately require safety certification or

approval. While all subcontractors may not necessarily be required to have an SMS, it is nevertheless the service provider's responsibility to ensure that its own safety performance requirements are met. In any case, it is essential for the service provider's SMS to interact as seamlessly as possible with the safety systems of subcontractors that provide products or services pertinent to the safe operation of aircraft. The interface between the organization's SMS and that of the subproduct or subservice provider's safety systems must address the identification of hazards, assessment of risk and development of risk mitigation strategies where applicable. The service provider should ensure that:

(a) there is a policy clearly establishing a safety accountability and authority flow between the service provider and the subcontractor;
(b) the subcontractor has a safety reporting system commensurate with its size and complexity that facilitates the early identification of hazards and systemic failures of concern to the service provider;
(c) the service provider's safety review board includes subcontractor representation, where appropriate;
(d) safety/quality indicators to monitor subcontractor performance are developed, where appropriate;
(e) the service provider's safety promotion process ensures subcontractor employees are provided with the organization's applicable safety communications; and
(f) any subcontractor roles, responsibilities and functions relevant to the service provider's emergency response plan are developed and tested.

The SMS-related accountabilities, responsibilities and authorities of all appropriate senior managers must be described in the organization's SMS documentation. It should include an accountability chart in terms of the delivery of safety as a core business process. Mandatory safety functions performed by the safety manager, safety office, safety action groups, etc., may be embedded into existing job descriptions, processes and procedures.

It must be emphasized that the primary responsibility for safety outcomes rests with those who 'own' the production processes. It is here where hazards are directly encountered, where deficiencies in processes contribute to safety risks, and where direct supervisory control and resource allocation can mitigate the safety risks to acceptable levels. The line managers are responsible for the management of an identified safety concern, its mitigation activities and subsequent performance.

The safety manager function is described in detail in the next section. From an accountability perspective, the person carrying out the safety manager function is responsible to the accountable executive for the performance of the SMS and for the delivery of safety services to the other departments in the organization.

2.3 Appointment of key safety personnel

2.3.1 Regulatory Requirements:

The service provider shall appoint a safety manager who is responsible for the implementation and maintenance of an effective SMS.

2.3.2 General Guidance

The appointment of a qualified safety manager is key to the effective implementation and functioning of a safety services office. The safety manager may be identified by different titles in different organizations, but for the purposes of this manual the generic term safety manager is used.

2.3.3 Implementation Guidance

The Safety Manager

In most organizations the safety manager is the individual responsible for the development and maintenance of an effective SMS. The safety manager also advises the accountable executive and line managers on safety management matters and is responsible for coordinating and communicating safety issues within the organization, as well as with external stakeholders. The safety manager's functions include, but are not necessarily limited to:

(a) managing the SMS implementation plan on behalf of the accountable executive;

(b) performing/facilitating hazard identification and safety risk analysis;

(c) monitoring corrective actions and evaluating their results;

(d) providing periodic reports on the organization's safety performance;

(e) maintaining records and safety documentation;

(f) planning and facilitating staff safety training;

(g) providing independent advice on safety matters;

(h) monitoring safety concerns in the aviation industry and their perceived impact on the organization's operations aimed at service delivery;

(i) coordinating and communicating (on behalf of the accountable executive) with the State's oversight authority and other State agencies as necessary on issues relating to safety; and

(j) coordinating and communicating (on behalf of the accountable executive) with international organizations on issues relating to safety.

The selection criteria for a safety manager should include, but not be limited to, the following:

(a) safety/quality management experience;

(b) operational experience;

(c) technical background to understand the systems that support operations;

(d) people skills;

(e) analytical and problem-solving skills;

(f) project management skills; and

(g) oral and written communications skills.

The safety manager is generally supported by additional staff. This will depend upon the size of the organization and the nature and complexity of the organization. The safety manager liaises directly with line managers or their delegates, such as where operational units are supported by dedicated safety officers.

The safety manager is the person responsible for the collection and analysis of safety data and the distribution of related safety information to line managers. The distribution of safety information by the safety services office is the first step in the safety risk management process. This information must be used by line managers to mitigate safety risks, which inevitably requires the allocation of resources. The necessary resources may be readily available to the line managers for this purpose.

Safety Review Committee

Additionally, a formal process is required to assess the effectiveness and efficiency of any mitigation strategies used to achieve the agreed safety performance targets

of the organization. One potential process includes the creation of a safety review committee (SRC). The SRC provides the platform to achieve the objectives of resource allocation and to assess the effectiveness and efficiency of risk mitigation strategies. The SRC is a very high-level committee, chaired by the accountable executive and composed of senior managers, including line managers responsible for functional areas as well as those from relevant administrative departments. The safety manager participates in the SRC in an advisory capacity only. The SRC may meet infrequently, unless exceptional circumstances dictate otherwise. The SRC:

(a) monitors the effectiveness of the SMS;

(b) monitors that any necessary corrective action is taken in a timely manner;

(c) monitors safety performance against the organization's safety policy and objectives;

(d) monitors the effectiveness of the organization's safety management processes which support the declared corporate priority of safety management as another core business process;

(e) monitors the effectiveness of the safety supervision of subcontracted operations; and

(f) ensures that appropriate resources are allocated to achieve safety performance beyond that required by regulatory compliance.

The SRC is strategic and deals with high-level issues related to policies, resource allocation and organizational performance monitoring. Once a strategic direction has been developed by the SRC, implementation of safety strategies must be coordinated throughout the organization. This can be accomplished by creating a safety action group (SAG).

Safety Action Group

SAGs are composed of line managers and front-line personnel and are normally chaired by a designated line manager. SAGs are tactical entities that deal with specific implementation issues per the direction of the SRC. The SAG:

(a) oversees operational safety performance within the functional areas of the organization and ensures that appropriate safety risk management activities are carried out with staff involvement as necessary to build up safety awareness;

(b) coordinates the resolution of mitigation strategies for the identified consequences of hazards and ensures that satisfactory arrangements exist for safety data capture and employee feedback;

(c) assesses the safety impact related to the introduction of operational changes or new technologies;

(d) coordinates the implementation of corrective action plans and ensures that corrective action is taken in a timely manner;

(e) reviews the effectiveness of previous safety recommendations; and

(f) oversees safety promotion activities as necessary to increase employee awareness of safety issues and to ensure that they are provided appropriate opportunities to participate in safety management activities.

2.4 Coordination of Emergency Response Planning

2.4.1 Regulatory Requirements:

The service provider shall ensure that an emergency response plan is properly coordinated with the emergency response plans of those organizations it must interface with during the provision of its services.

2.4.2 Implementation Guidance

An emergency response plan (ERP) documents actions to be taken by all responsible personnel during aviation-related emergencies. The purpose of an ERP is to ensure that there is an orderly and efficient transition from normal to emergency operations, including assignment of emergency responsibilities and delegation of authority.

Authorization for action by key personnel is also contained in the plan, as well as the means to coordinate efforts necessary to cope with the emergency. The overall objective is to save lives, the safe continuation of operations and the return to normal operations as soon as possible.

The applicability of emergency response planning extends to providers of aviation products that may be attributable to, or affected by, an aviation safety occurrence. The product provider's processes are generally called "contingency product support" and include emergency airworthiness action, alert services, and aircraft accident on-site support. The product provider need not change the name of these product support processes to ERP processes; however, they must be noted appropriately in the organization's SMS documentation. Refer to Attachment 3 for further guidance on ERP.

The ERP should set out the responsibilities, roles and actions for the various agencies and personnel involved in dealing with emergencies. It may include checklists and contact details and the ERP should be regularly reviewed and tested. Key personnel should have easy access to the ERP at all times.

For an AOC holder, a comprehensive ERP would include other aspects of aircraft accident response such as, crisis management centre, management of an accident site, news media, coordination with state investigations, family assistance, post critical incident stress counseling, etc. It should also include arrangements for emergencies at line stations.

2.5 SMS documentation

2.5.1 Regulatory Requirements:

The service provider shall develop an SMS implementation plan, formally endorsed by the organization, that defines the organization's approach to the management of safety in a manner that meets the organization's safety objectives.

The service provider shall develop and maintain SMS documentation that describes:

(a) the safety policy and objectives;

(b) SMS requirements;

(c) SMS processes and procedures;

(d) accountabilities, responsibilities and authorities for SMS processes and

procedures; and

(e) SMS outputs.

The service provider shall develop and maintain an SMS manual as part of its SMS documentation.

2.5.2 General Guidance

The SMS documentation should include a top-level description (exposition) document, which describes the organization's SMS according to its components and elements. Such a document facilitates the organization's internal administration, communication and maintenance of the SMS. At the same time, it serves as the organization's SMS communication (declaration) to CAA for the purpose of regulatory acceptance, assessment and subsequent oversight of the SMS. This top-level SMS document may be a stand-alone document or it can be a distinct "SMS section/chapter" within an existing organization-approved and CAA-accepted document. Where details of the organization's SMS processes are already addressed in existing documents, appropriate cross referencing to such documents is sufficient. This SMS document will need to be kept up to date, and where significant amendments are intended or made, they may require CAA concurrence where necessary.

Another aspect of SMS documentation is the compilation and maintenance of records substantiating the existence and ongoing operation of the SMS. Such records should be organized according to the respective SMS elements and associated processes. For certain processes it may be sufficient for the SMS documentation system to include copies or samples of records maintained within the organization's other documentation systems (such as the technical records department and central library). During the initial implementation phase, the SMS documentation may include a record of the gap analysis and phased implementation plan.

2.5.3 Implementation Guidance

The SMS documentation covers all elements and processes of the SMS and normally includes:

(a) a consolidated description of the SMS components and elements such as:

1) document and records management;

2) regulatory SMS requirements;

3) framework, scope and integration;

4) safety policy and safety objectives;

5) safety accountabilities and key personnel;

6) voluntary hazard reporting system;

7) incident reporting and investigation procedures;

8) hazard identification and risk assessment processes;

9) safety performance indicators;

10) safety training and communication;

11) continuous improvement and SMS audit;

12) management of change; and

13) emergency or operations contingency planning;

(b) a compilation of current SMS related records and documents such as:

1) hazards report register and samples of actual reports;

2) safety performance indicators and related charts;

3) record of completed or in-progress safety assessments;

4) SMS internal review or audit records;

5) safety promotion records;

6) personnel SMS/safety training records;

7) SMS/safety committee meeting minutes; and

8) SMS implementation plan (during implementation process).

3. SAFETY RISK MANAGEMENT

Service providers should ensure that the safety risks encountered in aviation activities are controlled in order to achieve their safety performance targets. This process is known as safety risk management and includes hazard identification, safety risk assessment and the implementation of appropriate remediation measures. The safety risk management process is illustrated in Figure 3-1.

The safety risk management component systematically identifies hazards that exist within the context of the delivery of its products or services. Hazards may be the result of systems that are deficient in their design, technical function, human interface or interactions with other processes and systems. They may also result from a failure of existing processes or systems to adapt to changes in the service provider's operating environment. Careful analysis of these factors during the planning, design and implementation phases can often identify potential hazards before the system becomes operational.

Understanding the system and its operating environment is also essential for achievement of high safety performance. Hazards may be discovered during the operational life cycle, through employee reports or incident investigations. Analysis of these hazards should be conducted in the context of the system. This context is key to avoiding attribution of events to "human error," where defects in the system may be neglected, remaining latent for future and potentially more serious events to occur.

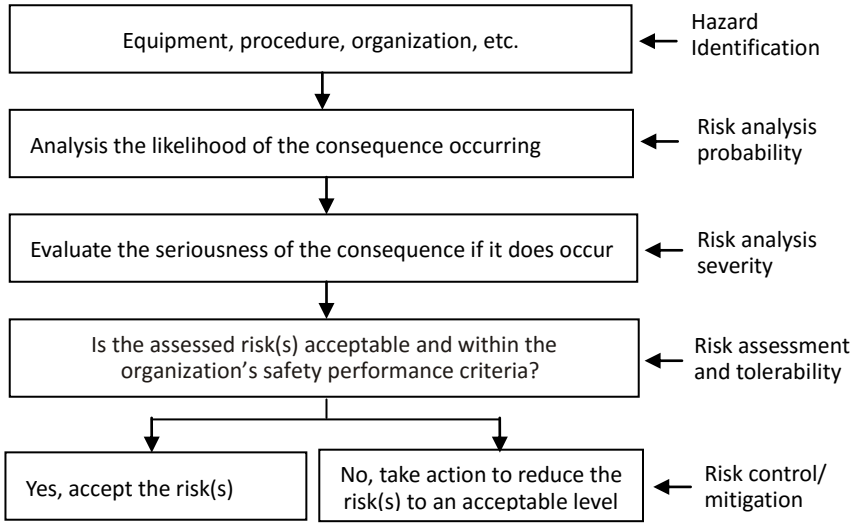


Figure 3-1 The safety risk management process

3.1 Hazard Identification

3.1.1 Regulatory Requirements:

The service provider shall develop and maintain a formal process that ensures that hazards associated with its aviation products or services are identified.

Hazard identification shall be based on a combination of reactive, proactive and predictive methods of safety data collection.

3.1.2 General Guidance

A hazard is generically defined by safety practitioners as a condition or an object with the potential to cause death, injuries to personnel, damage to equipment or structures, loss of material, or reduction of the ability to perform a prescribed function. For the purpose of aviation safety risk management, the term hazard should be focused on those conditions which could cause or contribute to unsafe operation of aircraft or aviation safety-related equipment, products and services.

Consider, for example, a fifteen-knot wind, which is not necessarily a hazardous condition. In fact, a fifteen knot wind blowing directly down the runway improves aircraft take-off and landing performance. However, a fifteen-knot wind blowing in a direction ninety degrees across a runway of intended take-off or landing creates a crosswind condition that may be hazardous due to its potential to contribute to an aircraft operational occurrence, such as a lateral runway excursion.

Hazards are an inevitable part of aviation activities. However, their manifestation and possible consequences can be addressed through various mitigation strategies to contain the potential for a hazard to result in unsafe aircraft or aviation equipment operations.

There is a common tendency to confuse hazards with their consequences or outcomes. A consequence is an outcome that can be triggered by a hazard. For example, a runway excursion (overrun) is a projected consequence in relation to the hazard of a contaminated runway. By first defining the hazard clearly, one can then project the proper consequence or outcome. It may be noted that consequences can be multi-layered, including such things as an intermediate unsafe event before an ultimate consequence (accident). Refer to Attachment 6, Table 2-A2-3, for further information.

In the crosswind example above, an immediate outcome of the hazard could be loss of lateral control followed by a consequent runway excursion. The ultimate consequence could be an accident. The damaging potential of a hazard materializes through one or many consequences. It is therefore important for safety assessments to include a comprehensive account of all likely consequences, described accurately and in practical terms. The most extreme consequence, loss of human life, should be differentiated from those that involve the potential for lesser consequences such as increased flight crew workload, passenger discomfort or reduction in safety margins. The description of consequences according to their plausible outcomes will facilitate the development and implementation of effective mitigation strategies through proper prioritization and allocation of limited resources. Proper hazard identification leads to appropriate evaluation of their potential outcomes.

The three methodologies for identifying hazards are:

(a) *Reactive.* This methodology involves analysis of past outcomes or events. Hazards are identified through investigation of safety occurrences. Incidents and accidents are clear indicators of system deficiencies and therefore can be used to determine the hazards that either contributed to the event or are latent.

(b) *Proactive.* This methodology involves analysis of existing or real-time situations, which is the primary job of the safety assurance function with its audits, evaluations, employee reporting, and associated analysis and assessment processes. This involves actively seeking hazards in the existing processes.

(c) *Predictive.* This methodology involves data gathering in order to identify possible negative future outcomes or events, analysing system processes and the environment to identify potential future hazards and initiating mitigating actions**.**

Hazard identification is the first step in the safety risk management process. The corresponding safety risks are then assessed within the context of the potentially damaging consequences related to the hazard. Where the safety risks are assessed to be unacceptable, additional safety risk controls must be built into the system.

In mature safety management systems, hazard identification is continuous and is an integral part of the service provider's organizational processes. A number of conditions trigger more in-depth and far-reaching hazard identification activities and may include:

(a) instances where the organization experiences an unexplained increase in aviation safety-related events or regulatory non-compliance;

(b) significant operational changes, including anticipated changes to key personnel or other major system components; and

(c) significant organizational changes, including anticipated growth and contraction, corporate mergers or acquisitions.

A structured approach to the identification of hazards may include the use of group brainstorming sessions in which subject-matter experts conduct detailed analysis scenarios. Hazard identification sessions require a range of experienced operational and technical personnel and are managed by a facilitator. The same group may also be used to assess corresponding safety risks.

The service provider's safety information management system should include safety assessment documentation that contains hazard descriptions, the related consequences, the assessed likelihood and severity of the safety risks, and required safety risk controls. Existing safety assessments should be reviewed whenever new hazards are identified and proposals for further safety risk controls are anticipated.

Figure 3-2 illustrates the hazard documentation and follow-up risk management process. Hazards are constantly identified through various data sources. The service provider is expected to identify hazards, eliminate these hazards or to mitigate the associated risks. In the case of hazards identified in products or services delivered through subcontractors, a mitigation could be the service provider's requirement for such organizations to have an SMS or an equivalent process for hazard identification and risk management.

The safety management information system becomes a source of safety knowledge to be used as reference in organizational safety decision-making processes. This safety knowledge provides material for safety trend analyses as well as for safety education. Guidance on voluntary and confidential hazard reporting systems is provided in Attachment 4 of this AC.

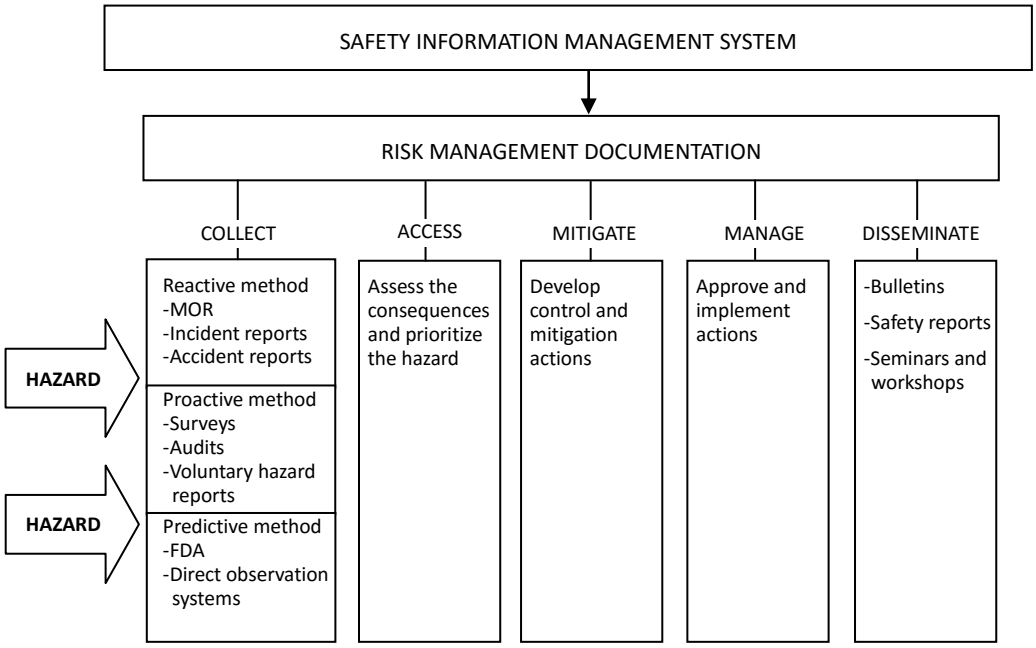


Figure 3-2 Hazard documentation and follow-up risk management process

3.1.3 Implementation Guidance

Accurate and timely reporting of relevant information related to hazards, incidents or accidents is a fundamental activity of safety management. The data used to support safety analyses are reported by multiple sources. One of the best sources of data is direct reporting by front-line personnel since they observe hazards as part of their daily activities. A workplace in which personnel have been trained and are constantly encouraged to report their errors and experiences is a prerequisite for effective safety reporting.

All personnel in aviation organizations should receive the appropriate safety management training, at a level commensurate with their responsibilities, so that everybody in the organization is prepared and able to identify and report hazards. From this perspective, hazard identification and reporting are everybody's responsibility. However, organizations must have designated personnel with the exclusive charge of hazard identification and analysis. This would normally be the personnel assigned to the safety services office. Therefore, broadening the previous perspective, in aviation organizations, hazard identification is everybody's responsibility, but accountability for hazard identification lies with dedicated safety personnel.

There are five basic characteristics that are universally associated with effective safety reporting systems (see Figure 3-3). Effective hazard reporting is a key component of safety management. Once reported, data on hazards can be analysed with other data sources to support the SRM and SA processes.

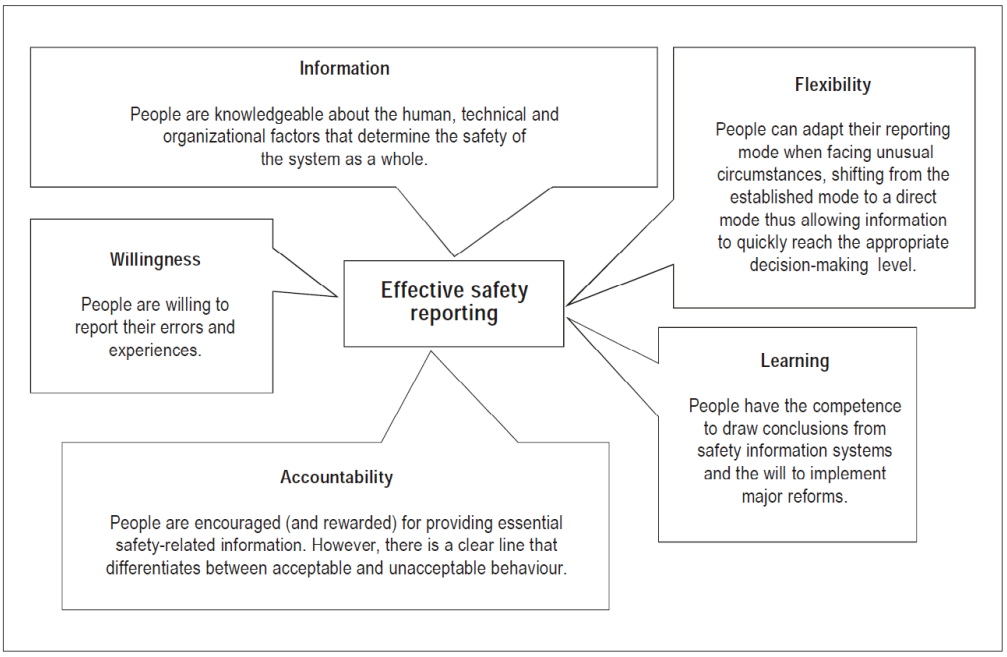


Figure 3-3 Effective safety reporting — five basic characteristics

Another source of data used to support SRM and SA processes is occurrence reporting. This may range from the highest-consequence occurrences (accidents, serious incidents) to lower-consequence events such as operational incidents, system/equipment failures or defects. While regulatory requirements for mandatory reporting of high-consequence occurrences (accidents, serious incidents) are common, a mature safety management environment will provide for the reporting of lower-consequence events as well. This will allow for the necessary monitoring mechanisms to address all potential high-consequence outcomes. The trend (rate of occurrence) of lower-consequence events is inevitably a precursor of higher-consequence outcomes to come.

The following may be considered while engaged in the hazard identification process:

(a) design factors, including equipment and task design;

(b) human performance limitations (e.g. physiological, psychological and cognitive);

(c) procedures and operating practices, including their documentation and checklists and their validation under actual operating conditions;

(d) communication factors, including media, terminology and language;

(e) organizational factors, such as those related to the recruitment, training and retention of personnel, the compatibility of production and safety goals, the allocation of resources, operating pressures and the corporate safety culture;

(f) factors related to the operational environment of the aviation system (e.g. ambient noise and vibration, temperature, lighting and the availability of protective equipment and clothing);

(g) regulatory oversight factors, including the applicability and enforceability of regulations and the certification of equipment, personnel and procedures;

(h) performance monitoring systems that can detect practical drift or operational deviations; and

(i) human-machine interface factors.

Hazards may be identified through proactive and predictive methodologies or as a result of accident or incident investigations. There are a variety of data sources of hazard identification that may be both internal and external to the organization. Examples of the internal hazard identification data sources include:

(a) normal operation monitoring schemes (e.g. flight data analysis for aircraft operators);

(b) voluntary and mandatory reporting systems;

(c) safety surveys;

(d) safety audits;

(e) feedback from training; and

(f) investigation and follow-up reports on accidents/incidents.

Examples of external data sources for hazard identification include:

(a) industry accident reports;

(b) State mandatory incident reporting systems;

(c) State voluntary incident reporting systems;

(d) State oversight audits; and

(e) information exchange systems.

The type of technologies used in the hazard identification process will depend upon the size and complexity of the service provider and its aviation activities. In all cases the service provider's hazard identification process is clearly described in the organization's SMS/safety documentation. The hazard identification process considers all possible hazards that may exist within the scope of the service provider's aviation activities including interfaces with other systems, both within and external to the organization. Once hazards are identified, their consequences (i.e. any specific events or outcomes) should be determined.

3.2 Safety Risk Assessment and Mitigation

3.2.1 Regulatory Requirements:

The service provider shall develop and maintain a process that ensures analysis, assessment and control of the safety risks associated with identified hazards.

3.2.2 General Guidance

Safety risk management is another key component of a safety management system. The term safety risk management is meant to differentiate this function from the management of financial risk, legal risk, economic risk and so forth. Safety risk is the projected likelihood and severity of the consequence or outcome from an existing hazard or situation. While the outcome may be an accident, an "intermediate unsafe event/consequence" may be identified as "the most credible outcome". Provision for identification of such layered consequences is usually associated with more sophisticated risk mitigation software.

Figure 3-4 presents the safety risk management process in its entirety. The process starts with the identification of hazards and their potential consequences. The safety risks are then assessed in terms of probability and severity, to define the level of safety risk (safety risk index). If the assessed safety risks are deemed to be tolerable, appropriate action is taken and the operation continues. The completed hazard identification and safety risk assessment and mitigation process is documented and approved as appropriate and forms part of the safety information management system.

If the safety risks are assessed as intolerable, the following questions become relevant:

(a) Can the hazards and related safety risk(s) be eliminated? If the answer is yes, then action as appropriate is taken and documented. If the answer is no, the next question is:

(b) *Can the safety risk(s) be mitigated?* If the answer is no, related activities must be cancelled. If the answer is yes, mitigation action as appropriate is taken and the next question is:

(c) *Do any residual safety risks exist?* If the answer is yes, then the residual risks must be assessed to determine their level of tolerability as well as whether they can be eliminated or mitigated as necessary to ensure an acceptable level of safety performance.

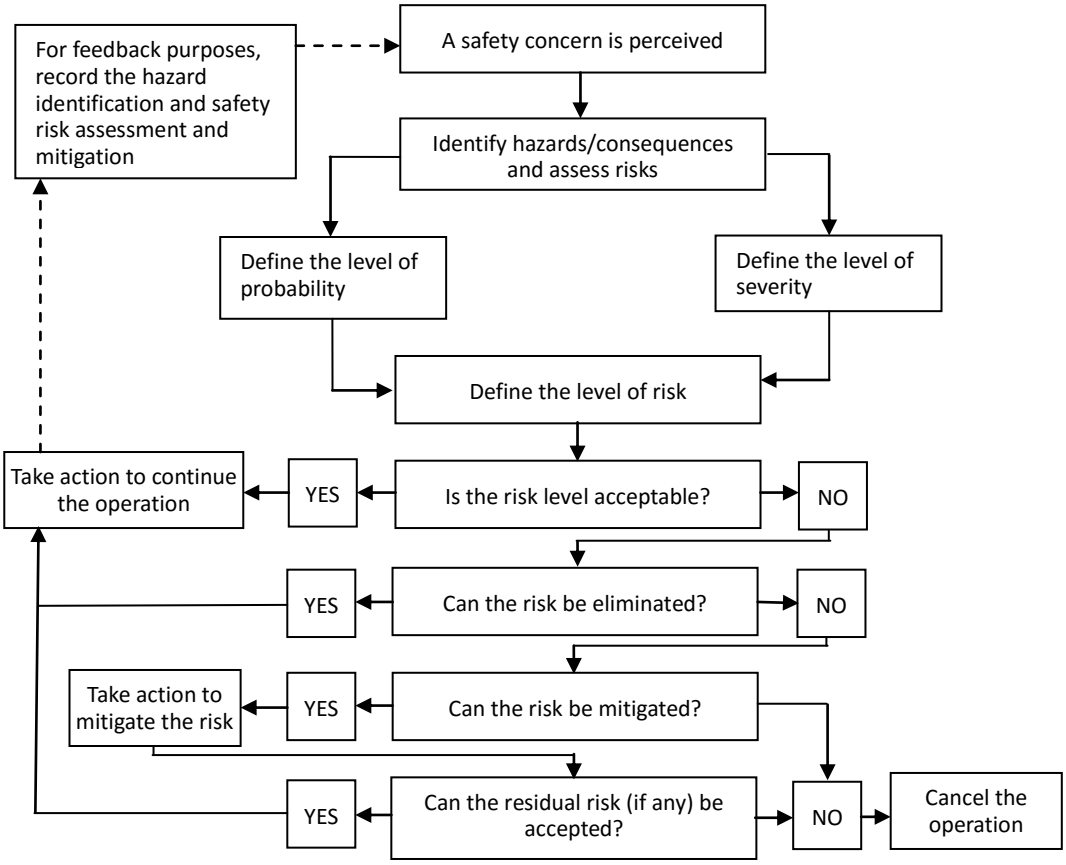


Figure 3-4 The safety risk management process

3.2.3 Implementation Guidance

Safety risk probability

The process of controlling safety risks starts by assessing the probability that the consequences of hazards will materialize during aviation activities performed by the organization. Safety risk probability is defined as the likelihood or frequency that a safety consequence or outcome might occur. The determination of likelihood can be aided by questions such as:

(a) Is there a history of occurrences similar to the one under consideration, or is this an isolated occurrence?

(b) What other equipment or components of the same type might have similar defects?

(c) How many personnel are following, or are subject to, the procedures in question?

(d) What percentage of the time is the suspect equipment or the questionable procedure in use?

(e) To what extent are there organizational, managerial or regulatory implications that might reflect larger threats to public safety?

Any factors underlying these questions will help in assessing the likelihood that a hazard may exist, taking into consideration all potentially valid scenarios. The determination of likelihood can then be used to assist in determining safety risk probability.

Figure 3-5 presents a typical safety risk probability table, in this case, a five-point table. The table includes five categories to denote the probability related to an unsafe event or condition, the description of each category, and an assignment of a value to each category.

It must be stressed that this is an example only and that the level of detail and complexity of tables and matrices should be adapted to be commensurate with the particular needs and complexities of different organizations.

Also, it should be noted that organizations may include both qualitative and quantitative criteria that may include up to fifteen values.

Probability of occurrence	Meaning	Value
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Figure 3-5 Safety risk probability table

Safety risk severity

Once the probability assessment has been completed, the next step is to assess the safety risk severity, taking into account the potential consequences related to the hazard. Safety risk severity is defined as the extent of harm that might reasonably

occur as a consequence or outcome of the identified hazard. The severity assessment can be based upon:

(a) *Fatalities/injury.* How many lives may be lost (employees, passengers, bystanders and the general public)?

(b) *Damage.* What is the likely extent of aircraft, property or equipment damage?

The severity assessment should consider all possible consequences related to an unsafe condition or object, taking into account the worst foreseeable situation. Figure 3-6 presents a typical safety risk severity table. It includes five categories to denote the level of severity, the description of each category, and the assignment of a value to each category. As with the safety risk probability table, this table is an example only.

Severity of occurrence	Meaning	Value
Catastrophic	- Equipment destroyed - Multiple deaths	A
Hazardous	- A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. - Serious injury - Major equipment damage	B
Major	- A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of increase in workload, or as a result of conditions impairing their efficiency. - Serious incident - Injury to persons	C
Minor	- Nuisance - Operating limitations - Use of emergency procedures - Minor incident	D
Negligible	- Little consequences	E

Figure 3-6 Safety risk severity table

Safety risk tolerability

The safety risk probability and severity assessment process can be used to derive a safety risk index. The index created through the methodology described above consists of an alphanumeric designator, indicating the combined results of the probability and severity assessments. The respective severity/probability combinations are presented in the safety risk assessment matrix in Figure 3-7.

The third step in the process is to determine safety risk tolerability. First, it is necessary to obtain the indices in the safety risk assessment matrix. For example, consider a situation where a safety risk probability has been assessed as occasional (4), and safety risk severity has been assessed as hazardous (B). The composite of

probability and severity (4B) is the safety risk index of the consequence.

Risk probability		Risk severity				
		Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

Figure 3-7 Safety risk assessment matrix

The index obtained from the safety risk assessment matrix must then be exported to a safety risk tolerability matrix (see Figure 3-8) that describes the tolerability criteria for the particular organization. Using the example above, the criterion for safety risk assessed as 4B falls in the "unacceptable under the existing circumstances" category. In this case, the safety risk index of the consequence is unacceptable. The organization must therefore:

(a) take measures to reduce the organization's exposure to the particular risk, i.e. reduce the likelihood component of the risk index;

(b) take measures to reduce the severity of consequences related to the hazard, i.e. reduce the severity component of the risk index; or

(c) cancel the operation if mitigation is not possible.

Note.— The inverted pyramid in Figure 3-8 reflects a constant effort to drive the risk index towards the bottom APEX of the pyramid. Figure 3-9 provides an example of an alternate safety risk tolerability matrix.

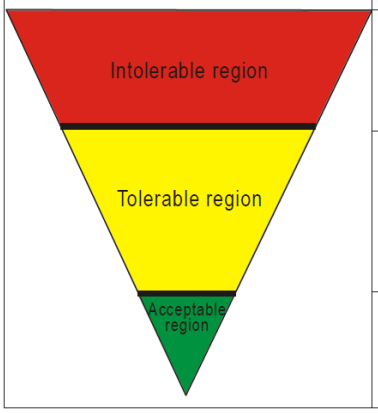
Tolerability description	Assessed risk index	Suggested criteria
	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	Acceptable based on risk mitigation. It may require management decision.
	3E, 2D, 2E, 1B, 1C, 1D, 1E	Acceptable

Figure 3-8 Safety risk tolerability matrix

Risk index Range	Risk Level	Suggested criteria
5A, 5B, 5C,4A 4B, 3A	High Risk	Cease or cut back operation promptly if necessary. Perform priority risk mitigation to ensure that additional or enhanced preventive controls are put in place to bring down the risk index to the moderate or low range.
5D, 5E, 4C, 4D 4E, 3B, 3C, 3D 2A, 2B, 2C, 1A	Moderate risk	Schedule performance of a safety assessment to bring down the risk index to the low range if viable.
3E, 2D, 2E, 1B, 1C, 1D, 1E	Low Risk	Acceptable as is. No further risk mitigation required.

Figure 3-9 An alternate safety risk tolerability matrix

Safety Risk Management

Safety risk management encompasses the assessment and mitigation of safety risks. The objective of safety risk management is to assess the risks associated with identified hazards and develop and implement effective and appropriate mitigations.

Safety risks are conceptually assessed as acceptable, tolerable or intolerable. Risks assessed as initially falling in the intolerable region are unacceptable under any circumstances. The probability and/or severity of the consequences of the hazards are of such a magnitude, and the damaging potential of the hazard poses such a threat to safety, that immediate mitigation action is required, resources must then be allocated to slide it down the triangle, into the tolerable region. If this cannot be achieved, then the operation aimed at the delivery of services which exposes the organization to the consequences of the hazards in question must be cancelled.

Safety risks assessed in the tolerable region are acceptable provided that appropriate mitigation strategies are implemented by the organization. A safety risk initially assessed as intolerable may be mitigated and subsequently moved into the tolerable region provided that such risks remain controlled by appropriate mitigation strategies.

Safety risks assessed as initially falling in the acceptable region are acceptable as they currently stand and require no action to bring or keep the probability and/or severity of the consequences of hazards under organizational control.

Risk management documentation/worksheet

Each risk mitigation exercise will need to be documented as necessary. This may be done on a basic spreadsheet or table for risk mitigation involving non-complex operations, processes or systems. For hazard identification and risk mitigation involving complex processes, systems or operations, it may be necessary to utilize customized risk mitigation software to facilitate the documentation process. Completed risk mitigation documents should be approved by the appropriate level of management. For an example of a basic risk mitigation worksheet, refer to Attachment 6 of this AC.

4. SAFETY ASSURANCE

Safety assurance consists of processes and activities undertaken by the service provider to determine whether the SMS is operating according to expectations and requirements. The service provider continually monitors its internal processes as well as its operating environment to detect changes or deviations that may introduce emerging safety risks or the degradation of existing risk controls. Such changes or deviations may then be addressed together with the safety risk management process.

The safety assurance process complements that of quality assurance, with each having requirements for analysis, documentation, auditing and management reviews to assure that certain performance criteria are met. While quality assurance typically focuses on the organization's compliance with regulatory requirements, safety assurance specifically monitors the effectiveness of safety risk controls.

The complementary relationship between safety assurance and quality assurance allows for the integration of certain supporting processes. Such integration can serve to achieve synergies to assure that the service provider's safety, quality and commercial objectives are met.

Finally, safety assurance activities should include the development and implementation of corrective actions in response to findings of systemic deficiencies having a potential safety impact. Organizational responsibility for the development and implementation of corrective actions should reside with the departments cited in the findings.

The following provides a list of generic aspects or areas to be considered to "assure safety" through safety assurance process:

(a) ***Responsibility.*** Who is accountable for management of the operational activities (planning, organizing, directing, controlling) and its ultimate accomplishment.

(b) ***Authority.*** Who can direct, control or change the procedures and who cannot as well as who can make key decisions such as safety risk acceptance decisions.

(c) ***Procedures.*** Specified ways to carry out operational activities and that translate the "what" (objectives) into "how" (practical activities).

(d) ***Controls.*** Elements of the system, including, hardware, software, special procedures or procedural steps, and supervisory practices designed to keep operational activities on track.

(e) ***Interfaces.*** An examination of such things as lines of authority between departments, lines of communication between employees, consistency of procedures, and clear delineation of responsibility between organizations, work units and employees.

(f) ***Process measures.*** Means of providing feedback to responsible parties that required actions are taking place, required outputs are being produced and expected outcomes are being achieved.

4.1 Safety Performance Monitoring and Measurement

4.1.1 Regulatory Requirements:

The service provider shall develop and maintain the means to verify the safety performance of the organization and to validate the effectiveness of safety risk controls.

The service provider's safety performance shall be verified in reference to the safety performance indicators and safety performance targets of the SMS.

4.1.2 Implementation Guidance

Safety performance indicators also provide objective evidence for the regulator to assess the effectiveness of the service provider's SMS and to monitor achievement of its safety objectives. The service provider's safety performance indicators consider factors such as the organization's safety risk tolerance, the cost/benefits of implementing improvements to the system, regulatory requirements and public expectations.

Safety Performance Indicators and Safety Performance Targets provide a measurable way of ensuring and demonstrating the effectiveness of an SMS beyond regulatory compliance. Safety performance monitoring is the process by which safety performance indicators of the organization are reviewed in relation to safety policies and objectives. Such monitoring would normally be done at the safety committee and where applicable safety action group level. Any significant abnormal trend would warrant appropriate investigation into potential hazards or risks associated with such deviation.

Information used to measure the organization's safety performance is generated through its safety reporting systems.

There are two types of reporting systems:

(a) mandatory incident reporting systems; and

(b) voluntary incident reporting systems.

Mandatory incident reporting systems require the reporting of certain types of events (e.g. serious incidents, runway incursions). This necessitates implementation of detailed regulations identifying the reporting criteria and scope of reportable occurrences. Mandatory reporting systems tend to collect more information related to high-consequence technical failures than other aspects of operational activities.

Voluntary reporting systems allow for the submission of information related to observed hazards or inadvertent errors without an associated legal or administrative requirement to do so. In these systems, regulatory agencies or organizations may offer an incentive to report. For example, enforcement action may be waived for reports of inadvertent errors or unintentional violations. Under these circumstances, reported information should be used solely to support the enhancement of safety. Such systems are considered "non-punitive" because they afford protection to reporters thereby ensuring the continued availability of such information to support continuous improvements in safety performance. While the nature and extent of service providers' non-punitive policies may vary, the intent is to promote an effective reporting culture and proactive identification of potential safety deficiencies.

Voluntary reporting systems may be confidential, requiring that any identifying information about the reporter is known only to "gatekeepers" in order to allow for follow-up action. Confidential incident reporting systems facilitate the disclosure of hazards leading to human error, without fear of retribution or embarrassment. Voluntary incident reports may be archived and de-identified once any necessary follow-up actions are taken. De-identified reports can support future trending analyses to track the effectiveness of risk mitigation and to identify emerging hazards.

To be effective, safety reporting tools should be readily accessible to operational personnel. Operational personnel should be educated on the benefits of safety reporting systems and provided with positive feedback regarding remedial actions taken in response to the report. The alignment of reporting system requirements, analysis tools and methods can facilitate exchange of safety information as well as comparisons of certain safety indicators. Guidance on voluntary and confidential reporting systems is provided in Attachment 4 of this AC.

Other sources of safety information to support safety performance monitoring and measurement may include:

(a) *Safety studies* are analyses used to gain an understanding of broad safety issues or those of a global nature. For example, the airline industry may produce safety recommendations and implement measures to reduce accidents and incidents during the approach and landing phases. Individual service providers may find that these global recommendations improve safety performance in the context of their aviation activities.

(b) *Safety reviews* are a fundamental component of change management. They are conducted during the introduction of new technologies, new procedures or systemic changes that affect aviation operations. Safety reviews have a clearly defined objective that is linked to the change under consideration. Safety reviews ensure that safety performance is maintained at appropriate levels during periods of change.

(c) *Safety surveys* examine procedures or processes related to a specific operation. Safety surveys may involve the use of checklists, questionnaires and informal confidential interviews. Safety surveys generally provide qualitative information that may require validation to determine appropriate corrective action. Nonetheless, surveys may provide an inexpensive source of significant safety information.

(d) *Audits* focus on the integrity of the organization's SMS and its supporting systems. Audits provide an assessment of safety risk controls and related quality assurance processes. Audits may be conducted by entities that are external to the service provider or through an internal audit process having the necessary policies and procedures to ensure its independence and objectivity. Audits are intended to provide assurance of the safety management functions, including staffing, compliance with approved regulations, levels of competency and training.

(e) *Internal investigations* are conducted for certain reportable safety events in accordance with internal or regulatory requirements. Accidents and serious incidents investigated by the appropriate State or regional authorities may also provide the impetus for internal investigations to be undertaken by service provider organizations.

The final output of a safety performance monitoring and measurement process is the development of safety performance indicators based on analysis of data collected through the sources referenced above.

The safety performance indicators and associated targets should be accepted by the State responsible for the service provider's authorization, certification or designation. Safety performance indicators are supplementary to any legal or regulatory requirements and do not relieve service providers from their regulatory obligations.

In practice, the safety performance of an SMS is expressed by safety performance indicators and their corresponding alert and target values. The service provider should monitor the performance of current indicators in the context of historical trends to identify any abnormal changes in safety performance. Likewise, target and

alert settings should take into consideration recent historical performance for a given indicator. Desired improvement targets should be realistic and achievable for the service provider and the associated aviation sector.

Establishing an alert level for a safety indicator is pertinent from a risk-monitoring perspective. An alert level is a common criteria to delineate the acceptable from the unacceptable performance regions for a particular safety indicator. As per generic safety metrics textbooks, a basic objective method for setting out-of-control (OOC) alert criteria is the use of the standard deviation principle. This method takes into consideration the standard deviation and average values of the preceding historical data points for a given safety indicator. These two values are then used to establish the alert level for the next monitoring period of the indicator.

A range of high-consequence as well as lower-consequence safety performance indicators provide a more comprehensive insight into the service provider's safety performance. This will ensure that high-consequence outcomes (e.g. accidents and serious incidents) as well as lower-consequence events (e.g. incidents, non-conformance reports, deviations) are addressed. Safety performance indicators are essentially data trending charts that track occurrences in terms of event rates (e.g. number of incidents per 1 000 flying hours). High-consequence indicators should be addressed first while lower-consequence indicators may be developed at the more mature phase of SMS implementation.

Once safety performance indicators and their corresponding targets and alert settings have been defined, the performance outcome of each indicator should be updated and monitored on a regular basis. The target and alert level for each indicator may be tracked for their respective performance status. A consolidated summary of the overall target and alert performance outcome of the complete safety performance indicators package may also be compiled/aggregated for a given monitoring period. Qualitative values (satisfactory/unsatisfactory) may be assigned for each "target achieved" and each "alert level not breached". Alternatively, numeric values (points) may be used to provide a quantitative measurement of the overall performance of the package of indicators. Examples of safety performance indicators and their target and alert setting criteria are provided in Attachment 5 of this AC.

4.2 The Management of Change

4.2.1 Regulatory Requirements:

The service provider shall develop and maintain a formal process to identify changes which may affect the level of safety risk associated with its aviation products or services and to identify and manage the safety risks that may arise from those changes.

4.2.2 Implementation Guidance

Aviation service providers experience change due to a number of factors including, but not limited to:

(a) organizational expansion or contraction;

(b) changes to internal systems, processes or procedures that support delivery of the products and services; and

(c) changes to the organization's operating environment.

Change may affect the appropriateness or effectiveness of existing safety risk mitigation strategies. In addition, new hazards, and related safety risks may be

inadvertently introduced into an operation whenever change occurs. Such hazards should be identified so as to enable the assessment and control of any related safety risks. Safety reviews, as discussed in the discussion on safety performance monitoring and measurement, can be valuable sources of information to support decision-making processes and manage change effectively.

The organization's management of change process should take into account the following three considerations:

(a) *Criticality.* Criticality assessments determine the systems, equipment or activities that are essential to the safe operation of aircraft. While criticality is normally assessed during the system design process, it is also relevant during a situation of change. Systems, equipment and activities that have higher safety criticality should be reviewed following change to make sure that corrective actions can be taken to control potentially emerging safety risks.

(b) *Stability of systems and operational environments.* Changes may be planned and under the direct control of the organization. Such changes include organizational growth or contraction, the expansion of products or services delivered, or the introduction of new technologies. Unplanned changes may include those related to economic cycles, labour unrest, as well as changes to the political, regulatory or operating environments.

(c) *Past performance.* Past performance of critical systems and trend analyses in the safety assurance process should be employed to anticipate and monitor safety performance under situations of change. The monitoring of past performance will also assure the effectiveness of corrective actions taken to address safety deficiencies identified as a result of audits, evaluations, investigations or reports.

As systems evolve, incremental changes can accumulate, requiring amendments to the initial system description. Therefore, change management necessitates periodic reviews of the system description and the baseline hazard analysis to determine their continued validity.

4.3 Continuous Improvement of the SMS

4.3.1 Regulatory Requirements:

The service provider shall monitor and assess the effectiveness of its SMS processes to enable continuous improvement of the overall performance of the SMS.

4.3.2 Implementation Guidance

Continuous improvement is measured through the monitoring of an organization's safety performance indicators and is related to the maturity and effectiveness of an SMS. Safety assurance processes support improvements to the SMS through continual verification and follow-up actions. These objectives are achieved through the application of internal evaluations and independent audits of the SMS.

Internal evaluations involve assessment of the service provider's aviation activities that can provide information useful to the organization's decision-making processes. It is here where the key activity of SMS — hazard identification and risk mitigation (HIRM) takes place. Evaluations conducted for the purpose of this requirement must be conducted by persons or organizations that are functionally independent of the technical processes being evaluated.

The internal evaluation function includes evaluation of safety management functions,

policymaking, safety risk management, safety assurance and safety promotion throughout the organization.

Internal audits involve the systematic and scheduled examination of the service provider's aviation activities, including those specific to implementation of the SMS. To be most effective, internal audits are conducted by persons or departments that are independent of the functions being evaluated. Such audits provide the accountable executive, as well as senior management officials responsible for the SMS, the ability to track the implementation and effectiveness of the SMS as well as its supporting systems.

External audits of the SMS may be conducted by relevant authorities responsible for acceptance of the service provider's SMS. Additionally, audits may be conducted by industry associations or other third parties selected by the service provider. These external audits enhance the internal audit system as well as provide independent oversight.

In summary, the evaluation and audit processes contribute to the service provider's ability to achieve continuous improvement in safety performance. Ongoing monitoring of the SMS, its related safety controls and support systems assures that the safety management process is achieving its objectives.

5. Safety Promotion

Safety promotion encourages a positive safety culture and creates an environment that is conducive to the achievement of the service provider's safety objectives. A positive safety culture is characterized by values, attitudes and behaviour that are committed to the organization's safety efforts. This is achieved through the combination of technical competence that is continually enhanced through training and education, effective communications and information sharing. Senior management provides the leadership to promote the safety culture throughout an organization.

An organizational safety effort cannot succeed solely by mandate or strict adherence to policies. Safety promotion affects both individual and organizational behaviour and supplements the organization's policies, procedures and processes, providing a value system that supports safety efforts.

The service provider must establish and implement processes and procedures that facilitate effective communication throughout all levels of the organization. Service providers should communicate their safety objectives, as well as the current status of any related activities and events. Service providers must also encourage "bottom-up" communication, providing an environment that allows senior management to receive open and constructive feedback from operational personnel.

5.1 Training and Education

5.1.1 Regulatory Requirements:

The service provider shall develop and maintain a safety training programme that ensures that personnel are trained and competent to perform their SMS duties.

The scope of the safety training programme shall be appropriate to each individual's involvement in the SMS.

5.1.2 Implementation Guidance

The safety manager should provide current information and facilitate training relevant to specific safety issues encountered by organizational units. The provision of training to appropriate staff, regardless of their level in the organization, is an indication of management's commitment to an effective SMS. Safety training and education curricula should consist of the following:

(a) organizational safety policies, goals and objectives;

(b) organizational safety roles and responsibilities related to safety;

(c) basic safety risk management principles;

(d) safety reporting systems;

(e) safety management support (including evaluation and audit programmes);

(f) lines of communication for dissemination of safety information;

(g) a validation process that measures the effectiveness of training; and

(h) documented initial indoctrination and recurrent training requirements.

Training requirements consistent with the needs and complexity of the organization should be documented for each area of activity. A training file should be developed

for each employee, including management.

Safety training within an organization must ensure that personnel are competent to perform their safety related duties. Training procedures should specify initial and recurrent safety training standards for operational personnel, managers and supervisors, senior managers and the accountable executive. The amount of safety training should be appropriate to the individual's responsibility and involvement in the SMS. The SMS training documentation should also specify responsibilities for development of training content and scheduling as well as training records management.

The training should include the organization's safety policy, safety roles and responsibilities, SMS principles related to safety risk management and safety assurance, as well as the use and benefits of the organization's safety reporting system(s).

Safety training for senior managers should include content related to compliance with national and organizational safety requirements, allocation of resources and active promotion of the SMS including effective interdepartmental safety communication. In addition, safety training for senior managers should include material on establishing safety performance targets and alert levels.

Finally, the safety training programme may include a session designed specifically for the accountable executive. This training session should be at a high level providing the accountable executive with an understanding of the SMS and its relationship to the organization's overall business strategy.

5.2 Safety Communication

5.2.1 Regulatory Requirements:

The service provider shall develop and maintain formal means for safety communication that:

(a) ensures personnel are aware of the SMS to a degree commensurate with their positions;

(b) conveys safety-critical information;

(c) explains why particular safety actions are taken; and

(d) explains why safety procedures are introduced or changed.

5.2.2 General Guidance

5.2.3 Implementation Guidance

The service provider should communicate the organization's SMS objectives and procedures to all operational personnel. The safety manager should regularly communicate information regarding the safety performance trends and specific safety issues through bulletins and briefings. The safety manager should also ensure that lessons learned from investigations and case histories or experiences, both internally and from other organizations, are distributed widely. Safety performance will be more efficient if operational personnel are actively encouraged to identify and report hazards. Safety communication therefore aims to:

(a) ensure that staff are fully aware of the SMS;

(b) convey safety-critical information;

(c) raise awareness of corrective actions; and

(d) provide information regarding new or amended safety procedures.

Examples of organizational communication initiatives include:

(a) dissemination of the SMS manual;

(b) safety processes and procedures;

(c) safety newsletters, notices and bulletins; and

(d) websites or email.

ATTACHMENT 1 SMS GAP ANALYSIS CHECK LIST

The initial gap analysis checklist in Table ATT-1-1 can be used as a template to conduct the first step of an SMS gap analysis. This format with its overall "Yes/No/Partial" responses will provide an initial indication of the broad scope of gaps and hence overall workload to be expected. The questionnaire may be adjusted to suit the needs of the organization and the nature of the product or service provided. This initial information should be useful to senior management in anticipating the scale of the SMS implementation effort and hence the resources to be provided. This initial checklist would need to be followed up by an appropriate implementation plan as per Tables ATT-1-2 and ATT-1-3.

A "Yes" answer indicates that the organization meets or exceeds the expectation of the question concerned. A "No" answer indicates a substantial gap in the existing system with respect to the question's expectation. A "Partial" answer indicates that further enhancement or development work is required to an existing process in order to meet the question's expectations.

Organization Name: _____ Analyzed by: _____

Date of Analysis: _____ Reference: _____

Table ATT-1-1 Gap Analysis Checklist

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
Component 1 — SAFETY POLICY AND OBJECTIVES			
Element 1.1 — Management commitment and responsibility			
1.1-1	Is there a safety policy in place?	☐Yes ☐No ☐Partial	
1.1-2	Does the safety policy reflect senior management's commitment regarding safety management?	☐Yes ☐No ☐Partial	
1.1-3	Is the safety policy appropriate to the size, nature and complexity of the organization?	☐Yes ☐No ☐Partial	
1.1-4	Is the safety policy relevant to aviation safety?	☐Yes ☐No ☐Partial	
1.1-5	Does the safety policy include a clear statement about the provision of the necessary resources for the implementation of the safety policy?	☐Yes ☐No ☐Partial	
1.1-6	Does the safety policy include the safety reporting procedures?	☐Yes ☐No ☐Partial	
1.1-7	Does the safety policy clearly indicate which types of operational behaviors are unacceptable?	☐Yes ☐No ☐Partial	
1.1-8	Does the safety policy include the conditions under which disciplinary action would not apply?	☐Yes ☐No ☐Partial	

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
1.1-9	Is the safety policy signed by the Accountable Executive?	☐Yes ☐No ☐Partial	
1.1-10	Is the safety policy communicated, with visible endorsement, throughout the [organization]?	☐Yes ☐No ☐Partial	
1.1-11	Is the safety policy periodically reviewed to ensure it remains relevant and appropriate to the [organization]?	☐Yes ☐No ☐Partial	
Element 1.2 — Safety accountabilities			
1.2-1	Has the [organization] identified an Accountable Executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the [organization], for the implementation and maintenance of the SMS?	☐Yes ☐No ☐Partial	
1.2-2	Does the Accountable Executive have full control of the financial resources required for the operations authorized to be conducted under the operations certificate?	☐Yes ☐No ☐Partial	
1.2-3	Does the Accountable Executive have final authority over all aviation activities of his organization?	☐Yes ☐No ☐Partial	
1.2-4	Has [Organization] identified and documented the safety accountabilities of management as well as operational personnel, with respect to the SMS?	☐Yes ☐No ☐Partial	
1.2-5	Is there a safety committee or review board for the purpose of reviewing SMS and safety performance?	☐Yes ☐No ☐Partial	
1.2-6	Is the safety committee chaired by the accountable executive or by an appropriately assigned deputy, duly substantiated in the SMS manual?	☐Yes ☐No ☐Partial	
1.2-7	Does the safety committee include relevant operational or departmental heads as applicable?	☐Yes ☐No ☐Partial	
1.2-8	Are there safety action groups that work in conjunction with the safety committee (especially for large/complex organizations)?	☐Yes ☐No ☐Partial	
1.2-9	Are the safety responsibilities, accountabilities and authorities documented and communicated throughout the [organization]?	☐Yes ☐No ☐Partial	
1.2-10	Has the [organization] included a definition of the levels of management with authority to make decisions regarding safety risk tolerability?	☐Yes ☐No ☐Partial	
Element 1.3 — Appointment of key personnel			
1.3-1	Has the organization appointed a qualified person to manage and oversee the day-to-day operation of the SMS?	☐Yes ☐No ☐Partial	
1.3-2	Does the qualified person have direct access or reporting to the	☐Yes ☐No	

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
	accountable executive concerning the implementation and operation of the SMS?	☐Partial	
1.3-3	Does the manager responsible for administering the SMS hold other responsibilities that may conflict or impair his role as SMS manager?	☐Yes ☐No ☐Partial	
1.3-4	Is the SMS manager's position a senior management position not lower than or subservient to other operational or production positions?	☐Yes ☐No ☐Partial	
Element 1.4 — Coordination of emergency response planning			
1.4-1	Does the [organization] have an emergency response/contingency plan appropriate to the size, nature and complexity of the organization?	☐Yes ☐No ☐Partial	
1.4-2	Does the emergency/contingency plan address all possible or likely emergency/crisis scenarios relating to the organization's aviation product or service deliveries?	☐Yes ☐No ☐Partial	
1.4-3	Does the ERP include procedures for the continuing safe production, delivery or support of its aviation products or services during such emergencies or contingencies?	☐Yes ☐No ☐Partial	
1.4-4	Is there a plan and record for drills or exercises with respect to the ERP?	☐Yes ☐No ☐Partial	
1.4-5	Does the ERP address the necessary coordination of its emergency response/contingency procedures with the emergency/response contingency procedures of other organizations where applicable?	☐Yes ☐No ☐Partial	
1.4-6	Does [Organization] have a process to distribute and communicate the ERP to all relevant personnel, including relevant external organizations?	☐Yes ☐No ☐Partial	
1.4-7	Is there a procedure for periodic review of the ERP to ensure its continuing relevance and effectiveness?	☐Yes ☐No ☐Partial	
Element 1.5 —SMS documentation			
1.5-1	Is there a top-level SMS summary or exposition document which is approved by the accountable manager and accepted by the CAA?	☐Yes ☐No ☐Partial	
1.5-2	Does the SMS documentation address the organization's SMS and its associated components and elements?	☐Yes ☐No ☐Partial	
1.5-3	Is [Organization] SMS framework in alignment with the regulatory SMS framework?	☐Yes ☐No ☐Partial	
1.5-4	Does [Organization] maintain a record of relevant supporting documentation pertinent to the implementation and operation of the SMS?	☐Yes ☐No ☐Partial	

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
1.5-5	Does [Organization] have an SMS implementation plan to establish its SMS implementation process, including specific tasks and their relevant implementation milestones?	☐Yes ☐No ☐Partial	
1.5-6	Does the SMS implementation plan address the coordination between the service provider's SMS and the SMS of external organizations where applicable?	☐Yes ☐No ☐Partial	
1.5-7	Is the SMS implementation plan endorsed by the accountable executive?	☐Yes ☐No ☐Partial	
1.5-8	Are relevant portions of SMS-related documentation incorporated into approved documentation, such as company operations manual, maintenance control/policy manual and airport operations manual, as applicable?	☐Yes ☐No ☐Partial	
1.5-9	Does the records system provide the control processes necessary to ensure appropriate identification, legibility, storage, protection, archiving, retrieval, retention time, and disposition of records?	☐Yes ☐No ☐Partial	
Component 2 — SAFETY RISK MANAGEMENT			
Element 2.1 — Hazard identification			
2.1-1	Is there a process for voluntary hazards/threats reporting by all employees?	☐Yes ☐No ☐Partial	
2.1-2	Is the voluntary hazard/threats reporting simple, available to all personnel involved in safety-related duties and commensurate with the size of the service provider?	☐Yes ☐No ☐Partial	
2.1-3	Does [Organization] SDCPS include procedures for incident/accident reporting by operational or production personnel?	☐Yes ☐No ☐Partial	
2.1-4	Is incident/accident reporting simple, accessible to all personnel involved in safety-related duties and commensurate with the size of the service provider?	☐Yes ☐No ☐Partial	
2.1-5	Does [Organization] have procedures for investigation of all reported incident/accidents?	☐Yes ☐No ☐Partial	
2.1-6	Are there procedures to ensure that hazards/threats identified or uncovered during incident/accident investigation processes are appropriately accounted for and integrated into the organization's hazard collection and risk mitigation procedure?	☐Yes ☐No ☐Partial	
2.1-7	Are there procedures to review hazards/threats from relevant industry reports for follow-up actions or risk evaluation where applicable?	☐Yes ☐No ☐Partial	
2.1-8	Is there a feedback process to notify contributors that their reports have been received and to share the results of the analysis?	☐Yes ☐No ☐Partial	
Element 2. 2 — Safety risk assessment and mitigation			

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
2.2-1	Is there a documented hazard identification and risk mitigation (HIRM) procedure involving the use of objective risk analysis tools?	☐Yes ☐No ☐Partial	
2.2-2	Is there a structured process for the analysis of the safety risks associated with the consequences of identified hazards, expressed in terms of probability and severity of occurrence?	☐Yes ☐No ☐Partial	
2.2-3	Are there criteria for assessing safety risks and establishing safety risk tolerability (i.e. the acceptable level of safety risk the organization is willing to accept)?	☐Yes ☐No ☐Partial	
2.2-4	Is the risk assessment reports approved by departmental managers or at a higher level where appropriate?	☐Yes ☐No ☐Partial	
2.2-5	Is there a procedure for periodic review of existing risk mitigation records?	☐Yes ☐No ☐Partial	
2.2-6	Is there a procedure to account for mitigation actions whenever unacceptable risk levels are identified?	☐Yes ☐No ☐Partial	
2.2-7	Is there a procedure to prioritize identified hazards for risk mitigation actions?	☐Yes ☐No ☐Partial	
2.2-8	Is there a programme for systematic and progressive review of all aviation safety-related operations, processes, facilities and equipment subject to the HIRM process as identified by the organization?	☐Yes ☐No ☐Partial	
Component 3 — SAFETY ASSURANCE			
Element 3.1 — Safety performance monitoring and measurement			
3.1-1	Are there identified safety performance indicators for measuring and monitoring the safety performance of the organization's aviation activities?	☐Yes ☐No ☐Partial	
3.1-2	Are the safety performance indicators relevant to the organization's safety policy as well as management's high-level safety objectives/goals?	☐Yes ☐No ☐Partial	
3.1-3	Do the safety performance indicators include alert/target settings to define unacceptable performance regions and planned improvement goals?	☐Yes ☐No ☐Partial	
3.1-4	Is the setting of alert levels or out-of-control criteria based on objective safety metrics principles?	☐Yes ☐No ☐Partial	
3.1-5	Do the safety performance indicators include quantitative monitoring of high-consequence safety outcomes (e.g. accident and serious incident rates) as well as lower-consequence events (e.g. rate of non-compliance, deviations)?	☐Yes ☐No ☐Partial	
3.1-6	Are safety performance indicators and their associated performance settings developed in consultation with, and subject	☐Yes ☐No	

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
	to, the civil aviation authority's agreement?	☐Partial	
3.1-7	Is there a procedure for corrective or follow-up action to be taken when targets are not achieved and alert levels are exceeded/breached?	☐Yes ☐No ☐Partial	
3.1-8	Are the safety performance indicators periodically reviewed?	☐Yes ☐No ☐Partial	
3.1-9	Are the following sources of safety information to support safety performance monitoring and measurement? Safety reporting systems ☐ Yes ☐ No Safety studies ☐ Yes ☐ No Safety reviews ☐ Yes ☐ No Safety audits ☐ Yes ☐ No Safety surveys ☐ Yes ☐ No Internal safety investigations ☐ Yes ☐ No	☐Yes ☐No ☐Partial	
Element 3.2 — The management of change			
3.2-1	Is there a procedure for review of relevant existing aviation safety-related facilities and equipment (including HIRM records) whenever there are pertinent changes to those facilities or equipment?	☐Yes ☐No ☐Partial	
3.2-2	Is there a procedure for review of relevant existing aviation safety-related operations and processes (including any HIRM records) whenever there are pertinent changes to those operations or processes?	☐Yes ☐No ☐Partial	
3.2-3	Is there a procedure for review of new aviation safety-related operations and processes for hazards/risks before they are commissioned?	☐Yes ☐No ☐Partial	
3.2-4	Is there a procedure for review of relevant existing facilities, equipment, operations or processes (including HIRM records) whenever there are pertinent changes external to the organization such as regulatory/industry standards, best practices or technology?	☐Yes ☐No ☐Partial	
3.2-5	Has the [organization] established a process to eliminate or modify safety risk controls that are no longer needed due to changes in the operational environment?	☐Yes ☐No ☐Partial	
Element 3.3 — Continuous improvement of the SMS			
3.3-1	Is there a procedure for periodic internal audit/assessment of the SMS?	☐Yes ☐No ☐Partial	
3.3-2	Is there a current internal SMS audit/assessment plan?	☐Yes ☐No ☐Partial	
3.3-3	Does the audit system cover all functions, activities and	☐Yes ☐No	

No.	Aspect to be analyzed or question to be answered	Answer	Status of implementation
	organizations within the organization?	☐Partial	
3.3-4	Does the SMS audit plan include the sampling of completed/existing safety risk assessments?	☐Yes ☐No ☐Partial	
3.3-5	Does the SMS audit plan include the sampling of safety performance indicators for data currency and their target/alert settings performance?	☐Yes ☐No ☐Partial	
3.3-6	Does the SMS audit plan cover the SMS interface with subcontractors or customers where applicable?	☐Yes ☐No ☐Partial	
3.3-7	Is there a process for SMS audit/assessment reports to be submitted or highlighted for the accountable manager's attention where appropriate?	☐Yes ☐No ☐Partial	
Component 4 — SAFETY PROMOTION			
Element 4.1 — Training and education			
4.1-1	Is there a programme to provide SMS training/familiarization to personnel involved in the implementation or operation of the SMS?	☐Yes ☐No ☐Partial	
4.1-2	Has the accountable executive undergone appropriate SMS familiarization, briefing or training?	☐Yes ☐No ☐Partial	
4.1-3	Are personnel involved in conducting risk mitigation provided with appropriate risk management training or familiarization?	☐Yes ☐No ☐Partial	
4.1-4	Is there evidence of organization-wide SMS education or awareness efforts?	☐Yes ☐No ☐Partial	
Element 4.2 — Safety communication			
4.2-1	Does [Organization] participate in sharing safety information with relevant external industry product and service providers or organizations, including the relevant aviation regulatory organizations?	☐Yes ☐No ☐Partial	
4.2-2	Is there evidence of a safety (SMS) publication, circular or channel for communicating safety (SMS) matters to employees?	☐Yes ☐No ☐Partial	
4.2-3	Are [Organization] SMS manual and related guidance material accessible or disseminated to all relevant personnel?	☐Yes ☐No ☐Partial	
4.2-4	Is safety-critical information disseminated throughout the [organization] and is the effectiveness of safety communication monitored?	☐Yes ☐No ☐Partial	
4.2-5	Is there a procedure that explains why particular safety actions are taken and why safety procedures are introduced or changed?	☐Yes ☐No ☐Partial	

DETAILED SMS GAP ANALYSIS AND IMPLEMENTATION TASKS (TABLE ATT-1-2**)**

The initial gap analysis checklist in Table ATT-1-1 should then be followed up by using the detailed "SMS gap analysis and implementation task identification plan" in Table ATT-1-2. Once completed, Table ATT-1-2 will provide follow-up analysis on details of the gaps and help translate these into actual required tasks and subtasks in the specific context of the organization's processes and procedures. Each task will then accordingly be assigned to appropriate individuals or groups for action. It is important that correlation of individual element/task development with their descriptive placeholders in the SMS document be provided for in Table ATT-1-2 in order to trigger progressive updating of the draft SMS document as each element is implemented or enhanced. (Initial element write-ups in SMS documents tend to be anticipatory rather than declaratory.)

3. ACTIONS/TASKS IMPLEMENTATION SCHEDULE (TABLE ATT-1-3**)**

Table ATT-1-3 will show the milestones (start-end dates) scheduled for each task/action. For a phased implementation approach, these tasks/actions will need to be sorted according to the phase allocation of their related elements. Refer to Attachment 2 of this AC for the phased prioritization of SMS elements as appropriate. Table ATT-1-3 can be a separate consolidation of all outstanding actions/tasks or, if preferred, be a continuation of Table ATT-1-2 in the form of a spreadsheet. Where it is anticipated that the actual number of tasks/actions and their milestones are sufficiently voluminous and complex so as to require utilizing a project management software to manage them, this may be done by using software such as MS project/Gantt chart as appropriate. Table ATT-1-4 is an illustration of a Gantt chart.

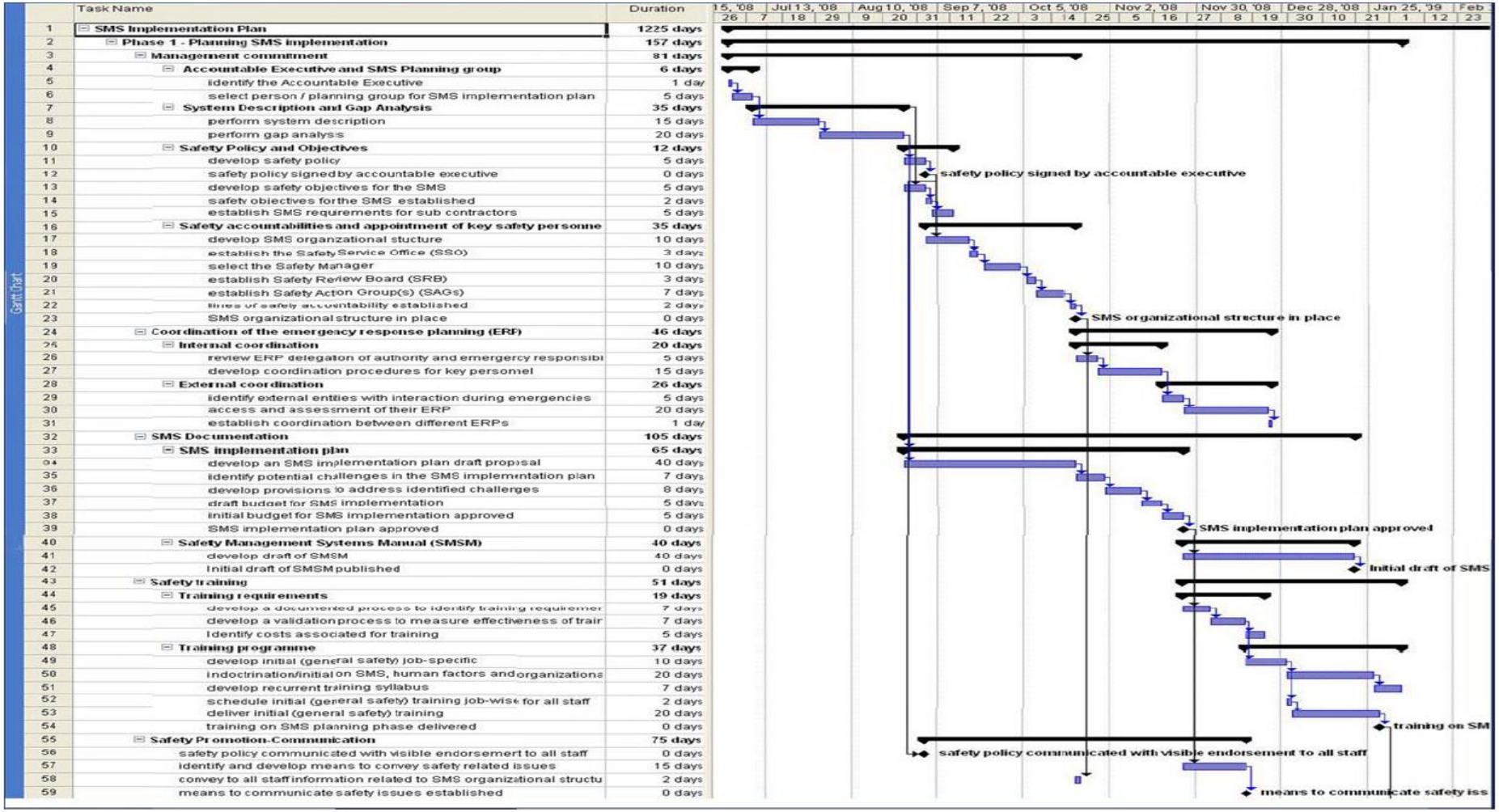
Table ATT-1-2 Example SMS gap analysis and implementation task identification plan

GAQ Ref		*Gap analysis question*	*Answer (Yes/No/Partial)*	*Description of Gap*	*Action/Task required to fill the gap*	*Assigned task group/person*	*SMS document reference*	*Status of action/ task (Open/WIP/Closed)*
1.1-1		Is there a safety policy in place	Partial	The existing safety policy addresses OSHE only.	a) enhance the existing safety policy to include aviation SMS objectives and policies or develop a separate aviation safety policy; b) have the safety policy approved and signed by the accountable executive	Task Group 1	Chapter 1 Section 1.3	Open

Table ATT-1-3. Example SMS implementation schedule

Action/task required to fill the gap	*SMS document ref.*	*Assigned task group/person*	*Status of action/task*	*Schedule/timeline*												
				1Q 10	*2Q 10*	*3Q 10*	*4Q 10*	*1Q 11*	*2Q 11*	*3Q 11*	*4Q 11*	*1Q 12*	*2Q 12*	*3Q 12*	*4Q 12*	*Etc.*
1.1-1 a) Enhance the existing safety policy to include aviation SMS objectives and policies or develop a separate aviation safety policy.	Chapter 1, Section 1.3.	Task Group 1	Open													
1.1-1 b) Require the safety policy to be approved and signed by the accountable executive.																

Table ATT-1-4. Sample SMS implementation schedule (Gantt chart)



	Task Name	Duration
1	SMS Implementation Plan	1225 days
2	Phase 1 - Planning SMS implementation	157 days
3	Management commitment	81 days
4	Accountable Executive and SMS Planning group	6 days
5	identify the Accountable Executive	1 day
6	select person / planning group for SMS implementation plan	5 days
7	System Description and Gap Analysis	35 days
8	perform system description	15 days
9	perform gap analysis	20 days
10	Safety Policy and Objectives	12 days
11	develop safety policy	5 days
12	safety policy signed by accountable executive	0 days
13	develop safety objectives for the SMS	5 days
14	safety objectives for the SMS established	2 days
15	establish SMS requirements for sub contractors	5 days
16	Safety accountabilities and appointment of key safety personne	35 days
17	develop SMS organizational stucture	10 days
18	establish the Safety Service Office (SSO)	3 days
19	select the Safety Manager	10 days
20	establish Safety Review Board (SRB)	3 days
21	establish Safety Action Group(s) (SAGs)	7 days
22	lines of safety accountability established	2 days
23	SMS organizational structure in place	0 days
24	Coordination of the emergeacy response planning (ERP)	46 days
25	Internal coordination	20 days
26	review ERP delegation of authority and emergercy responsibi	5 days
27	develop coordination procedures for key personnel	15 days
28	External coordination	26 days
29	identify external entities with interaction during energencies	5 days
30	access and assessment of their ERP	20 days
31	establish coordination between different ERPs	1 day
32	SMS Documentation	105 days
33	SMS implementation plan	65 days
34	develop an SMS implementation plan draft proposal	40 days
35	identify potential challenges in the SMS implementation plan	7 days
36	develop provisions to address identified challerges	8 days
37	draft budget for SMS implementation	5 days
38	initial budget for SMS implementation approved	5 days
39	SMS implementation plan approved	0 days
40	Safety Management Systems Manual (SMSM)	40 days
41	develop draft of SMSM	40 days
42	Initial draft of SMSM published	0 days
43	Safety training	51 days
44	Training requirements	19 days
45	develop a documented process to identify training requiremer	7 days
46	develop a validation process to measure effectiveness of trair	7 days
47	Identify costs associated for training	5 days
48	Training programme	37 days
49	develop initial (general safety) job-specific	10 days
50	indoctrination/initial on SMS, human factors and organizations	20 days
51	develop recurrent training syllabus	7 days
52	schedule initial (general safety) training job-wise for all staff	2 days
53	deliver initial (general safety) training	20 days
54	training on SMS planning phase delivered	0 days
55	Safety Promotion-Communication	75 days
56	safety policy communicated with visible endorsement to all staff	0 days
57	identify and develop means to convey safety related issues	15 days
58	convey to all staff information related to SMS organizational structu	2 days
59	means to communicate safety issues established	0 days

ATTACHMENT 2 SMS PHASED IMPLEMENTATION APPROACH

Commercial Air Operator's Certificate (AOC) holders and Repair Station should completed the Phase IV by December 31, 2016. Organization responsible for the type design or manufacture of aircraft, newly entry Operator and Repair Station should follow the time frame and implementation phases in the Table ATT-2-1.

0. General

0.1 The objective of this attachment is to introduce an example of the four SMS implementation phases. The implementation of an SMS is a systematic process. Nevertheless, this process may be quite a challenging task depending on factors, such as the availability of guidance material and resources required for implementation, as well as the service provider's pre-existing knowledge of SMS processes and procedures.

0.2 The reasons for a phased approach to SMS implementation include:

a) the provision of a manageable series of steps to follow in implementing an SMS, including allocation of resources;

b) the need to allow implementation of SMS framework elements in various sequences, depending upon the results of each service provider's gap analysis;

c) the initial availability of data and analytic processes to support reactive, proactive and predictive safety management practices; and

d) the need for a methodical process to ensure effective and sustainable SMS implementation.

0.3 The phased approach recognizes that implementation of a fully mature SMS is a multi-year process. A phased implementation approach permits the SMS to become more robust as each implementation phase is completed. Fundamental safety management processes are completed before moving to successive phases involving processes of greater complexity.

0.4 Four implementation phases are proposed for an SMS. Each phase is associated with various elements (or sub-elements) as per the SMS framework. It is apparent that the particular configuration of elements in this guidance material is not meant to be absolute. Service providers may choose to make adjustments as may be deemed appropriate for the circumstances. A summary of the four phases of SMS implementation and their corresponding elements is shown in Table ATT-2-1.

1.1 Phase 1

The objective of Phase 1 of SMS implementation is to provide a blueprint of how the SMS requirements will be met and integrated into the organization's control systems, as well as an accountability framework for the implementation of the SMS.

During Phase 1, basic planning and assignment of responsibilities are established. Central to Phase 1 is the gap analysis. From the gap analysis, an organization can determine the status of its existing safety management processes and can begin planning for the development of further safety management processes. The significant output of Phase 1 is the SMS implementation plan.

At the completion of Phase 1, the following activities should be finalized in such a manner that meets the expectations of the civil aviation oversight authority, as set forth in relevant requirements and guidance material:

Table ATT-2-1 Four phases of SMS implementation

Phase 1 (12 months)*	*Phase 2 (12 months)*	*Phase 3 (18 months)*	*Phase 4 (18 months)*
1. SMS Element 1.1 (i): a) identify the SMS accountable executive; b) establish an SMS implementation team; c) define the scope of the SMS; d) perform an SMS gap analysis. **2. SMS Element 1.5 (i):** a) develop an SMS implementation plan. **3. SMS Element 1.3:** a) establish a key person/office responsible for the administration and maintenance of the SMS. **4. SMS Element 4.1 (i):** a) establish an SMS training programme for personnel, with priority for the SMS implementation team. **5. SMS Element 4.2 (i):** a) initiate SMS/safety communication channels.	**1. SMS Element 1.1 (ii):** a) establish the safety policy and objectives, **2. SMS Element 1.2:** a) define safety management responsibilities and accountabilities across relevant departments of the organization; b) establish an SMS/safety coordination mechanism/ committee; c) establish departmental/ divisional SAGs where applicable. **3. SMS Element 1.4:** a) establish an emergency response plan. **4. SMS Element 1.5 (ii):** a) initiate progressive development of an SMS document/manual and other supporting documentation.	**1. SMS Element 2.1 (i):** a) establish a voluntary hazard reporting procedure. **2. SMS Element 2.2:** a) establish safety risk management procedures. **3. SMS Element 3.1 (i):** a) establish occurrence reporting and investigation procedures; b) establish a safety data collection and processing system for high- consequence outcomes; c) develop high-consequence SPIs and associated targets and alert settings. **4. SMS Element 3.2:** a) establish a management of change procedure that includes safety risk assessment. **5. SMS Element 3.3 (i):** a) establish an internal quality audit programme; b) establish an external quality audit programme.	**1. SMS Element 1.1 (iii):** a) enhance the existing disciplinary procedure/ policy with due consideration of unintentional errors or mistakes from deliberate or gross violations. **2. SMS Element 2.1 (ii):** a) integrate hazards identified from occurrence investigation reports with the voluntary hazard reporting system; b) integrate hazard identification and risk management procedures with the subcontractor's or customer's SMS where applicable. **3. SMS Element 3.1 (ii):** a) enhance the safety data collection and processing system to include lower consequence events; b) develop lower-consequence SPIs and associated targets/alert settings. **4. SMS Element 3.3 (ii):** a) establish SMS audit programmes or integrate them into existing internal and external audit programmes; b) establish other operational SMS review/survey programmes where appropriate. **5. SMS Element 4.1 (ii):** a) ensure that the SMS training programme for all relevant personnel has been completed. **6. SMS Element 4.2 (ii):** a) promote safety information sharing and exchange internally and externally.
SMS Element 1.5: SMS documentation (Phases 1 to 4) >>			
SMS Elements 4.1 and 4.2: SMS training, education and communication (Phases 1 and thereafter) >>>>>>>>>>>>>>>>>>			
Note 1.— The implementation period indicated is an approximation. The actual implementation period is dependent on the scope of actions required for each element allocated and the size/complexity of the organization. *Note 2.— The SMS element numbers indicated correspond to the ICAO SMS element numbers. Suffixes such as a), b) and c) indicate that the element has been subdivided to facilitate the phased implementation approach.*			

1.1.1 Management commitment and responsibility — Element 1.1 (i)

a) Identify the accountable executive and the safety accountabilities of managers. This activity is based on Elements 1.1 and 1.2 of the SMS framework.

b) Establish an SMS implementation team. The team should be comprised of representatives from the relevant departments. The team's role is to drive the SMS implementation from the planning stage to its final implementation. Other functions of the implementation team will include but not be limited to:

1) developing the SMS implementation plan;

2) ensuring the adequate SMS training and technical expertise of the team in order to effectively implement the SMS elements and related processes; and

3) monitoring of and reporting on the progress of the SMS implementation, providing regular updates and coordinating with the SMS accountable executive.

c) Define the scope of the organization's activities (departments/divisions) to which the SMS will be applicable. The scope of the organization's SMS applicability will subsequently need to be described in the SMS document as appropriate. This activity is based on Element 1.5 of the SMS framework. Guidance on the system description is provided in 1.4.2 of this AC.

d) Conduct a gap analysis of the organization's current systems and processes in relation to the SMS framework requirements (or the relevant SMS regulatory requirements). Guidance on an SMS gap analysis for a service provider is provided in Attachment 1 to this AC.

1.1.2 SMS implementation plan — Element 1.5 (i)

Develop an SMS implementation plan on how the organization will implement the SMS on the basis of the identified system and process gaps resulting from the gap analysis. An example of a basic SMS implementation plan is provided in Attachment 1 to this AC.

1.1.3 Appointment of key safety personnel — Element 1.3

a) Identify the key SMS person (safety/quality function) within the organization who will be responsible for administering the SMS on behalf of the accountable executive.

b) Establish the safety services office.

1.1.4 Training and education — Element 4.1 (i)

a) Conduct a training needs analysis.

b) Organize and set up schedules for appropriate training of all staff according to their individual responsibilities and involvement in the SMS.

c) Develop safety training considering:

1) initial (general safety) job-specific training; and

2) recurrent training.

d) Identify the costs associated with training.

e) Develop a validation process that measures the effectiveness of training.

f) Establish a safety training records system.

1.1.5 Safety communication — Element 4.2 (i)

a) Initiate a mechanism or medium for safety communication.

b) Establish a means to convey safety information through any of:

1) safety newsletters, notices and bulletins;

2) websites;

3) email.

1.2 Phase 2

The objective of Phase 2 is to implement essential safety management processes, while at the same time correcting potential deficiencies in existing safety management processes. Most organizations will have some basic safety management activities in place at different levels of implementation. This phase aims at consolidating existing activities and developing those which do not yet exist.

1.2.1 Management commitment and responsibility — Element 1.1 (ii)

a) Develop a safety policy.

b) Have the accountable executive sign the safety policy.

c) Communicate the safety policy throughout the organization.

d) Establish a review schedule for the safety policy to ensure it remains relevant and appropriate to the organization.

e) Establish safety objectives for the SMS by developing safety performance standards in terms of:

1) safety performance indicators;

2) safety performance targets and alert levels; and

3) action plans.

f) Establish the SMS requirements for subcontractors:

1) establish a procedure to write SMS requirements into the contracting process; and

2) establish the SMS requirements in the bidding documentation.

1.2.2 Safety accountabilities — Element 1.2

a) Define safety accountabilities and communicate them throughout the organization.

b) Establish the safety action group (SAG).

c) Establish the safety/SMS coordination committee.

d) Define clear functions for the SAG and the safety/SMS coordination committee.

e) Establish lines of communication between the safety services office, the accountable executive, the SAG and the safety/SMS coordination committee.

f) Appoint the accountable executive as the chairperson of the safety/SMS coordination committee.

g) Develop a schedule of meetings for the safety services office to meet with the safety/SMS coordination committee and SAG as needed.

1.2.3 Coordination of emergency response planning — Element 1.4

a) Review the outline of the ERP related to the delegation of authority and assignment of emergency responsibilities.

b) Establish coordination procedures for action by key personnel during the emergency and the return to normal operations.

c) Identify external entities that will interact with the organization during emergency situations.

d) Assess the respective ERPs of the external entities.

e) Establish coordination between the different ERPs.

f) Incorporate information about the coordination between the different ERPs in the organization's SMS documentation.

Note.— Refer to Attachment 3 for further guidance on ERP.

1.2.4 SMS documentation — Element 1.5 (ii)

a) Create an SMS documentation system to describe, store, retrieve and archive all SMS-related information and records by:

1) developing an SMS document that is either a stand-alone manual or a distinct section within an existing controlled organization manual;

2) establishing an SMS filing system to collect and maintain current records relating to the organization's ongoing SMS processes;

3) maintaining records to provide a historical reference as well as the current status of all SMS processes such as: a hazard register; an index of completed safety assessments; SMS/safety training records; current SPIs and associated safety objectives; internal SMS audit reports; SMS/safety committee meeting minutes and the SMS implementation plan;

4) maintaining records that will serve as evidence of the SMS operation and activities during internal or external assessment or audit of the SMS.

1.3 Phase 3

The objective of Phase 3 is to establish safety risk management processes. Towards the end of Phase 3, the organization will be ready to collect safety data and perform safety analyses based on information obtained through the various reporting systems.

1.3.1 Hazard identification — Element 2.1 (i)

a) Establish a voluntary reporting procedure. Refer to Attachment 4 for guidance.

b) Establish a programme/schedule for systematic review of all applicable aviation safety-related processes/equipment that are eligible for the HIRM process.

c) Establish a process for prioritization and assignment of identified hazards for risk mitigation.

1.3.2 Safety risk assessment and mitigation — Element 2.2

a) Establish a safety risk management procedure, including its approval and periodic review process.

b) Develop and adopt safety risk matrices relevant to the organization's operational or production processes.

c) Include adopted safety risk matrices and associated instructions in the organization's SMS or risk management training material.

1.3.4 Safety performance monitoring and measurement — Element 3.1 (i)

a) Establish an internal occurrence reporting and investigation procedure. This may include mandatory or major defect reports (MDR) where applicable.

b) Establish safety data collection, processing and analysis of high-consequence outcomes.

c) Establish high consequence safety indicators (initial ALoSP) and their associated target and alert settings. Examples of high-consequence safety indicators are accident rates, serious incident rates and monitoring of high risk non-compliance outcomes. Refer to Attachment 5 for guidance on safety performance indicators.

d) Reach an agreement with the CAA on safety performance indicators and safety performance targets.

1.3.5 The management of change — Element 3.2

a) Establish a formal process for the management of change that considers:

1) the vulnerability of systems and activities;

2) the stability of systems and operational environments;

3) past performance;

4) regulatory, industry and technological changes.

b) Ensure that management of change procedures address the impact on existing

safety performance and risk mitigation records before implementing new changes.

c) Establish procedures to ensure that safety assessment of new aviation safety-related operations, processes and equipment are conducted (or accounted for) as applicable, before they are commissioned.

1.3.6 Continuous improvement of the SMS — Element 3.3 (i)

a) Develop forms for internal evaluations.

b) Define an internal audit process.

c) Define an external audit process.

d) Define a schedule for evaluation of facilities, equipment, documentation and procedures to be completed through audits and surveys.

e) Develop documentation relevant to operational safety assurance.

1.4 Phase 4

Phase 4 is the final phase of SMS implementation. This phase involves the mature implementation of safety risk management and safety assurance. In this phase operational safety assurance is assessed through the implementation of periodic monitoring, feedback and continuous corrective action to maintain the effectiveness of safety risk controls.

1.4.1 Management commitment and responsibility — Element 1.1 (iii)

Enhance the existing disciplinary procedure/policy with due consideration of unintentional errors/mistakes from deliberate/gross violations.

1.4.2 Hazard identification — Element 2.1 (ii)

a) Integrate the hazards identified from occurrence investigation reports with the voluntary reporting system.

b) Integrate hazard identification and risk management procedures with the subcontractor or customer SMS where applicable.

c) If necessary, develop a process for prioritizing collected hazards for risk mitigation based on areas of greater need or concern.

1.4.3 Safety performance monitoring and measurement — Element 3.1 (ii)

a) Enhance the safety data collection and processing system to include lower-consequence events.

b) Establish lower-consequence safety/quality indicators with target/alert level monitoring as appropriate (mature ALoSP).

c) Reach an agreement with the CAA on lower-consequence safety performance indicators and safety performance target/alert levels.

1.4.4 Continuous improvement of the SMS — Element 3.3 (ii)

a) Establish SMS audits or integrate them into existing internal and external audit programmes.

b) Establish other operational SMS review/survey programmes where appropriate.

1.4.5 Training and education — Element 4.1 (ii)

Complete an SMS training programme for all relevant personnel.

1.4.6 Safety communication — Element 4.2 (ii)

Establish mechanisms to promote safety information sharing and exchange internally and externally.

1.5 SMS elements progressively implemented throughout Phases 1 to 4

In the phased approach implementation, the following three key elements are progressively implemented throughout each phase:

1.5.1 SMS documentation — Element 1.5

As the SMS progressively matures the relevant SMS manual and safety documentation must be revised and updated accordingly. This activity will be inherent to all phases of SMS implementation and must be maintained after implementation as well.

1.5.2 Training and education — Element 4.1 and Safety communication — Element 4.2

As with SMS documentation, training, education and safety communication are important ongoing activities throughout all phases of SMS implementation. As the SMS evolves, new processes, procedures or regulations may come into effect or existing procedures may change to cater for the SMS requirements. To ensure these changes are effectively understood and implemented by all personnel involved in safety related duties it is vital that training and communication remain as ongoing activities throughout and after the complete implementation of the SMS.

ATTACHMENT 3 EMERGENCY RESPONSE PLANNING

1. Perhaps because aviation accidents are rare events, few organizations are prepared when one occurs. Many organizations do not have effective plans in place to manage events during or following an emergency or crisis. How an organization fares in the aftermath of an accident or other emergency can depend on how well it handles the first few hours and days following a major safety event. An emergency response plan (ERP) outlines in writing what should be done after an accident or aviation crisis and who is responsible for each action. Among different product and service providers, such emergency planning may be known by different terms such as contingency plan, crisis management plan and continuing airworthiness support plan. In this manual, the generic term emergency response plan (ERP) is used to address the relevant contingency plans expected of aviation service providers whose products/services may have an impact on aviation safety.

2. While there is a tendency to think of emergency response planning with respect to aircraft or aerodrome operations, usually as a result of an aircraft accident, the expectation can equally be applied to other aviation service providers. In the case of ATS providers this may include a major power outage or loss of radar, communications or other major facilities. For a maintenance organization it may involve a serious breach of airworthiness requirements resulting in the grounding of a fleet (AOG). For a design and manufacturing organization, a serious design deficiency may result in a global AOG that requires emergency re-design, modification, production and retrofitting actions (emergency airworthiness directives) to address such a crisis. Where there is a possibility of an organization's aviation operations or activities being compromised by other crises or emergencies originating from external sources, such as a public health emergency/pandemic, these scenarios should also be addressed in its aviation ERP as appropriate. Hence, an ERP is essentially an integral component of an organization's safety risk management procedure to address all possible safety or quality-related emergencies, crises or events that its product or services could contribute to or be associated with.

   The ERP should address all possible/likely scenarios and have appropriate mitigating actions or processes put in place so that the organization, its customers, the public and/or the industry at large may have a better level of safety assurance as well as service continuity.

3. Successful response to an emergency begins with effective planning. An ERP provides the basis for a systematic approach to managing the organization's affairs in the aftermath of a significant unplanned event — in the worst case, a major accident.

4. The purpose of an emergency response plan is to ensure:

   a) delegation of emergency authority;

   b) assignment of emergency responsibilities;

   c) documentation of emergency procedures and processes;

   d) coordination of emergency efforts internally and with external parties;

   e) safe continuation of essential operations while the crisis is being managed;

   f) proactive identification of all possible emergency events/scenarios and their corresponding mitigation actions, etc.

5. To be effective, an ERP should:

   a) be appropriate to the size, nature and complexity of the organization;

b) be readily accessible to all relevant personnel and other organizations where applicable;

c) include checklists and procedures relevant to specific emergency situations;

d) have quick-reference contact details of relevant personnel;

e) be regularly tested through exercises;

f) be periodically reviewed and updated when details change, etc.

ERP contents

6. An ERP would normally be documented in the format of a manual that should set out the responsibilities, roles and actions of the various agencies and personnel involved in dealing with specific emergencies. An ERP should take account of such considerations as:

a) *Governing policies.* The ERP should provide direction for responding to emergencies, such as governing laws and regulations for investigations, agreements with local authorities, company policies and priorities.

b) *Organization.* The ERP should outline management's intentions with respect to the responding organizations by:

1) designating who will lead and who will be assigned to the response teams;

2) defining the roles and responsibilities of personnel assigned to the response teams;

3) clarifying the reporting lines of authority;

4) setting up an emergency management centre (EMC);

5) establishing procedures for receiving a large number of requests for information, especially during the first few days after a major accident;

6) designating the corporate spokesperson for dealing with the media;

7) defining what resources will be available, including financial authorities for immediate activities;

8) designating the company representative to any formal investigations undertaken by State officials;

9) defining a call-out plan for key personnel.

An organizational chart could be used to show organizational functions and communication relationships.

c) *Notifications.* The plan should specify who in the organization should be notified of an emergency, who will make external notifications and by what means. The notification needs of the following should be considered:

1) management;

2) State authorities (search and rescue, the regulatory authority, the accident investigation board, etc.);

3) local emergency response services (aerodrome authorities, fire fighters, police, ambulance, medical agencies, etc.);

4) relatives of victims (a sensitive issue that, in many States, is handled by the police);

5) company personnel;

6) media; and

7) legal, accounting, insurers, etc.

d) *Initial response.* Depending on the circumstances, an initial response team may be dispatched to the accident or crisis site to augment local resources and oversee the organization's interests. Factors to be considered for such a team include:

1) Who should lead the initial response team?

2) Who should be included on the initial response team?

3) Who should speak for the organization at the accident site?

4) What would be required by way of special equipment, clothing, documentation, transportation, accommodation, etc.?

e) *Additional assistance.* Employees with appropriate training and experience can provide useful support during the preparation, exercising and updating of an organization's ERP. Their expertise may be useful in planning and executing such tasks as:

1) acting as passengers or customers in exercises;

2) handling survivors or external parties;

3) dealing with next of kin, authorities, etc.

f) *Emergency management centre (EMC).* An EMC (normally on standby mode) may be established at the organization's headquarters once the activation criteria have been met. In addition, a command post (CP) may be established at or near the crisis site. The ERP should address how the following requirements are to be met:

1) staffing (perhaps for 24 hours a day, 7 days per week, during the initial response period);

2) communications equipment (telephones, facsimile, Internet, etc.);

3) documentation requirements, maintenance of emergency activity logs;

4) impounding related company records;

5) office furnishings and supplies; and

6) reference documents (such as emergency response checklists and procedures, company manuals, aerodrome emergency plans and telephone lists).

The services of a crisis centre may be contracted from an airline or other specialist organization to look after the service provider's interests in a crisis away from home base. Company personnel would normally supplement such a contracted centre as soon as possible.

g) *Records.* In addition to the organization's need to maintain logs of events and activities, the organization will also be required to provide information to any State investigation team. The ERP should address the following types of information required by investigators:

1) all relevant records about the product or service concerned;

2) lists of points of contact and any personnel associated with the occurrence;

3) notes of any interviews (and statements) with anyone associated with the event;

4) any photographic or other evidence.

h) *Accident site.* For a major accident, representatives from many jurisdictions have legitimate reasons for accessing the site: for example, police; fire fighters; medics; aerodrome authorities; coroners (medical examining officers) to deal with fatalities; State accident investigators; relief agencies such as the Red Cross and even the media. Although coordination of the activities of these stakeholders is the responsibility of the State's police and/or investigating authority, the service provider should clarify the following aspects of activities at the accident site:

1) nominating a senior company representative at the accident site if:

— at home base;

— away from home base;

— offshore or in a foreign State;

2) management of surviving victims;

3) the needs of the relatives of victims;

4) security of the wreckage;

5) handling of human remains and personal property of the deceased;

6) preservation of evidence;

7) provision of assistance (as required) to the investigation authorities;

8) removal and disposal of the wreckage; etc.

i) *News media.* How the company responds to the media may affect how well the company recovers from the event. Clear direction is required regarding, for example:

1) what information is protected by statute (FDR data, CVR and ATC recordings, witness statements, etc.);

2) who may speak on behalf of the parent organization at head office and at the accident site (public relations manager, chief executive officer or other senior executive, manager, owner);

3) prepared statements for immediate response to media queries;

4) what information may be released (what should be avoided);

5) the timing and content of the company's initial statement;

6) provisions for regular updates to the media.

j) *Formal investigations.* Guidance for company personnel dealing with State accident investigators and police should be provided.

k) *Family assistance.* The ERP should also include guidance on the organization's approach to assisting crisis victims or customer organizations. This guidance may include such things as:

1) State requirements for the provision of assistance services;

2) travel and accommodation arrangements to visit the crisis site;

3) programme coordinator and point(s) of contact for victims/customers;

4) provision of up-to-date information;

5) temporary assistance to victims or customers.

Note.— ICAO Circular 285, Guidance on Assistance to Aircraft Accident Victims and their Families*, provides further guidance on this subject.*

l) *Post-occurrence review.* Direction should be provided to ensure that, following the emergency, key personnel carry out a full debrief and record all significant lessons learned which may result in amendments to the ERP and associated procedures.

Checklists

7. Everyone involved in the initial response to a major aviation event will be suffering from some degree of disorientation. Therefore, the emergency response process lends itself to the use of checklists. These checklists can form an integral part of the company's operations manual or emergency response manual. To be effective, checklists must be regularly:

a) reviewed and updated (for example, currency of call-out lists and contact details); and

b) tested through realistic exercises.

Training and exercises

8. An ERP is a paper indication of intent. Hopefully, much of an ERP will never be tested under actual conditions. Training is required to ensure that these intentions are backed by operational capabilities. Since training has a short "shelf life", regular drills and exercises are advisable. Some portions of the ERP, such as the call-out and communications plan, can be tested by "desktop" exercises. Other aspects, such as "on-site" activities involving other agencies, need to be exercised at regular intervals. Such exercises have the advantage of demonstrating deficiencies in the plan, which can be rectified before an actual emergency. For certain service providers such as airports, the periodic testing of the adequacy of the plan and the conduct of a full-scale emergency exercise may be mandatory.

ATTACHMENT 4 VOLUNTARY AND CONFIDENTIAL REPORTING SYSTEMS

Note.— The guidance below is based on the example of an integrated air operator and maintenance organization.

An organization's voluntary and confidential reporting system should, as minimum, define:

(a) the objective of the reporting system;

(b) the scope of the aviation sectors/areas covered by the system;

(c) who can make a voluntary report;

(d) when to make such a report;

(e) how the reports are processed;

(f) contact to whom.

(a) The objective of the reporting system;

Example:

The key objective of [Organization name] voluntary and confidential reporting system is to enhance the safety of our company's aviation activities through the collection of reports on actual or potential safety deficiencies that would otherwise not be reported through other channels. Such reports may involve occurrences, hazards or threats relevant to the safety of our aviation activities. This system does not eliminate the need for formal reporting of accidents and incidents according to our company SOPs, as well as the submission of mandatory occurrence reports to the relevant regulatory authorities.

The [Name of system] is a voluntary, non-punitive, confidential occurrence and hazard reporting system administered by the [Name of department/office]. It provides a channel for the voluntary reporting of aviation occurrences or hazards relevant to our organization's aviation activities, while protecting the reporter's identity.

Note.— In establishing such a system, the organization will have to decide whether to integrate or segregate its Occupational Safety, Health and Environment (OSHE) reporting system from this aviation safety reporting system. This may depend on the respective aviation and OSHE authorities' expectations or requirements. Where there is a separate OSHE reporting system in the company, this should be highlighted accordingly in this paragraph to guide the reporter as necessary.

(b) The scope of the aviation sectors/areas covered by the system;

Example:

The [Name of system] covers areas such as:

a) flight operations;

b) hangar aircraft maintenance;

c) workshop component maintenance;

d) technical fleet management;

e) inventory technical management;

f) engineering planning;

g) technical services;

h) technical records;

i) line maintenance;

j) etc.

(c) Who can make a voluntary report;

Example:

If you belong to any of these operational areas or departments, you can contribute to aviation safety enhancement through the [Name of system] by reporting on occurrences, hazards or threats relevant to our organization's aviation activities:

a) flight and cabin crew members;

b) air traffic controllers;

c) licensed aircraft engineers, technicians or mechanics;

d) employees of maintenance, design and manufacturing organizations;

e) airport ground handling operators;

f) aerodrome employees;

g) general aviation personnel;

h) etc.

(d) When to make such a report;

Example:

You should make a report when:

a) you wish for others to learn and benefit from the incident or hazard but are concerned about protecting your identity;

b) there is no other appropriate reporting procedure or channel; and

c) you have tried other reporting procedures or channels without the issue having been addressed.

(e) How the reports are processed;

Example:

The [Name of system] pays particular attention to the need to protect the reporter's identity when processing all reports. Every report will be read and validated by the manager. The manager may contact the reporter to make sure he understands the nature and circumstances of the occurrence/hazard reported and/or to obtain the necessary additional information and clarification.

When the manager is satisfied that the information obtained is complete and coherent, he will de-identify the information and enter the data into the [Name of system] database.

Should there be a need to seek input from any third party, only the de-identified data will be used.

The [Name of system] form, with the date of return annotated, will eventually be returned to the reporter. The manager will endeavour to complete the processing within ten (10) working days if additional information is not needed. In cases where the manager needs to discuss with the reporter or consult a third party, more time may be needed.

If the manager is away from his office for a prolonged period, the alternate manager will process the report. Reporters can rest assured that every [Name of system] report will be read and followed through by either the manager or the alternate manager.

Safety information sharing within the company and the aviation community

Relevant de-identified reports and extracts may be shared within the company as well as with external aviation stakeholders as deemed appropriate. This will enable all concerned personnel and departments within the company as well as appropriate external aviation stakeholders to review their own operations and support the improvement of aviation safety as a whole.

If the content of a [Name of system] report suggests a situation or condition that poses an immediate or urgent threat to aviation safety, the report will be handled with priority and referred, after de-identification, to the relevant organizations or authorities as soon as possible to enable them to take the necessary safety actions.

(f) Contacting the [Name of system] manager;

Example:

You are welcome to call the [Name of system] manager to enquire about the [Name of system] or to request a preliminary discussion with the [Name of system] manager before making a report. The manager and alternate manager can be contacted during office hours from Monday to Friday at the following telephone numbers:

[Name of system] administrator

Mr. ABC

Tel.:

Alternate administrator

Mr. XYZ

Tel.:

ATTACHMENT 5 SMS SAFETY PERFORMANCE INDICATORS

1. Tables ATT 5-1 to ATT 5-2 (safety indicator examples) provide illustrative examples of State aggregate safety performance indicators (SPIs) and their corresponding alert and target level setting criteria. The SMS SPIs are reflected on the right-hand side of the tables. The corresponding alert and target level criteria for each indicator are to be accounted for as shown. The SSP safety performance indicators on the left-hand side of the tables are shown to indicate the necessary correlation between the SMS and SSP safety indicators. SMS SPIs should be developed by product and service providers in consultation with their respective State regulatory organizations. Their proposed SPIs will need to be congruent with the State's SSP safety indicators; hence necessary agreement/acceptance should be obtained.

2. Table ATT 5-3 (example of an SMS safety performance indicator chart) is an example of what a high consequence SMS safety performance indicator chart looks like. In this case it is an airline operator's reportable/mandatory incident rate. The chart on the left is the preceding year's performance, while the chart on the right is the current year's ongoing data updates. The alert level setting is based on basic safety metrics standard deviation criteria. The Excel spreadsheet formula is "=STDEVP". For the purpose of manual standard deviation calculation, the formula is:

$$\sigma = \sqrt{\frac{\sum(x-\mu)^2}{N}}$$

where "X" is the value of each data point; "N" is the number of data points and "μ" is the average value of all the data points.

3. The target setting is a desired percentage improvement (in this case 5%) over the previous year's data point average. This chart is generated by the data sheet shown in Table ATT 5-4.

4. The data sheet in Table ATT 5-4 is used to generate the safety performance indicator chart shown in Table ATT 5-3. The same can be used to generate any other safety performance indicator with the appropriate data entry and safety performance indicator descriptor amendment.

5. Table ATT 5-5 (example of an SMS performance summary) provides a summary of all the operators' SMS safety indicators, with their respective alert and target level outcomes annotated. Such a summary may be compiled at the end of each monitoring period to provide an overview of the SMS performance. If a more quantitative performance summary measurement is desired, appropriate points may be assigned to each Yes/No outcome for each target and alert outcome. Example:

High-consequence indicators:

Alert level not breached [Yes (4), No (0)]

Target achieved [Yes (3), No (0)]

Lower-consequence indicators:

Alert level not breached [Yes (2), No (0)]

Target achieved [Yes (1), No (0)]

This may allow a summary score (or percentage) to be obtained to indicate the overall SMS safety performance at the end of any given monitoring period.

Table ATT 5-1. Examples of safety performance indicators for air operators

SMS safety performance indicators (individual service provider)

High-consequence indicators (occurrence/outcome-based)			*Lower-consequence indicators (event/activity-based)*		
Safety performance indicator	Alert level criteria	Target level criteria	Safety performance indicator	Alert level criteria	Target level criteria
Air operator individual fleet monthly serious incident rate (e.g. per 1000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator combined fleet monthly incident rate (e.g. per 1000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
Air operator combined fleet monthly serious incident rate (e.g. per 1000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration
Air operator engine IFSD incident rate (e.g. per 1000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	Operator voluntary hazard report rate (e.g. per 1000 FH)	Consideration	Consideration
			Operator DGR incident report rate (e.g. per 1000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate
Additional samples refer to Table ATT 5-2-1					

Table ATT 5-2. Examples of safety performance indicators for maintenance organizations

SMS safety performance indicators (individual service provider)

High-consequence indicators (occurrence/outcome-based)			*Lower-consequence indicators (event/activity-based)*		
MRO/POA quarterly rate of component technical warranty claims	Average + 1/2/3 SD (annual or 2 yearly reset)	__% (e.g. 5%) improvement between each annual mean rate	MRO/POA/DOA internal QMS/SMS annual audit LEI % or findings rate (findings per audit)	Consideration	Consideration

Table ATT 5-2-1 Safety Performance Indicator Samples (Indicators for **systems** issue, Indicators for **operational** issue, *Indicators to monitor **external factors**)*

Note: Before adopting any of these as your own SPIs, you should determine if the particular indicator is relevant to your specific organization, considering the maturity of your SMS and the specific features you would like to improve or that need attention.

Indicators for systems issue		
Area	**Focus of measurement**	**Metrics**
Compliance	-internal audits/compliance monitoring: all non- compliances	- total number per audit planning cycle / trend - % of findings analyzed for their safety significance,
	-internal audits/ compliance monitoring: significant non-compliances	- number of significant findings versus total number of findings - number of repeat findings within audit planning cycle
	-internal audits/ compliance monitoring: responsiveness to corrective action requests	- average lead time for completing corrective actions per oversight planning cycle - trend
	-external audits/ compliance monitoring: all non- compliances	- total number per oversight planning cycle / trend - % of findings analyzed for their safety significance,
	-external audits: significant non-compliances	- number of significant findings versus total number of findings
	-external audits: responsiveness to corrective action requests	- average lead time for completing corrective actions per oversight planning cycle - trend
	-consistency of results between internal and external audits/compliance monitoring	- number of significant findings only revealed through external audits
SMS effectiveness	-strategic management	- the degree to which safety is considered in the organization's official plans and strategy documents - the frequency with which the organization's official plans and strategy documents are reviewed with regards to safety
	-management commitment	- number of management walk-arounds per month/quarter/year - number of management meetings dedicated to safety per month/quarter/year

Indicators for systems issue		
Area	**Focus of measurement**	**Metrics**
SMS effectiveness	-turnover rate of key safety personnel	- length of term - number of cases where the reasons for departure of key personnel have been analyzed
	-supervision	- number of cases where supervisors provided positive feedback on safety-conscious behavior of your staff per month/quarter/year
	-reporting	- number of reports received per month/quarter/year & trend - % of reports for which feedback to reporter was provided within 10 working days - % of reports followed by an independent safety review
	-hazard identification	- number of accident/serious incident scenarios analyzed to support Safety Risk Management (SRM) per month/quarter/year - number of new hazards identified through the internal reporting system per month/quarter/year & trend - findings from external audits concerning hazards that have not been perceived by personnel/ management previously - number of safety reports received from staff per month/quarter/year & trend
	-risk controls	- number of new risk controls validated per month/quarter/year - % of overall budget allocated to new risk controls
	-HR management & competence development	- % of staff for which a competence profile has been established - % of staff who have had safety management training - frequency for reviewing competence profiles - frequency of reviewing the scope, content, and quality of training programs - number of changes made to training programs following feedback from staff per month/quarter/year - number of changes made to training programs following analysis of internal safety reports per month/quarter/year

Indicators for systems issue		
Area	**Focus of measurement**	**Metrics**
SMS effectiveness	- management of change	- number of organizational changes for which a formal safety risk assessment has been performed per month/quarter/year & trend - number of changes to Standard Operating Procedures (SOPs) for which a formal safety risk assessment has been performed per month/quarter/year & trend - number of technical changes (e.g., new equipment, new facilities, new hardware) for which a formal safety risk assessment has been performed per month/quarter/year & trend - number of risk controls implemented for changes per month/quarter/year & trend - % of changes (organizational/SOP/technical etc.) that have been subject to risk assessment
	-emergency response planning (ERP)	- number of emergency drills per year - frequency of reviewing the ERP - number of trainings on ERP per month/quarter/year - % of staff trained on the ERP within a quarter/year - number of meetings with main partners and contractors to coordinate ERP per month/quarter/year
	- safety promotion	- number of safety communications published - number of trainings performed - number of safety briefings performed. - (per month/quarter/year)
	-safety culture	- the extent to which personnel consider safety as a value that guides their everyday work (e.g., on a scale from 1= low to 5=high) - the extent to which personnel consider that safety is highly valued by their management - the extent to which human performance principles are applied - the extent to which the personnel take initiatives in improving organizational practices or report problems to management

Indicators for systems issue		
Area	**Focus of measurement**	**Metrics**
		- the extent to which safety conscious behavior is supported - the extent to which staff and management are aware of the risks your operations imply for themselves and for others.

Indicators for operational issue		
Area	**High Severity outcome to be prevented**	**Metrics**
Air Operators (see also Air Traffic Management/ Air Navigation Services for additional indicators)	-traffic collision	- number of Traffic Collision Avoidance System (TCAS) resolution advisories per 1000 flight hours (FH)
	-runway excursion	- number of unstabilized approaches per 1000 landings
	-ground collision	- number of runway incursions per 1000 take-offs
	-controlled flight into terrain	- number of Ground Proximity Warning System (GPWS) and Enhanced Ground Proximity Warning System (EGPWS) warnings per 100 take-offs
	-accident/incident related to poor flight preparation	- number of cases where flight preparation had to be done in less than the normally allocated time - number of short fuel events per 100 flights - number of fuel calculation errors per 100 flights
	-accident/incident related to fatigue	- number of extensions to flight duty periods per month/quarter/year & trends
	-accident/incident related to ground-handling	- number of incidents with ground handlers per month/quarter/year & trends - number of mass and balance errors per ground handler per month/quarter/year & trends - number of dysfunctions per ground handler per month/quarter/year & trends

Indicators for operational issue		
Area	**High Severity outcome to be prevented**	**Metrics**
Air Operators	- maintenance related accident/incidents	- Pilots Reports (PIREPS) per 100 take offs - deferred items per month and aircraft - In Flight Shut Down (IFSD) per 1000 FH - In Flight Turn Backs (IFTB) and deviations per 100 take offs - number of service difficulty reports filed with the Civil Aviation Authority dispatch reliability: - number of delays of more than 15 minutes due to technical issues per 100 take offs - number of cancellations per 100 scheduled flights due to technical issues - rejected take offs per 100 take offs due to technical issues
Maintenance Organizations	-maintenance planning/rostering related accident/incidents	- % of work orders for which a detailed planning has been made
	-maintenance planning/rostering related accident/incidents	maintenance engineer fatigue / maintenance error: - % of work orders with a difference > 10% between the expected lead time and the actual processing time - % of work orders with a difference > 10% between the estimated work force and the actual needs
	-maintenance related accident/incidents	maintenance error: - % of work orders that required re-work - number of duplicate inspections that identified a maintenance error
	-maintenance data related accident/incidents	- number of safety reports related to ambiguous maintenance data
	-maintenance related accident/incidents	- number of investigations performed following components removed from service significantly before expected life limit was reached
Air Traffic Management/ Air Navigation Services	-traffic collision	- number of level busts/exposure - number of TCAS required action (RA) (with and without loss of separation) /exposure - number of minimum separation infringement/exposure

Indicators for operational issue		
Area	**High Severity outcome to be prevented**	**Metrics**
		- number of inappropriate separation (airspace in which separation minima is not applicable) /exposure - number of aircraft deviation from air traffic control (ATC) clearance/exposure - number of airspace infringements/exposures
	-traffic collision / controlled flight into terrain	- number of aircraft deviations from air traffic management (ATM) procedures/exposure - number of inappropriate or absences of ATC assistance to aircraft in distress
	-controlled flight into terrain	- number of near Controlled Flight Into Terrain (CFIT) IFSD /exposure
	-runway excursion	- number of inappropriate ATC instruction (no instruction, wrong information, action communicated too late, etc.)
	-runway incursion	- % of runway incursions where no avoiding action was necessary - % of runway incursion where avoiding action was necessary
Airports	-post-accident/incident fire	- Fire Extinguishing Services (ICAO Airport Fire Fighting Categories) decrease in value (# decrease- hours/ # airport annual operating hours) - number of radio/phone failures per 100 operations - number of fire rescue vehicles failures per 100 operations
	-runway incursion	- runway incursions per 1000 operations signage: - number of failures or defects found during routine inspection - number of defects reported - average lead-time for repair/replacement (per month/quarter/year & trends)
	-collision with vehicle on ground / ground-equipment	- notified platform safety rules violations per 1000 operations.
	-ground collision with wildlife	- number of ground collisions with wildlife

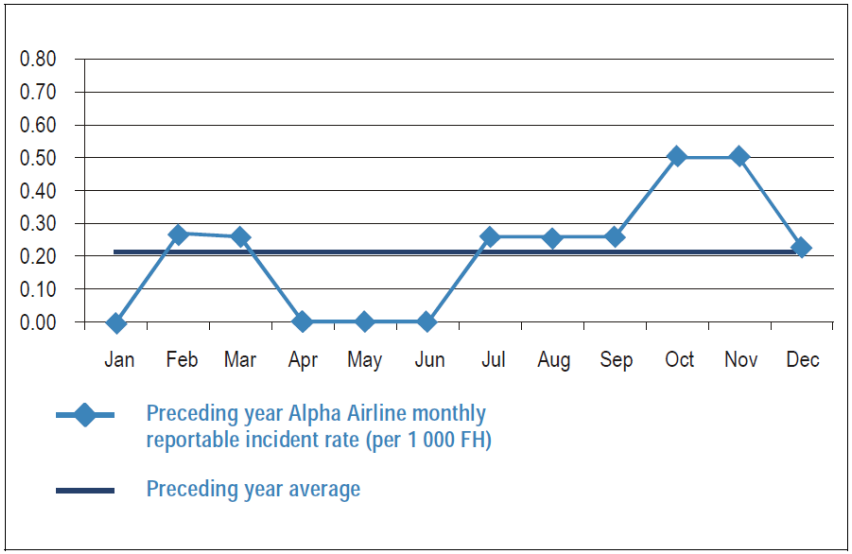
Indicators for operational issue		
Area	**High Severity outcome to be prevented**	**Metrics**
		- number of inspections of fences and other protective devices per month/quarter/year
	-FOD (Foreign Object Damage)	- number of FOD found during routine inspections - number of FOD found out of inspections and after report
	-runway incursion	runway lights - number of failures or defects found during routine inspection - number of defects reported - average lead-time for repair/replacement (per month/quarter/year & trends)
	-bird-strike In Flight Shut Down (IFSD)	- number IFSD per 10000 FH following bird-strike
Flight Training Organizations	-accident/incident related to poor training	- number of trainees per instructor - number of changes in instructor per training - number of major changes to training program (per month/quarter/year & trends)
	-accident/incident related to poor training/complacency during examinations	- number of significant deviations from average pass rates
Design Organizations	-design related accident/incidents	During the design phase: - number of design changes requested due to design errors per program and per period - number of rejected compliance demonstrations per program and per period
	-design planning related accident/incident	- % of technical reports with a difference > 10% between the expected lead time and the actual processing time - % of technical reports with a difference > 10% between the estimated work force and the actual needs
	design related accident/incidents	Post certification: - number of service difficulty/safety reports due to design errors per program and per period

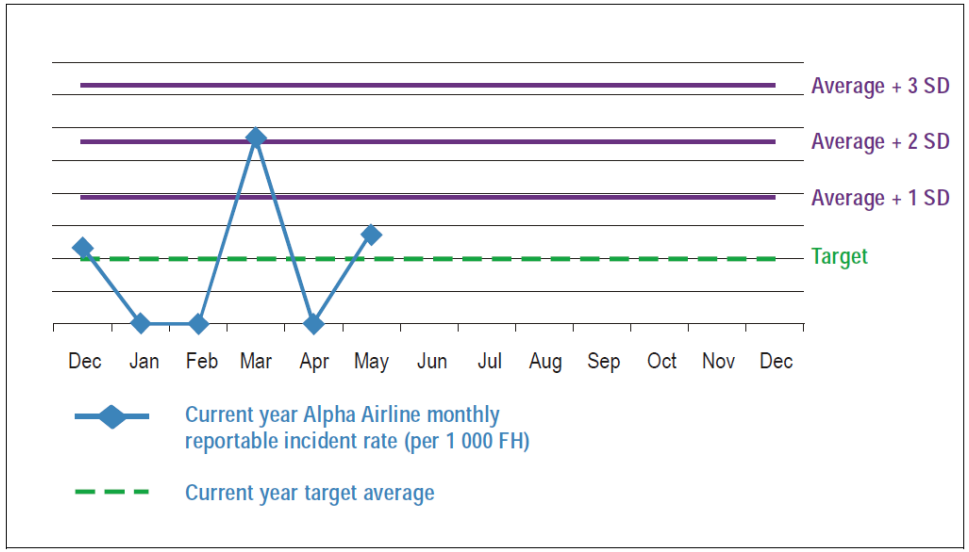
Indicators for operational issue		
Area	**High Severity outcome to be prevented**	**Metrics**
		- number of safety reports related to ambiguous design data - number of design changes classified incorrectly (minor/major) per period
Manufacturing Organizations	-manufacturing related accident/incidents	- number of service difficulty/safety reports due to manufacturing errors per program and per period
	-manufacturing process related accident/incidents	- % of work orders that required re-work - number of investigations performed following work orders that required re-work - % of duplicate inspections that identified a manufacturing error - number of cases where final delivery was delayed due to significant non-compliances - number of investigations performed following delayed delivery
	-manufacturing data related accident/incidents	- number of safety reports related to ambiguous manufacturing data
	-manufacturing planning related accident/incidents	- Production personnel fatigue / production error: - % of work orders with a difference > 10% between the estimated work force and the actual needs - % work orders with a difference > 10% between the expected lead time and the actual processing time

Indicators to monitor external factors		
Area	**Monitoring Focus**	**Metrics**
Regulations	- new regulations	- number of new regulatory requirements that will affect your organization within the next 12 months
	-amendments to regulations	- number of amended regulatory requirements that will affect your organization within the next 6 months

Indicators to monitor external factors		
Area	**Monitoring Focus**	**Metrics**
	-evolution towards performance-based regulations	- number of objective based rules for which you have defined your own means of compliance
Technology	- new technologies relevant to your core business – hardware	- % of total investment that is spent on new technologies
	-new technologies relevant to your core business – software	- % of total investment that is spent on new technologies
	-new technologies relevant to your core business	- rate of obsolescence of existing qualifications
	-new technologies installed in aircraft	- number of aircraft modifications / Supplemental Type Certificates (STCs) that require a change to your company's rating
	-new technologies installed in aircraft	- number of new modifications / STC that require new qualifications
Competition	-financial turn -over	- evolution in your turnover
	-staff turnover	- average time to fill a vacant post - number of staff leaving to work for a competitor
	-market opportunities	- evolution in the number of requests for quotation from new customers - ratio of requests for quotation from new customers that are followed by a firm order
	-competitors	- evolution in the number of your direct competitors

Table ATT 5-3. Example of an SMS safety performance indicator chart (with alert and target level settings)





a) Alert level setting:

The alert level for a new monitoring period (current year) is based on the preceding period's performance (preceding year), namely its data points average and standard deviation. The three alert lines are average + 1 SD, average + 2 SD and average + 3 SD.

b) Alert level trigger:

An alert (abnormal/unacceptable trend) is indicated if any of the conditions below are met for the current monitoring period (current year):
— any single point is above the 3 SD line
— 2 consecutive points are above the 2 SD line
— 3 consecutive points are above the 1 SD line.

When an alert is triggered (potential high risk or out-of-control situation), appropriate follow-up action is expected, such as further analysis to determine the source and root cause of the abnormal incident rate and any necessary action to address the unacceptable trend.

c) Target level setting (planned improvement):

The target level setting may be less structured than the alert level setting, e.g. target the new (current year) monitoring period's average rate to be say 5% lower (better) than the preceding period's average value.

d) Target achievement:

At the end of the current year, if the average rate for the current year is at least 5% or more lower than the preceding year's average rate, then the set target of 5% improvement is deemed to have been achieved.

e) Alert and target levels — validity period:

Alert and target levels should be reviewed/reset for each new monitoring period, based on the equivalent preceding period's average rate and SD, as applicable.

Table ATT 5-4. Sample data sheet used to generate a high-consequence SMS safety indicator chart (with alert and target setting criteria)

Preceding year						Current year							
Month	Total FH	Number of reportable/ MOR incidents	Incident rate*	Average		Month	Total FH	Number of reportable/ MOR incidents	Incident rate*	Preceding year average + 1 SD	Preceding year average + 2 SD	Preceding year average + 3 SD	Current year target average
January	3992	---	0.00	0.21		January	4369	1.00	0.23	0.39	0.56	0.73	0.20
February	3727	1.00	0.27	0.21		February	4090	0.00	0.00	0.39	0.56	0.73	0.20
March	3900	1.00	0.26	0.21		March	3316	0.00	0.00	0.39	0.56	0.73	0.20
April	3870	---	0.00	0.21		April	3482	2.00	0.57	0.39	0.56	0.73	0.20
May	3976	---	0.00	0.21		May	3549	0.00	0.00	0.39	0.56	0.73	0.20
June	3809	---	0.00	0.21		June	3633	1.00	0.28	0.39	0.56	0.73	0.20
July	3870	1.00	0.26	0.21		July				0.39	0.56	0.73	0.20
August	3904	1.00	0.26	0.21		August				0.39	0.56	0.73	0.20
September	3864	1.00	0.26	0.21		September				0.39	0.56	0.73	0.20
October	3973	2.00	0.50	0.21		October				0.39	0.56	0.73	0.20
November	3955	2.00	0.51	0.21		November				0.39	0.56	0.73	0.20
December	4369	1.00	0.23	0.21		December				0.39	0.56	0.73	0.20
		Average	0.21					Average					
		SD	1.8					SD					

Average + 1 SD	Average + 2 SD	Average + 3 SD		Current year target is say 5% average rate improvement over the average rate for the preceding year, which is:	0.20
0.39	0.56	0.73			

Current year alert level setting criteria is based on preceding year (Average + 1/2/3 SD).

* Rate calculation (per 1000 FH)

Table ATT 5-5 Example of Alpha Airline's SMS safety performance measurement (say for the year 2010)

High-consequence safety performance indicator					
SPI description		*SPI alert level criteria (for 2010)*	*Alert level breached (Yes/No)*	*SPI target level criteria (for 2010)*	*Target achieved (Yes/No)*
1	Alpha Airline's A320 fleet monthly serious incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	Yes	5% improvement of the 2010 average rate over the 2009 average rate	No
2	Alpha Airline's A320 fleet engine IFSD incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	Yes	3% improvement of the 2010 average rate over the 2009 average rate	Yes
3	etc				

Lower-consequence safety indicators					
SPI description		*SPI alert level criteria (for 2010)*	*Alert level breached (Yes/No)*	*SPI target level criteria (for 2010)*	*Target achieved (Yes/No)*
1	Operator combined fleet monthly incident rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	Yes	5% improvement of the 2010 average rate over the 2009 average rate	No
2	Operator internal QMS annual audit LEI % or findings rate (findings per audit)	More than 25% average LEI or any Level 1 finding or more than 5 Level 2 findings per audit	Yes	5% improvement of the 2010 average rate over the 2009 average rate	Yes
3	Operator voluntary hazard report rate (e.g. per 1 000 FH)	TBD		TBD	
4	Operator DGR incident report rate (e.g. per 1 000 FH)	Average + 1/2/3 SD (annual or 2 yearly reset)	No	5% improvement of the 2010 average rate over the 2009 average rate	Yes
5	etc.				

Note 1.— Other process indicators. Apart from the above SMS level safety indicators, there may be other system level indicators within each operational area of an organization. Examples would include process- or system-specific monitoring indicators in engineering, operations, QMS, etc., or indicators associated with performance-based programmes such as fatigue risk management or fuel management. Such process- or system-specific indicators should rightly be administered as part of the system or process concerned. They may be viewed as specific system or process level indicators which supplement the higher level safety performance indicators. They should be addressed within the respective system or process manuals/SOPs as appropriate. Nevertheless, the criteria for setting alert or target levels for such indicators should preferably be aligned with that of the SMS level safety performance indicators where applicable.

Note 2.— Selection of indicators and settings. The combination (or package) of high and lower-consequence safety indicators is to be selected by an organization according to the scope of the organization's system. For those indicators where the suggested alert or target level setting criteria is not applicable, the organization may consider alternate criteria as appropriate. General guidance is to set alerts and targets that take into consideration recent historical or current performance.

ATTACHMENT 6 EXAMPLES OF "SAFETY RISK MITIGATION WORKSHEET"

Company Name	**Safety Risk Mitigation Worksheet**	Control No:

Table 2-A2-1. Hazard and Consequence

Operation/Process:	Describe the process/operation/equipment/system being subjected to this HIRM exercise.		
Hazard:	If there is more than one hazard to the operation/process, use a separate worksheet to address each hazard.		
Unsafe Event:	If there is more than one UE to the hazard, use a separate worksheet to address each UE-UC combination.		
Ultimate Consequence:	If there is more than one UC to the hazard, use a separate worksheet to address each UC.		

Table 2-A2-2. Risk Index and Tolerability of Consequence/Unsafe Event

	Current risk tolerability (taking into consideration any existing PC/RM/EC)				Resultant Risk index and tolerability (taking into consideration any new PC/RM/EC)		
	Severity	Probability	Tolerability		Severity	Probability	Tolerability
Unsafe Event							
Ultimate Consequence							

Table 2-A2-3. Risk mitigation

Hazard	PC	EF	EC		RM	EF	EC	
H	PC1 (Existing)	EF (Existing)	EC1(Existing)	UE	RM1	EF (to RM1)	EC (to EF)	UC
			EC2(New)					
	PC1 (Existing)	EF1(New)	EC (New)		RM2	EF (to RM2)	EC (to EF)	
		EF2(New)	EC (New)					
	PC1 (New)	EF(New)	EC (New)		RM3	EF (to RM3)	EC (to EF)	

Safety Risk Mitigation Worksheet - Sample 1

1. *Operation/process (Table 2-A2-1).* Description of the operation or process which is being subjected to this hazard/risk mitigation exercise.
2. *Hazard (H).* An undesirable condition or situation which may lead to unsafe event(s) or occurrence(s). Sometimes the term “threat” (e.g. TEM) is used instead of “hazard”.
3. *Unsafe event (UE).* A possible intermediate unsafe event before any ultimate consequence, accident or most credible outcome. Identification of an unsafe event is applicable only where there is a need to distinguish and establish mitigating actions upstream and downstream of such an intermediate event (before the ultimate consequence/accident) (e.g. “over temperature event” before an “engine failure”). If this intermediate UE state is not applicable for a particular operation, then it may be excluded as appropriate.
4. *Ultimate consequence (UC).* The most credible outcome, ultimate event or accident.
5. *Preventive control (PC).* A mitigating action/mechanism/defence to block or prevent a hazard/threat from escalating into an unsafe event or ultimate consequence.
6. *Escalation factor (EF).* A possible latent condition/factor which may weaken the effectiveness of a preventive control (or recovery measure). Use where applicable only. It is possible that an escalation factor may sometimes be referred to as a “threat”.
7. *Escalation control (EC).* A mitigating action/mechanism to block or prevent an escalation factor from compromising or weakening a preventive control (or recovery measure). Use where applicable only.
8. *Current risk index and tolerability.* Risk mitigating action (Table 2-A2-3) is applicable whenever an unacceptable current tolerability level of an unsafe event or ultimate consequence is identified in Table 2-A2-2. Current risk index and tolerability shall take into consideration existing preventive controls, where available.
9. *Resultant risk index and tolerability.* Resultant risk index and tolerability are based on the combined current preventive controls (if any) together with the new preventive controls/escalation controls/recovery measures put in place as a result of the completed risk mitigation exercise.

Table Att-1. Severity table (basic)

Level	*Descriptor*	*Severity description (customize according to the nature of the product or the service provider's operations)*
1	Insignificant	No significance to aircraft-related operational safety
2	Minor	Degrades or affects normal aircraft operational procedures or performance
3	Moderate	Partial loss of significant/major aircraft systems or results in abnormal application of flight operations procedures
4	Major	Complete failure of significant/major aircraft systems or results in emergency application of flight operations procedures
5	Catastrophic	Loss of aircraft or lives

Table Att-2. Severity table (alternate)

		Severity description (customize according to the nature of the product or service provider's operations)					
Level	*Descriptor*	*Safety of aircraft*	*Physical injury*	*Damage to assets*	*Potential revenue loss*	*Damage to environment*	*Damage to corporate reputation*
1	Insignificant	No significance to aircraft-related operational safety	No injury	No damage	No revenue loss	No effect	No implication
2	Minor	Degrades or affects normal aircraft operational procedures or performance	Minor injury	Minor damage Less than $__	Minor loss Less than $__	Minor effect	Limited localized implication
3	Moderate	Partial loss of significant/major aircraft systems or results in abnormal flight operations procedure application	Serious injury	Substantial damage Less than $__	Substantial loss Less than $__	Contained effect	Regional Implication
4	Major	Complete failure of significant/major aircraft systems or results in emergency application of flight operations procedures	Single fatality	Major damage Less than $__	Major loss Less than $__	Major effect	National Implication
5	Catastrophic	Aircraft/hull loss	Multiple fatality	Catastrophic damage More than $__	Massive loss More than $__	Massive effect	International implication

Note.— Use the highest severity level obtained to derive the risk index in the risk index matrix table.

Table Att-3. Likelihood table

Level	*Descriptor*	*Likelihood description*
A	Certain/frequent	Is expected to occur in most circumstances
B	Likely/occasional	Will probably occur at some time
C	Possible/remote	Might occur at some time
D	Unlikely/improbable	Could occur at some time
E	Exceptional	May occur only in exceptional circumstances

Table Att-4. Risk index matrix (severity × likelihood)

Likelihood	*Severity*				
	1. Insignificant	*2. Minor*	*3. Moderate*	*4. Major*	*5. Catastrophic*
A. Certain/frequent	Moderate (1A)	Moderate (2A)	High (3A)	Extreme (4A)	Extreme (5A)
B. Likely/occasional	Low (1B)	Moderate (2B)	Moderate (3B)	High (4B)	Extreme (5B)
C. Possible/remote	Low (1C)	Low (2C)	Moderate (3C)	Moderate (4C)	High (5C)
D. Unlikely/improbable	Negligible (1D)	Low (2D)	Low (3D)	Moderate (4D)	Moderate (5D)
E. Exceptional	Negligible (1E)	Negligible (2E)	Low (3E)	Low (4E)	Moderate (5E)

Table Att-5. Risk acceptability (tolerability) table

Risk Index	*Tolerability*	*Action required (customize as appropriate)*
5A, 5B, 4A	Extreme risk	Stop operation or process immediately. Unacceptable under the existing circumstances. Do not permit any operation until sufficient control measures have been implemented to reduce the risk to an acceptable level. Top management approval required.
5C, 4B, 3A	High risk	Caution. Ensure that risk assessment has been satisfactorily completed and declared preventive controls are in place. Senior management approval of risk assessment before commencement of the operation or process.
1A, 2A, 2B, 3B, 3C, 4C, 4D, 5D, 5E	Moderate risk	Perform or review risk mitigation as necessary. Departmental approval of risk assessment.
1B, 1C, 2C, 2D, 3D, 3E, 4E	Low risk	Risk mitigation or review is optional.
1D, 1E, 2E	Negligible risk	Acceptable as is. No risk mitigation required.

Company Name	Safety Risk Mitigation Worksheet	Control No.:

Evaluated By/ Date		Reviewed By/ Date		Approved by/ Date	
Process Description					

No.	Hazard Description	Cause/Factor	Risk Rating			Current Measure to Reduce the Risk	Further Action to Reduce Risk	Risk Rating			Responsibility
			P	S	R			P	S	R	

P: Probability **S**: Severity **R**: Risk

Safety Risk Mitigation Worksheet - Sample 2

ATTACHMENT 7 GLOSSARY

ALARP As low as reasonably practicable

ALoS Acceptable level of safety

AMO Approved maintenance organization

AOC Air operator certificate

EMS environment management system

ERP Emergency response plan

OHSMS occupational health and safety management system

QA Quality assurance

QC Quality control

QMS Quality management system

SA Safety assurance

SAG Safety action group

SARPs Standards and Recommended Practices (ICAO)

SEMS Security Management System

SMM Safety management manual

SMS Safety management system(s)

SMSM Safety management systems manual

SOPs Standard operating procedures

SRB Safety review board

SRM Safety risk management

SSP State safety program